Model Curriculum

Construction Welder
(Electives: MIG/TIG/SMAW)

SECTOR: Construction
SUB-SECTOR: Real Estate and Infrastructure Construction
OCCUPATION: Fabrication
REF ID: CON/Q01252, V1.0
NSQF LEVEL: 4

Skill India

Construction Skill Development Council

N·S·D·C National Skill Development Corporation

Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CONSTRUCTION SKILL DEVELOPMENT COUNCIL OF INDIA

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Construction welder (Electives: MIG/ TIG/ SMAW)**' QP No. '**CON/ Q 1252 NSQF Level 4**'

Date of Issuance: **January 5th , 2018**

Valid up to: **October 25th , 2019 / Valid up to the next review date of the Qualification Pack**

Authorised Signatory
(Construction Skill Development Council of India)

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Construction Welder (Electives: MIG/TIG/SMAW)

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Construction Welder (Electives: MIG/TIG/SMAW)", in the "Construction" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Construction Welder(Electives: MIG/TIG/SMAW)**		
Qualification Pack Name & Reference ID. ID	CON/Q1252, v1.0		
Version No.	1.0	**Version Update Date**	25-10-2019
Pre-requisites to Training	10th standard pass with 3 years site experience as a Tack Welder or equivalent		
Training Outcomes	**After completing this programme, participants will be able to:** **Compulsory:** • **Carry out grinding activities on structural steel elements:** • **Work effectively in a team to deliver desired results at the workplace:** • **Work according to personal health, safety and environment protocol at construction site:** **Electives (mandatory to select at least one)** **Elective 1: Construction Welder MIG** • **Carry out preparatory works for MIG welding operations:** • **Carry out MIG welding as per requirement in fabrication workshop or construction site:** **Elective 2: Construction Welder TIG** • **Carry out preparatory works for TIG welding operations:** • **Carry out tungsten inert gas welding as per requirement in fabrication workshop or construction site** **Elective 3: Construction Welder SMAW** • **Carry out preparatory work for shielded metal arc welding operations** • **Carry out shielded metal arc welding as per requirement in fabrication workshop or construction site**		

This course encompasses 3 out of s3 Compulsory NOS (National Occupational Standards), 3 out of 3 Electives of "Construction Welder (Electives: MIG/TIG/SMAW)" Qualification Pack issued by "Construction Skill Development Council of India".

Compulsory NOS			
Sr. No.	**Module**	**Key Learning Outcomes**	**Equipment Required**
1	**Introduction** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	• Introduction to role and responsibilities of the job role • Introduction to various types of welding • Introduction to different processes involved in fabrication & their purpose • need and importance of tack welding • Brands of welding equipments & their power ratings • Various hazards in fabrication Yards • Occupational Disease related to welding works and their symptoms • Importance of following safety precautions while welding • Introduction to Shop drawings (symbols and details etc.) • Basic math • units of measurement and conversion • career growth paths	• class room • White board • Computer • Projector • Charts and displays regarding MIG and SMAW welding

2	**Carry out grinding activities on structural steel element**
	
	Theory Duration
	(hh:mm)
	36:00
	Practical Duration
	(hh:mm)
	84:00
	
	Corresponding NOS Code
	CON/N1206
		Theory:
		• Application of grinding in welding works
		• Types of grinders applicable for welders, their components, different consumables and safety guidelines
		• Different type of finishing done on welds
		• Knowledge to optimizing the use of consumables
		• Procedure of using angle grinders (including explanation of important parameters like angle of grinding, application of pressure etc.)
		• Knowledge of thickness of materials to grinded off in different patterns.
		Practical:
		The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition:
		
		• Identify and confirm the thickness to be removed and the pattern of grinding
		• Check the accessibility of the joint for grinding
		• select the consumables and working conditions of the machine
		• follow proper procedure to grind off
		  ○ excessive root reinforcements
		  ○ defective weld joints
			Tools:
			• Portable/ Hand/ Angle grinder
			• Chalk/ marker
			• Measuring tapes
			• Hammer
			• Tweezers
			Safety Equipment
			• Safety Helmet
			• Hand gloves
			• Nose mask
			• Ear muffs
			• Googles
			• Jump suit
			• Safety harness
			• Safety shoes

3	**Work effectively in a team to deliver desired results at the workplace** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 17:00 **Corresponding NOS Code** CON/N8001	**Theory:-** **Understand the concept of:** • Method of oral and written communication skills with co-workers, trade seniors while handling and carrying out visual checks on materials, tools and equipment • How to interpret scope of joint preparation and repair activities, material/ tools handling by adhering to instructions or consulting with seniors • Method of reporting to seniors clearly and promptly • Seek necessary support and complete assigned tasks within stipulated time duration • Keep good relation and maintain well behavior with co-workers **Demonstration/ Practical:-** The skills will be developed and practiced while carrying out following trade related activities 1. Selection of materials, tools or devices for defined purpose under 2. observing joint preparation, bolting and welding activities	
4	**Work according to personal health, safety and environment protocol at construction site** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 17:00 **Corresponding NOS Code** CON/N9001	**Theory: -** • Types of hazards involved in construction sites • Types of hazards involved in of Grinding and welding works • Importance of proper ventilation and illumination while conducting welding works • Hazards of welding fumes • Emergency safety control measures and actions to be taken under emergency situation, concept of safety evacuation plan • Knowledge of various occupational diseases related to welding • Knowledge of checking leakage in gas pipelines and cylinder used for welding • Knowledge of situations under which a fire hazard can occur and conditions to avoid fire • Concept of :- 1. First Aid process 2. Use of fire extinguisher 3. Classification of fires and fire extinguisher 4. Safety drills • PPEs to be used for welding works, importance of selecting proper welding glass and mask	Safety Equipment • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection • Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet • Welding glass

