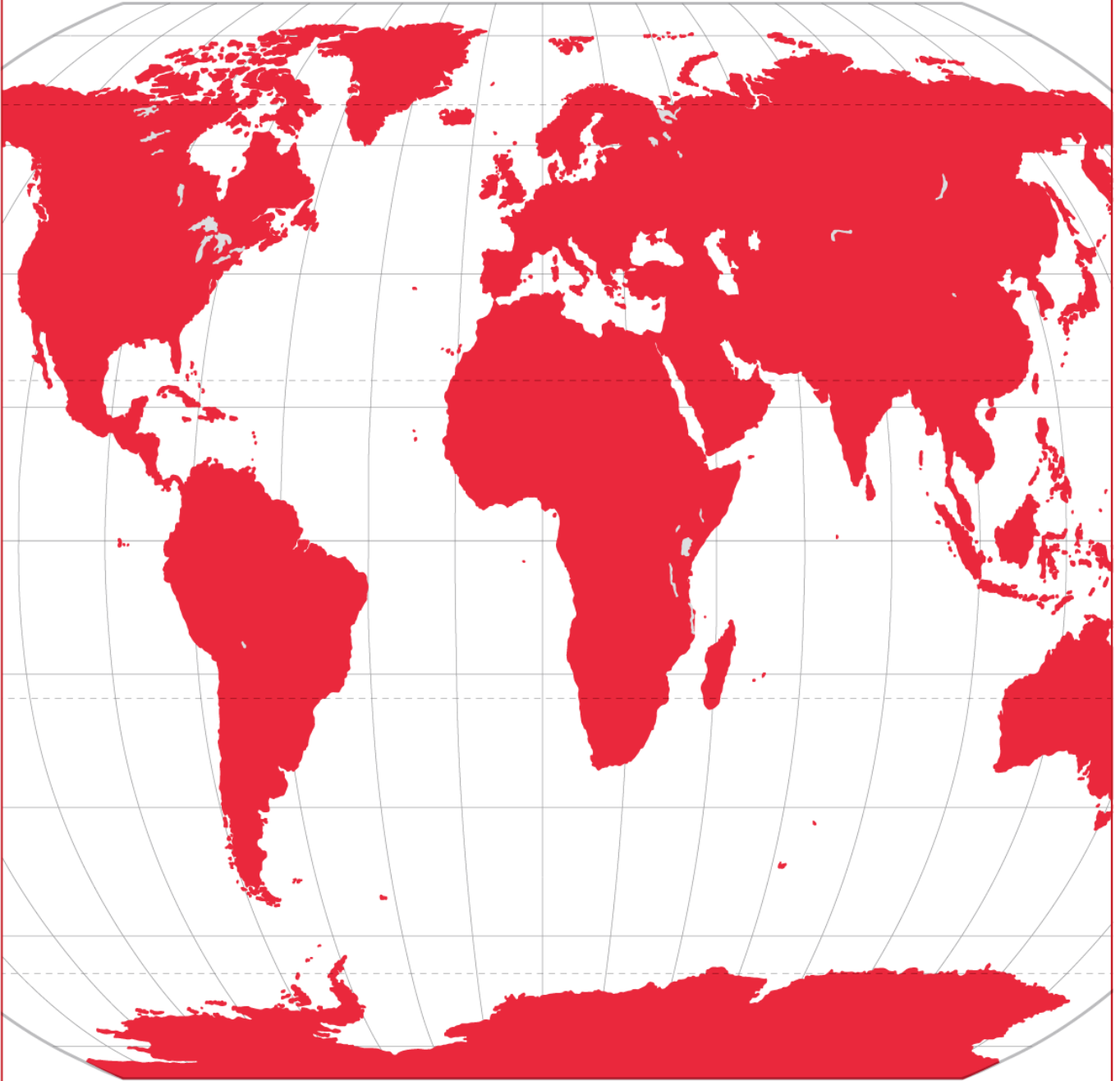


**IIW Guideline
PERSONNEL WITH RESPONSIBILITY FOR
WELDING COORDINATION**



**Minimum Requirements for the Education,
Examination and Qualification**



IAB-252-07/SV-00

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MINIMUM REQUIREMENTS FOR THE EDUCATION,
TRAINING, EXAMINATION, AND QUALIFICATION

Personnel with Responsibility for Welding Coordination
(as described in ISO 14731 and other International and National Standards)

International Welding Engineer (IWE)

former : Doc. IAB-002-2000/EFW-409 Rev. 2

International Welding Technologist (IWT)

former : Doc. IAB-003-2000/EFW-410 Rev. 2

International Welding Specialist (IWS)

former : Doc. IAB-004-2000/EFW-411 Rev. 1

International Welding Practitioner (IWP)

former : Doc. IAB-005-2002/EFW-451 Rev. 1

Prepared and issued by the IAB-International Authorisation Board
Under the authority of the IIW-International Institute of Welding

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

**For more information regarding the Qualification System,
the IAB/EFW Combined Secretariat or the National ANB should
be contacted**

(see in the IIW site the ANB contacts)

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Preface

This document is based upon the European Welding Engineer/ Technologist/ Specialist/ Practitioner Guidelines as developed by the European Federation for Welding, Joining and Cutting (EWF), through an Agreement first signed 19 July, 1997, at the Annual Meeting of the International Institute of Welding (IIW) in San Francisco, California, USA and which has been renewed and further developed since then. It has been established in that Agreement that the International Welding Engineer/ Technologist/ Specialist/ Practitioner Diploma is equivalent to the European Welding Engineer/ Technologist/ Specialist/ Practitioner Diploma.

The former EWF ANBs may issue the European Welding Engineer/ Technologist/ Specialist/ Practitioner diplomas for as long as these qualifications are referenced in the standard EN 719.

Copies of this document are available from the IIW IAB Secretariat or their designated distributor.



MINIMUM REQUIREMENTS FOR THE EDUCATION, TRAINING, EXAMINATION AND QUALIFICATION OF PERSONNEL

1. Introduction

This guideline for the international education, training, examination and qualification of welding personnel has been prepared, evaluated and formulated by Group A "Education, Training and Qualification" of the International Authorisation Board (IAB) of the International Institute of Welding IIW.

Section I of the guideline covers the minimum requirements for education and training, agreed upon by all IIW Authorised National Bodies (ANB), in terms of objectives, scope, expected results and the teaching hours to be devoted to achieving them. It will be revised periodically by IAB Group A to take into account changes to reflect the "state of the art". Students having successfully completed this course of education and the appropriate examinations will be expected to be capable of applying the technology required in welding engineering as covered by this guideline.

Section II of the guideline covers the rules for examination and qualification.

