

# Model Curriculum

## 16. Flux cored Arc Welder (Semi Automatic)

**SECTOR:**

**SUB-SECTOR:** CAPITAL GOODS  
MACHINE TOOLS, DIES, MOULDS AND  
PRESS TOOLS, PLASTICS  
MANUFACTURING MACHINERY, TEXTILE  
MANUFACTURING MACHINERY, PROCESS  
PLANT MACHINERY, ELECTRICAL AND  
POWER MACHINERY

**OCCUPATION:** Welding and Cutting

**REF ID:** CSC/Q0205, V1.0

**NSQF LEVEL:** 5



## Certificate

### CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**CAPITAL GOODS SKILL COUNCIL**

for the

**MODEL CURRICULUM**

Complying to National Occupational Standards of  
Job Role/ Qualification Pack: 'Flux Cored Arc Welder (Semi Automatic)' QP No. 'CSC/ Qo205, NSQF Level 4'

Date of Issuance: April 14<sup>th</sup>, 2014

Valid up to : August 30<sup>th</sup>, 2016

\*\*Valid up to the next review date of the Qualification Pack or the  
\*Valid up to date mentioned above whichever is earlier.



Authorised Signatory  
Tourism & Hospitality Skill Council

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# Flux Cored Arc Welder (Semi Automatic)

## CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Flux cored arc welder”, in the “Capital Goods” Sector/Industry and aims at building the following key competencies amongst the learner

<b>Program Name</b>	<b>Designer Mechanical</b>		
<b>Qualification Pack Name &amp; Reference ID. ID</b>	CSC/Q0205, v1.0		
<b>Version No.</b>	1.0	<b>Version Update Date</b>	
<b>Pre-requisites to Training</b>	10 <sup>th</sup> std pass		
<b>Training Outcomes</b>	<p><b>After completing this programme, participants will be able to:</b></p> <ul style="list-style-type: none"> <li>• <b>Perform Semi automatic flux cored arc welding process to prepare joints:</b> perform of semi-automatic flux cored arc welding process for a range of standard welding job requirements as per welding procedure specification (WPS).</li> <li>• <b>Manually weld carbon and low alloy steels using MMAW/SMAW:</b> perform manual metal arc welding (MMAW) welding also known as Shielded Metal Arc Welding (SMAW) for producing various types of joints on carbon and low alloy steels in 1G/1F, 2G/2F and 3G/3F welding positions as per specific instructions given.</li> <li>• <b>Manually cut metal and metal alloys using oxy fuel gas:</b> manual cutting operations using oxy-fuel gas such as oxy-acetylene.</li> <li>• <b>Manually cut metals using plasma arc:</b> cut different materials (mild carbon steel, stainless steel, aluminum, high tensile and special steels, and other materials) in various profiles pertaining to the gas cutting process.</li> <li>• <b>Basic health and safety practices at the workplace:</b> identify risks and hazards at workplace, use of PPE, and apply good housekeeping practices, etc.</li> <li>• <b>Work effectively with others:</b> effectively communicate with others and demonstrate good ethical practices and discipline.</li> </ul>		

