

National Competency Standards
for
WELDER
(Level-2,3&4)

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INTRODUCTION

A welder is a skilled tradesman who specializes in joining materials together or fills and repairs holes on metal constructions. Welders work on all types of industrial, manufacturing and construction applications; some even work underwater to repair oil rig foundations, ship hulls and other types of sub-aquatic structures. Skilled welders know the welding specifications of many types of materials. Apprenticeship or education/certification enables the learners to get familiar with advanced welding techniques. Through the application of these techniques and skills, they may weld manually or use machines to weld metal components.

Welders typically work from drawings or specifications, then use their knowledge of base metals and joining techniques to select the appropriate material for the job. They cut, position, and tack weld the material/s in preparation for one of the many welding processes. The difficulty of the job depends on the types of materials and welding positions. Regardless of the type of welding process, welders are exposed to intense and blinding heat and radiations and must take special care to ensure their own safety and the safety of those around them. Welders wear special gloves and aprons to prevent sparks and flame from burning their clothes and skin. In addition to taking safety precautions, welders also maintain their equipment and work with various power tools to prepare materials for welding. The specific job duties of a welder vary depending on the skills of the welder and the industry in which he works. Due to universal need for their skills, welders are in high demand not only nationally but also internationally.

In order to meet the domestic and worldwide demand for welders, National Vocational and Technical Training Commission (NAVTTTC) in collaboration with TVET Sector Support Program (TVET-SSP) has developed national vocational qualifications comprising of generic, functional and technical competency standards for welder occupation. To facilitate the process of developing national qualifications for welder, a Qualification Development Committee (QDC) was established under NVQF Operational Manual-1.

Competency standards, which are benchmarks for the performance, cover the commercial aspects of a welder's job. Required skills, underpinning knowledge and attitudes expected of a welder have been incorporated in these competency standards while setting standards for the performance of a welder.

Sector Skills Council (SSC) for Construction and experts from related industries have thoroughly reviewed and validated the competency standards as proposed by the QDC in terms of their relevancy and currency to the requirement of the job. The validated competency standards will provide the basis for the development of further curricula, assessment materials and instructional materials that will support competency based training and assessment activities.

PURPOSE OF THE QUALIFICATION

The purpose of these qualifications is to set high professional standards for welder's job. These national qualifications will support training providers in enhancing the quality of training and assessment in Pakistan. The specific objectives of developing these qualifications are as under:

- Improve the overall quality of training delivery and setting national benchmarks for training of welders in the country
- Provide flexible pathways and progressions to learners enabling them to receive relevant, up-to-date and recent skills

- Provide basis for competency based assessment which is recognized and accepted by employers
- Establish a standardized and sustainable system of training for welders in the country

DATE OF VALIDATION

These national qualifications have been validated by the Qualifications Validation Committee (QVC) on 13th& 14th February 2018 and they will remain in currency until 13th February 2021.

CODE OF QUALIFICATION

Qualification Title	Code
National Vocational Certificate Level 2 in Shielded Metal Arc Welding [Flat (1F, 1G) and Horizontal (2F, 2G) Positions]	0715MMT12
National Vocational Certificate Level 2 in Gas Metal Arc Welding [Flat (1F, 1G) and Horizontal (2F, 2G) Positions]	0715MMT13
National Vocational Certificate Level 2 in Flux Cored Arc Welding [Flat (1F, 1G) and Horizontal (2F, 2G) Positions]	0715MMT14
National Vocational Certificate Level 2 in Gas Tungsten Arc Welding [Flat (1F, 1G) and Horizontal (2F, 2G) Positions]	0715MMT15
National Vocational Certificate Level 2 in Submerged Arc Welding [Flat (1F, 1G) Position]	0715MMT16
National Vocational Certificate Level 3 in Shielded Metal Arc Welding [Vertical (3F, 3G) and Overhead (4F, 4G) Positions]	0715MMT17
National Vocational Certificate Level 3 in Gas Metal Arc Welding [Vertical (3F, 3G) and Overhead (4F, 4G) Positions]	0715MMT18
National Vocational Certificate Level 3 in Flux Cored Arc Welding [Vertical (3F, 3G) and Overhead (4F, 4G) Positions]	0715MMT19
National Vocational Certificate Level 3 in Gas Tungsten Arc Welding [Vertical (3F, 3G) and Overhead (4F, 4G) Positions]	0715MMT20
National Vocational Certificate Level 4 in Shielded Metal Arc Welding [All Positions (6G)]	0715MMT21
National Vocational Certificate Level 4 in Gas Metal Arc Welding [All Positions (6G)]	0715MMT22
National Vocational Certificate Level 4 in Flux Cored Arc Welding [All Positions (6G)]	0715MMT23
National Vocational Certificate Level 4 in Gas Tungsten Arc Welding [All Positions (6G)]	0715MMT24

ENTRY REQUIREMENTS

The entry requirement for Level-2 Qualifications is Middle or Matric.

