

GUIDANCE SYSTEM

FOR WORKERS ENTERING THE COMPOSITE INDUSTRY

Project: CompoWin – More Skilled Hands for High-Tech Production

2020-1-BG01-KA202-079268

www.compohub.eu

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1. HOW DO I GET AND KEEP A JOB IN A COMPOSITE WORKSHOP?

In the composite industry, every manufacturer of composite products is valuable. **Our desire is for every manufacturer to achieve the highest possible level of competence. We will help you with that! What's more, the excellent tools developed in the European CompoHub and CompoWin projects will help you with this.** These were projects funded by the EU Erasmus+ programme.

In order to gain and keep a job in a composite workshop, you need to achieve at least the level of 'Assistant'. This is discussed in the next page and diagram 2. But for now, it is important that the path and stages in your development are clearly and precisely determined in advance. This is important also for you as you can monitor your progress.

As a main guideline, the mentors and other co-workers will always measure you by the following **three categories**.

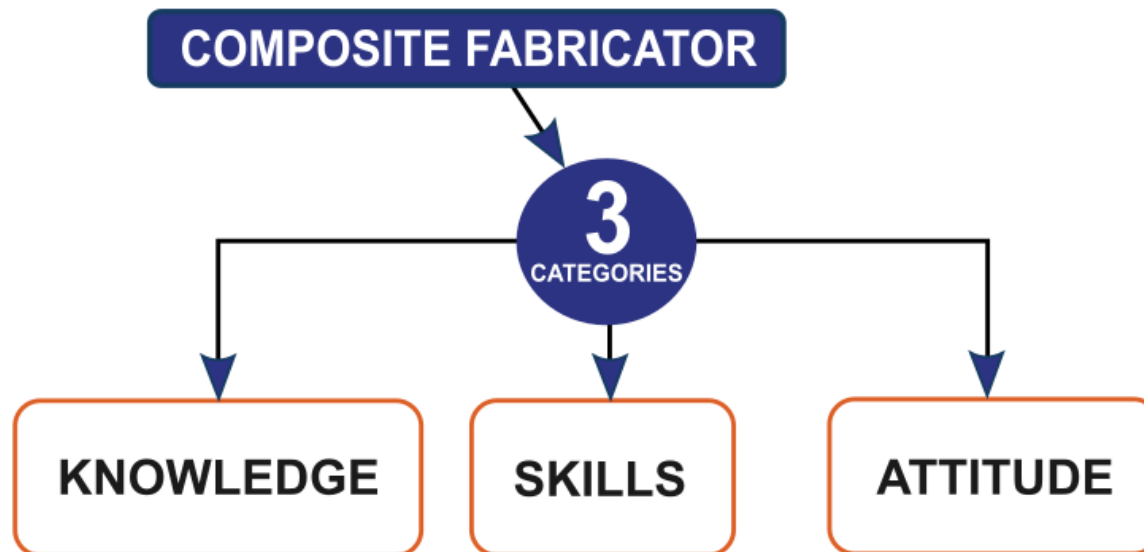


Diagram 1

KNOWLEDGE is how much you know and how you are familiar with the composite production. Knowledge enables you to correctly use materials, tools and apply production procedures. You can not develop good skills without a knowledge base. Some knowledge you will get in the workshop, but most of it through on-line learning at the CompoWIN internet portal.

SKILL means how skillfully you perform your tasks. Skill results in accuracy and speed. Skill is developed with repetitions. It comes with practice.

GOOD ATTITUDE means a good attitude toward work, your co-workers, to the products and towards safety. It means working hard, taking responsibility. It also includes good synergy and interpersonal relations with your team members. It also includes taking care of yourself and your co-workers in regards to safety. Observe the most accurate and well behaved members of your team and mirror their attitude. Try hard to make your attitude an example for younger coworkers or novices.

2. LEVELS OF FABRICATORS IN A COMPOSITE WORKSHOP

Fabrication of composite parts is a team effort. The team achieves the best results, if it is structured. This means that every team member has a role and responsibility.

