Model Curriculum

Iron & Steel-Tungsten Inert Gas Welding (GTAW)

SECTOR: IRON & STEEL
SUB-SECTOR: STEEL, SPONGE – IRON, FERRO ALLOYS, RE ROLLERS, REFRACTORY
OCCUPATION: WELDING
REF ID: ISC/Q0911
NSQF LEVEL: 4

Skill India

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

INDIAN IRON AND STEEL SECTOR SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Iron & Steel – Tungsten Inert Gas Welder (GTAW)**' QP No. '**ISC/Q0911 NSQF Level 4**'

Date of Issuance: **December 22nd , 2015**

Valid up to: **December 21st, 2016**

** Valid up to the next review date of the Qualification Pack*

Authorised Signatory
(Indian Iron and Steel Sector Skill Council)

TABLE OF CONTENTS

Iron & Steel-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 "Iron & Steel" Sector/Industry and aims at building the following key competencies amongst the learner.

Program Name	**Iron & Steel-Tungsten Inert Gas Welder (GTAW)**		
Qualification Pack Name & Reference ID.	**Iron & Steel-Tungsten Inert Gas Welder (GTAW) ISC/Q0911**		
Version No.	1.0	**Version Update Date**	30-12-2015
Pre-requisites to Training	Minimum qualification – 10th standard / ITI Pass		
Training Outcomes	**After completing this programme, participants will be able to:** • Perform Tungsten Inert Gas Welding (TIG) • Manually Cut Metal and metal alloys • Use basic health and safety practices at the workplace Works effectively with others		

This course encompasses 4 out of 4 National Occupational Standards (NOS) of "Iron & Steel-Tungsten Inert Gas Welder (GTAW)" Qualification Pack issued by "Indian Iron & Steel Sector Skill Council".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Over view of Iron & Steel Industry** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	• Understanding Iron & steel industry • Understanding types of Iron & Steel Industry • Understanding products of Iron & Steel industry • Activities in Iron & Steel Industry	PPTs of Iron and steel manufacturing, Charts showing the same
2	**5S & House keeping** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 06:00	• Identification of bottlenecks in functioning of work place • Various methods of housekeeping both pre-work & post-work as well	PPTs of 5S, Display Charts of 5S, Audit Checklists of 5S

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code ISC/N0008		
3	**Perform Tungsten Inert Gas (TIG) Welding also known as Gas tungsten Inert Gas Welding (GTAW)** **Theory Duration** (hh:mm) 32:00 **Practical Duration** (hh:mm) 144:00 **Corresponding NOS Code** ISC/N0911	• Working with safety at all times • Preparing welding operations • Carrying out welding operations • Testing of quality • Post welding techniques • Dealing with contingencies	Engineering, fabrication drawings, work instructions, Hand tools for welding, measuring instruments &precision measuring instruments. TIG Welding machines with accessories
4	**Manually Cut Metal and metal alloys** **Theory Duration** (hh:mm) 24:00 **Practical Duration** (hh:mm) 120:00 **Corresponding NOS Code** ISC/Q0910	• Working with safety at all times • Preparing cutting operations • Carrying out cutting operations • Testing of quality • Post cutting techniques • Dealing with contingencies	PPTs of Oxy-Gas cutting, attachments such as Electrode Gases, Tips Cups, Air plasma, Oxygen injected, Duel gas, various hand tools and display of same calibration tools & precession measuring instruments
5	**Use basic health and safety practices at the workplace Theory** **Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 22:00 **Corresponding NOS Code** ISC/N0008	• Health and safety procedures • Fire safety procedures • Emergencies, rescue and first aid procedures	PPE, Different Type of Safety Sign, First Aid Box, Step Ladder, Sample Accident reports ,Fire Extinguishers, Items required for fire extinguisher and fire Safety
6	**Work effectively with others**	• Ensure appropriate communication with superiors, peers and others as applicable at work place	Communication skills PPTs, Posters Team

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Theory Duration (hh:mm) 08:00 **Practical Duration** (hh:mm) 08:00 **Corresponding NOS Code** ISC/N0008	• Demonstrate appropriate behaviour and etiquette at work place	management posters
	Total Duration **Theory Duration 80:00** **Practical Duration 300:00**	**Unique Equipment Required:** a) Sample Fabrication drawings, b) Basic hand tools such as spanner, pliers, pullers c) Measuring & Precision measuring instruments such a micro-meter, Venire callipers, d) GTAW machines with all needed accessories e) Manual cutting setup with all needed accessories f) Material and Equipment for cleaning g) Sample Documents for reporting's h) Sample quality Controlling formats i) Personal protective Equipment's and clothes j) Different Type of Safety Sign, First Aid Box, k) Safety instrument and clothing, Step Ladder, Sample Accident reports l) Fire Extinguishers, Items required for fire extinguisher and fire Safety	

Grand Total Course Duration: **380Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **Indian Iron and Steel Sector Skills Council**)*

Trainer Prerequisites for Job role: "Gas Tungsten Arc Welding (GTAW)" mapped to Qualification Pack: "ISC/Q0911

Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "ISC/Q0911".
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field.
3	**Minimum Educational Qualifications**	Min. ITI Welder pass and preferably CTI/ATI cleared/ Diploma Mechanical
4a	**Domain Certification**	Certified for Job Role: "Gas Tungsten Arc Welding (GTAW)" mapped to QP: "ISC/Q0911".Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/1402". Minimum accepted score is 80%
5	**Experience**	Min. 5 years relevant industry experience and minimum 3 years' experience as Trained or un trained for same Job Role/ Trade

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Iron & Steel-Tungsten Inert Gas Welding (GTAW)
Qualification Pack	ISC/Q0911
Sector Skill Council	Indian Iron & Steel Sector Skill Council

Sr. No.	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	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on these criteria.
5	To pass the Qualification Pack , every trainee should score a minimum of 60% in every NOS.
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
ISC/N0911: Perform 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	**450**	6	2	4
	PC2. Take necessary safety precautions for TIG welding operations		6	2	4
	PC3. Adhere to procedures and system in place for health and safety, PPER and other regulations		6	2	4
	PC4. Check all connections of machines, welding leads, gas connection arrangement, electrode holder		7	2	5
	PC5. Interpret weld procedure data sheets specifications		15	5	10
	PC6. Select welding machines e.g. inverters, rectifiers and generators, according to the materials and task		10	5	5

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC7. Select proper welding torch and electrode(W) that meet the job requirement and specification, select tungsten electrode by the colour of the tip according to base metal, and correct diameter		15	5	10
	PC8. Obtain filler wire according to specifications		7	2	5
	PC9. Prepare for the TIG welding process		5	0	5
	PC10. Prepare the materials and joint in readiness for welding		7	2	5
	PC11. Select and fit the welding shielding gases for a range of given applications including back purging		10	5	5
	PC12. Plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS		7	2	5
	PC13. Connect torches and components		5	0	5
	PC14. Connect and adjust regulators and flow meters to cylinders		5	0	5
	PC15. Read, set and adjust current (amperage) as required		15	5	10
	PC16. Set pre-purge with shielding gas as required		15	5	10
	PC17. Prepare tungsten by sharpening or balling it to desired tip shape		5	0	5
	PC18. Set and verify gas flow rates		15	5	10
	PC19. Prepare and support the joint, using the appropriate methods		15	5	10
	PC20. Tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding, wherever required		15	5	10
	PC21. Match feed and travel speed as required		15	5	10
	PC22. Perform TIG welding operations to meet welding procedure specification requirements		15	5	10

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC23. 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)		15	5	10
	PC24. Use correct angle of torch and filler wire, direction of weld and inclusion defect		15	5	10
	PC25. Weld the joint to the specified quality, dimensions and profile		15	5	10
	PC26. Use manual welding and related equipment, to carry out TIG welding processes		15	5	10
	PC27. Use welding consumables appropriate to the material and application, to include AC current types and DC current types		15	5	10
	PC28. Produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817		15	5	10
	PC29. produce joints from various materials in different forms		15	5	10
	PC30. Use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification		15	5	10
	PC31. Check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection		15	5	10
	PC32. Identify various weld defects		7	2	5
	PC33. Detect surface imperfections and deal with them appropriately		7	2	5
	PC34. Carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)		15	5	10

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC35. Prepare for non-destructive testing of the welds for a range of tests		15	5	10
	PC36. Prepare for destructive tests on weld specimens for select tests		15	5	10
	PC37. Shut down and make safe the welding equipment and gases on completion of the welding activities, clean the area & store the accessories in designated place		15	5	10
	PC38. Detect equipment malfunctions and deal with them appropriately		15	5	10
	PC39. 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		5	0	5
	NOS Total	**Total**	**450**	**143**	**307**
ISC/N0910: Manually cut metal and metal alloys using oxy-fuel gases	PC1. Work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	**300**	10	5	5
	PC2. Take necessary safety precautions for gas cutting operations including equipment, processes and checks		10	5	5
	PC3. Interpret cutting procedure data sheets specifications		10	5	5
	PC4. Check regulators, hoses and check that valves are securely connected and free from leaks and damage		5	0	5
	PC5. Check equipment is calibrated and approved for use		5	0	5
	PC6. Check/fit the correct gas nozzle to the torch		5	0	5
	PC7. Ensure preheat and oxygen holes on the tips are clean		10	5	5
	PC8. Check that a flashback arrestor is fitted		15	5	10
	PC9. Set appropriate gas pressures		5	0	5