		• Reporting procedure to the concerned authority in emergency situations • Standard procedure of handling, storing and stacking material, fabrication accessories • What is safe disposal of waste, type of waste and their disposal • basic ergonomic principles as per applicability **<u>Demonstration/ Practical (D/P) :-</u>** The skills will be developed and practiced while carrying out following trade related activities in a predictable and familiar working condition. 1. Selection of PPEs and use them appropriately as per working need of scaffolding activities like: a. Performing welding using various techniques on various types of base metals b. performing grinding works for finishing or repairing welds 2. Selection of fire extinguisher based on classification of fire, standard practice of storing & stacking firefighting equipments/ materials at work locations 3. Perform checks so as to ensure that there is no gas leakage 4. Disposal of waste materials as per their nature and effects on weather	
	COMPULSORY NOS: **Total Duration** **Theory Duration** **58:00** **Practical Duration** **118:00**	**Unique Equipment Required:** class room, White board , Computer, Projector, Charts and displays regarding MIG and SMAW welding Portable/ Hand/ Angle grinder, Chalk/ marker, Measuring tapes, Hammer, Tweezers, Safety Helmet, Hand gloves, Nose mask, Ear muffs, Googles , Jump suit, Safety harness, Safety shoes	
Electives (mandatory to select at least one Title)			
Elective 1: Construction Welder MIG			
5	**Carry out preparatory works for MIG welding operations** **Theory Duration** (hh:mm) 60:00 **Practical Duration** (hh:mm) 140:00 **Corresponding NOS Code** CON/N1253	**<u>Theory:</u>** **<u>Prepare welding Equipment:</u>** • Read and interpret the WPS to identify the initial setting of the machine, electrode specifications, temperature and other relevant details • Knowledge to assemble the equipment and make connections to auxiliary equipment's • Knowledge to confirm and/or select correct consumables like gas, filler etc. • Knowledge of consumable specification, types and use	<u>Preparatory Tools:</u> • Wire brush • Cloth • Cleaning solutions • Light source • Ventilation/ exhaust fan • Clamps, jigs and fixtures • Anchors • Ball Peen Hammer • Needle Nose Pliers

		• Knowledge of Properties of different types of shield gases and their application • Knowledge of polarity of the welding machine • Knowledge to check the working conditions of the welding torch, gas valves, gas lines. Electric cables, filler wire feeding machine, work clamps etc. • Knowledge to detect leakage of gases **<u>Prepare base metal</u>** • Knowledge to check and ensure that the surface is cleaned and free from moisture • Importance of proper illumination and ventilation • Knowledge of operation of welding gauges and measurement • Knowledge of various type of joints and welding for the same **<u>Demonstration/ Practical (D/P):-</u>** The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition: 1. Preparation of Welding machine: Carry out following connections & Perform checks ➢ Connect all electrical connections keeping in mind the polarity ➢ Check the welding gun, nozzle and gauges for damage ➢ Check and confirm that flashback arrestor is installed ➢ Make adjustments to wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine 2. Prepare Area and Base metal for welding: ➢ Check and confirm that proper lighting and ventilation arrangements are made ➢ Check and confirm that all electrical connections are properly terminated ➢ Check and confirm that gas cylinders are stacked properly ➢ Confirm that the electrodes used are as per requirement ➢ Confirm the base metal is free from oil, grease, paint or any other impurity ➢ Check and confirm visually that the root gap and bevel angle is as mentioned in the drawings ➢ Check and confirm that the base metal is properly anchored	• Lineman's Pliers • Tape Measure • Combination Square • Chipping Hammer • Flat Cross-Cut Bastard File • Round Cross-Cut Bastard File • Scribe • Soap Stone <u>Welding Tools:</u> • GMAW welding machine inclusive of regulators, Gas hose & all standard accessories. • Welding Transformer with all accessories • Filler wire spool • Wire feeding machine • Welding Gun • Shielding Gas • Shielding gas trolley with chains • Arc welding cables • Work clamps • Universal Weld measuring gauge • Temp stick <u>Safety Equipment</u> • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection

			• Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet • Welding glass
6	**Carry out MIG welding as per requirement in fabrication workshop or construction site** **Theory Duration** (hh:mm) 67:00 **Practical Duration** (hh:mm) 157:00 **Corresponding NOS Code** CON/N1254	**Theory:** • Read and interpret ➢ Welding specifications and parameters from WPS ➢ Welding details (symbols, location, length, position etc.) from shop drawings ➢ Manufactures guidelines relating to specifications of consumables, equipment etc. ➢ Fit up details/ reports to understand the specification of joints • Knowledge of welding in different positions • Knowledge of different types of welding patters • Detailed knowledge of components of welding equipment along with their specifications • Detailed knowledge of various types of shielding gases and their applications • Knowledge of different types of joints • Knowledge of various effects of welding on dirty surface (effect on welds and effect on health) • Detailed knowledge of various types of defects in welding, their causes and remedy **Demonstration/ Practical (D/P) :-** The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition: • Perform preheating of the base metal • Perform MIG welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I sections etc. of varying thickness (3mm, to 50 mm) • The welding should be performed as per the WPS provided • Demonstrate assembling, dismantling and cleaning of the equipment • Demonstrate how to	Welding Tools: • GMAW welding machine inclusive of regulators, Gas hose & all standard accessories. • Welding Transformer with all accessories • Filler wire spool • Wire feeding machine • Welding Gun • Shielding Gas • Shielding gas trolley with chains • Arc welding cables • Work clamps • Universal Weld measuring gauge • Temp stick Safety Equipment • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection • Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet

