INNOVATIVE QUALIFICATIONS FOR TECHNOLOGICAL AND ORGANIZATIONAL INNOVATION IN BUILDING SECTOR

D. 3.2 – Identification of a training scheme for the qualification ”Construction Site Technician”

WP3 – Implementation and update of the common qualification “Construction Site Technician”

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1. Introduction

The technological and organisational innovation and the changing normative framework in the construction industry requires to update existing or introduce new qualification profile for Construction site technician. This can be done by integrating and in some cases improving the existing knowledges, skills and capabilities. The person who has acquired the construction site technician qualification offered in the ICARO project, working together with a senior construction manager, will become a very important part of the construction process.

The purpose of this document is to define the training scheme for the common qualification “Construction site Technician” in order to create a technical background and a common cultural reference. The training scheme has to provide clear evidence of the cultural revolution in progress, a paradigm shift that involves the entire construction industry and specifically the key figure of the Construction Site Technician.

The content of the qualification is set out in the previous intellectual outputs trough Tasks 2.1, 2.2 and 2.3 by experts involved in the partnership. The learning outcomes identified in them are the basis for this document.

The training scheme also contains a work-based learning component. It is necessary that training institutions are able to build a "database" of the companies interested in the course and the young people trained. Furthermore, training centers should prepare indicators, based on EQAVET (see deliverable D4.2 EQAVET Quality Assurance in ICARO) to define the relationship with the company in order to foster a transparent way for the recruitment of the students.

A match between Training Scheme and EU standards will be done in order to validate and certificate the learning outcomes with reference to ECVET and EQF. This action will

enhance the mobility of workers, according to one of the objectives of the Europe 2020 Strategy.

Learning on the job and mobility become the determinants of a real Work Integration Plan that is necessary to be able to manage in quality, with those tools that the ICARO project intends to propose.

2. Preconditions for integration of ICARO learning outcomes

Updating or changing VET curriculum is not a direct or easy process in all the cases. In the case of ICARO learning outcomes this process depends mainly on two factors:

- The correspondence of the ICARO learning outcomes with existing learning outcomes in the current VET curricula for Construction Site Technicians;
- The autonomy of a VET provider to update or change the current curricula. In some countries, curriculum is defined primarily at the national level, while in other education systems curriculum is more a matter for local and even classroom-based decision-making.

The first step that a VET provider has to do is to analyse and compare the ICARO defined learning outcomes with the current VET curricula for construction site technicians.

To integrate those learning outcomes that are not present, it is necessary to know whether the VET provider has autonomy to include them in their curricula. If that is the case, the integration can be done without any difficulty by adjusting the learning outcomes of the Construction Site Technician qualification.

In any other case, the VET provider interested in delivery of the ICARO learning outcomes has to use alternative solutions like defining new optional credits or define a special diploma for those students that do the training intended with ICARO qualification.

3. Structure of the training scheme for the new qualification of Construction Site Technician

The design of the new curriculum should be structured around the main learning outcomes which were defined by the ICARO project team in the presentation of the new Construction site technician qualification scheme and divided into seven key qualification units, which are as follows:

- Construction Site Technician's preliminary activities;
- Site management and coordination of building site's activities (residential and commercial buildings, engineering structures, infrastructure);
- Energy efficiency and sustainable construction;
- Waste management;
- Digitalization;
- Soft skills;
- Specific skills with reference to the construction site typology.

In the context of the EU, the new Construction Site Technician qualification is based on ECVET (European Credit system for Vocational Education and Training) credit system. ECVET works hand in hand with the European Qualifications Framework (EQF) to provide greater transparency in European qualifications, promoting the mobility of workers and learners, and facilitating lifelong learning. ICARO learning units will lead to an EQF 5 qualification.

ECVET credits are a numerical representation of the overall weight of learning outcomes in a qualification and of the relative weight of units in relation to the qualification. Thus, if the learning process is conducted in member country, the suggested weighting and allocation of ECVET credits for ICARO's course are as follows:

Qualification unit 1 ~8% – > 2 credits (25 hours->1 credit);

Qualification unit 2 ~17% – > 4 credits (25 hours->1 credit);

Qualification unit 3 ~21% – > 5 credits (25 hours->1 credit);

Qualification unit 4 ~10% – > 2 credits (25 hours->1 credit);

Qualification unit 5 ~21% – > 5 credits (25 hours->1 credit);

Qualification unit 6 ~15% – > 4 credits (25 hours->1 credit);

Qualification unit 7 ~8% – > 2 credits (25 hours->1 credit).

Total recommended time of the course is 600 hours (with minimum of 120 WBL hours), corresponding to 24 ECVET credits.

Having completed the course, learners will acquire:

- General knowledge on Construction Site Technician's preliminary activities;
- Principles of site management and coordination of building site's activities;
- Knowledge on energy efficiency and sustainable construction;
- Basics of waste management;
- Principles and benefits of construction digitalization;
- Improving the soft skills required in the activities of a construction site technician;
- General knowledge on specific skills needed in construction site management.

Materials and teaching resources required for ICARO qualification trainings	
Teaching materials	**Recourses for practical training**
Relevant textbooks	A practical training class, equipped with: • computers with Internet access;
Slide show presentations	

Tests and tasks to assess acquired skills	• materials and equipment for acquiring knowledge about the installation of ventilated facades; • materials and equipment to master the knowledge about the installation of external wall insulation; • materials and equipment to acquire knowledge about the installation of roof waterproofing and insulation; • modern digital technologies used on the construction site.
Legislation, regulations and other normative documents related to: • occupational health and safety; • requirements for construction technical documents; • energy efficiency; • waste management; • CAD and BIM models;	
Examples of building projects and its technical documentations,	Computer class, equipped with computer equipment corresponding to the present day requirements of the software (Software for working with CAD and BIM models, project management software and current communication software).
Examples of case studies to explain individual topics	Stands to demonstrate the operation of energy efficient equipment.

