

EWF Guideline EUROPEAN THERMAL SPRAYING SPECIALIST



Minimum Requirements for the Education,
Examination and Qualification



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MINIMUM REQUIREMENTS FOR THE EDUCATION,
TRAINING, EXAMINATION AND QUALIFICATION

**European Thermal Spraying Specialists
ETSS**

Prepared and issued by EWF- European Federation for Welding, Joining and Cutting

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

**For more information regarding the EWF Qualification System,
the EWF-IAB/IIW Combined Secretariat or the National ANB
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Section I: Minimum Requirements for the Education of European Thermal Spraying Specialist

The use of this guideline is restricted to organizations approved by the Authorized National Body (ANB). The section II of this guideline covers the examination and qualification of European Thermal Spraying Specialists.

Introduction

This guideline for the European education and training of the Thermal Spraying Specialist has been prepared, evaluated and formulated by Members of the Subcommittee Thermal Spraying of the Committee for Education and Training of the EWF. It is designed to provide the basic core education in thermal spraying technology required for a number of thermal spraying personnel being active in job functions such as inspection, supervision, foremanship, instruction, technical sales etc.. It is possible that additional training and/or experience may be required by the thermal spraying personnel beyond the basis core education to lead to qualifications in the applicable job functions. Additional training programmes will be established as required.

The guideline covers the minimum requirements for education and training, agreed upon by all national welding societies, to which thermal spraying is allied in most cases, within the EWF, in terms of themes, keywords and times devoted to them. It will be revised periodically by the Subcommittee to take into account any changes that may effect the "state of the art". Students having successfully completed this course of education will be expected of being capable of applying the thermal spraying technology as covered in this guideline. A subsequent document covers the examination and certification.

The contents are given in the following structure:

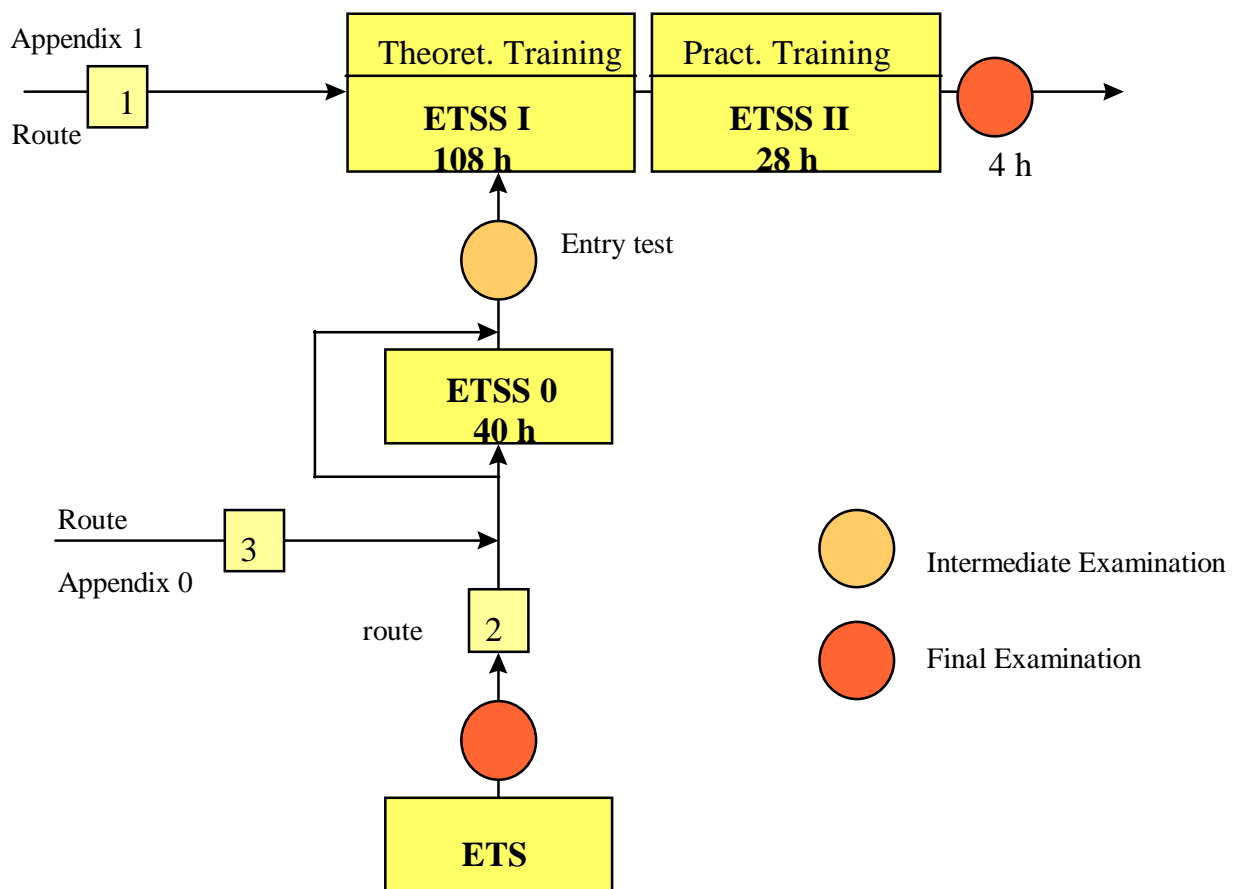
Theoretical Education	teaching hours
1. Thermal spraying processes: introduction and principles and environmental aspects	25
2. Spray material selection and bonding mechanisms	19
3. Working procedure, health and safety	19
4. Spray results and documentation	21
5. Application engineering and quality management	25
	109
6. Examination	4
Practical Training	
7. Practical training/demonstration	27
	140

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.

