CSWIP 3.1

CSWIP Welding Inspector preparation course

Introduction

The CSWIP 3.1 - Welding Inspector Level 2 certification is recognised internationally in many industrial sectors and is among the most sought-after by leading global operators in the Oil & Gas and Power Generation sectors.

Participants attending this training course will develop the following competencies:

- Understand the factors that affect the quality of the steel fusion welding
- recognise the characteristics of the most common welding processes in relation to quality control.
- interpreting drawing instructions and symbols to ensure that the specifications are met.
- manage and report the inspections of welded joints, macrographs and other mechanical tests.
- evaluate a weld according to the acceptability criteria and draw up a report
- confirm the quality of the starting material.
- recognise the effect of deviations from the specification on welding quality.

Course Objectives

The prime objective of joining this CSWIP 3.1 Training Program is to understand the factors influencing the quality of fusion welds in steels. It helps the inspectors to recognize characteristics of commonly used welding processes in relation to quality control. The welding inspector will be responsible for interpreting drawing instructions and symbols to ensure that specifications are met.

Course Methods

The training course will combine presentations with interactive practical exercises, supported by video materials, activities and case studies.

PROGRAM SUMMARY

The course will provide an overall perspective on the following:

- The duties and responsibilities of a welding inspector; fusion welding processes; typical weld defects; types of steel; carbon-manganese, low alloy and stainless steels; hardening of steels; weldability; heat treatment; parent metal defects; visual inspection; testing parent metals and welds; destructive tests; NDT techniques; welder and procedure approval; codes and standards; outline of safe working practices; practice in examination questions; continuous and end-of-course assessment.

Course Outline

Day 1

- 1 Typical Duties of Welding Inspectors
- 1.1 General
- 2 Terms and Definitions
- 2.1 Types of weld
- 2.2 Types of Joints (see BS EN ISO 15607)
- 2.3 Features of the completed weld
- 2.4 Weld preparation
- 2.5 Size of butt welds
- 2.6 Fillet weld
- 2.7 Welding position, slope and rotation
- 2.8 Weaving
- 3 Welding Imperfections and Materials Inspection
- 3.1 Definitions
- 3.2 Cracks
- 3.3 Cavities
- 3.4 Solid inclusions
- 3.5 Lack of fusion and penetration
- 3.6 Imperfect shape and dimensions
- 3.7 Miscellaneous imperfections
- 3.8 Acceptance standards
- 4 Destructive Testing
- 4.1 Test types, pieces and objectives
- 4.2 Macroscopic examination

Course Outline

Day 2

- 5 Non-destructive Testing
- 5.1 Introduction
- 5.2 Radiographic methods
- 5.3 Ultrasonic methods
- 5.4 Magnetic particle testing
- 5.5 Dye penetrant testing
- 6 WPS/Welder Qualifications
- 6.1 General
- 6.2 Qualified welding procedure specifications
- 6.3 Welder qualification
- 7 Materials Inspection
- 7.1 General
- 7.2 Material type and weldability
- 7.3 Alloying elements and their effects
- 7.4 Material traceability
- 7.5 Material condition and dimensions
- 7.6 Summary
- 8 Codes and Standards
- 8.1 General
- 8.2 Definitions
- 8.3 Summary

Course Outline

Day 3

- 9 Welding Symbols
- 9.1 Standards for symbolic representation of welded joints on drawings
- 9.2 Elementary welding symbols
- 9.3 Combination of elementary symbols
- 9.4 Supplementary symbols
- 9.5 Position of symbols on drawings
- 9.6 Relationship between the arrow and joint lines
- 9.7 Position of the reference line and weld symbol
- 9.8 Positions of the continuous and dashed lines
- 9.9 Dimensioning of welds
- 9.10 Complimentary indications
- 9.11 Indication of the welding process
- 9.12 Weld symbols in accordance with AWS 2.4
- 10 Introduction to Welding Processes
- 10.1 General
- 10.2 Productivity
- 10.3 Heat input
- 10.4 Welding parameters
- 10.5 Power source characteristics
- 11 Manual Metal Arc/Shielded Metal Arc Welding (MMA/SMAW)
- 11.1 MMA basic equipment requirements
- 11.2 Power requirements
- 11.3 Welding variables
- 11.4 Summary of MMA/SMAW
- 12 TIG Welding
- 12.1 Process characteristics
- 12.2 Process variables
- 12.3 Filler wires
- 12.4 Tungsten inclusions
- 12.5 Crater cracking
- 12.6 Common applications
- 12.7 Advantages
- 12.8 Disadvantages

Course Outline

Day 4

- 13 MIG/MAG Welding
- 13.1 Process
- 13.2 Variables
- 13.3 MIG basic equipment requirements
- 13.4 Inspection when MIG/MAG welding
- 13.5 Flux-cored arc welding (FCAW)
- 13.6 Summary of solid wire MIG/MAG
- 14 Submerged Arc Welding
- 14.1 Process
- 14.2 Fluxes
- 14.3 Process variables
- 14.4 Storage and care of consumables
- 14.5 Power sources
- 15 Thermal Cutting Processes
- 15.1 Oxy-fuel cutting
- 15.2 Plasma arc cutting
- 15.3 Arc air gouging
- 15.4 Manual metal arc gouging
- 16 Welding Consumables
- 16.1 Consumables for MMA welding
- 16.2 AWS A 5.1– and AWS 5.5-
- 16.3 Inspection points for MMA consumables
- 16.4 Consumables for TIG/GTW
- 16.5 Consumables for MIG/MAG
- 16.6 Consumables for SAW welding
- 17 Weldability of Steels
- 17.1 Introduction
- 17.2 Factors that affect weldability
- 17.3 Hydrogen cracking
- 17.4 Solidification cracking
- 17.5 Lamellar tearing
- 17.6 Weld decay
- 18 Weld Repairs
- 18.1 Two specific areas

Course Outline

Day 5

- 19 Residual Stresses and Distortions
- 19.1 Development of residual stresses
- 19.2 What causes distortion?
- 19.3 The main types of distortion?
- 19.4 Factors affecting distortion?
- 19.5 Prevention by pre-setting, pre-bending or use of restraint
- 19.6 Prevention by design
- 19.7 Prevention by fabrication techniques
- 19.8 Corrective techniques
- 20 Heat Treatment
- 20.1 Introduction
- 20.2 Heat treatment of steel
- 20.3 Post weld heat treatment (PWHT)
- 20.4 PWHT thermal cycle
- 20.5 Heat treatment furnaces
- 21 Arc Welding Safety
- 21.1 General
- 21.2 Electric shock
- 21.3 Heat and light
- 21.4 Fumes and gases
- 21.5 Noise
- 21.6 Summary
- 22 Calibration
- 22.1 Introduction
- 22.2 Terminology
- 22.3 Calibration frequency
- 22.4 Instruments for calibration
- 22.5 Calibration methods
- 23 Application and Control of Preheat
- 23.1 General
- 23.2 Definitions
- 23.3 Application of preheat
- 23.4 Control of preheat and interpass temperature