3.1. Qualification Unit 1 - Construction Site Technician's preliminary activities

Unit Summary:

First qualification unit introduces to skills, such as the identification of the best methodology for the implementation of technical solutions are developed, knowledge

about normative documents of occupational health and safety and how to implement it, knowledge of requirements of legal acts for environmental protection and safe use of materials, warehousing, energy efficiency and effective use of other resources, monitoring and improving the process. Learners will learn how to prepare reports and how inspections are performed.

By completing this unit learners should gain these competences:

- To be able to analyse technical project and planning of working activities;
- To be able to implement occupational health and safety solutions;
- To be able to implement circular economy and environmental protection solutions at the stages of building construction and use;
- To be able to apply instructions of the project and technical documentation concerning the environmental resources.

<table>
<tr><td colspan="2">Unit 1 - Construction Site Technician's preliminary activities</td><td colspan="2">Total duration: ~8% of all course</td></tr>
<tr><td colspan="2">Recommended Knowledge:</td><td colspan="2">Construction fundamentals</td></tr>
<tr><td colspan="2">EQF level:</td><td colspan="2">5</td></tr>
<tr><td colspan="2">ECVET credits:</td><td colspan="2">2 credits</td></tr>
<tr><td colspan="4">Competencies of Unit 1</td></tr>
<tr><td>1.1. Analysing technical project and planning of working activities.</td><td>1.2. Implementing occupational health and safety solutions.</td><td>1.3. Implementing circular economy and environmental protection solutions at the stages of building construction and use.</td><td>1.4. Applying instructions of the project and technical documentation concerning the environmental</td></tr>
</table>

			resources.
Delivery methods			
Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material			
Assessment			
Evaluation task together with work-based learning experience			

3.1.1. Analysing technical project and planning of working activities

Competence 1 - Analysing technical project and planning of working activities	
General description	
Propose and analyse an initial study plan/programme, proposed project of work, to establish its Base Plan/Programme, carrying out basic performance calculations.	
Learning outcomes	
Knowledge	*Good knowledge about methodologies for the implementation of technical solutions*
	Good knowledge about composition of technical project
	Good knowledge about construction materials
Skills	*Ability to analyse systemised information and data*
	Ability to perform calculations and to approve the materials selected in accordance with the construction project
	Ability to explain the choices with argumentations
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Methodologies applied for the	The initial situation is analysed according to an established model of the processes (phases and sub-phases), detecting the

implementation of technical solutions	information necessary for its complete definition. The performance data of the sub-processes (activities) are determined from databases or estimates indicated by the person in charge or the manager.
Composition of the technical project and its analysis	Prepare a preview of the Execution Plan/Programme for reviewing by the planning manager, taking data and identifying activities, estimating resources and durations and establishing relationships, according to the direction of the project/work execution.
Selection and calculation of building materials	Complete and conform the information of chapters and items to know the economic scope of the project/work proposed, applying the established coding system and generating a budget (Initial Cost Estimation).

3.1.2. Implementing occupational health and safety solutions

Competence 2 - Implementing occupational health and safety solutions	
General description	
Detect contingencies related to occupational risks, facilities and conditions of the assigned work/s, carrying out the required checks, in order to promote and control a safety development of the work, in accordance with the Health and Safety Plan and with the specific regulations for construction works.	
Learning outcomes	
Knowledge	*Good knowledge about normative documents of occupational health and safety*
	Good knowledge about solutions used to ensure work safety
	Good knowledge about composition of security working plan
Skills	*Ability to apply the requirements of normative documents of occupational health and safety*
	Ability to adopt rational and effective solutions, in collaboration with profiles in charge of security at work
	Ability to evaluate the security working plan
Delivery and Assessment	
The unit will be delivered through:	The unit will be assessed through:

– Theoretical lessons – Practical activities – Discussions – Role-play	– Evaluation – Oral examination/exercises – Project – Written exercises/test

Content outlines	
Content	**Description**
Normative documents of occupational health and safety applied in construction	Identify the activities inherent to health and safety at work and the basic regulatory framework that regulates it in the construction sector, assessing the importance of the measures and techniques for the prevention of occupational hazards and protection, as well as the need for preventive management.
Solutions used to ensure security at work	Monitor and control basic preventive actions during the execution of the activities carried out in the work/s assigned, in order to promote the safe development of the works, checking the adequate use of the equipment and means of work.
Security working plan – its composition and application	Identify the prescriptions of the Health and Safety Plan of construction site for different types of works, interpreting the measures to be applied on the basis of Health and Safety Plans and construction site blueprints.

