Model Curriculum

Tungsten Inert Gas Welder (GTAW)

SECTOR:	**CAPITAL GOODS**
SUB-SECTOR:	**1. Machine Tools**
	2. Dies, Moulds and Press Tools
	3. Plastic Manufacturing Machinery
	4. Textile Manufacturing Machinery
	5. Process Plant Machinery
	6. Electrical and Power Machinery
	7. Light Engineering Goods
OCCUPATION:	**Welding and Cutting**
REF ID:	**CSC/Q0212, v1.0**
NSQF LEVEL:	**4**

Skill India
कौशल भारत-कुशल भारत

CGSC
CAPITAL GOODS SKILL COUNCIL

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CAPITAL GOODS SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Tungsten Inert Gas Welder (GTAW)'** QP No. **'CSC/Q 0212, NSQF Level 4'**

Date of Issuance: Nov 24th,2017

Valid up to : Nov 24th,2021

**Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)*

Authorised Signatory
(Capital Goods Skill Council)

TABLE OF CONTENTS

Tungsten Inert Gas Welder (GTAW)

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Tungsten Inert Gas Welder (GTAW)", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Tungsten Inert Gas Welder (GTAW)**		
Qualification Pack Name & Reference ID. ID	CSC/Q0212, v1.0		
Version No.	1.0	**Version Update Date**	31/10/2018
Pre-requisites to Training	10th Standard passed, preferably 3 months Manual/ Shielded Metal Arc Welding experience required		
Training Outcomes	**After completing this programme, participants will be able to:** • Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding. • Apply basic health and safety practices at the workplace. • Work effectively with colleagues and supervisors.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Tungsten Inert Gas Welder (GTAW)" Qualification Pack issued by "Capital Goods Skill Council".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction** **Theory Duration** (hh:mm) 03:00 **Practical Duration** (hh:mm) 0:00 **Corresponding NOS Code** Bridge Module	• State the necessity of welding. • Explain various types of welding processes. • Compare welding processes with respect to procedures and application. • State the principle of TIG welding. • Explain safe working practices to be followed while carrying out TIG welding. • Identify hazards associated with TIG welding to avoid accidents. • Explain roles and responsibilities of a Tungsten Inert Gas Welder (GTAW).	Training kit (Trainer guide, Presentations).
2	**Perform basic Tungsten Inert Gas Welding (TIG) also known as Gas Tungsten Arc Welding (GTAW)** **Theory Duration** (hh:mm) 37:00 **Practical Duration** (hh:mm) 100:00 **Corresponding NOS Code** CSC/N0212	• Identify various types of joints. • Describe various welding positions. • Identify Personal Protective Equipment used in TIG welding. • Explain the factors to be considered in TIG welding. • State the purpose of using shielding gas in TIG welding. • Identify various gases/combination of gases for shielding. • Identify equipment required for TIG welding. • List common tools used in TIG welding. • Explain the process and importance of purging. • Explain the method to prepare the work area for welding operation. • Prepare the materials and joint in readiness for welding. • Select suitable shielding gases based on the base metal. • Plan for the welding operations accurately. • Connect flow meters and adjust flow rate. • Check the condition of base material and prepare edges for the welding. • Produce joints from various materials in different forms. • Check the dimensions as per WPS. • Identify possible defects and take corrective actions.	Training kit (Trainer guide, Presentations), transformer, rectifier, inverter, generator, multimeter, voltmeter, welding torch, electrode, filler wire return clamp, jigs and fixtures, ceramic nozzle, collet, collet holder, gas lens, bakelite cap, Wire brushes, linishers, hammer, power saw, Angle grinders- pedestal and straight, chisel etc., leather gloves; leather apron; welding screen - helmet type; hand screen welding; safety shoes, centre punch, divider, caliper outside, steel rule, ball pen hammer, chipping hammer.
3	**Health and safety** **Theory Duration** (hh:mm) 10:00	• Explain the importance of Personal Protective Equipment (PPE). • Identify appropriate PPE for the various tasks performed. • Identify job site risks and hazards to avoid accidents at the work place.	Training kit (Trainer guide, Presentation), leather gloves, leather apron, welding screen – helmet types, hand screen welding and