To enable this, there are four levels of composite fabricators. These are:

- **ASSISTANT**
- **FABRICATOR**
- **MASTER**
- **PRODUCT LEADER**

What are the roles at each level is shown on the next page in diagram 2. When you enter the composite industry, you will probably work on the level of assistant. If you are skillful, work responsibly and you are curious, you will very rapidly reach the level of fabricator. The level of master can be achieved by anyone who really thinks about the processes and results, is accurate and innovative. The level of product leader is everything that a master does plus the added competencies for management.

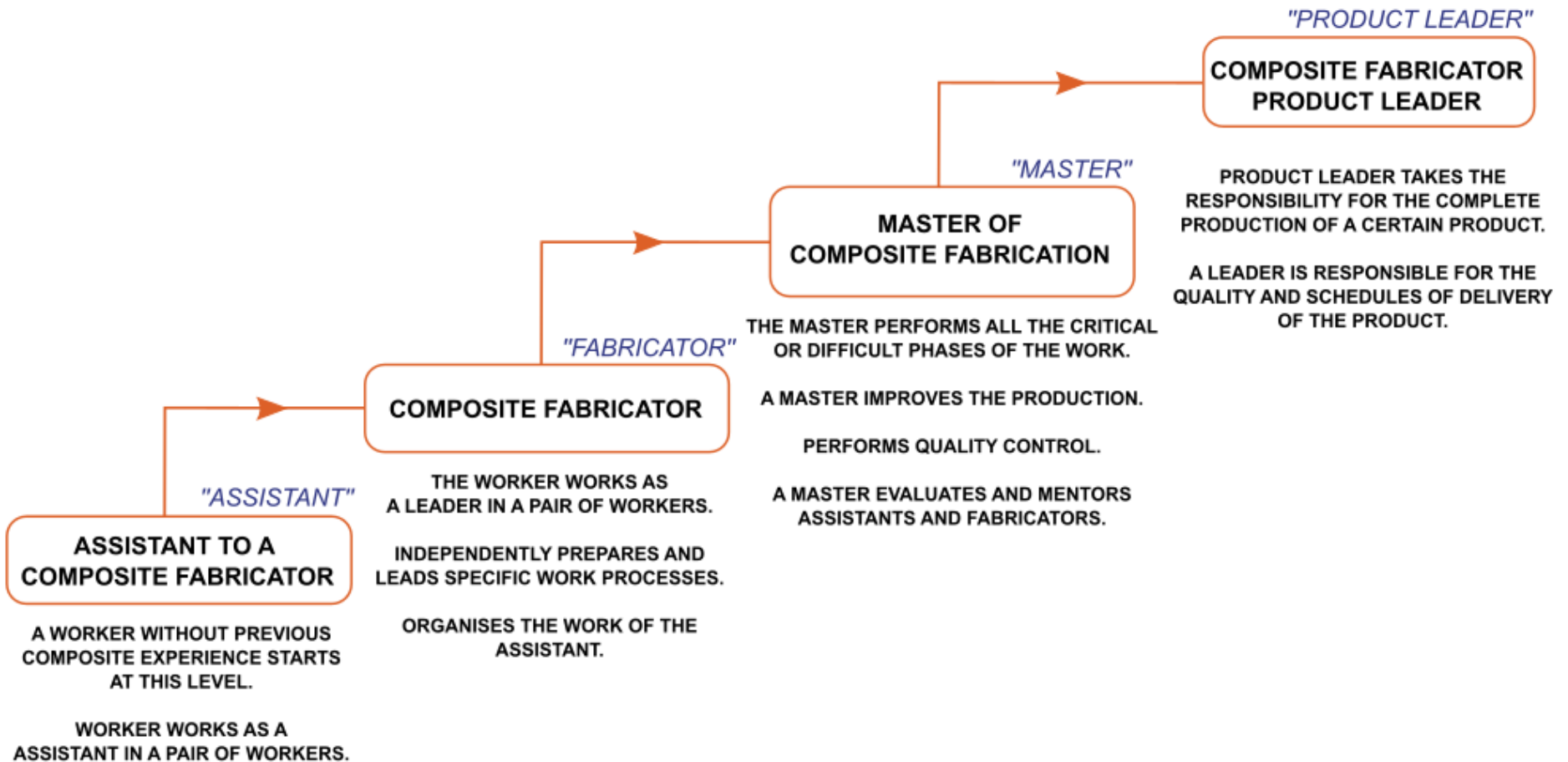


Diagram 2

3. WHERE TO START AND HOW TO PROGRESS?

Entry into a composite industry is a great career move If you like manual hand skills, where you are in touch with actual products. So how does one take the first step?

