2022

MINISTRY OF HUMAN RESOURCES

HRD CORP
HUMAN RESOURCE DEVELOPMENT CORPORATION

INDUSTRIAL SKILLS FRAMEWORK
MACHINERY AND EQUIPMENT
WELDING

IN COLLABORATION WITH

MEMA
MACHINERY & EQUIPMENT MANUFACTURERS ASSOCIATION

MEiF
Machinery & Engineering Industries Federation

MALAYSIAN WJS

Published By,

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PREFACE

Malaysia's Machinery and Equipment industry is fast-growing and significantly contributes to the national economy. Thus, the first version of the Industrial Skills Framework for Machinery and Equipment was developed in 2019 with key industry players and employer associations to address talent development needs within the respective industry. HRD Corp recognised the importance of enhancing the IndSF document for this industry in 2022 to increase the number of focus areas covered and enrich the information on current talent development skillsets required. HRD Corp, through its collaborators, Machinery and Equipment Manufacturer Association (MEMA), Machinery and Engineering Industries Federation (MEIF) and Malaysian Welding and Joining Society (MJWS), have identified critical focus areas and subject matter experts (SMEs) that will be involved in the initiative. Workshop sessions were conducted both physically and online. The IndSF Machinery & Equipment focusing on Welding covers three main focus areas as listed below:

WELDING PRACTITIONER

WELDING INSPECTION

WELDING COORDINATOR

ACKNOWLEDGEMENT

SUBJECT MATTER EXPERTS

We would like to thank all subject matter experts who have contributed to the development of the Industrial Skills Framework document for the Manufacturing & Equipment - Welding

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ACKNOWLEDGEMENT

SUBJECT MATTER EXPERTS

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FOREWORD

CHIEF EXECUTIVE

HRD Corp

YBhg. Datuk Shahul Dawood

It has been almost two years since the Industrial Skills Framework (IndSF) initiative was introduced by HRD Corp. Today, we are proud to have successfully published eleven IndSF documents. This proves that more industries out there are recognising the importance of having a comprehensive set of guidelines for skills, competencies, and training needs, as well as suitable certification programmes for employees.

At HRD Corp, upskilling and reskilling remain our main priorities, particularly amidst the pandemic. We are working hard to assist Malaysians from all walks of life, especially those who lost their jobs, to identify new career and income opportunities, especially as the country progresses toward its recovery period. However, one of the major challenges in doing so is understanding the current talent requirements among industries and transferring that knowledge to the public. This initiative aims to bridge this crucial skill, talent and competencies gap between the industry and current or future employees.

Another significant change within many industries today is the shift towards embracing digitalisation in their business operations. The pandemic has led industries to consider remote working as an alternative, thereby reducing the need for a physical work environment. Some conventional roles have become obsolete while new ones have emerged to support this significant and rapid digital transformation within various industries. Such changes must be communicated to the Malaysian workforce to enable successful hiring based on new skills and competencies that are required by the industry. In line with this, HRD Corp is fully committed to engaging with more industries to join and work with us to develop future IndSF documents.

Finally, I would like to take this opportunity to congratulate all subject matter experts from the industry for their tireless effort and dedication in developing the IndSF document for Machinery & Equipment. Delivering this initiative to the Malaysian workforce is a great honour. HRD Corp will continue to play a vital role in shaping a globally competitive and skilful Malaysian workforce today and tomorrow.

FOREWORD

PRESIDENT

Machinery and Engineering Industries Federation (MEIF)
Machinery & Equipment Manufacturers Association (MEMA)

Mac Ngan Boon

The Malaysian government has identified the Machinery and Equipment (M&E) sector as one of the main focus areas for growth and expansion. The Malaysian Investment Development Authority (MIDA) positioned Malaysia as the destination of choice within the ASEAN region, with the M&E sector among Malaysia's high-growth and catalytic industries. The M&E sector recorded an export value of RM49.92 billion in 2021, and its contribution to Malaysia's GDP was consistently at 0.7 per cent from 2017 to 2021.

The various challenges faced by the M&E industry, mainly in employment, revealed the need for relevant competencies and technical skills in the talent pool. In addition, some positions require knowledge not taught in university or TVET institutions. Therefore, the Machinery and Engineering Industries Federation (MEIF) and one of its industry association members, the Machinery & Equipment Manufacturers Association (MEMA), in collaboration with Malaysia Productivity Corporation (MPC) and HRD Corporation, digitally published "Industrial Skills Framework for Machinery and Equipment subsector - welding" to empower talent development in the subsector. The framework identified the job scope in the welding occupational areas and addressed the required skills and competencies in the M&E sector. It is a good reference for the industry and educational institutions to analyse human resource competency requirements and a career guide for the public.

Welding is one of the essential activities in the M&E sector, undertaken by skilled, qualified welders working to a welding quality management system under the control of a responsible welding coordinator and welding engineer. While most careers experience significant swings in demand, the welding field is relatively stable. The welding profession is considered a good trade, and most welders are paid a good wage for their work.

Through these sectorial requirements, I foresee a series of welding-related training programs designed by HRD Corp-approved training providers to address the skills gap between talent supply and demand. This framework will be used for the other sub-sectors of the M&E Industry.

I want to take this opportunity to congratulate all members of HRD Corp's Sectorial Training Committees, Subject Matter Experts from the industry, MPC secretariat, and especially HRD Corp for their tireless effort and contribution to developing this Industrial Skill Framework for the Machinery and Equipment sector - welding" and as a follow-up, I would like to see expansion to the other sub-sectors of the industry.

FOREWORD

PRESIDENT

Malaysian Welding and Joining Society (MWJS)

Saharudin Bin Kambari

First of all, on behalf of the Malaysian Welding and Joining Society (MWJS) and national welding communities at large, I would like to congratulate the Human Resource Development Corporation (HRD Corp) on the success of publishing the welding carrier and development information.

We would like to thank HRD Corp for inviting the Malaysian Welding and Joining Society to be part of the expert panel group to provide input in developing the HRD Corp's Industrial Skills Framework (IndSF): Machinery & Equipment - Welding document.

In Malaysia, manufacturing industries involving steel products have developed progressively from simple family businesses to conglomerate entities. In this venture, welding activities play essential roles from simple to sophisticated processes involving down hand skilled workers up to managerial professionals.

Manufactured products must meet consumer requirements based on standards and specifications before entering the market. To fulfil this requirement, workforce skills must meet the quality set by the industries concerned through the certification programme integrating various codes and standards. Through IndSF, welding activity has been identified as a major skilled block in manufacturing industrial products, and the workforce must be certificated.

Skilled workforces are acquired through modulated training programmes and assessed for competency achieved by a structured examination of theory and practical subject matters. This certificated programme is encapsulated in this document which provides guidance on human capital in the welding fraternity that gives a clear carrier pathway in various job levels from the coded welder, welding inspector and welding coordination personnel.

I would like to thank those individuals from MWJS, MEIF, MEMA, MPC and other organisations who have contributed time and effort in preparing and developing this document for national human capital in welding for machinery and equipment manufacturing industries.

GUIDELINES

01

This document serves as a guide for individuals, employers and training providers to learn more about the knowledge, experience and skills mastery required in the machinery and equipment industry.

02

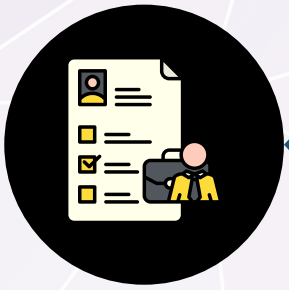
The prepared job matrix may serve as a reference for career progression within the industry.

03

The Industrial Skills Framework for the Agriculture Industry - Oil Palm Plantation will FOCUS ON Level 4 of the Malaysian Skill Certification (or its equivalent) and above

04

It is a complementary document to the existing references developed by the National Occuptional Skills Standard (NOSS) and Malaysian Qualification Framework (MOF).



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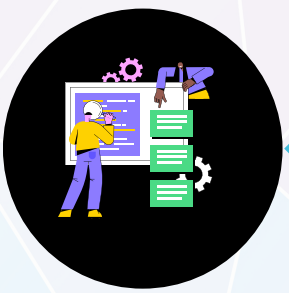
It is a COMPLEMENTARY DOCUMENT to existing references developed by the National Occupational Skills Standard (NOSS) and Malaysian Qualifications Framework (MQF)



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The Industrial Skills Framework document is not exhaustive and may be reviewed from time to time for continuous improvement, parallel with the latest changes within the industry.

HRD CORP INDUSTRIAL SKILLS FRAMEWORK

Human Resource Development Corporation (HRD Corp) was established in 1993. As an agency under the Ministry of Human Resources, it is responsible for the collection of levy from key industries and the disbursement of training grants to registered employers through its internal mechanisms known as the Human Resources Development Fund (HRDF). Today it has expanded its role to include training and development programmes for all Malaysian talents and employers, as well as providing income-generating opportunities to all communities in need.

About HRD Corp Industrial Skills Framework

HRD Corp developed the Industrial Skills Framework (IndSF) to support the industry in acquiring a skilled workforce that meets the level of competencies and experience needed by the industry.

The development is supported by the participation of subject matter experts that represent industry associations and employers of the Machinery and Equipment. This is done based on the underlying principles below:

Focus on all levels of Malaysian Skills Certification or its equivalent and above.

Accommodate the needs of in-service workers.

Built upon the National Occupational Skills Standard (NOSS).

Developed together with the industry and benchmarked against successful frameworks or model(s).

Meet the competency requirements of sectors currently covered under the PSMB Act 2001.

With the IndSF, employees and employers can enhance their skills for career progression. The levy utilisation process also becomes more guided as employers can choose from a list of industry-relevant training programmes that can provide a greater return on investment for their company.

SECTORIAL INFORMATION
BUSINESS OUTLOOK

WHAT IS WELDING ?

Welding is essentially a fabrication, repair, maintenance, manufacturing and constructional engineering activity. In the last several decades, welding has evolved as an interdisciplinary activity requiring the synthesis of knowledge from various disciplines including quality inspection and incorporating the most advanced tools of various basic and applied sciences

WELDING INDUSTRY IN MALAYSIA

Welding industrial development in Malaysia is a critical enabling technology for various industries predominated by metals. The process of joining metals has become more sophisticated and is now more focused on adding value to welded products needed by most industries. In recent years, welding has become a centre of attention in the metalworking sector as the processes involved in welding activities are more intricate compared to other industries with bigger machinery operations. Welding processes depend more on the use of human judgment to ensure the quality of welded products, thus requiring welders to have higher technical capabilities. Considering that the welding process is knowledge-based, innovation is a vital element for the growth of the industry.

SECTORIAL INFORMATION
BUSINESS OUTLOOK

WELDING INDUSTRY IN MALAYSIA

It supports the principles of national development such as RMK- 12 and WKB 2030 and also completes the Digital Economy Blueprint Malaysia in encouraging the development of the digital economy. IR 4.0 industrialisation refers to a disruptive transformation in the industry through the use of emerging technologies. It is a new technology that combines the physical, digital realms and biology, which affects all fields, industries and economies.

HRD Corp's actively implemented efforts include re-skilling and re-upgrading programmes for industrial workers. This rapid development can be seen with the positive involvement of vocational training institutions and universities in providing skilled workers and welding technologists, and engineers to meet the national welding industry market and also toward IR 4.0 needs.

