



Intellectual Output 2

European Adhesive Engineer and Specialist Profile Curricula

- Short Version -

This is a reduced version; it is not the full Guideline

For more information regarding the Qualifications System, the IAB/EFW Combined Secretariat or the National ANB should be contacted
(see in the IIW and EWF sites the ANB contacts)

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EWF Guideline

EUROPEAN ADHESIVE ENGINEER AND SPECIALIST

Minimum Requirements for the Education, Examination and Qualification

Section I: Minimum Requirements for the Education of European Adhesive Engineer and Specialist

The use of this guideline is restricted to organizations approved by the Authorized Nominated Body (ANB). The section II of this guideline covers the examination and qualification of European Adhesive Engineers (EAE) and Specialists (EAS).

ANB is accredited according to EN ISO/CEI 17024

1. Introduction

This guideline for the European Education and Training of Adhesive Engineers and Specialists has been prepared, evaluated and formulated by Members of the Committee for Education and Training of the EWF. It is designed to provide the basic core education in adhesive technology required for a number of adhesive personnel being active in job functions such as foreman, instruction, technical sales etc. It is possible that additional training and/or experience may be required by the adhesive personnel beyond the basic core education to lead to qualification in the applicable job functions.

The European Adhesive Engineer has advanced knowledge and critical understanding of adhesive technology application.

He / she shall have advanced skills at a level that is required in the field of bonding technology which demonstrate:

- technology mastery and required innovation
- being able to solve high-level complex and unpredictable problems
- being able to choose the proper technical and economical solutions in complex and unpredictable conditions
- the ability to manage highly complex technical and professional activities or projects related to bonding applications



- taking responsibility for decision making in unpredictable work or study contexts
- taking responsibility for managing the professional development of individuals and groups of workers

The European Adhesive Specialist has specialized and factual knowledge in the field of adhesive bonding technology.

He / she shall have skills at a level that is required in the field of bonding technology which demonstrate:

- being able to develop solutions on common/regular problems
- being able to choose appropriate methods when applying bonding technology in common /regular problems
- being able to manage and supervise common or standard adhesive applications and related professional activities
- taking responsibility for decision making in common or standard work
- taking responsibility to supervise the tasks of adhesive and related personnel.

The guideline covers the minimum requirements for education and training, agreed upon by all nominated bodies of welding and joining in each country within the EWF, in terms of themes, keywords and times devoted to them. It will be revised periodically by the Committee to take into account any changes which may affect the "state of the art". Students having successfully completed this course of education will be expected being capable of applying adhesive technology as covered by this guideline. The subsequent section II of this document covers the examination and qualification.

The contents are given in the following structure.

Theoretical Education	Teaching hours	
	EAE	EAS
1. Adhesion and Adhesives	48	14
2. Materials as Adherends	40	14
3. Construction & Design	28	8
4. Durability	28.5	12.5
5. Bonding Process	33.4	12.5
6. Testing and Analysis	30	14



Theoretical Education	Teaching hours	
	EAE	EAS
7. Health & Safety	8	4
8. Quality Management	24	4.75
9. Manufacturing Case Studies	24	8
Practical Education	40	22
Examination	12H15	8
Total	316,05	121,75

A teaching hour will contain at least 50 minutes of direct teaching time. It is not obligatory to follow exactly the order of the topics given in this guideline and choice in the arrangement of the syllabus is permitted.

In this syllabus, the workload (WL) is an estimation of the time learners typically need to achieve the defined learning outcomes. WL covers theoretical training and self-study, as well as the time devoted to practical training and examination.

ECVET credit points are allocated to the Competence Unit and Qualification, where 1 credit equals to 25 hours of workload.

It is to be noted that the overall structure of the syllabus for all levels (EAE, EAS and EAB) is similar, but some items are not considered appropriate in the Education of EAS and EAB. The depth to which each topic is dealt with is indicated by the number of hours allocated to it in the guideline. This will be reflected in the scope and depth of the examination.

