



INTERNATIONAL EDUCATION, QUALIFICATION AND CERTIFICATION SYSTEMS IN WELDING



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ABSTRACT

Welding technology is involved in a major part of metal constructions many of which require tight technical specifications and quality control. The risks associated with a default in operation of a welded construction can be very severe as shown by examples from the past, which led to the loss of human lives and high material damages. A way to minimise the risks during the welding constructions is to have competent people engaged on the fabrication, this can be obtain via the training and qualification of he welding related personnel.

The International System for Education and Qualification of Welding Personnel has been implemented based on the harmonised European System for education and qualification of welding personnel. This paper gives an overview of the International System focusing on the training guidelines and the quality assurance system developed. Systems for harmonisation of Certification of Welding Personnel and for supporting companies using welding to implement ISO 3834 have been developed by EWF and are presently being transferred to IIW in line with the EWF/IIW agreement established in 2000.

IIW-Thesaurus keywords: *Education; Welding; Personnel qualification; Recommendations; Rules.*



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1 INTRODUCTION

The EWF-European Welding Federation work on the development of harmonised courses which started in 1980, resulted in the implementation of a series of Guidelines and in the definition of examination criteria for welding personnel.

In parallel, the IIW – International Institute of Welding, Commission XIV “Education and Training” has dedicated its activity to the interchange of know-how in training in welding.

In 1998, EWF and IIW signed the first agreement of co-operation towards the development of a single international system for education and qualification of welding personnel. By use of a single syllabus for each level of training course and a harmonized system for examinations management, the same qualification may be awarded in any country.

EWF has further developed the system towards certification of welding personnel and as well developed a system for certification of companies complying with the ISO 3834 requirements. These systems have been implemented in Europe for the last ten years. EWF and IIW agreed to transfer these systems to IIW and the approval and start of implementation of the IIW Certification Systems for Welding Personnel and Companies according to ISO 3834 at international level is now initiating in 2008.

2 THE INTERNATIONAL AUTHORISATION BOARD – IAB

In order to administer the training and qualification system and to develop it still further, the IIW has established the IAB – International Authorisation Board. This organisation aimed at the effective implementation of the system in all IIW countries, by publishing Guidelines for training syllabuses and examinations and implementing the Quality Assurance system controlling the system.

An Organisation, recognised by the IIW National member, is appointed as the Authorised National Body (ANB) for the supervision of the system in each country. Representatives from these ANBs form the operational management within the IAB, nominate and approve Lead Assessors and Peer Assessors who ensure conformity of each ANB to agreed Rules.

The IIW has operated such a system for eight years, offering courses and qualifications for Welding Engineers, Inspectors, Welders and others. These qualifications form the basis of the widely accepted International Diplomas.



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This international system now comprises the documents given in Figure 1.

— Education, Examination and Qualification Guidelines for:

- Personnel with Responsibility for Welding Coordination (includes former International Welding Engineer – IWE, International Welding Technologist – IWT, International Welding Specialist – IWS, International Welding Practitioner – IWP)
- International Welding Inspection Personnel – IWIP
- International Welder – IW
- International Welded Structures Designer – IWSD
- Distance Learning (IWE, IWT, IWS, IWIP C/S)

— Rules and Procedures for the implementation of IIW Guidelines for the Education, Examination and Qualification of Welding Personnel.

Figure 1 — IIW International Qualification System documents

There are now 35 countries that have joined this system and become an Authorised National Body, as follows: Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, India, Iran, Italy, Japan, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Ukraine and United Kingdom.

There are 4 Countries with the ANB Applicant Status, as follows: Indonesia, Nigeria, Turkey and United States of America.

3 THE INTERNATIONAL TRAINING AND QUALIFICATION SYSTEM FOR WELDING PERSONNEL

The harmonised courses, are now offered around the world through IIW/IAB. There are more than 625 Authorised Training Bodies approved and supervised by the ANBs for implementing the IIW Qualification courses, which combine both underpinning knowledge and application experience, thereby providing close links with industrial practice. After the main education, special courses for additional learning are offered in many special areas, thus providing a specific education still closer to the job function.

The existing Guidelines define the course syllabus, defining for each subject objectives, scope and expected results, including the minimum teaching duration in hours assigned to them (Figures 2 and 3). Access to the harmonised courses is allowed only to those who possess an appropriate general education, equivalent but different for each country as these are based on national education systems.