3.1.3. Implementing circular economy and environmental protection solutions at the stages of building construction and use

Competence 3 - Implementing circular economy and environmental protection solutions at the stages of building construction and use	
General description	
General overview about the basic concepts driving the Prevention of Construction and Demolition Waste (CDW) and the existing relevant legislation, as well as of the more established internationally methods / techniques for the prevention of CDW	
Learning outcomes	
Knowledge	*Good knowledge of requirements of legal acts for environmental protection and safe use of materials, warehousing*
	Good knowledge of requirements of legal acts for energy efficiency and effective use of other resources

Skills	*Ability to monitor and improve the use of materials*
	Ability to acquire information concerning industrial process, machinery and plants, raw materials
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Application of legal acts for environmental protection and safe use of materials, warehousing	General overview of the main sustainable construction acts, techniques and of the sustainability indicators used for assessing the sustainability performance of new or existing buildings, related to their design, construction, materials, operation, maintenance, refurbishment and end of life.
Application of legal acts for energy efficiency and effective use of other resources	General overview of the main national and international Energy efficiency regulations, the new technologies applied to buildings 'maintenance and refurbishment and their importance for a better quality and performance of existing buildings.
Effective use of materials and other resources	Knowing the established methods / techniques applied for the reuse and recycling of Construction and Demolition Waste (CDW), the kind of CDW materials that can be reused and/or recycled, as well as the issue of separation and sorting of CDW at the construction site.

3.1.4. Applying instructions of the project and technical documentation concerning the environmental resources

Competence 4 - Applying instructions of the project and technical documentation concerning the environmental resources
General description

Recognise the function and presentation of the most important documents specific to an Integrated Quality System (Quality, Environment and Risks Prevention), their contents and specific management aspects.	
Learning outcomes	
Knowledge	*Good knowledge about environmental conduct of the company*
	Good knowledge about environmental embedded and unified management systems
Skills	*Ability to organize inspections, recons, firm and environmental examinations*
	Ability to prepare reports on the environmental conduct of the company
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Evaluation of environmental conduct of the company	Basic knowledge on the environmental legislations and monitoring of its compliance.
Applicable operations for firm and environmental examinations	Describe the documentary control processes related to an Integrated Quality System, identifying the documents associated with the areas of quality and environment.

3.2. Qualification Unit 2 - Site management and coordination of building site's activities (residential and commercial buildings, engineering structures, infrastructure)

Unit Summary:

This unit covers areas such as: Preparation of construction documentation, filling of various forms, monitoring of the correct execution of work, monitoring of logistics and procurement process, coordination of work teams in accordance with the project schedule of works. It also introduces to preparation of the executive design of construction works, construction rules, assessment of effectiveness of solutions, identification of budgetary estimation for the working activities, selection of means and materials and construction products according to the structure design documentation.

The main competencies to be acquired in this unit are the following:

- To be able to prepare construction documentation, under the management of the supervision and be able to manage the daily work on site;
- To be able to supervise the implementation of the technical solutions of the project and the construction process;
- To be able to organise technical construction works on site;
- To be able to coordinate Construction Site staff.

Unit 2 - *Site management and coordination of building site's activities (residential and commercial buildings, engineering structures, infrastructure)*	**Total duration:** *~17% of all course*		
Recommended Knowledge:	Construction fundamentals, Management fundamentals		
EQF level:	5		
ECVET credits:	4 credits		
Competencies of Unit 2			
2.1. Preparation of construction	2.2. Supervision of the implementation	2.3. Organising technical	2.4. Coordination of Construction

documentation, under the management of the supervision and ability to manage the daily work on site.	of the project technical solutions and the construction process	construction works on site	Site staff
Delivery methods			
Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material			
Assessment			
Evaluation task together with work-based learning experience			

3.2.1. Preparation of construction documentation, under the management of the supervision and ability to manage the daily work on site

Competence 1 - Preparation of construction documentation, under the management of the supervision and ability to manage the daily work on sit	
General description	
Competence 1 deals with the management of activities on site and with the preparation of operative documentation. It also implies the ability to distribute the tasks and responsibilities within the staff and workers. The Construction site technician will also learn how to manage and solve eventual issues and problems.	
Learning outcomes	
Knowledge	*Good knowledge of construction documentation (graphs, models and parts of drawings), both on paper and with electronic tools.*
	Good knowledge of the procedure to implement the planned activities, by managing the variances.
	Good knowledge about site management activities.
Skills	*Ability to prepare construction documentation, under the supervision of the project manager.*
	Ability to manage the daily activities on site.
	Ability to manage the process related to electronic documentation.

Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test

Content outlines	
Content	**Description**
Documents used in construction	Construction site start-up documents, safety documentation and accounting documents; Organizational model and site organization chart; Timetable and site layout; Regulatory aspects relating to the development of construction works.
Define the relief and tracking of the work to be carried out	Survey and tracing technique with electronic and traditional instrumentation.
Construction work monitoring and process management	Technique for the organization and activity of the construction site (phases, processes, roles and tools); Preparation of construction sites yard and site traffic.
Preparation of drawings for construction works	Preparation of drawings for the performance and explanation of daily tasks.

3.2.2. Supervision of the implementation of the project technical solutions and the construction process

Competence 2 - Supervision of the implementation of the project technical solutions and the construction process
General description
Competence 2 deals with the responsibility of the construction site technician to correctly implement the procedures foreseen in the project received by the designer; the technician will also learn to critically analyse the situation and identify possible solutions to technical and operative issues on site.
Learning outcomes

Knowledge	*Good knowledge about executive design of construction works.*
	Good knowledge of construction work monitoring report and construction rules.
	Good knowledge of activity budgetary estimate and of estimated metrics.
Skills	*Ability to supervise the implementation of the technical solutions of the project and the construction process.*
	Ability to evaluate the effectiveness of solutions, in compliance with the supervisor's instructions.
	Ability to prepare an adequate estimate of costs and timing of construction and check the executive design that has been produced by the team of expert.
	Ability to check and verify how much of the documents received is correctly executable and also suggest alternative solutions.

Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test

Content outlines	
Content	**Description**
Technological (executive) design of construction works	Work planning and site management; planning, control of production and processes; procedures for carrying out works in compliance with the general safety plan.
Application of effective solutions and their assessment	Strategies and techniques to optimize results and to address any critical issues.
Budgetary and metric estimations	Construction site accounting: preparation and use of accounting books.

3.2.3. Organising technical construction works on site

Competence 3 - Organising technical construction works on site

General description	
Competence 3 is devoted to the operative and daily activities on site. A specific focus will be on materials, logistic, orders of products in compliance with the project developed by the designer and other experts of higher profile.	
Learning outcomes	
Knowledge	*Good knowledge of construction materials.*
	Good knowledge about project design and compliance of materials with it.
	Good knowledge about material logistics and procurement process.
Skills	*Ability to organise technical construction works on site*
	Ability to select construction products according to the structure design documentation
	Ability to manage materials and orders considering the available resources.
	Ability to identify executive problems and suggest technical solutions.
	Ability to prepare construction progress reports
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Project specifications and selection of materials and products	Selection of construction products according to the structure design documentation; Technical characteristics, conditions and methods of use of materials, machines and equipment.
Material procurement process and logistics	Inspection of compliance and quality of received materials and management of order documents. Construction site logistics elements.

Organisation of operative activities on site	Preparation of daily and periodic reports; Principles of construction technology and building materials;

3.2.4. Coordination of Construction Site staff

Competence 4 - Coordination of Construction Site staff	
General description	
In this unit, the construction site technician will learn how to manage the working team; the main means of communication will be analysed and strategies for the active engagement of staff members will be identified. The technician should also master the financial aspects of the project design, in order to distribute the workforce correctly.	
Learning outcomes	
Knowledge	*Good knowledge about team coordination*
	Good knowledge about construction project timing and responsibilities.
	Good knowledge about working time documentation
Skills	*Ability to coordinate construction site staff*
	Ability to communicate tasks orally and in writing
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Correct formulation of tasks and their communication in different ways	Elements of project management; Communication with the members of the team, resolutions of relational issues.
Concepts of construction work teams and subcontractors	Human resource management and construction site organization techniques; Techniques and tools for quality control and production control; Elements of the subcontracting.

Working time accounting and related documentation	Completing working time documentation, control and assessment of performance of work teams and sub-contractors.

3.3. Qualification Unit 3 - Energy efficiency and sustainable construction

Unit Summary:

This unit describes the use of energy efficiency strategies and renewable energy system integration in buildings. Unit enclose basics on energy legislation and certifications, on the characteristics of sustainable construction, bioclimatic strategies measures, and the integration of renewable energy systems. Basic principles how to choose alternative solutions to oil-based fuels through renewable energies that can be easily applied to buildings consumptions: heating, cooling, hot water and electricity (DHW). Learning content introduces technologies of high energy efficiency applied during the installation of renewable energy systems and tools applied for energy monitoring in lighting consumption and generation. Energy efficiency deals not only with renewable sources but also with construction process, so this unit presents how the evaluation of the thermal behaviour of the building is made, proper technological and constructive solutions to reduce heat losses and entry of heat. Also monitoring and management activities explained of the execution of ventilated facades, external wall insulation systems, execution of waterproofing and insulation of roofs, walls and underground floors according to technical specifications of the project.

This qualification unit has five main competences needed to be achieved by completing its course:

- To be able to take care of the implementation of the solution that have been designed, which influence the energy performance of the building, and eventually propose solution;
- To know the thermal behaviour of the building;
- To be able to monitor the construction of Ventilated Facades;
- To be able to monitor the installation of External Wall Insulation Systems;
- To be able to monitor waterproofing and insulation of roofs, walls and underground floors.

<table>
<tr><td colspan="2">Unit 3 - Energy efficiency and sustainable construction</td><td colspan="3">Total duration: ~21% of all course</td></tr>
<tr><td colspan="2">Recommended Knowledge:</td><td colspan="3">Construction fundamentals, Energy fundamentals, Management fundamentals</td></tr>
<tr><td colspan="2">EQF level:</td><td colspan="3">5</td></tr>
<tr><td colspan="2">ECVET credits:</td><td colspan="3">5 credits</td></tr>
<tr><td colspan="5">Competencies of Unit 3</td></tr>
<tr><td>3.1. To be able to take care of the implementation of the solution that have been designed, which influence the energy performance of the building, and eventually propose solution</td><td>3.2. To know the thermal behaviour of the building.</td><td>3.3. Monitoring the construction of Ventilated Facades</td><td>3.4. Monitoring the installation of External Wall Insulation Systems</td><td>3.5. Monitoring of waterproofing and insulation of roofs, walls and underground floors</td></tr>
<tr><td colspan="5">Delivery methods</td></tr>
<tr><td colspan="5">Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material</td></tr>
<tr><td colspan="5">Assessment</td></tr>
</table>

Evaluation task together with work-based learning experience

3.3.1. Taking care of the implementation of the solution that have been designed, which influence the energy performance of the building, and eventually propose solution.

Competence 1 - Taking care of the implementation of the solution that have been designed, which influence the energy performance of the building, and eventually propose solution	
General description	
General overview about the renewable energy systems that apply to the building sector and monitor execution processes.	
Learning outcomes	
Knowledge	*Good knowledge about renewable energy sources*
	Good knowledge about renewable energies that can be easily applied to buildings consumptions
	Good knowledge about energy monitoring tools
Skills	*Ability to control the execution of the elements that influence the energy performance of the building*
	Ability to identify the components of energy labels for buildings and their indicators
	Ability to use high energy efficiency technologies in construction process
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Types of renewable energy sources	Being able to recognize the different renewable energy systems used in the building sector.
Use of renewable energy sources for	Being able to supervise the installation of renewable energy systems and their processes.

different building consumption systems	
Energy labels for buildings and their indicators	Being able to extract and comunicate information about the (voluntary) environmental labelling applied in the EU and internationally and why they are useful in the construction industry.
Energy monitoring process	Explanation of montoring tools and ability to choose the adequate one according to construction process.