The course consists of theoretical training and practical training. Applicants must pass theoretical and practical exam (optional for EAE).

The theoretical education given to the EAE students aims at an advanced knowledge of a field of work or study, involving a critical understanding of principles and applicability of the appropriate bonding technology, and the materials behavior including standards and safety regulations.

The theoretical education given to the EAS students aims at a specialised, factual and theoretical knowledge of principles and applicability of bonding technology.

The themes and keywords are given as 'scope' in the Competence Unit descriptions, together with the 'Objective' and the 'Learning Outcomes' defined in terms of 'Knowledge application', 'Practical application' and 'Competences'.



The practical training advised in this Guideline will bring the students to the comprehensive skills, required for practical work in industry, meaning for the Engineer the appreciation of the bonding processes and for the Specialist the supervision of tasks she or he will be asking others to perform.

2. Routes to Qualification

Three distinct routes to gain the qualifications described in this document have been agreed:

1. The Standard Route
2. The Alternative Route
3. Distance Learning Route

The Standard Route

The Standard Route requires successful completion of EWF approved courses which are designed to meet all the requirements in this Guideline. This is the route (Path 1 in diagrams 1 and 2) recommended by EWF as offering the fastest, most comprehensive manner in which the syllabus may be covered.

The Alternative Route

The Alternative Route is aimed at individuals who may already have experience of the job function at a particular level without holding the appropriate qualification diploma. These individuals will have already gained full or part knowledge of the syllabus defined in this guideline and can demonstrate their capability to proceed to examination either directly without compulsory attendance at an ANB approved training course or by attending only part of such a course.

Distance Learning Route

Distance Learning Route requires successful completion of EWF approved courses which are designed to meet all the requirements in this Guideline and specific requirements on the Distance Learning Guideline that shall be followed.

3. General Access Conditions

In a separate document (EWF-658 latest edition) the definitions for every country are given in detail the defined access conditions approved by EWF Technical Committee are given in detail for all countries participating in the EWF system. Applicants not fulfilling the access conditions may follow the course as guests, but entry to the related examination is not permitted.

The implementation of the access conditions is the responsibility of the ANB.

In following parts of chapter 3, diagrams are used for schematic illustration of the text. It should be noted that it is the text which is binding.

3.1 EAE

It is agreed that entry to the program should be on a postgraduate level. Participants should have a primary degree in an engineering discipline or equivalent in natural sciences recognised by the national government and assessed by the ANB. Therefore, it would be expected that participants should have at least a Bachelor degree at university level with a minimum study of 3 years, e.g.

- a relevant qualification from an accredited program in accordance with the Washington Accord for professional qualification of engineers, or
- a First Cycle Bologna Framework engineering qualification, or
- an engineering qualification at EQF Level 6,
- or equivalent in natural sciences

In case of co-operation arrangements, e.g. with universities, parts of the course EAE are given under careful control of the ANB according to the EAE syllabus with scope, objectives, and learning outcomes can be given under careful control of the ANB. The participant is allowed to enter the EAE course through the Path 2 (see topics 1 and 2 as well as the diagram 1 below).

The following additional conditions shall be observed for the different routes through the EAE course:

1. Students who have authenticated evidence that they have passed the examinations in all subjects of their Bachelor engineering degree studies but still have to complete a thesis are allowed to attend the EAE course and the corresponding written parts of the final examination;
2. Students shall present their degree diploma to the Board of Examiners before being allowed to take the final oral examination for EAE.