		➢ Ensure proper penetration of weld ➢ Covering the weld pool with shielding gas ➢ Check root pass for cracks ➢ Perform visual inspections of weld for spatters, cracks, craters, undercuts etc.	• Welding glass
	ELECTIVE 1: Total Duration **Theory Duration** **127:00** **Practical Duration** **297:00**	**Unique Equipment Required:** Preparatory Tools Wire brush, Cloth, Cleaning solutions, Light source, Ventilation/ exhaust fan, Clamps, jigs and fixtures, Anchors, Ball Peen, Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut, Bastard File, Round Cross-Cut Bastard File, Scribe, Soap stone Welding Tools GMAW welding machine inclusive of regulators, Gas hose & all standard accessories, Welding Transformer with all accessories, Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, Shielding gas trolley with chains, Arc welding cables, Work clamps , Universal Weld measuring gauge, Temp stick Safety Equipment Leather Hand Gloves, Jump suit, Wire brush, Hand & Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	
Elective 2: Construction Welder TIG			
7	**Carry out preparatory works for TIG welding operation** **Theory Duration** (hh:mm) 60:00 **Practical Duration** (hh:mm) 140:00 **Corresponding NOS Code** CON/N1255	**Theory:** **Prepare TIG welding Equipment:** • Read and interpret the WPS to identify the initial setting of the machine, electrode specifications, temperature and other relevant details • Knowledge to assemble the equipment and make connections to auxiliary equipment's • Knowledge to confirm and/or select correct consumables like gas, filler etc. • Knowledge of consumable specification, types and use • Knowledge of Properties of different types of shield gases and their application • Knowledge of polarity of the welding machine • Knowledge to check the working conditions of the welding torch, gas valves, gas lines. Electric cables, filler wire feeding machine, work clamps etc. • Knowledge to detect leakage of gases	Preparatory Tools: • Wire brush • Cloth • Cleaning solutions • Light source • Ventilation/ exhaust fan • Clamps, jigs and fixtures • Anchors • Ball Peen Hammer • Needle Nose Pliers • Lineman's Pliers • Tape Measure • Combination Square • Chipping Hammer • Flat Cross-Cut Bastard File • Round Cross-Cut Bastard File

		• Knowledge to understand the correct polarity of the setup and effects of reverse polarity. • Knowledge of relationships between various welding parameters like wire feed, speed control voltage, gas regulation, rate of flow of shielding gas etc. on quality of welds and control of these parameters to achieve desired quality • Knowledge of selecting and preparing tungsten electrodes, correct method of preparing the electrode based upon the joint type • Knowledge of different types of filler electrodes and their specifications **<u>Prepare base metal</u>** • Knowledge to check and ensure that the surface is cleaned and free from moisture • Importance of proper illumination and ventilation • Knowledge of operation of welding gauges and measurement • Knowledge of various type of joints and welding for the same **<u>Demonstration/ Practical (D/P):-</u>** The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition: 1. Preparation of TIG Welding machine: • Carry out following connections & Perform checks ➢ Connect all electrical connections keeping in mind the polarity ➢ Check the welding gun, nozzle and gauges for damage ➢ Check and confirm that flashback arrestor is installed ➢ Make adjustments to wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine ➢ Check and prepare the tungsten electrode as per specification ➢ Select and confirm that the filler material is as per specification 2. Prepare Area and Base metal for welding: ➢ Check and confirm that proper lighting and ventilation arrangements are made ➢ Check and confirm that all electrical connections are properly terminated	• Scribe • Soap Stone <u>Welding Tools:</u> • GTAW welding machine inclusive of regulators, Gas hose & all standard accessories. • Welding Transformer with all accessories • Filler wire spool • Welding Gun • Shielding Gas • Shielding gas trolley with chains • Arc welding cables • Work clamps • Universal Weld measuring gauge • Temp stick • Tungsten Electrode <u>Safety Equipment</u> • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection • Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet • Welding glass

		➢ Check and confirm that gas cylinders are stacked properly ➢ Confirm that the electrodes used are as per requirement ➢ Confirm the base metal is free from oil, grease, paint or any other impurity ➢ Check and confirm visually that the root gap and bevel angle is as mentioned in the drawings ➢ Check and confirm that the base metal is properly anchored	
8	**Carry out tungsten inert gas welding as per requirement in fabrication workshop or construction site** **Theory Duration** (hh:mm) 67:00 **Practical Duration** (hh:mm) 157:00 **Corresponding NOS Code** CON/N1256	**Theory:** • Read and interpret ➢ Welding specifications and parameters from WPS ➢ Welding details (symbols, location, length, position etc.) from shop drawings ➢ Manufactures guidelines relating to specifications of consumables, equipment etc. ➢ Fit up details/ reports to understand the specification of joints • Knowledge of operation of various auxiliary equipment of TIG welding machine • Detailed knowledge of the procedure of TIG welding including the method of metal transfer, physical and chemical changes occurring during welding, effects of heating metals. • Knowledge of welding in different positions • Knowledge of different types of welding patters • Detailed knowledge of components of welding equipment along with their specifications • Detailed knowledge of various types of shielding gases and their applications • Knowledge of different types of joints • Knowledge of various effects of welding on dirty surface (effect on welds and effect on health) • Detailed knowledge of various types of defects in welding, their causes and remedy **Demonstration/ Practical (D/P):-** The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition: • Perform TIG welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like	Welding Tools: • GTAW welding machine inclusive of regulators, Gas hose & all standard accessories. • Welding Transformer with all accessories • Filler wire spool • Welding Gun • Shielding Gas • Shielding gas trolley with chains • Arc welding cables • Work clamps • Universal Weld measuring gauge • Temp stick • Tungsten Electrode Safety Equipment • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection • Fire extinguishers

