

## Qualification Pack



# Senior Tungsten Inert Gas Welder (GTAW)

QP Code: CSC/Q0213

Version: 2.0

NSQF Level: 5

Capital Goods Skill Council || 1st Floor, L-29, Outer Circle, Connaught Place  
New Delhi - 110001 || email: [coo@cgsc.in](mailto:coo@cgsc.in)



## Qualification Pack

### Contents

|   |    |
|---|----|
| CSC/Q0213: Senior Tungsten Inert Gas Welder (GTAW).....                           | 3  |
| <i>Brief Job Description</i> .....  | 3  |
| Applicable National Occupational Standards (NOS) .....                            | 3  |
| <i>Compulsory NOS</i> .....   | 3  |
| <i>Qualification Pack (QP) Parameters</i> .....                                   | 3  |
| CSC/N1335: Follow the health and safety practices at the workplace .....          | 5  |
| CSC/N1336: Coordinate with co-workers to achieve work efficiency.....             | 12 |
| CSC/N0213: Supervise and perform Tungsten Inert Gas (TIG) Welding on metals ..... | 18 |
| Assessment Guidelines and Weightage.....  | 26 |
| <i>Assessment Guidelines</i> .....  | 26 |
| <i>Assessment Weightage</i> .....   | 26 |
| Acronyms .....  | 27 |
| Glossary .....  | 28 |

## Qualification Pack

### CSC/Q0213: Senior Tungsten Inert Gas Welder (GTAW)

#### Brief Job Description

The incumbent in the job is responsible for supervising and performing GTAW welding process to produce various joints and post-welding activities such as inspection of equipment condition, gauging, testing and inspection of welded work pieces.

#### Personal Attributes

The job holder must have an eye for detail as well as the patience and discipline required to carry out detailed and repetitive tasks. The candidate should be able to read and understand technical manuals, instructions and warnings.

#### Applicable National Occupational Standards (NOS)

##### Compulsory NOS:

1. [CSC/N1335: Follow the health and safety practices at the workplace](#)
2. [CSC/N1336: Coordinate with co-workers to achieve work efficiency](#)
3. [CSC/N0213: Supervise and perform Tungsten Inert Gas \(TIG\) Welding on metals](#)

#### Qualification Pack (QP) Parameters

|            |   |
|------------|---|
| Sector     | Capital Goods   |
| Sub-Sector | 1. Machine Tools<br>2. Dies, Moulds and Press Tools<br>3. Plastics Manufacturing Machinery<br>4. Textile Manufacturing Machinery<br>5. Process Plant Machinery<br>6. Electrical and Power Machinery<br>7. Light Engineering Goods |
| Occupation | Welding and Cutting   |
| Country    | India   |
| NSQF Level | 5   |

### Qualification Pack

|   |  |
|---|--|
| Aligned to NCO/ISCO/ISIC Code                     | NCO-2015/7212.0105   |
| Minimum Educational Qualification & Experience    | 12th Pass + ITI Welding (2 years) with 2 years of experience in the relevant field<br>Or<br>12th Pass with 4 years of experience in the relevant field<br>Or<br>GTAW Welder Level - 4 with 2 years of experience in the relevant field |
| Minimum Level of Education for Training in School |  |
| Pre-Requisite License or Training                 | NA   |
| Minimum Job Entry Age                             | 18 Years   |
| Last Reviewed On                                  |  |
| Next Review Date                                  |  |
| Deactivation Date                                 |  |
| NSQC Approval Date                                |  |
| Version   | 2.0  |
| Reference code on NQR                             |  |
| NQR Version                                       | 2.0  |

## Qualification Pack

### CSC/N1335: Follow the health and safety practices at work

#### Description

This OS unit is about following the appropriate health and safety practices at work. It covers responsibilities towards self and others to ensure a safe work environment.

#### Scope

This unit/task covers the following:

- Maintain personal health and safety
- Assist in hazard management
- Check the first aid box, firefighting and safety equipment
- Assist in waste management
- Follow the fire safety guidelines
- Follow the emergency and first-aid procedures
- Carry out relevant documentation and review

#### Elements and Performance Criteria

##### *Maintain personal health and safety*

To be competent, the user/individual on the job must be able to:

- PC1. follow the recommended practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask
- PC2. check the work conditions, assess the potential health and safety risks, and take appropriate measures to mitigate them
- PC3. select and use the appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions
- PC4. follow the recommended techniques while lifting and moving heavy objects to avoid injury
- PC5. follow the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment

##### *Assist in hazard management*

To be competent, the user/individual on the job must be able to:

- PC6. identify existing and potential hazards at work
- PC7. assess the potential risks and injuries associated with the identified hazards
- PC8. coordinate with the supervisor or other relevant personnel to prevent or minimise the identified hazards
- PC9. handle hazardous materials safely and store them in the designated storage