3.3.2. Knowing the thermal behaviour of the building.

Competence 2 - Knowing the thermal behaviour of the building.	
General description	
Knowing the importance of thermal insulation types and insulation systems requirements for the thermal performance of buildings, the materials, execution and quality requirements, the suitability and sustainability of applications techniques for anomalies mitigation and the energy rehabilitation of buildings.	
Learning outcomes	
Knowledge	*Good knowledge about thermal behaviour of the building*
	Good knowledge about constructive solutions to reduce heat losses and entry of heat
Skills	*Ability to analyse the thermal behaviour of the building*
	Ability to recognise pathologies and together outlining the phases to be taken in a retrofitting building
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Thermal behaviour of the building	Knowing the importance of a good thermal insulation of the building in order to acomplish energy efficiency standards
The most common	Being able to identify most common mistakes when isolating

pathologies and outline phases to be taken	buildings from a thermal and acustic perspective and be able to tackle those pathologies accordingly.
Technological and constructive solutions intended to reduce heat losses and entry of heat	Knowing the best constructive solutions to avoid or reduce heat losses/entry in order to accomplish energy efficiency standards.

3.3.3. Monitoring the execution of Ventilated Facades according to project design

Competence 3 - Monitoring the execution of Ventilated Facades according to project design	
General description	
Know the adequate materials and the phases to be followed for the execution of ventilated facedes.	
Learning outcomes	
Knowledge	*Good knowledge of steps for installing ventilated facades*
	Good knowledge about materials used for the installation of ventilated facades
Skills	*Ability to monitor the construction of ventilated facades*
	Ability to determine that the installation of ventilated facades is carried out in accordance with the technical specifications of the project
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Installation technology of ventilated facades	Knowing new methods and technologies adequate to install ventilated facades and the construction process.
Materials used for	Identification of the materials that should be used for ventilated

ventilated facades	facedes acording to the construction project

3.3.4. Monitoring the installation of External Wall Insulation Systems

Competence 4 - Monitoring the installation of External Wall Insulation Systems	
General description	
Know the adequate materials and the phases to be followed for the execution of external wall insulation systems	
Learning outcomes	
Knowledge	*Good knowledge of steps for installing external wall insulation systems*
	Good knowledge about materials used for the installation of external wall insulation systems
Skills	*Ability to monitor the installation of external wall insulation systems*
	Ability to determine that the installation of external wall insulation systems is carried out in accordance with the technical specifications of the project
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Installation technology of external wall insulation systems	Knowing new methods and technologies adequate to install external wall insulation systems.
Materials used for external wall insulation systems	Identification of the materials that should be used for external wall insulation systems acording to the construction project making the building more energy efficient

3.3.5. Monitoring of waterproofing and insulation of roofs, walls and underground floors

Competence 5 - Monitoring of waterproofing and insulation of roofs, walls and

underground floors	
General description	
Know the adequate materials and the phases to be followed for the execution of waterproofing and insulation of roofs, walls and underground floors	
Learning outcomes	
Knowledge	*Good knowledge of steps for installing waterproofing and insulation of roofs, walls and underground floors*
	Good knowledge about materials used for the installation of waterproofing and insulation of roofs, walls and underground floors
Skills	*Ability to manage waterproofing and insulation of roofs, walls and underground floors*
	Ability to determine that the installation of waterproofing and insulation of roofs, walls and underground floors is carried out in accordance with the technical specifications of the project
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Installation technology of waterproofing and insulation of roofs, walls and underground floors	Knowing new methods and technologies adequated to install waterproofing and insulation of roofs, walls and underground floors
Materials used for waterproofing and insulation of roofs, walls and underground floors	Identification of the materials that should be used for waterproofing and insulation of roofs, walls and underground floors according to the construction project.

3.4. Qualification Unit 4 - Waste management

Unit Summary:

The main aim of this unit is to present general EU policy and regulations regarding waste management. It introduces to different waste materials and their procedures of disposal. Main knowledge about construction waste chain and its management are introduced.

Fourth qualification unit of ICARO Construction Site Technician qualification has two main competences:

- To be able to manage the construction and demolition waste chain, by overseeing all the step of the process;
- To be able to manage the specific types of waste materials.

Unit 4 - *Waste management*	**Total duration:** *~10% of all course*
Recommended Knowledge:	Construction fundamentals, Management fundamentals
EQF level:	5
ECVET credits:	2 credits
Competencies of Unit 4	
4.1. Managing the construction and demolition waste chain, by overseeing all the step of the process	4.2. Managing the specific types of waste materials
Delivery methods	
Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material	
Assessment	
Evaluation task together with work-based learning experience	

3.4.1. Managing the construction and demolition waste chain, by overseeing all the step of the process

Competence 1 - Managing the construction and demolition waste chain, by overseeing all the step of the process	
General description	
The learning unit deals with the knowledge of different typologies of waste materials and with the correct procedures to dispose the residues produced in a construction site. The tasks of the construction site technician in this field, are limited and always coordinated by the waste management expert.	
Learning outcomes	
Knowledge	*Good knowledge of legislative requirements for waste management*
	Good knowledge of procedures for the disposal of construction waste materials and residues.
	Good knowledge of construction project documentation dealing with waste management.
	Good knowledge about waste management strategy
Skills	*Ability to identify the different steps and responsibilities of the construction and demolition waste chain*
	Ability to understand and plan waste management strategy according to project documentation and in cooperation with the on-site expert.
	Ability to oversee all the step of the process
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
EU and national legislation to regulate construction waste management	Main legislative and regulatory references in the field of waste management and civil and productive discharges; Main legislative and regulatory references in the field of waste management and civil and productive discharges.