		angle, plate, pipe, channels, I sections etc. of varying thickness (3mm, to 50 mm) • The welding should be performed as per the WPS provided • Demonstrate assembling, dismantling and cleaning of the equipment • Demonstrate how to ➢ Ensure proper penetration of weld ➢ Covering the weld pool with shielding gas ➢ Check root pass for cracks ➢ Perform visual inspections of weld for spatters, cracks, craters, undercuts etc.	• Sand buckets Flashback arrestors • Welding helmet • Welding glass •
	ELECTIVE 2: Total Duration **Theory Duration** **127:00** **Practical Duration** **297:00**	**Unique Equipment Required:** Preparatory Tools Wire brush, Cloth, Cleaning solutions, Light source, Ventilation/ exhaust fan, Clamps, jigs and fixtures, Anchors, Ball Peen, Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut, Bastard File, Round Cross-Cut Bastard File, Scribe, Soap stone Welding Tools GMAW welding machine inclusive of regulators, Gas hose & all standard accessories, Welding Transformer with all accessories, Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, Shielding gas trolley with chains, Arc welding cables, Work clamps , Universal Weld measuring gauge, Temp stick Safety Equipment Leather Hand Gloves, Jump suit, Wire brush, Hand & Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	
Elective 3: Construction Welder SMAW			
9	**Carry out preparatory work for shielded metal arc welding operations** **Theory Duration** (hh:mm) 60:00 **Practical Duration** (hh:mm) 140:00 **Corresponding NOS Code** CON/N1257	**Theory:** **Prepare SMA welding Equipment:** • Read and interpret the WPS to identify the initial setting of the machine, electrode specifications, temperature and other relevant details • Knowledge to assemble the equipment and make connections to auxiliary equipment's • Knowledge to confirm and/or select correct consumables like gas, filler etc. • Knowledge of consumable specification, types and use • Knowledge of Properties of different types of shield gases and their application • Knowledge of polarity of the welding machine • Knowledge to check the working conditions of the welding torch, gas	Preparatory Tools: • Wire brush • Cloth • Cleaning solutions • Light source • Ventilation/ exhaust fan • Clamps, jigs and fixtures • Anchors • Ball Peen Hammer • Needle Nose Pliers • Lineman's Pliers • Tape Measure • Combination Square

		valves, gas lines. Electric cables, filler wire feeding machine, work clamps etc. • Knowledge to detect leakage of gases • Knowledge to understand the correct polarity of the setup and effects of reverse polarity. • Knowledge of relationships between various welding parameters like wire feed, speed control voltage, gas regulation, rate of flow of shielding gas etc. on quality of welds and control of these parameters to achieve desired quality • Knowledge of selecting and preparing tungsten electrodes, correct method of preparing the electrode based upon the joint type • Knowledge of different types of filler electrodes and their specifications **Prepare base metal** • Knowledge to check and ensure that the surface is cleaned and free from moisture • Importance of proper illumination and ventilation • Knowledge of operation of welding gauges and measurement • Knowledge of various type of joints and welding for the same **Demonstration/ Practical (D/P):-** The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition: 1. Preparation of SMA Welding machine: • Carry out following connections & Perform checks ➢ Connect all electrical connections keeping in mind the polarity ➢ Check the electrode holder for workability ➢ Make adjustments to current and voltage etc. in the welding machine ➢ Check and prepare the electrode as per specification 2. Prepare Area and Base metal for welding: ➢ Check and confirm that proper lighting and ventilation arrangements are made ➢ Check and confirm that all electrical connections are properly terminated ➢ Confirm that the electrodes used are as per requirement	• Chipping Hammer • Flat Cross-Cut Bastard File • Round Cross-Cut Bastard File • Scribe • Soap Stone Welding Tools: • SMAW welding machine inclusive of regulators, Gas hose & all standard accessories. • Welding Transformer with all accessories • Filler wire spool • Welding Gun • Arc welding cables • Work clamps • Universal Weld measuring gauge • Temp stick Safety Equipment • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection • Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet • Welding glass

		➢ Confirm the base metal is free from oil, grease, paint or any other impurity ➢ Check and confirm visually that the root gap and bevel angle is as mentioned in the drawings ➢ Check and confirm that the base metal is properly anchored	
10	**Carry out shielded metal arc welding as per requirement in fabrication workshop or construction site** **Theory Duration** (hh:mm) 67:00 **Practical Duration** (hh:mm) 157:00 **Corresponding NOS Code** CON/N1258	**Theory:** • Read and interpret ➢ Welding specifications and parameters from WPS ➢ Welding details (symbols, location, length, position etc.) from shop drawings ➢ Manufactures guidelines relating to specifications of consumables, equipment etc. ➢ Fit up details/ reports to understand the specification of joints • Knowledge of operation of various auxiliary equipment of SMA welding machine • Detailed knowledge of the procedure of SMA welding including the method of metal transfer, physical and chemical changes occurring during welding, effects of heating metals. • Knowledge of welding in different positions • Knowledge of different types of welding patters • Detailed knowledge of components of welding equipment along with their specifications • Knowledge of different types of joints • Knowledge of various effects of welding on dirty surface (effect on welds and effect on health) • Detailed knowledge of various types of defects in welding, their causes and remedy **Demonstration/ Practical (D/P):-** The skills will be developed and practiced while carrying out following trade related activities in stimulated site condition: • Perform SMA welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I sections etc. of varying thickness (3mm, to 50 mm) • The welding should be performed as per the WPS provided	• Wire brush • Cloth • Cleaning solutions • Light source • Ventilation/ exhaust fan • Clamps, jigs and fixtures • Anchors • Ball Peen Hammer • Needle Nose Pliers • Lineman's Pliers • Tape Measure • Combination Square • Chipping Hammer • Flat Cross-Cut Bastard File • Round Cross-Cut Bastard File • Scribe • Soap Stone Welding Tools: • SMA welding machine inclusive of regulators, Gas hose & all standard accessories. • Welding Transformer with all accessories • Welding Gun • Arc welding cables • Work clamps • Universal Weld

