Model Curriculum

QP Name: Tungsten Inert Gas Welder (GTAW)

QP Code: CSC/Q0212

QP Version: 2.0

NSQF Level: 4

Model Curriculum Version: 2.0

Capital Goods Skill Council || 1st Floor, L-29, Outer Circle, Connaught PlaceNew Delhi – 110001 ||
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Training Parameters

Sector	Capital Goods
Sub-Sector	1. Machine Tools 2. Dies, Moulds and Press Tools 3. Plastics Manufacturing Machinery 4. Textile Manufacturing Machinery 5. Process Plant Machinery 6. Electrical and Power Machinery 7. Light Engineering Goods
Occupation	Welding and Cutting
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7212.0105
Minimum Educational Qualification and Experience	10th Class with 2 years of experience Or 10th class + ITI - Welding (2years) Or 12th Pass with 6 Months of experience Or Shielded Metal Arc Welder NSQF Level 3 with 2 years of experience in the relevant field
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	31/03/2022
Next Review Date	31/03/2025
NSQC Approval Date	31/03/2022
QP Version	2.0
Model Curriculum Creation Date	31/03/2022
Model Curriculum Valid Up to Date	31/03/2025
Model Curriculum Version	2.0
Minimum Duration of the Course	480 Hours 00 Minutes
Maximum Duration of the Course	480 Hours 00 Minutes

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Perform preparatory activities such as identification of raw material, tools and equipment, lifting of workpiece, inspection of tools and equipment etc.
- Perform TIG welding process by following organisational procedure.
- Perform post-welding operations such as inspection, quality check, cleaning etc.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Optimize the use of resources to ensure less wastage and maximum conservation.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module					
Module 1: Introduction to the role of a Tungsten Inert Gas Welder (GTAW)	8:00	0:00	0:00	00:00	8:00
CSC/N1335 – Follow the health and safety practices at work NOS Version- 2.0 NSQF Level- 3	**20:00**	**40:00**	**0:00**	**0:00**	**60:00**
Module 2: Health and safety practices	20:00	40:00	0:00	00:00	60:00
CSC/N1336 – Coordinate with co-workers to achieve work efficiency NOS Version-2.0 NSQF Level- 3	**20:00**	**30:00**	**0:00**	**00:00**	**50:00**
Module 3: Process of coordinating with co-workers to achieve work efficiency	20:00	30:00	0:00	00:00	50:00
CSC/N0212 – Perform Tungsten Inert Gas (TIG) Welding on metals NOS Version No. – 2.0 NSQF Level – 4	**72:00**	**290:00**	**0:00**	**00:00**	**362:00**
Module 4: Perform Tungsten Inert Gas Welding (TIG) process	72:00	290:00	0:00	00:00	362:00
Total Duration	**120:00**	**360:00**	**0:00**	**00:00**	**480:00**

Module Details

Module 1: Introduction to the role of a Tungsten Inert Gas Welder (GTAW)

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of a Tungsten Inert Gas Welder (GTAW).

Duration: 08:00	Duration: 00:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of a Tungsten Inert Gas Welder (GTAW). • Discuss the job opportunities of a Tungsten Inert Gas Welder (GTAW). • Describe the size and scope of the capital good industry and its sub-sectors. • Explain about Indian capital goods manufacturing market. • Discuss the standards and procedures involved in the different operations of welding.	
Classroom Aids:	
Whiteboard, marker pen, projector, standard checklists and schedules	
Tools, Equipment and Other Requirements	

Module 2: Health and safety Practices

Mapped to CSC/N1335 v2.0

Terminal Outcomes:

- Demonstrate ways to maintain personal health and safety.
- Describe the process of assisting in hazard management.
- Explain how to check the first aid box, firefighting and safety equipment.
- Describe the process of assisting in waste management.
- Explain the importance of following the fire safety guidelines.
- Explain the importance of following the emergency and first-aid procedures.
- Demonstrate the process of carrying out relevant documentation and review.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask. • Explain the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them. • Explain the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions. • Explain the recommended techniques to be followed while lifting and moving heavy objects to avoid injury. • Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment. • Explain the importance and process of identifying existing and potential hazards at work. • Describe the process of assessing the potential risks and injuries associated with the various hazards. • Explain how to prevent or minimise different types of hazards. • Explain how to handle and store hazardous materials safely. • Explain the importance of ensuring the first aid box is updated with the relevant first aid supplies. • Describe the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable	• Demonstrate the use of appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions. • Demonstrate how to handle hazardous materials safely. • Demonstrate the process of testing the firefighting and various safety equipment to ensure they are in usable condition. • Demonstrate the process of recycling and disposing different types of waste appropriately. • Demonstrate how to use the appropriate type of fire extinguisher to extinguish different types of fires safely. • Demonstrate how to administer appropriate first aid to the injured personnel. • Demonstrate the process of performing Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest. • Demonstrate the process of carrying out appropriate documentation following a health and safety incident at work, including all the required information.