The contents are given in the following structure (overview):

Table with 9 columns: Modules of Theoretical Education and fundamental practical skills, IWE (MT, P1), IWT (MT, P1), IWS (MT, P1), IWP (MT, P1). Rows include Welding processes and equipment, Materials and their behaviour during welding, Construction and design, Fabrication, applications engineering, Sub-total, Fundamental practical skills (Part 2), and Total.

* teaching hours are the minimum for the Standard Route, see 2.4; MT = Module Total (Part 1 + Part 3); P1 = Part 1; Figures under P1 are given for the Standard Route (see 4.1).

It is to be noted that the overall structure of the syllabus for all levels (IWE, IWT, IWS, and IWP) is similar, but some topics are not considered in all levels of qualification. These topics are indicated by 0 hours in this guideline. The depth to which a 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.

2. Routes to Qualification

Three distinct routes to gaining the qualifications described in this document have been agreed.

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



2.1 The Standard Route

The Standard Route requires attendance at IIW approved Training Courses designed to meet all the requirements in this Guideline. This is the route (Route 1 in diagrams 1, 2, 3, and 4) recommended by IIW as offering the fastest, most comprehensive manner in which the syllabus may be covered.

The Standard Route also allows for a limited amount of prior learning (Part 1 of each qualification course; see Section I) to be taken into account, for example during University or College courses or by distance learning (Route 2 in diagrams 1, 2, 3, and 4). This prior learning shall be approved by the ANB.

2.2 The Alternative Route

The Alternative Route allows those who have gained the knowledge of the syllabus in the full detail defined in this Guideline and who can demonstrate their capability in all respects, to proceed to examination without compulsory attendance at an ANB approved Training Course.

2.3 Distance Learning Programs

The Part 1 theory module may be taught in Distance Learning Programs under control of the ANB.

When the Part 1 and Part 3 theory modules are combined or the Part 3 theory module is taught separately the requirements of the Distance Learning Guideline IAB 195-2004 shall be followed.

2.4 Teaching hours

The meaning of the teaching hours is the following:

Standard Route:	minimum number of hours devoted to the subject
Alternative Route:	recommended number of hours devoted to the subject
Distance Learning:	recommended number of hours devoted to the subject
Part 1:	maximum number of hours devoted to the subject in Part 1

A "teaching hour" shall contain at least 50 minutes of direct teaching time.

3. General Access Conditions

In a separate document (Directory of Access Conditions, Doc. IAB-020-2000) the defined access conditions approved by Group B "Implementation and Authorisation" of the International Authorisation Board (IAB) of the International Institute of Welding IIW are given in detail for all countries participating in the IAB system. Applicants not fulfilling the access conditions may follow the course as guests, but entry to the IIW examination is not permitted.

The following general conditions shall be observed when passing through the IWE, IWT, IWS and IWP courses:

1. Students who have successfully passed the intermediate examination of Part 1 of the course are allowed to attend Part 2 and Part 3 of the course;
2. The implementation of the access conditions is the responsibility of the ANB.

3.1 International Welding Engineer IWE

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 its equivalent recognised by the national government and assessed by the ANB. Therefore, it would be expected that participants should have at least a Bachelor degree.

In case of co-operation arrangements, e.g. with universities, according to which the IWE Part 1 of the curriculum structure (see Section I) is presented under careful control of the ANB, the participant is allowed to enter the IWE course through the Route 2 (see item 2.1 and the diagram 1).

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

1. Students who have authenticated evidence that they have passed the examinations in all subjects of their engineer study – except the diploma thesis – are allowed to attend Part 2 and Part 3 of the IWE 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 IWE.

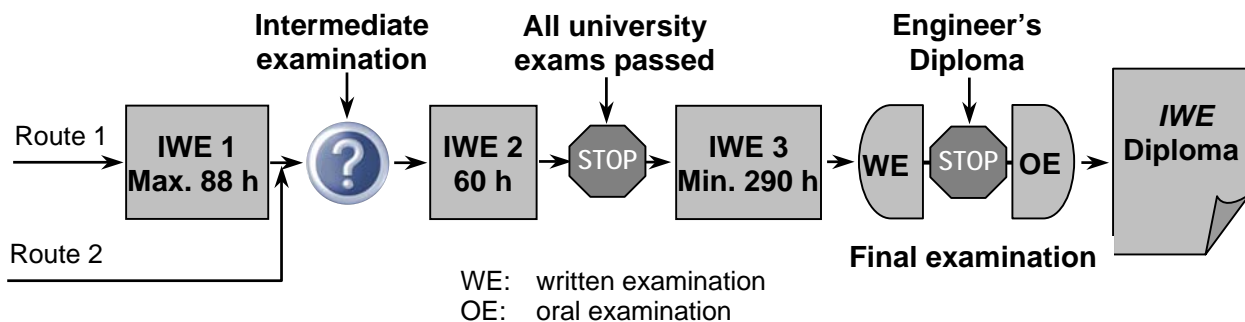


Diagram 1

3.2 International Welding Technologist IWT

It is agreed that entry to the program should be on the basis of a higher technical education below that required for the International Welding Engineer. Participants should have a primary degree in an engineering discipline or its equivalent recognised by the national government and assessed by the ANB.

In case of co-operation arrangements, e.g. with technical colleges, according to which the IWT Part 1 of the curriculum structure (see Section I) is presented under careful control of the ANB, the participant is allowed to enter the IWT course through the Route 2 (see item 2.1 and the diagram 2).

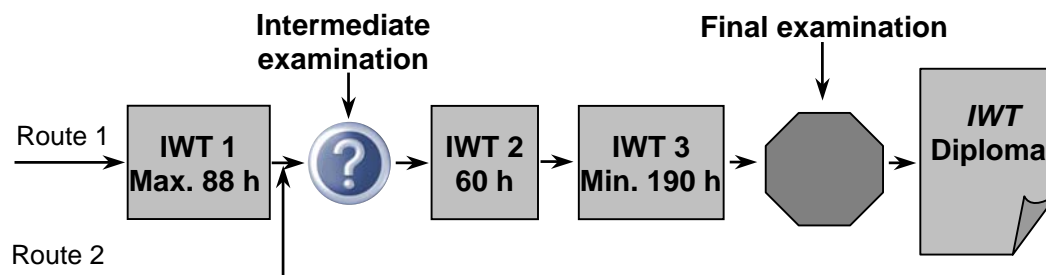


Diagram 2

3.3 International Welding Specialist IWS

It is agreed that entry to the program through the Routes 1 and 2 should be on the basis of a specific technical education below that required for the International Welding Technologist.

In case of co-operation arrangements, e.g. with technical colleges, according to which the IWS Part 1 of the curriculum structure (see Section I) is presented under careful control of the ANB, the participant is allowed to enter the IWS course through the Route 2 (see item 2.1 and the diagram 3).