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IWE	
WELDING PROCESSES AND EQUIPMENT	93 h
MATERIALS	111 h
CONSTRUCTION AND DESIGN	64 h
FABRICATION APPLICATIONS	110 h
PRACTICAL PART	60 h

TOTAL	438 h
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IWS	
WELDING PROCESSES AND EQUIPMENT	45 h
MATERIALS	47 h
CONSTRUCTION AND DESIGN	22 h
FABRICATION APPLICATIONS	53 h
PRACTICAL PART	60 h

TOTAL	227 h
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IWT	
WELDING PROCESSES AND EQUIPMENT	76 h
MATERIALS	82 h
CONSTRUCTION AND DESIGN	40 h
FABRICATION APPLICATIONS	80 h
PRACTICAL PART	60 h

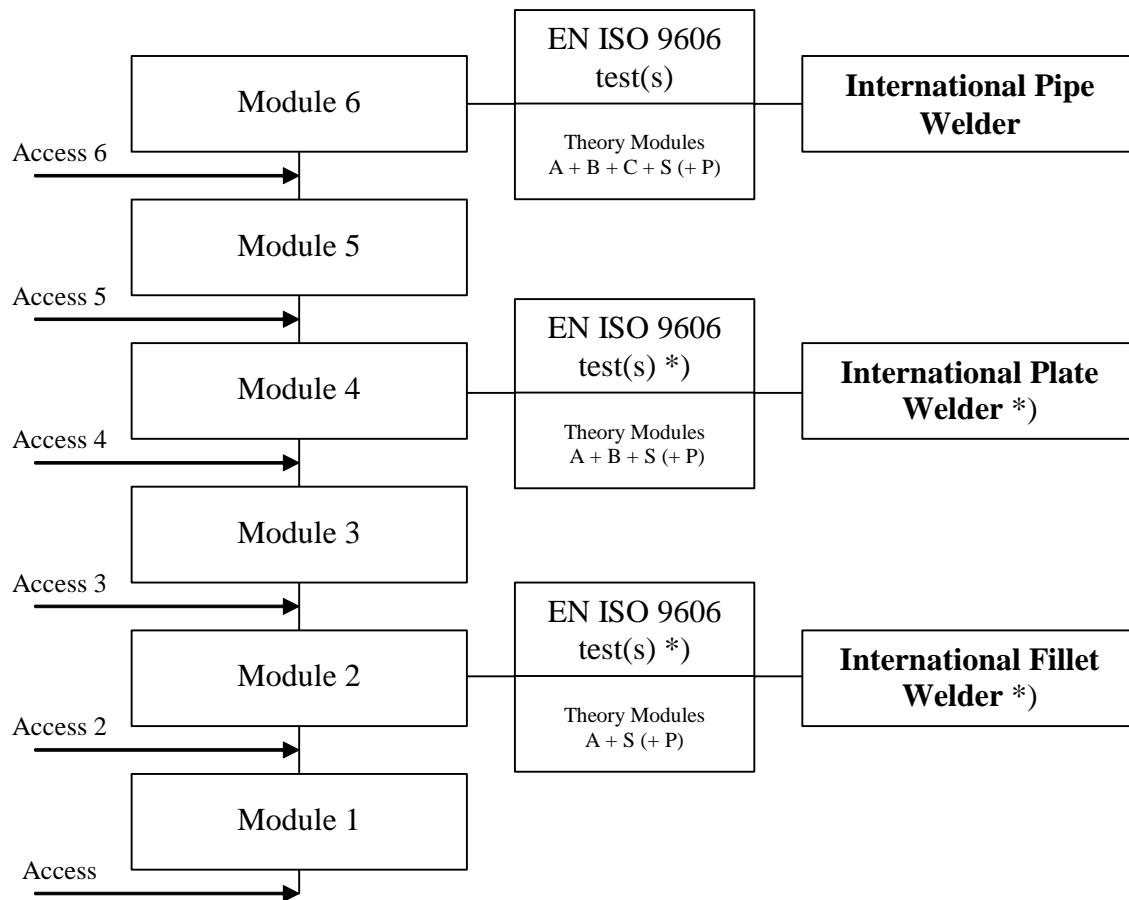
TOTAL	338 h
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IWP	
WELDING PROCESSES AND EQUIPMENT	22 h
MATERIALS	22 h
CONSTRUCTION AND DESIGN	8 h
FABRICATION APPLICATIONS	28 h
PRACTICAL PART	60 h