##### *Check the first aid box, firefighting and safety equipment*

To be competent, the user/individual on the job must be able to:

- PC10. check the first aid box to ensure it is updated with the relevant first aid supplies
- PC11. check and test the firefighting and various safety equipment to ensure they are in usable condition

## Qualification Pack

PC12. coordinate with the supervisor for the repair and replacement of firefighting and safety equipment

### *Assist in waste management*

To be competent, the user/individual on the job must be able to:

PC13. segregate waste into appropriate categories

PC14. recycle the recyclable waste appropriately

PC15. dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations

### *Follow the fire safety guidelines*

To be competent, the user/individual on the job must be able to:

PC16. use the appropriate type of fire extinguisher to extinguish different types of fires safely

PC17. follow the recommended practices for a safe rescue during a fire emergency

PC18. coordinate with the fire department to request assistance to extinguish a serious fire

### *Follow the emergency and first-aid procedures*

To be competent, the user/individual on the job must be able to:

PC19. follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety

PC20. follow the recommended practices to minimise loss to organisational property during an emergency

PC21. follow the recommended procedure to free a person from electrocution

PC22. administer appropriate first aid to the injured personnel

PC23. perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest

PC24. coordinate with the emergency services to request medical assistance for seriously injured/ ill personnel requiring professional medical attention or hospitalisation

### *Carry out relevant documentation and review*

To be competent, the user/individual on the job must be able to:

PC25. carry out appropriate documentation following a health and safety incident at work, including all the required information

PC26. coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident

PC27. assist in implementing appropriate changes to improve the health and safety conditions at work

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. 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

KU2. the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them

### Qualification Pack

- KU3. the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions
- KU4. the recommended techniques to be followed while lifting and moving heavy objects to avoid injury
- KU5. the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment
- KU6. the importance and process of identifying existing and potential hazards at work
- KU7. the process of assessing the potential risks and injuries associated with the various hazards
- KU8. how to prevent or minimise different types of hazards
- KU9. how to handle and store hazardous materials safely
- KU10. the importance of ensuring the first aid box is updated with the relevant first aid supplies
- KU11. the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition
- KU12. the criteria for segregating waste into appropriate categories
- KU13. the appropriate methods for recycling the recyclable waste
- KU14. the process of disposing of the non-recyclable waste safely and the applicable regulations
- KU15. use of different types of fire extinguishers to extinguish different types of fires
- KU16. the recommended practices to be followed for a safe rescue during a fire emergency
- KU17. how to request assistance from the fire department to extinguish a serious fire
- KU18. the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property
- KU19. common health and safety hazards present in a work environment, associated risks, and how to mitigate them
- KU20. safe working practices to be followed while working at various hazardous sites and using electrical equipment
- KU21. the importance of ensuring easy access to firefighting and safety equipment
- KU22. the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases
- KU23. various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents
- KU24. different methods of extinguishing fire
- KU25. different materials used for extinguishing fire, such as sand, water, foam, CO<sub>2</sub>, dry powder, etc.
- KU26. the applicable rescue techniques to be followed during a fire emergency
- KU27. the importance of placing safety signs and instructions at strategic locations in a workplace and following them
- KU28. different types of first aid treatment to be provided for different types of injuries
- KU29. potential injuries associated with incorrect manual handling
- KU30. how to move an injured person safely
- KU31. various hazards associated with the use of various machinery, tools, implements, equipment and materials

### Qualification Pack

- KU32. the importance of ensuring no obstruction and free access to fire exits
- KU33. how to free a person from electrocution safely
- KU34. how to administer appropriate first aid to an injured person
- KU35. how to perform Cardiopulmonary Resuscitation (CPR)
- KU36. the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation
- KU37. the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included
- KU38. the importance and process of reviewing the health and safety conditions at work regularly or following an incident
- KU39. the importance and process of implementing appropriate changes to improve the health and safety conditions at work

### Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. maintain work-related notes and records
- GS2. communicate clearly and politely with co-workers and clients
- GS3. read the relevant literature to get the latest updates about the field of work
- GS4. listen attentively to understand the information being shared
- GS5. plan and prioritise tasks to ensure timely completion
- GS6. take quick decisions to deal with workplace emergencies and accidents
- GS7. identify possible disruptions to work and take appropriate preventive measures
- GS8. coordinate with the co-workers to achieve the work objectives
- GS9. evaluate all possible solutions to a problem to select the best one