condition. • Explain the criteria for segregating waste into appropriate categories. • Describe the appropriate methods for recycling recyclable waste. • Describe the process of disposing of the non-recyclable waste safely and the applicable regulations. • Explain the use of different types of fire extinguishers to extinguish different types of fires. • State the recommended practices to be followed for a safe rescue during a fire emergency. • Explain how to request assistance from the fire department to extinguish a serious fire. • Explain the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property. • State the common health and safety hazards present in a work environment, associated risks, and how to mitigate them. • State the safe working practices to be followed while working at various hazardous sites and using electrical equipment. • Explain the importance of ensuring easy access to firefighting and safety equipment. • Explain the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases. • Explain various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents. • Describe different methods of extinguishing fire. • List different materials used for extinguishing fire. • Explain the applicable rescue techniques to be followed during a fire emergency. • Explain the importance of placing safety signs and instructions at strategic locations in a workplace and following them. • Explain different types of first aid treatment to be provided for different	

types of injuries. • State the potential injuries associated with incorrect manual handling. • Explain how to move an injured person safely. • State various hazards associated with the use of various machinery, tools, implements, equipment and materials. • Explain the importance of ensuring no obstruction and free access to fire exits. • Explain how to free a person from electrocution safely. • Explain how to administer appropriate first aid to an injured person. • Explain how to perform Cardiopulmonary Resuscitation (CPR). • Explain the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation. • State the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included. • Explain the importance and process of reviewing the health and safety conditions at work regularly or following an incident. • Explain the importance and process of implementing appropriate changes to improve the health and safety conditions at work.	
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
Tools, Equipment and Other Requirements	
Personal Protective Equipment, Cleaning Equipment and Materials, Sanitizer, Soap, Mask	

Module 3: Process of coordinating with co-workers to achieve work efficiency

Mapped to CSC/N1336 v2.0

Terminal Outcomes:

- Demonstrate ways to work and communicate effectively with co-workers.
- Discuss ways to promote diversity and inclusion at the workplace.

Duration: 20:00	Duration: 30:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance and process of effective communication in the workplace. • Explain the barriers to effective communication and how to overcome them. • Explain the importance of teamwork in an organisation's and individual's success. • Explain the importance of active listening in the work environment. • State the appropriate techniques to be followed for active listening. • Explain the importance of tone and pitch ineffective communication. • Explain the importance of avoiding casual expletives and unpleasant terms while communicating professional circles. • Explain the importance of maintaining discipline and ethical behaviour at work. • State the common reasons for interpersonal conflict and how to resolve them. • Explain the importance of developing effective working relationships for professional success. • Describe the process of expressing and addressing grievances appropriately and effectively. • Explain the importance and process of planning daily tasks to ensure their timely completion and efficient use of time. • Explain the importance of adhering to the limits of authority at work. • Explain the importance of following the applicable quality standards and timescales at work. • Explain the importance of coordinating with co-workers to achieve the work objectives efficiently. • Explain the relevant documentation requirements.	• Demonstrate the process of preparing the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically. • Demonstrate how to mentor and assist subordinates in the execution of their work responsibilities. • Demonstrate the process of using various resources efficiently to ensure maximum utilisation and minimum wastage. • Demonstrate how to communicate clearly and politely to ensure effective communication with co-workers. • Demonstrate appropriate verbal and non-verbal communication that is respectful of genders and disability.

• Explain the importance of providing appropriate information clearly and systematically in work documents. • State the escalation matrix to be followed to deal with out of authority tasks and concerns. • Explain the importance and process of mentoring and assisting subordinates in the execution of their work responsibilities. • Explain how to identify possible disruptions to work prevent them. • Explain how to use various resources efficiently to ensure maximum utilisation and minimum wastage. • Explain the recommended practices to be followed at work to avoid and resolve conflicts at work. • Explain the importance and process of efficient and timely dissemination of information to the authorised personnel. • Explain the procedure to report inappropriate behaviour e.g., harassment.	
Classroom Aids:	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
NA	

Module 4: Perform Tungsten Inert Gas Welding (TIG) process

Mapped to CSC/N0212, v2.0

Terminal Outcomes:

- Perform the steps to carry out preparatory activities such as lifting of workpiece, inspection of tools and equipment, selection of workpiece etc.
- Demonstrate the process of TIG welding.
- Perform the steps to carry out post-welding activities.