QUALIFICATIONS DEVELOPMENT COMMITTEE

The Qualifications Development Committee consisted of following members:

S.No.	Name	Organization
1.	Dr. Mirza Nadeem Baig	Pakistan Welding Institute (DACUM Facilitator)
2.	Saba Sadiq	DESCON Technical Institute, Lahore
3.	Basit Ali	Infinity College of Engineering, Lahore
4.	M. Aslam Khatak	Heavy Mechanical Complex, Taxila
5.	Malik M. Nazir Awan	Pakistan Welding Institute, Islamabad
6.	Aziz Ullah Khan	Technical Support Organization, Chashma Nuclear Power Generating Station, Kundian, Mianwali
7.	Azhar Iqbal	Heavy Mechanical Complex-3, Taxila
8.	AwaisTanoli	Heavy Mechanical Complex-3, Taxila

QUALIFICATIONS VALIDATION COMMITTEE

The Qualifications Validation Committee consisted of following members:

S.No.	Name	Organization
1.	Dr. Mirza Nadeem Baig	Pakistan Welding Institute (DACUM Facilitator)
2.	Dr. Rashid Rizwan	Heavy Mechanical Complex-3, Taxila
3.	Hannan Hussain Gilani	Heavy Mechanical Complex-3, Taxila
4.	Ehsan Elahi	Consultant/Principal@ TEVTA, Punjab
5.	Shahid Hussain	DDFC Pvt. Ltd., Lahore
6.	Asad Mahmood	QADBROS Engineering, Lahore
7.	Muhammad Zahid	DESCON Technical Institute, Lahore
8.	Muhammad Nadeem	DESCON Technical Institute, Lahore
9.	Muhammad Uzair	DESCON Technical Institute, Lahore

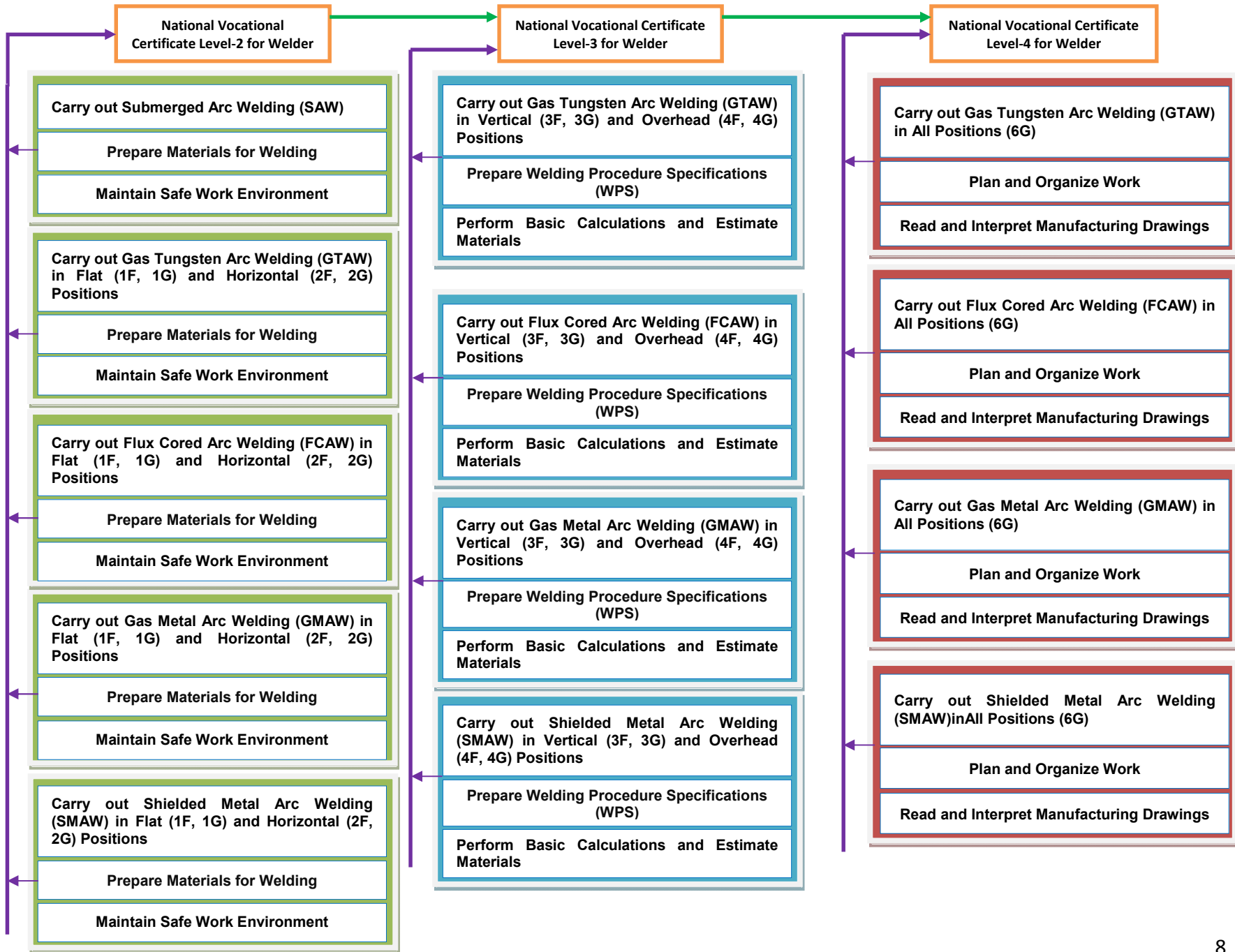
10.	Yasir	Shining Vocational College, Abbottabad
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REGULATIONS FOR THE QUALIFICATION AND SCHEDULE OF UNITS