TOTAL	140 h
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IWIP	IWI-C	IWI-S	IWI-B
	Comprehensive	Standard	Basic
WELDING PROCESSES AND EQUIPMENT	23 h	13 h	11 h
MATERIALS	52 h	41 h	25 h
CONSTRUCTION AND DESIGN	21 h	17 h	12 h
FABRICATION APPLICATIONS	24 h	23 h	17 h
WELDING INSPECTION MODULES	48 h	40 h	27 h
PRACTICAL PART	49 h	23 h	15 h
TOTAL	217 h	157 h	107 h

Figure 2 — Example of themes and teaching times for five qualification levels



**) At the option of the ATB and in agreement with the ANB, it may not be necessary to issue intermediate certificates and diplomas.*

Figure 3 — The over-all structure of training and examination of the international welder

At International level within IIW-IAB activities, the work under development comprises the development of new Guidelines: “Mechanized Welding Operators” and “Mechanical Destructive Testing at Specialist Level” and the Definitions of a Harmonised Examination System that includes Questions and Answers databanks and Operating Procedures.

For more information it is possible to download short versions of each IIW Qualification Guideline, on the IIW web site (www.iiw-iis.org) and EWF web site (www.ewf.be)



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4 THE INTERNATIONAL HARMONISED EXAMINATION FOR THE TRAINING AND QUALIFICATION SYSTEM FOR WELDING PERSONNEL

The IIW is aware of the importance of the mobility of labour within the world wide community, and a lot of work has been put on the harmonisation of a standard examination system, to ensure that welding personnel trained in the EWF-IIW/IAB system is examined in a uniform way, so that those gaining a Diploma in any EWF-IIW/IAB Member will have achieved the same minimum standard. This will be obtained by the development and implementation of a EWF-IIW/IAB Harmonised Examination.

To achieve the above mentioned goal, rules and procedures have been approved, and also an Internet Database Software tool has been developed.

The Harmonised Examination Questions Database will be shared by all EWF-IIW/IAB members.

The Database Software enables several features, such as: the approval of questions by Teams of International Experts, the translation of the questions to the several Members mother languages, automatic generation of harmonised exams, sort out statistics regarding the questions used on the exams and automatic exams scoring.

Examples of Database Software Screens are shown below, focusing questions, exams and users' tools (see Figures 4 to 6).

The screenshot shows a web browser window displaying the 'EWF-IIW/IAB PERSONNEL QUALIFICATION SYSTEM Harmonised exams' interface. The page title is 'EWF-IIW/IAB PERSONNEL QUALIFICATION SYSTEM Harmonised exams' and the user name is 'JDFernandes'. The page contains a table of questions with the following columns: Level, Module, Subject, Difficulty, Part, Scope, Question, and With/Without Translation. The table lists five questions, each with a unique ID and OLD ID, and a description of the question. The 'With/Without Translation' column contains dropdown menus for each question.

Level	Module	Subject	Difficulty	Part	Scope	Question	With/Without Translation
IWE	1	1.2	1	1	YES	ID: 22 OLD ID: 306 A welding flame with excess of acetylene would take a welding pool to	-- With Translation -- -- Without Translation --
IWE	1	1.3	2	1	YES	ID: 11044 OLD ID: 2656 A conventional diode placed in a circuit allows the passage of current in one direction only. A silicon controlled rectifier (SCR) operates slightly differently. How does it work?	-- With Translation -- -- Without Translation --
IWE	1	1.4	2	1	YES	ID: 39 OLD ID: 323 A welding arc can be started in different ways (starting from a non-conducting situation and at room temperature). Essential for all these ways is:	-- With Translation -- -- Without Translation --
IWE	1	1.4	3	1	YES	ID: 145 OLD ID: 429 A one-phase transformer is used in a power source. The number of windings on the primary side is 500 and on the secondary side 100. The voltage on the primary side is 230 V and the secondary current is 10 A	-- With Translation -- -- Without Translation --
IWE	1	1.6	2	1	YES	ID: 56 OLD ID: 340 A flat or constant voltage power source is usually used for MIG/MAG welding	-- With Translation -- -- Without Translation --