SECTORIAL INFORMATION

BUSINESS OUTLOOK

WELDING

Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a joint as the parts cool. Welding is usually used on metals and thermoplastics . The completed welded joint may be referred to as a weldment. [2]

WELDING COORDINATOR

Welding coordinators supervise the workflow of welding applications. They monitor welding processes performed by other welders, supervise the staff, being sometimes responsible for vocational training. They also weld particularly demanding parts.[3]

WELDING INSPECTION

Welding inspection typically consists of a series of quality control checks carried out by welding inspectors. It ensures welded joints meet required levels of quality and are fit for the intended purpose. A range of welding inspection techniques may be applied, depending on factors such as joint configuration, specific defects of interest, material type/thickness and whether in shop or on site.[4]

WELDING PRACTITIONER

Welding practitioner is a person who has a relevant qualification or certification to work with Welding coordinators in manufacturing companies. Welding Practitioner possesses a basic core education in welding technology and skill to support a range of job functions namely coded welders, welding supervisors, welding foreman, welding instructor, welding inspectors and welding technical sales personnel.

SECTORIAL INFORMATION

BUSINESS OUTLOOK

WELDER

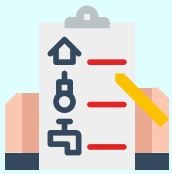
- Different types of welding jobs are used during all phases of industrial operations, so the need for welders is steady across various industries.
- Welding career paths may include working for contracting and construction companies, building permanent and temporary infrastructures, repairing military equipment, or working various pipeline jobs. Many of the welding jobs in Malaysia are in the manufacturing industry.

- Some careers in welding can be exciting for people who want to travel or work in non-traditional environments. For example, welders who specialise in metal fabrication may find themselves travelling with racing pit crews to repair and construct customised racing equipment.
- Welding offers many career advantages for people who like working with their hands, who are mechanically inclined and who enjoy contributing their skills to the tangible creation of a building, project or structure.

ENGINEERING

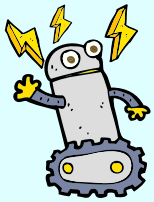
SALES

INSPECTION



CONSTRUCTION

WELDING CAREER FIELDS



ROBOTIC

PROJECT MANAGEMENT

ENTERPRENUER

EDUCATION

SECTORIAL INFORMATION
BUSINESS OUTLOOK

COMMON SKILLS FOR A WELDER

ADMINISTRATIVE FOCUS

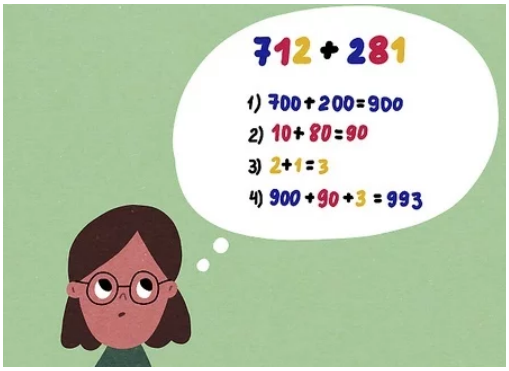
Welders need to be able to document their work, as well as conduct and oversee inventory of supplies.

PHYSICAL STAMINA

Strength can be a helpful asset when applying for welder positions. Welding involves lifting, bending, stooping and twisting to connect and sometimes dismantle heavy equipment.

MATHEMATIC SKILLS

Welders need to understand the dimensions of the task at hand and make quick and accurate calculations while also reading blueprints and sketches to secure everything in the right place.



TECHNICAL SKILLS

Welding requires you to have great ability in handling tools and technology.

SECTORIAL INFORMATION
BUSINESS OUTLOOK
DEMOGRAPHIC INFORMATION OF MACHINERY & EQUIPMENT UNDER HRD CORP

	TOTAL
No. of Registered Employers	1,404
No. of Employee Covered	126,804
Levy Collected	RM23.1 mil
Levy Utilisation	0.7%
Financial Assistance	RM182,285
Training Places	125

(Source : HRD Corp Internal Data, Jan 2022 - June 2022

SECTORIAL INFORMATION
BUSINESS OUTLOOK

COURSES ATTENDED BY EMPLOYEES

1. ASME Section IX Welding Qualifications
2. AWS-CWI (Certified Welding Inspector)
3. Certificate In Welding Technology
4. CQI-15 2nd Edition Welding System Assessment Training Course
5. CSWIP Visual Welding Inspector Level 1 (WIS1)
6. JWES Certified Welding Coordinator (AWE/WE/SWE)
7. Fiber Laser Welding Machine Literature Technical Training
8. International Institute of Welding Diploma of Welding Specialist(IWS) - Welding Process Equipment (WPE 1)
9. Soft Skill Training (Welding)
10. Welder Qualification Test(WQT) - Shielded Metal Arc Welding (SMAW/MMA) SKM Level 3 - 6G (Inclined Pipe)

SECTORIAL INFORMATION BUSINESS OUTLOOK

TALENT DESIRED ATTRIBUTE

Up-skilling

Companies must up-skill their workforce via in-house or external training centres to help employees become more knowledgeable and develop new competencies related to their current position. It enables employees to strengthen their current skills, develop new ones, attract potential employers, and bag their desired career roles.

Re-skilling

Industry 4.0 is expected to result in job displacement to a certain extent. Reskilling equips workers to switch lanes and move into new roles within an organisation. Several jobs will cease to exist, and some new jobs will be created. Companies will have to invest in re-skilling of the labour force to prepare for this expected shift.

Continuous Learning

Given that the labour force will have to adapt to some changes, they will resist and oppose the implementation of newer technologies. This will require companies to plan for the mindset change of their employees to facilitate a smooth transition to advanced manufacturing processes.

Technological and tool handling

The ability to learn new technologies and practices such as Robotic welding equipment skills.

Ability to work with data

A welder must be able to process and analyse data and information obtained from machines, understand visual data output, and make decisions. They also must have basic statistical knowledge to work with data.

Technical know-how

Welders should have inter-disciplinary and generic knowledge about technology and specialised knowledge about welding activities and processes in place. They should obtain technical know-how about machines to carry out welding-related activities.

Personal Skills

Interpersonal skills are important for communicating and working with groups and individuals personally and professionally. People with strong interpersonal skills build good relationships and work well with others.

SECTORIAL INFORMATION

BUSINESS OUTLOOK

EMPLOYER	FUTURE TALENT	CURRENT EMPLOYEE
Refer to the Skills Framework to find out about employees skills standards.	Refer to the Skills Framework to find out about careers in the sector.	Refer to the Skills Framework to find out how to chart their career progression.
IDENTIFY relevant/required training programmes and succession plans for the employees based on the occupation.	**IDENTIFY** the job opportunities in the sector along with career pathways attributes based on the occupation.	**IDENTIFY** skill gaps in their current job role to upskill and reskill.
PLAN training sessions for employees and their career advancement.	**UNDERSTAND** the skills required to perform the job and identify relevant training for professional self development.	**PLAN** their career progression.

IDENTIFY relevant training programmes.

TRAINING PROGRAMMES

Embarking on a career

Programmes that equip future talents with the relevant knowledge.

Programmes that will upskill/reskill the current employees.

Lifelong learning to fulfill existing and emerging demands of the industry

SKILLS & DESCRIPTION OF COMPETENCIES

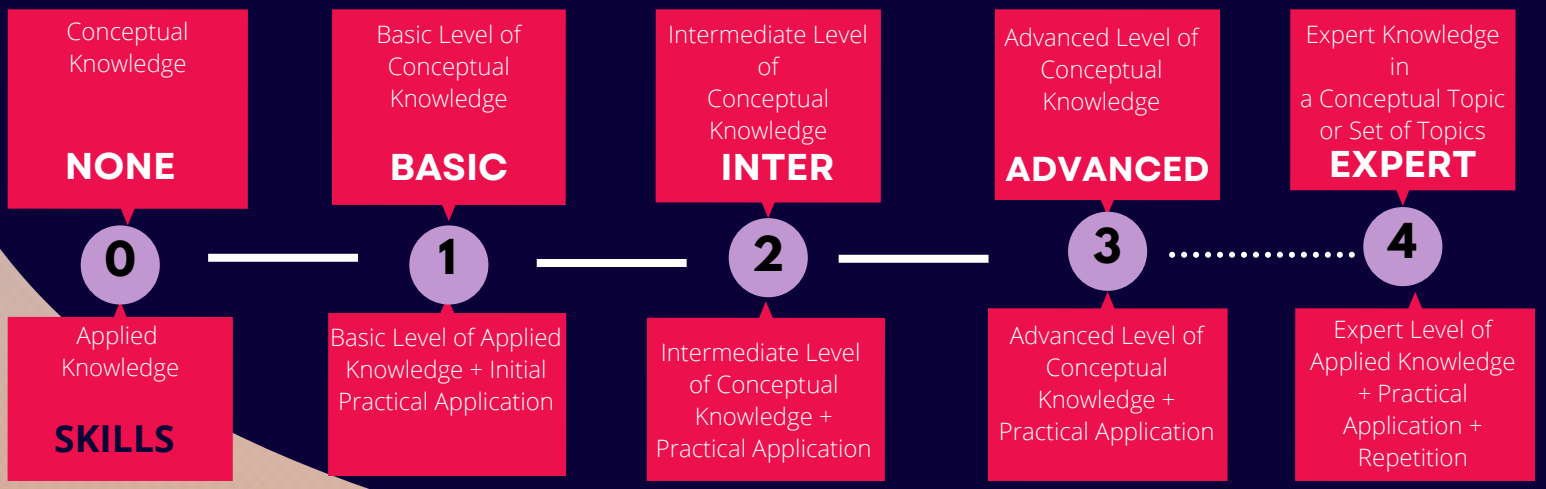
LEVEL DESCRIPTORS

MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF)

NO	DESCRIPTION
1	• Competent in performing a range of varied work activities, most of which are routine and predictable.
2	• Competent in performing a significant range of varied work activities in various contexts. Some of the activities are non-routine and require individual responsibility and autonomy.
3	• Competent in performing a broad range of varied work activities in various contexts, most of which are complex and non-routine. There is a considerable responsibility, autonomy, and control or guidance of others are often required.
4	• Competent in performing a broad range of complex technical or professional work activities carried out in various contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and allocation of resources is often present. A higher level of technical skills should also be demonstrated.
5	• Competent in applying a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and significant responsibility for the work of others are required. Must also be able to allocate substantial resources accordingly and demonstrate solid personal accountability for analysis, diagnosis, design, planning, execution and evaluation. Specialisation in a particular technical skill area should be demonstrated.
6	• Achievement at this level reflects the ability to refine and use relevant understanding, methods and skills to address complex problems with limited definitions. It includes taking responsibility for planning and developing courses of action that result in substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of different perspectives, approaches of schools of thought and the theories that underpin them.
7	• Achievement at this level reflects the ability to reformulate and use relevant understanding, methodologies and approaches to address problematic situations that involve many interacting factors. It includes taking responsibility for planning and developing courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of theoretical and relevant methodological perspectives and how they affect their sub-area of study or work.
8	• Achievement at this level reflects the ability to develop original understanding and extend a sub-area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complex and interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgment and leadership in sharing responsibility for developing a field of work or knowledge or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work.

Source: Organisational Framework (OF), 2017

REQUIRED COMPETENCY LEVEL (RCL)



LEVEL	INDICATOR	DESCRIPTION
0	None	Denotes a lack of competence in a specific area or topic
1	Basic	Denotes an understanding of fundamentals and some initial practical application.
2	Intermediate	Denotes a solid conceptual understanding and some practical application.
3	Advanced	Denotes significant conceptual knowledge and practical experience in performing a competency to a consistently high standard.
4	Expert	Denotes extensive knowledge, refined skills and prolonged experience in performing a defined competency at the highest standards.