Not Applicable

SUMMARY OF COMPETENCY STANDARDS

Code	Competency Standards	Level	Credits	Category
1.	Maintain Safe Work Environment	2	03	Generic
2.	Read and Interpret Manufacturing Drawings	4	15	Functional
3.	Perform Basic Calculations and Estimation for welding Work	3	05	Functional
4.	Plan and Organize Work	4	10	Functional
5.	Prepare Welding Procedure Specifications (WPS)	3	15	Functional
6.	Prepare Materials for Welding	2	10	Technical
7.	Carry out Shielded Metal Arc Welding (SMAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions	2	20	Technical
8.	Carry out Shielded Metal Arc Welding (SMAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions	3	20	Technical
9.	Carry out Shielded Metal Arc Welding (SMAW) in All Positions (6G)	4	20	Technical
10.	Carry out Gas Metal Arc Welding (GMAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions	2	10	Technical
11.	Carry out Gas Metal Arc Welding (GMAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions	3	20	Technical
12.	Carry out Gas Metal Arc Welding (GMAW) in All Positions (6G)	4	20	Technical
13.	Carry out Flux Cored Arc Welding (FCAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions	2	10	Technical
14.	Carry out Flux Cored Arc Welding (FCAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions	3	20	Technical
15.	Carry out Flux Cored Arc Welding (FCAW) in All Positions (6G)	4	20	Technical
16.	Carry out Gas Tungsten Arc Welding (GTAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions	2	20	Technical
17.	Carry out Gas Tungsten Arc Welding (GTAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions	3	20	Technical
18.	Carry out Gas Tungsten Arc Welding (GTAW) in All Positions (6G)	4	20	Technical
19.	Carry out Submerged Arc Welding (SAW)	2	10	Technical



Code:

Maintain Safe Work Environment

Overview

This Competency Standard identifies the competencies required to apply occupational safety and health(OSH) at workplace in accordance with the organization's approved guidelines and procedures. You will be expected to identify and use Personal Protective Equipment (PPE) according to the job requirement and potential hazards at workplace. The underpinning knowledge regarding OSH will be sufficient to provide the basis for your work.

Competency Units	Performance Criteria
1. Identify Hazards at Workplace	<p>P1. Read and interpret work processes and procedures correctly to identify risk of hazards at workplace</p> <p>P2. Recognize engineering processes, tools, equipment and consumable materials that have the potential to cause harm</p> <p>P3. Identify any potential hazards and take appropriate action to minimize the risk</p>
2. Observe Occupational Safety and Health (OSH)	<p>P1. Work safely always, complying with health and safety precautions, regulations and other relevant guidelines</p> <p>P2. Identify health and safety hazards at the workplace so that potential for personal injury, damage to equipment or workplace is prevented, and corrective action is taken</p> <p>P3. Deal with problems which are within your control, and report those that cannot be resolved to the safety officer</p> <p>P4. Wear, adjust, and maintain personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures</p> <p>P5. Keep work area clean and clear of obstructions, and storing tools or equipment so that the potential for accident or injury is prevented</p>

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Types of hazards that are most likely to cause harm to health and safety
- Health and safety precautions
- Health and safety signs and symbols

- Techniques and methods to identify the risks of hazards at workplace
- Dealing with hazards to avoid any accident or injury
- Safety reporting procedures and documentation
- Use of Personal Protective Equipment
- First aid treatment methods including methods of resuscitation
- Fire-fighting methods
- Safe methods of handling heavy loads

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Identify possible hazards at workplace
- Use correct Personal Protective Equipment (PPE) for the assigned job

Code:

Read and Interpret Manufacturing Drawings

Overview

This competency standard is designed to gain basic knowledge and skills required to read and interpret manufacturing drawings and welding symbols. The standard covers specific knowledge related to reading and understanding manufacturing drawings, interpreting welding symbols, recognizing materials and specifications, and bill of material/s and manufacturing parts according to manufacturing drawings.