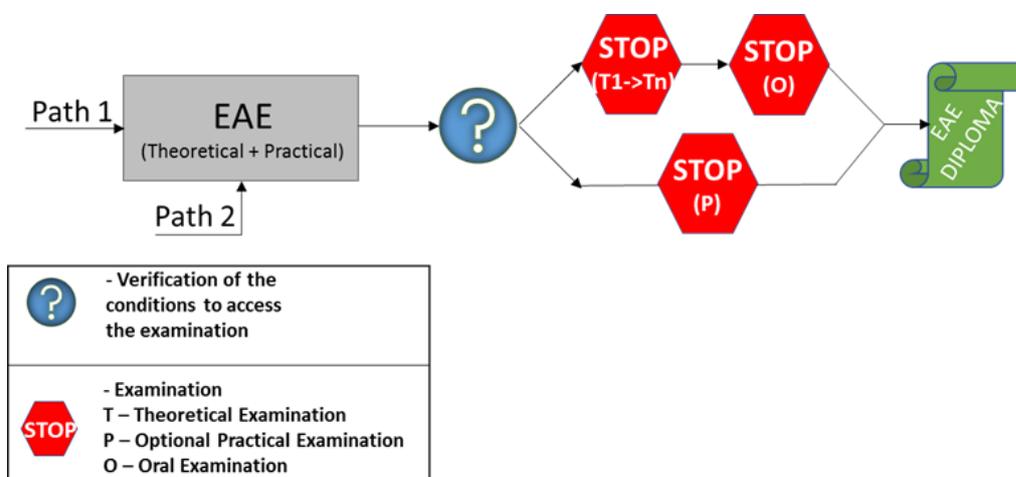




Diagram 1: EAE-route

3.2 EAS

For entry to the EAS training programme 3 paths are available at European level:

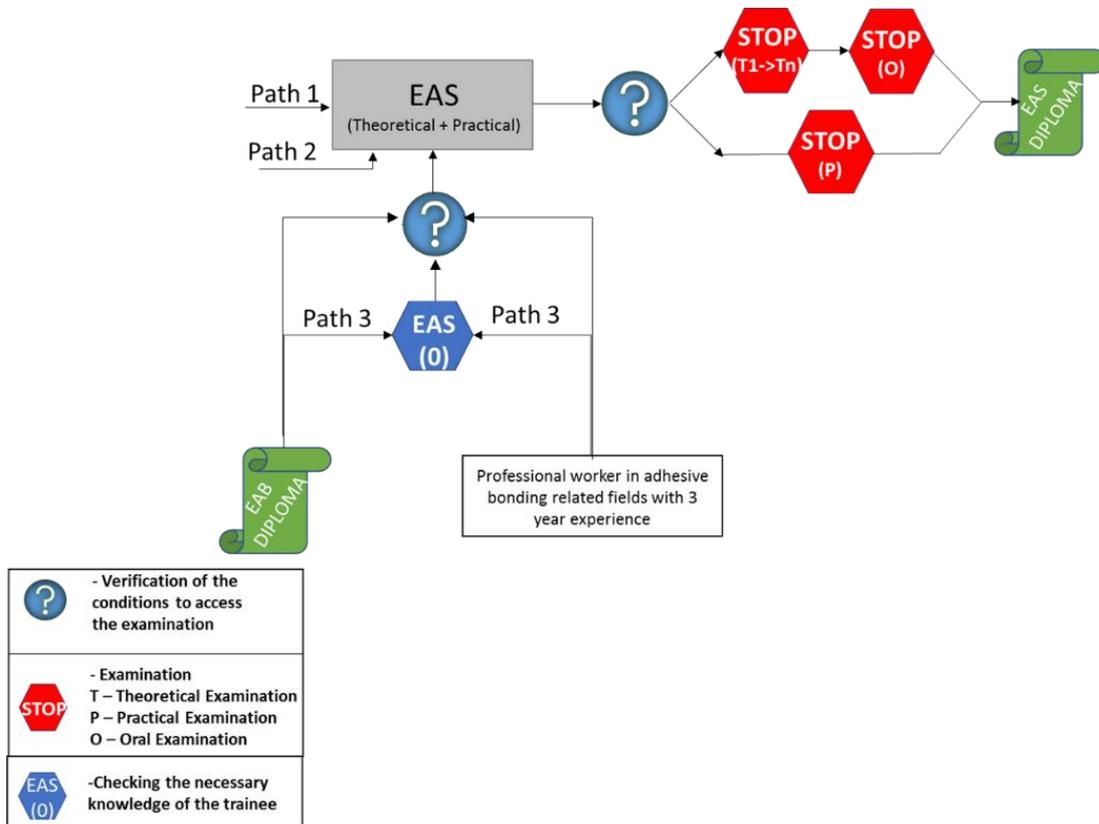


Diagram 2: EAS-route



Path 1 and 2:

For the access to the EAS, the minimum requirements are:

- Specific technical qualification equivalent to EQF level 4, thus according to the national definitions given in another document;
- a minimum age of 20 years including 2 years of job related experience.

In case of cooperation arrangements e.g. with technical colleges, according to which basic parts of the course EAS are given under careful control of the ANB, before the participant complies with the access conditions, the access may be according to the path 2 indicated in the graph.

Path 3

For access to the EAS competence unit part 0, the minimum requirements are EAB qualification or qualification of a professional worker (with certificate after examination) in material processing profession and a minimum of three years' experience in adhesive related activities, and a minimum age of 22 years.

Students who enter from the Bonder or professional worker (Path 3) must pass an entry test. Those who feel they lack the necessary basic technical education may take the preparatory EAS part 0 course before the test. If a student fails in the entry test, he/she must take the full EAS part 0 course before the next test.

Applicants not fulfilling the access conditions may follow the course as guests, but entry to EAS examination is not permitted.

Syllabus

Theoretical Education EAS 0 24 hours + Exam

1. Introduction 1 Hour
2. Units 1 hour
3. Technical Calculation 4 hours
4. Technical Drawing 4 hours
5. Basics of Chemistry 4 hours
6. Basics of Materials 3 hours
7. Mechanical Engineering 3 hours
8. Calculation of strength 3 hours
9. Joining 1 hour



4. Syllabus

4a. Theoretical Training

QUALIFICATION	KNOWLEDGE	SKILLS	COMPETENCES	EQF LEVEL (EQF L)	WORKLOAD (WL)	TEACHING HOURS	ECVET POINTS
EUROPEAN ADHESIVE ENGINEER	Advanced knowledge and critical understanding of the principles and applicability of bonding technology.	Advanced problem-solving skills, including evaluation, allowing to choose the proper technical and economical solutions, when applying bonding technology, in complex and unpredictable conditions.	<p>Manage bonding technology application in a high complex context.</p> <p>Act autonomously as the responsible person for decision making and definition of Adhesive bonding related personnel's tasks.</p>	6	580,5	263,9	23
EUROPEAN ADHESIVE SPECIALIST	Specialised, factual and theoretical knowledge of the principles and applicability of bonding technology.	Specialised range of cognitive and practical skills, allowing to develop solutions or choose the appropriate methods, when applying bonding technology, in common/regular problems.	<p>Manage and supervise common or standard bonding technology applications in an unpredictable context.</p> <p>Take responsibility with limited autonomy for decision making in common or standard work and supervise the Adhesive bonding related personnel's tasks.</p>	5	214	91,75	9