FOCUS AREAS

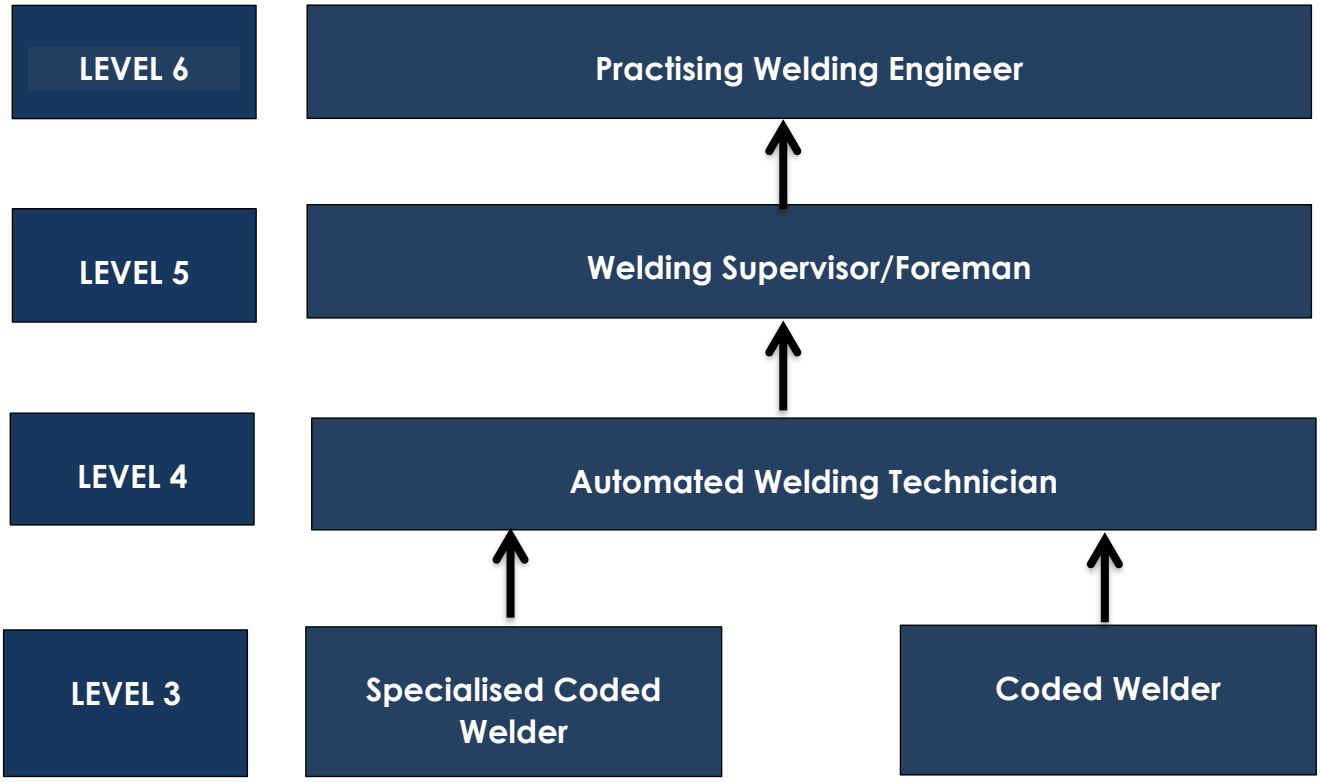
WELDING PRACTITIONER

WELDING INSPECTION

WELDING COORDINATION

WELDING PRACTITIONER

CAREER PATHWAY: WELDING PRACTITIONER



Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Practitioner**
Job Title	**: Coded Welder**	**Level**	**: 3**

Job Description

A coded welder is an individual who has passed a Welder Qualification Test (WQT) in a welding process using an approved Welding Procedure Specification (WPS).

ROLES & RESPONSIBILITIES

- Performs the welding job based upon the internal QA check sheet and external customer specification requirements and Welding Procedure Specification (WPS);
- Welds according to all appropriate codes and procedures;
- Prepares and assesses welded surfaces as required, structures and components to identify errors;
- Checks finished work to make sure it falls within the tolerances;
- Performs all functions safely and follows all safety standards and procedures;
- Sets up, positions and operates hand and power tools such as shielded metal arc and gas metal arc welding equipment;
- Determines welder setting required on a project;
- Uses basic math skills to calculate and convert decimals and fractions as needed;
- Monitors quality of weld using appropriate tools and measuring devices;
- Performs grinding, gouging, shaping using the grinder, cutting torch, etc.;
- Takes full accountability to ensure the workplace meet the 5S housekeeping standard;
- Obeys safety rule and regulations;
- Assists in the setup of machine and material preparation based upon the process drawing and material picking list;
- Measures & cuts/prepares materials to specifications;
- Must be able to meet all manufacturing performance goals like quality, cycle time, cost, and work in process and inventory control;
- Maintains working conditions of welding machinery, equipment and accessories
- Supports the Total Preventive Maintenance (TPM) programme and works toward reducing welding machine downtime;
- Assures the welding machine run time and product output meet the target given by the supervisor; and
- Performs the daily welding report.

Pre-Requisite
1. A valid certificate in welding from an accredited institution: Sijil Kemahiran Malaysia (SKM) – Welding Level 3 or equivalent; or
2. Welder Qualification Test (WQT) for specific code; or
3. Passed in individual welding codes / certified for a specific code.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	3	• English & Malay language
2. Communication and interpersonal skills	3	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	3	• Time management • Project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	3	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	3	• Heat stress and strain
6. Familiar with ISO certification requirements	3	• Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011

Soft Skills	Competency Level	Recommended Training
7. Maintain safe working practices	3	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	3	• 5S • Lean manufacturing

Technical Skills	Competency Level	Recommended Training
1. Able to perform varying welding positions based on codes and standards	3	• 1G Coded Welder Qualification Training and Assessment (WQT)* • 2G Coded Welder Qualification Training and Assessment (WQT)* • 3G Coded Welder Qualification Training and Assessment (WQT)* • 4G Coded Welder Qualification Training and Assessment (WQT)* • 5G Coded Welder Qualification Training and Assessment (WQT)* • 6G Coded Welder Qualification Training and Assessment (WQT)* • Sheet Metal Welder Qualification Training and Assessment (WQT)* • Electric arc process • Brazing (if required)
2. Able to read and understand blueprint for welders	3	• Welding symbols • Joint design • NDT symbols

Technical Skills	Competency Level	Recommended Training
		• Measurement unit
3. Able to understand appropriate welding codes, standards, specifications and procedures	3	• Code welder certifications by the American Welding Society (AWS) • American Society of Mechanical Engineers (ASME) or equivalent
4. Able to acquire knowledge of welding technologies	3	• Welding metallurgy • Welding principle • Welding method • Welding application • Welding equipment and processes • Welding code, standard, specification and procedure • Welding safety
5. Able to perform: a) Shielded Metal Arc Welding (SMAW) b) Gas Tungsten Arc Welding (GTAW) c) Flux Cored Arc Welding (FCAW) d) Gas Metal Arc Welding (GMAW)	3	• SKM level 3 welding courses or equivalent • Shielded Metal Arc Welding (SMAW) • Gas Tungsten Arc Welding (GTAW) • Flux Cored Arc Welding (FCAW) • Gas Metal Arc Welding (GMAW)
6. Able to perform semi-automatic - Submerged Arc Welding (SAW)	3	• Mechanised welding and automatic welding • Maintenance and calibration

Technical Skills	Competency Level	Recommended Training
- Gas Metal Arc Welding (GMAW) Automatic welding: - Solid state welding - E.g.: projection welding - Ultrasonic welding - Friction stir welding - Spot welding		
7. Able to perform fusion and braze welding using oxy-fuel process	3	• Fusion welding, braze welding, brazing equipment and its operation
8. Able to perform cutting and gouging process	3	• Air carbon arc cutting process • Plasma arc cutting process

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Practitioner**
Job Title	**: Specialised Coded Welder**	**Level**	**: 3**

Job Description

A specialised coded welder is an individual who has passed a Welder Qualification Test (WQT) in a welding process on specific exotic material (e.g.: stainless steel, duplex, aluminium, titanium, etc.) using approved Welding Procedure Specification (WPS).

ROLES & RESPONSIBILITIES

- Performs the welding job based upon the internal QA check sheet and external customer specification requirements and Welding Procedure Specification (WPS);
- Welds according to all appropriate codes and procedures;
- Prepares and assesses welded surfaces as required, structures and components to identify errors;
- Checks finished work to make sure it falls within the tolerances;
- Performs all functions safely and follows all safety standards and procedures;
- Sets up, positions and operates hand and power tools such as shielded metal arc and gas metal arc welding equipment;
- Determines welder setting required on a project;
- Uses basic math skills to calculate and convert decimals and fractions as needed;
- Monitors quality of weld using appropriate tools and measuring devices;
- Performs grinding, gouging, shaping using grinder, cutting torch, etc.;
- Takes full accountability to ensure the workplace meet the 5S housekeeping standard;
- Obeys safety rules and regulations;
- Assists in the setup of machine and material preparation based upon the process drawing and material picking list;
- Measures & cuts/prepares materials to specifications;
- Must be able to meet all manufacturing performance goals like quality, cycle time, cost, and work in process and inventory control;
- Maintains working conditions of welding machinery, equipment and accessories;
- Supports the Total Preventive Maintenance (TPM) programme and works towards reducing welding machine downtime;

- Assures the welding machine run time and product output meet the target given by the supervisor; and
- Performs the daily welding report.

Pre-Requisite
1. A valid certificate in welding from an accredited institution: Sijil Kemahiran Malaysia (SKM) Level 3 in welding or equivalent; or
2. Welder Qualification Test (WQT) for specific exotic material; or
3. Welding training and certification from accredited training centres; or
4. Welding apprentice program; or
5. Pass in individual welding codes/ certified for a specific code.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	3	• English & Malay language courses
2. Communication and interpersonal skills	3	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	3	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	3	• Team building
5. Ability to work different shifts in a variety of	3	• Heat stress and strain

Soft Skills	Competency Level	Recommended Training
temperatures and environments		
6. Familiar with ISO certification requirements	3	• Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011
7. Maintain safe working practices	3	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	3	• 5S • Lean manufacturing

Technical Skills	Competency Level	Recommended Training
1. Valid welder coding certificate a) Able to perform all kinds of welding, brazing and cutting on any metal using tools commonly used in welding work b) Plans layouts, constructs, installs, repairs, and maintains all types of pipelines, fittings and fixtures as required in plant construction and maintenance using tools commonly used in pipe-fitting work	3	• 1G Coded Welder Qualification Training and Assessment (WQT)* • 2G Coded Welder Qualification Training and Assessment (WQT)* • 3G Coded Welder Qualification Training and Assessment (WQT)* • 4G Coded Welder Qualification Training and Assessment (WQT)* • 5G Coded Welder Qualification Training and Assessment (WQT)* • 6G Coded Welder Qualification Training and Assessment (WQT)* • Sheet Metal Welder Qualification Training and Assessment (WQT)*

Technical Skills	Competency Level	Recommended Training
		• Electric arc process • Brazing (if required)
2. Able to read and understand blueprint for welders	3	• Welding symbols • Joint design • NDT symbols • Measurement unit
3. Able to understand appropriate welding codes, standards, specifications and procedures	3	• Welding codes, standards, specifications and procedure • Exotic material specification
4. Able to select appropriate consumables for the specific exotic material	3	• Welding consumable
5. Able to acquire knowledge of welding technologies	3	• Welding metallurgy • Welding principle • Welding method • Welding application • Welding equipment and processes • Welding code, standard, specification and procedure • Welding safety
6. Able to perform : SMAW/GTAW/GMAW/PAW a. Shielded Metal Arc Welding(SMAW) b. Gas Tungsten Arc Welding (GTAW) c. Gas Metal Arc Welding (GMAW)	3	• SKM level 3 welding courses or equivalent • Shielded Metal Arc Welding(SMAW) • Gas Tungsten Arc Welding (GTAW) • Gas Metal Arc Welding (GMAW)

Technical Skills	Competency Level	Recommended Training
d. Plasma Arc Welding (PAW)		• Plasma Arc Welding (PAW)
7. Able to perform cutting and gouging process	3	• Air carbon arc cutting process • Plasma arc cutting process
8. Monitor semi-automatic and automatic welding	4	• Mechanised welding and automatic welding • Maintenance and calibration

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Practitioner**
Job Title	**: Automated Welding Technician**	**Level**	**: 4**

Job Description

An automated welding technician is an individual who is responsible for the setup, maintenance and operation of mechanised & robotic welding equipment. An automated welding technician is critical to the fabrication of metallic parts or assemblies through welding using a mechanised or robotic machine. An automated welding technician is also responsible for designing and programming the device, maintaining and troubleshooting welding machines and implementing automated welding for manufacturing and production.