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC10. Use the correct procedure for lighting, adjusting and extinguishing the flame		5	0	5
	PC11. Adjust torch valve for type of flame such as neutral, carburizing and oxidizing		5	0	5
	PC12. Follow sequence of operations such as pre-heating material and initiating cut		10	5	5
	PC13. Mark out the locations for cutting accurately and as per requirement		5	0	5
	PC14. Use appropriate and safe procedures for handling and storing of gas cylinders.		5	0	5
	PC15. Prepare the work area for the cutting activities		5	0	5
	PC16. Obtain the appropriate tools and equipment for the oxy-fuel gas cutting operations, and check that they are in a safe and usable condition		10	5	5
	PC17. Check that the oxy-fuel gas cutting equipment is set up for the operations to be performed		5	0	5
	PC18. Adjust cylinder valves and adjust regulator for operating pressure to achieve specifications for required operations		10	0	10
	PC19. Where appropriate, mark out the components for the required operations, using appropriate tools and techniques		10	0	10
	PC20. Perform trial cut to check for cut defects		5	0	5
	PC21. Operate the oxy-fuel gas cutting equipment to produce items/cut shapes to the dimensions and profiles specified into various forms		10	5	5
	PC22. Use various types of oxy-fuel gas cutting methods		10	5	5

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC23. Perform various cutting operations correctly		5	0	5
	PC24. Produce thermal cuts in various forms of material (metal of 3mm and above)		5	0	5
	PC25. Produce cut profiles for various type of materials		15	5	10
	PC26. Produce thermally-cut components which meet specified quality criteria leave the work area in a safe and tidy condition on completion of the cutting activities		5	0	5
	PC27. Recognize and correct burn-back and flashback		10	5	5
	PC28. Detect and correct defects in cut		5	0	5
	PC29. Check that the finished components meet the standard required		15	5	10
	PC30. Use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification		10	0	10
	PC31. Identify various cutting defects		15	5	10
	PC32. Report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions		10	5	5
	PC33. Detect equipment malfunctions and deal with them appropriately		5	0	5
	PC34. 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		10	5	5
	PC35. Shut down and make safe the cutting equipment on completion of the cutting activities		10	5	5
	PC36. In case of emergencies follow standard emergency procedures		10	5	5
	NOS Total	**Total**	**300**	**85**	**215**

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
ISC/N0008: Use basic health and safety practices at the workplace	PC1. Use protective clothing/equipment for specific tasks and work conditions	**150**	9	4	5
	PC2. State the name and location of people responsible for health and safety in the workplace		6	1	5
	PC3. State the names and location of documents that refer to health and safety in the workplace		2	1	1
	PC4. Identify job-site hazardous work and state possible causes of risk or accident in the workplace		8	4	4
	PC5. Carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		6	1	5
	PC6. State location of general health and safety equipment in the workplace		6	1	5
	PC7. Inspect for faults, set up and safely use steps and ladders in general use		6	1	5
	PC8. Work safely in and around trenches, elevated places and confined areas		6	1	5
	PC9. Lift heavy objects safely using correct procedures		6	1	5
	PC10. Apply good housekeeping practices at all times		2	1	1
	PC11. Identify common hazard signs displayed in various areas		6	5	1
	PC12. Retrieve and/or point out documents that refer to health and safety in the workplace		5	1	4
	PC13. Use the various appropriate fire extinguishers on different types of fires correctly		9	4	5
	PC14. Demonstrate rescue techniques applied during fire hazard		8	4	4
	PC15. Demonstrate good housekeeping in order to prevent fire hazards		2	1	1

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC16. Demonstrate the correct use of a fire extinguisher		6	1	5
	PC17. Demonstrate how to free a person from electrocution		6	1	5
	PC18. Administer appropriate first aid to victims as required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc.		8	3	5
	PC19. Demonstrate basic techniques of bandaging		6	1	5
	PC20. Respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		7	2	5
	PC21. Perform and organize loss minimization or rescue activity during an accident in real or simulated environments		6	1	5
	PC22. 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		6	1	5
	PC23. Demonstrate the artificial respiration and the CPR Process		6	1	5
	PC24. Participate in emergency procedures		6	1	5
	PC25. Complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26. Demonstrate correct method to move injured people and others during an emergency		2	1	1
	NOS Total	**Total**	**150**	**45**	**105**
ISC/N0009: Work effectively with others	PC1. Accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	**100**	10	5	5

				Marks Allocated	
Assessable Outcome	**Assessment criteria**	**Total Marks (1000)**	**Out Of**	**Theory**	**Practical**
	PC2. Accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		9	4	5
	PC3. Provide information to others clearly, at a pace and in a manner that helps them to understand		11	1	10
	PC4. Display helpful behaviour by assisting others in performing tasks in a positive manner, where required and possible		10	5	5
	PC5. Consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	5	5
	PC6. Display appropriate communication etiquette while working		11	1	10
	PC7. Display active listening skills while interacting with others at work		11	1	10
	PC8. Use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		8	3	5
	PC9. Demonstrate responsible and disciplined behaviours at the workplace		14	4	10
	PC10. Escalate grievances and problems to supervisor		6	1	5
	NOS Total	**Total**	**100**	**30**	**70**
	Grand Total	**1000**	**1000**	**303**	**697**
	Percentage Weightage:			**50%**	**50%**
	Minimum Pass% to qualify (aggregate):			**60%**	