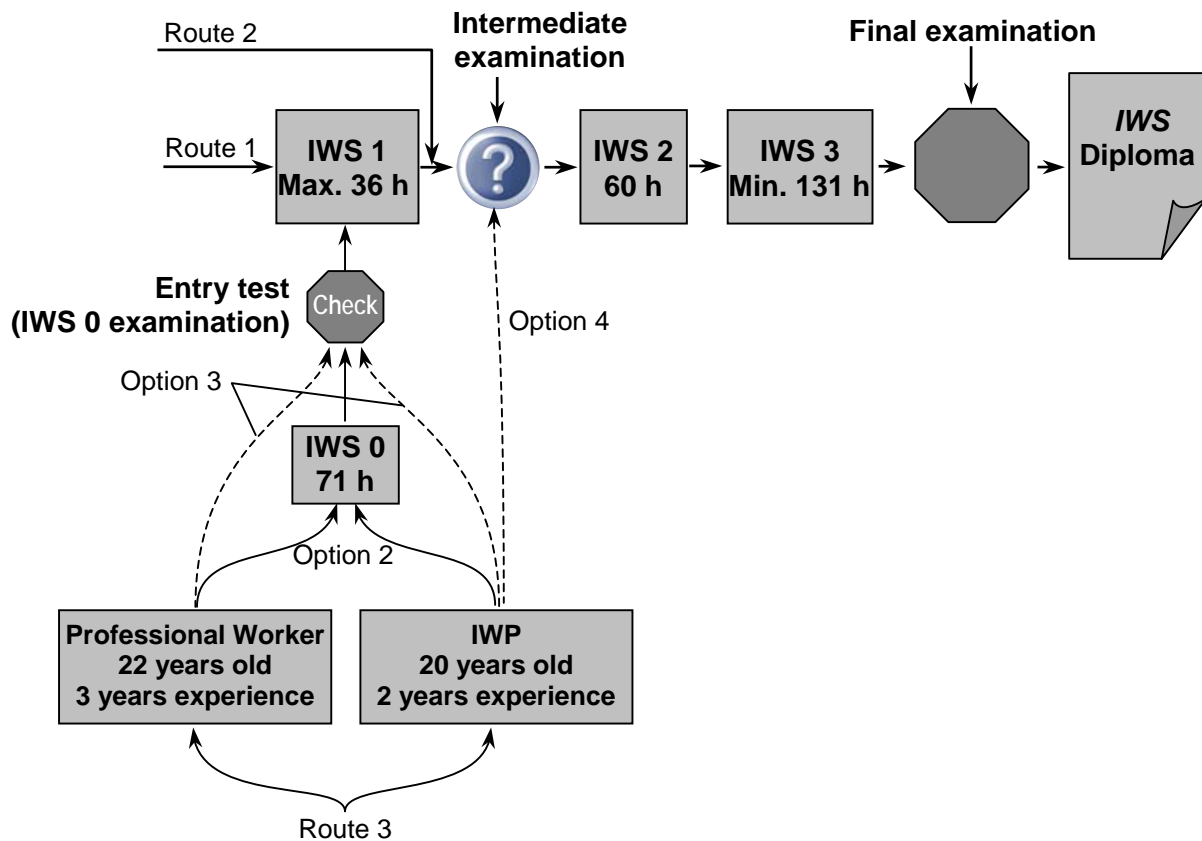


Diagram 3

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

1. Route 1 and 2: a minimum age of 20 years including 2 years of job related experience is required;
2. Route 3: For the access to the module IWS Part 0 the minimum requirements are:
 - International Welding Practitioner (IWP) or (see on above diagram option 2)
 - Qualification of a professional worker (with diploma after examination) in metalworking professions and minimum 3 years experience in welding related activities, and a minimum age of 22 years. National definitions are given in the Directory of Access Conditions (see on above diagram option 2).

3. A qualified professional worker (as stated above) or an IWP Diploma holder not fulfilling the IWS National Access Requirements should be allowed to go directly to the IWS Part 0 examination if they can prove that they have achieved the knowledge prescribed by the IWS Part 0 (see on above diagram option 3).
4. If the IWP Diploma holder fulfills the IWS National Access Requirements, he may skip the entry test (IWS Part 0 examination) and IWS Part 1 and only perform the IWS Part 1 intermediate exam (see on above diagram option 4).

3.4 International Welding Practitioner IWP

In order to enter the International Welding Practitioner course, participants are required to be skilled in practical welding and to have had experience as a welder in industry. As well as assuming theoretical education, the International Welding Practitioner course also serves to entrance the practical welding skills level of the participants.

In case of co-operation arrangements, e.g. with technical colleges, according to which the IWP Part 1 of the curriculum structure (see Section I) is presented under careful control of the ANB, the participant is allowed to enter the IWP course through the Route 2 (see item 2.1 and the diagram 4).

The following standard access conditions are applicable to the IWP course. Applicants are required to

1. Hold a valid welder qualification certificate ISO 9606 H-L045 ss nb in one of the welding processes listed in 5.1 of ISO 9606, or equivalent, e.g. EN 287 H-L045 ss nb, or ASME IX 6G.
or hold a valid welder qualification as a plate welder for the following conditions: PE ss nb or PC and PF ss nb, according to ISO 9606 at least in one process, and/or other national equivalent in the IIW member country.
2. Be a minimum age of 20 years including 2 years experience as a welder.

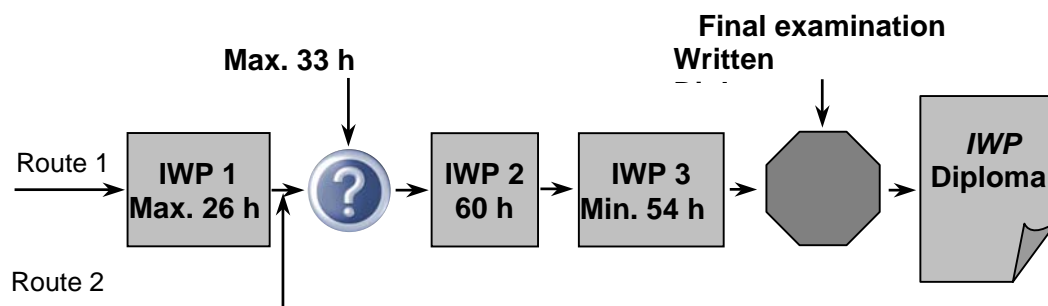


Diagram 4

4. Special Requirements

4.1 Standard Route

An applicant (excluding guests) shall satisfy the ANB access conditions. If the ANB decides that the access conditions are adequately met, the applicant is then required to attend a training course conducted by an Approved Training Body (ATB) giving as a minimum the hours of instruction detailed in this Guideline as teaching hours. At the conclusion of this course of instruction the student may enter the examinations for the award of the applicable IIW Diploma.