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.

Access to Education

For the entry to the programme three routes are available:



Route 1:

For the access to the module ETSS Part I the minimum requirements are:

- Specific technical qualifications, the national definitions are given in appendix 1 and a minimum age of 20 years including 2 years of job related experience.

Route 2:

For access to the module ETSS part 0 the minimum requirements are:

- ETS Qualification (European Thermal Sprayer - Guideline EWF Doc. 507) and a minimum of 2 years experience in thermal spraying related activities.

Route 3:

or

- Thermal sprayer and 5 years experience
- Qualification of a professional worker in metalworking professions and minimum of 3 years experience in thermal spraying related activities, and a minimum age of 22 years, national definitions are given in appendix 0.

Students who enter from route 2 and 3 must pass an entry test. Those who feel they lack the necessary technical education may take the preparatory ETSS part 0 course before the test. If a student fails in the entry test, he must take the full ETSS part 0 course before the next test.

The rules for the conduct of the final examination by the ANB are prescribed under Examination and Qualification in this guideline.

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

Theoretical Education ETSS 0

The module ETSS 0 aims at teaching basic technical knowledge, which in general is lacking with participants entering via route 2 and 3 in comparison to participants entering via route 1. It provides the chance for professional worker to be qualified as a European Thermal Spraying Specialist.

The module ETSS 0 deals with the following subjects:

Subject	hours
Introduction	2
Units	2
Technical Calculation	13
Technical Drawing	6
Basics of Electrotechnics	3
Basics of Chemistry	4
Properties of Materials and Metal Products	6
Machining of Materials	2
Survey of Thermal Spray Processes	2
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	40 hours

Appendix 0

National definitions for the minimum requirements for the access to the Thermal Spraying Specialists' education and examination via the route 3 defined above:

Austria:

Professional worker in a metal working profession

Belgium:

Holders of a B.S.O. (Beroeps Secundair Onderwijs) or a E.S.P. (Enseignement Secondaire Professionnel) qualification plus demonstrated practical skill in two processes + three years of practical experience

Denmark:

Craftsman (diploma of skill) in metalworking professions (Faglaert med svendebrev)

Finland:

3 years at institute of vocational education or equivalent (mechanical line) or sufficient technical knowledge and 3 years experience in metalworking professions (including at least 1 year experience in thermal spraying)

France:

Germany:

Certificate of a professional worker in metalworking professions (Facharbeiterbrief), obtained after successful examination by the chambers of industry or craft organisations

Italy:

National certificate (diploma) of professional worker obtained at public or private professional school recognized by the district education authorities ("Regioni" or "Provincie Autonome")

Ireland:

Luxembourg:

Certificate of a professional worker in metalworking professions (CATP = certificat d'aptitude technique et professionnel), obtained after successful examination by the chambers of trade

Netherlands:

NIL/SOM diploma level 3 ("grounddiploma")

Norway:

Qualification as skilled worker - letter of skill - in:

Plate/welding, mechanical processes or electro-mechanical processes - according Norwegian education system
(Grunnskole, GK Mekaniske fag, VK1 plate/sveise-sfag, fagprøve) Min. 2 years experience in Thermal Spraying

Portugal:

- Second cycle of basic education or,
- First cycle of basic education plus two years in a Professional Training Centre of the metalworking area (Profissional Qualificado)

Spain:

Professional worker in metalworking professions

Sweden:

Access is possible via three routes:

a) 2 years at Gymnasieskolans plat-och svetslinje (practical, upper secondary school).
Prior to 1993

or

b) 3 years at Gymnasieskolans (practical, upper secondary school). After 1993

or

c) Older equivalent education with at least 2 years of technical education after the compulsory school leading to at least the same competence as alternatives a) and b) above

All ETSS-students must have minimum 3 years of industry practice in a metalworking profession

Switzerland:

Certificate of a professional worker in metalworking professions, obtained after successful examination by the craft organisation (Eidg. Fähigkeitsausweis)

United Kingdom:

Approved craft certificates in engineering subjects issued by, for example, City & Guilds of London Institute

or

Approved Level 2/3 National Vocational Qualifications or other nationally recognized vocational qualifications in engineering subjects