Competency Units	Performance Criteria
1. Read and Understand Manufacturing Drawings	<p>P1. Recognize basics of lines used in engineering drawings</p> <p>P2. Describe uses of lines in engineering drawings</p> <p>P3. Recognize and explain orthographic and isometric views of a drawing</p> <p>P4. Identify manufacturing requirements according to drawings</p> <p>P5. Prepare job layout according to manufacturing requirements</p>
2. Interpret Welding Symbols	<p>P1. Understand basic and supplementary welding symbols used in manufacturing drawings</p> <p>P2. Understand and differentiate between types of welds and joints</p> <p>P3. Identify welding requirements according to welding symbols given in the manufacturing drawings</p>
3. Recognize Material Specifications and Bill of Material (BOM)	<p>P1. Identify material specifications according to manufacturing drawing</p> <p>P2. Identify bill of material (BOM) according to manufacturing drawing</p>
4. Manufacture Parts	<p>P1. Interpret dimensional tolerances according to manufacturing drawing</p> <p>P2. Assemble and tack weld parts according to manufacturing drawing</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Basic elements of engineering drawing
- Drawing symbols

- Dimensioning techniques
- Tolerances
 - General tolerance
 - Angular tolerance
 - Geometric tolerance
- Drawing techniques
 - Perspective
 - Exploded view
 - Hidden view technique
- Projections
 - First angle projections
 - Third angle projections

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare and interpret technical drawings and sketches based on provided specifications

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Drawing or Sketch
2.	Layout Tools
3.	Measuring Devices
4.	Handheld Calculator
5.	Fabrication and Welding Equipment
6.	Base Metals
7.	Welding Consumables

Code:

Perform Basic Calculations and Estimation for Welding Work

Overview

This competency standard identifies the competencies required to prepare estimates in accordance with client's guidelines. You will be expected to estimate materials, ensuring cost effectiveness, conforming to standards and regulations. The underpinning knowledge regarding calculations and estimation will be sufficient to provide the basis for your work.

Competency Units	Performance Criteria
1. Perform Fundamental Mathematical Operations	<p>P1. Interpret the requirement for mathematical operations as per given job</p> <p>P2. Perform simple calculations involving whole numbers, mixed numbers, fractions and decimals using four mathematical fundamental operations</p>
2. Perform Conversion of Units	<p>P1. Convert units to the required figures using the given formulae</p> <p>P2. Convert English measurements to metric measurements according to procedure</p>
3. Calculate Volume of Welds	<p>P1. Identify the requirements for calculation such as volume, mass and, or density of the materials</p> <p>P2. Calculate correct volume of welds as per standard procedures</p>
4. Estimate Welding Materials	<p>P1. Recognize the requirements of welding materials as per job requirements</p> <p>P2. Estimate required welding materials as per job requirements</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Basic engineering terminologies used in welding work
- English and metric system of measurements
- Methods of conversion from one unit to the other
- Four fundamental mathematical operations i.e. addition, subtraction, multiplication and division
- Method of transposing formulae
- Methods of formulation of equation
- Interpretation of drawings, sketches and symbols used in mechanical work
- Types of welding materials
- Methods of estimation of materials for welding

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- For a given specification and drawing, carry out estimation of materials for welding work

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Relevant Literature/Books/Formulae Sheet
2.	Measuring Tools
3.	Components
4.	Calculator
5.	Pen and Paper
6.	Tools and Facilities Appropriate to Processes or Activity
7.	Materials Relevant to the Proposed Activity
8.	Working Drawing or Plans or Sketches or Welding Procedure Specifications (WPS) Required by Client

Code:

Plan and Organize Work

Overview

This competency standard is designed to gain basic knowledge and skills required to plan and organize work at workplace. The standard covers specific knowledge of setting objectives, planning and scheduling work activities, implementing work plans, monitoring work activities and reviewing and evaluating work plans.

Competency Units	Performance Criteria
1. Set Objectives	<p>P1. Identify realistic and attainable objectives</p> <p>P2. Set objectives consistent with and linked to work activities in accordance with organizational aims</p> <p>P3. Set objectives with clear time frames</p> <p>P4. Support team members to achieve objectives</p>
2. Plan and Schedule Work Activities	<p>P1. Identify and prioritize tasks/work activities to be completed as directed</p> <p>P2. Break down tasks/work activities into steps in accordance with set time frames</p> <p>P3. Allocate resources as per requirements of the activities</p> <p>P4. Coordinate schedule of work activities with concerned personnel</p>
3. Implement Work Plans	<p>P1. Identify work methods and practices in consultation with concerned personnel</p> <p>P2. Implement work plans in accordance with set time frames, resources and standards</p>
4. Monitor Work Activities	<p>P1. Monitor and compare work activities with set objectives</p> <p>P2. Monitor work performance</p> <p>P3. Report deviations from work activities and coordinate recommendations with appropriate personnel</p> <p>P4. Observe timeliness of report</p> <p>P5. Establish and maintain files in accordance with standard operating procedures (SOPs)</p>
5. Review and Evaluate Work Plans	<p>P1. Review work plans, strategies and implementation based on accurate, relevant and current information</p> <p>P2. Provide results of review to concerned parties</p> <p>P3. Conduct performance appraisal in accordance with organization rules and regulations</p> <p>P4. Prepare recommendations and present to appropriate</p>

	<p>personnel and authorities</p> <p>P5. Implement feedback mechanisms in line with organization policies</p>
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Organization's strategic plan, policies rules and regulations, laws and objectives for work unit activities and priorities
- Organization's policies, strategic plans, guidelines related to the role of the work unit
- Team work and consultation strategies

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Setting objectives for the work
- Plan and schedule work activities
- Implement work plans
- Monitor work activities
- Review and evaluate work plans and activities

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Tools, Equipment and Facilities Appropriate to the Proposed Activities
2.	Materials Relevant to the Proposed Activities
3.	Work Plan Schedules
4.	Drawings, Sketches or Blueprint
5.	Desktop Computer/Laptop
6.	Multimedia
7.	Overhead Projector
8.	Printer

Code:

Prepare Welding Procedure Specifications (WPS)

Overview

This competency standard is designed to gain basic knowledge and skills required to prepare Welding Procedure Specifications (WPS). The standard covers specific knowledge related to recognizing, interpreting and explaining and preparing Welding Procedure Specifications (WPS).