Construction site waste management plan and strategy development	Life cycle of construction waste; Interpretation and implementation of the procedures described into operative documents developed by the waste management expert.

3.4.2. Managing the specific types of waste materials

Competence 2 - Managing the specific types of waste materials	
General description	
In this unit the focus will be on legislative procedures, according to the different typologies of waste produced on a construction site. The construction site technician will learn how to interpret the documents received by the waste management expert and to correctly implement the defined procedures on operative site.	
Learning outcomes	
Knowledge	*Good knowledge of legislative requirements for waste management*
	Good knowledge of different waste materials
	Good knowledge about different procedures of disposal
Skills	*Ability to recognize the specific types of waste materials*
	Ability to plan the activities on site, keeping into account the rules for the correct management of construction waste materials, and with the support of a waste management experts present on site.
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Types of waste generated in construction	Environmental legislation and pollution factors in the construction sector;
Management of	Construction waste classification;

different types of waste and procedures of disposal	Special waste deriving from demolition, construction and excavation activities.

3.5. Qualification Unit 5 - Digitalization

Unit Summary:

The learning content covering digital construction is primarily concerned with digital tools designed to collaborate with other participants in construction projects. It includes tools for communication, project management. It acquaints with digital data used in construction projects and learn how to view it, how to collect data and store it correctly in the digital space. Of course, the learning content also deals with Building Information Modelling (BIM) methodology, which is increasingly used in construction, and its application in professional field.

This qualification unit covers these competences:

- To be able to get the information and data needed for the construction work;
- To be able to communicate and collaborate with the other construction stakeholders and colleagues;
- To be able to create, understand, manage and analyse digital content in construction;
- To be able to protect the personal and other digital data.

Unit 5 - *Digitalization*	**Total duration:** *~21% of all course*
Recommended Knowledge:	Construction fundamentals, Management fundamentals
EQF level:	5
ECVET credits:	5 credits

Competencies of Unit 5			
5.1. Getting the information and data needed for the construction work	5.2. Translation of information with highly technical content to the personnel responsible for execution; Collaboration with the other construction stakeholders and colleagues	5.3. Creating simple digital content for the explanation of tasks and critical issues concerning the construction site	5.4. Collection and management of personal and sensitive data in compliance with the GDPR n. 2016/679
Delivery methods			
Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material			
Assessment			
Evaluation task together with work-based learning experience			

3.5.1. Getting the information and data needed for the construction work

Competence 1 - Getting the information and data needed for the construction work	
General description	
This competence includes the main information used in the construction process, the sources for finding this information, the requirements for the evaluation of available information, the features of how to identify reliable sources of information. In addition, digital tools for information processing are also reviewed.	
Learning outcomes	
Knowledge	*Good knowledge about the process of evaluating the information gathered*

	Good knowledge about digital tools used to gather, view and analyze information
Skills	*Ability to get the information and data needed for the construction work*
	Ability to read, understand, and filter data through the use of digital tools
	Ability to evaluate and interpret the collected data

Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test

Content outlines	
Content	**Description**
Digital data and tools for processing them	Information used in the construction process. Different formats of digital information and their viewing and processing methods.
Reliable data sources	Key features of how to distinguish reliable sources of information. Verification of available information.
Data analysis, comparison and interpretation	Different information analysis methodologies. Principles of information summarization and its interpretation. Identification of essential features of available information.

3.5.2. Translation of information with highly technical content to the personnel responsible for execution; Collaboration with the other construction stakeholders and colleagues

Competence 2 - Translation of information with highly technical content to the personnel responsible for execution; Collaboration with the other construction stakeholders and colleagues
General description
This unit presents the main ways of cooperation in construction project activities. The presented key terms are used in the daily activities of a construction technician and are accepted at the international level. The guidelines provided are intended to facilitate the translation of texts written in a foreign language.
Learning outcomes

Knowledge	*Good knowledge about project management software and applications*
	Good knowledge about acceptable behaviour on the internet and in general on digital environments
Skills	*Ability to interact in digital work environments through digital tools*
	Ability to store, share and collaborate through digital files on cloud-based environments

Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test

Content outlines	
Content	**Description**
Communication in the digital environment. Methods of communication and etiquette	Proper communication in the digital space. Secure ways to communicate. Communication etiquette. Tools for different ways of communicating.
Translation of construction technical information and international terms	International construction terms and abbreviations. Guidelines for translating technical text and digital tools to help with these tasks.
Digital tools for construction project management	Digital tools used in project management activities and their main application possibilities.