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 08:00 **Corresponding NOS Code** CSC/N1335	Hazards: sharp edged and heavy tools; heated metals; gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tools and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.). Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness) • Identify the names and locations of people responsible for health and safety in the workplace. • Identify documents that refer to health and safety in the workplace and where they are located. • Carry out safe working practices while dealing with hazards to ensure the safety of self and others. Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc. • Inspect steps and ladders for faults, set them and use them safely. Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc. Ladders set up: firm/level base, clip/lash	safety shoes.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		down, leaning at the correct angle, etc. • Work safely in and around trenches, elevated places and confined areas. • Lift heavy objects safely using correct procedures. • Apply good housekeeping practices at all times. Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces • Identify common hazard signs displayed in various areas. Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.	
4	**Fire Safety** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** CSC/N1335	• Identify causes of fire accidents. • Recognise required fire extinguisher based on the type of fire. Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents). • Use the various appropriate fire extinguishers on different types of fires correctly. • Interpret fire safety signs. • Inspect evacuation plan in case of fire. • Identify the location of assembly point, fire exit and fire alarm. • Follow reporting procedure in case of a fire. • Participate in fire safety drills at the workplace. • Demonstrate good housekeeping in order to prevent fire hazards.	Training kit (Trainer guide, Presentation), Class A, B, C and D fire extinguishers.
5	**Emergencies, rescue and first aid procedure** **Theory Duration** (hh:mm) 09:00	• Follow electrical safety procedures. • Use approved method to rescue a person from electrocution. • State the importance of first aid. • Identify the contents of a first aid kit. • Administer first aid in case of minor injuries, bleeding, burns, choking, electrical shock, poisoning, etc.	Training kit (Trainer guide, Presentation), First aid kit with all contents.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 18:00 **Corresponding NOS Code** CSC/N1335	• Demonstrate the artificial respiration and CPR process. • Follow correct method to move injured people and others during an emergency. • Explain stages of crisis and crisis management. • Participate in emergency procedures as per role. Emergency procedures: raising alarm, safe/efficient evacuation, correct means of escape, correct assembly point, roll call, correct return to work. • Write an accident/incident report or dictate a report to another person and send report to person responsible. Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified.	
6	**Working effectively with others** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N1336	• State various categories of people that one is required to communicate and co-ordinate within the organization. • Explain the importance of effective communication in the workplace. • Explain the importance of teamwork in organizational and individual success. • Describe various components of effective communication and active listening. • Describe the barriers to effective communication. • Provide and receive information to and from authorized persons accurately and within agreed timescale. • Give information to others clearly, at a pace and in a manner that helps them to understand. • Assist others in performing tasks in a positive and helpful manner, where required and possible. • Take measures to maximize effectiveness and efficiency in carrying out tasks by consulting with and assisting others. • Follow appropriate communication etiquette while working. Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa), use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism, etc.	Training kit (Trainer guide, Presentation)

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Apply active listening skills while interacting with others at work. • Explain the importance of ethics and discipline for professional success. • Describe common reasons for interpersonal conflict and ways of managing interpersonal conflict effectively. • Explain the importance of developing effective working relationships for professional success. • Display responsible and disciplined behaviors at the workplace. Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. • Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict.	
	Total Duration **Theory Duration 84:00** **Practical Duration 216:00**	**Unique Equipment Required:** Leather gloves; leather apron; welding screen - helmet type; hand screen welding; safety shoes; fire extinguishers - dry powder fire extinguisher; fire bucket with sand, first aid kit; transformer, rectifier, inverter, generator, multimeter, volt meter, Welding torch, electrode, filler wire Return clamp, jigs and fixtures, ceramic nozzle, collet, collet holder, gas lens, bakelite cap, Wire brushes, linishers, hammer, power saw, Angle Grinders-Pedestal and straight, chisel etc. Leather gloves; leather apron; welding screen - helmet type; hand screen welding; safety shoes, Fire Extinguishers, First aid kit with all contents.	