## Qualification Pack

### Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Maintain personal health and safety</i>   | 7            | 12              | -             | -          |
| PC1. follow the recommended practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask | 2            | 3               | -             | -          |
| PC2. check the work conditions, assess the potential health and safety risks, and take appropriate measures to mitigate them                           | 1            | 2               | -             | -          |
| PC3. select and use the appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions                                       | 1            | 2               | -             | -          |
| PC4. follow the recommended techniques while lifting and moving heavy objects to avoid injury  | 1            | 3               | -             | -          |
| PC5. follow the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment                      | 2            | 2               | -             | -          |
| <i>Assist in hazard management</i>   | 4            | 10              | -             | -          |
| PC6. identify existing and potential hazards at work   | 1            | 1               | -             | -          |
| PC7. assess the potential risks and injuries associated with the identified hazards  | 1            | 3               | -             | -          |
| PC8. coordinate with the supervisor or other relevant personnel to prevent or minimise the identified hazards  | 1            | 3               | -             | -          |
| PC9. handle hazardous materials safely and store them in the designated storage  | 1            | 3               | -             | -          |
| <i>Check the first aid box, firefighting and safety equipment</i>  | 3            | 7               | -             | -          |
| PC10. check the first aid box to ensure it is updated with the relevant first aid supplies   | 1            | 2               | -             | -          |
| PC11. check and test the firefighting and various safety equipment to ensure they are in usable condition  | 1            | 3               | -             | -          |
| PC12. coordinate with the supervisor for the repair and replacement of firefighting and safety equipment   | 1            | 2               | -             | -          |
| <i>Assist in waste management</i>  | 3            | 8               | -             | -          |
| PC13. segregate waste into appropriate categories  | 1            | 3               | -             | -          |

### Qualification Pack

|  |           |           |   |   |
|--|-----------|-----------|---|---|
| PC14.recycle the recyclable waste appropriately  | 1         | 3         | - | - |
| PC15.dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations  | 1         | 2         | - | - |
| <i>Follow the fire safety guidelines</i>   | 3         | 12        | - | - |
| PC16.use the appropriate type of fire extinguisher to extinguish different types of fires safely   | 1         | 4         | - | - |
| PC17.follow the recommended practices for a safe rescue during a fire emergency  | 1         | 4         | - | - |
| PC18.coordinate with the fire department to request assistance to extinguish a serious fire  | 1         | 4         | - | - |
| <i>Follow the emergency and first-aid procedures</i>   | 7         | 12        | - | - |
| PC19.follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety  | 1         | 2         | - | - |
| PC20.follow the recommended practices to minimise loss to organisational property during an emergency  | 1         | 3         | - | - |
| PC21.follow the recommended procedure to free a person from electrocution  | 1         | 2         | - | - |
| PC22.administer appropriate first aid to the injured personnel   | 1         | 2         | - | - |
| PC23.perform Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest   | 1         | 2         | - | - |
| PC24.coordinate with the emergency services to request medical assistance for seriously injured/ ill personnel requiring professional medical attention or hospitalisation | 2         | 1         | - | - |
| <i>Carry out relevant documentation and review</i>   | 3         | 9         | - | - |
| PC25.carry out appropriate documentation following a health and safety incident at work, including all the required information  | 1         | 3         | - | - |
| PC26.coordinate with the relevant personnel to review health and safety conditions at work regularly or following an incident  | 1         | 3         | - | - |
| PC27.assist in implementing appropriate changes to improve the health and safety conditions at work  | 1         | 3         | - | - |
| <b>NOS Total</b>   | <b>30</b> | <b>70</b> | - | - |

## Qualification Pack

### National Occupational Standards (NOS) Parameters

|                     |  |
|---------------------|--|
| NOS Code            | CSC/N1335  |
| NOS Name            | Follow the health and safety practices at the work |
| Sector              | Capital Goods                                      |
| Sub-Sector          | Generic  |
| Occupation          | Generic  |
| NSQF Level          | 3  |
| Credits             | TBD  |
| Version             | 2.0  |
| Last Reviewed Date  |  |
| Next Review Date    |  |
| Deactivation Date   |  |
| NSQC Clearance Date |  |

## Qualification Pack

### CSC/N1336: Coordinate with co-workers to achieve work efficiency

#### Description

This OS unit is about working in coordination with co-workers to achieve the work objectives efficiently. It also covers practising inclusion at work.