ROLES & RESPONSIBILITIES

- Assists in the integration, start-up and debugging of plant floor welding equipment, including weld controls, MIG welding, resistance spot welding and projection welding (fasteners);
- Provides mechanised/automated machine preventative maintenance, troubleshooting, repairs, and mastering;
- Follows company policies on Health, Safety & Environment and PPE requirements
- Contributes to the continuous improvement initiatives on all aspects of the job;
- Provides technical support in developing and improving welding processes;
- Provides support in the analysis and resolution of weld equipment failures;
- Troubleshoots part fit-up problems;
- Assists in the development of the weld quality control process;
- Familiar with electrical and mechanical troubleshooting, AC motors and variable frequency drives;
- Familiar with low and high-pressure hydraulics, pneumatics, and lubrication systems;
- Maintains safety standards of equipment and work area and safely performs all duties following the company safety policies; and
- Performs additional duties as assigned.

Pre-Requisite
1. Bachelor of Technology in mechatronic/welding or equivalent; or
2. Diploma of Technology or Diploma Kemahiran Malaysia (DKM) in mechatronic/welding or equivalent with a minimum of 1 year of working experience; or
3. Sijil Kemahiran Malaysia (SKM) in mechatronic/welding level 3 or equivalent with a minimum of 2 years of working experience.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	3	• English & Malay language
2. Communication and interpersonal skills	3	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	3	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	3	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	3	• Heat stress and strain
6. Familiar with ISO certification requirements	3	• Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011

Soft Skills	Competency Level	Recommended Training
7. Maintain safe working practices	3	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	3	• 5S • Lean manufacturing

Technical Skills	Competency Level	Recommended Training
1. Able to read and understand welding blueprint	4	• Welding symbols • Joint design • NDT symbols • Measurement unit
2. Review material and consumable specification	4	• Material and consumable specification
3. Monitor semi-automatic and automatic welding	4	• Mechanised welding and automatic welding • Maintenance and calibration
4. Able to perform robotic welding operation	4	• IR4.0 robotic operation system • Robotic GMAW process • Robotic GTAW process • Robotic macro laser weld process • Robotic spot welding process
5. Knowledge of welding technologies	4	• Welding principle • Welding technology • Welding safety • Welding application • Welding process • Welding metallurgy

Technical Skills	Competency Level	Recommended Training
		• Welding code, standard, specification and procedure
6. Able to perform troubleshooting, maintaining and improvement of highly automated controls, robotic and welding system	4	• Robotic light service and maintenance • Robotic welding machine calibration

Focus Area : Welding	**Sub Focus Ara : Welding Practitioner**
Job Title : Welding Supervisor/ Foreman	**Level : 5**

Job Description

A welding supervisor/foreman is an individual who plans, manages, monitors and solves problems on all welding activities safely to deliver welding products that meet the specified quality within budget and schedule.

ROLES & RESPONSIBILITIES

- Monitors the quality of welding work to ensure that it meets industry standards;
- Develops and implements safety policies, procedures and practices for the workplace;
- Reports to management about the status of projects, including delays that may occur due to equipment problems or other issues;
- Trains new welders in proper welding techniques and safety procedures;
- Reviews blueprints and other plans to ensure welders can carry out welding job according to the blueprints;
- Provides technical assistance to other welders when needed;
- Ensures that proper safety precautions are taken while during welding;
- Train welders on new equipment and technologies;
- Maintains welding activity record, including total materials used, welders' qualification, etc.;
- Assists welding engineer in executing production daily plan schedule to meet shipment plan;
- Communicates job expectations and performance requirements to welders;
- Responsible for overall factory weld shop performance in terms of 5S, on-time delivery, quality, weld count and cost (cycle time and overtime);
- Initiates and implements manufacturing process capability and continuous quality improvement;
- Plans on resource and capacity to determine working shifts and overtime arrangement, when necessary, while also ensuring productivity output met as per target planned;
- Manages all day-to-day welding-related activities; and
- Carries any other tasks assigned by Welding Engineer.

Pre-Requisite
1. Bachelor of Technology in welding or equivalent; or
2. Diploma of Technology in welding / Diploma Kemahiran Malaysia (DKM) in welding or equivalent with a minimum of 2 years of working experience; or
3. Sijil Kemahiran Malaysia (SKM) in welding level 3 or equivalent with a minimum of 5 years of working experience.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	3	• English & Malay language
2. Communication and interpersonal	3	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	3	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	4	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	4	• Heat stress and strain
6. Proficient with Quality Management System (QMS)	4	• Quality Management System (QMS) ISO 3834 / ISO 17314

Soft Skills	Competency Level	Recommended Training
		• Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011 • International codes and standards • Preparation of project quality plan • Preparation of QC procedures • Final QA / QC documentation / QC dossiers
7. Maintain safe working practices	4	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	4	• 5S • Lean manufacturing

Technical Skills	Competency Level	Recommended Training
1. Able to control essential welding-related aspects to ensure technical, health, safety and environmental requirements of welded production. They include: • Welding personnel • Equipment • Production planning • Welding procedure specifications • Work instructions • Welding consumables • Materials	4	• Welding supervisory • Welding quality and inspection • Welding machine calibrations

Technical Skills	Competency Level	Recommended Training
• Inspection and testing before welding • Inspection and testing during welding • Inspection and testing after welding • Post-weld heat treatment		
2. Able to do quality records & understand procedures • Non-conformance and corrective actions • Calibration and validation of measuring, inspection and testing equipment • Identification and traceability	4	• QA&QC (auditing, monitoring and reporting) • IR 4.0 welding management (software) • Coordination of code or internal QM requirements and welder qualification
3. Blueprint reading for welders • ISO welding symbols, shop math and measurement, welds and weld joints, inspection, etc. • Basic plant piping layout drawing • Basic pressure vessel drawing (dimensioning and tolerance) • Structural steel drawing (detailing / joint configuration)	4	• Advance-welding symbols • Advance-joint design • NDT symbols • Measurement units

Technical Skills	Competency Level	Recommended Training
4. Able to verify material and consumable specification	4	• Understanding of Mill Test Certificate interpretation • Material and consumable specification • Consumable and specific application
5. Able to understand appropriate welding codes, standards, specifications and procedures	4	• Welding codes, standards, specifications and procedure
6. Welding technology	4	• Welding principle • Basic welding metallurgy / weld ability of steel • Advance welding technology and processes • Advance materials and consumables • Intelligent welding process management
7. Monitor semi-automatic and automatic welding	4	• Mechanised welding and automatic welding • Maintenance and calibration
8. Monitor fusion and braze welding using oxy-fuel process	4	• Fusion welding, braze welding and brazing equipment and its operation

Technical Skills	Competency Level	Recommended Training
9. Monitor cutting and gouging process	4	• Air carbon arc cutting process • Plasma arc cutting process
10. Analyse welding imperfection, rectification and prevention	4	• Welding defect and prevention
11. Able to practise safety, health and environment in welding	4	• Health, safety and environmental management

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Practitioner**
Job Title	**: Practising Welding Engineer**	**Level**	**: 6**

Job Description

A practising welding engineer is an individual who has been trained to apply welding engineering principles in a manner that will result in the creation of sound welded structures, components or products most effectively and efficiently.

ROLES & RESPONSIBILITIES

- Preparation and qualification of Welding Procedure Specification (WPS) in accordance with applicable codes, standards and specifications;
- Provides report identification (numbering) of the Procedure Qualification Reports (PQR) and ensures that the report is verified and approved by the client's engineer;
- Responsible for the customised storage and use of welding consumables (materials);
- Witnesses welder's performance/qualification, issues welding pass number and certificate as necessary for those who passed the test and monitors the performance of these welders;
- Compiles and maintains all welding reports and documents for the final documentation process;
- Develops and implements the welder evaluation procedure;
- Assists in the preparation of welding sequence and resolves other problems/activities related to welding;
- Evaluates materials (metallurgical, mechanical, physical) based on mill certificates and applicable standards and specification;
- Conducts inspections to ensure product quality;
- Develops new welding procedures that can increase fabrication productivity;
- Maintains a proper record of tools and equipment;
- Improves and upgrades current working practices and Standard Operating Procedure (SOP) in welding and related activities;
- Carries out the requirements of the safety operation procedures for the welding process and is responsible for their safety;
- Equipment inspection and maintenance, responsible for the stable performance of the equipment;

- Ensures projects are compliant with all local, regional, and national regulatory requirements, codes and controls;
- Applies 5S and LEAN manufacturing concepts;
- Researches new technology or development tools to remain informed of current technology;
- Thorough understanding of lean six sigma tools, projects and processes and ability to incorporate these into assigned engineering projects;
- Leads in a small or large project, as assigned;
- Reviews completed projects for accuracy, clarity and completeness; and
- Performs other duties and responsibilities as assigned.

