

VISUAL INSPECTION OF WELDS

COURSE DESCRIPTION

Visual inspection provides the basic element for evaluation of structures or components being fabricated/maintained. It constitutes an important aspect of practicable quality control for weldments with joints that may require testing.

It has been proven in numerous situations that an effective program of visual inspection will result in the discovery of the vast majority of those defects which would be found later using some other more expensive non-destructive test methods.

This course includes an outline of the fundamental requisites for personnel performing visual inspection of welds and provides an introduction to visual examination related to welding. Hands-on practical sessions will be conducted to allow participants to use these inspection tools for measurement of welds on actual specimens or replicas. Participants will follow a course program based on AWS text and workbook on Visual Inspection. Inspection personnel will also find that this course useful and greatly enhances their skills.

COURSE CONTENT

- Fundamental of Visual Inspection
- Weld joint geometry and welding terminology
- Welding processes
- Welding discontinuities
- Non-destructive testing
- Hands-on practical session involving the use of inspection equipment

WHO SHOULD ATTEND

Welding inspectors, quality assurance /quality control inspectors, maintenance engineers, design engineers, supervisors, foreman, mechanical engineers, technical officers, technicians, welders and inspection personnel

SAFETY IN WELDING & CUTTING PROCESSES

COURSE DESCRIPTION

This course is aimed at creating a general awareness of health and safety aspects of welding and related processes. It is intended to provide a background for welding personnel and others that may use or are involved with welding processes.

Safety is an important consideration in all welding, cutting and related work. An activity is not satisfactorily completed if someone is injured. The hazards that may be encountered with most welding, cutting, and related processes, and also the practices that will minimise personal injury and property damage will be covered in this course.

After successfully completing this course, participants will be able to create a safe work environment in their workplace.

COURSE CONTENT

- Introduction and Objectives
 - *Safety Regulations and Practices*
- General Hazards in Welding and their Control
 - *Electrical*
 - *Radiation*
 - *Burns and Fires*
 - *Fumes and Gases*
 - *Noise*
- Health and Safety for Specific Operations
 - *Gas Welding, Cutting and Heating*
 - *Welding in Confined Spaces*
 - *Welding Containers*
 - *Welding Processes*

WHO SHOULD ATTEND

All personnel whose responsibilities are in making decision, exercising of judgement concerning welding operations in the following industries :

Oil and Gas, Manufacturing, Petrochemical, Power Generation and Power Stations, Shipbuilding/Shiprepair and Construction, Offshore Fabrication, Railways, Service and Maintenance and Metal Fabrication.

Welding Engineers & Inspectors, Field & Production Engineers, Planning & Equipment Inspectors, Maintenance & Safety Engineers & Supervisors, Design, Manufacturing, Mechanical & Inspection Engineers, Factory, Fabrication & Engineering Managers, Quality Control Engineers & Supervisors, Quality Assurance Engineers & Supervisors.

API-510 PRESSURE VESSEL INSPECTOR
AMERICAN PETROLEUM INSTITUTE

COURSE DESCRIPTION

The main emphasis of this programme is on improving and ensuring safety through the use of owner/user or third-party inspectors specialised in pressure equipment in a manner that protects employees, the public, and the environment.

It provides the oil, gas and petrochemical industry with the assurance that pressure vessel inspectors trained and certified under this internationally recognised programme have the required knowledge and experience for the job in the field.

Course participants aspiring to be certified by American Petroleum Institute will undergo a rigorous programme to get them well versed with the various code books and standards, including API Standards that cover maintenance, inspection, rating, repair and alteration of pressure vessels.

COURSE CONTENT

- Introduction
- Terminology
- Overview: API-510, Pressure Vessel Inspection Code – Maintenance Inspection, Rating, Repair and Alteration
- Overview : API 571, Damage Mechanisms Affecting Fixed Equipment in the Refining Industry
- Overview : API 572, Inspection of Pressure Vessels
- Overview : API 576, Inspection of Pressure-Relieving Devices
- Overview : API 577, Welding Inspection and Metallurgy
- ASME, Boiler and Pressure Vessel Code
 - a. ASME Section V
 - b. ASME Section VIII
 - c. ASME Section IX
- Report Writing
- Summary

WHO SHOULD ATTEND

Applicable to all personnel working in the oil, gas and petrochemical industry, and who are involved in the design, procurement, engineering construction, operation, maintenance and inspection of pressure vessel and related facilities.