#### Scope

This unit/task covers the following:

- Work effectively with co-workers
- Communicate effectively with co-workers
- Practice inclusion at work

#### Elements and Performance Criteria

##### *Work effectively with co-workers*

To be competent, the user/individual on the job must be able to:

- PC1. plan daily tasks at work to ensure their timely completion and efficient use of time
- PC2. carry out work responsibilities adhering to the limits of authority
- PC3. follow the supervisor's instructions to ensure adherence to the applicable quality standards and timescales
- PC4. coordinate with the co-workers to achieve the work objectives efficiently
- PC5. prepare the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically
- PC6. coordinate with the supervisor or relevant personnel to deal with out of authority tasks and concerns
- PC7. mentor and assist subordinates in the execution of their work responsibilities
- PC8. identify possible disruptions to work through coordination with the relevant stakeholders and take appropriate preventive measures
- PC9. use various resources efficiently to ensure maximum utilisation and minimum wastage
- PC10. follow the recommended practices to avoid and resolve conflicts at work
- PC11. follow the relevant organisational policies to ensure disciplined behaviour with maximum productivity at work

##### *Communicate effectively with co-workers*

To be competent, the user/individual on the job must be able to:

- PC12. follow the organisational policy for the efficient and timely dissemination of information to the authorised personnel
- PC13. communicate clearly and politely to ensure effective communication with co-workers
- PC14. follow the appropriate techniques for active listening during interactions

##### *Practice inclusion at work*

To be competent, the user/individual on the job must be able to:

- PC15. empathise with Persons with Disabilities (PwD)

## Qualification Pack

PC16. adopt gender-neutral behaviour at work

### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the importance and process of effective communication in the workplace
- KU2. the barriers to effective communication and how to overcome them
- KU3. the importance of teamwork in an organisation's and individual's success
- KU4. the importance of active listening in the work environment
- KU5. the appropriate techniques to be followed for active listening
- KU6. importance of tone and pitch in effective communication
- KU7. importance of avoiding casual expletives and unpleasant terms while communicating professional circles
- KU8. the importance of maintaining discipline and ethical behaviour at work
- KU9. the common reasons for interpersonal conflict and how to resolve them
- KU10. the importance of developing effective working relationships for professional success
- KU11. how expressing and addressing grievances appropriately and effectively
- KU12. the importance and process of planning daily tasks to ensure their timely completion and efficient use of time
- KU13. the importance of adhering to the limits of authority at work
- KU14. the importance of following the applicable quality standards and timescales at work
- KU15. the importance of coordinating with the co-workers to achieve the work objectives efficiently
- KU16. the relevant documentation requirements
- KU17. the importance of providing appropriate information clearly and systematically in work documents
- KU18. the escalation matrix to be followed to deal with out of authority tasks and concerns
- KU19. the importance and process of mentoring and assisting subordinates in the execution of their work responsibilities
- KU20. how to identify possible disruptions to work prevent them
- KU21. how to use various resources efficiently to ensure maximum utilisation and minimum wastage
- KU22. the recommended practices to be followed at work to avoid and resolve conflicts at work
- KU23. the importance and process of efficient and timely dissemination of information to the authorised personnel
- KU24. how to communicate clearly and politely to ensure effective communication
- KU25. the importance of following the recommended practices to ensure an inclusive environment for PwD and all genders at work



## Qualification Pack

### Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. maintain work-related notes and records
- GS2. read work-related and other relevant literature
- GS3. communicate politely and -professionally
- GS4. listen attentively to understand the information or instructions being shared
- GS5. plan and prioritise tasks to ensure timely completion
- GS6. take prompt decisions to deal with workplace emergencies and accidents
- GS7. evaluate all possible solutions to a problem to select the best one

## Qualification Pack

### Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Work effectively with co-workers</i>  | 20           | 24              | -             | -          |
| PC1. plan daily tasks at work to ensure their timely completion and efficient use of time  | 2            | 4               | -             | -          |
| PC2. carry out work responsibilities adhering to the limits of authority   | 2            | 4               | -             | -          |
| PC3. follow the supervisor's instructions to ensure adherence to the applicable quality standards and timescales                                   | 2            | 4               | -             | -          |
| PC4. coordinate with the co-workers to achieve the work objectives efficiently   | 2            | 4               | -             | -          |
| PC5. prepare the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically | 2            | 4               | -             | -          |
| PC6. coordinate with the supervisor or relevant personnel to deal with out of authority tasks and concerns   | 2            | 4               | -             | -          |
| PC7. mentor and assist subordinates in the execution of their work responsibilities  | 2            | 4               | -             | -          |
| PC8. identify possible disruptions to work through coordination with the relevant stakeholders and take appropriate preventive measures            | 2            | 4               | -             | -          |
| PC9. use various resources efficiently to ensure maximum utilisation and minimum wastage   | 2            | 4               | -             | -          |
| PC10. follow the recommended practices to avoid and resolve conflicts at work  | 1            | 4               | -             | -          |
| PC11. follow the relevant organisational policies to ensure disciplined behaviour with maximum productivity at work                                | 1            | 3               | -             | -          |
| <i>Communicate effectively with co-workers</i>   | 6            | 15              | -             | -          |
| PC12. follow the organisational policy for the efficient and timely dissemination of information to the authorised personnel                       | 2            | 5               | -             | -          |
| PC13. communicate clearly and politely to ensure effective communication with co-workers   | 2            | 5               | -             | -          |
| PC14. follow the appropriate techniques for active listening during interactions   | 2            | 5               | -             | -          |
| <i>Practice inclusion at work</i>  | 4            | 12              | -             | -          |