3.5.3. Creating simple digital content for the explanation of tasks and critical issues concerning the construction site

Competence 3 - Creating simple digital content for the explanation of tasks and critical issues concerning the construction site
General description

<table>
<tr><td colspan="2">This competence presents the models of projects of different detail found in construction these days. Software for developing and reviewing these models. It also teaches how to create simple digital content.</td></tr>
<tr><td colspan="2">Learning outcomes</td></tr>
<tr><td rowspan="3">Knowledge</td><td>Good knowledge on different levels of detail of digital content (2D;3D;4D;5D)</td></tr>
<tr><td>Good knowledge on digital tools used for surveying at various stages of construction</td></tr>
<tr><td>General knowledge on GPS based digital tools and internet of things</td></tr>
<tr><td rowspan="4">Skills</td><td>Ability to create, understand, manage and analyse digital content in construction</td></tr>
<tr><td>Ability to use and navigate the digital environments mostly used in the construction sector, such as CAD and BIM</td></tr>
<tr><td>Ability to understand and amend the required digital content at all levels of detail and complexity</td></tr>
<tr><td>Ability to use digital tools and devices on the construction site</td></tr>
<tr><td colspan="2">Delivery and Assessment</td></tr>
<tr><td>The unit will be delivered through:
– Theoretical lessons
– Practical activities
– Discussions
– Role-play</td><td>The unit will be assessed through:
– Evaluation
– Oral examination/exercises
– Project
– Written exercises/test</td></tr>
<tr><td colspan="2">Content outlines</td></tr>
<tr><td>Content</td><td>Description</td></tr>
<tr><td>Introduction to CAD and BIM environment</td><td>General features of CAD and BIM models, their differences. Digital tools designed to work with these models.</td></tr>
<tr><td>BIM and different levels of detail</td><td>Different levels of detail in BIM models. Their differences and the information that is presented in each of them.</td></tr>
<tr><td>Introduction to digital tools used for building surveys</td><td>Possibilities of digital tools used for building surveys and their application in different situations. Processing of information obtained during surveys.</td></tr>
</table>

3.5.4. Collection and management of personal and sensitive data in compliance with the GDPR n. 2016/679

Competence 4 - Collection and management of personal and sensitive data in compliance with the GDPR n. 2016/679	
General description	
This unit contains basic information on the protection of personal data. There is a clear explanation of what data is considered personal data.	
Learning outcomes	
Knowledge	*Good knowledge of the latest GDPR regulations*
Skills	*Ability to protect the personal and other digital data*
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
EU and national legislation defining the GDPR	Introduction to national and EU-level data protection legislation in construction.
Definition of personal data and methods of secure storage	Definition of data protection and detailed explanation of what is considered personal data. Different ways of collecting and storing personal data and the laws governing them.

3.6. Qualification Unit 6 - Soft skills

Unit Summary:

This unit describes the soft skill needed to the site tecnhinicians in term of communication and problems solution garanteing the respect of the execution of the work and a good relation among profiles involved. The construction site technician must be an interface both with the technical management and with the subcontractors, must be able to manage

unforeseen events and conflictual behaviour which can flexibly redirect the priorities of the tasks assigned within the limits allowed by the project. Dealing with digital tools, he/she should be able to identify problems, analyse them and solve them with the same tools or other alternatives that are part of his/her knowledge

Competences covered by this unit are:

- To be able to communicate and present the construction progress report;
- To be able to do problem solving with digital tools.

Unit 6 - *Soft skills*	**Total duration:** *~15% of all course*
Recommended Knowledge:	Communication and problem solving also with digital tools
EQF level:	5
ECVET credits:	4 credits
Competencies of Unit 6	
6.1. Communication and presentation of the construction progress report	6.2. Problem solving with digital tools
Delivery methods	
Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material	
Assessment	
Evaluation task together with work-based learning experience	

3.6.1. Communication and presentation of the construction progress report

Competence 1 - Communication and presentation of the construction progress report
General description
Unit deals with the responsability to interface with the companies' technical management and sub-contractors; deals with the management of the preparation of the

main activities, preparation of main theme questions, highlights, collection of information, data, conclusions and other outcomes, materials of the activity for presentation; participation in discussions and problem solving.	
Learning outcomes	
Knowledge	*Good knowledge of data collection sources and tools, including digital data collection equipment*
	Basic knowledge of group management communication techniques
	Good knowledge of leadership dynamics
Skills	*Ability to prepare reports, any kind of documentation and meetings by collecting relevant data useful for their communication effectiveness*
	Ability to solve problems and open to finding new solutions in accordance with the work plan
	Ability to plan work within a time frame
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Documentation sources	Reporting, safety documents, tender contract, technical regulations - performance characteristics of building systems - informative design data
Social media	Communication tools; Online communication; Internet.
Leadership	Conflict management; Motivation; Diagnosis - Contextualisation - Solution - Problem decision; Time management.

Effective communication	Effective communication and group management; Listening skills.

3.6.2. Problem solving with digital tools

Competence 2 - Problem solving with digital tools	
General description	
Competence deals with the responsibility of the construction site technician to identify needs and problems, and to resolve conceptual problems and problem situations in digital construction environments or communicate them to superiors;	
Learning outcomes	
Knowledge	*Good knowledge on the most common problems in construction and their solutions*
	Functional knowledge of digital tools
Skills	*Ability to identify needs and problems, and to resolve conceptual problems*
	Ability to use digital tools applied to site work, evaluate the effectiveness of solutions, to solve problems
	Ability to interact with digital tools and equipments in case of malfunctions
Delivery and Assessment	
The unit will be delivered through: – Theoretical lessons – Practical activities – Discussions – Role-play	The unit will be assessed through: – Evaluation – Oral examination/exercises – Project – Written exercises/test
Content outlines	
Content	**Description**
Technological	The main digital tools for interacting between the different professional profile working on the site
Application of the procedure	Platforms for managing calls for tender; Collaborative/ information platforms to manage site complexity and contingencies

3.7. Qualification Unit 7 - Specific skills with reference to the construction site typology

Unit Summary:

Due to the different legal regulations in different countries, additional Units of Competence are also provided. These units are not mandatory for acquiring Construction Site Technician qualification, but optional to choose. These additional qualification units deal with specific skills with reference to the construction site typology.