This course encompasses 6 out of 6 National Occupational Standards (NOS) of “Flux cored arc welder (Semi automatic)” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p><b>Perform Semi-Automatic Flux cored Arc Welding Process to Prepare Joints</b></p> <p><b>Theory Duration</b> (hh:mm) 50:00</p> <p><b>Practical Duration</b> (hh:mm) 140:00</p> <p><b>Corresponding NOS Code</b> CSC/No205</p>	<ul style="list-style-type: none"> <li>• Explain safety practices to be followed when operating flux cored arc welding installations</li> <li>• Identify Personal Protective Equipment required for flux cored arc welding</li> <li>• Correctly wear Personal Protective Equipment</li> <li>• Identify hazards associated with arc welding machines and take corrective actions to avoid such hazards</li> <li>• State the method to store gas cylinders safely and correctly</li> <li>• Explain principles of flux cored arc welding including fusion welding</li> <li>• Identify main parts of Flux Core Arc Welding (FCAW) equipment and its operation –rectifier, inverter, generator, wire feed system, welding cables, welding guns, nozzles, return clamps, solenoid valves, jog feed control, gas purge control,</li> <li>• Identify common tools required for FCAW-angle grinders, wire brushes, linishers, hammers, power saw, chisel, wrenches, wire cutters ,MIG pliers etc</li> <li>• List welding consumables required for FCAW-wire electrodes, wires and rods</li> <li>• Select right kind of welding torch and consumables depending self shielded or gas shielded FCAW</li> <li>• Define common terms used FCAW</li> <li>• Explain the procedure and techniques used to deposit weld bead</li> <li>• List the factors that that determine weld bead shape-gun angle, weld bead profile, electrode extension stick out, fillet weld extension stick out, gun travel speed, current and voltage and thickness of material</li> <li>• List types of weld beads-stringer, and weave</li> <li>• Explain weld bead quality characteristics</li> <li>• Explain the importance of gas flow rate in FCAW</li> <li>• Explain weld positions and joint types - flat (PA) IG/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G,vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, plate to pipe (fixed) 5F</li> </ul>	<p>Training Kit (PowerPoint, Trainer Guide)</p> <p>FCAW setup with all accessories, Volt meter, ammeter, tong tester, angle grinder, wire brushes, linishers, wire brushes, hammer, power saw, wrenches, wire cutters, chipping hammer, die penetrant tester, Personal Protective Equipment</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>Kinds of Joints: fillet lap joints, tee fillet joints, corner joints, butt joints (square, single vee, double vee)</p> <ul style="list-style-type: none"> <li>• Explain welding techniques-fine adjustment of parameters, correct manipulation of the torch, blending in stops/starts, tack weld, angle of torch, wire feed speed, voltage, gas flow rate, stick-out</li> <li>• Explain the methods of distortion control</li> <li>• List types of destructive /non-destructive tests to assess weld quality</li> <li>• State principles of gouging and back gouging</li> <li>• Interpret weld procedure data specification sheets, PQR and WPS</li> <li>• Select right kind of welding machine based on the task</li> <li>• Prepare the materials and joint in readiness for welding</li> <li>• Setup the welding equipment for operation</li> <li>• Select the welding shielding gases for the for the range of given applications</li> <li>• Connect torches and components correctly</li> <li>• Connect and adjust regulators and flow meters to cylinder correctly</li> <li>• Adjust wire feed rate and set current, voltage as per the requirement</li> <li>• Weld joints according to approved procedures - 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, Material-carbon steel, stainless steel, alloy steels, hard facing alloys, Forms-sheet (less than 3 mm),plate, structural section, pipe/tube and other forms</li> <li>• Remove welding slag using appropriate methods and tools without damaging the weld and the weld piece</li> <li>• Carryout visual inspection to identify defects and take corrective actions to avoid recurrence of defects</li> <li>• Check the quality of weld bead in terms of dimensional and geometrical conformance</li> <li>• Carryout die penetrant tests to assess fine defects open to the surface and not detected by visual inspections</li> </ul>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> <li>Assist in the preparation for NDT testing of welds</li> <li>Perform DT tests like macro examination, nickel brick test, bend tests, mechanical and chemical tests</li> <li>Fill up appropriate technical forms ,activity logs as per the requirement</li> <li>Follow proper communication protocol</li> <li>Communicate with people in respectful manner in line with organizational policy</li> <li>Perform numerical operations, geometry and calculations</li> <li>Maintain current knowledge of application standards, legislation etc.</li> <li>Demonstrate problem solving abilities</li> <li>Plan, organize and sequence work operations as per the job requirement</li> <li>Work in a team to achieve better results</li> </ul>	
2	<p><b>Manually Weld Carbon and Low Alloy Steels in 1G/1F, 2G/2F, and 3G/3F Welding Positions using MMAW/SMAW</b></p> <p><b>Theory Duration</b> (hh:mm) 40:00</p> <p><b>Practical Duration</b> (hh:mm) 90:00</p> <p><b>Corresponding NOS Code</b> CSC/N0204</p>	<ul style="list-style-type: none"> <li>Explain various welding techniques</li> <li>Identify various types of base metal such as mild or low carbon steel, stainless steel etc.</li> <li>State applications Manual arc welding / Shield metal arc welding</li> <li>Follow safety precautions while performing MMAW or SMAW</li> <li>Identify Personal Protective equipment used in MMAW/SMAW</li> <li>Identify and state the function of MMAW welding equipment –transformer, rectifier, generators, and invertors</li> <li>List consumables required in MMAW /SMAW welding</li> <li>Classify electrodes based on the covering</li> <li>Identify welding accessories like holders, cables etc.</li> <li>Name ancillary equipment required for Manual Metal Arc Welding</li> <li>Interpret welding symbols</li> <li>Differentiate between fillet and groove</li> <li>Identify various types of joints-lap, tee, corner, butt, square, single vee and double vee)</li> <li>Name various welding positions – flat,</li> </ul>	<p>Training Kit (PowerPoint, Trainer Guide)</p> <p>Arc Welding Machines(MMAW AC/DC ) -Welding machine of minimum 200 Amps</p> <p>Chisel, File set, Try Square, Hacksaw Frame , wire brush, Flat Tongs, Steel Rule, Divider, Tong , Measuring tools, Leather hand Gloves, ear plug, mouth mask, Industry Helmet, Leather Apron, Goggles, Leg Guard, Hand Guard, safety shoes as per batch requirement, Scribes, dot punch, Center Punch , Number Punch, First</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>horizontal, vertical and overhead - welding positions (ISO 6947 – PA, PB, PC, PD, PE, PF, PG; ASME IX – I-6 G/1-6 F)</p> <ul style="list-style-type: none"> <li>• Interpret common welder testing codes - ASME section IX, EN 287, ISO 9606, IS 731</li> <li>• Read and interpret Welding Procedure Specifications (WPS) and Standard Operating Procedures</li> <li>• Explain critical parameters required to produce joints of desired quality – electrode angle, arc length, thickness of base metal and travel speed</li> <li>• Explain applications of various welding techniques – push, perpendicular and drag</li> <li>• Identify various types of beads</li> <li>• Interpret bead characteristics</li> <li>• Explain impact of polarity</li> <li>• Select right sized electrode based on the metal thickness and base metal composition</li> <li>• Check the condition of welding leads, earthing arrangements and electrode holder</li> <li>• Connect welding leads, earthing arrangements and electrode holder</li> <li>• Select right kind of welding equipment based on the task</li> <li>• Prepare joints for the welding operation</li> <li>• Set amperage based on the metal thickness and composition</li> <li>• Tack weld joint at appropriate intervals and check the readiness of the equipment before final welding</li> <li>• Strike and maintain a stable arc</li> <li>• Produce fillet and grooved welded joints in various positions - flat (PA) IG/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, 4G Plate (overhead) Plate to Pipe (Fixed) 5F, pipe welding 5G/5F and 6G</li> <li>• Achieve weld quality equivalent to Level C of ISO 1857</li> <li>• Carry out visual inspection to identify defects and take corrective actions to avoid recurrence of such defects –lack of continuity, uneven and irregular ripple formation, excessive spatter, burn through, undercut, overlap, inclusions, distortion, porosity, surface cracks, lack of</li> </ul>	<p>Aid Kit, Magger , Tester , Binding Tape, electrodes Equipment For Destructive &amp; Non Destructive Tests, Welding Simulator, Magger , Tester , Binding Tape, electrodes</p>



Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>fusion or incomplete fusion, lack of penetration, excessive penetration etc.</p> <ul style="list-style-type: none"> <li>• Measure dimensional and geometrical accuracy using prescribed/suggested instruments</li> <li>• List Non Destructive Testing (NDT) / Destructive Testing (DT) inspection methods</li> <li>• Carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)</li> <li>• Prepare for destructive tests on weld specimens for fillet, butt and corner</li> </ul>	
3	<p><b>Manually cut Metal and Metal Alloys using Oxy-Fuel Gas</b></p> <p><b>Theory Duration</b> (hh:mm) 30:00</p> <p><b>Practical Duration</b> (hh:mm) 70:00</p> <p><b>Corresponding NOS Code</b> CSC/No203</p>	<ul style="list-style-type: none"> <li>• Explain safety precautions to be followed in oxy-fuel gas cutting</li> <li>• Identify Personal Protective Equipment used in oxy-fuel gas cutting</li> <li>• Correctly wear Personal Protective Equipment</li> <li>• Explain hazards associated with oxy-fuel cutting method and take corrective actions to avoid such hazards</li> <li>• Read and interpret Welding Procedure Specifications (WPS) and Standard Operating Procedures</li> <li>• Explain principle of oxy-fuel gas cutting</li> <li>• Identify various types of gas cutting equipment – hand held oxy-fuel gas cutting equipment, portable track driven cutting equipment, fixed bench gas cutting equipment</li> <li>• List components of oxy-fuel gas setup</li> <li>• Identify Oxygen and Acetylene cylinder based on the colour coding</li> <li>• List accessories that aid in cutting operation – cutting guides, trammels and templates</li> <li>• List marking tools required for gas cutting operation</li> <li>• Differentiate between high and low pressure gas regulators</li> <li>• Differentiate between single stage and two stage gas regulators</li> <li>• Explain the relation between base metal thickness and nozzle type</li> <li>• Explain the importance of pre heating</li> <li>• List types of flames used in gas cutting and explain the application</li> <li>• Explain methods to arrest backfire, flashback and other fires</li> <li>• List purging tools and detail their function</li> </ul>	<p>Training Kit (PowerPoint, Trainer Guide)</p> <p>Gas Cutting attachments, Stand, Gas Welding Torch, Trolley, Grating Table, Working Table, FLASBACK ARRESTOR, Vice Mounted Tables with bench vices fixed, Gas Cylinders (Two each of Oxygen Gas, Acetylene Gas), Regulator (Single stage Acetylene Regulator), DE grinder 30 cm wheel motorized Pedestal type; AG-4 &amp; AG-7 Grinders, Chisel, File set, Try Square, Hacksaw Frame, wire brush, Flat Tongs, Steel Rule, Divider, Tong, Measuring tools, Power Saw, Personal Protective Equipment</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> <li>Setup oxy-fuel gas setup</li> <li>Carryout leak testing at critical points of the system</li> <li>Apply correct lighting procedure</li> <li>Produce various types of flames by varying the oxygen supply</li> <li>Select right kind of flame as per the requirement</li> <li>List sequence of operations to be performed</li> <li>Carryout marking on the work piece as per the drawing</li> <li>Perform various cutting operations to include down-hand straight cuts (freehand), making straight cuts (track guided), cutting regular shapes, cutting irregular shapes, making angled cuts, cutting chamfers, making radial cuts, gouging/flushing, beveled edge – weld preparations, cutting out holes</li> <li>Produce thermal cuts in various forms of material (metal of 3mm and above)</li> <li>produce cut profiles for various type of materials and forms – Materials: mild carbon steel, high tensile and special steels, Forms: plate, rolled section, pipe/tubes and sold bars</li> <li>Identify various cutting defects and take remedial actions</li> <li>Perform quality checks as per the instruction sheet</li> </ul>	
4	<p><b>Manually Cut Metal Using Plasma Arc</b></p> <p><b>Theory Duration</b> (hh:mm) 30:00</p> <p><b>Practical Duration</b> (hh:mm) 90:00</p> <p><b>Corresponding NOS Code</b> CSC/No207</p>	<ul style="list-style-type: none"> <li>Explain safety precautions to be followed in plasma cutting</li> <li>Identify material types – mild steel, high alloy steel, stainless steel, aluminium and alloys</li> <li>Identify Personal Protective Equipment used in Plasma arc cutting</li> <li>Correctly wear Personal Protective Equipment</li> <li>Explain hazards associated with plasma arc cutting method and take corrective actions to avoid such hazards</li> <li>Explain the principle of plasma arc cutting</li> <li>Interpret common terms used in plasma cutting</li> <li>Read and interpret Welding Procedure Specifications (WPS) and Standard Operating Procedures</li> <li>Explain working principle of 'Transferred' and 'Non transferred' welding equipment</li> </ul>	Training Kit (PowerPoint, Trainer Guide) Plasma Cutter, Rail ,power cables , water tank etc