Before the EU funded projects of CompoWN and CompoHUB entry and progress in this field was difficult and took a long time. But now, with the CompoWin tools - among them is this guide - your entry will be faster and you will have more control and influence over your progress.

The path to employment is presented below on diagram 3.

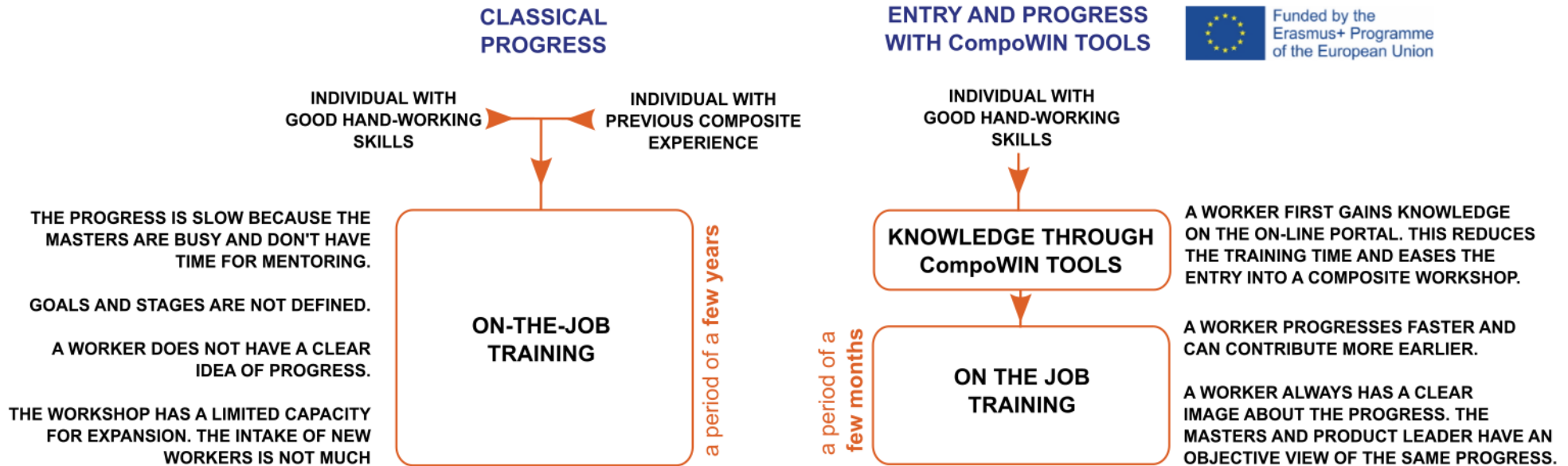


Diagram 3

This document is one of the CompoWin tools. The document is a guide to employment. There is a high probability that you had obtained this guide from a composite workshop that is using also other CompoWIN tools.

At this time you are probably in one of two different situations:

- **A composite workshop already offered you a job.** In this case this guide will help progress faster. In the category of knowledge you will progress easier and faster through the on-line course, since you will be getting concurrent hands-on experience in the workshop at the same time.
- **You had identified a composite workshop, where you would like to work.** In this case the CompoWIN tools will greatly increase your chances for employment. You can do this by self-study of a few basic chapters from the on-line learning. With this you will also demonstrate that you are motivated and really interested in this field of work.

For both cases the next step is to get access to the compohub.eu on-line learning portal.

4. ACQUIRE KNOWLEDGE WITH CompoWIN TOOLS

In workshops that use CompoWIN tools the learning of knowledge is done partially in the work environment and partially on the on-line learning portal.



