CERTIFICATION SCHEME FOR WELDING AND INSPECTION PERSONNEL

DOCUMENT NO. CSWIP-WS-1-90

Requirements for the Certification of Welding Supervisors

2nd Edition

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Issued under the authority of the Governing Board for Certification
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FOREWORD

The Certification Scheme for Welding and Inspection Personnel (CSWIP) is a comprehensive scheme which provides for the examination and certification of individuals seeking to demonstrate their knowledge and/or competence in their field of operation. The scope of CSWIP includes all levels of Welding Inspectors, Welding Supervisors, Welding Instructors and Underwater Inspection personnel.

CSWIP is managed by the Certification Management Board, which acts as the Governing Board for Certification, in keeping with the requirements of the industries served by the scheme. The Certification Management Board, in turn, appoints specialist Management Committees to oversee specific parts of the scheme. All CSWIP Boards and Committees comprise member representatives of relevant industrial and other interests.

The requirements governing the Registration of Welding Supervisors are detailed in a separate document. Success in the appropriate CSWIP examination is one of the prerequisites of Registration.

Registration is strongly recommended as it helps to satisfy the CSWIP certificate renewal requirements, see Clause 9.5.

ACCESS TO CERTIFICATION

Access to certification schemes is not improperly restricted. The sole criteria for certification are given in the document (and any subsequent amendments) and no other criteria will be applied. Certification is not conditional on the candidate applying for other services or membership from TWI Certification Ltd, its parent, or any other groups or associations.

1 OBJECTIVES

The manufacture of safe, cost-effective welded products and structures is critically dependent on the control exercised in fabrication to ensure that welding and related operations are correctly and safely carried out. This means that the work must be carefully supervised by personnel who understand the significance of welding requirements and of the high cost of rectifying matters which should not have gone wrong in the first place. The supervision of welding production is therefore a key feature of engineering manufacture and it is most important that those in charge of welding operations have attained the level of competence necessary to supervise the work correctly.

Moreover, the employment of welding personnel with appropriate competence is a requirement of EN 719 [(1)] and a key feature of EN 729[(2)].

The scheme will give major purchasers an assurance from their suppliers of welded products that fabrication is supervised by qualified staff; it provides the individual

[(1)] EN 719: 1994 Welding Co-ordination – Tasks and Responsibilities. Also published as ISO 14731

[(2)] EN 729: 1995: Quality Requirements for Welding (in four parts). Also published as ISO 3834.

with a nationally accepted mark of his status and the employer with the ability to assure his clients that his production welding is competently supervised.

2 SCOPE

The scheme is intended for personnel who have relevant experience in welding supervision, and who have attained a minimum level of knowledge as evidenced by examination. This document provides the procedure by which certification is sought and the requirement for the approval of the related training course.

3 DEFINITION

The Welding Supervisor is a person responsible for the shop floor (or site) planning and supervision of welding activities, for the direction of the welding workforce, and for controlling the manufacture by welding in accordance with specified instructions.

4 EXAMINATION PROCEDURE

The candidate is not required to demonstrate his knowledge of every aspect of welding technology because he is concerned specifically with the use of welding in production. It is therefore appropriate to test his understanding of fabrication related aspects only and certification shall require the successful completion of an approved training course (Appendix 1).

Exemption from the course (but not the examination) may be granted to holders of:

a) City & Guilds Certificate 215 Part 3: Advanced Welding Engineering Craft Studies.
b) City & Guilds Certificate 213 Part 3: Fabrication and Welding Engineering Craft Studies (a compendium of relevant sections of 215, 216, 217, 218).
c) City & Guilds Certificate 74 (Advanced): Welding.
d) City & Guilds Certificate 265 Part 1: Fabrication and Welding Engineering Technician's Certificate.
e) Welding Institute Welding Technician Certificate.
f) National Certificate in Fabrication and Welding Technology
g) European Welding Specialist Diploma.

