PR1 Update of the European Adhesive Bonder Curricula

KNOWBOND

Boosting Knowledge of Adhesive Bonding Personnel

Project No. 2021-1-PT01-KA220-VET-000033229

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Project Result	Due Date	Leading Organisation	Dissemination Level
PR1	30 June 2023	IFAM	Public

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1. Introduction

1.1. General

Project result (PR1) presents the draft guideline for Specific European Adhesive Bonding Training - SEABT. PR1 has been prepared and evaluated by the KNOWBOND partner consortium. In the beginning a market survey was performed with relevant VET provider and certification bodies active in the field of adhesive bonding training courses.

It is designed to provide basic training in adhesive bonding technology required for adhesive bonding personnel working in defined adhesive bonding executive functions. Executive functions involve the conduction of all steps necessary to produce a high quality adhesively bonded joint. It is possible that especially the above-mentioned bonding executive personnel will need additional training and/or experience beyond this basic training in order to qualify for the corresponding professional functions.

This result is a proposal to update the EWF EAB Qualification and Training Guideline (EWF-515r2-19), which will be requested for approval among all national welding and joining societies of EWF. The subsequent EWF guideline will be revised periodically by the committee to reflect any changes that affect the "state of the art". Participants who successfully complete this SEABT training are expected to be able to properly apply the adhesive bonding technology described in this draft guideline to their respective workplaces in accordance with the competency attainment goals set forth herein.

2. Specific European Adhesive Bonding Training – SEABT Professional Profile

The role of the person completing the SEABT course is to conduct all necessary working steps to produce a high quality adhesively bonded joint. This includes the preparation of the workplace, the substrates and adhesives. Moreover, the person will apply surface treatment methods in respect of the used substrate material, he or she will apply the adhesive, perform the joining, fixing and curing of the joint.

2.1. General learning outcomes for the SEABT qualification

The SEABT expected learning outcomes are described in two ways: generic outcome descriptors organized in knowledge, skills, autonomy and responsibility (targeted in this clause) and in detail for each competence unit organized in knowledge and skills corresponding for the independent proficiency level within EWF´s Systems Framework levels, in alignment with the European Qualification Framework (EQF level 4). This also refers to the ECVET system. Credit points are allocated to the Competence Unit and Qualification, where 1 credit equals to 25 hours of workload. The course/curriculum is organized according to 4 Competence Units (CU) / Units of Learning Outcomes (ULOs), as shown in chapter 3.1.

The candidate completing the training under this programme shall possess a factual knowledge and understanding of some universally valid basic principles of adhesive bonding technology, as well as required skills and autonomy level to perform specific adhesive bonding field of activities / processes.

SEABT Qualification					
EWF Level	**Knowledge**	**Skills**	**Autonomy & Responsibility**	**Teaching Hours**	**Workload in hours**
Independent	Factual knowledge (basic understanding) of adhesive bonding technology principles and concepts.	Be able to carry out adhesive bonding technology work for a limited and specific scope of adhesive bonding activities/processes	Work under supervision and work instructions in a competent manner, giving feedback in case of irregularities.	24	48

SEABT general outcomes descriptors

2.2. Structure of the Specific European Adhesive Bonding Training - SEABT qualification

2.2.1. Subject content design of a training program

The technical content of the respective training program is designed in accordance with the regulations on which this draft guideline is based and is the responsibility of the respective recognized ATB. For this composition, the ATB can - in the sense of a "modular principle" - add selectable competence units in addition to the compulsory competence units that must be included in every training program. The mandatory minimum time frame of a SEABT (see chapter 2.2.2) shall be observed.

The SEABT qualification basically consists of a compulsory competence unit (CU1), which must be the subject of every SEABT qualification, and competence units (CU2, CU3 and optional CU4) according to table 1, the content of which can be selected for the respective target group.

The competence units listed in Tables 3 and 4 are selectable and are to be added according to need and client requirement or specific target group (CU2 and CU3, optional CU4).

The optional competence unit 4 describes a module for specific adhesive bonding topics. This module can be selected by the recognized ATB if required. The ATB is responsible for the content of this module. In the sense of a specific customer orientation, this opens the possibility for the ATB to also include specific topics in the SEABT that possibly go beyond the fixed contents in this guideline.

In any case, the mandatory minimum time frame of a SEABT (see chapter 2.2.2) shall be observed. Irrespective of the specific training course structure and the respective target group, each SEABT qualification has to fulfil the following requirements:

1. the respective composition of the course must fulfil the superordinate learning objective of the SEABT.

2. even in the case of industry or company-specific courses, the product-neutral character of the course must be recognizable beyond doubt and verifiable by the ATB.

2.2.2. Duration of the training program

The total duration of each training program (compulsory and selectable competence units / see Table 1) must be at least 24 hours.