HOW TO ENTER AND PROGRESS IN THE COMPOSITE INDUSTRY

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The online learning portal is located at this address:: www.compohub.eu

When you open a webpage, you must create a username and password. Remember this entries. Better yet - write them down here:
Your username is: _____ Your password is: _____ Remember that the correct use of capital and small letters is important.

Our recommendation is that you use this on-line portal through your computer and not smartphone.

If you have problems with registration or later login, don't give up. Computers sometimes make issues. Don't allow minor issues prevent your entry into the world of composite manufacturing. If you have issues, write an e-mail to info@afomx.si and we will help you obtain access.

5. GETTING KNOWLEDGE BEFORE EMPLOYMENT

So you decided to start reading the on-line content? Great!

To make a very positive impression on your chosen workshop, read through a couple of short chapters in the compohub.eu on-line portal.

Follow this procedure: When you have registered and can login into the portal, find the chapters that are listed below in table 2. Read through each chapter. Every chapter has embedded questions. Every chapter also has Handout and summy printout, where the key points for that chapter are listed. You can easily approach any composite workshop when you understand most of the points on that handout.

While learning use the following table to track your progress.

Course	Lesson	Did I finish the lesson? (YES/NO)	Did I answer all the questions? (YES/NO)	Do I understand most of the handout? (YES/NO)
A-B-C OF COMPOSITES	INTRODUCTION			
A-B-C OF COMPOSITES	FIBERS AND FABRICS			
A-B-C OF COMPOSITES	RESIN SYSTEMS			
BASIC MANUFACTURING PROCESS	HAND LAYUP			

Table 2

When you fill out this table arrange for a visit at your chosen composite workshop. There is a good chance you will leave this visit with a job offer.

6. KEY COMPETENCES

When you start working in a composite workshop you will build on knowledge with skills and attitude. The table below is a map which competencies you have to achieve.

The table lists the key competencies for an individual to reach a certain level in the composite workshop. These levels correspond to the diagram 2 of this guide.

Work area	Description of competency	<i>assistant</i>	<i>fabricator</i>	<i>master</i>	<i>product lead</i>
MATERIAL PREPARATION	Prepares the material for composite production on the basis of technical documentation	partially	fully	fully	fully
LAMINATION AND VACUUM BAGGING	Prepares and sorts fabrics, resins and auxiliary materials. Performs hand layup and if necessary vacuum bagging.	partially	mostly	fully	fully
CUTTING AND CLOSING	Cuts and bonds composite parts.	partially	mostly	fully	fully
FINISH	Produces a surface finish of parts and assemblies.	partially	mostly	fully	fully
ASSEMBLY	Assembles and installs composite parts.	partially	mostly	fully	fully
CONTROL AND REPAIRS	Performs inspection of the composite parts. Performs small repair work on damaged parts.	not	partially	fully	fully

Table 3

7. DETAILED PLAN TO PROGRESS TO THE NEXT LEVEL

The following part of the guide is useful when you are already working in a composite workshop. By clearly presenting the tasks and skills in the tables on the following pages, both you and your superiors can keep track of exactly what you know and what you are still missing for the next level.

Don't forget to keep acquiring knowledge. Table 1 listed only the initial contents of the online textbook. There is even more really useful content on the online portal that is good for you to study while working.

Something else is important.

Enter the motivation and data for your national vocational qualification.

To apply for the national vocational qualification, you must attain the level of **MASTER**.

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WORK AREA (1 od 6)	KEY TASKS	COMPETENCIES	assistant	fabricator	master
<p>MATERIAL PREPARATION</p> <p>The worker collects and prepares material for the production of composite products based on the lamination plan.</p>	<ul style="list-style-type: none"> recognizes different fabric materials and their technological properties and separates them recognizes different weaves and knows their properties checks the compliance of the cutting template with technical documentation 	Recognize the type of materials necessary for making a composite product.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Review and read the lamination plan / layup schedule.	-	Signature of a master and date	Signature of a master and date
		Select and prepare the material for the production of composite products based on the lamination plan.	-	Signature of a master and date	Signature of a master and date
		Use appropriate personal protective equipment.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Describe the dangers of improper use of protective equipment either due to improper material handling or manufacturing processes	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Identify different weaves and explain their technological properties.	-	Signature of a master and date	Signature of a master and date