Competency Units	Performance Criteria
1. Recognize Welding Procedure Specifications (WPS)	<p>P1. Know the purpose of Welding Procedure Specifications (WPS)</p> <p>P2. Describe and understand contents of Welding Procedure Specifications (WPS)</p> <p>P3. Recognize common acronyms used in Welding Procedure Specifications (WPS)</p>
2. Interpret and Explain Welding Procedure Specifications (WPS)	<p>P1. Recognize materials specifications (base metals and fillers) according to Welding Procedure Specifications (WPS)</p> <p>P2. Recognize weld type and joint design according to Welding Procedure Specifications (WPS)</p> <p>P3. Recognize welding positions and parameters according to Welding Procedure Specifications (WPS)</p>
3. Prepare a Welding Procedure Specifications (WPS)	<p>P1. Prepare sample Welding Procedure Specifications (WPS) following a simple welding procedure</p> <p>P2. Follow written Welding Procedure Specifications (WPS) to produce a production/sample weld</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Written communication skills (reading and comprehension)
- Purpose of Welding Procedure Specifications
- Common contents of WPS
- Groupings of materials
- Thickness range
- Types of welds
- Joint design
- Welding processes

- Welding positions
- Welding consumables
- Electrical characteristics - volts, current, polarity
- Shielding gases
- Purge gas
- Gas flow rate
- Nozzle diameter
- Pre-heat/Post-heat
- Welding speed

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Interpret a range of WPS documents

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Welding Procedure Specifications (WPS)
2.	Applicable Manufacturing Codes/Standards
3.	Relevant Literature/Books

Code:

Prepare Materials for Welding

Overview

This competency standard is designed to gain basic knowledge and skills required to prepare materials for a specific job. The standard covers specific knowledge of marking the material as per drawing/job requirement, setting up cutting equipment, cutting and preparing edges of base materials, cleaning surfaces and edges, preparing welding consumables and fitting up base materials.

Competency Units	Performance Criteria
1. Select and Mark Material/s as per Drawing/Job Requirement	<p>P1. Select and obtain required material/s as per job requirements</p> <p>P2. Select appropriate marking tools as per job requirements</p> <p>P3. Mark the area to be cut as per drawing/job requirements</p>
2. Cut and Prepare Edge/s of Base Materials	<p>P1. Select appropriate cutting equipment as per job requirements</p> <p>P2. Set-up cutting equipment as per manufacturer's instructions/job requirements</p> <p>P3. Cut the base material as per job specifications and dimensions provided in the drawing</p> <p>P4. Prepare edges of the base materials as per drawing/WPS</p> <p>P5. Check dimensions of the prepared edges as per drawing/WPS</p> <p>P6. Select proper tools and chemicals for cleaning</p> <p>P7. Clean the edges of the base materials as per job requirements</p>
3. Prepare Welding Consumables	<p>P1. Select relevant welding consumables as per job requirements/WPS</p> <p>P2. Prepare consumables in accordance with required specifications</p>
4. Fit-up Base Materials	<p>P1. Select proper tools and equipment to fit-up base materials</p> <p>P2. Tack weld joint/s as per drawing/welding procedure specifications (WPS)</p> <p>P3. Check root gap as per drawing/welding procedure specifications (WPS)</p> <p>P4. Check alignment as per applicable code/standard</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Interpretation of drawings and sketches
- Selection of appropriate method of edge preparation
- Selection of appropriate cutting equipment, accessories and supplies
- Operation of cutting equipment such as mechanical, gas and plasma
- Operation of grinding equipment
- Safety procedures for cutting and grinding

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform edge preparation in accordance with WPS and safety procedures

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Cutting equipment and Accessories
2.	Grinding Equipment and Accessories
3.	Measuring Tools
4.	Personal Protective Equipment (PPE)
5.	Relevant Documentation such as WPS and Working Drawing
6.	Stand-by Fire-Fighting Equipment
7.	Supplies and Materials
8.	Cutting Gases (Oxygen, Acetylene)
9.	Gouging Electrodes
10.	Grinding/Cutting Discs
11.	Run on/Run off, Backing Plates/Ring

Code:

Carry Out Shielded Metal Arc Welding (SMAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Shielded Metal Arc Welding (SMAW) operations in Flat (1F, 1G) and Horizontal (2F, 2G) position at workplace. The standard covers specific knowledge of performing Shielded Metal Arc Welding (SMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Flat (1F, 1G) and Horizontal (2F, 2G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for SMAW	P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings P2. Prepare SMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer's instructions P4. Connect welding machine to an independent power supply P5. Set polarity indicated in the welding procedure specifications
2. Make Fillet Welds on Carbon Steel Plate	P1. Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld P2. Maintain gap between electrode and base metal as per standard practices P3. Carry out welding in Flat (1F) and Horizontal (2F) positions following standard procedures P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects
3. Make Groove Welds on Carbon Steel Plate	P1. Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld P2. Maintain gap between electrode and base metal as per standard practices

	<p>P3. Carry out welding in Flat (1G)and Horizontal (2G)positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
<p>4. Perform Post Welding Operations</p>	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply AC and DC
- Polarity setting according to standard specifications
- Specifications/ classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre- heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform SMAW fillet weld at 1F, 2F positions, groove weld at 1G, 2G positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories

22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Shielded Metal Arc Welding (SMAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Shielded Metal Arc Welding (SMAW) operations in Vertical (3F, 3G) and Overhead (4F, 4G) positions at workplace. The standard covers specific knowledge of performing Shielded Metal Arc Welding (SMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Flat (1F, 1G) and Horizontal (2F, 2G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for SMAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare SMAW welding machine in accordance with welding procedure specifications/ manufacturer's instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Flat (3F) and Horizontal (4F) positions following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
3. Make Groove Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Flat (3G) and Horizontal (4G) positions following standard procedures</p>

	<p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
4. Perform Post Welding Operations	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply AC and DC
- Polarity setting according to standard specifications
- Specifications/ classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre- heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform SMAW fillet weld at 3F, 4F positions, groove weld at 3G, 4G positions as per given job specifications

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables

24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Shielded Metal Arc Welding (SMAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Shielded Metal Arc Welding (SMAW) operations in Vertical (3F, 3G) and Overhead (4F, 4G) position sat workplace. The standard covers specific knowledge of performing Shielded Metal Arc Welding (SMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Vertical (3F, 3G) and Overhead (4F, 4G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for SMAW	P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings P2. Prepare SMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer's instructions P4. Connect welding machine to an independent power supply P5. Set polarity indicated in the welding procedure specifications
2. Make Fillet Welds on Carbon Steel Plate	P1. Adjust welding parameters (current, voltage, etc.) as per welding procedure specifications/job requirements to produce acceptable weld P2. Maintain gap between electrode and base metal as per standard practices P3. Carry out welding in Vertical (3F) and Overhead (4F) positions following standard procedures P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects
3. Make Groove Welds on Carbon Steel Plate	P1. Adjust welding parameters (current, voltage, etc.) as per welding procedure specifications/job requirements to produce acceptable weld P2. Maintain gap between electrode and base metal as per standard practices P3. Carry out welding in Vertical (3G) and Overhead (4G)

	<p>positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
4. Perform Post Welding Operations	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply AC and DC
- Polarity setting according to standards specification
- Specifications/ classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre- heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform SMAW fillet weld at 3F,4F positions, groove weld at 3G, 4G positions as per given job specifications

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories

22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Shielded Metal Arc Welding (SMAW) in All Positions (6G)

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Shielded Metal Arc Welding (SMAW) operations in all (6G) positions at workplace. The standard covers specific knowledge of performing Shielded Metal Arc Welding (SMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in all (6G) positions of pipe. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for SMAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare SMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer's instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Groove Welds on Carbon Steel Pipe	<p>P1. Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in all(6G) positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual</p>

	discontinuities as per recognized standards P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects
3. Perform Post Welding Operations	P1. Carry out finishing work of welds following standard procedures P2. Inspect weld visually and mark any visual defects, as required P3. Carry out repair work in accordance with approved procedures, as required P4. Clean work area in accordance with workplace safety practices P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply AC and DC
- Polarity setting according to standard specifications
- Specifications/ classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre- heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform SMAW welding in all (6G) positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables

24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Gas Metal Arc Welding (GMAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Metal Arc Welding (GMAW) operations in Flat (1F, 1G) and Horizontal (2F, 2G) positions at workplace. The standard covers specific knowledge of performing Gas Metal Arc Welding (GMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Flat (1F, 1G) and Horizontal (2F, 2G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for GMAW	P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings P2. Prepare GMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions P4. Connect welding machine to an independent power supply P5. Set polarity indicated in the welding procedure specifications
2. Make Fillet Welds on Carbon Steel Plate	P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld P2. Maintain gap between electrode and base metal as per standard practices P3. Carry out welding in Flat (1F) and Horizontal (2F) positions following standard procedures P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects
3. Make Groove Welds on Carbon Steel Plate	P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld

	<p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Flat (1G) and Horizontal (2G) positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
<p>4. Perform Post Welding Operations</p>	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform MAW fillet weld in Flat (1F) and Horizontal (2F) positions, groove weld in Flat (1G) and Horizontal (2G) positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder

19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Gas Metal Arc Welding (GMAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Metal Arc Welding (GMAW) operations in Vertical (3F, 3G) and Overhead (4F, 4G) positions at workplace. The standard covers specific knowledge of performing Gas Metal Arc Welding (GMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove in Vertical (3F, 3G) and Overhead (4F, 4G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for GMAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare GMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Vertical (3F) and Overhead (4F) positions following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>

<p>3. Make Groove Welds on Carbon Steel Plate</p>	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Vertical (3G) and Overhead (4G) positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
<p>4. Perform Post Welding Operations</p>	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld

- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform GMAW fillet weld in Vertical (3F) and Overhead (4F) positions, groove weld in Vertical (3G) and Overhead (4G) positions as per given job specifications

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors

17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Gas Metal Arc Welding (GMAW) in All Positions (6G)

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Metal Arc Welding (GMAW) operations in all positions(6G) at workplace. The standard covers specific knowledge of performing Gas Metal Arc Welding (GMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making groove welding in all positions(6G) of pipe. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for GMAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare GMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Groove Welds on Carbon Steel Pipe	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/ job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in all positions (6G) following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>

3. Perform Post Welding Operations	P1. Carry out finishing work of welds following standard procedures P2. Inspect weld visually and mark any visual defects, as required P3. Carry out repair work in accordance with approved procedures, as required P4. Clean work area in accordance with workplace safety practices P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform groove weld in all positions(6G)of pipe as per given job specifications

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes

4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves

30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry out Flux Cored Arc Welding (FCAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Flux Cored Arc Welding (FCAW) operations at workplace. The standard covers specific knowledge of performing Flux Cored Arc Welding (FCAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Flat (1F, 1G) and Horizontal (2F, 2G) Positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for FCAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare FCAW welding machine in accordance with welding procedure specifications/manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in in Flat (1F) and Horizontal (2F) Positions following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
3. Make Groove Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Flat (1G) and Horizontal (2G) Positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure</p>

	<p>specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
4. Perform post welding operations	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Procedure of FCAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform FCAW fillet weld at 1F,2F positions, groove weld at 1G, 2G positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables

24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry out Flux Cored Arc Welding (FCAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Flux Cored Arc Welding (FCAW) operations at workplace. The standard covers specific knowledge of performing Flux Cored Arc Welding (FCAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds at different positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for FCAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare FCAW welding machine in accordance with welding procedure specifications/manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Vertical (3F) and Overhead (4F) positions following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
3. Make Groove on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p>

	<p>P3. Carry out welding in Vertical (3G) and Overhead (4G) positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
<p>4. Perform Post Welding Operations</p>	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Procedure of FCAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform FCAW fillet weld in 3F, 4F positions, groove weld in 3G, 4G positions as per given job specifications

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder

19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry out Flux Cored Arc Welding (FCAW) in All (6G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Flux Cored Arc Welding (FCAW) operations at workplace. The standard covers specific knowledge of performing Flux Cored Arc Welding (FCAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making groove weld in all positions (6G) of pipe. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for FCAW	P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings P2. Prepare FCAW welding machine in accordance with welding procedure specifications/manufacturer instructions P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions P4. Connect welding machine to an independent power supply P5. Set polarity indicated in the welding procedure specifications
2. Make groove welds in all positions on carbon steel plates	P1. Adjust welding parameters (current, voltage, wire feed speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld P2. Maintain gap between electrode and base metal as per standard practices P3. Carry out welding in all positions (6G) following standard procedures P4. Deposit root pass as per welding procedure specifications/job requirements P5. Deposit filling passes as per welding procedure specifications/job requirements P6. Deposit capping pass as per welding procedure specifications/job requirements P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards

	P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects
3. Perform Post Welding Operations	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization's guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Procedure of FCAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform FCAW groove weld in 6G position as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables

24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Gas Tungsten Arc Welding (GTAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Tungsten Arc Welding (GTAW) operations at workplace. The standard covers specific knowledge of performing Gas Tungsten Arc Welding (GTAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Flat (1F, 1G) and Horizontal (2F, 2G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for GTAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare GTAW welding machine in accordance with welding procedure specifications/manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, polarity etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Flat (1F) and Horizontal (2F) positions following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
3. Make Groove Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, polarity etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Flat (1G) and Horizontal (2G)</p>

	<p>positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
<p>4. Perform Post Welding Operations</p>	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Process of GTAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform GTAW fillet weld in Flat (1F) and Horizontal (2F) positions, groove weld in Flat (1G) and Horizontal (2G) positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment

21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Gas Tungsten Arc Welding (GTAW) in Vertical (3F, 3G) and Overhead (4F, 4G) Positions

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Tungsten Arc Welding (GTAW) operations at workplace. The standard covers specific knowledge of performing Gas Tungsten Arc Welding (GTAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Vertical (3F, 3G) and Overhead (4F, 4G) positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for GTAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare GTAW welding machine in accordance with welding procedure specifications/manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, polarity etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Vertical (3F) and Overhead (4F) positions following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
3. Make Groove Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, polarity etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as</p>