ICARO partnership has suggested some competences related to specific construction works, which can be found in the description of the new Construction Site Technician qualification.

Unit 7 - *Specific skills with reference to the construction site typology*	**Total duration:** *~8% of all course*
Recommended Knowledge:	Construction fundamentals, Management fundamentals
EQF level:	5
ECVET credits:	2 credits
Competencies of Unit 7	
This section is optional and one of the following competencies can be chosen: 7.1. – Managing and supervising technical aspects of the construction project 7.2. – Managing and supervising industrialized construction (IC) 7.3. – Managing and supervising water supply and sewerage system installation according to construction documentation 7.4. – Managing and supervising heating, ventilation and air-conditioning system installation according to construction documentation 7.5. – Managing and supervising installation of electricity network, low voltage and communication systems according to construction documentation	

Delivery methods
Theoretical lessons, Practical activities; Illustration, visualization and transmission of learning material
Assessment
Evaluation task together with work-based learning experience

The student who has chosen this additional unit must decide which of the five competencies to choose.

Competence 1	Competence 2	Competence 3	Competence 4	Competence 5
Knowledge				
General knowledge in hydraulics structures; General knowledge in means of communication constructions; General knowledge in plant systems; General knowledge in building and commercial structures.	*General knowledge on prevalent industrialized building types; General knowledge on pre-assembly and assembly on-site; General knowledge on Lean construction principles.*	*General knowledge of water supply system installation; General knowledge of sewage system installation; General knowledge about the supervision of the installation of water supply and sewerage systems.*	*General knowledge of heating system installation; General knowledge of the installation of ventilation and air conditioning systems; General knowledge of heating, ventilation and air-conditioning systems monitoring.*	*General knowledge of electrical network installation; General knowledge of the installation of low voltage and communication systems; General knowledge about the supervision of the installation of the electricity network, low voltage, communication*

				systems.
Skills				
Ability to manage and supervise technical aspects of the construction project	*Ability to manage and supervise industrialized construction*	*Ability to manage and supervise water supply and sewerage system installation*	*Ability to manage and supervise heating, ventilation and air-conditioning system*	*Ability to manage and supervise installation of electricity network, low voltage and communication systems*

ICARO project partnership identified that new qualification for Construction Site Technician should have a duration of 600 hours (with a minimum of 120 WBL hours). Taking into account that in most countries duration of one credit varies from 25 to 30 hours – partnership decided to create ICARO qualification assigning 25 hours to one credit.

Partnership identified the weight of each qualification unit in terms of training hours. In individual cases each country can make changes depending on the regulations in force and degree of autonomy that VET providers have. Duration of the course can be changed individually according to national regulations, but it should not be shorter than in ICARO qualification proposal.

Development methodology of additional units in case a VET provider needs to develop new or additional units for construction management skills on digital and green technology, is available through the deliverables of the ICARO project on the official project website. All documents which were used by the ICARO partnership created ICARO qualification units is available through the deliverables of the ICARO project. The methodology comprises the following reports, which outline the steps followed by ICARO partners, and could similarly be applied in extending the work of ICARO to fit the needs of different/specialised target groups:

• Definition of research tools for data collection

• Data analysis and reporting on qualification units

• Principles of grouping of learning outcomes into qualification units

The development of the new units can be based on the four-stage process, including:

- Needs evaluation and Analysis;
- Curriculum Design;
- Content development;
- Assessment and evaluation.

3.9. Assessment

An assessment will be accomplished in order to evaluate whether the participants have achieved the learning outcomes of the training or not. This is related to the learning objectives of the programme. The learning objectives connect the instructional content (what you would like to test) with the assessment (how you would like to test it).

For the ICARO qualification it suggested to create the following assessment materials:

- **Theoretical assessment:** a written form of assessment. Participants answer questions about the course content. Theoretical assessment should contain multiple answer questions and open-ended questions. The number of questions should be chosen to best reflect the learner's knowledge and to cover the whole course as widely as possible.
- **Practical test:** learners demonstrate the skills which are required for their future job. It is suggested to have one practical exercise made by a training provider. Along with the practical task, the tasks performed during the learner's WBL activities are also assessed.

Theoretical assessment

It is expected that training provider creates its own bank of multiple choice questions to test the knowledge of the students. A test should consist of a number of questions that is spread across the learning objectives, with at least one question for each learning objective. It is also proposed to set a time limit within which this test must be performed. For more technical knowledges open ended questions should be used.

Practical test

It is recommended to have a bank of exercises, which can show skills gained during the training. Practical part of assessment should not take more than 2 hours. The practical test must show whether the student is able to apply the knowledge acquired during the training by performing the real tasks assigned to him/her.

Together with practical test, WBL activities is also evaluated. After the WBL activities, the learner must present the practice report prepared, together with the assessment of the Work-Based Learning supervisor. The final evaluation of these activities is carried out by the training provider. To this end, an evaluation team is set up, which organise oral survey to examine key aspects of WBL activities, based on the practice report and the supervisor's assessment.

The following key competencies are assessed in this survey: motivation, a sense of duty, punctuality, responsibility, communication skills, the quality of assigned tasks and general assessment of work skills acquisition.

Interim evaluations

At the end of each qualification unit, it is recommended to carry out interim assessments. The suggestion is to perform it through short practical assignments, tests, or open-ended written or oral questions. Applying such an assessment would make this qualification even more attractive as it would attract people who want to complete only

certain units of competence. The principle of lifelong learning would also be applied in this way.