The maximum amount of hours of the lectures, which can be included in Part 1 are given after “P1=” in the following definition of the theoretical education (see Section I). The definition of the precise syllabus of Part 1 is the responsibility of the ANB.

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.

The rules for the conduct of the final examination by the ANB are prescribed under Examination and Qualification Section in this guideline (Section II). The intermediate examination is mandatory for access Route 2 and it is the responsibility of the training school to ensure that those entering by this Route 2 have achieved the required knowledge of Part 1 to enter Part 2 and Part 3 of the course. Failure in the intermediate examination will require the student to enter Part 1 of the course.

4.2 Alternative Route

An applicant shall submit to the ANB the documents indicated in the items 4.2.1, 4.2.2, 4.2.3 and 4.2.4 for a paper assessment together with an application form.

The ANB shall determine through a paper assessment if the application is suitable for further detailed assessment (Appendix III).

The following Access Conditions for the alternative route shall be checked by a paper assessment (see the list of access conditions, doc IAB-020-2000). This assessment is an evaluation of practice of related job function in welding.

4.2.1 International Welding Engineer IWE

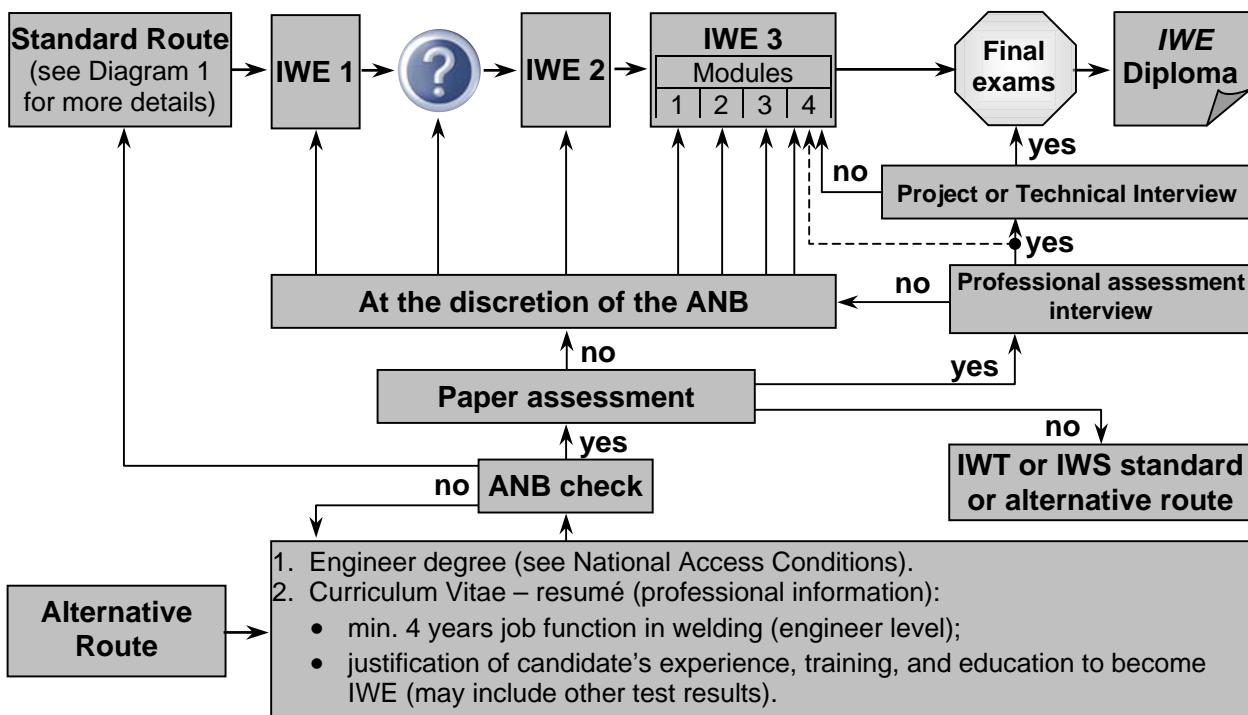


Diagram 5 Alternative versus Standard Routes for IWE qualification
(see also appendix III)

- A copy of a diploma showing graduation in an engineering subject complying with the Access Conditions.
- A curriculum vitae (CV) - resume containing professional information:
 - evidence of at least 4 years job function in welding at the level of an engineer (in a period of 6 years before application);
 - justification of candidate's experience, training, and education to become IWE (may include other test results).

4.2.2 International Welding Technologist IWT

- A copy of a diploma showing graduation as technologist complying with the Access Conditions.
- A curriculum vitae (CV) - resume containing professional information:
 - evidence of at least 4 years job function in welding at the level of a technologist (in a period of 6 years before application);
 - justification of candidate's experience, training, and education to become IWT (may include other test results).