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> <li>• Identify 'Transferred' and 'Non Transferred' plasma arc equipment</li> <li>• List cutting equipment and types of consumables used in plasma cutting equipment</li> <li>• Explain construction of cutting torch</li> <li>• List types of plasma arc gases and explain their suitability</li> <li>• Identify plasma arc cutting equipment including plasma power source, pilot arc ignition system, torch, portable straight line cutters, profile cutting machines, air filter with regulator, burner electrode, compressor, nozzle, electrode holder, contact tube, front cap, gas supply system with gauges, cooling system, earthing clamp, connecting leads and cables</li> <li>• Identify cutting guides and templates</li> <li>• Identify various types of cutting torches (air plasma, oxygen injected and dual gas)</li> <li>• Explain importance of torch to arc distance in relation to thickness of materials, types of torches and gases</li> <li>• Explain factors that affect nozzle life</li> <li>• Explain gouging and back gouging principles, methods and procedure</li> <li>• Identify purging tools and explain their function</li> <li>• Carryout primary inspection of regulators, hoses and valves</li> <li>• Select correct nozzle based on the metal thickness</li> <li>• Connect nozzle to the torch</li> <li>• Explain ampere range and gas pressure range based on the type of material and material thickness</li> <li>• Carryout marking operation wherever necessary</li> <li>• Explain the importance of correct angle to cut and right speed</li> <li>• Explain cutting techniques – stand-off, circle cutting, profile cutting, edge, stenting holes and piercing technique</li> <li>• Carryout cutting operation - down-hand straight cuts (freehand), making straight cuts (track guided), cutting regular shapes, cutting irregular shapes, making angled cuts, cutting chamfers, making radial cuts, gouging/flushing, bevelled edge –weld preparations, cutting out holes on mild steel, high alloy steel, stainless steel,</li> </ul>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>aluminium and alloys</p> <ul style="list-style-type: none"> <li>Produce thermal cuts in various forms of material (plate, rolled section, pipe/tube and solid bars)</li> <li>Adhere to the stated quality criterion</li> </ul> <p>Identify defects arising out of plasma arc cutting and explain the remedial measures</p> <p>Measure dimensional and geometrical aspects of the cut material</p>	
5	<p><b>Health and safety</b></p> <p><b>Theory Duration</b> (hh:mm) 10:00</p> <p><b>Practical Duration</b> (hh:mm) 08:00</p> <p><b>Corresponding NOS Code</b> CSC/N1335</p>	<ul style="list-style-type: none"> <li>Explain the importance of personal protective equipment (PPE) required for gas cutting operation</li> <li>State the causes for accidents</li> <li>Identify job site hazardous work and state possible causes of risk or accident at the workplace</li> <li>Explain the importance of '5S' at the workplace</li> </ul>	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Leather gloves, leather apron, welding screen – helmet types, hand screen welding and safety shoes</p>
6	<p><b>Fire Safety</b></p> <p><b>Theory Duration</b> (hh:mm) 05:00</p> <p><b>Practical Duration</b> (hh:mm) 30:00</p> <p><b>Corresponding NOS Code</b> CSC/N1335</p>	<ul style="list-style-type: none"> <li>Explain types of fires - Class A, B, C and D</li> <li>Select appropriate fire extinguisher to control fire</li> <li>Use PASS method to operate a fire extinguisher</li> <li>Follow fire safety signs and safe evacuation method in case of a fire</li> <li>Identify the location of assembly point, fire exit, fire alarm</li> <li>Follow reporting procedure in case of a fire</li> </ul>	<p>Training kit (Trainer guide, PowerPoint)</p> <p>Class A, B, C, D and K fire extinguishers</p>
7	<p><b>Emergencies, rescue and first aid procedure</b></p> <p><b>Theory Duration</b> (hh:mm) 09:00</p> <p><b>Practical Duration</b> (hh:mm) 18:00</p> <p><b>Corresponding NOS</b></p>	<ul style="list-style-type: none"> <li>Follow electrical safety procedures</li> <li>Use approved method to rescue a person from electrocution</li> <li>State the importance of first aid</li> <li>Identify the contents of a first aid kit and their application</li> <li>Administer first aid in case of bleeding, burns, choking, electrical shock, poisoning, etc.</li> <li>Use of CPR process</li> <li>Bandage wounds</li> </ul>	<p>Training kit (Trainer guide, PowerPoint)</p> <p>First aid kit with all contents</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<b>Code</b> CSC/N1335	<ul style="list-style-type: none"> <li>Explain stages of crisis and crisis management</li> <li>Prepare an incident report</li> </ul>	
8	<b>Work effectively with others</b>  <b>Theory Duration</b> (hh:mm) 20:00  <b>Practical Duration</b> (hh:mm) 60:00  <b>Corresponding NOS Code</b> CSC/N1336	<ul style="list-style-type: none"> <li>Explain the importance of team work and team dynamics</li> <li>State 4Cs of working in a team</li> <li>Explain types of communication</li> <li>Apply effective communication technique</li> <li>Overcome barriers to effective communication</li> <li>Demonstrate active listening skills</li> <li>Demonstrate good customer service skills</li> <li>Explain the importance of ethical behaviour in your day-to-day work</li> <li>State the importance of discipline in life and apply the same at workplace</li> </ul>	Training kit (Trainer guide, PowerPoint)
9	<b>Final Assessment</b>  <b>Theory Duration</b> (hh:mm) 04:00  <b>Practical Duration</b> (hh:mm) 06:00  <b>Corresponding NOS Code</b>	<ul style="list-style-type: none"> <li>To test skills and knowledge</li> </ul>	
	<b>Total Duration</b>  <b>Theory Duration</b> <b>198:00</b>  <b>Practical Duration</b> <b>512:00</b>	<b>Unique Equipment Required:</b> FCAW setup with all accessories, Volt meter, ammeter, tong tester, angle grinder, wire brushes, linishers, wire brushes, hammer, power saw, wrenches, wire cutters, chipping hammer, die penetrant tester, Personal Protective Equipment , Arc Welding Machines(MMAW AC/DC ) -Welding machine of minimum 200 Amps, Chisel, File set, Try Square, Hacksaw Frame , wire brush, Flat Tongs, Steel Rule, Divider, Tong , Measuring tools, Leather hand Gloves, ear plug, mouth mask, Industry Helmet, Leather Apron, Goggles, Leg Guard, Hand Guard, safety shoes as per batch requirement, Scribes, dot punch, Center Punch , Number Punch, First Aid Kit, Magger , Tester , Binding Tape, electrodes Equipment For Destructive & Non Destructive Tests, Welding Simulator, Magger , Tester , Binding Tape, electrodes, Gas Cutting attachments, Stand, Gas Welding Torch , Trolley, Grating Table, Working Table, FLASBACK ARRESTOR, Vice Mounted Tables with bench vices fixed, Gas Cylinders (Two each of Oxygen Gas ,Acetylene Gas ), Regulator (Single stage Acetylene Regulator ), DE grinder 30 cm wheel motorized Pedestal type; AG-4 & AG-7 Grinders, Chisel, File set, Try Square, Hacksaw Frame , wire brush, Flat Tongs, Steel Rule, Divider, Tong , Measuring tools, Plasma Cutter,Rail ,power cables , water tank , Class A, B, C, D and K fire extinguishers, First aid kit with all contents	