Figure 4 — Database Software screen regarding the list of questions with active status

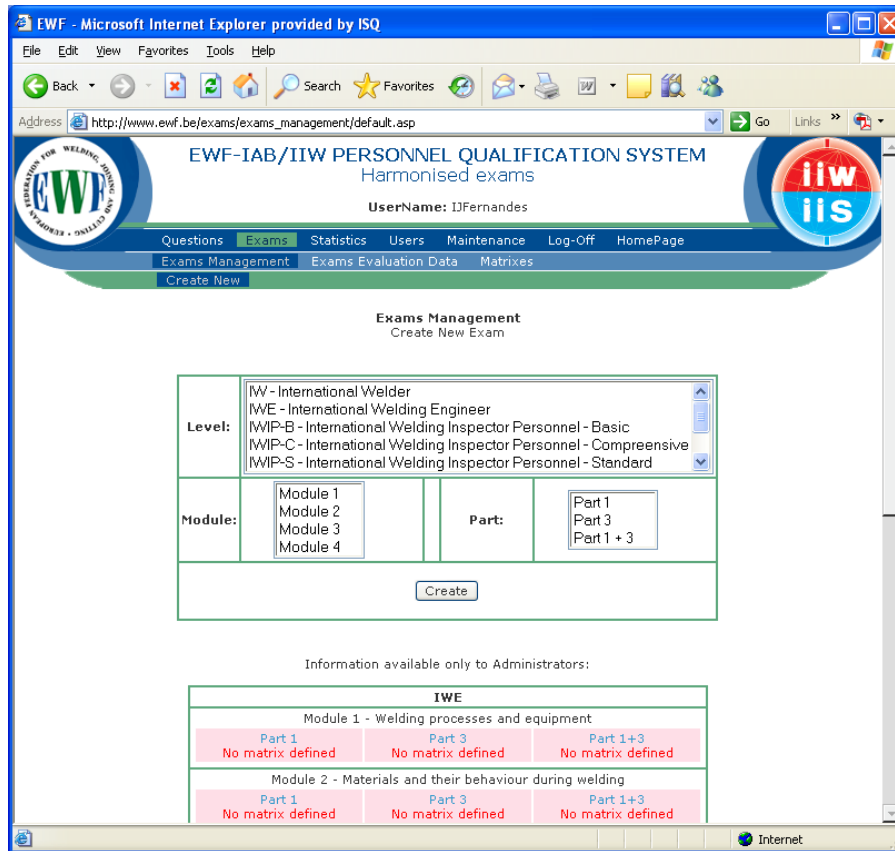


Figure 5 — Database Software screen regarding Exams Generation

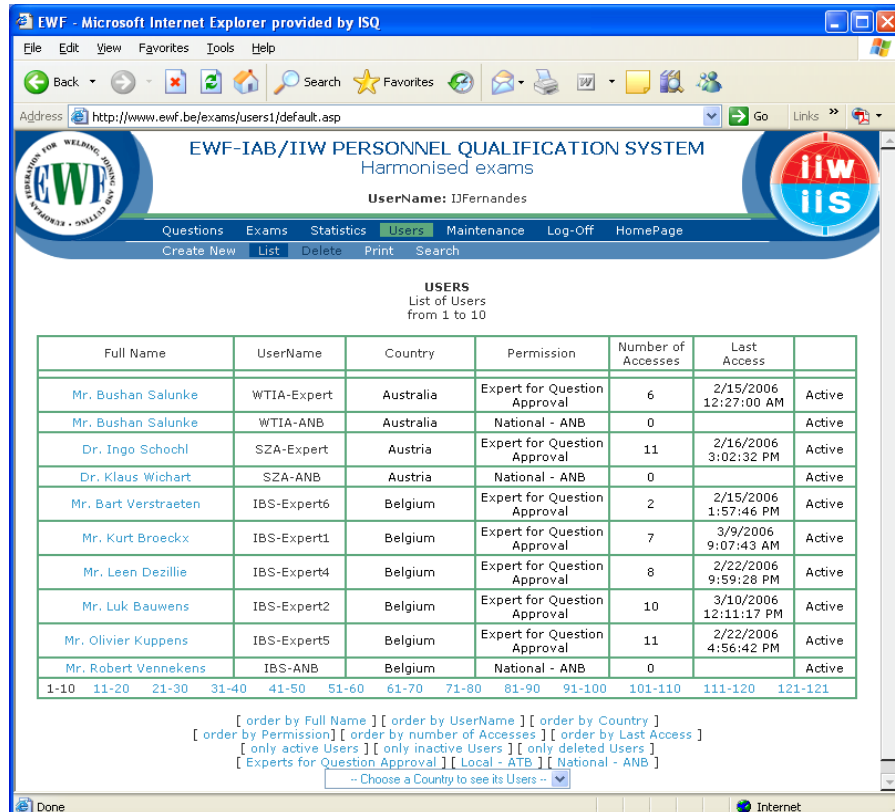


Figure 6 — Database Software screen regarding Users



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5 IIW CERTIFICATION SYSTEM FOR WELDING PERSONNEL

Safety and profit depend on technical control of welding operations. Key staff in all welding related activities needs to have an appropriate level of competence in welding technology and its application. In addition to employing competent and tested welders, manufacturers should ensure that engineers, designers and technicians who deal with welding matters have proven relevant competence. This is increasingly becoming a contract requirement: a trend which is expected to accelerate as new European Directives and International Standards for welding come into force. ISO 14731 "Welding Coordination – Tasks and Responsibilities" requires people with welding related responsibilities to be able to demonstrate that they are competent to carry out those responsibilities.

The IIW Certification Scheme provides a simple means by which job capability can be assessed and recognised. It defines the profile of education, knowledge, experience and responsibility required for a range of conventional welding tasks, and provides a professional assessment procedure.