### Qualification Pack

|  |           |           |          |          |
|--|-----------|-----------|----------|----------|
| PC15. empathise with Persons with Disabilities (PWD) | 2         | 6         | -        | -        |
| PC16. adopt gender-neutral behaviour at work         | 2         | 6         | -        | -        |
| <b>NOS Total</b>                                     | <b>30</b> | <b>70</b> | <b>-</b> | <b>-</b> |



## Qualification Pack

### National Occupational Standards (NOS) Parameters

|                     |   |
|---------------------|---|
| NOS Code            | CSC/N1336   |
| NOS Name            | Coordinate with co-workers to achieve work efficiency |
| Sector              | Capital Goods   |
| Sub-Sector          | Generic   |
| Occupation          | Generic   |
| NSQF Level          | 3   |
| Credits             | TBD   |
| Version             | 2.0   |
| Last Reviewed Date  |   |
| Next Review Date    |   |
| Deactivation Date   |   |
| NSQC Clearance Date |   |

## Qualification Pack

# CSC/N0213: Supervise and perform Tungsten Inert Gas (TIG) Welding on metals

## Description

This unit is about supervising and performing Tungsten Inert Gas (TIG) Welding and post-welding operations as per the given specifications and standards specified by the organisation.

## Scope

The scope covers the following :

- Prepare for welding operations
- Perform Tungsten Inert Gas (TIG) Welding operations
- Manage post-welding operations

## Elements and Performance Criteria

### *Prepare for welding operations*

To be competent, the user/individual on the job must be able to:

- PC1. identify the work to be done and product specifications by interpreting the product drawing, Welding Procedure Specification (WPS) and job orders
- PC2. prepare plan and schedule to meet the production target and give instructions to welders and helpers about the processes required to be performed for achieving the same
- PC3. select the right material, equipment, fixtures, accessories, welding torch and consumables (i.e. tungsten electrode, filler wire, shielding gas etc.) as per the SOP and job requirements
- PC4. ensure that all the tools, welding machines, measuring instruments, accessories, consumables and input materials (carbon steel, low alloy steel) required for the job are in stock, functioning properly and are available on the shop floor
- PC5. ensure that input materials are as per the requirements and meet required quality standards
- PC6. plan the welding activities before starting the actual process as per WPS
- PC7. guide the welders and helpers in setting of the TIG welding machine and its parameters as per the WPS and SOP
- PC8. check that welding apparatus is set for operation, workpieces and fixtures are installed on apparatus and aligned with the electrodes properly as per the job requirements
- PC9. ensure that electrodes distance, contact area, pressure, application etc. are maintained as specified in Work Instructions (WI)
- PC10. verify set up by running test weld on the specimen (scrap plate)
- PC11. obtain clearance from quality control for weld joint before welding

### *Perform Tungsten Inert Gas (TIG) Welding operations*

To be competent, the user/individual on the job must be able to:

- PC12. follow safety precautions during welding work as per SOP and organizational guidelines
- PC13. use correct technique for starting the arc (i.e. (using HF (high frequency) unit, scratching the

### Qualification Pack

electrode on the job material, lifting the electrode immediately after touching the job material)

- PC14. weld the first component and inspect it for conformance to required specifications by using precision gauges
- PC15. check the output for quality and correct the welding machine settings to meet the required quality output
- PC16. support the welders and helpers in performing TIG welding process using appropriate welding techniques as per SOP
- PC17. supervise the welding operations and mass production process of component to ensure delivery as per plan
- PC18. monitor that welders and helpers are producing joints of the specified dimensional accuracy and required weld quality which is equivalent to level B of ISO 5817
- PC19. ensure that welding operators and technicians are following the do's and don'ts of the manufacturing process as defined in SOPs/WI
- PC20. ensure the welding process parameters (air pressure, electrode force, electrode distance, gas flow, etc.) are within standards by reading the various gauges and correct them if not within standards
- PC21. support the welders and helpers in comparing the dimensions of the final welded piece as prescribed in the WPS and engineering drawing

#### *Manage post-welding operations*

To be competent, the user/individual on the job must be able to:

- PC22. conduct random sampling and quality checks on the finished products and report the same to the relevant authorities or take action for its improvement
- PC23. support the welders and helpers in conducting visual inspection, destructive and non-destructive tests on the work pieces
- PC24. carry out LPT tests to assess fine defect open to the surface not detected by visual inspection (VT)
- PC25. ensure that the welders and helpers are segregating and storing the welded components properly by following organisational procedures
- PC26. ensure that the welders and helpers are disposing scrap or waste material in accordance with the company policies and environmental regulations
- PC27. check the machine operations for any malfunctions/defects in the component and immediately inform the supervisor/maintenance team for correction
- PC28. prepare and maintain records related to welding and maintenance conducted

### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. relevant legislation, standards, policies, and procedures followed in the organization
- KU2. the basic principle of welding process
- KU3. TIG welding and its process flow
- KU4. various types of welding joints (i.e. fillet lap joints, tee fillet joints, corner joints, butt joints (square, single vee, double vee, single j (for higher thickness), double j)

### Qualification Pack

- KU5. different welding positions (i.e. flat (PA) 1G/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, Plate to Pipe (Fixed) 5F, Pipe to Pipe 5G, Pipe welding at inclined position 6G)
- KU6. how to read and interpret WPS, welding drawings and symbols
- KU7. welding specific equipment requirements for TIG welding  
**TIG welding equipment:** transformers, rectifiers, generators, invertors;  
**Consumables** - Tungsten electrodes, filler wire, shielding gas  
**Welding accessories** - holders, cables, welding torch and accessories;  
**Ancillary equipment** - power saw, angle, pedestal and straight grinders, tong tester; etc.
- KU8. SOP recommended by the manufacturer for using tools, measuring instruments, accessories, MMAW welding machine etc. during the welding process
- KU9. main components and controls of welding equipment
- KU10. type of current used and implication
- KU11. ISO colour codes for welding apparatus such as gas cylinder, hoses, electric cables, etc.
- KU12. **joint preparation process:** made rust free; cleaned - free from scaling, paint, oil/grease; made dry and free from moisture; edges to be welded prepared as per job requirement - such as flat, square or bevelled; use various machines and techniques for the above (e.g. chamfering machine, grinding and stripping, gas or plasma cutting, etc.); correctly positioned (positioning: devices and techniques; jigs and fixtures; setting up joint in correct position & alignment)
- KU13. impact of various welding parameters like voltage, current, gas flow rate, speed, pressure, torch angle, cycle time, electrode distance etc. on the quality and quantity of welding
- KU14. various materials used for TIG welding and their properties
- KU15. SOP recommended by the organisation for operating TIG welding machine and its accessories
- KU16. use, impact and importance of gas pressures and flow rates in relationship to the type of material being welded and the consumables used
- KU17. pre- and post-flow purge and its importance
- KU18. reasons for using shielding gases, and the types and application of the various gases  
**Shielding gases:** shielding gases for GTAW; applications for shielding gases/gas mixtures (argon, argon/helium mixtures, argon/hydrogen mixtures, nitrogen argon/nitrogen mixtures); gas pressure requirements; flow rates for applications; back purging
- KU19. impact of shielding gas composition and purity on welding quality
- KU20. selection criteria of tungsten electrode
- KU21. use, impact and importance of gas pressures and flow rates in relationship to the type of material being welded and the consumables used
- KU22. SOP recommended by the organisation for checking irregularities in the product/work piece
- KU23. factors that affect weld quality standards  
**Quality standards:** required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joints at stop/start positions merge smoothly; weld surface is (free from cracks; substantially free from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; substantially free from arcing or chipping marks); fillet welds are: equal in leg length, slightly convex in profile (where applicable),

### Qualification Pack

size of the fillet equivalent to the thickness of the material welded; weld contour is (of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formation); welds are adequately fused, and there is minimal undercut, overlap and surface inclusions; tack welds are blended in to form part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint

KU24. various defects associated with the TIG welding process

**Weld defects:** lack of continuity of the weld; uneven and irregular ripple formation; incorrect weld size or profile; undercutting; overlap; inclusions; porosity; internal cracks; surface cracks; lack of fusion; lack of penetration; welding spatter; gouges; stray arc strikes; sharp edges

KU25. how to control distortion (such as welding sequence; deposition technique)

KU26. various testing techniques like visual, destructive and non-destructive

KU27. safety requirements during the welding work

### Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and interpret drawings, work instructions, equipment manuals and process documents

GS2. communicate the welding process requirements to the supervisor and co-workers

GS3. attentively listen and comprehend the information given by the supervisor/team members

GS4. write any work related information in English/regional language

GS5. recognise a workplace problem and take suitable action

GS6. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS7. plan and organize tools, machines and consumables for carrying out welding job

GS8. complete the assigned tasks with minimum supervision

GS9. report to the supervisor or deal with a colleague individually, depending on the type of concern