On this basis, the respective target group-oriented design and execution of a training program is the responsibility of the respective recognized ATB.

The time spans for the respective contents given in the list of main topics below may deviate by a maximum of 25% (exceptions: Health and Safety and Examination), depending on the needs of the training program to be conducted. This gives the ATB the possibility - in addition to the selection of the specific competence units (CU 2, CU3 and optional CU 4) - to adapt the SEABT qualification even better to the requirements of the clients and participants. It is the responsibility of the ATB to ensure that in case of a reduction of a time scope specified given in the list of main topics below, the affected individual topic is nevertheless covered in a professionally adequate manner and that the content composition of the course in the overall context of the qualification measure fulfils the superordinate SEABT qualification objective and the required competences.

3. 2 Main training subjects (SEABT)

3.1. General

The training competence units of the SEABT are given in the Table 1. The training consists of compulsory competence units and selectable competence units.

Table 1: Training competence units

Main training subject

1. CU1 "Introduction to Adhesive Bonding" (compulsory):

    Fundamentals of adhesion and adhesives

    Surface treatment (basics)

    The main families of adhesives and sealants (basics)

    Design and construction of adhesive joints

    Quality assurance /Quality management

    Durability of adhesively bonded joints

    Benefits and limitation of adhesive bonding technology

    Health and safety

2. CU2 "Specific surface treatment methods" (selectable):

    Specific cleaning methods

    Mechanical treatment

    Chemical treatment

    Physical treatment

    Primer

3. CU3 "Specific adhesives and sealants" (selectable):

    1K Epoxides

    2K Epoxides

    1K Polyurethanes

2K Polyurethanes

1K Silicones

1K SMPs

Cyanoacrylates

Anaerobically curing adhesives

MMA/2K Acrylics

Radiation curing adhesives

Hotmelts

Solvent based adhesives

Water based adhesives

PSA

Optional 4. CU4 "Specific adhesive bonding topics"

3.2 Access conditions to SEABT course

The SEABT participant must be proficient in the respective language in which the Training program is carried out to the extent that he/she can follow the lessons competently, carry out the practical exercises according to oral and written work instructions and take the examination. Furthermore, a minimum age of 16 is required and basic skills in material processing are recommended.

3.2. Examination procedure

3.2.1. Admission to the examination

Training program participants who can prove that they have attended 90% of the SEABT lessons are admitted to the examination.

3.2.2. Duration and structure of the examination

The total examination time is 4.5 hours and is divided into 4 hours of practical examination and 0.5 hours of theoretical written examination. The assessment for each CU can be performed separately.

3.2.3. SEABT confirmation after passing the examination

After passing the examination, a record of achievement is awarded. This record of achievement contains the name, surname, place and birthdate of the participant, place and name of the executing ATB of the SEABT, as well as a detailed list of the competence units that were part of the SEABT in which the person participated.

4. Possible areas of application of a Specific European Adhesive Bonding Training - SEABT qualification according to industrial sectors and adhesive bonding technology applications

4.1. General

Clauses 5.2 and 5.3 only show possibilities for which a SEABT qualification could be used and do not represent a binding or complete indication. 5.2 therefore shows examples of typical industrial sectors where adhesive bonding is used, 5.3 shows adhesive application areas independent of industrial sectors. There may be overlaps between 5.2 and 5.3.

The technical and directive-compliant design of a SEABT qualification is the responsible task of the respective recognised ATB.

4.2. Some typical examples of potential industrial areas

This chapter lists, by way of example and by no means in its entirety, a number of industrial manufacturing sectors in which adhesive bonding technology is used and SEABT can potentially be used:

- Civil engineering / Building construction
- Shipbuilding industry
- Bus construction
- Special vehicle construction
- Automotive
- Wind energy industry

4.3. Some examples of typical areas of adhesive bonding applications

This chapter lists, by way of example and by no means completely, a range of typical bonding applications for which SEABT may be used:

- **Window bonding**
- **Plastic bonding**
- Glas bonding
- **Metal bonding**
- Machine operators of dosing systems

5. Instructions on how to set up a customer- and workplace-oriented Training program

Each Training program requires special preparation, as these qualifications are company/industry specific and/or - regardless of company and industry - only relate to very specific, selected adhesive application areas. In order to achieve the best possible customer orientation and the best possible adhesive bonding technology competence building success with the customer through a SEABT, the following questions must be carefully and honestly clarified in advance by the executing ATB with the potential client:

What are the typical adhesive bonding applications?
What does typical adhesive bonding work look like in the company?
Which adhesively bonded substrate materials are used?
Which adhesives are used?
Which surface treatments are used?
...