Duration: 72:00	Duration: 290:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss basic principle of welding process. • Describe basic process of TIG welding. • Describe different types of welds and welding joints. • Describe different welding positions. • Discuss the information derived from the job orders, Welding Procedure Specification (WPS) and engineering drawings and instructions received from supervisor. • List tools, measuring instruments, equipment, accessories, consumables and input material required during TIG welding work. • Explain the selection criteria of tools, equipment, accessories, consumables, measuring instruments and input material for the TIG welding work. • Discuss the organisational process of collecting and arranging tools, equipment, accessories, consumables, measuring instruments and input material from the store. • Discuss the need of adequate supply of components and consumables during welding. • Summarise the steps to be performed for checking the input material, tools and equipment before use. • Describe pre-purge and post-purge. • Elaborate importance and application of back purging. • Describe purpose and importance of pre-heating and post-heating of workpiece. • Explain methods to achieve pre-heat and post heat requirements. • Discuss the importance of maintaining welding parameters as per the Work Instructions (WI) and their impact on	• Read the drawing, WPS and job orders for identifying work requirements. • Apply appropriate ways of checking the input material, tools and equipment for defects before use. • Demonstrate the standard operating procedure to use tools, equipment and measuring instruments required during job. • Show how to prepare the work area for welding activities. • Show how to prepare the materials and joint for welding process. • Show how to set the TIG welding apparatus and its parameters as per the work instructions. • Show how to set pre-purge with shielding gas. • Demonstrate the procedure of installing the work pieces and fixture on the apparatus and aligning with the electrodes. • Apply appropriate ways to prepare tungsten electrode and sharpen its tip into desired shape. • Demonstrate organisational procedure of verifying set up by running test weld specimen. • Demonstrate organizational specified procedure of starting TIG welding machine and performing TIG welding process in all positions for producing different type of joints. • Show how to maintain correct angle of torch, travel speed, direction of weld and feed as per requirement during the welding operation. • Read the measurement gauges and monitor the process parameters to

quality and quantity of output product. • List the steps to be performed for TIG welding process. • Describe various TIG welding operations to produce different joints on different forms of metal. • Describe methods to produce the various joints i.e. with filler wire and without filler wire. • Discuss the importance of monitoring process parameters and machine operations during the welding and correcting them as per the requirements. • Discuss post welding processes like inspection, cleaning, maintenance etc. • Explain methods of inspecting the quality of welded workpieces. • List the commonly occurring defects and their remedies in the welded workpieces. • Describe various testing techniques like visual, destructive and non-destructive. • Discuss the process of segregating, tagging and storing of damaged and ok workpieces as per organisational guidelines. • List different methods for disposing off waste material and scrap. • Discuss the necessary precautions to avoid any hazard and accident during welding activities.	maintain the quality standards. • Demonstrate procedure of producing the various joints by both the methods i.e. with filler wire and without filler wire • Employ appropriate ways of measuring and comparing welded piece dimensions with the specified dimensions in the job orders. • Show how to shut down the welding equipment and remove the workpiece after completion of welding activities. • Demonstrate appropriate inspection method to check the quality of welded workpieces. • Employ appropriate testing methods like destructive and non-destructive tests for checking the quality of welded workpiece. • Demonstrate procedure to segregate, tag and store welded pieces as per organisational guidelines. • Demonstrate organisational procedure of cleaning and storing all the tools, machine and equipment after completion of work. • Employ appropriate ways for checking the machine operations for any defects in the component. • Show how to dispose waste as per organisational guidelines. • Perform steps to report to the supervisor about any problems faced or anticipated during the complete process.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Basic tool box, Work bench with vice • Hammer, Chisel set, Centre punch 9mm x 127mm, Dividers 20 cm, Wire brush 15 cm x 3.7 mm, Spark lighter, Number punch 6 mm and letter punch 6 mm, Scriber 15 cm, Tongs holding • Steel rule, Screw driver set, Hacksaw frame adjustable 30 cm, Magnifying glass 15 cm, Weld measuring gauge fillet and butt, file set, Steel tape 182 cm flexible in case, Try square • Rubber hose clips, Spindle key (for opening cylinder valve), Pressure regulator oxygen double stage, Pressure regulator acetylene regulator, Tip cleaner, Outfit spanner • Power hacksaw, Portable grinder • Power source, TIG welding set • Dye penetrant test kit, Ultrasonic testing kit, Magnetic particle testing kit, X-ray testing kit • Hand book, job orders, work order, completion material requests, and Technical Reference Books. • **Safety materials**: Fire extinguisher, welding helmet, Leather sleeves, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, safety shoes and first-aid kit • **Cleaning material**: Tip cleaner, wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Mechanical	4	Welding	1	Welding	NA
B.E/B.Tech	Mechanical	3	Welding	1	Welding	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Tungsten Inert Gas Welder (GTAW), CSC/Q0212, version 2.0". Minimum accepted score is 80%.	"Trainer, MEP/Q2601 v1.0" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Mechanical	4	Welding	1	Welding	NA
B.E/B.Tech	Mechanical	3	Welding	1	Welding	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Tungsten Inert Gas Welder (GTAW), CSC/Q0212, version 2.0". Minimum accepted score is 80%.	"Assessor; MEP/Q2701 v1.0" Minimum accepted score is 80%.

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Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - Assessor must be ToA certified & trainer must be ToT Certified
    - Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - Hard copies of the documents are stored
    - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
    - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
SOP	Standard Operating Procedure
WI	Work Instructions
PPE	Personal Protective equipment