Pre-Requisite
1. Bachelor's degree from an accredited discipline in welding engineering, which may include coursework in chemistry, calculus, trigonometry, physics, metallurgy and material, mechanical/ mechatronic/manufacturing system engineering; or
2. Diploma with 5-8 years of relevant working experience; or
3. Equivalents qualification / professional certification with 8 – 10 years of recognised working experience.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	4	• English & Malay language
2. Communication and interpersonal skills	4	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	4	• Time management • Understanding project management and Inspection Test Plan (ITP)

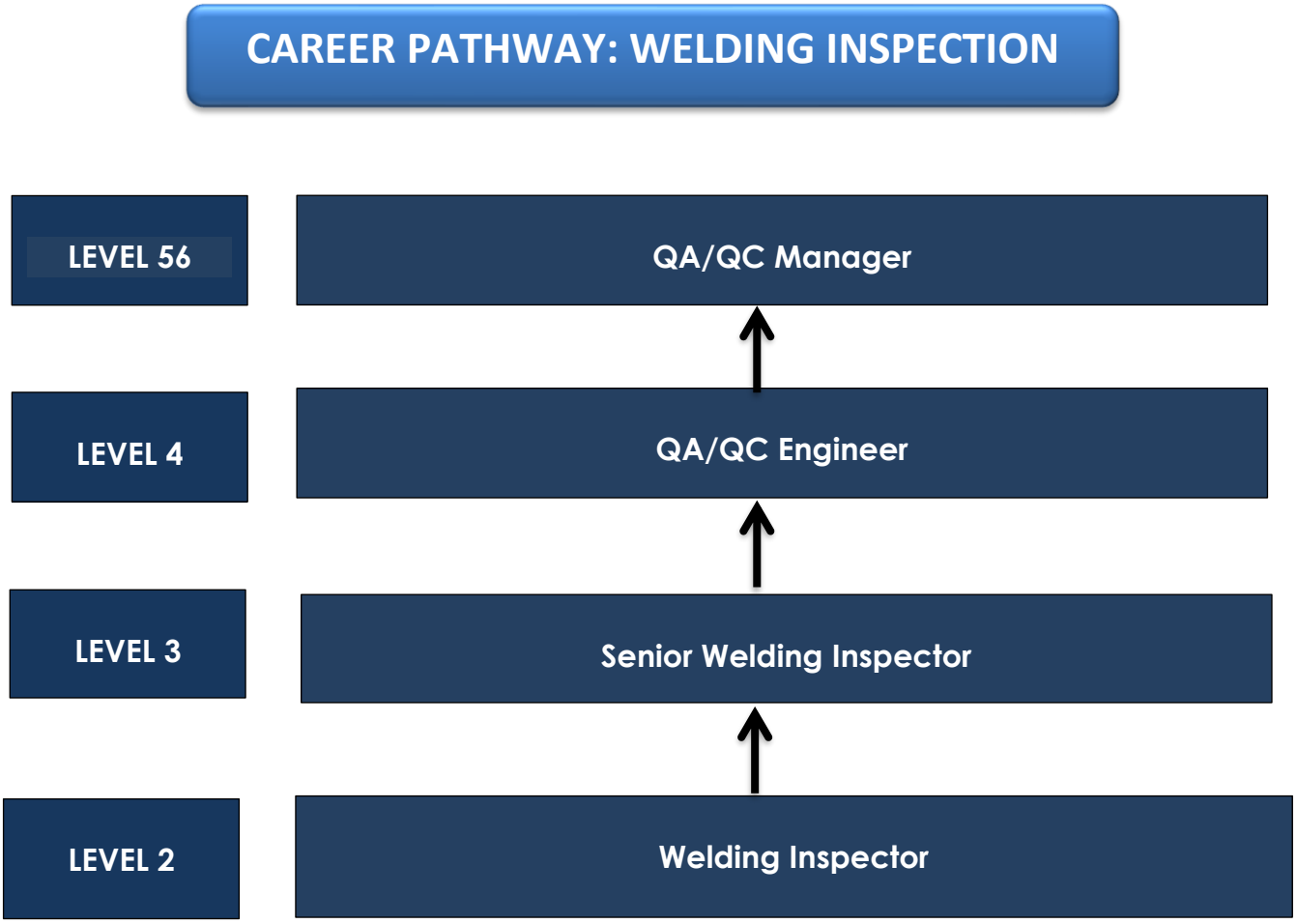
Soft Skills	Competency Level	Recommended Training
		• IR4.0 application tool (software)
4. Ability to work independently and in a team environment	4	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	4	• Heat stress and strain
6. Maintain safe working practices	4	• Health, safety and environmental management
7. Implement 5S and lean manufacturing	4	• 5S • Lean manufacturing
8. Proficiency in the use of personal computers, Microsoft Office products (Excel, Word and PowerPoint) and e-mail skills required	4	• Computer literacy
9. Develop project management skills	4	• Project management • IR4.0 / IOT applications
10. Others (E.g.: attention to detail, physical abilities, mathematics skills, administrative skills, robotics knowledge, problem-solving acumen, pressure management skills, teamwork abilities, leadership, technological knowledge)	4	• Problem-solving technique • Lead auditor (QMS)

Technical Skills	Competency Level	Recommended Training
1. Knowledge of engineering theories, design principles and practices, and design evaluation techniques	4	• Structural integrity • Welding joint design • Pressurised equipment • Structural • Sheet metal
2. Knowledge of welding blueprint reading and interpretation	4	• Sheet metal manufacturing drawing • Pressure vessel drawing • Structural drawing • Piping drawing (P&ID) • Pipes spool isometric drawing • Structural drawing • Geometrical & Dimensioning (GD&T) • Welding symbol and weld symbol
3. Verify automated robotic manufacturing and associated controls systems	3	• IR4.0 intelligent welding management system • IR4.0 welding monitoring • IR4.0 welding NDT / NDE
4. Verify fusion and braze welding using oxy-fuel process.	3	• Fusion welding, braze welding, brazing equipment and its operation
5. Verify welding design construction	4	• CADD application • CAD/CAM • Product design and manufacturing • Heavy engineering • Construction

Technical Skills	Competency Level	Recommended Training
		• Introduction to metal sheet fabrication process
6. Verify fabrication and application activities	4	• Behaviour of materials and their response to welding and joining methods • Quality assurance/quality control requirement in fabrication
7. Verify materials' properties and their behaviour	4	• Materials properties and their behaviour
8. Verify fabrication and welding project management	4	• Structural /construction • Pressurised equipment • Plant piping • Structural
9. Ensure welding quality control procedure Implemented	4	• DT/NDT appreciation • IR4.0 real-time monitoring • Code, standards, and specification references
10. Proficient with Quality Management System (QMS)	4	• QMS ISO 3834 / ISO 17314 • Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011 • International codes and standards • Preparation of project quality plan • Preparation of QC procedures

Technical Skills	Competency Level	Recommended Training
		• Final QA / QC documentation / QC dossiers
11. Analyse welding defect and failure	4	• Welding defect and prevention

WELDING INSPECTION


CAREER PATHWAY: WELDING INSPECTION
LEVEL 56
QA/QC Manager
LEVEL 4
QA/QC Engineer
LEVEL 3
Senior Welding Inspector
LEVEL 2
Welding Inspector

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Inspection**
Job Title	**: Welding Inspector**	**Level**	**: 2**

Job Description

A welding inspector is an individual who is competent and responsible for inspecting and assessing the quality of welding work and compliance with the specification. The welding inspector ensures welds are safe and ready to function as part of the device or structure produced. The welding inspectors also inspect the equipment and ensure welders adhere to all related safety regulations.

Roles and Responsibilities

- Understands factors which influence the quality of fusion welds in metals;
- Recognises characteristics of commonly used welding processes concerning quality control;
- Interprets drawing instructions and symbols to ensure that specifications are met.
- Sets up facilities and reports on visual inspection of welds, micro sections examination and other mechanical tests;
- Ensures welding works are carried out using qualified Welding Procedures Specification (WPS) and certified coded welders based on Welder Qualification Test (WQT);
- Assesses visual, Non-Destructive Testing (NDT) and mechanical testing reports on welds to meet acceptance levels;
- Confirms that incoming material meets stipulated specification requirements and recognises the effects on weld quality when departure from specification; and
- Takes the lead role in training Welding Inspector trainees.

Pre-Requisite

1. A valid certificate in welding inspection from an accredited institution: Sijil Kemahiran Malaysia (SKM) Welding Inspection; or equivalent.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	3	• English & Malay language

Soft Skills	Competency Level	Recommended Training
2. Communication and interpersonal skills	3	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	3	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	3	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	3	• Heat stress and strain
6. Proficient with Quality Management System (QMS)	3	• QMS ISO 3834 / ISO 17314 • Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011 • International codes and standards • Preparation of project quality plan • Preparation of QC procedures

Soft Skills	Competency Level	Recommended Training
		• Final QA / QC documentation / QC dossiers
7. Maintain safe working practices	3	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	3	• 5S • Lean manufacturing
9. Proficiency in the use of personal computers, Microsoft Office products (Excel, Word and PowerPoint) and e-mail skills required	3	• Computer literacy

Technical Skills	Competency Level	Recommended Training
1. Able to review Welding Procedure Specification (WPS) to comply with project specification and to witness Welding Procedure Qualification Test (WPQT) and to approve WPS	4	• Welding Procedure Specification (WPS) • Welding Procedure Qualification Test (WPQT)
2. Able to conduct Welder Qualification Test (WQT) to comply with project specifications and to approve coded welder	4	• Welder Qualification Test (WQT) • Visual, Non-Destructive Test and Destructive Test
3. Able to interpret welding drawings, symbols and materials specification	4	• Welding drawing and symbol

Technical Skills	Competency Level	Recommended Training
4. Able to identify appropriate welding machines, materials and consumables	4	• Welding process • Welding material and consumable
5. Able to identify site work condition	4	• Requirements of welding condition at the site
6. Able to conduct welding inspection before, during and after welding	4	• Welding inspection
7. Able to identify required Non-Destructive Testing (NDT)	4	• Introduction to NDT
8. Able to review reports (Visual, NDT & Mechanical) for acceptance/rejection of weld	4	• Health, safety & environment • Codes and standards for acceptance and rejection criteria
9. Able to provide repair and rework procedures, monitoring and acceptance	4	• Welding repair and rework
10. Able to compile Manufacturer Data Report (MDR)	4	• Manufacturer Data Report (MDR)

Focus Area : Welding	Sub Focus Area : Welding Inspection
Job Title : Senior Welding Inspector	Level : 3

Job Description

A senior welding inspector is an individual who is competent and responsible for the planning, management and supervision of welding inspection activities to comply with specification and safety requirements.

Roles and Responsibilities

- Understands the various facets of welding inspection and quality control;
- Assesses the validity of welding procedure;
- Recognises origins of weld defects;
- Interprets features of a fracture surface and prepares detailed reports;
- Scrutinises and corrects inspection reports;
- Plans, organises, and supervises the use of skilled inspectors and NDT personnel;
- Conduct pre-, during and post-welding audits; and
- Takes the lead role in training Welding Inspector.

Pre-Requisite

1. A valid certificate in welding inspection from an accredited institution: Sijil Kemahiran Malaysia (SKM) – Welding Inspection level 3; or equivalent.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	4	• English & Malay language
2. Communication and interpersonal skills	4	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking

Soft Skills	Competency Level	Recommended Training
3. Ability to complete multiple projects within time constraints	4	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	4	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	4	• Heat stress and strain
6. Proficient with Quality Management System (QMS)	4	• QMS ISO 3834 / ISO 17314 • Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011 • International codes and standards • Preparation of project quality plan • Preparation of QC procedures • Final QA / QC documentation / QC dossiers
7. Maintain safe working practices	4	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	4	• 5S • Lean manufacturing
9. Proficiency in the use of personal computers,	4	• Computer literacy

Soft Skills	Competency Level	Recommended Training
Microsoft Office products (Excel, Word and PowerPoint) and e-mail skills required		
10. Develop project management skills	3	• Project management

Technical Skills	Competency Level	Recommended Training
1. Able to review Welding Procedure Specification (WPS) to comply with project specification and to witness Welding Procedure Qualification Test (WPQT) and to approve WPS	4	• Welding Procedure Specification (WPS) • Welding Procedure Qualification Test (WPQT)
2. Able to conduct Welder Qualification Test (WQT) to comply with project specifications and to approve coded welder	4	• Welder Qualification Test (WQT) • Visual, Non-Destructive Test and Destructive Test
3. Able to interpret welding drawings, symbols and materials specification	4	• Welding drawing and symbol
4. Able to identify appropriate welding machines, materials and consumables	4	• Welding process • Welding material and consumable
5. Able to identify site work condition	4	• Requirements of welding condition at the site
6. Able to conduct welding inspection before, during and after welding	4	• Welding inspection

Technical Skills	Competency Level	Recommended Training
7. Able to identify required Non-Destructive Testing (NDT)	4	• Introduction to NDT
8. Able to review reports (Visual, NDT & Mechanical) for acceptance/rejection of weld	4	• Welding defects • Codes and standards for acceptance and rejection criteria
9. Able to provide repair and rework procedures, monitoring and acceptance	4	• Welding repair and rework
10. Able to compile Manufacturer Data Report (MDR)	4	• Manufacturer Data Report (MDR)

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Inspection**
Job Title	**: QA/QC Engineer**	**Level**	**: 4**

Job Description

A QA/QC Engineer is an individual who undertakes quality management and quality control of welding activities, including inspection in the project handled at fabrication shops and site installations. QA/QC engineer will directly report to QA/QC Manager with regard to quality matters during the execution of the projects.