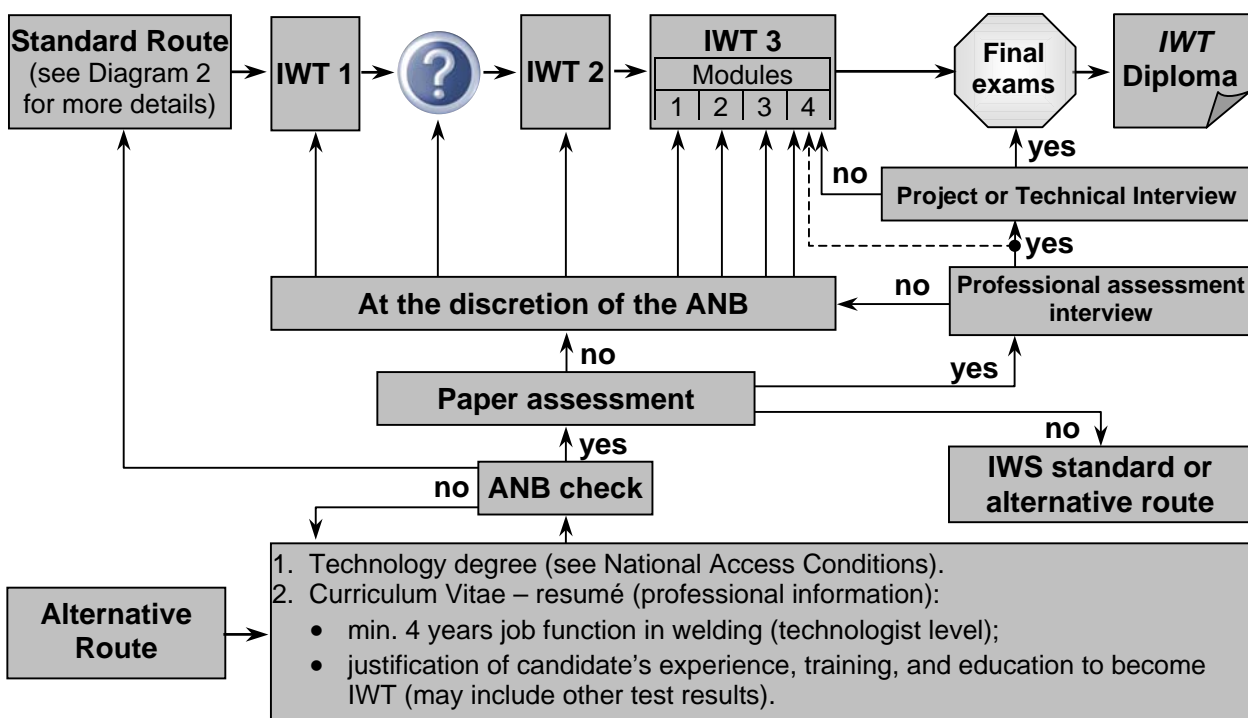


Diagram 6 Alternative versus Standard Routes for IWT qualification
(see also appendix III)

4.2.3 International Welding Specialist IWS

- A copy of documentary proof showing compliance with the Access Conditions for IWS.
- A curriculum vitae (CV) - resume containing professional information:
 - evidence of at least 3 years job function in welding at a level equivalent to that of a specialist (in a period of 6 years before application);
 - justification of candidate's experience, training, and education to become IWS (may include other test results).

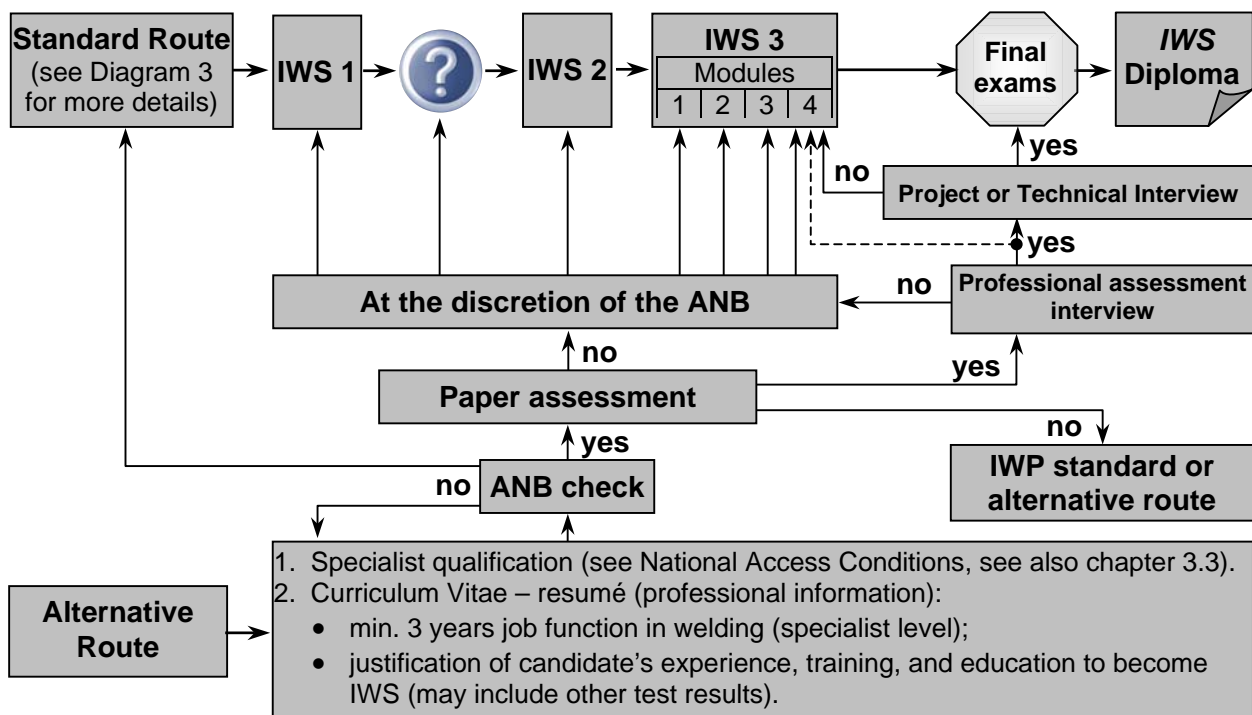


Diagram 7 Alternative versus Standard Routes for IWS qualification
(see also appendix III)

4.2.4 International Welding Practitioner IWP

- A copy of a valid welder qualification certificate according with chapter 3.4 of the standard route.
- A curriculum vitae (CV) - resume containing professional information:
 - min. 3 years job function in welding as a certified plate or tube welder in a period of 5 years before application plus
 - min. 1 year job function in welding practitioner level in a period of 3 years before application;
 - justification of candidate’s experience, training, and education to become IWP (may include other test results).