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<p>MATERIAL PREPARATION</p> <p>(continued)</p>	<p>Clean the mold, apply the release agent and prepare it for use.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Fill in the technological documentation and, if necessary, store samples of resin and laminate chips and mark them according to the work process.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>In the real case of the material or. material from the technical and safety data sheet understands the basic properties and potential hazards and explains them</p>	-	Signature of a master and date	Signature of a master and date

WORK AREA (2 od 6)	KEY TASKS	COMPETENCY	assistant	fabricator	master
<p>LAMINATION AND</p>	<ul style="list-style-type: none"> cuts the fabric by making optimal use of the material prepares cutting templates knows the basic properties of resins 	<p>Based on technological documentation provides a basic time estimate and the main steps of the production process.</p>	-	-	Signature of a master and date
		<p>Preparation of the workplace with all the necessary tools and other accessories and materials needed for the work</p>	Signature of a master and date	signature Master's	Signature of a master and date

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<p>VACUUM BAG</p> <p>The worker prepares and sorts cut fabrics and accessory materials, performs hand lamination and vacuum bags the laminate.</p> <p>LAMINATION AND VACUUM BAG</p> <p>(continued)</p>	<ul style="list-style-type: none"> • Knows the basic properties of auxiliary materials (fillers) • knows the procedures for preparing auxiliary materials for lamination • knows the basics of vacuuming a vacuum bag and seals it • knows the basics of hardening a composite part • hardens the product by gradually heating the product in or outside a mold in the oven by maintaining the temperature for a certain number of hours 	Check that all tools are properly maintained and correct any deficiencies before starting work.	Signature of a master and date	signature Master's	Signature of a master and date
		Use personal protective equipment.	Signature of a master and date	signature Master's	Signature of a master and date
		Provides enough space for work and takes care of the tidiness and ergonomics of the workplace during the process.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Mark and cut fabrics to make optimal use of the material.	-	Signature of a master and date	Signature of a master and date
		Calculate the mass and volume mixing ratio of resins and mix and prepare resin.	-	Signature of a master and date	Signature of a master and date
		Competently and consistently mix laminating resin.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Wets and laminates the fabric.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Make a vacuum bag and seal it and apply the correct vacuum to the product.	-	Signature of a master and date	Signature of a master and date
		Explain the process of post-curing of the parts at elevated temperatures.	-	Signature of a master and date	Signature of a master and date

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<p>LAMINATION AND VACUUM BAG</p> <p>(continued)</p>	<p>Clean your workplace in a timely manner and remove waste material.</p>	-	Signature of a master and date	Signature of a master and date
	<p>During the stages, correctly assess which tools are no longer needed, clean them or at least remove them so that they do not affect the cleanliness of the workplace and the environment.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Fill in the technological documentation.</p>	-	Signature of a master and date	Signature of a master and date
	<p>Properly sort waste materials with special emphasis on those that may be harmful to the environment.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Sort waste according to recyclable properties.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Describe the dangers of improper use of protective equipment either due to improper material handling or manufacturing processes process.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>On an example of a material or substance from the technical and safety data sheet understand the basic properties and hazards and explains them.</p>	-	Signature of a master and date	Signature of a master and date
	<p>Explain the basic principles of different procedures (infusions, RTM, gelcoating,</p>	-	-	Signature of a master and date

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		autoclave work, SPRINT) and the advantages and disadvantages of each procedure.			
		Explain the advantages and disadvantages of the hand lamination process.	-	-	Signature of a master and date

WORK AREA (3 od 6)	KEY TASKS	COMPETENCY	assistant	fabricator	master
<p>CUTTING, CLOSING AND DEMOLDING</p> <p>Worker cuts composite part</p> <p>Closes molds and demolds the finished parts.</p>	<ul style="list-style-type: none"> follows the rules of cutting composite products and understands the impact of composite dust on health and the environment uses at least two different methods of cutting composite products performs the final cut according to the prescribed 	Preparation of the workplace with all the necessary tools and other accessories and materials needed for the work	-	-	Signature of a master and date
		Check that all tools are properly maintained and correct any deficiencies before starting work.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Use personal protective equipment.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Provide enough space for work and takes care of the tidiness and ergonomics of the workplace during the process.	Signature of a master and date	Signature of a master and date	Signature of a master and date