Roles and Responsibilities

- Supervises the quality of welding work and carries out surveillance and inspection of welding activities;
- Ensures welding procedures are reviewed and approved by the authorised body as required, covering all materials which are to be welded on the project;
- Ensures the welding clearance resources and procedures meets the project schedule needs;
- Ensures that the welding works are carried out per the overall programme;
- Reports the status of inspections and repair rates to the Quality Manager regularly and ensures that adverse or unusual trends are investigated and corrected;
- Ensures that all welding operations have quality control records properly maintained and that welding drawings are completed and reviewed;
- Ensures that the percentage sampling and control method of radiography and inspection is used for the control of individual welders and line classes as required;
- Ensures that NDT is performed safely and effectively following the relevant codes and standards;
- Ensures all welders are properly qualified in accordance with governing codes;
- Reviews and approves all NDT and Post Weld Heat Treatment (PWHT) procedures;
- Reviews, approves, and accepts all welding packs and coordinates with senior welding inspector as required;
- Reviews the qualifications of all NDT technicians, making sure that they are adequately qualified for the examinations assigned;
- Reviews radiographs submitted to an agreed sampling plan; and
- Audits welding quality systems.

Pre-Requisite
1. Bachelor's degree from an accredited discipline in welding engineering which may include coursework in chemistry, calculus, trigonometry, physics, metallurgy and material, Mechanical/ Mechatronic/Manufacturing System Engineering with a minimum of 1 year of working experience; or
2. Diploma with a minimum of 3 years of relevant working experience; or
3. Equivalents Qualification / Professional Certification with a minimum of 5 years of relevant experience.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	4	• English & Malay language
2. Communication and interpersonal skills	4	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	4	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	4	• Team building
5. Ability to work different shifts in a variety of temperatures and environments	4	• Heat stress and strain

Soft Skills	Competency Level	Recommended Training
6. Proficient with Quality Management System (QMS)	4	• QMS (ISO 3834 / ISO 17314) • Introduction to ISO 9001, ISO 9004, ISO 14000. ISO 19011 • International codes and standards • Preparation of project quality plan • Preparation of QC procedures • Final QA / QC documentation / QC dossiers
7. Maintain safe working practices	4	• Health, safety and environmental management
8. Implement 5S and lean manufacturing	4	• 5S • Lean manufacturing
9. Proficiency in the use of personal computers, Microsoft Office products (Excel, Word and PowerPoint) and e-mail skills required	4	• Computer literacy
10. Develop project management skills	3	• Project management

Technical Skills	Competency Level	Recommended Training
1. Able to review Welding Procedure Specification (WPS) to comply with project specification and	4	• Welding Procedure Specification (WPS)

Technical Skills	Competency Level	Recommended Training
to witness Welding Procedure Qualification Test (WPQT) and to approve WPS		• Welding Procedure Qualification Test (WPQT)
2. Able to conduct Welder Qualification Test (WQT) to comply with project specifications and to approve coded welder	4	• Welder Qualification Test (WQT) • Visual, Non-Destructive Test and Destructive Test
3. Able to interpret welding drawings, symbols and materials specification	4	• Welding drawing and symbol
4. Able to identify appropriate welding machines, materials and consumables	4	• Welding process • Welding material and consumable
5. Able to identify site work condition	4	• Requirements of welding condition at the site
6. Able to conduct welding inspection before, during and after welding	4	• Welding inspection
7. Able to identify required Non-Destructive Testing (NDT)	4	• Introduction to NDT
8. Able to review reports (Visual, NDT & Mechanical) for acceptance/rejection of weld	4	• Welding defects • Codes and standards for acceptance and rejection criteria
9. Able to provide repair and rework procedures,	4	• Welding repair and rework

Technical Skills	Competency Level	Recommended Training
monitoring and acceptance		
10. Able to compile Manufacturer Data Report (MDR)	4	• Manufacturer Data Report (MDR)

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Inspection**
Job Title	**: QA/QC Manager**	**Level**	**: 5**

Job Description

QA/QC Manager is an individual who undertakes quality management and quality control procedures of welding activities and staff supervision to ensure that the product meets quality and efficiency standards. QA/QC Manager shall work with clients to ensure the final products meet their needs and requirements.

Roles and Responsibilities

- Manages all aspects of quality on the assigned project, including supervising assigned quality personnel, overseeing the implementation of the project quality plan, acting as primary liaison to the client on all quality-related issues and responsible for ensuring sufficient training is conducted for project personnel on the quality management system and project specific procedures;
- Coordinates contract quality activities with the project manager, including determining resources, establishing primary objectives and development of the audit & surveillance plan;
- Prepares and maintains project quality metrics to measure the performance of established criteria and communicates information to the construction manager;
- Performance improvements initiatives are then developed in conjunction with the project manager for implementation on the project;
- Works directly with corporate quality manager to develop and implement new quality initiatives on assigned contracts and also provides feedback on quality issues to ensure continuous improvement initiatives are disseminated to other contracts when applicable;
- Develops and implements QA/QC procedures, contract quality plan and model discipline Inspection Test Plan (ITP);
- Ensures that project procedures are updated and duly implemented;
- Ensures that the contractors' quality control records reflect the items in the inspection and test plan with strict adherence to identified 'hold points';
- Reviews, coordinates and accepts all contractors' deliverables as detailed in the supplier document index, such as quality plans, inspection and test plans, method statements, procedures, specifications, materials supplies and certification, trade tests, third-party inspection, etc., before work commencing;

- Monitors and ensures that a comprehensive record of documentation and certification of work is maintained to support a satisfactory handover of project completion to the client; and
- Ownership of the audit schedule and implementation at work site operations relating to work practices and procedures.

Pre-Requisite
1. Bachelor's degree in engineering/technology/science with a minimum of 5 years of working experience in a relevant welding field; or
2. Diploma in engineering/technology/science with a minimum of 7 years of working experience in a relevant welding field; or
3. Equivalents Qualification / Professional Certification with a minimum of 10 years of working experience in a relevant welding field.

Soft Skills	Competency Level	Recommended Training
1. Effective communication (verbal & written) in English and Malay	4	• English & Malay language courses
2. Communication and interpersonal skills	4	• Communication • Interpersonal • Leadership • Organisation • Problem-solving • Critical thinking
3. Ability to complete multiple projects within time constraints	4	• Time management • Understanding project management and Inspection Test Plan (ITP) • IR4.0 application tool (software)
4. Ability to work independently and in a team environment	4	• Team building

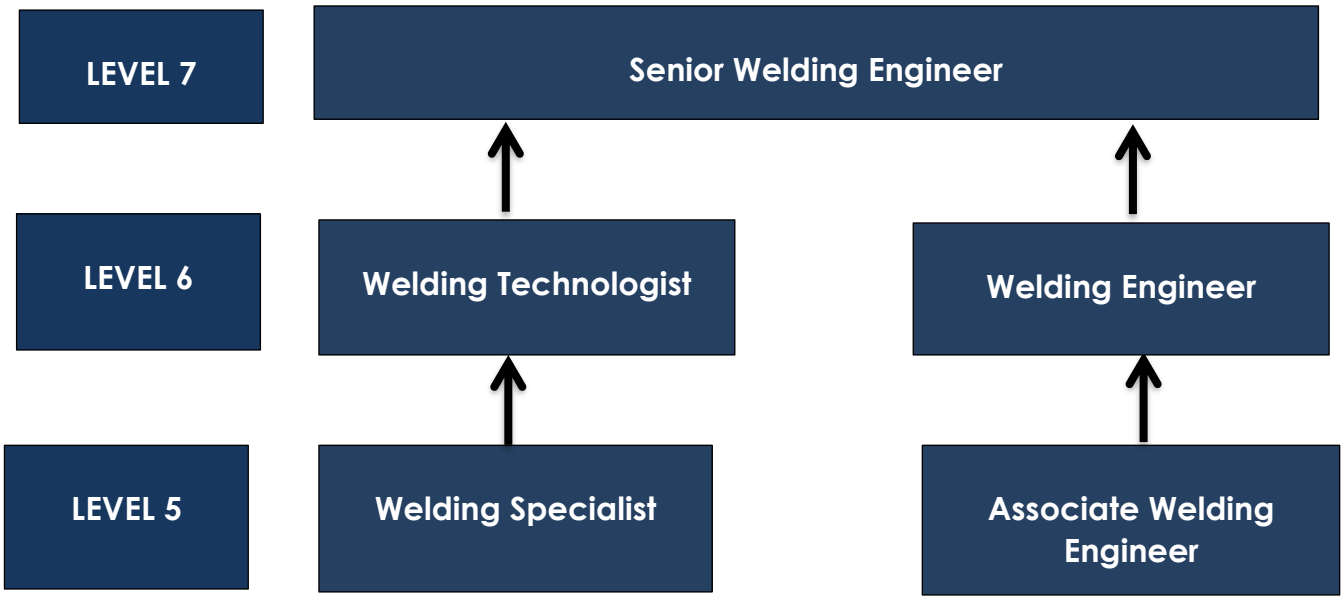
Soft Skills	Competency Level	Recommended Training
5. Proficient with Quality Management System (QMS)	4	• QMS ISO 3834 / ISO 17314 • Introduction to ISO 9001, ISO 9004, ISO 14000, ISO 19011 • International codes and standards • Preparation of project quality plan • Preparation of QC procedures • Final QA / QC documentation / QC dossiers
6. Maintain safe working practices	4	• Health, safety and environmental management
7. Implement 5S and lean manufacturing	4	• 5S • Lean manufacturing
8. Proficiency in the use of personal computers, Microsoft Office products (Excel, Word and PowerPoint) and e-mail skills required	4	• Computer literacy
9. Develop project management skills	4	• Project management

Technical Skills	Competency Level	Recommended Training
1. Able to evaluate/validate Welding Procedure Specification (WPS) to comply with project specification	4	• Welding Procedure Specification (WPS)
2. Able to organise/manage Welder Qualification Test (WQT) to comply with project specification and to approve coded welder	4	• Welder Qualification Test (WQT) • Visual, Non-Destructive Test and Destructive Test
3. Able to decide/assign required welding drawings, symbols and materials specification	4	• Welding drawing and symbol
4. Able to decide/assign appropriate welding machine, materials and consumables	4	• Welding process • Welding material and consumable
5. Able to evaluate site work condition	4	• Requirements of welding condition at the site
6. Able to organise/manage welding inspection before, during and after welding	4	• Welding inspection
7. Able to decide on required Non-Destructive Testing (NDT)	4	• Introduction to NDT
8. Able to validate report (Visual, NDT & Mechanical) for acceptance/rejection of weld	4	• Welding defects • Codes and standards for acceptance and rejection criteria

Technical Skills	Competency Level	Recommended Training
9. Able to validate/approve repair and rework procedures, monitoring and acceptance	4	• Welding repair and rework
10. Able to validate/approve Manufacturer Data Report (MDR)	4	• Manufacturer Data Report (MDR)

WELDING COORDINATION

CAREER PATHWAY: WELDING COORDINATION



Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Coordination**
Job Title	**: Welding Specialist**	**Level**	**: 5**

Job Description

A Welding Specialist is an individual who employs his basic knowledge of physics, engineering, metallurgy, materials, welding, and standards to design. A Welding Specialist assists a Welding Technologist/Engineer in examining and evaluating welds as well as planning, supervising, and documenting welding operations per relevant codes, contracts or drawings.