Because certification is concerned with current competence rather than historical attainment, periodic renewal is required. The scheme provides a convincing way of supporting companies seeking to achieve compliance with ISO 14731.

It must be remembered that the only body which can issue an authority to work to an individual is the employer: EWF and IIW are only in a position to assist and support this process in a way which is convincing to the employer's customers particularly in relation to ISO 14731. Employers may also require some third party certification of their welding operations and one route to achieve this is the ISO 14731. Although it does not require the welding co-ordinators to hold any particular qualification or certification, possession by the Welding Co-ordinators of a relevant IIW certificate will assist in the process of company certification.

Four levels of certification are available, based on the past first four EWF Diplomas: European Welding Engineer, Technologist, Specialist and Practitioner nowadays replaced by the existing International Welding Engineer, Technologist, Specialist and Practitioner. The first three of these qualifications are deemed to satisfy the technical knowledge requirements of ISO 14731.



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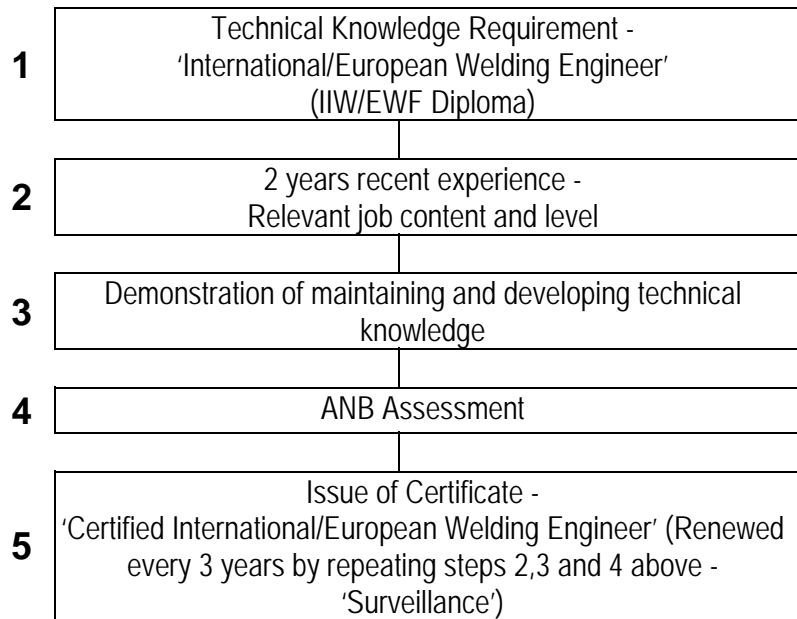


Figure 7 — Steps to certification

Figure 7 shows the route to achieve Engineer level certification and the route for the other levels are similar. The certification titles are shown in Figure 8.