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<p>CUTTING, CLOSING AND DEMOLDING</p> <p>(continued)</p>	<p>dimensions in the technical documentation</p> <ul style="list-style-type: none"> • knows bonding technology and properties of bonding agents • correctly prepares adhesive joint • Sands parts with different sanding machines and methods 	Preparation of the workplace with all the necessary tools and other accessories and materials needed for the work	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Carefully trim the composite parts while they are still in the molds.	-	Signature of a master and date	Signature of a master and date
		Demold the parts.	-	Signature of a master and date	Signature of a master and date
		Roughly trim the parts to an oversize, taking into account work safety.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Cut the part to the final size and sand the edges, taking into account work safety.	-	-	Signature of a master and date
		Perform test closing of molds - dry-fit.	-	Signature of a master and date	Signature of a master and date
		Prepare the adhesive joint (cleaning, sanding) and apply the bonding agent.	-	Signature of a master and date	Signature of a master and date
		Performs closing of larger molds.	-	-	Signature of a master and date

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<p>CUTTING, CLOSING AND DEMOLDING</p> <p>(continued)</p>	<p>Clean your workplace in a timely manner and remove waste material.</p>	-	Signature of a master and date	Signature of a master and date
	<p>During the stages, correctly assess which tools are no longer needed, clean them or at least remove them so that they do not affect the cleanliness of the workplace and the environment.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Constantly monitor the time of manufacture and working conditions (especially room temperature and moisture) and record them in the technological documentation, if necessary and at appropriate intervals.</p>	-	Signature of a master and date	Signature of a master and date
	<p>Properly sorts waste materials with special emphasis on those that may be harmful to the environment.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Sort waste according to recyclable properties.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date
	<p>Describe the dangers of improper use of protective equipment either due to improper material handling or manufacturing processes process.</p>	Signature of a master and date	Signature of a master and date	Signature of a master and date

		Communicate with co-workers accurately, clearly and unambiguously, so that the work process runs with the synergy of a team.	-	Signature of a master and date	Signature of a master and date
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WORK AREA (4 od 6)	KEY TASKS	COMPETENCY	assistant	fabricator	master
SURFACE FINISH A worker completes the surface finish of composite parts.	<ul style="list-style-type: none"> • prepares a part for finishing • uses different techniques of applying materials for surface finish • surface finishes composite products • knows different technologies of surface finish • distinguishes surface finish materials by usability and technological properties 	Preparation of the workplace with all the necessary tools and other accessories and materials needed for the work	-	-	Signature of a master and date
		Check that all tools are properly maintained and correct any deficiencies before starting work.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Use personal protective equipment.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Provide enough space for work and takes care of the tidiness and ergonomics of the workplace during the process.	Signature of a master and date	Signature of a master and date	Signature of a master and date

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<p>SURFACE FINISH (continued)</p>	<ul style="list-style-type: none"> Is familiar with tools and machines for surface finish 	Preparation of the workplace with all the necessary tools and other accessories and materials needed for the work	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Evaluate the final appearance of the product and compare it with the technological requirement	-	-	Signature of a master and date
		Perform preparatory work for the final finish (base coat, abrading, basic filler)		Signature of a master and date	Signature of a master and date
		With a combination of procedures (cleaning, sanding, polishing, varnishing, painting) performs the final surface finish of the part	-	-	Signature of a master and date
		Properly sorts waste materials with special emphasis on those that may be harmful to the environment.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Sort waste according to recyclable properties.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Communicate with co-workers accurately, clearly and unambiguously, so that the work process runs with the synergy of a team.	Signature of a master and date	Signature of a master and date	Signature of a master and date