Competence unit	Subject title	Qualification Level (Training Hours)	
		EAE	EAS
1 ADHESION AND ADHESIVES	General introduction to adhesive technology	8	4
	Adhesives & Sealants	40	10
2. MATERIALS AS ADHERENDS	Important Adherend Properties	16	6
	Surface Pre -treatment	24	8
3.CONSTRUCTION AND DESIGN	Fundamentals of the Strength of Materials	8	2,5
	Joint Design	10	4
	Calculation of Stresses in Bonded Joints	12	
	Hybrid Joints	3	1,5
4.DURABILITY	Introduction	1	0,5
	Thermal Effects on Adhesive Joints	4	1
	Moisture Effects on Adhesive Joints	4	1
	Electrochemical and Corrosion Effects on Adhesive Joints	2	
	Chemical Effects on Adhesive Joints	2	1
	Radiation and Vacuum Effects on Adhesives in Bonded Joints	1	
	Mechanical Stress Effects on Adhesive Joints	7	4,5
	Combined Temperature - Moisture - Mechanical Stress Effects on Adhesive Joints	4	2
	Weathering and Ageing Effects on Adhesive Joints	2	1,5
	Durability Assessment and Life Prediction for Adhesive Joints	1 ½	1
5– BONDING PROCESS	Introduction to the Bonding Process	1	0,5
	Sourcing and Storing Adhesives	1	0,5
	Preparation and application of the Adhesives	7	2,5
	Assembly	5	2
	Bonding Pressure	0,25	0,4
	Adhesive Curing	4	1,5
	Inspection	4	0,75
	Repair	1	1
Automation and Robotics	5	2,5	



	Factory Layout	24	8
6. TESTING AND ANALYSIS	Property Determination for Adhesive, Adherend or Joint	4	2
	characterisation of Raw Material and Cured Adhesive	8	4
	Destructive Testing	4	3
	Non-Destructive Testing	10	5
	Examination of Joint Fracture Surfaces and Adhesive Layer	4	
7. HEALTH AND SAFETY	Selection Tables and Performance Specifications	0,5	0,5
	Checklist with Comments	2	0
	Countermeasures	1	
	Data Section	3,5	2,5
8. QUALITY MANAGEMENT	National Rules and Regulations	1	1
	Introduction – The Adhesive Bonding Process	1	0,5
	Raw Materials Control	4	1
	Process Control	8	2,25
	End-product Control	3	1
	Available Quality Tools and Techniques	4	0
	Employee Training and Certification	2	0
9. MANUFACTURING CASE STUDIES	Company Quality Management System and Certification	2	0
	Industrial Case Studies	12	4
	Group Exercises	12	4

4. Practical Training

The objectives of this section are to give experience and appreciation to the Engineer, of processes he or she will specify, and to the Specialist of tasks he or she will be asking others to perform.

PRACTICAL SKILLS TRAINING			EAE	EAS
A	Surface Pre-treatment of Substrates	<p>Practical experience of each main surface pre-treatment type on different substrates [as defined in subject 2.2], i.e. cleaning and degreasing, surface roughening, chemical treatments including anodising, physical treatments including at least one from plasma, corona, flame or UV/ozone, primers including coupling agents, conversion coatings and protective coatings. Measurement and assessment of treated surface, related to key surface features, e.g. wettability by contact angle or surface tension inks.</p> <p>First set of practical exercises (4b1) summarises the basic requirements.</p>	40 hours	22 hours
B	Health and Safety	<p>The considerations on health and safety, storage conditions, disposal, workshop environment (temperature, humidity, cleanliness, etc) and safety instructions will be highlighted [in accordance with Competence Unit 7].</p>		
C	Use of Different Adhesives	<p>Storage conditions, including safe and efficient handling</p> <p>Opening the pot</p> <p>Metering and mixing (for two part adhesives)</p> <p>Dispensing adhesives, manually or with semi-automatic and automatic equipment such as pneumatic guns and cartridges, in order to appreciate viscosity and cure speed.</p> <p>Realisation of test specimens (single lap-shear, "pin and collar", peel specimens with different types of adhesives including the calibration of the bond-line thickness, the curing process).</p> <p>For each type of adhesive used, the influence of not following the correct procedures (metering, mixing, curing) on the quality of the joint will be demonstrated.</p> <p>Second set of practical exercises (4b2) summarises the basic requirements.</p>		