## Qualification Pack

### Assessment Criteria

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Prepare for welding operations</i>   | 12           | 19              | -             | 8          |
| PC1. identify the work to be done and product specifications by interpreting the product drawing, Welding Procedure Specification (WPS) and job orders  | 1            | 2               | -             | 1          |
| PC2. prepare plan and schedule to meet the production target and give instructions to welders and helpers about the processes required to be performed for achieving the same   | 1            | 3               | -             | 1          |
| PC3. select the right material, equipment, fixtures, accessories, welding torch and consumables (i.e. tungsten electrode, filler wire, shielding gas etc.) as per the SOP and job requirements  | 3            | 2               | -             | 2          |
| PC4. ensure that all the tools, welding machines, measuring instruments, accessories, consumables and input materials (carbon steel, low alloy steel) required for the job are in stock, functioning properly and are available on the shop floor | 2            | 3               | -             | 1          |
| PC5. ensure that input materials are as per the requirements and meet required quality standards  | 1            | 1               | -             | -          |
| PC6. plan the welding activities before starting the actual process as per WPS  | 1            | 1               | -             | -          |
| PC7. guide the welders and helpers in setting of the TIG welding machine and its parameters as per the WPS and SOP  | 1            | 2               | -             | 1          |
| PC8. check that welding apparatus is set for operation, workpieces and fixtures are installed on apparatus and aligned with the electrodes properly as per the job requirements   | 1            | 2               | -             | 1          |
| PC9. ensure that electrodes distance, contact area, pressure, application etc. are maintained as specified in Work Instructions (WI)  | 1            | 1               | -             | 1          |
| PC10. verify set up by running test weld on the specimen (scrap plate)  | -            | 1               | -             | -          |

### Qualification Pack

|  |    |    |   |   |
|--|----|----|---|---|
| PC11.obtain clearance from quality control for weld joint before welding   | -  | 1  | - | - |
| <i>Perform Tungsten Inert Gas (TIG) Welding operations</i>   | 11 | 19 | - | 6 |
| PC12.follow safety precautions during welding work as per SOP and organizational guidelines  | -  | 1  | - | - |
| PC13.use correct technique for starting the arc (i.e. (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material)    | 1  | 2  | - | - |
| PC14.weld the first component and inspect it for conformance to required specifications by using precision gauges  | 2  | 4  | - | 2 |
| PC15.check the output for quality and correct the welding machine settings to meet the required quality output   | 1  | 2  | - | - |
| PC16.support the welders and helpers in performing TIG welding process using appropriate welding techniques as per SOP   | 2  | 3  | - | 1 |
| PC17.supervise the welding operations and mass production process of component to ensure delivery as per plan  | 1  | 2  | - | 1 |
| PC18.monitor that welders and helpers are producing joints of the specified dimensional accuracy and required weld quality which is equivalent to level B of ISO 5817                                      | 1  | 2  | - | 1 |
| PC19.ensure that welding operators and technicians are following the do's and don'ts of the manufacturing process as defined in SOPs/WI  | 1  | -  | - | - |
| PC20.ensure the welding process parameters (air pressure, electrode force, electrode distance, gas flow, etc.) are within standards by reading the various gauges and correct them if not within standards | 1  | 1  | - | 1 |
| PC21.support the welders and helpers in comparing the dimensions of the final welded piece as prescribed in the WPS and engineering drawing  | 1  | 2  | - | - |
| <i>Manage post-welding operations</i>  | 7  | 12 | - | 6 |
| PC22.conduct random sampling and quality checks on the finished products and report the same to the relevant authorities or take action for  | 1  | 2  | - | 1 |

### Qualification Pack

|   |           |           |          |           |
|---|-----------|-----------|----------|-----------|
| its improvement   |           |           |          |           |
| PC23.support the welders and helpers in conducting visual inspection, destructive and non-destructive tests on the work pieces                        | 1         | 3         | -        | 2         |
| PC24.carry out LPT tests to assess fine defect open to the surface not detected by visual inspection (VT)   | 1         | 2         | -        | 1         |
| PC25.ensure that the welders and helpers are segregating and storing the welded components properly by following organisational procedures            | 1         | 2         | -        | 1         |
| PC26.ensure that the welders and helpers are disposing scrap or waste material in accordance with the company policies and environmental regulations  | 1         | 1         | -        | -         |
| PC27.check the machine operations for any malfunctions/defects in the component and immediately inform the supervisor/maintenance team for correction | 1         | 1         | -        | -         |
| PC28.prepare and maintain records related to welding and maintenance conducted  | 1         | 1         | -        | 1         |
| <b>NOS Total</b>  | <b>30</b> | <b>50</b> | <b>-</b> | <b>20</b> |