Grand Total Course Duration: **300 Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **Capital Goods Skill Council)***

Trainer Prerequisites for Job role: "Tungsten Inert Gas Welder (GTAW)" mapped to Qualification Pack: "CSC/Q0212 v1.0"

Sr. No.	Area	Details
1	**Description**	Perform manual TIG (GTAW) welding for a range of standard welding job requirements. This is for a skilled welder who can weld different materials (carbon steel, aluminum, nickel, titanium, copper and stainless steel) in various positions and prepare various joints including corner, butt, fillet and tee. Set-up and prepare for operations interpreting the right information from the WPS.
2	**Personal Attributes**	Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.
3	**Minimum Educational Qualifications**	Diploma /Degree in Mechanical Engineering
4a	**Domain Certification**	Certified for Job Role: "Tungsten Inert Gas Welder (GTAW)" mapped to QP: "CSC/Q0212, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q0102". Minimum accepted as per respective SSC guidelines is 80%.
5	**Experience**	• 3-4 years of industry experience in the relevant field • 3-4 years of teaching experience

Annexure: Assessment Criteria

Criteria For Assessment Of Trainees

Job Role: Tungsten Inert Gas Welder (GTAW)

Qualification Pack: CSC/Q0212

Sector Skill Council: Capital Goods Skill Council

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Total Marks: 300	**Compulsory NOS**			**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out of**	**Theory**	**Skills Practical**
CSC/N0212 Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	**100**	3	1	2
	PC2.take necessary safety precautions for TIG welding operations		2	0	2
	PC3.interpret weld procedure data sheets specifications		3	1	2
	PC4.check that all measuring equipment is within calibration date		2	0	2
	PC5.check if welding machines eg. transformer, inverters (AC/DC), rectifiers and generators have been made available by the authorized person		2	1	1

	PC6.check if welding torch, tungsten electrode and filler wire have been made available by the authorized person		2	1	1
	PC7.prepare for the TIG welding process		2	1	1
	PC8.prepare the materials and joint in readiness for welding		2	0	2
	PC9.fit the welding shielding gases given by the authorised person, for a range of given applications		2	0	2
	PC10.plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS		2	0	2
	PC11.connect torches and the components		2	0	2
	PC12.connect and adjust regulators and flow meters to cylinders		3	1	2
	PC13.read, set and adjust current (amperage) as required		3	1	2
	PC14.set pre-purge with shielding gas as required		2	1	1
	PC15.prepare tungsten by sharpening or balling it to desired tip shape		3	1	2
	PC16.set and verify gas flow rates		2	1	1
	PC17.prepare and support the joint, using the appropriate methods		3	1	2
	PC18.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		2	0	2
	PC19.match feed and travel speed as required		2	0	2
	PC20.perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements		5	1	4
	PC21.use correct technique for starting the arc (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material)		4	2	2
	PC22.use correct angle of torch and filler wire		4	1	3
	PC23.weld the joint to the specified quality, dimensions and profile		4	1	3
	PC24.use manual welding and related equipment, to carry out TIG welding processes		4	1	3

	PC25.produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817		4	1	3
	PC26.use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)		4	2	2
	PC27.produce joints from various materials in different forms		2	0	2
	PC28.weld joints in good access situations, in select positions		3	1	2
	PC29.make sure that the work area is maintained and left in a safe and tidy condition		2	0	2
	PC30.use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification		4	2	2
	PC31.check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection		3	1	2
	PC32.identify various weld defects		3	1	2
	PC33.detect surface imperfections and deal with them appropriately		2	1	1
	PC34.report any defect or imperfection identified to the authorised person		2	0	2
	PC35.shut down and make safe the welding equipment on completion of the welding activities		2	0	2
	PC36.detect equipment malfunctions and deal with them appropriately		2	0	2
	PC37. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		2	0	2
		Total	**100**	**26**	**74**
CSC/N1335 Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions	**100**	4	1	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3

	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others		4	2	2
	PC6.state methods of accident prevention in the work environment of the job role		3	2	1
	PC7.state location of general health and safety equipment in the workplace		5	2	3
	PC8.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC9.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC10.lift heavy objects safely using correct procedures		4	2	2
	PC11.apply good housekeeping practices at all times		5	2	3
	PC12.identify common hazard signs displayed in various areas		3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		4	1	3
	PC14.use the various appropriate fire extinguishers on different types of fires correctly		3	1	2
	PC15.demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards		4	1	3
	PC17.demonstrate the correct use of a fire extinguisher		4	1	3
	PC18.demonstrate how to free a person from electrocution		4	1	3
	PC19.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC20.demonstrate basic techniques of bandaging		3	1	2
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC23.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2

	PC24.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC25.participate in emergency procedures		4	1	3
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		4	2	2
		Total	**100**	**36**	**64**
CSC/N1336 Work effectively with others	PC1.receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7
	PC2.pass information accurately to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
		Total	**100**	**30**	**70**