API 653 ABOVEGROUND STORAGE TANK INSPECTOR
AMERICAN PETROLEUM INSTITUTE

COURSE DESCRIPTION

The main emphasis of this programme is on safe storage and material handling of petroleum products in a manner that protects employees, the public, and the environment. It provides the oil, gas and petrochemical industry with the assurance that storage tank inspectors trained and certified under this internationally recognised programme have the required knowledge and experience for the job in the field.

Course participants aspiring to be certified by American Petroleum Institute will undergo a rigorous programme to get them well versed with the various code books and standards, including API Standards that cover inspection, repair, alteration and reconstruction of the aboveground storage tank.

COURSE CONTENT

- Introduction
- Terminology
- Overview : API 650, Welded Steel Tanks for Oil Storage
- Overview : API 653, Tank Inspection, Repair, Alteration and Reconstruction
- Overview :
 - a. API 651 – Cathodic Protection of Aboveground Petroleum Storage Tanks
 - b. API 652 – Lining of Aboveground Petroleum Storage Tanks
 - c. API 571 – Damage Mechanisms Affecting Fixed Equipment in the Refining Industry
 - d. API 575 – Inspection of Atmospheric and Low-Pressure Storage Tanks
 - e. API 577 – Welding Inspection and Metallurgy
- Overview (as related to API 653)
 - a. ASME Section V
 - b. ASME Section IX
- Report Writing
- Case Studies
- Summary

WHO SHOULD ATTEND

Applicable to all personnel working in the oil, gas and petrochemical industry, and who are involved in the design, procurement, engineering construction, operation, maintenance and inspection of storage tanks and related facilities.

API-570 PIPING INSPECTOR
AMERICAN PETROLEUM INSTITUTE

COURSE DESCRIPTION

The main emphasis of this programme is on promoting safety and maintaining optimal performance through the use of inspectors specialised in process piping systems. It provides the oil, gas and petrochemical industry with the assurance that piping inspectors trained and certified under this internationally recognised programme have the required knowledge and experience for the job in the field.

Course participants aspiring to be certified by American Petroleum Institute will undergo a rigorous programme to get them well versed with the various code books and standards, including API Standards that cover inspection, repair, alteration and rerating of in-service piping systems.

COURSE CONTENT

- Introduction
- Terminology
- Overview : API 570, Piping Inspector Code - Inspection, Repair, Alteration and Rerating of In-Service Piping Systems
- Overview : API 571, Damage Mechanisms Affecting Fixed Equipment in the Refining Industry
- Overview : API 574, Inspection Practices for Piping System Components
- Overview : API 577, Welding Inspection and Metallurgy
- Overview : API 578, Material Verification Program for New and Existing Alloy Piping Systems
- ASME, Boiler and Pressure Vessel Code
 - a. ASME Section V
 - b. ASME Section IX
- ASME B16.5, Pipe Flanges and Flanged Fittings
- ASME B31.3, Process Piping
- Report Writing
- Summary

WHO SHOULD ATTEND

Applicable to all personnel working in the oil, gas and petrochemical industry, and who are involved in the design, procurement, engineering construction, operation, maintenance and inspection of in-service piping systems and related facilities.

API-571 SUPPLEMENTAL INSPECTION
AMERICAN PETROLEUM INSTITUTE

COURSE DESCRIPTION

This course and certification program is a result of a need to address equipment deterioration while in service and that deficiencies due to degradation or from original fabrication may be found during subsequent inspection. It look at damage mechanisms affecting equipment in the refining and petrochemical industries. It emphasized the key first step in safety and reliably managing equipment is identifying and understanding the relevant damage mechanisms. It covers the importance of proper identification of damage mechanisms when implementing the API Inspection Codes (API 510, API 570, API 653) and in conducting risk based inspection as per API 580 and API 581. In addition, the program will also discuss on the evaluation of remaining life and fit-for-service assessment using API 579.

This program covers the general guidelines as to the most likely damage mechanisms for common alloys in the refining and petrochemical industry. It also provide information that can be utilized by plant inspection personnel to assist in identifying likely cause of damage, and are intended to introduce the concepts of service-induced deterioration and failure modes.