	<p>per standard practices</p> <p>P3. Carry out welding in Vertical (3G) and Overhead (4G) positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
4. Perform Post Welding Operations	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Process of GTAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform GTAW fillet weld in Vertical (3F) and Overhead (4F) positions, groove weld in Vertical (3G) and Overhead (4G) positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder

19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Gas Tungsten Arc Welding (GTAW) in All Positions (6G)

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Tungsten Arc Welding (GTAW) operations at workplace. The standard covers specific knowledge of performing Gas Tungsten Arc Welding (GTAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in All positions of plate and pipe (6G). The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for GTAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare GTAW welding machine in accordance with welding procedure specifications/manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Groove Welds on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, polarity etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in Vertical (3G) and Overhead (4G) positions following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual</p>

	discontinuities as per acceptance standards P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects
3. Perform Post Welding Operations	P1. Carry out finishing work of welds following standard procedures P2. Inspect weld visually and mark any visual defects, as required P3. Carry out repair work in accordance with approved procedures, as required P4. Clean work area in accordance with workplace safety practices P5. Maintain and store tools/equipment/consumable materials in accordance with organization's guidelines

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/ classification of electrode/s required for the job
- Welding procedure specifications (WPS)
- Process of GTAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform GTAW fillet weld in Vertical (3F) and Overhead (4F) positions, groove weld in Vertical (3G) and Overhead (4G) positions as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder
19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets

26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights

Code:

Carry Out Submerged Arc Welding (SAW)

Overview

This Competency Standard is designed to gain basic knowledge and skills required to perform Submerged Arc Welding (SAW) operations at workplace. The standard covers specific knowledge of performing Submerged Arc Welding (SAW)) by selecting and setting up welding equipment, installing consumables, adjusting and welding parameters and making fillet and groove welds at different positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Competency Units	Performance Criteria
1. Prepare Welding Machine and Accessories for SAW	<p>P1. Identify welding requirements from the job, welding procedure specifications and/or technical drawings</p> <p>P2. Prepare SAW welding machine in accordance with welding procedure specifications/manufacturer instructions</p> <p>P3. Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions</p> <p>P4. Connect welding machine to an independent power supply</p> <p>P5. Set polarity indicated in the welding procedure specifications</p>
2. Make Fillet Weld on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed, welding speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p> <p>P3. Carry out welding in 1F position following standard procedures</p> <p>P4. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
3. Make Groove Weld on Carbon Steel Plate	<p>P1. Adjust welding parameters (current, voltage, wire feed speed, welding speed etc.) as per welding procedure specifications/job requirements to produce acceptable weld</p> <p>P2. Maintain gap between electrode and base metal as per standard practices</p>

	<p>P3. Carry out welding in 1G position following standard procedures</p> <p>P4. Deposit root pass as per welding procedure specifications/job requirements</p> <p>P5. Deposit filling passes as per welding procedure specifications/job requirements</p> <p>P6. Deposit capping pass as per welding procedure specifications/job requirements</p> <p>P7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards</p> <p>P8. Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects</p>
<p>4. Perform Post Welding Operations</p>	<p>P1. Carry out finishing work of welds following standard procedures</p> <p>P2. Inspect weld visually and mark any visual defects, as required</p> <p>P3. Carry out repair work in accordance with approved procedures, as required</p> <p>P4. Clean work area in accordance with workplace safety practices</p> <p>P5. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Understanding of technical drawings
- Electrical supply (AC and DC)
- Polarity setting according to standard specifications
- Specifications/Classification of electrode/s and flux required for the job
- Welding procedure specifications (WPS)
- Process of SAW
- Method of Pre – heating of base metal
- Electrical parameters like (voltage, current etc.) and their effects on weld
- Welding techniques as per WPS/instruction sheet
- Visual welding defects
- Welding codes and standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Perform SAW fillet weld at 1F position and groove weld at 1G position as per given job specification

Tools and Equipment Required

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	SMAW Power Source with All Accessories
2.	Carbon Steel Plates/Pipes
3.	SMAW Electrodes
4.	Electrode Backing Oven
5.	Grinder
6.	Cutting Discs
7.	Grinding Discs
8.	Bevelling Machine
9.	Chipping Hammer
10.	MS Wire Brush
11.	Acetone
12.	File Set
13.	Adjustable Wrench
14.	Torque Wrench
15.	Ear Plugs
16.	Fume Extractors
17.	Exhaust Fans
18.	Pencil Grinder

19.	WPS/ Instruction Sheet
20.	Pre-Heating Equipment
21.	Gouging Equipment with All Accessories
22.	Air Compressor
23.	Welding Tables
24.	Jigs and Fixtures
25.	Fire Blankets
26.	Fire Extinguishers
27.	Cotton Gloves
28.	Leather Apron
29.	Welding Gloves
30.	Welding Helmet
31.	Safety Goggles
32.	Safety Helmet
33.	Safety Shoes
34.	Set of Nose Pliers
35.	Set of Screw Drivers
36.	Bench Vice
37.	Spanner Set
38.	Measuring Tools/Gauges/Templates
39.	Screw Driver Set
40.	Allen Key Set
41.	Emergency Lights