## Qualification Pack

### National Occupational Standards (NOS) Parameters

|                            |   |
|----------------------------|---|
| <b>NOS Code</b>            | CSC/N0213   |
| <b>NOS Name</b>            | Supervise and perform Tungsten Inert Gas (TIG) Welding on metals  |
| <b>Sector</b>              | Capital Goods   |
| <b>Sub-Sector</b>          | <ol style="list-style-type: none"> <li>1. Machine Tools</li> <li>2. Dies, Moulds and Press Tools</li> <li>3. Plastics Manufacturing Machinery</li> <li>4. Textile Manufacturing Machinery</li> <li>5. Process Plant Machinery</li> <li>6. Electrical and Power Machinery</li> <li>7. Light Engineering Goods</li> </ol> |
| <b>Occupation</b>          | Welding and Cutting   |
| <b>NSQF Level</b>          | 5   |
| <b>Credits</b>             | TBD   |
| <b>Version</b>             | 2.0   |
| <b>Last Reviewed Date</b>  |   |
| <b>Next Review Date</b>    |   |
| <b>NSQC Clearance Date</b> |   |

## Qualification Pack

### Assessment Guidelines and Assessment Weightage

#### Assessment Guidelines

1. Criteria for assessment for the Qualification Pack will be created by CGSC.
2. Performance Criteria (PC) have been assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
3. The assessment for the theory part will/may be based on knowledge bank of questions approved CGSC.
4. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
5. Assessment Agencies will create Assessor Guides comprising of Theory and Practical Assessment Set and Guidelines for each examination/training centre (as per assessment criteria below). The same will be approved by CGSC for adequacy.
6. To successfully attain Certification on the Qualification Pack, the trainee must score a minimum of 70% in each Core NOS and minimum of 50% in all non-core NOS. In addition, a candidate needs to attain a minimum overall pass percentage of 70% for certification.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

#### Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

#### Assessment Weightage

##### Compulsory NOS

| National Occupational Standards   | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage  |
|---|--------------|-----------------|---------------|------------|-------------|------------|
| CSC/N1335. Use basic health and safety practices at the workplace           | 30           | 70              | -             | -          | 100         | 15         |
| CSC/N1336. Coordinate with co-workers to achieve work efficiency            | 30           | 70              | -             | -          | 100         | 15         |
| CSC/N0213. Supervise and perform Tungsten Inert Gas (TIG) Welding on metals | 30           | 50              | -             | 20         | 100         | 70         |
| <b>Total</b>  | <b>90</b>    | <b>190</b>      | <b>-</b>      | <b>20</b>  | <b>300</b>  | <b>100</b> |

## Qualification Pack

### Acronyms

|      |   |
|------|---|
| NOS  | National Occupational Standard(s)               |
| NSQF | National Skills Qualifications Framework        |
| QP   | Qualifications Pack                             |
| TVET | Technical and Vocational Education and Training |
| GTAW | Gas Tungsten Arc Welding                        |
| TIG  | Tungsten Inert Gas Welding                      |
| NDT  | Non-Destructive Testing                         |
| DT   | Destructive Testing                             |
| WPS  | Welding Procedure Specification                 |
| RT   | Radiographic Testing                            |
| UT   | Ultrasonic Testing                              |
| DPT  | Dye Penetration Testing                         |
| MPT  | Magnetic Particle Testing                       |
| FPT  | Fluorescent Penetrant Testing                   |
| CO2  | Carbon Dioxide                                  |
| CPR  | Cardiac Pulmonary Resuscitation                 |

## Qualification Pack

### Glossary

|  |  |
|--|--|
| <b>Sector</b>                                | Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.  |
| <b>Sub-sector</b>                            | Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.   |
| <b>Occupation</b>                            | Occupation is a set of job roles, which perform similar/ related set of functions in an industry.  |
| <b>Job role</b>                              | Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.  |
| <b>Occupational Standards (OS)</b>           | OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts. |
| <b>Performance Criteria (PC)</b>             | Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.  |
| <b>National Occupational Standards (NOS)</b> | NOS are occupational standards which apply uniquely in the Indian context.   |
| <b>Qualifications Pack (QP)</b>              | QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.   |
| <b>Unit Code</b>                             | Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'  |
| <b>Unit Title</b>                            | Unit title gives a clear overall statement about what the incumbent should be able to do.  |
| <b>Description</b>                           | Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.   |
| <b>Scope</b>                                 | Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.  |

## Qualification Pack

|   |  |
|---|--|
| <b>Knowledge and Understanding (KU)</b> | Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.   |
| <b>Organisational Context</b>           | Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.   |
| <b>Technical Knowledge</b>              | Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.   |
| <b>Core Skills/ Generic Skills (GS)</b> | Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles. |
| <b>Electives</b>                        | Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.  |
| <b>Options</b>                          | Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.  |