5 THE EXAMINATION

A multiple-choice question and written answer examination is used to test the candidate's knowledge of the welding technology identified in the training syllabus. (Appendix 1).

Further details of the examination and specimen questions are given in Appendix 2.

6 REQUIRED EXPERIENCE

Candidates shall normally have a practical welding background and must have a

minimum of three years relevant welding experience covering the areas listed below:

a) **Pre-manufacturing**

Interpret the requirements of codes and standards
Ensure that the correct welding procedures are available
Ensure that the welders' qualifications are correct
Ensure that the specified welding and related equipment is available and in good working order
Supply of validated parent metal to the fabrication shop
Control of welding consumables, supply and storage
Ensure availability of specific approved documentation.

b) **Production**

Preparation:

Checking the joint preparation, fit-up and cleanliness before welding.

Welding:

Assignment of welders
Control/deployment of welders
Control the function of equipment and accessories; calibration
Control of welding consumables
Control of use of welding procedures
Control of tack welding; sequences of tack welding
Control of weld process parameters
Control of work technique
Control of preheating, heat input, post weld heat treatment
Control of welding sequences.

c) **Inspection and testing**

Control of weld finish and dimensions
Control of throat thickness and leg length of welds
Control of shape and dimensions of the welded components
Assign appropriate non-destructive testing of the welds.

d) **Record keeping**

For example, weld quality records, inspection and test plans, etc.

e) **Shop Management**

Supervision of the fabricating area
Control of safe working practices in accordance with statutory and other requirements
Supervision of quality control procedures.

7 APPLICATION FOR EXAMINATION AND FEES

Candidates will be required to submit an application form and a CV. All the information requested must be on these forms. No applications can be considered confirmed until receipt of correctly completed documents. Application forms ask for specific details of experience and training and must be signed to the effect that these details are correct.

8 APPROVAL OF COURSES

Training establishments seeking approval must first submit to TWI Certification Ltd an enquiry form to justify an application. If accepted, the establishment must then submit written application accompanied by a detailed training programme, course texts and visual aids. If acceptable in principle, the establishment will be visited to examine the facilities in place and to interview the staff who will provide the instruction. Courses will only be approved if presented by staff appropriately qualified.

A fee is charged for this work and operation of the course is subject to a franchise fee per student.

9 CERTIFICATION

9.1 Results Notices

All candidates will be sent a results notice. This notice will also be sent to the organisation paying the examination fee, if not paid by the candidate.

9.2 Successful candidates

Two copies of a certificate of proficiency will be issued to the organisation or person that pays the examination fees. Duplicate certificates to replace those lost or destroyed will be issued only after extensive enquiries.

9.3 Unsuccessful candidates

Candidates who fail to obtain a certificate may attempt one retest of those parts of the examination in which success was not achieved. The retest must be completed within one year of the initial test, otherwise candidates will have to repeat the complete examination. If the retest is failed, the candidate must return to Initial status.

9.4 Period of validity

The certificate is valid for five years from the date of completion of the initial test and may be renewed for a further five years on application, provided evidence is produced in accordance with Clause 9.5.1. Certificates are only valid provided:

a) they are within date.
b) they are on standard cream CSWIP paper bearing the CSWIP logo in black on gold signed by an officer of CSWIP and embossed with the CSWIP stamp.
c) they have been signed by the individual to whom the certificate is awarded.
d) they are accompanied by a valid official CSWIP identity card.

Photocopies are unauthorised by CSWIP and should only be used for internal administrative purposes.

9.5 Renewal

9.5.1 Five year renewal

In order for the certificate to be renewed after five years, the holder has to demonstrate that he/she has maintained his/her competence by:

i) providing evidence of continuous work activity in welding supervision

ii) providing evidence that the holder has kept up to date in welding technology.

One way of satisfying Part (ii) is by Registration as a Welding Supervisor, see separate document. Part (i) can be satisfied either by the employer signing the reverse of the certificate or, if the holder has had a number of different jobs, by submitting a log sheet of relevant work activity covering the period of validity of the certificate.