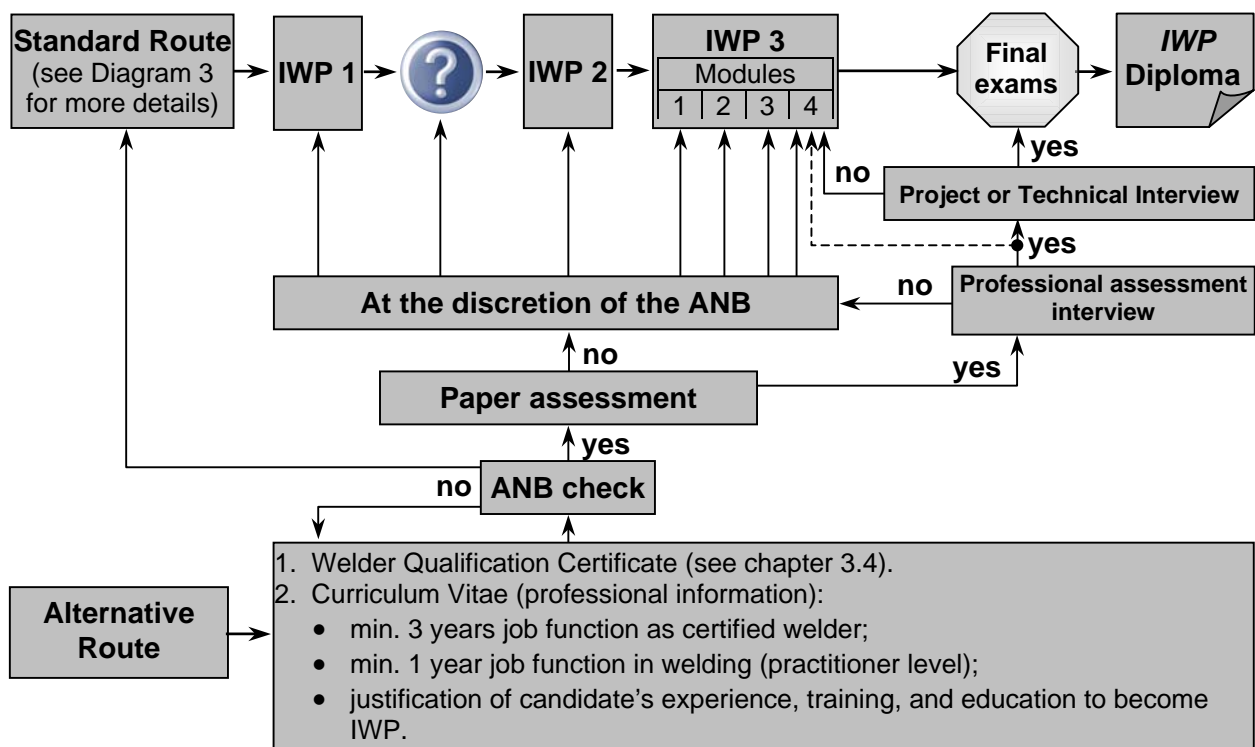


Diagram 8 Alternative versus Standard Routes for IWP qualification
(see also appendix III)



Section I: Theoretical and Practical Education – Part 1, Part 2 and Part 3, Syllabus and Performance Objectives

(Figures are teaching hours. Those after “P1=” are maximum teaching hours which can be included in Part 1)

I.1. Theoretical Education - Part 1 and Part 3

Module 1: Welding processes and equipment

Subject Title	Qualification Level *			
	(Training Hours Part 3+Part 1/Part 1 –Training Hours)			
	IWE	IWT	IWS	IWP
1.1 - General introduction to welding technology	3/3	3/3	1/1	1/1
1.2 Oxy-gas Welding and related processes	2/2	2/2	2/2	2/2
1.3 Electrotechnics, a review	2/2	2/2	2/2	2/2
1.4 The arc	4/4	4/4	1/0	1/0
1.5 Power sources for arc welding	4/4	4/4	3/1	2/1
1.6 Introduction to gas shielded arc welding	2/2	2/2	2/2	2/2
1.7 TIG Welding	6/4	6/4	4/2	2/2
1.8 MIG/MAG and Flux Cored Arc Welding	6/4	6/4	4/2	2/2
1.9 MMA Welding	8/4	6/4	4/2	2/2
1.10 Submerged-Arc Welding	6/4	4/4	2/0	2/0
1.11 Resistance Welding	8/0	6/0	2/0	0/0
1.12.1 Other Welding Processes – LASER; Electron Beam; Plasma	5/0	3/0	2/0	1/0
1.12.2 Other Welding Processes, other than 1.12.1	5/0	3/0	2/0	1/0
1.13 Cutting and other edge preparation processes	4/2	4/2	2/0	2/0
1.14 Surfacing and Spraying	2/0	2/0	1/0	0/0
1.15 Fully mechanised processes and robotics	6/0	4/0	2/0	0/0
1.16 Brazing and soldering	4/0	4/0	2/0	0/0
1.17 Joining processes for plastics	4/0	2/0	1/0	0/0
1.18 Joining processes for ceramics and composites	2/0	1/0	0/0	0/0
1.19 Welding laboratory	10/0	8/0	6/0	0/0
Total	93/35	76/35	45/14	22/14

* P1 = Part 1, Figures under P1 are given for the Standard Route (see 4.1)



Module 2: Materials and their behaviour during welding

Subject Title	Qualification Level *			
	(Training Hours Part 3+Part 1/Part 1 –Training Hours)			
	IWE	IWT	IWS	IWP
2.1 Manufacture and designation of steels	2/2	2/2	1/1	1/1
2.2 Testing Materials and the weld joint	8/4	8/4	6/2	3/2
2.3 Structure and properties of pure metals	4/4	4/4	2/2	0/0
2.4 Alloys and Phase Diagrams	5/5	5/5	3/3	2/2
2.5 Iron – Carbon Alloys	4/4	4/4	2/2	1/1
2.6 Heat treatment of base materials and welded joints	4/4	4/4	3/2	1/1
2.7 Structure of the welded joint	4/4	4/4	2/2	2/2
2.8 Plain Carbon and Carbon-Manganese Steels	6/4	5/4	2/2	2/2
2.9 Fine - grained steels	4/2	2/2	2/0	1/0
2.10 Thermomechanically controlled process steels (TMCP -steels)	4/4	4/4	2/2	1/1
2.11 Cracking phenomena in welded joints	6/2	4/2	4/0	2/0
2.12 Application of structural and high strength steels	2/0	2/0	1/0	1/0
2.13 Low alloy steels for cryogenic applications	4/0	2/0	1/0	0,5/0
2.14 Low alloy creep resistant steels	4/0	2/0	1/0	0,5/0
2.15 Introduction to corrosion	6/0	2/0	1/0	0/0
2.16 High-alloyed (stainless) steels	8/0	6/0	3/0	2/0
2.17 Introduction to wear	2/0	1/0	0/0	0/0
2.18 Protective layers	4/0	2/0	1/0	0/0
2.19 High alloy creep resistant and heat resistant steels	2/0	1/0	0/0	0/0
2.20 Cast irons and steels	2/0	2/0	1/0	0/0
2.21 Copper and copper alloys	4/0	1/0	1/0	0/0
2.22 Nickel and nickel alloys	4/0	1/0	1/0	0/0
2.23 Aluminium and aluminium alloys	6/0	4/0	2/0	2/0
2.24 Other metals and alloys	2/0	1/0	1/0	0/0
2.25 Joining dissimilar materials	4/0	3/0	2/0	0/0
2.26 Metallographic examinations	6/0	6/0	2/0	0/0
Total	111/39	82/39	47/18	22/12

* P1 = Part 1, Figures under P1 are given for the Standard Route (see 4.1)



Module 3: Construction and Design

Subject Title	Qualification Level *			
	(Training Hours Part 3+Part 1/Part 1 –Training Hours)			
	IWE	IWT	IWS	IWP
3.1 Basic theory of structural systems	4/4	4/4	2/0	0/0
3.2 Fundamentals of the strength of materials	4/4	4/4	2/2	0/0
3.3 Welded Joint design	4/4	4/4	4/0	4/0
3.4 Basics of weld design	8/2	6/2	3/2	0/0
3.5 Behaviour of welded structures under different types of loading	4/0	2/0	1/0	0/0
3.6 Design of welded structures with predominantly static loading	8/0	5/0	3/0	2/0
3.7 Behaviour of welded structures under dynamic loading	6/0	2/0	1/0	1/0
3.8 Design of dynamically loaded welded structures	8/0	4/0	2/0	0/0
3.9 Design of welded pressure equipment	6/0	4/0	2/0	1/0
3.10 Design of aluminium alloys structures	4/0	2/0	1/0	0/0
3.11 Reinforcing-steel welded joints	2/0	1/0	1/0	0/0
3.12 Introduction to fracture mechanics	6/0	2/0	0/0	0/0
Total	64/14	40/14	22/4	8/0