Sr. No.	Module	Key Learning Outcomes	Equipment Required

Grand Total Course Duration: **710 Hours, 0 Minutes**

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

## Trainer Prerequisites for Job role: "Flux cored Arc welder (Semi automatic)" mapped to Qualification Pack: "CSC/Qo205 v1.0"

Sr. No.	Area	Details
1	<b>Description</b>	Perform semi-automatic flux cored arc welding process for a range of standard welding job requirements as per welding procedure specification (WPS)
2	<b>Personal Attributes</b>	Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness.
3	<b>Minimum Educational Qualifications</b>	Diploma /Degree in Mechanical Engineering
4a	<b>Domain Certification</b>	Certified for Job Role: "Designer-Mechanical" mapped to QP: "CSC/Qo205, v1.0". Minimum accepted score is 80%
4b	<b>Platform Certification</b>	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted 70 % as per respective SSC guidelines is 70%.
5	<b>Experience</b>	<ul style="list-style-type: none"> <li>3-4 years of industry experience in the relevant field</li> <li>3-4 years of teaching experience</li> </ul>

### Annexure: Assessment Criteria

<b>Assessment Criteria</b>	
<b>Job Role</b>	<b>Flux Cored Arc Welder (Semi-Automatic)</b>
<b>Qualification Pack</b>	<b>CSC/Qo205, v1.0</b>
<b>Sector Skill Council</b>	<b>Capital Goods Skill Council</b>

