

# Model Curriculum

## Operator- Broaching Machine

**SECTOR:** CAPITAL GOODS  
**SUB-SECTOR:** 1. Machine Tools  
2. Plastics Manufacturing Machinery  
3. Textile Manufacturing Machinery  
4. Process Plant Machinery  
5. Electrical and Power Machinery  
6. Light Engineering Goods  
**OCCUPATION:** Machining  
**REF ID:** CSC/Q0114, V1.0  
**NSQF LEVEL:** 2



## 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: 'Operator – Broaching Machine' QP No. 'CSC/Q 0314, NSQF Level 2'

Date of Issuance: April 30<sup>th</sup>, 2014

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

Head up to the right is the side of the Qualification Pack. It is the  
back of the Qualification Pack when the certificate is issued.



Authorised Signatory  
Tourism & Hospitality Skill Council

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# Operator-Broaching Machine

## CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Operator-Broaching Machine”, in the “Capital Goods” Sector/Industry and aims at building the following key competencies amongst the learner

<b>Program Name</b>	<b>Operator-Broaching Machine</b>		
<b>Qualification Pack Name &amp; Reference ID. ID</b>	CSC/Q0114, v1.0		
<b>Version No.</b>	1.0	<b>Version Update Date</b>	
<b>Pre-requisites to Training</b>	10 <sup>th</sup> Standard 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 broaching operations to produce a range of metal components using broaching machines:</b> perform broaching operations to produce a range of components which require machining of features like keyways, square holes, hexagonal and octagonal holes, holes with a single flat side, splines, serrations and special forms.</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 3 out of 3 National Occupational Standards (NOS) of “Operator-Broaching Machine” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p><b>Perform broaching operations to produce a range of metal components using broaching machine</b></p> <p><b>Theory Duration</b> (hh:mm) 40:00</p> <p><b>Practical Duration</b> (hh:mm) 100:00</p> <p><b>Corresponding NOS Code</b> <b>CSC/N0114</b></p>	<ul style="list-style-type: none"> <li>• Define broaching</li> <li>• Explain the necessity of broaching</li> <li>• List types of broaching machines               <ul style="list-style-type: none"> <li>○ Horizontal boring machine</li> <li>○ Vertical boring machine</li> </ul> </li> <li>• Read first angle and third angle engineering drawings</li> <li>• Identify most commonly used ferrous and non-ferrous metals and explain their physical properties</li> <li>• Explain various systems of measurement</li> <li>• Convert units from one system of measurement to another</li> <li>• Explain Limits, Fits and Tolerances</li> <li>• Identify various work holding devices used in broaching operation</li> <li>• State the factors that determine the pulling pressure               <ul style="list-style-type: none"> <li>○ Material</li> <li>○ Type of tooling</li> <li>○ Machine condition</li> <li>○ Tolerance</li> <li>○ Finish required etc.</li> </ul> </li> <li>• State the effect of feed on the following materials               <ul style="list-style-type: none"> <li>○ Low carbon steel</li> <li>○ High carbon steel</li> <li>○ Low alloy steel</li> <li>○ Stainless steel</li> <li>○ Cast iron</li> <li>○ Aluminium</li> <li>○ Al alloys</li> <li>○ Bronze</li> <li>○ Bronze alloys</li> </ul> </li> <li>• State the necessity of cutting fluids and list various cutting fluids used in broaching operations</li> <li>• Identify hazards associated broaching operation and take necessary steps to avoid such hazards</li> <li>• List Personal Protective Equipment (PPE) required for broaching operation</li> <li>• Wear Personal Protective Equipment correctly</li> <li>• Follow recommended safety precautions while performing broaching operation</li> <li>• Explain the application of the following measuring equipment               <ul style="list-style-type: none"> <li>○ Internal micrometer</li> </ul> </li> </ul>	<p>Training kit (Trainer guide, PowerPoint), Personal Protective Equipment (PPE), horizontal broaching machine, vertical boring machine, steel rules, internal micrometer, external micrometer, depth micrometer, vernier calliper, protractor, slip gauge, bore/hole gauge, thread gauge, plug gauge, radius /profile gauge, pneumatic or magnetic table, machine vice, angle plate, vee blocks and clamps, fixtures, 3 jaw chuck, 4 jaw chuck, ancillary indexing device, jigs</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> <li>○ External micrometer</li> <li>○ Depth micrometer</li> <li>○ Vernier calliper</li> <li>○ Slip gauge</li> <li>○ Hole/bore gauge</li> <li>○ Thread gauge</li> <li>○ Plug gauge</li> <li>○ Radius/profile gauge</li> <li>● Read and establish job requirements from the job specification document</li> <li>● Prepare the component for the broaching operation</li> <li>● Prepare for the broaching activities by mounting, positioning and correctly setting a range of work holding devices</li> <li>● Identify the location of emergency stop button and emergency brakes</li> <li>● Set the machine tool operating parameters to achieve the component Specification</li> <li>● Set up machine in accordance with instructions and specifications</li> <li>● Carryout broaching operations by following standard procedures               <ul style="list-style-type: none"> <li>○ Keyways</li> <li>○ Square holes</li> <li>○ Hexagonal and octagonal holes</li> <li>○ Holes with a single flat side</li> <li>○ Splines</li> <li>○ Serrations</li> <li>○ Special forms</li> </ul> </li> <li>● Perform quality checks to ensure that quality parameters and dimensional accuracies are as per the job specification               <ul style="list-style-type: none"> <li>○ Dimensional tolerance +/-0.20 mm</li> <li>○ Surface finish 1.6 micrometer</li> <li>○ Check the components for false tool cuts, burrs and sharp edges</li> </ul> </li> <li>● Fill up appropriate technical forms, process charts, activity logs</li> <li>● Communicate with people in respectful form and manner in line with organizational protocol</li> <li>● Identify problems with work planning, procedures, output and behavior and their implications</li> <li>● Plan, prioritize and sequence work operations as per job requirements</li> </ul>	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
2	<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>Personal Protective Equipment (PPE)</p>
3	<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>
4	<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 Code</b> CSC/N1335</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> <li>Explain stages of crisis and crisis management</li> <li>Prepare an incident report</li> </ul>	<p>Training kit (Trainer guide, PowerPoint)</p> <p>First aid kit with all contents</p>
5	<p><b>Work effectively with others</b></p> <p><b>Theory Duration</b> (hh:mm) 20:00</p> <p><b>Practical Duration</b> (hh:mm) 60:00</p>	<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> </ul>	<p>Training kit (Trainer guide, PowerPoint)</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<b>Corresponding NOS Code</b> CSC/N1336	<ul style="list-style-type: none"> <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 the workplace</li> </ul>	
	<b>Total Duration</b>  <b>Theory Duration</b> <b>84:00</b>  <b>Practical Duration</b> <b>216:00</b>	<b>Unique Equipment Required:</b> Personal Protective Equipment (PPE), horizontal broaching machine, vertical boring machine, steel rules, internal micrometer, external micrometer, depth micrometer, vernier calliper, protractor, slip gauge, bore/hole gauge, thread gauge, plug gauge, radius /profile gauge, pneumatic or magnetic table, machine vice, angle plate, vee blocks and clamps, fixtures, 3 jaw chuck, 4 jaw chuck, ancillary indexing device, jigs Class A, B, C, D and K fire extinguishers, First aid kit with all contents.	