COURSE CONTENT

- Introduction and scope
- References
- Definition of terms and abbreviations
- General damage mechanisms – all industries
 - Mechanical and metallurgical failure mechanisms
 - Uniform or localized loss of thickness
 - High temperature corrosion
 - Environment – assisted cracking
- Refining industry damage mechanisms
 - General
 - Uniform or localized loss in thickness phenomena
 - Environment – Assisted cracking
 - Other mechanisms

WHO SHOULD ATTEND

Current certification as either API 510, 570 or 653 inspectors

METAL JOINING & CUTTING PROCESSES

COURSE DESCRIPTION

Welding is essential to the expansion and productivity of our industries. Welding has become one of the principal means of fabricating and repairing metal products. It is almost impossible to name an industry, large or small, that does not employ some form of welding. Industry has found that welding is an efficient, dependable and economical means of joining metal in practically all metal fabricating operations and in most construction.

COURSE CONTENT

- Introduction to Metal Joining and Cutting Processes
- Shielded Metal Arc Welding (SMAW)
- Gas Metal Arc Welding (GMAW)
- Flux Cored Arc Welding (FCAW)
- Gas Tungsten Arc Welding (GTAW)
- Submerged Arc Welding (SAW)
- Other Welding and Brazing Processes
- Cutting Processes

WHO SHOULD ATTEND

All personnel whose responsibilities are in making decisions and exercising of judgement concerning welding operations in the following industries :

Oil & Gas, Manufacturing, Petrochemical, Power Generation & Power Stations, Shipbuilding/Shiprepair and Construction, Offshore Fabrication, Railways, Service and Maintenance and Metal Fabrication

Welding Engineers and Inspectors, Field and Production Engineers, Planning and Equipment Inspectors, Maintenance and Safety Engineers and Supervisors, Design, Manufacturing, Mechanical and Inspection Engineers, Factory, Fabrication and Engineering Managers, Quality Control Engineers and Supervisors, Quality Assurance Engineers and Supervisors.

STRUCTURAL WELDING DESIGN

COURSE DESCRIPTION

This course has been developed by the American Welding Society (AWS) for engineers with little formal education in welding, but with increasing on-the-job welding responsibilities. The emphasis is on basic concepts and applications. The course is designed to help engineers understand the cost savings and efficiency attainable through the proper design of weldments.

Participants will follow a course programme based on AWS text and workbook on Welding Structural Design. Welding inspectors will also find that this course greatly enhances their performance and helps them prepare for the AWS Certified Welding Inspector certification.

COURSE CONTENT

- Material properties & structural materials
- Welding processes
- Welding filter metals
- Welding cost analysis
- Weld types, joint types, welding symbol & procedures
- Introduction to structural welding design
- Welding design & concept
- Structural shapes, sectional properties & redesign of castings(and forging) to weldments
- Connection design
- AISC structural connection types
- Determination of weld stresses & weld size
- AWS stress allowable
- Weld design practices
- Weldability, inspection & fitness for purpose
- Welding stress & distortion
- Welding safety & health

WHO SHOULD ATTEND

All personnel whose responsibilities are in making decisions, exercising of judgement concerning welding operations in the following industries :

Oil and Gas, Manufacturing, Petrochemical, Power Generation and Power Stations, Shipbuilding/Shiprepair and Construction, Offshore Fabrication, Railways, Service and Maintenance and Metal Fabrication.

Welding engineers and Inspectors, Field and Production Engineers, Planning and Equipment Inspectors, Maintenance and Safety Engineers and Supervisors, Design, Manufacturing, Mechanical and Inspection Engineers, Factory, Fabrication and Engineering Managers, Quality Control Engineers and Supervisors, Quality Assurance Engineers and Supervisors.

PROTECTIVE COATING INSPECTION

COURSE DESCRIPTION

The course is designed for technical personnel in industry who have to tackle coating problems related to metals but do not have the specialised knowledge and training in the subject. It provides course participants with sufficient knowledge and expert guidance to use the best methods to solve or at least to cope with coating problems frequently encountered or likely to be confronted.

Informative case studies on coating failures will bring actual industrial problems and their solutions into the classroom.