* P1 = Part 1, Figures under P1 are given for the Standard Route (see 4.1)

Module 4: Fabrication, applications engineering

Subject Title	Qualification Level *			
	(Training Hours Part 3+Part 1/Part 1 –Training Hours)			
	IWE	IWT	IWS	IWP
4.1 Introduction to quality assurance in welded fabrication	6/0	6/0	2/0	1/0
4.2 Quality control during manufacture	14/0	12/0	10/0	6/0
4.3 Residual Stresses and Distortion	6/0	4/0	2/0	2/0
4.4 Plant facilities, welding jigs and fixtures	4/0	4/0	4/0	2/0
4.5 Health and Safety	4/0	4/0	3/0	2/0
4.6 Measurement, Control and Recording in Welding	4/0	4/0	4/0	2/0
4.7 Non Destructive Testing	20/0	10/0	10/0	10/0
4.8 Economics	8/0	5/0	2/0	1/0
4.9 Repair Welding	2/0	2/0	2/0	2/0
4.10 Fitness for Purpose	2/0	1/0	0/0	0/0
4.11 Case Studies	40/0	28/0	14/0	0/0
Total	110/0	80/0	53/0	28/0

* P1 = Part 1, Figures under P1 are given for the Standard Route (see 4.1)



I.2 Theoretical Education - IWS 0

The module IWS 0 aims at teaching basic technical knowledge, which in general is lacking in participants entering via the route 3 when compared to participants entering via routes 1 and 2. It provides the chance for professional workers and International Welding Practitioners to become qualified as International Welding Specialists.

The module IWS 0 deals with the following subjects:

	Teaching hours
0.1 Introduction	1
0.2 Units	2
0.3 Technical Calculation	12
0.4 Technical Drawings	12
0.5 Basics of Electro-technology	6
0.6 Basics of Chemistry	2
0.7 Basics of Materials	8
0.8 Metal Products	2
0.9 Machining of Materials	2
0.10 Technical Mechanics	10
0.11 Calculation of Strength	10
0.12 Joining Elements	2
0.13 Survey on Welding Processes	2
<hr/>	
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I.3. Practical Education – Part 2

I.3.1 For the IWE; IWT and IWS

This part does not aim at providing practical skills to the welding engineer/technologist/specialist but on gaining knowledge on the control of the different welding processes. The students shall become as familiar as possible with the problems and typical defects associated with incorrect use of the different welding methods. During their exercises the students are guided by skilled welding teachers.

Practical Training	hours:
Oxyacetylene welding and cutting	6
MMA	10
TIG	10
MIG/MAG + Flux Cored Arc Welding	14
Demonstrations or video presentations on processes	20
Gouging	
Brazing	
Plasma welding	
Plasma cutting	
Submerged-arc welding	
Resistance welding	
Friction welding	
Electron beam welding	
Laser welding	
Other processes	
total :	60

Candidates may be exempted by the ATB from the practical training, on a process by process basis, if they can demonstrate practical experience and/or training in the process concerned.

The laboratory exercises contained in the foregoing modules 1 to 4 of the theoretical part are additional and given usually at a later stage of the education.

I.3.2 For the IWP

The practical training has to be done on an individual basis.

The main processes are: MMA, MIG/MAG, FCAW, TIG and Gas Welding. 40 hours shall be reserved to broaden the student's skill in other relevant materials within his welder qualification/s. This training shall end with a practical examination in more than one process or more than one group of material (according ISO 9606 or national standards). For MIG welding only material group 22 and for Gas welding only material groups 1.1 and 1.2 are relevant.

If a student can demonstrate existing practical skill in and an understanding of the welding of different materials, it is accepted that he can sit for the practical examination in these processes and materials without prior practical training.

Typical test pieces and positions are given in Table 1. The test pieces shall be welded as single side welding without backing, except for aluminium, where backing is allowed. Each ANB will work to a similar table based on comparable national standards.



Valid national certificates are accepted as replacements for the practical examinations with test pieces in Table 1.

Table 1: Recommended test pieces and positions for practical examinations:

The dimensions given in the table are recommended/proposed, but not mandatory, other dimensions are accepted.

Welding process		Practical Test		
ISO/EN 9606/287	ISO/EN 9606/287	Material Group (ISO TR 15608)	Weld Position	Test Dimension(s) Diameter/Thickness
MMA	111	1	PF/BW	6,0 – 13,0
		3	PF/BW	6,0 – 13,0
		4, 5, 6	H-L045/BW	∅60,3 – ∅114.3/ 3.9 – 7.11
		7	PF/BW	6,0 – 13,0
		8	PB/FW	6,0 – 13,0
TIG	141	1	H-L045/BW	∅60,3 – ∅114.3 3.9 – 7.11
		3	PF/BW	2,0 – 6,0
		4, 5, 6	H-L045/BW	∅60,3 – ∅114.3 3.9 – 7.11
		7	PF/BW	2,0 – 6,0
		8	H-L045/BW	∅60,3 – ∅114.3 3.9 – 7.11
		22	PF/BW	2,0 – 6,0
MIG	131	22	PF/BW	6,0 – 13,0
MAG (and/or metal cored)	135 (136)	1	PF/BW	6,0 – 13,0
		8	PB/FW	6,0 – 13,0
FCAW (flux cored only)	136	1	PF/BW	6,0 – 13,0
		8	PF/BW	6,0 – 13,0
		3	PA/FW	6,0 – 13,0
GAS	311	1	H-L045/BW	∅60,3 – ∅114.3 3.9 – 7.11

Twenty hours shall be reserved to give the student basic understanding of the possibilities and limitations of the other processes mentioned in Table 1. The purpose of this training is only to demonstrate the possibilities and limitations of these processes, and no practical examination is required. If the student can demonstrate to the training establishment skill in and understanding of the other processes, he may be exempted from this training.

Acceptance criteria for the practical examination:

The quality of welding shall comply with ISO 9606, or comparable quality levels defined in National welders qualification standards used by IIW IAB Group A countries. A welder qualification certificate may be issued.



APPENDIX I:

Requirements for equipment, facilities and specimens for the International Welding Engineer (IWE), Technologist (IWT), Specialist (IWS) and Practitioner (IWP) course leading to the award of IIW qualification

1. Equipment

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

1.1 Welding equipment

Equipment for the following processes shall be available for practical exercises.