<b>Sr. No.</b>	<b>Guidelines for Assessment</b>
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 center based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 60% in aggregate and 40% in each NOS
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP



Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
<b>1. CSC/No205 Perform semi-automatic flux cored arc welding process to prepare joints</b>	PC1.work safely at all times, complying with health and safety and other relevant regulations and guidelines	<b>100</b>	2	1	1
	PC2.stop machine in case of emergencies and start when safe using correct procedure		3	1	2
	PC3.operate machine safety devices in line with set procedures		2	1	1
	PC4.stop the machine in a timely and safe manner during an emergency		2	0	2
	PC5.interpret for weld procedure data sheets specifications, PQR and WPS points		2	1	1
	PC6.select welding machines such as inverters, rectifiers and generators, according to the task		2	1	1
	PC7.select electrodes according to classification and specifications		2	1	1
	PC8.prepare the materials and joint in readiness for welding,		2	0	2
	PC9.check the joint for accuracy before final welding		2	0	2
	PC10.check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms		1	0	1
	PC11.prepare the welding equipment for a range of given applications		1	0	1
	PC12.select the welding shielding gases for a range of given applications		1	0	1
	PC13.plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS		2	1	1
	PC14.clean wire feeder and torch tip using correct procedures		2	1	1
	PC15.connect torches and components correctly		1	0	1
	PC16.connect and adjust regulators and flow meters to cylinders correctly		1	0	1
	PC17.adjust wire feed rate and read and set current as per requirement		2	1	1
	PC18.set other welding parameters (eg. voltage) as per requirement		2	1	1