COURSE CONTENT

- Duties of the inspector
- Introduction to corrosion
- Surface preparation
- Introduction to coatings technology
- Coating application methods
- Coating failure, coating repair and maintenance
- Inspecting the environment
- Inspection of coating material and its application
- Safety and quality assurance
- Logbook scheme (Documentation)

WHO SHOULD ATTEND

Plant Maintenance Engineers and Supervisors, Materials Engineers, Design, Manufacturing, Mechanical and Inspection Engineers, Quality Assurance/Control Personnel, Chemical Treatment Personnel, Protective Coating and Lining Personnel and all personnel whose responsibilities are in making decisions and exercising judgement concerning protective coating in the following industries:

Oil Refinery, Petrochemical, Power Generation and Power Stations, Offshore Fabrication and Maintenance, Shiprepair and Construction, Metal Fabrication and Maintenance, Chemical Treatment and Protective Coating (e.g. painting) industries.

INSPECTION OF PRESSURE EQUIPMENT

COURSE DESCRIPTION

The programme emphasises improving and ensuring safety through the use of owner/user or third-party inspectors specialised in pressure equipment in a manner that protects employees, the public, and the environment.

COURSE CONTENT

- Basic aspects of inspection
- Inspector's responsibilities, duties, attributes and code of ethics
- Boilers and Pressure equipment
- Safety during inspection
- Methods of inspection
- Pressure equipment inspection
- Assessment of pressure equipment integrity
- Materials
- Manufacture
- Common modes and causes of deterioration and failure.
- Repair, alteration (modification) replacement and re-rating.
- Documentation

WHO SHOULD ATTEND

Applicable to all personnel working in the oil, gas and petrochemical industry, and who are involved in the design, procurement, engineering construction, operation, maintenance and inspection of pressure equipment and related facilities.



AWS-CERTIFIED WELDING INSPECTOR
AMERICAN WELDING SOCIETY

COURSE DESCRIPTION

The course will serve as a sound refresher in welding inspection, particularly for practising welding inspectors and anyone aspiring to be an AWS-certified welding inspector. The main emphasis is on what a professional welding inspector should know in actual practice. Course participants will undergo a rigorous programme to get them well versed with the codes/standards in use, the fundamentals of welding inspector, and actual hands-on examinations of weld replicas with various inspection tools.

COURSE CONTENT

- The Welding Inspector
 - *Documents Governing Welding Inspection and Control of Materials*
 - *Weld Joint Geometry and Welding Terminology*
- Welding and Non-Destructive Testing Symbols
 - *Code Review*
 - *Welding Procedure and Welder Qualification*
- Welding, Brazing and Cutting Processes
 - *Welding Metallurgy for the Welding Inspector*
- Mechanical and Chemical Properties of Metal
 - *Destructive Testing*
 - *Weld and Base Metal Discontinuities*
 - *Non-Destructive Testing*
- Non-Destructive Testing
 - *Visual Inspector as an Effective Quality Control Tool*
- AWS CWI Examination

PRE-REQUISITES FOR EXAMINATION PARTICIPANTS

Certified Welding Inspector (CWI) Level

- Minimum of 5-year industry experience or
- Minimum of 3-year industry experience with degree/diploma holders in engineering technology, engineering physics or physical science

Certified Associate Welding Inspector (CAWI) Level

- Minimum of 2-year industry experience or
- Minimum of 6-month industry experience with degree/diploma holders in engineering technology, engineering physics or physical science

Both CWI and CAWI examination candidates are required to pass an eye examination.

WHO SHOULD ATTEND

All personnel whose responsibilities are in making decision, exercising of judgement concerning welding operations in the following industries:

Oil and Gas, Manufacturing, Petrochemical, Power Generation and Power Stations, Shipbuilding/ Shiprepair and Construction, Offshore Fabrication, Railways, Service and Maintenance and Metal Fabrication.



Setsco Training Centre is an Approved Training Body (ATB) by IIW Authorised Nominated Body (ANB) Singapore Welding Society (SWS)



INTERNATIONAL WELDING INSPECTION PERSONNEL

WELDING TECHNOLOGY MODULES (BASIC LEVEL)

OVERVIEW

This course is designed for welding inspection personnel who are involved in job functions in the field of fabrication, construction, petrochemical, refinery, marine, and other relevant industries.