Certification title	Welding knowledge qualification level required
Certified International/European Welding Engineer	International/European Welding Engineer
Certified International/European Welding Technologist	International/European Welding Technologist
Certified International/European Welding Specialist	International/European Welding Specialist
Certified International/European Welding Practitioner	International/European Welding Practitioner

Figure 8 — Certification and qualification titles

The EWF welding personnel certification system was transferred to IIW in 2008. So far five European members have implemented the system and the opening of the system to the International community is expected to strongly increase its use worldwide.



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6 MANAGEMENT OF TRAINING, QUALIFICATION AND CERTIFICATION SYSTEMS FOR WELDING PERSONNEL

In order to ensure that the mechanism by which the education and training Guidelines established by IIW/IAB are implemented throughout the world, IAB appoints an organisation in each country. These organisations are assessed and monitored against a set of rules compiled in the IAB Doc.IAB-001 - "Rules for the implementation of IAB Guidelines for the education, examination and qualification of welding personnel" and Operational Procedures.

These organisations are known as Authorised National Bodies (ANBs) and are responsible for ensuring that the standards of education, examination and qualification are maintained in their country. In this, the objective is that qualified personnel at a certain level will achieve the same minimum level of knowledge, irrespective to the country in which they have been qualified.

The role of the ANB in its own country regarding personnel qualification includes:

- i) The approval of training establishments, ATB- Authorised Training Body, for the conduct of courses in accordance with IIW guidelines.
- ii) The conduct of the examinations.
- iii) The qualification and certification of personnel and the recording of relevant information.

An ANB accepts responsibility in its own country for the implementation of the IIW/IAB requirements, for the maintenance of the agreed standards, and for promoting IIW qualifications in accordance with the provisions of this Document.

The ATBs - Authorised Training Bodies are approved by the National ANBs to implement the IIW training courses aiming at awarding the IIW Qualification Diplomas. This recognition is based on audits conducted by the National ANB, through which it is assured that the ATB has the capabilities to fulfil the requirements defined under the IIW rules, procedures and guidelines.

The ANB has the responsibility to develop and score the exams. The ATBs are allowed to invigilate the written exams. If oral exams are needed the examination panel is composed by ANB and ATB representatives.

It is possible to approve ATBs in countries that are not IIW members and this can be done through agreements between the applicant ATB and an active ANB from another country. This approval is ruled by a specific procedure.



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7 THE EWF AND IIW PERSONNEL T&Q&CERT. EVOLUTION IN FIGURES

Below is show some tables with the evolution of awarded Diplomas and certificates under the International and European Systems for Welding Personnel regarding the Qualification and Certification.