Renewal must take place not later than 21 days after the date of expiry. It is the certificate holder's responsibility to ensure that renewal takes place at the appropriate time**.** Only under extreme circumstances will certificates be renewed after a lapse of six calendar months from the date of expiry shown on the certificate and late renewal will be subject to a special fee.

9.5.2 Ten year renewal

Certificates are renewed beyond ten years from the initial examination (or from a previous ten year renewal) by the holder successfully completing a renewal examination prior to the expiry of the certificate in addition to the renewal procedure given in Clause 9.5.1.

The 10 year examination will consist of a multi choice written paper.

Failure at the retest point will mean that the candidate **must** take the

full course and initial examination again to regain the qualification.

9.6 COMPLAINTS AND APPEALS

An aggrieved party in a dispute which considers itself to have reasonable grounds for questioning the competency of a CSWIP qualified person may petition the Governing Board for non-renewal of the certificate. Such a petition must be accompanied by all relevant facts, and if in the opinion of the Board an adequate case has been presented, a full investigation of the circumstances under dispute will be initiated. If the petition is substantiated to the satisfaction of the Board, the certificate will not be renewed without further test.

Appeals against failure to certify or against non-renewal of the certificate may be made by the inspector or the employer upon application in writing to the Governing Board.

10 EXEMPTIONS

Candidates who successfully complete the approved course and the examination will be exempt from Parts 1 and 2 of the European Welding Specialist Course.

11 RECORDS

The Chief Executive, TWI Certification Ltd maintains records of successful and unsuccessful candidates. These records are accessible to the Governing Board or its nominees at all reasonable times.

ADDRESSES

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For specific information on examinations and arranging for them to be carried out, contact the approved Examining Body:

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CERTIFICATION OF WELDING SUPERVISORS

APPENDICES TO DOCUMENT NO CSWIP-WS-1-90

Appendix 1: Syllabus for the approved training course (Copyright TWI Certification Ltd)

Appendix 2: Specimen questions for the examination.

APPENDIX 1: SYLLABUS FOR THE APPROVED TRAINING COURSE

1 INTRODUCTION AND OBJECTIVES

This appendix lists the subjects that must be covered by an approved training course for the welding supervisor scheme. The order in which the subjects are taught need not necessarily be the same as the order in which they are listed here.

2 SUPERVISION, PRODUCTION AND PLANNING

Introduction

Responsibilities, duties, qualifications and supervisory skills of supervisors (see main document, Section 6, Required experience).

Codes and Standards

Terms, symbols and definitions in welding
Standards for welding and fabrication
Application standards
Relation to contract specifications.

Planning and Production

Interpretation of drawings for fabrication

Planning and control, eg:

Selection and layout of plant, handling of material
Selection and training of welders
Scheduling welding activities.

Production targets.

3 MATERIALS OF CONSTRUCTION

Classification, properties and typical applications of steels, aluminium alloys and other engineering materials in common use. The elementary structure of metals and the effect of adding alloying elements.

4 WELDING TECHNOLOGY

Welding and allied processes

Description, characteristics and application of the following:

Manual metal arc welding
Submerged arc welding

Flux-cored arc welding
Gas metal arc welding
Tungsten inert gas welding
Resistance and solid phase welding
Electroslag welding
Oxy-acetylene welding
Brazing
Plasma-arc welding
Flame cutting and gouging
Arc cutting and gouging
Surfacing/metal spraying
Laser welding
Electron beam welding

Welding equipment

Mechanisation and automation
Principles of operation; principal components of power sources and their ancillary equipment
Care and maintenance

Welding practice

Welding consumables (electrodes, filler metals, fluxes, gases etc) and their selection:

Standards and classification
Storage, drying and baking
Hydrogen control

Welding process variables and their effects:

current, voltage, travel speed, arc length, electrode angle, electrode stick-out, polarity, flow rates of shielding and purging gases.