Theoretical Education: ETSS - Part I

1. Thermal spraying processes: introduction and principles and environmental aspects **hours**

<u>1.1</u>	<u>General</u>	1
<u>1.2</u>	<u>Mechanical, chemical, thermal attack of surfaces</u>	2
<u>1.3</u>	<u>Possibilities to protect surfaces</u>	1
<u>1.4</u>	<u>Thermal spraying processes: principles incl. spraying and handling equipment</u>	1 1
	<u>1.4.1 Oxygen fuel flame spraying</u>	6
	<u>1.4.2 Arc spraying</u>	2
	<u>1.4.3 Plasma spraying</u>	2
	<u>1.4.4 Low pressure plasma spraying - LPPS</u>	1
<u>1.5</u>	<u>Handling the equipment for all processes</u>	1
<u>1.6</u>	<u>Environmental aspects and waste disposal</u>	6

Thermal spraying processes: introduction and principles
and environmental aspects

Total hours: 25

2. Spray material selection and bonding mechanisms

<u>2.1</u>	<u>Coating functions and related materials</u>	6
<u>2.2</u>	<u>Spray material</u>	6
<u>2.3</u>	<u>Bonding mechanism</u>	7

Spray material selection and bonding mechanisms

Total hours: 19

3. Working procedure, health and safety

<u>3.1</u>	<u>Pre-spray conditions and preparation</u>	4
<u>3.2</u>	<u>Substrate, bond coats and intermediate layers</u>	3
<u>3.3</u>	<u>Working procedure</u>	5
<u>3.4</u>	<u>Post treatment</u>	3
<u>3.5</u>	<u>Health and safety</u>	4

Working procedure, health and safety **total hours: 19**

4. Spray results and documentation

<u>4.1</u>	<u>Spray results</u>	6
<u>4.2</u>	<u>Faults and defects:</u>	4
<u>4.3</u>	<u>Measurement, recording, testing and documentation</u>	11

Spray results and documentation **Total hours: 21**

5. Application engineering and quality management

<u>5.1</u>	<u>Economics</u>	3
<u>5.2</u>	<u>Quality management</u>	4
<u>5.3</u>	<u>Other processes and new developments</u>	2
<u>5.4</u>	<u>Typical applications and case studies</u>	16

Application engineering and quality management **Total hours: 25**

Practical training/demonstration: ETSS Part II

This part does not aim at practical skills of the thermal spraying specialist but on gaining knowledge on the control of different thermal spraying processes. The students shall become as familiar as possible with the difficulties and typical defects associated with incorrect use of the different thermal spraying methods. During their exercises the students are guided by skilled thermal spraying personnel.

<u>Practical training and demonstration</u>	hours
1. <u>Practical demonstration</u>	7
2. <u>Practical instructions</u>	14
3. <u>Practical demonstration of fusion and post treatment</u>	3
4. <u>Visual inspection, testing and measuring</u>	3
<hr/> <u>Practical training/demonstration</u>	Total hours: 27

Appendix 1

National definitions for the minimum requirements for the access to the Thermal Spraying Specialists' education and examination via route 1 defined previously:

Austria:

High craft or industry qualification in metal working professions.
(Meister im Gewerbe oder in der Industrie)

Belgium:

Holders of the B.S.O (Beroeps Secundair Onderwijs) or a E.S.P. (Enseignement Secondaire Professionnel) qualification plus certificate of a "seventh" year of professional education plus demonstrated practical skill in two processes + two years of practical experience.

Denmark:

Master craftsman in metalworking. E.g. exam og autoriseret gas, sand og sanitetsmester

Finland:

3 years at institute of vocational education or equivalent (mechanical line) or sufficient technical knowledge and 3 years experience in metalworking professions

France:

High craft or industry qualification in metalworking professions

Germany:

High craft or industry qualification in metalworking professions.
(Meisterprüfung in Handwerk oder Industrie)

Italy:

Diploma of technical professional school (at least 3 years after middle school), recognized by the Minister of Education

Ireland:

Luxembourg:

Master craftsman in metalworking (Inhaber einer Meisterprüfung im metallverarbeitenden Handwerk)

The Netherlands:

NIL/SOM diploma level 4 ("vakdiploma")

or

MTS

Norway:

Qualification as skilled worker - letter of skill - in:
Thermal spraying - according Norwegian education system
(Grunnskole, GK Mekaniske fag, VK1 Mek.prosessfag, fagprøve)

Portugal:

- Third cycle of basic education;
- Second cycle of basic education plus three years in a professional center of metalworking area (Profissional Qualificado)

Spain:

High Technician (Technico superior) in metalworking professions or nationally recognized studies equivalent to the above

Sweden:

Access is possible via three routes:

a) 2 years at Gymnasieskolans plat- och svetslinje (practical, upper secondary school).
Prior to 1993

or

b) 3 years at Gymnasieskolans (practical, upper secondary school. After 1993

or

c) Older equivalent education with at least 2 years of technical education after the compulsory school leading to at least the same competence as alternatives a) and) above

Switzerland:

High craft qualification in metalworking professions.
(dipl. Meister oder Betriebsfachmann mit eidg. Fachausweis)

United Kingdom:

BTech/Scotvec, National Certificate in Engineering,

or

Approved City & Guilds of London Institute Part 3 Certificate in Engineering Subjects,

or

Approved Level 3 National Vocational Qualification in Engineering Subjects