		• Demonstrate assembling, dismantling and cleaning of the equipment • Demonstrate how to ➢ Ensure proper penetration of weld ➢ Check root pass for cracks ➢ Perform visual inspections of weld for spatters, cracks, craters, undercuts etc.	measuring gauge • Temp stick • Wire brush • Cloth • Ball Peen Hammer • Needle Nose Pliers • Lineman's Pliers • Chipping Hammer • File <u>Safety Equipment</u> • Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather • Safety goggles • Nose mask • Ear protection • Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet • Welding glass
	ELECTIVE 3: Total Duration **Theory Duration 127:00** **Practical Duration 297:00**	**Unique Equipment Required:** Preparatory Tools Wire brush, Cloth, Cleaning solutions, Light source, Ventilation/ exhaust fan, Clamps, jigs and fixtures, Anchors, Ball Peen, Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut, Bastard File, Round Cross-Cut Bastard File, Scribe, Soap stone Welding Tools GMAW welding machine inclusive of regulators, Gas hose & all standard accessories, Welding Transformer with all accessories, Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, Shielding gas trolley with chains, Arc welding cables, Work clamps , Universal Weld measuring gauge, Temp stick Safety Equipment Leather Hand Gloves, Jump suit, Wire brush, Hand & Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	

	Grand Total Duration **Minimum Duration for QP: 600** **Theory:185** **Practical: 415** **Maximum Duration for QP: 1780** **Theory: 717** **Practical: 1063**	**Unique Equipment Required:** class room, White board, Computer, Projector, Charts and displays regarding MIG and SMAW welding Different types of cleaners and accessories, Clamps and vices, Spark lighter, Welding Transformer with all accessories, Welding Transformer (or) Inverter based welding machine with all accessories, D.C Arc welding rectifiers set with all accessories, AC/DC SMAW and GTAW welding machine with water or air cooled torch and standard accessories, Argon regulator, Gas hose, water circulating system (if required), Trolley for cylinder, Clamps, Tapes, Electrode holders, Gas regulators, Flashback arrestors, welding helmet, Welding glass Chipping hammer, Chisel, Leather Hand Gloves, Jump suit, Wire brush, Hand & Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Chipping hammer, Chisel, Leather Hand Gloves, Jump suit Wire brush, Hand & Leg guards leather, Safety goggles Nose mask, Ear protection, Fire extinguishers, Clamps and vices, Spark lighter, Sand buckets, Temperature measuring gun or chalks, Oxygen Gas Pressure regulator, Acetylene Gas Pressure regulator, Portable gas cutting machine, Trolley for cylinder, Oxy Acetylene Gas cutting blow pipe , Oxygen, Acetylene Cylinders, Flashback arrestors Leather Hand Gloves, Jump suit, Wire brush, Hand & Leg guards leather, Safety goggles, Nose mask, Ear protection Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass

(This syllabus/ curriculum has been approved by ***Construction Skill Development Council of India)***

Trainer Prerequisites for Job role: "Construction Welder (Electives: MIG/TIG/SMAW) Welder" mapped to Qualification Pack: "CON/Q1252 , v1.0"

Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "CON/Q1252".
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**	ITI/12th
4a	**Domain Certification**	Trainer/Assessor-80% in each NOS of Qualification Pack "MEP/Q0102" or "MEP/Q0104" and Lead trainer/Lead Assessors- 90% in each NOS of Qualification Pack "MEP/Q0101" or "MEP/Q0103"
4b	**Platform Certification**	Trainer/Assessor-50% in each NOS of Qualification Pack "MEP/Q0101" or "MEP/Q0103"& 80% overall, Lead trainer/ Lead Assessors- 50% in each NOS of Qualification Pack "MEP/Q0101" or "MEP/Q0103"and overall 90%
5	**Experience**	i. Technical Degree holder with minimum three years of Field experience and preferably two years of teaching experience or, ii. In case of a Diploma Holder five years of field experience and preferably two years of teaching experience or, iii. In case of ITI/12th pass minimum eight years of field experience and preferably two years of teaching Experience.

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role	Construction Welder(Electives: MIG/TIG/SMAW)
Qualification Pack	CON/Q1252
Sector Skill Council	Construction

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 knowledge part will be based on knowledge bank of questions created by Assessment Bodies subject to approval by SSC
3. Individual assessment agencies will create unique question papers for knowledge/theory part for assessment of candidates as per assessment criteria given below
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on assessment criteria.
5. The passing percentage for each QP will be 70%. To pass the Qualification Pack, every trainee should score a minimum of 70% individually in each NOS.
6. The Assessor shall check the final outcome of the practices while evaluating the steps performed to achieve the final outcome.
7. The trainee shall be provided with a chance to repeat the test to correct his procedures in case of improper performance, with a deduction of marks for each iteration.
8. After the certain number of iteration as decided by SSC the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.
9. 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 within the specified timeframe set by SSC.
10. Minimum duration of Assessment of each QP shall be of 4hrs/trainee.