D	Quality Control of Joints/Testing	<p>Practical experience of the different methods described for the quality control of the joint (at the different stages of the process) [as defined in Competence Units 6 and 8].</p> <p>The bonded joints produced on the second day will be tested destructively.</p> <p>Microscopic examination of fracture surfaces.</p> <p>Visual assessment and physical measurement of joint features (e.g. Tg of cured adhesive overflow to detect correct cure cycle). NDT methods including ultrasonic, acoustic (e.g. coin-tap) or electrical tests.</p> <p>Third set of practical exercises (4b3) summarises the basic requirements.</p>		
E	Joint Type	Lap joints, coaxial joints, lamination of multilayers and skin - core (foam, honeycomb)		
F	Manufacture of Bonded Joints with Different Materials	Metals - mild steel, aluminium; Plastics - thermoplastic (e.g. polypropylene), thermoset composite (e.g. GRP); Others - rubber, concrete, fabric		



4b. 1 First set of practical exercises

Practical Exercises - Surface Pre-treatment of Substrates						
No. of exercise	Hours		Type of Joint	Examples of Surface Preparation	Adhesives	Remarks
	EAE	EAS				
1	5	2 ½	Lap joint	Degrease, grit blast, degrease	2 Part Cold Cure: To be decided by the organisation in collaboration with the trainer	A representative cross section of joint types, surface preparation in conjunction with an appropriate adhesive shall be used to assess the candidate. Ensure that laboratory training and reduction to practice in industry are concordant.
2	5	2 ½	Peel joints e.g. bead peel test	Primers Chemical Treatments (where appropriate) Physical treatments Practical exercises on adhesion (only for EAE)		
3	3	2	Hybrid joining			
4	1	1	Preparation for Examination			
Total	14	8				



4b. 2 Second set of practical exercises

Practical Exercises - Use of Different Adhesive Systems						
No. of exercise	Hours		Type of Joint	Surface Preparation	Adhesives	Remarks
	EAE	EAS				
1	4	2	Lap joint	Degrease, grit blast, degrease	A compulsory core of adhesives shall be used: 2 part cold cure epoxy; 1 part moisture cure PU.	A representative cross section of joint types, adhesive systems (including dispensing techniques) shall be used to assess the candidate.
2	4	2	Peel Specimen			
3	2	1	Thread locking			
4	2	1	Hybrid joining			
5	1	1	Preparation for Examination			
Total	13	7				



4b. 3 – Third set of practical exercises

Practical Exercises - Quality Control of Joints/Testing				
No. of exercise	Hours		Test	Remarks
	EAE	EAS		
1	The balance of the specific hours shall be decided by the group in conjunction with the trainer		Adherend Prior to Bonding	Joints to meet consistent values
2			Adhesive (Reception & Storage)	
3			Cured adhesive	
4			NDT	
5	1	1	Preparation for Examination	
Total	13	7		

PRACTICAL TRAINING EXERCISES

Practical exercises	EAE	EAS
	Hours	
4b1 - Surface Pre-treatment of Substrates	14	8
4b2 – Use of Different Adhesive Systems	13	7
4b3 - Quality Control of Joints/Testing	13	7
TOTAL	40	22



APPENDIX I: Requirements for equipment, facilities and specimens for the International Adhesive Bonding Engineer (EAE), and Specialist (EAS) course leading to the award of EWF qualification

1. Equipment

The following equipment shall be in good working order and fit for its purpose:

1.1 Bonding equipment:

- fixation devices for lap shear samples
- devices for measuring temperature and humidity
- application devices for adhesives
- balances
- test machine
- curing oven
- Flame or plasma treatment equipment
- personnel safety equipment

Equipment for the above-mentioned processes shall be available for practical exercises.

“Include equipment used in classes.”

Further processes covered by the syllabus may be shown by means of demonstrations or video presentations.

1.2 Other equipment

Mechanical testing, examination and NDT equipment shall be available for both demonstration and laboratory work purposes.

2. Specimens

A reference collection of well documented specimens, should reflect the processes covered by the Guideline and one specimen per process is required (at minimum for the most common bonding processes; recommended is to show all other processes by means of slides, photos, etc.). Preferably the specimens should cover a number of materials and thicknesses.