For itself, the ATB has to answer the following questions:

Is a SEABT offer the best solution in the specific case of the request or is a comprehensive EWF qualification (EAB, EAS, EAE) the better offer?
Can the potential client's personnel qualification expectations be seriously met within the framework of a SEABT?
Is the respective ATB capable of seriously fulfilling the potential client's personnel qualification requirements within the framework of the SEABT?
…

6. Linking the SEABT qualification with the EWF EAB qualification and SEABT follow-up qualifications

Linking the SEABT with the EWF EAB qualification is possible in principle.

For this purpose, the participant of a SEABT qualification must verify that he/she has acquired and verified all subject contents of an EWF EAB qualification (40 h) within two years and within the framework of SEABT further training measures in theory and practical exercises, both conducted by a recognised ATB. The official verification is the prerequisite for admission to an official EWF EAB examination (written, practical, oral), after the successful passing of which he/she will receive the EWF EAB diploma.

To achieve the EAB Diploma, due to the fact that the EWF EAB qualification, unlike the SEABT qualification, is holistic, i.e. without restrictions on specific adhesive bonding activities, company/industry specifics and joining part materials, participation in the EWF EAB examination is required.

7. Examples of possible implementation of the training

7.1. Potential industrial area: automotive

7.1.1. Typical area of adhesive bonding application: Window bonding

7.1.2. Requirement profile of a SEABT-course "Window bonding"

Target group:	Adhesive Bonding Personnel who manually adhesively bond glass parts to different metals and coated metals
Aim of the qualification:	Increase of the quality and reproducibility of the adhesively bonded joints
Scope of production:	small series production
Used adhesives:	1k/2k Polyurethanes, 1k SMPs, Radiation curing adhesives, Pressure sensitive adhesives
Surface treatment used:	cleaning of the surfaces of the adhesively bonded substrates, mechanical treatment, primer

CU no	Subject no	subject	Teaching hours
1 Introduction to adhesive bonding			
	1.1	Fundamentals of adhesion and adhesives	1
	1.2	Surface treatment - basics	1
	1.3	The main families of adhesives and sealants - basics	2
	1.4	Construction and design	0,5
	1.5	Quality assurance / Quality management	1
	1.6	Durability of adhesively bonded joints	0,5
	1.7	Benefits and limitation of adhesives	1
	1.8	Health and safety	1
		Practical exercises	4,75
2 Specific surface treatment methods			
	2.1	Specific cleaning methods	1
	2.2	Mechanical treatment	0,5
	2.5	Primer	0,5
		Practical exercises	2
3 Specific adhesives and sealants			
	3.3	1K Polyurethanes	1
	3.4	2K Polyurethanes	1
	3.6	1K SMPs	0,5
	3.10	Radiation curing adhesives	0,5
	3.14	Pressure sensitive adhesives	0,5
		Practical exercises	2
Examination			
		Examination theoretical	1
		Examination practical	4,75
Sum			24

7.2. Potential industrial area: Wind power plant

7.2.1. Typical area of adhesive bonding application: Bonding of wind turbine blades

7.2.2. Requirement profile of a SEABT-course “Plastic bonding”

Target group:	Adhesive Bonding Personnel who manually adhesively bond plastics and fiber reinforced plastics
Aim of the qualification:	Increase of the quality and reproducibility of the adhesively bonded joints
Scope of production:	small series production
Used adhesives:	2k Epoxies, 1k/2k Polyurethanes, 1k SMPs,

Surface treatment used: cleaning of the surfaces of the adhesively bonded substrates, mechanical treatment, physical treatment

CU no	Subject no	subject	Teaching hours
1 Introduction to adhesive bonding			
	1.1	Fundamentals of adhesion and adhesives	1
	1.2	Surface treatment - basics	1
	1.3	The main families of adhesives and sealants - basics	2
	1.4	Construction and design	0,5
	1.5	Quality assurance / Quality management	1
	1.6	Durability of adhesively bonded joints	0,5
	1.7	Benefits and limitation of adhesives	1
	1.8	Health and safety	1
		Practical exercises	4,75
2 Specific surface treatment methods			
	2.1	Specific cleaning methods	1
	2.2	Mechanical treatment	0,5
	2.3	Physical treatment	1
		Practical exercises	2
3 Specific adhesives and sealants			
	3.2	2K Epoxids	1
	3.3	1K Polyurethanes	1
	3.4	2K Polyurethanes	0,5
	3.6	1K SMPs	0,5
		Practical exercises	2
Examination			
		Examination theoretical	1
		Examination practical	4,75
Sum			24

This proposal is merely an example of how a recognized ATB could design the content of a SEABT on its own responsibility on the basis of a requirements profile previously defined in consultation with the potential client.

The didactic-methodical development and the concrete implementation based on this, including the practical exercises, is also the responsibility of the recognized ATB.