Compulsory NOS Total Mark : 300				Marks Allocation	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Mark**	**Out Of**	**Theory**	**Skills Practical**
CON/N1206: Carry out grinding activities on structural steel elements	PC1. ensure that the grinder is in proper working condition	**100**	8	2	6
	PC2. check that guard is installed on the machine and is secure and effective.		6	2	4
	PC3. check and notify any inadequacy like incorrect type of grinder, incorrect consumable issued etc. in the grinding tool to appropriate authority		8	2	6
	PC4. check the accessibility (in between joints, large distance from power source etc.)of the grinder for the work		8	2	6
	PC5. identify the location of surface to be grinded.		8	2	6
	PC6. clean the metal surface to remove any foreign matter like dust, rust, paint, oil etc.		6	2	4
	PC7. clamp and fix the metal before grinding		8	2	6
	PC8. select appropriate consumables as per work		8	2	6
	PC9. gather and identify information from superiors regarding the dimensions of grinding, angle of grinding etc.		8	2	6
	PC10. select proper body position so that hand movements are comfortable and smooth				
	PC11. move the grinding tool in desired patterns as per work requirements		8	2	6
	PC12. provide proper pressure at correct angle as per work requirement to minimize the waste age of consumables		8	2	6
	PC13. grind off defective weld joints to required depth joints		8	2	6
	PC14. grind off excessive root reinforcements in welded joint if required.		8	2	6
		Total	**100**	**30**	**70**
CON/N8001: Work effectively in a team to deliver desired results at the workplace	PC1. pass on work related information/ requirement clearly to the team members	**100**	7	2	5
	PC2. inform co-workers and superiors about any kind of deviations from work		7	2	5
	PC3. address the problems effectively and report if required to immediate supervisor appropriately		10	3	7
	PC4. receive instructions clearly from superiors and respond effectively on same		7	2	5
	PC5. communicate to team members/subordinates for appropriate work technique and method		10	3	7
	PC6. seek clarification and advice as per requirement and applicability		7	2	5
	PC7. hand over the required material, tools tackles, equipment and work fronts timely to interfacing teams		27	8	19

	PC8. work together with co-workers in a synchronized manner		27	8	19
		Total	**100**	**30**	**70**
CON/N9001: Work according to personal health, safety and environment protocol at construction site	PC1. identify and report any hazards, risks or breaches in site safety to the appropriate authority	**100**	7	2	5
	PC2. follow emergency and evacuation procedures in case of accidents, fires, natural calamities		7	2	5
	PC3. follow recommended safe practices in handling construction materials, including chemical and hazardous material whenever applicable		10	3	7
	PC4. participate in safety awareness programs like Tool Box Talks, safety demonstrations, mock drills, conducted at site		7	2	5
	PC5. identify near miss , unsafe condition and unsafe act		7	2	5
	PC6. use appropriate Personal Protective Equipment (PPE) as per work requirements including: • Head Protection (Helmets) • Ear protection • Fall Protection • Foot Protection • Face and Eye Protection • Hand and Body Protection • Respiratory Protection (if required)		10	3	7
	PC7. handle all required tools, tackles , materials & equipment safely		7	2	5
	PC8. follow safe disposal of waste, harmful and hazardous materials as per EHS guidelines		7	2	5
	PC9. install and apply properly all safety equipment as instructed		13	4	9
	PC10. follow safety protocol and practices as laid down by site EHS department		13	4	9
	PC11. collect and deposit construction waste into identified containers before disposal, separate containers that may be needed for disposal of toxic or hazardous wastes		7	2	5
	PC12. apply ergonomic principles wherever required		7	2	5
		Total	**100**	**30**	**70**

ELECTIVES Elective 1: Construction Welder MIG					
Total Marks: 200				Marks Allocation	
Assessment outcomes	Assessment Criteria for outcomes	Total Mark	Out Of	Theory	Skills Practical
CON/1253: Carry out preparatory works for MIG welding operations	PC1. use and identify proper personal protective equipment such as hand gloves, nose mask, ear plugs, head protection, safety harness etc.	100	3	1	2
	PC2. use appropriate welding masks		3	1	2
	PC3. check for any gas leakages prior to striking arc		3	1	2
	PC4. check the electrical connections for tightness and termination		3	1	2
	PC5. inspect the lighting arrangement for adequacy		4	1	3
	PC6. inspect and Clear the work area of any flammable objects like boxes, plastic etc.		4	1	3
	PC7. ensure that subordinates are following safety norms		4	1	3
	PC8. attend any and all prep talks and tool box talks organized on site		4	1	3
	PC9. use and identify proper personal protective equipment such as hand gloves, nose mask, ear plugs, head protection, safety harness etc.		4	1	3
	PC10. use appropriate welding masks		4	1	3
	PC11. check for any gas leakages prior to striking arc		4	1	3
	PC12. ensure that the gas cylinders are in upright positions		4	1	3
	PC13. inspect electric collections for adequately tight and secure prior to commencing the work		4	1	3
	PC14. ensure that work clamps are adequately secured and in correct polarity (-ve on welding bed and +ve on electrode)		4	1	3
	PC15. ensure that welding tip and welding cup are in order		4	1	3
	PC16. make initial adjustments of electrode consumption rate and voltage as per requirement.		4	1	3
	PC17. ensure proper lighting		4	1	3
	PC18. inspect that the gas valves are properly functioning and adjust the same as per instructions		4	1	3
	PC19. ensure that electrodes are compatible with base metal requirement ventilation arrangement is available		4	1	3
	PC20. check the electrodes comply with weld requirements		4	1	3
	PC21. clean the surface to be welded before starting the welding operations		4	1	3
	PC22. check that adequate root gap is available		4	1	3
	PC23. check the bevel angle visually		4	1	3