Roles and Responsibilities

- Ensures the quality of welding work meets industry standards;
- Adheres to safety policies, procedures, and practices for the workplace;
- Report to the welding engineer/technologist about the status of works, including delays that may occur due to equipment problems or other issues;
- Provides technical assistance to other welders when needed;
- Trains welders on new equipment and technologies;
- Assists welding engineer/technologist in executing production daily plan schedule to meet shipment plan;
- Communicates job expectations and performance requirements to welders; and
- Carries any other tasks assigned by the Welding Engineer/Technologist.

Pre-Requisite

1. Master's degree in Materials / Welding Engineering/Technology (at least 1 year of working experience in welding and fabrication works); or
2. Bachelor's degree in Materials / Welding Engineering/Technology (at least 2 years of working experience in welding and fabrication works); or
3. Diploma or Certificate in Welding Engineering/Technology (at least 4 years of working experience in welding and fabrication).

Soft Skills	Competency Level	Recommended Training
1. Work as a technical member of a team	3	• Team building • Effective coaching
2. Communicate with other team members/welders	3	• Effective communication and presentation • Conflict management

Soft Skills	Competency Level	Recommended Training
		• Effective delegation
3. Guide a technical team/welder	3	• Leadership training for head technical • Workforce development • Analytical behavioural • Decision making • Performance management
4. Prepare welding essential items cost analysis	3	• Design thinking • Business analytics
5. Conduct presentation to welding engineer and welder	3	• Effective communication and presentation
6. Implement workplace safety and health	3	• Health, safety and environmental management
7. Conduct QA and QC implementation processes	3	• Quality control and assurance management
8. Monitor project progress	3	• Intermediate-level project management
9. Use computer for report writing	3	• Word Processing, spreadsheet, slide presentation and database software • Project monitoring tool

Technical Skills	Competency Level	Recommended Training
1. Implement optimal welding processes based on project requirements, working closely with the entire welding team to ensure	3	• Essential welding processes and equipment • Fundamental materials and their behaviour during welding

Technical Skills	Competency Level	Recommended Training
a smooth operation		• Introduction design and construction • Basic fabrication & application engineering • Welding specialist training and assessment* • Associate welding engineer training and assessment* • DT and NDT for technician
2. Understand engineering assessments and lab-based tests if necessary to determine the most optimal equipment and protocols for the project and the team		
3. Ensure the operation of welding equipment and optimise for better performance		
4. Prepare technical reports and record any relevant data obtained from welding tests		
5. Assist the implementation of the entire welding process and work with welders and other team members		
6. Conduct ongoing evaluations during the welding process to offer more efficient solutions		
7. Ensure that all the welding is conducted following the necessary codes and standards		

Technical Skills	Competency Level	Recommended Training
8. Ensure welds that there are no flaws and defects, or work with the welding team to perform the necessary repairs		
9. Assist in controlling technical welding projects and provides the needed guidance and direction to the team		
10. Assist in designing and choosing the best testing systems for each project		
11. Detect any issues and their root causes		
12. Sound understanding of all the key types of common welding processes such as GMAW, GTAW, SMAW, and FCAW		

**Certification Programme*

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Coordination**
Job Title	**: Associate Welding Engineer**	**Level**	**: 5**

Job Description

An Associate Welding Engineer is an individual who employs his basic knowledge of physics, engineering, metallurgy, materials, welding, and standards to design. Associate Welding Engineer assists a Welding Engineer in examining and evaluating welds as well as planning, supervising, and documenting welding operations per relevant codes, contracts or drawings.

Roles and Responsibilities

- Ensures the quality of welding work meets industry standards;
- Adheres to safety policies, procedures, and practices for the workplace;
- Reports to the welding engineer/technologist about the status of works, including delays that may occur due to equipment problems or other issues;
- Provides technical assistance to other welders when needed;
- Trains welders on new equipment and technologies;
- Assist welding engineer/technologist in executing production daily plan schedule to meet shipment plan;
- Communicates job expectations and performance requirements to welders; and
- Carries any other tasks assigned by the Welding Engineer.

Pre-Requisite

1. Master's degree in Materials / Welding Engineering/Technology (at least 1 year of working experience in welding and fabrication works); or
2. Bachelor's degree in Science or Engineering (at least 1 year of working experience in welding and fabrication works); or
3. Bachelor's other than Science or Engineering (at least 2 years of working experience in welding and fabrication works); or
4. Diploma in Welding Engineering (at least 1 year of working experience in welding and fabrication works); or
5. Diploma in Science or Engineering (at least 2 years of working experience in welding and fabrication works); or
6. Diploma other than Science or Engineering (at least 4 years of working experience in welding and fabrication works); or

Pre-Requisite
7. Certificate in Technology (at least 1 year of working experience in welding and fabrication works); or
8. Certificate in Science or Engineering (at least 2 years of working experience in welding and fabrication works); or
9. Graduate from Technical High School (at least 2 years of working experience in welding and fabrication works); or
10. Graduate from High School other than Technical (at least 4 years of working experience in welding and fabrication works); or
11. None of the above (at least 7 years of working experience in welding and fabrication works).

Soft Skills	Competency Level	Recommended Training
1. Work as a technical member of a team	3	• Team building • Effective coaching
2. Communicate with other team members/welders	3	• Effective communication and presentation • Conflict management • Effective delegation
3. Guide a technical team/welder	3	• Leadership training for head technical • Workforce development • Analytical behavioural • Decision making • Performance management
4. Prepare welding essential items cost analysis	3	• Design thinking • Business analytics
5. Conduct presentation to welding engineer and welder	3	• Effective communication and presentation

Soft Skills	Competency Level	Recommended Training
6. Implement workplace safety and health	3	• Health, safety and environmental management
7. Conduct QA and QC implementation processes	3	• Quality control and assurance management
8. Monitor project progress	3	• Intermediate-level project management
9. Use computer for report writing	3	• Word processing, spreadsheet, slide presentation and database software • Project monitoring tool

Technical Skills	Competency Level	Recommended Training
1. Implement optimal welding processes based on project requirements, working closely with the entire welding team to ensure a smooth operation	3	• Essential welding processes and equipment • Fundamental materials and their behaviour during welding • Introduction design and construction • Basic fabrication & application engineering • Welding specialist training and assessment* • Associate welding engineer training and assessment* • DT and NDT for technician
2. Understand engineering assessments and lab-based tests if necessary to determine the most optimal equipment and protocols for the project and the team		
3. Ensure the operation of welding equipment and optimise for better performance		
4. Prepare technical		

Technical Skills	Competency Level	Recommended Training
reports and record any relevant data obtained from welding tests		
5. Assist the implementation of the entire welding process and work with welders and other team members		
6. Conduct ongoing evaluations during the welding process to offer more efficient solutions		
7. Ensure that all the welding is conducted following the necessary codes and standards		
8. Ensure welds that there are no flaws and defects, or work with the welding team to perform the necessary repairs		
9. Assist in controlling technical welding projects and provides the needed guidance and direction to the team		
10. Assist in designing and choosing the best testing systems for each project		
11. Detect any issues and their root causes		

Technical Skills	Competency Level	Recommended Training
12. Sound understanding of all the key types of common welding processes such as GMAW, GTAW, SMAW, and FCAW		

**Certification Programme*

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Coordination**
Job Title	**: Welding Technologist**	**Level**	**: 6**

Job Description

Welding Technologist is an individual who employs his extensive knowledge of physics, engineering, metallurgy, materials, welding, and standards to design, examine, and evaluate welds, as well as to plan, supervise, and document welding operations per relevant codes, contracts or drawings. The role of the Welding Technologist is essential to the integrity of the vast number of buildings, vehicles, machinery and products that require welds.

Roles and Responsibilities

- Prepares and qualifies welding procedure specification (WPS) in accordance with applicable codes, standards and specifications;
- Provides report identification (numbering) of the Procedure Qualification Reports (PQR) and ensures that the report is verified and approved;
- Responsible for the customised storage and the use of welding consumables (materials);
- Witnesses welder's performance/qualification, issues welding pass number and certificate as necessary for those who passed the test and monitors the performance of these welders;
- Compiles and maintains all welding reports and documents for the final documentation process. Develops and implements the Welder Evaluation Procedure;
- Prepares welding sequence and resolves other problems/activities related to welding;
- Evaluates materials (metallurgical, mechanical, physical) based on mill certificates and applicable standards and specification;
- Conducts inspections to ensure product quality;
- Develops new welding procedures that can increase fabrication productivity;
- Maintains a proper record of tools and equipment;
- Improves and upgrades current working practices and Standard Operating Procedure (SOP) in welding and related activities;
- Carries out the requirements of the safety operation procedures for the welding process and be responsible for their safety;
- Carries out equipment inspection and maintenance, responsible for the stable performance of the equipment;
- Ensures projects are compliant with all local, regional, and national regulatory requirements, codes and controls;

- Applies 5S and LEAN manufacturing concepts;
- Researches new technology or development tools to remain informed of current technology;
- Thorough understanding of LEAN Six Sigma tools, projects and processes and ability to incorporate these into assigned engineering projects;
- Takes the lead role in a small or large project, as assigned;
- Reviews completed projects for accuracy, clarity, and completeness; and
- Performs other duties and responsibilities as assigned.

Pre-Requisite
1. Master's degree in Materials / Welding Engineering/Technology (at least 2 years of working experience in welding and fabrication works); or
2. Bachelor's degree in Materials / Welding Engineering/Technology (at least 4 years of working experience in welding and fabrication works); or
3. Diploma or Certificate in Welding Engineering/Technology (at least 6 years of working experience in welding and fabrication works).

Soft Skills	Competency Level	Recommended Training
1. Work as a technical member of a team	3	• Team building • Effective coaching
2. Communicate with other team members/welders	3	• Effective communication and presentation • Conflict management • Effective delegation
3. Guide a technical team/welder	4	• Leadership training for head technical • Workforce development • Analytical behavioural • Decision making • Performance management
4. Prepare welding essential items cost analysis	3	• Design thinking • Business analytics

Soft Skills	Competency Level	Recommended Training
5. Conduct presentation to welding engineer and welder	4	• Effective communication and presentation
6. Implement workplace safety and health	3	• Health, safety and environmental management
7. Conduct QA and QC implementation processes	4	• Quality control and assurance management
8. Monitor project progress	3	• Intermediate-level project management
9. Use computer for report writing	3	• Word processing, spreadsheet, slide presentation and database software • Project monitoring tool

Technical Skills	Competency Level	Recommended Training
1. Plan optimal welding processes based on project requirements, working closely with the entire welding team to ensure a smooth operation	4	• Essential welding processes and equipment • Fundamental materials and their behaviour during welding • Basic design and construction • Intermediate fabrication & application engineering • Welding technologist training and assessment* • Welding engineer training and assessment*
2. Plan engineering assessments and lab-based tests if necessary to determine the most optimal equipment and protocols for the project and the team		
3. Manage the operation of welding equipment and optimise for better performance		

Technical Skills	Competency Level	Recommended Training
4. Verify detailed reports and analyse any relevant data obtained from welding tests		• DT and NDT for technologist
5. Organise the entire welding process and work with welders and other team members		
6. Organise ongoing evaluations during the welding process to offer more efficient solutions		
7. Verify that all the welding is conducted following the necessary codes and standards		
8. Verify welds, ensuring that there are no flaws and defects, or work with the welding team to perform the necessary repairs		
9. Manage entire welding projects and provide the needed guidance and direction to the team		
10. Decide the best testing systems for each project		
11. Specify the essential key types of common welding processes such as GMAW, GTAW, SMAW, and FCAW		

**Certification Programme*

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Coordination**
Job Title	**: Welding Engineer**	**Level**	**: 6**

Job Description

Welding Engineer is an individual who employs his extensive knowledge of physics, engineering, metallurgy, materials, welding, and standards to design, examine, and evaluate welds, as well as to plan, supervise, and document welding operations per relevant codes, contracts or drawings. The role of the Welding Engineer is essential to the integrity of the vast number of buildings, vehicles, machinery and products that require welds.