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC19.set pre-purge with shielding gas as per requirement		2	1	1
	PC20.set and verify gas flow rates		1	0	1
	PC21.confirm that the machine is calibrated, set up and operating correctly, ready for the joining operations to be carried out		1	0	1
	PC22.check the installation has been approved for production		1	0	1
	PC23.check supplies of components and consumables are adequate and correctly prepared		1	0	1
	PC24.select and use tools and equipment such as fillet gauges, calculators, measuring tapes, squares and straight edges		1	0	1
	PC25.ensure all safety equipment is in place and functioning correctly		1	0	1
	PC26.connect cables and ground clamps to power source correctly and safely change components according to task		2	1	1
	PC27.select and use tools and equipment such as temperature sticks, pyrometer, thermometers and pre-heat monitoring equipment		1	0	1
	PC28.identify material required according to drawings and specifications		2	1	1
	PC29.select required amount of materials		1	0	1
	PC30.verify appropriate heat treatments have been applied as per requirement		2	1	1
	PC31.check, adjust and use welding and related equipment for flux cored wire welding		1	0	1
	PC32.use correct work and travel angles, flow rate, travel speed and electrode extensions as required for the job		3	1	2
	PC33.weld joints according to approved welding procedures in good access situations in various positions		4	1	3
	PC34.select consumables appropriate to the material, its thickness and application include (more than one of) wire types and sizes from different material groups		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	and at least two different shielding gases (where applicable)				
	PC35.weld the joint to the specified quality, dimensions and profile		3	0	3
	PC36.adjust wire stick-out as per requirement		2	1	1
	PC37.use welding consumables appropriate to the material and application to DC current types		2	0	2
	PC38.produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817		3	0	3
	PC39.produce joints from various materials in different forms		2	0	2
	PC40.weld joints in good access situations, in select positions		2	0	2
	PC41.produce welded components covering different joint configurations		1	0	1
	PC42.produce welded components covering different material groups		1	0	1
	PC43.carry out welding and monitor the machine operations in accordance with specifications and job instructions		3	1	2
	PC44.monitor the process operation and machine functions, and make adjustments as required to welding parameters and mechanisms within their permitted		3	1	2
	PC45.place and secure parts to be welded as per requirement		2	1	1
	PC46.transfer methods of information from parent piece to off-cuts and crop pieces accurately		1	0	1
	PC47.remove welding slag using appropriate methods and tools without damaging the weld and the weld piece		1	0	1
	PC48.identify various weld defects by using appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification		3	1	2
	PC49.check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC50.detect surface imperfections and deal with them appropriately		1	0	1
	PC51.carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)		2	0	2
	PC52.assist in preparation for non-destructive testing of the welds, for a range of tests		1	0	1
	PC53.prepare for destructive tests on weld specimens for select tests		1	0	1
	PC54.shut down and make safe the welding equipment on completion of the welding activities		1	0	1
	PC55.detect equipment malfunctions and deal with them appropriately		2	0	2
	PC56.deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		2	0	2
	<b>Total</b>		<b>100</b>	<b>22</b>	<b>78</b>
<b>2.CSC/No204 Manually weld carbon and low alloy steels in 1G/1F, 2G/2F and 3G/3F welding positions using Manual Metal Arc Welding/ Shielded Metal Arc Welding</b>	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	<b>100</b>	3	1	2
	PC2.adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations		3	1	2
	PC3.check the condition of, welding leads, earthing arrangements and electrode holder		2	0	2
	PC4.report any faults or potential hazards to appropriate authority		3	1	2
	PC5.follow fume extraction safety procedures		3	1	2
	PC6.read and interpret routine information on written job instructions and drawings, welding procedure specifications and standard operating procedures		5	2	3
	PC7.identify welding machines eg. transformers, rectifiers, inverters and generators, according to the task		2	0	2
	PC8.prepare the work area for the welding activities		2	0	2
	PC9.perform measurements for joint preparation and routine MMAW		4	1	3
	PC10.prepare the materials and joint in readiness for welding		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC11.use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment		2	0	2
	PC12.connect equipment to power source		2	0	2
	PC13.connect cables, electrode holders, return leads and ground clamps to appropriate terminal		3	1	2
	PC14.re-dry electrodes as per electrode classification requirement		3	1	2
	PC15.set, read and adjust amperage controls		4	2	2
	PC16.verify set up by running test weld specimen (scrap plate)		2	1	1
	PC17.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		3	1	2
	PC18.report any faults or problem to appropriate authority		3	1	2
	PC19.strike and maintain a stable arc		2	0	2
	PC20.stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques)		2	0	2
	PC21.maintain constant puddle by using appropriate travel speed		3	1	2
	PC22.maintain proper bead sequence with respect to groove/fillet configurations and positions		3	1	2
	PC23.remove slag in an appropriate manner (eg. wire brush, hammer, etc.)		3	1	2
	PC24.produce welded joints to the specified quality, dimensions and profile applicable to carbon and low alloy steel sheets and plates from 1.5 – 24 mm		4	1	3
	PC25.produce fillet and groove joints in 1F/1G, 2F/2G and 3F/ 3G welding position as per the WPS specified using single or multi-run welds		4	1	3
	PC26.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		4	1	3
	PC27.produce joints on carbon and low alloy steel materials using various methods		4	1	3
	PC28.shut down and make safe the welding equipment on completion of the welding activities		3	1	2
	PC29.measure and check that all dimensional and geometrical aspects of the weld are as per instructions		4	2	2
	PC30.check that the welded joint conforms to the instructions given, by checking various quality parameters by visual inspection		3	1	2
	PC31.identify various weld defects using visual inspection		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC32.detect and report surface imperfections to appropriate authority		3	1	2
	PC33.deal with defects in welding as per instructions given		3	1	2
	<b>Total</b>		<b>100</b>	<b>22</b>	<b>78</b>
<b>3.CSC/No203 Manually cut metal and metal alloys using oxy fuel gas</b>	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines		3	1	2
	PC2.take necessary safety precautions for gas cutting operations including equipment, processes and checks		3	1	2
	PC3.interpret cutting procedure data sheets specifications		3	1	2
	PC4.check regulators, hoses and check that valves are securely connected and free from leaks and damage		2	0	2
	PC5.check equipment is calibrated and approved for use		2	0	2
	PC6.check/fit the correct size gas nozzle to the torch		2	0	2
	PC7.ensure preheat and oxygen holes on the tips are clean		2	0	2
	PC8.check that a flashback arrestor is fitted		2	0	2
	PC9.set appropriate gas pressures		2	0	2
	PC10.use the correct procedure for lighting, adjusting and extinguishing the flame		3	1	2
	PC11.adjust torch valve for type of flame such as neutral, carburizing and oxidizing		3	1	2
	PC12.follow sequence of operations such as pre-heating material and initiating cut		3	1	2
	PC13.mark out the locations for cutting accurately and as per requirement		3	1	2
	PC14.use appropriate and safe procedures for handling and storing of gas cylinders		3	1	2
	PC15.prepare the work area for the cutting activities		2	0	2
	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		2	0	2
	PC17.check that the oxy-fuel gas cutting equipment is set up for the operations to be performed		2	0	2
	PC18.adjust cylinder valves and adjust regulator for operating pressure to achieve specifications for required operations		3	1	2
	PC19.where appropriate, mark out the components for the required operations, using appropriate tools and techniques		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC20.perform trial cut to check for cut defects		2	0	2
	PC21.operate the oxy-fuel gas cutting equipment to produce items/cut shapes to the dimensions and profiles specified		5	1	4
	PC22.use various types of oxy-fuel gas cutting methods		4	1	3
	PC23.perform various cutting operations correctly		4	1	3
	PC24.produce thermal cuts in various forms of material (metal of 3mm and above)		4	1	3
	PC25.produce cut profiles for various type of materials and forms		3	1	2
	PC26.produce thermally-cut components which meet specified quality criteria		3	1	2
	PC27.recognize and correct burnback and flashback		3	1	2
	PC28.detect and correct defects in cut		2	0	2
	PC29.ensure the work area is left in a safe and tidy condition on completion of the cutting activities		2	0	2
	PC30.check that the finished components meet the standard required		3	1	2
	PC31.use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification		3	1	2
	PC32.identify various cutting defects and follow organisation recommended procedures to address them		3	1	2
	PC33.report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions		3	1	2
	PC34.detect equipment malfunctions and deal with them appropriately		2	0	2
	PC35.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		3	1	2
	PC36.shut down and make safe the cutting equipment on completion of the cutting activities		2	0	2
	PC37.in case of emergencies follow standard emergency procedures		2	0	2
	<b>Total</b>		<b>100</b>	<b>21</b>	<b>79</b>
<b>4.CSC/No207 Manually cut metal materials using plasma arc</b>	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines		3	1	2
	PC2.take necessary safety precautions for plasma		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	cutting operations including equipment, processes and checks				
	PC3.interpret cutting procedure data sheets specifications		3	1	2
	PC4.check regulators, hoses and check that valves are securely connected and free from leaks and damage		3	1	2
	PC5.check equipment is calibrated and approved for use		2	0	2
	PC6.check/fit the correct nozzle to the torch		3	1	2
	PC7.match correct tips and cups to the torch as per requirement and manufacturer's equipment instructions		2	0	2
	PC8.set the amperage and gas pressure as per metal thickness, metal type, and type of gas		2	0	2
	PC9.use the correct procedure for lighting, adjusting and extinguishing the arc		3	1	2
	PC10.use appropriate and safe procedures for handling and storing of gas cylinders		3	1	2
	PC11.prepare the work area for the cutting activities		3	1	2
	PC12.obtain the appropriate tools and equipment for the plasma arc cutting operations, and check that they are in a safe and usable condition		3	1	2
	PC13.check that the plasma arc cutting equipment is correctly set up for the operations to be performed		2	0	2
	PC14.carry out correct measurements required using appropriate equipment and methods for planning the cut		3	1	2
	PC15.where appropriate, mark out the components for the required operations, using appropriate tools and techniques		3	1	2
	PC16.perform trial cut to check for cut defect		3	1	2
	PC17.operate the plasma cutting equipment to produce items/cut shapes to the dimensions and profiles as specified		4	1	3
	PC18.use the correct angles to cut and the right speed		4	1	3
	PC19.use various types of plasma arc cutting methods/techniques		4	1	3
	PC20.perform various cutting operations correctly		4	1	3
	PC21.produce thermal cuts in various forms of material		4	1	3
	PC22.produce cut profiles for various type of materials		4	1	3
	PC23.produce thermally-cut components which meet specified quality criteria		4	1	3



Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC24.detect and correct defects in cut		3	1	2
	PC25.leave the work area in a safe and tidy condition on completion of the cutting activities		2	0	2
	PC26.check that the finished components meet the required standard		3	1	2
	PC27.use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the cut material are to the specification		4	2	2
	PC28.identify various cutting defects		3	1	2
	PC29.report any difficulties or problems that may arise with the cutting activities, and carry out any agreed actions		3	1	2
	PC30.detect equipment malfunctions and deal with them appropriately		2	0	2
	PC31.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		4	1	3
	PC32.shut down and make safe the cutting equipment on completion of the cutting activities or during an emergency		2	0	2
	PC33.follow standard emergency procedures in case of emergencies		2	0	2
	<b>Total</b>		<b>100</b>	<b>26</b>	<b>74</b>
5.CSC/N1335 Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions		5	2	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3.state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others state methods of accident prevention in the work environment of the job role		4	2	2
	PC6.state location of general health and safety equipment in the workplace		3	2	1
	PC7.inspect for faults, set up and safely use steps and ladders in general use		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC8.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC9.lift heavy objects safely using correct procedures		5	2	3
	PC10.apply good housekeeping practices at all times		4	2	2
	PC11.identify common hazard signs displayed in various areas		5	2	3
	PC12.retrieve and/or point out documents that refer to health and safety in the workplace		3	1	2
	PC13.use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC14.demonstrate rescue techniques applied during fire hazard		4	1	3
	PC15.demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC16.demonstrate the correct use of a fire extinguisher		4	1	3
	PC17.demonstrate how to free a person from electrocution		4	1	3
	PC18.administer appropriate first aid to victims was required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.		4	1	3
	PC19.demonstrate basic techniques of bandaging		3	1	2
	PC20.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		4	1	3
	PC21.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	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		3	1	2
	PC23.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC24.participate in emergency procedures		3	2	1
	PC25.complete a written accident/incident report or dictate a		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	report to another person, and send report to person responsible				
	PC26.demonstrate correct method to move injured people and others during an emergency		4	1	3
	<b>Total</b>		<b>100</b>	<b>36</b>	<b>64</b>
<b>6.CSC/N1336 Work effectively with others</b>	PC1.accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	<b>100</b>	10	3	7
	PC2.accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
	<b>Total</b>		<b>100</b>	<b>30</b>	<b>70</b>
	<b>Grand Total</b>	<b>600</b>	<b>600</b>	<b>157</b>	<b>443</b>
	<b>Percentage Weightage:</b>			<b>26</b>	<b>74</b>
	<b>Minimum Pass% to qualify (aggregate):</b>			<b>60</b>	