Manual metal arc welding	- 111
MIG welding	- 131
MAG welding	- 135/136
TIG welding	- 141
Gas welding	- 311
Gas flame cutting	- 81

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

1.2 Other equipment

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

2. Specimens

A reference collection of well documented weld specimens, polished and etched, should reflect the processes covered by the Guideline and, as a minimum, one specimen per process is required. Preferably the specimens should cover a number of materials and thicknesses.



APPENDIX II:

Abbreviations for Processes:

The following abbreviations used in the document show the relation between the ISO designation, the process abbreviations used in Europe and those used in the USA.

ISO 4063	European (EA) and American (AA) abbreviations		Full name
111	EA	MMA	Manual Metal Arc Welding
	AA	SMAW	Shielded Metal Arc Welding
114	EA	FCAW	Flux-cored wire metal arc welding
	AA	FCAW	Flux-cored arc welding
12	EA	SAW	Submerged Arc Welding
	AA	SAW	Submerged Arc Welding
13	EA	GMAW	Gas Shielded Metal Arc Welding
	AA	GMAW	Gas Metal Arc Welding
131	EA	MIG	Metal-arc Inert Gas Welding
	AA	GMAW	Gas Metal Arc Welding
135	EA	MAG	Metal-arc Active Gas Welding
	AA	GMAW	Gas Metal Arc Welding
136	EA	FCAW	Flux-cored wire metal-arc welding with active gas shield
	AA	FCAW	Flux-cored arc welding
137	EA	FCAW	Flux-cored wire metal-arc welding with inert gas shield
	AA	FCAW-S	Flux-cored arc welding
141	EA	TIG	Tungsten Inert Gas Welding
	AA	GTAW	Gas Tungsten Arc Welding
21	EA		Spot Welding
	AA	RSW	Resistance Spot Welding
25	EA		Resistance Butt Welding
	AA	RSEW	Upset Welding
3	EA		Gas Welding
	AA	OFW	Oxy-fuel Gas Welding
311	EA		Oxy-acetylene Welding
	AA	OAW	Oxy-acetylene Welding
81	EA		Flame Cutting
	AA	OFC	Oxyfuel Gas Cutting
86	EA		Flame Gouging
	AA		Thermal Gouging

APPENDIX III:**ANB Detailed Assessment**

After the candidate has fulfilled the requirements of the ANB paper check he will be admitted to the ANB Detailed Assessment (Diagram 9).

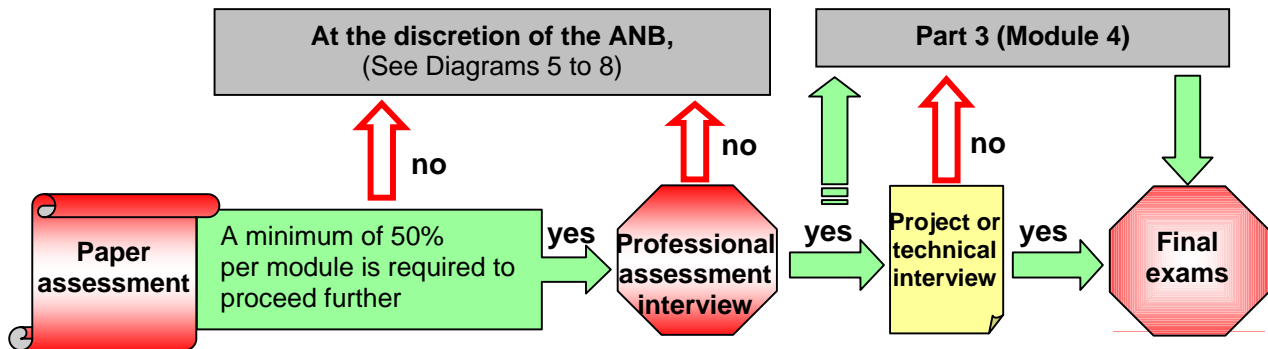


Diagram 9: ANB detailed Assessment

The full ANB detailed assessment shall contain:

- a detailed paper assessment (checklist with points)
- a professional assessment interview designed to test understanding and ability to reason in welding technology regarding the IIW relevant guideline syllabus
- a project or a technical interview to test logical application of knowledge regarding the IIW relevant guideline Module 4 syllabus

The sequence of this assessment shall be determined by the ANB. It is at the discretion of the ANB to terminate the assessment and send the candidate back or into the standard route.

**Appendix IV:****List of Referenced Standards**

Standard (-series)	Title
ASME IX	American Society of Mechanical Engineers; Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications
EN 287-1	Qualification test of welders - Fusion welding - Part 1: Steels
IIW SST 1093-8 (draft)	IIW recommendation on the application of an engineering critical assessment in design, fabrication and inspection to assess the fitness for purpose of welded structures
EN 1418	Welding personnel - Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials
ISO 2553	Welded, brazed and soldered joints - Symbolic representation on drawings
ISO 3834	Quality requirements for fusion welding of metallic materials (series)
ISO 4063	Welding and allied processes - Nomenclature of processes and reference numbers
ISO 5817	Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections
ISO 9000	Quality management systems (series)
ISO 9606	Approval testing of welders - Fusion welding (series)
ISO 9692	Welding and allied processes - Recommendation for joint preparation
ISO 9712	Non-destructive testing - Qualification and certification of personnel
ISO10042	Welding - Arc-welded joints in aluminium and its alloys - Quality levels for imperfections
EN 12062	Non-destructive examination of welds - General rules for metallic materials
ISO 13916	Welding - Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature
ISO 13920	Aluminium and aluminium alloys – Scrap (series)



Standard (-series)	Title
EN 14324	Brazing - Guidance on the application of brazed joints
ISO 14731	Welding coordination - Tasks and responsibilities
CEN/TR 15135	Welding - Design and non-destructive testing of welds
ISO/TR 15235	Welding - Methods for assessing imperfections in metallic structures
ISO 15607	Specification and qualification of welding procedures for metallic materials - General rules
CR ISO/TR 15608	Welding - Guidelines for a metallic material grouping system
ISO 15609	Specification and qualification of welding procedures for metallic materials – Welding procedure specification (series)
ISO 15610	Specification and qualification of welding procedures for metallic materials - Qualification based on tested welding consumables
ISO 15611	Specification and qualification of welding procedures for metallic materials - Qualification based on previous welding experience
ISO 15612	Specification and qualification of welding procedures for metallic materials - Qualification by adoption of a standard welding procedure
ISO 15613	Specification and qualification of welding procedures for metallic materials - Qualification based on pre-production welding test
ISO 15614	Specification and qualification of welding procedures for metallic materials - Welding procedure test (series)
ISO 17660	Welding - Welding of reinforced steel (series)
ISO 17662	Welding - Calibration, verification and validation of equipment used for welding, including ancillary activities
CR ISO 17663	Welding - Guidelines for quality requirements for heat treatment in connection with welding and allied processes