Grand Total Course Duration: **300 Hours, 0 Minutes**

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



## Trainer Prerequisites for Job role: “Operator-Broaching Machine” mapped to Qualification Pack: “CSC/Q0114 v1.0”

Sr. No.	Area	Details
1	<b>Description</b>	Perform broaching operations to produce a range of components which require machining of features like keyways, square holes, hexagonal and octagonal holes, holes with a single flat side, splines, serrations and special forms.
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: “ <u>Operator-Broaching Machine</u> ” mapped to QP: “CSC/Q0114, 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: “MEP/Q0102”. Minimum accepted as per respective SSC guidelines is 80%.
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>Operator-Broaching Machine</b>
<b>Qualification Pack</b>	<b>CSC/Q0114, 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 center (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 70% in every NOS.
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
<b>1.CSC/N0114 Perform broaching operations to produce a range of metal components using broaching machines</b>	PC1.comply with health and safety, environmental and other relevant regulations and guidelines at work	100	3	1	2
	PC2.adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing broaching operations		4	1	3
	PC3.ensure work area is clean and safe from hazards		2	0	2
	PC4.ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC5.ensure that machine guards are in place and are correctly adjusted		2	0	2
	PC6.check that all measuring equipment is within calibration date		2	0	2
	PC7.ensure availability of job specification from a valid source		2	0	2
	PC8.read and establish job requirements from the job specification document		2	0	2
	PC9.ensure that the components used are free from foreign objects, dirt or other contamination		2	0	2
	PC10.prepare and maintain the work area as per procedure or operation specification		3	1	2
	PC11.plan to carry out the required broaching activities and the sequence of operations as per specifications		3	1	2
	PC12.follow the defined operating procedures and apply safe working practices and procedures at all times		3	1	2
	PC13.obtain all the appropriate materials, tools and equipment required for the broaching operation		2	0	2
	PC14.prepare for the broaching activities by mounting, positioning and correctly setting a range of work holding devices		3	0	3
	PC15.fit and align the appropriate broach		3	0	3
	PC16.align the work piece in relationship to machine axis		3	0	3
	PC17.set the machine tool operating parameters to achieve the component specification		4	1	3
	PC18.set up machine in accordance with instructions and specifications		4	1	3
	PC19.set up the machine to produce internal and external profiles		4	0	4
	PC20.seek any necessary instruction/training on the operation of the machine, where required		3	0	3
	PC21.hold components securely, without		3	0	3

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	distortion				
	PC22.ensure that machine settings are adjusted as and when required to maintain the required accuracy		2	0	2
	PC23.obtain the component drawings, specifications and/or job instructions required for the components to be machined		2	0	2
	PC24.use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate IS or ISO standards in relation to work undertaken)		3	0	3
	PC25.use and extract information from reference charts, tables, graphs and standards		3	0	3
	PC26.operate the machine tool controls safely and correctly, in line with operational procedures		6	2	4
	PC27.control the machine in both hand and power modes for normal operations		3	0	3
	PC28.stop the machine in both normal and emergency situations correctly, and follow right procedure for restarting after an emergency		4	1	3
	PC29.position and secure work holding devices to the machine spindle		4	0	4
	PC30.perform the technique of trial cut for checking dimensional accuracy		4	0	4
	PC31.perform the checks to be carried out on the components before removing them from the machine, and the equipment needed for this activity		4	0	4
	PC32.ensure that the quality control procedures are used while operating the equipment		3	1	2
	PC33.ensure that the components produced meet the required specification for quality and accuracy		3	1	2
	<b>Total</b>		<b>100</b>	<b>12</b>	<b>88</b>
<b>2.CSC/N1335 Use basic health and safety practices at the workplace</b>	PC1.use protective clothing/equipment for specific tasks and work conditions	<b>100</b>	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

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	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
	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 where 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		3	2	1

Assessable Outcome	Assessment Criteria	Total Mark (300)	Out Of	Marks Allocation	
				Theory	Skills Practical
	procedures				
	PC25.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		4	1	3
	PC26.demonstrate correct method to move injured people and others during an emergency		4	1	3
	<b>Total</b>		<b>100</b>	<b>36</b>	<b>64</b>
<b>3.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>300</b>	<b>78</b>	<b>222</b>
	<b>Percentage Weightage:</b>			<b>26</b>	<b>74</b>
	<b>Minimum Pass% to qualify (aggregate):</b>			<b>70</b>	