	PC24. make sure that surface is smooth and free of irregularities		4	1	3
	PC25. remove any oxides, dust or foreign particles from the surface		4	1	3
	PC26. ensure that the surface is not painted or galvanized		4	1	3
		Total	**100**	**30**	**70**
CON/N1254: Carry out MIG welding as per requirement in fabrication workshop or construction site	PC1. interpret weld requirements from fabrication drawings	**100**	2	1	1
	PC2. confirm the weld specifications if required from superiors		3	1	2
	PC3. understand the weld requirements like position of weld, type of joint, number of passed required etc.		5	2	4
	PC4. estimate the number or length of filler material required to complete the weld		5	2	4
	PC5. pre heat the base material before welding if required		5	2	4
	PC6. maintain correct body posture as per requirement of weld		5	2	4
	PC7. adjust the wire stick out and regulate the gas flow rate accordingly		5	2	4
	PC8. use appropriate patterns of welding as per position and type of joints		5	2	4
	PC9. hold the welding gun at proper angle as per requirement		5	2	4
	PC10. make required number of passes		5	2	4
	PC11. make steady passes of weld to ensure proper heat generation and penetration		5	2	4
	PC12. make adjustments in welding machine if required		5	2	4
	PC13. disconnect the equipment correctly and store the same as per manufacture guidelines and site safety parameters		5	2	4
	PC14. clean the welded joint		5	2	4
	PC15. ensure proper penetration of weld		5	2	4
	PC16. ensure that the weld is properly shielded by shielding gas		5	2	4
	PC17. ensure proper heat input through arc		5	2	4
	PC18. reduce the spatter spray during the welding		5	2	4
	PC19. check the root pass for cracks		5	2	4
	PC20. visually check for spatters, craters, undercuts		5	2	4
	PC21. visually check the welded joint for cracks		5	2	4
		Total	**100**	**30**	**70**

ELECTIVES **Elective 2: Construction Welder TIG**					
Total Marks: 200				**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Mark**	**Out Of**	**Theory**	**Skills Practical**
CON/1255: Carry out preparatory works for TIG welding operations	PC1. use and identify proper personal protective equipment such as hand gloves, nose mask, ear plugs, head protection, safety harness etc.	**100**	3	1	2
	PC2. use appropriate welding masks		3	1	2
	PC3. check for any gas leakages prior to striking arc		3	1	2
	PC4. check the electrical connections for tightness and termination		3	1	2
	PC5. inspect the lighting arrangement for adequacy		3	1	2
	PC6. inspect and clear the work area of any flammable objects like boxes, plastic etc.		3	1	2
	PC7. ensure that subordinates are following safety norms		3	1	2
	PC8. attend any and all prep talks and tool box talks organized on site		3	1	2
	PC9. Participate in all safety drills organized on site		3	1	2
	PC10. use appropriate fire safety equipment and procedure in case of fire		3	1	2
	PC11. identify and report any other unsafe act or condition to appropriate authority		3	1	2
	PC12. keep the shielding gas cylinders in upright position only		3	1	2
	PC13. ensure that shielding gas is purely inert e. g argon		3	1	2
	PC14. check the pipes, valves/ regulator and flow meter is securely connected		3	1	2
	PC15. taper the tungsten rod and sharpen the point of the electrode for better arc stability. The electrode should be grinded parallel to length		4	1	3
	PC16. clean the electrode prior to use to remove any foreign matter		3	1	2
	P17. adjust the tungsten stick out as per requirement based upon type of joint, base metal properties etc.		4	1	3
	PC18. stack required number of filler rods\ electrodes as per instructions		3	1	2
	PC19. clean the filler rod to remove any foreign particles in order to avoid weld contamination		3	1	2
	PC20. ensure that filler material are compatible with base metal and as per weld specifications		3	1	2
	PC21. ensure that work clamps are adequately secured and in correct polarity (+ ve on welding bed and -ve on electrode)		4	1	3
	PC22. ensure that electrical connections are tight, secure and compatible with the equipment		3	1	2

	PC23. clean the surface to be welded before starting the welding operations		3	1	2
	PC24. check that adequate root gap is available		3	1	2
	PC25. check the bevel angle visually		3	1	2
	PC26. make sure that surface is smooth and free of irregularities		3	1	2
	PC27. remove any oxides, dust or foreign particles from the surface		3	1	2
	PC28. ensure that the surface is not painted or galvanized		3	1	2
	PC29. ensure that the joint is properly secured against any movement		3	1	2
	PC30. identify the joints to be welded, their location and position of welding		3	1	2
	PC31. extract the weld specifications like type of joint, throat for fillet, number of passes required, specifications of filler rod, required heat input, preheat temperature etc. form relevant charts and drawings		4	1	3
	PC32. estimate the number or length of filler material required to complete the weld		3	1	2
		Total	**100**	**30**	**70**
CON/N1256: Carry out tungsten inert gas welding as per requirement in fabrication workshop or construction site	PC1. ignite the arc by superimposing the high frequency over high voltage	**100**	4	1	3
	PC2. avoid touching the tungsten rod to the base metal		4	1	3
	PC3. ensure that the filler rod is always inside the sheilding gas cover to avoid contamination during welding operation		5	2	4
	PC4. select proper body position so that hand movements are comfortable and smooth		4	1	3
	PC5. position head such that weld is clearly visible		4	1	3
	PC6. ensure that weld location is properly illuminated and ventilated		4	1	3
	PC7. use appropriate patterns of welding as per position and type of joints		5	2	4
	PC8. hold the welding gun at proper angle as per requirement(70-80 ^{o} from base plate)		5	2	4
	PC9. ensure that the arc length is not too large and is as per heat requirement		5	2	4
	PC10. adjust the travel speed of weld to ensure proper penetration		5	2	4
	PC11. make required number of passes		4	1	3
	PC12. make steady passes of weld to ensure proper heat generation and penetration		5	2	4
	PC13.make required adjustments in welding machine		5	2	4
	PC14. disconnect the equipment correctly and store the same as per manufacture guidelines and site safety parameters		5	2	4