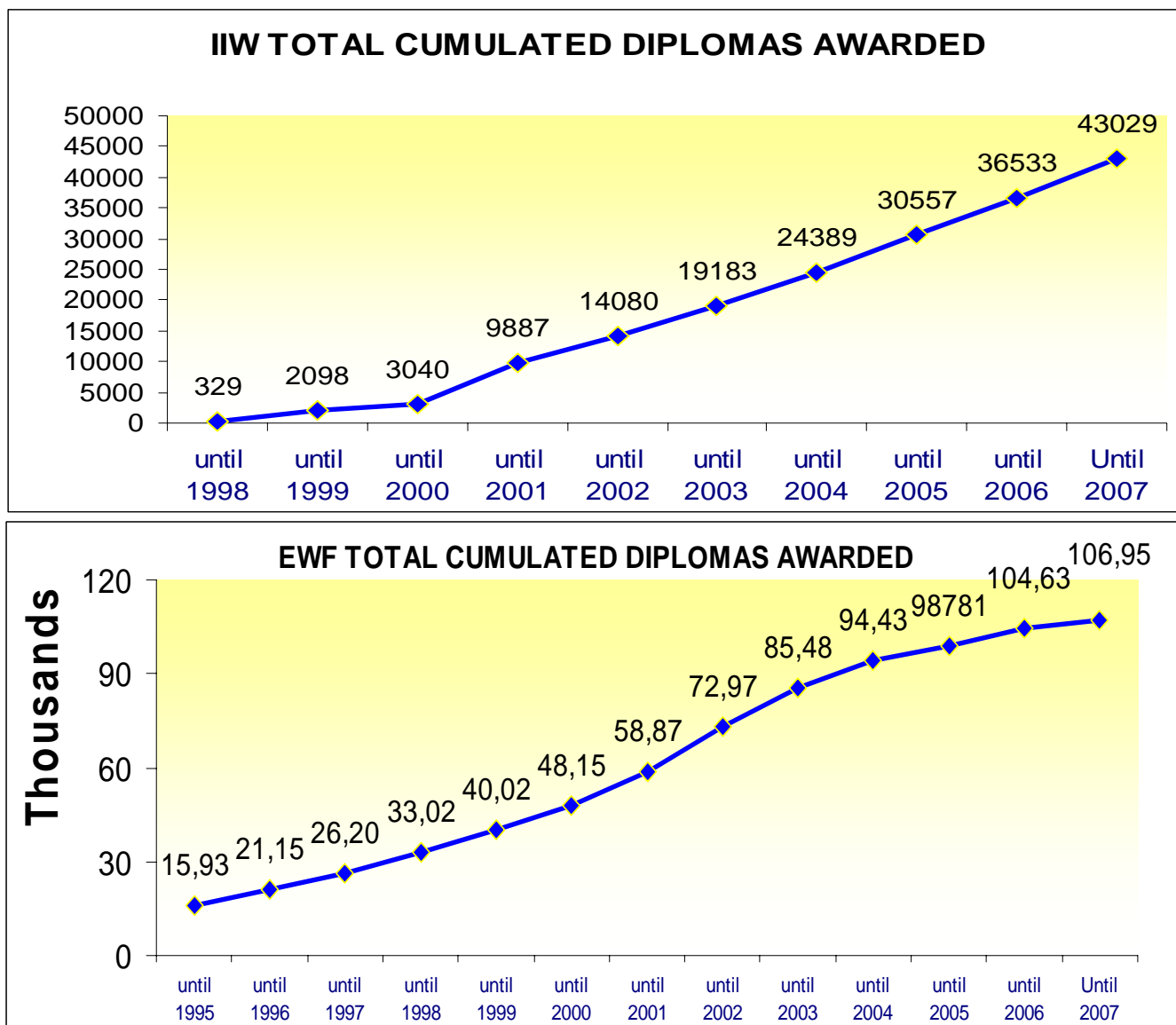


Figure 9 — IIW and EWF Cumulated Diplomas awarded



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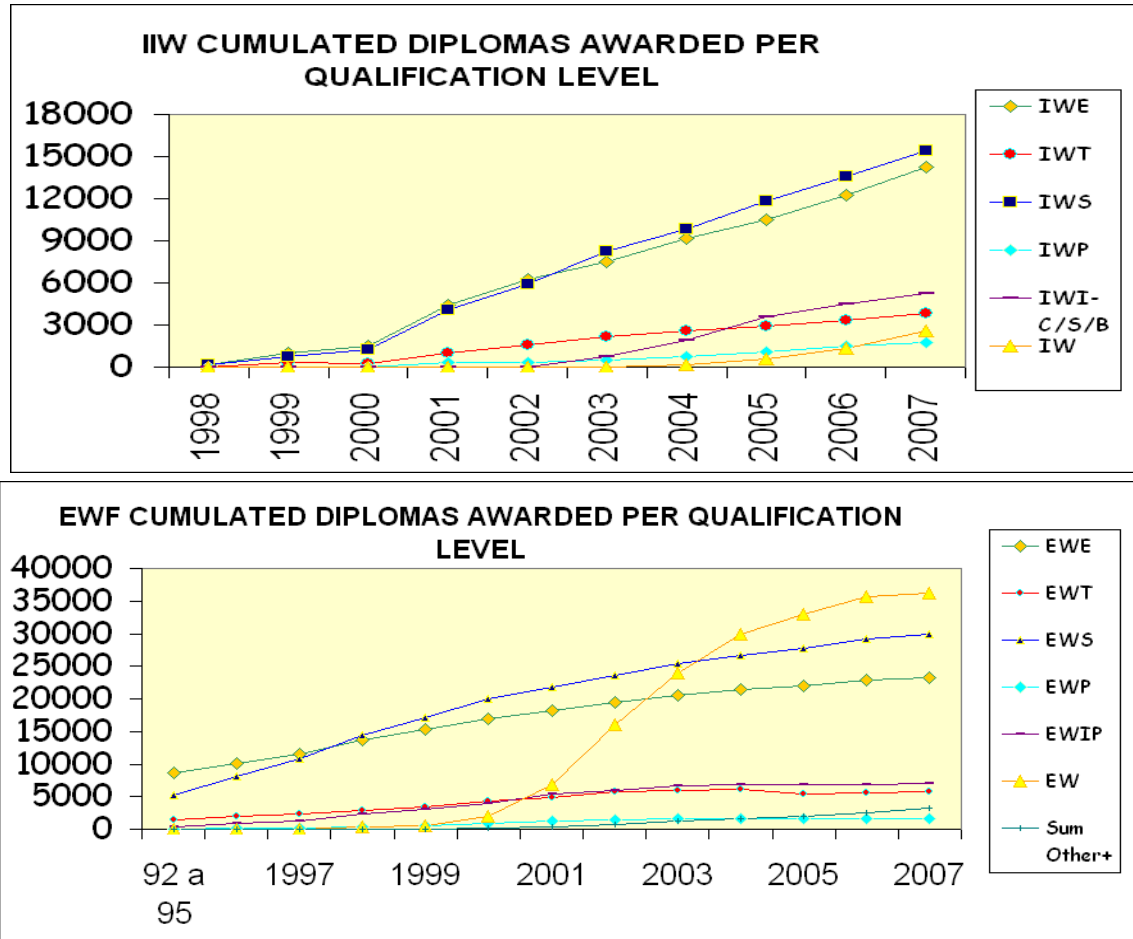


Figure 10 — IIW and EWF Cumulated Diplomas awarded per Level of Qualification



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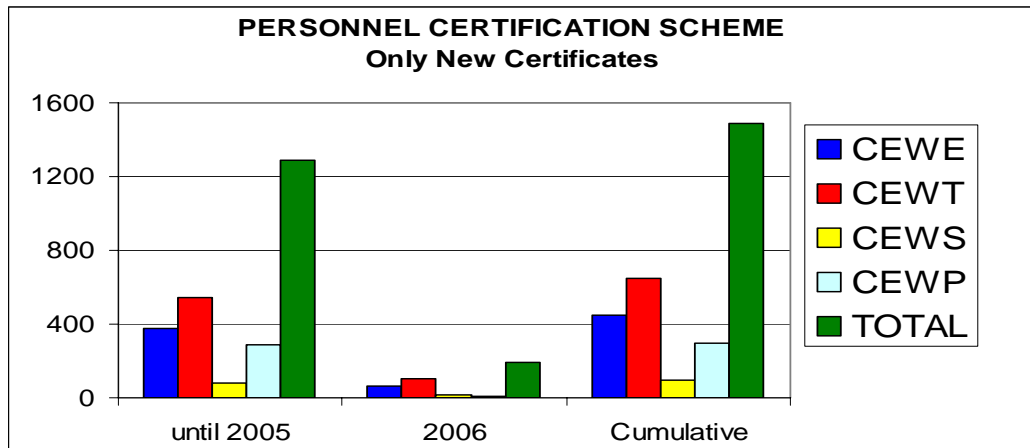


Figure 11 — EWF Cumulated Certificates Awarded, no figures regarding IIW System because it has been approved in January 2008

8 CONCLUSION

The International Education, Qualification and Certification Systems for Welding Personnel are recognised worldwide and objectively supported by industry and by international training and accreditation entities, opening the way towards one Global Education, Qualification and Certification Systems for Welding Personnel.

The relevance of these International Systems are increasing worldwide generating interest of new countries to enter the system. Every year new countries apply for membership of which Indonesia, Nigeria, turkey and United States are examples.

The consolidation of the International System is in good progress with an average number of diplomas awarded of 6 000 per year and an expected growth of approximately 5 % per year.

This consolidation being further ensured through the implementation of a harmonised examination system, which now represents 25 % of the total examination paper for International welding engineers.

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