Joint preparation:

Weld preparation requirements and examples
Cleanliness of weld preparations.

Welding procedure specifications (WPS):

Content of WPS and its key role in quality assurance.

Control of distortion:

Factors influencing distortion, for example, joint preparation, fit-up, welding speed, welding process used, welding sequence, material thickness and the use of jigs and fixtures.

Remedial action, for example approved heating or mechanical techniques.

Preheat, interpass and post-weld heat treatment:

Methods of heating, and measurement and control of temperatures.

Weld defects:

Common weld defects: misalignment, poor shape, undercut, excess penetration, slag, porosity, lack of fusion, lack of penetration.

Repair of welds.

Properties of welded joints

Properties of welded joints including: strength, toughness, hardness, corrosion resistance
Effect of heat treatment, including normalising, annealing, preheating, quench and tempering, solution treatment and post-weld heat treatment.
Influence of heat input and cooling rate on the deposited weld metal and heat-affected zone
Influence of composition of parent metal and consumables on weld properties
Dilution
Influence of restraint
Weldability
Hydrogen cracking (HAZ and weld), solidification cracking, reheat cracking, transverse cracking and lamellar tearing
Modes of failure: eg brittle fracture and fatigue.

5 QUALITY ASSURANCE AND CONTROL

Quality assurance (QA):

Quality manual (or quality plan)
Quality documentation for welding: welding procedure specifications (WPS), welding procedure qualification (WPQ), welder qualification and welding records
Calibration of welding equipment and instruments

Quality Control (QC):

Requirements of inspection before, during and after welding, qualification of inspection personnel

Checking performance and accuracy; calibration

Methods of inspection and testing in accordance with the relevant application standard:

Visual: weld size, form and shape; undercut, overlap, surface conditions
Destructive: chemical analysis, tensile, bend, impact, nick-break, CTOD, macro and hardness tests
Non-destructive: visual, magnetic, penetrant, ultrasonic and radiographic inspection; hydrostatic and proof testing.
Detection and measurement of weld defects.

6 SAFETY

Identification of hazards and necessary action

Examples of hazards:

Electric shock
Fire and explosion
Fumes
Cylinder handling
Use of scaffolding
X and gamma radiation
Welding arcs.

Typical safety procedures:

Safety education
Risk assessment
Ventilation and monitoring of the workplace
Eye, ear and skin protection
Storage of gases
First aid.

Statutory requirements: Health and Safety at Work Act regulations covering:

Workplace
Provision and Use of Work Equipment
Manual Handling operations
Personal Protective Equipment at Work
Management of Health and Safety at Work.
COSHH

APPENDIX 2: SPECIMEN QUESTIONS

MULTI-CHOICE PAPER

This section of the examination requires 40 multiple choice questions to be answered in 1 hour. The pass mark is 70%. Specimen questions are give below:

1 Arc blow in DC welding arcs is caused by:

a) the effect of wind on an exposed welding arc
b) magnetism set up within the work and its effect on the welding arc
c) the electrode burning at one side only due to poor manufacture
d) none of the above

(correct answer – b)

2 Which of the following analyses would give an austenitic stainless steel?

a) 12% chromium, 2% nickel
b) 0.2% carbon, 6% nickel, 2% manganese
c) 18% chromium, 8% nickel
d) all of the above.

(correct answer - c)

3 Electrical power is normally measured in:

a) Horsepower
b) Newtons
c) Joules
d) Watts

(correct answer –d)

WRITTEN PAPER

This section of the examination requires a total of four (4) questions to be answered out of eight (8) in two hours. There are four groups of questions covering different subject areas and one question from each group must be answered. The pass mark is 70%.

Specimen questions are given below:

1 With the aid of drawings explain the difference between dip, globular and spray transfer in MIG/\MAG welding when using bare wires.

2 A 2m long submerged arc butt weld is required to join two 38mm thick steel plates. Discuss the factors that need to be considered when deciding whether single sided or double sided joint should be used.