Roles and Responsibilities

- Prepares and qualifies welding procedure specification (WPS) per applicable codes, standards and specifications;
- Provides report identification (numbering) of the Procedure Qualification Reports (PQR) and ensures that the report is verified and approved;
- Responsible for the customised storage and use of welding consumables (materials);
- Witnesses welder's performance/qualification, issues welding pass number and certificate as necessary for those who passed the test and monitors the performance of these welders;
- Compiles and maintains all welding reports and documents for the final documentation process;
- Develops and implements the Welder Evaluation Procedure;
- Prepares welding sequence and resolves other problems/activities related to welding;
- Evaluates materials (metallurgical, mechanical, physical) based on mill certificates and applicable standards and specifications;
- Conducts inspections to ensure product quality;
- Develops new welding procedures that can increase fabrication productivity ;
- Maintains a proper record of tools and equipment;
- Improves and upgrades current working practices and Standard Operating Procedure (SOP) in welding and related activities;
- Carries out the requirements of the safety operation procedures for the welding process and be responsible for their safety;
- Carries out equipment inspection and maintenance, responsible for the stable performance of the equipment;

- Ensures projects are compliant with all local, regional, and national regulatory requirements, codes and controls;
- Applies 5S and LEAN manufacturing concepts;
- Researches new technology or development tools to remain informed of current technology;
- Thorough understanding of LEAN Six Sigma tools, projects and processes and ability to incorporate these into assigned engineering projects;
- Takes the lead role in a small or large project, as assigned;
- Reviews completed projects for accuracy, clarity, and completeness; and
- Performs other duties and responsibilities as assigned.

Pre-Requisite
1. Master's degree in Materials / Welding Engineering/Technology (at least 2 years of working experience in welding and fabrication works); or
2. Bachelor's degree in Science or Engineering (at least 2 years of working experience in welding and fabrication works); or
3. Bachelor's other than Science or Engineering (at least 4 years of working experience in welding and fabrication works); or
4. Associate Welding Engineer Certificate holder (at least 3 years of working experience in welding and fabrication works); or
5. Diploma in Welding Engineering (at least 3 years of working experience in welding and fabrication works); or
6. Diploma in Science or Engineering (at least 4 years of working experience in welding and fabrication works); or
7. Diploma other than Science or Engineering (at least 7 years of working experience in welding and fabrication works); or
8. Certificate in Technology (at least 4 years of working experience in welding and fabrication works): or
9. Certificate in Science or Engineering (at least 6 years of working experience in welding and fabrication works); or
10. Graduate from Technical High School (at least 7 years of working experience in welding and fabrication works); or
11. Graduate from High School other than Technical (at least 8 years of working experience in welding and fabrication works).

Soft Skills	Competency Level	Recommended Training
1. Work as a technical member of a team	4	• Team building • Effective coaching
2. Communicate with other team members/welders	3	• Effective communication and presentation • Conflict management • Effective delegation
3. Guide a technical team/welder	4	• Leadership training for head technical • Workforce development • Analytical behavioural • Decision making • Performance management
4. Prepare welding essential items cost analysis	4	• Design thinking • Business analytics
5. Conduct presentations to other welding engineers and welders	4	• Effective communication and presentation
6. Implement workplace safety and health	3	• Health, safety and environmental management
7. Conduct QA and QC implementation processes	4	• Quality control and assurance management
8. Monitor project progress	4	• Advanced-level project management
9. Use computer for report writing	3	• Word processing, spreadsheet, slide presentation and database software • Project monitoring tool

Technical Skills	Competency Level	Recommended Training
1. Plan optimal welding processes based on project requirements, working closely with the entire welding team to ensure a smooth operation 2. Plan engineering assessments and lab-based tests if necessary to determine the most optimal equipment and protocols for the project and the team 3. Manage the operation of welding equipment and optimise for better performance 4. Verify detailed reports and analyse any relevant data obtained from welding tests 5. Organise the entire welding process and work with welders and other team members 6. Organise ongoing evaluations during the welding process to offer more efficient solutions 7. Verify that all the welding is conducted following the necessary codes and standards	4	• Essential welding processes and equipment • Fundamental materials and their behaviour during welding • Basic design and construction • Intermediate fabrication & application engineering • Welding technologist training and assessment* • Welding engineer training and assessment* • DT and NDT for technologist

Technical Skills	Competency Level	Recommended Training
8. Verify welds, ensuring that there are no flaws and defects, or work with the welding team to perform the necessary repairs		
9. Manage entire welding projects and provide the needed guidance and direction to the team		
10. Specify the best testing systems for each project		
11. Decide the essential key types of common welding processes such as GMAW, GTAW, SMAW, and FCAW		

**Certification Programme*

Focus Area	**: Welding**	**Sub Focus Area**	**: Welding Coordination**
Job Title	**: Senior Welding Engineer**	**Level**	**: 7**

Job Description

Senior Welding Engineer is an individual who employs his comprehensive knowledge of physics, engineering, metallurgy, materials, welding, and standards to design, examine and evaluate welds, as well as to plan, supervise and document welding operations following relevant codes, contracts or drawings. The role of the Senior Welding Engineer is critical to the integrity of the vast number of buildings, vehicles, machinery and products that require welding. Senior Welding Engineer takes Quality Assurance responsibility for products related to fabrication, welding affiliate process from start to finish. They frequently assume leadership duties, coordinating with clients and other teams and conducting training and quality control procedures for their work group.

Roles and Responsibilities

- Reviews, validates and endorses welding procedure specification (WPS) in accordance with applicable codes, standards and specifications;
- Reviews Procedure Qualification Reports (PQR) and ensures that the report is verified and approved;
- Verifies all welding reports and documents for the final documentation process;
- Approves welding sequence and resolves other problems/activities related to welding;
- Verifies materials (metallurgical, mechanical, and physical) based on mill certificates and applicable standards and specifications;
- Validates inspections to ensure product quality;
- Develops new welding procedures that can increase fabrication productivity;
- Improves and upgrades current working practices and Standard Operating Procedure (SOP) in welding and related activities;
- Ensures the requirements of the safety operation procedures for the welding process and be responsible for their safety;
- Ensures the stable performance of all equipment;
- Ensures projects are compliant with all local, regional, and national regulatory requirements, codes and controls;
- Applies 5S and LEAN manufacturing concepts; and
- Researches new technology or development tools to remain informed of current technology;

- Lead initiative of LEAN Six Sigma tools, projects and processes and ability to incorporate these into assigned engineering projects;
- Takes the lead role in a small or large project, as assigned;
- Reviews completed projects for accuracy, clarity and completeness; and
- Performs other duties and responsibilities as assigned.

Pre-Requisite
1. Welding Engineer certificate holder (at least 3 years of working experience in welding and fabrication works); or
2. Master's degree in Materials / Welding Engineering/Technology (at least 3 years of working experience in welding and fabrication works); or
3. Bachelor's degree in Science or Engineering (at least 3 years of working experience in welding and fabrication works); or
4. Bachelor's other than Science or Engineering (at least 6 years of working experience in welding and fabrication works); or
5. Diploma in Welding Engineering (at least 5 years of working experience in welding and fabrication works); or
6. Diploma in Science or Engineering (at least 6 years of working experience in welding and fabrication works); or
7. Diploma other than Science or Engineering (at least 10 years of working experience in welding and fabrication works); or
8. Certificate in Technology (at least 6 years of working experience in welding and fabrication works).

Soft Skills	Competency Level	Recommended Training
1. Work as a senior member of a team	4	• Team-building supervision • Effective coaching
2. Communicate with other team members/supervisors	4	• Effective communication and presentation • Conflict management • Effective delegation

Soft Skills	Competency Level	Recommended Training
3. Manage a technical team	4	• Leadership training for head technical • Workforce development • Analytical behavioural • Decision making • Performance management
4. Evaluate cost analysis	4	• Design thinking • Business analytics
5. Conduct presentation to senior management	4	• Effective communication and presentation
6. Evaluate workplace safety and health	4	• Health, safety and environmental management
7. Comprehend QA and QC implementation processes	4	• Total quality management
8. Supervise project progress	4	• High-level project management
9. Able to conduct a presentation	4	• Advanced word processing, spreadsheet, slide presentation and database software • Computerised project management tool

Technical Skills	Competency Level	Recommended Training
1. Review, design and supervise optimal welding processes based on project requirements, working closely with the entire welding team to ensure a smooth operation	4	• Advanced welding processes and equipment • Advanced materials and their behaviour during welding • Advanced design and construction • Advanced fabrication & application engineering • Senior welding engineer training and assessment* • DT and NDT for manager
2. Review and validate detailed assessments and lab-based tests if necessary to determine the most optimal equipment and protocols for the project and the team		
3. Ensure optimisation of welding equipment performance		
4. Review and validate detailed reports and verify any relevant data obtained from welding tests		
5. Monitor the entire welding process and work with welders and other team members		
6. Verify ongoing evaluations during the welding process to offer more efficient solutions		
7. Ensure that all the welding is conducted following the		

Technical Skills	Competency Level	Recommended Training
necessary codes and standards		
8. Manage entire welding projects and provide the needed guidance and direction to the team		
9. Design and choose the best testing systems for each project		
10. Detect any issues and their root causes		
11. Ensure the chosen material is of the right quality for the intended product		
12. Ensure welding engineering inspection services to make sure the site, equipment, technology, machines, and teams meet all the requirements		
13. Approve the essential key types of common welding processes such as GMAW, GTAW, SMAW, and FCAW		

**Certification Programme*

LIST OF ABBREVIATION

AC	Alternating current
AWS	American Welding Society
ASME	American Society of Mechanical Engineers
CADD	Combined Annotation Dependent Depletion
CAD	Exothermic welding
DKM	Diploma Kemahiran Malaysia
DT	Destructive testing
FCAW	Flux Cored Arc Welding
GTAW	Gas Tungsten Arc Welding
GMAW	Gas Metal Arc Welding
ISO	International Organization of Standardization
IOT	Internet of things
ITP	Inspection Test Plan
IR4.0	Industry Revolution 4.0
5S	Sort, Set in Order, Shine, Standardize, Sustain
MDR	Manufacturer Data Report
MIG	Metal Inert Gas
NDT	Non-destructive testing
NDE	Non-destructive examination
PAW	Plasma Arc Welding
SMAW	Shielded Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
GD&T	Geometrical & Dimensioning
QA	Quality Assurance
QC	Quality Control
QM	Quality Management
QMS	Quality Management System
WPS	Welding Procedure Specification
WQT	Welder Qualification Test
PWHT	Post Weld Heat Treatment
PQR	Procedure Qualification Reports
P&ID	Piping drawing
PPE	Personal Protective Equipment
SKM	Sijil Kemahiran Malaysia
SOP	Standard Operating Procedure
WPS	Welding Procedure Specification
WQT	Welder Qualification Test

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