ACCESS CONDITIONS

IWI-BASIC

Route 1

- At least two years of professional welding related experience; or
- having educational backgrounds in science or engineering

Route 2

- Holding an existing IIW qualification as International Welding Practitioner or higher may proceed direct to the Welding Inspection Module at the relevant level

COURSE CONTENT

- Welding processes and equipment
- Materials and their behaviour during welding
- Construction and design
- Fabrication, applications engineering



OUTCOME OF TRAINING

- Understand in general, the basics of electricity in relation to the requirements of welding technology and also key electronic components used in power sources
- Understand the principles of carbon contents, addition of alloys, crystal structures and their representation in phase and transformation diagram
- Understand basic metallurgy of steels, testing of materials and heat treatments
- Weldability of different alloys and problem-solving
- Understand the weldability of metals under different loads and the design of welded structures
- Identify the different non-destructive testing methods and repair methods

International Welding Inspection Personnel – Welding Technology

Contact Details:

See Wah Kiaw

Tel: +65 6895 0633

Email: seewk@setsco.com

Website: www.setsco.com

Welding Technology Modules	IWI-Basic (Hours)
Module 1: Welding processes and equipment	17
Module 2: Materials and their behaviour during welding	19
Module 3: Construction and design	5
Module 4: Fabrication, applications engineering	6
Subtotal	47

COURSE DURATION

47 Hours (6 days)

TRAINING EVALUATION

International Welding Inspection Personnel (IWIP) - Basic Level
Welding Technology Exam (WTE-B)

(Note: Exam Fee to be paid separately to Singapore Welding Society)

CLASS SIZE

Minimum: 10 Students

Maximum: 20 Students

COURSE FEES

S\$2,000 (exclusive 7% GST)

VENUE

Setsco Services Pte Ltd
18 Teban Gardens Crescent,
Singapore 608925

REGISTRATION

Participants can register the course online at:
<http://www.setsco.com/setsco/Info/html/id/2.html>



Setsco Training Centre is an Approved Training Body (ATB) by IIW Authorised Nominated Body (ANB) Singapore Welding Society (SWS)

INTERNATIONAL WELDING INSPECTION PERSONNEL



WELDING INSPECTION MODULES (BASIC LEVEL)

OVERVIEW

This course is designed for welding inspection personnel who are involved in job functions in the field of fabrication, construction, petrochemical, refinery, marine, and other relevant industries.

ACCESS CONDITIONS

IWI-BASIC

Route 1

- At least two years of professional welding related experience; or
- having educational backgrounds in science or engineering

Route 2

- Holding an existing IIW qualification as International Welding Practitioner or higher may proceed direct to the Welding Inspection Module at the relevant level

COURSE CONTENT

- Quality Assurance / Quality Control in Inspection
- Testing of welds and reporting
- Practical work on testing



OUTCOME OF TRAINING

- Understand the objectives of welding inspection, the goal of construction codes and quality standards, the inspection stages and the inspector's relationship with other welding personnel.
- Understand the principles of quality assurance and quality control and recognise the related standards and their application to welded fabrication as a special process.
- Gain knowledge of the standards related to welders/operators and welding procedure qualification, and understand the requirements for measurement, testing and control during welding and allied operations.
- Able to identify the characteristics of the fundamental types of weld imperfections, recognise their possible position with reference with the welded joint and to verify their visibility with the current NDT techniques.
- Gain knowledge with regards to defect significance and to be able to compare between families of imperfections and their significance, understand the morphology of the imperfections, recognise the possible influence of each type of imperfection.
- Understand the general principals of different NDT methods and their advantages and disadvantages, be able to understand NDT test reports and film interpretation.
- Understand the system of training, qualification and certification of NDT personnel, the basic principles of welder qualification tests, to identify and be able to review, evaluate and validate the key documents that are used in the quality control.

International Welding Inspection Personnel – Welding Inspection

Contact Details:

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Welding Inspection Modules	IWI-Basic (Hours)
Module 1 - Quality Assurance / Quality Control in Inspection	20
Module 2 - Testing of welds and Reporting	18
Module 3 - Practical work on testing	17
Total	55

COURSE DURATION

55 Hours (7 days)

TRAINING EVALUATION

International Welding Inspection Personnel (IWIP) - Basic Level
Welding Inspection Exam (WIE-B)

(Note: Exam Fee to be paid separately to Singapore Welding Society)

CLASS SIZE

Minimum: 10 Students

Maximum: 20 Students

COURSE FEES

S\$2,200 (exclusive 7% GST)

VENUE

Setsco Services Pte Ltd
18 Teban Gardens Crescent,
Singapore 608925

REGISTRATION

Participants can register the course online at:

<http://www.setsco.com/setsco/Info/html/id/2.html>