	PC15. clean the welded joint		4	1	3
	PC16. ensure proper penetration of weld		5	2	4
	PC17. ensure that the weld is properly shielded by shielding gas		5	2	4
	PC18. ensure proper heat input through arc		5	2	4
	PC19. reduce the spatter spray during the welding		5	2	4
	PC20. check the root pass for cracks		4	1	3
	PC21. visually check for spatters, craters, undercuts		4	1	3
	PC22. visually check the welded joint for cracks		4	1	3
		Total	**100**	**30**	**70**

ELECTIVES Elective 3: Construction Welder SMAW					
Total Marks: 200				Marks Allocation	
Assessment outcomes	Assessment Criteria for outcomes	Total Mark	Out Of	Theory	Skills Practical
CON1257: Carry out preparatory works for Shielded metal Arc welding operations	PC1. Use and identify proper personal protective equipment such as hand gloves, nose mask, ear plugs, head protection, safety harness etc.	100	4	1	3
	PC2. Use appropriate welding masks		4	1	3
	PC3. Check the electrical connections for tightness and termination		4	1	3
	PC4. Inspect the lighting arrangement for adequacy		4	1	3
	PC5. Inspect and Clear the work area of any flammable objects like boxes, plastic etc.		4	1	3
	PC6. Ensure that subordinates are following safety norms		4	1	3
	PC7. Attend any and all perp talks and tool box talks organized on site		4	1	3
	PC8. Participate in all safety drills organized on site		4	1	3
	PC9. Use appropriate fire safety equipments and procedure in case of fire		4	1	3
	PC10. Identify and report any other unsafe act or condition to appropriate authority		4	1	3
	PC11. inspect electric collection to be adequately tight and secure prior to commencing the work		4	1	3
	PC12. attach the work clamps to the base metal		4	1	3
	PC13. select the polarity depending upon the thickness of material and other parameters of work requirement		4	1	3
	PC14. store the electrodes correctly as per manufactures guidelines		4	1	3
	PC15. clean the surface to be welded before starting the welding operations		4	1	3
	PC16. check that adequate root gap is available		4	1	3
	PC17. check the bevel angle visually		4	1	3
	PC18. make sure that surface is smooth and free of irregularities		4	1	3
	PC19. remove any oxides, dust or foreign particles from the surface		4	1	3
	PC20. ensure that the temperature at joint is as per specifications		4	1	3
	PC21. ensure that the surface is not painted or galvanized		4	1	3
	PC22. ensure that the joint is properly secured against any movement		4	1	3
	PC23. identify the joints to be welded, their location and position of welding		4	1	3
	PC24. extract the weld specifications like type of joint, throat for fillet, number of passes required, specifications of filler rod, required heat input, preheat temperature etc. form relevant charts and drawings		4	1	3
	PC25. estimate the number or length of filler material required to complete the weld		4	1	3

	Total Marks	Total	100	25	75
CON/N1258: Carry out shielded metal arc welding as per requirement in fabrication workshop or construction site	PC1. ignite the arc by striking the electrode on the base metal like a match	100	3	1	2
	PC2. select proper body position so that hand movements are comfortable and smooth		5	2	4
	PC3. position head such that weld is clearly visible		3	1	2
	PC4. ensure that weld location is properly illuminated and ventilated		5	2	4
	PC5. use appropriate patterns of welding as per position and type of joints		5	2	4
	PC6. push or drag the arc as per requirement		5	2	4
	PC7. ensure that the Arc length is not too large and is as per heat requirement		5	2	4
	PC8. adjust the travel speed of weld to ensure proper penetration		5	2	4
	PC9. make required number of weld passes		5	2	4
	PC10. make steady passes of weld to ensure proper heat generation and penetration		5	2	4
	PC11. clean the weld after each pass to scrap out the slag formed on the surface of weld		5	2	4
	PC12. make required adjustments in welding machine		5	2	4
	PC13. disconnect the equipment correctly and store the same as per manufacture guidelines and site safety parameters		5	2	4
	PC14. efficiently dispose of the stubs of electrode left after completing the welding		3	1	2
	PC15. clean the welded joint by removing slag formed during the welding process		5	2	4
	PC16. ensure proper penetration of weld		5	2	4
	PC17. ensure that the weld is properly shielded throughout the operation		5	2	4
	PC18. ensure proper heat input through arc		5	2	4
	PC19. reduce the spatter spray during the welding		5	2	4
	PC20. check the root pass for cracks		5	2	4
	PC21. visually check for spatters, craters, undercuts		3	1	2
	PC22. visually check the welded joint for cracks		3	1	2
	Total Marks	**Total**	**100**	**30**	**70**