WORK AREA (5 od 6)	KEY TASKS	COMPETENCY	assistant	fabricator	master
<p>ASSEMBLY AND BONDING</p> <p>worker assembles composite parts and larger assemblies</p>	<ul style="list-style-type: none"> • bonds composite semi-finished products • bonds composite assemblies • knows the technological sequence of composite products assembly 	Preparation of the workplace with all the necessary tools and other accessories and materials needed for the work	-	-	Signature of a master and date
		Check that all tools are properly maintained and correct any deficiencies before starting work.	-	Signature of a master and date	Signature of a master and date
		Use personal protective equipment.	-	Signature of a master and date	Signature of a master and date
		Provide enough space for work and takes care of the tidiness and ergonomics of the workplace during the process.	Signature of a master and date	Signature of a master and date	Signature of a master and date
		Bond composite elements on a detachable or non-detachable joint according to the appropriate technological process.	-	Signature of a master and date	Signature of a master and date
		Bond larger or more critical assemblies with a small tolerance.	-	-	Signature of a master and date

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		Communicate with co-workers accurately, clearly and unambiguously, so that the work process runs with the synergy of a team	Signature of a master and date	Signature of a master and date	Signature of a master and date
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WORK AREA (6 od 6)	KEY TASKS	COMPETENCY	assistant	fabricator	master
INSPECTION AND REPAIRS Worker performs quality control of products or semi-finished products. Maintains and performs minor and major repairs	<ul style="list-style-type: none"> visually determine the condition of the element, assembly or. product performs less demanding repairs of composite parts performs repair procedure (cleaning, patching, replacement and surface finish) 	Critically evaluates the finished product or semi-finished product according to specification	-	signature Master's	signature and date
		Compares physical product with known technological requirements	-	-	signature and date
		Clearly and objectively present the findings	-	-	signature and date
		Visually determine the condition of the damaged or broken element, assembly or.of	-	Signature the master and date	Signature master and date
		Determine the materials used for repair	-	-	Signature of the master and date

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of composite parts.		Explain the method and sequence of repair	-	-	Signature of the master and date
		Performs maintenance procedure (cleaning, patching, replacement of parts, surface treatment)	-	Signature of the master and date	signature Master's

1. IN CONCLUSION

This guide will be summarized with an initial thought. **Our desire is for every new composite worker to achieve the highest possible level of competence. We will help you with that!**

The guide in front of you will accompany you for a number of months. We suggest that you print it out and put it in the folder. Have this folder with you while learning and during the introduction to the composite workshop environment. Our wish is that you complete this folder by adding a successfully obtained National Vocational Qualification certificate - Manufacturer of composite products.

The guide concludes with a graphical summary of how best to use this guide and how to progress the fastest and best along the path and levels in the composite industry.

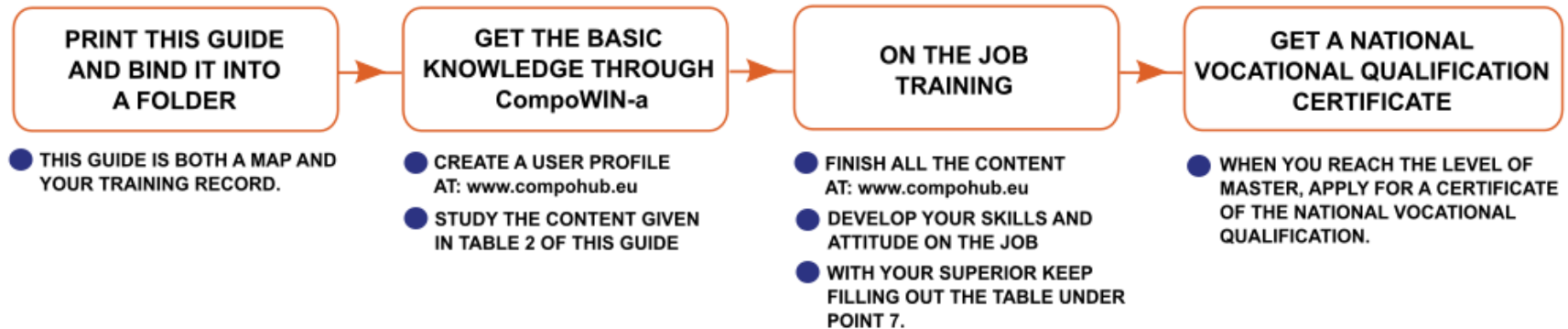


Diagram 4