Model Curriculum

Gas Cutter

SECTOR: Construction
SUB-SECTOR: Real Estate and Infrastructure Construction
OCCUPATION: Fabrication
REF ID: CON/Q1204, V1.0
NSQF LEVEL: 2

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: 'Gas Cutter' QP No. 'CON/ Q 1204 NSQF Level 2'

Date of Issuance: November 13th, 2017

Valid up to: March 1st , 2020 / Valid up to the next review date of the Qualification Pack

Authorised Signatory
(Construction Skill Development Council of India)

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Gas Cutter

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Gas Cutter", in the "Construction" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Gas Cutter**		
Qualification Pack Name & Reference ID	CON/Q1204, v1.0		
Version No.	1.0	**Version Update Date**	18-08-2019
Pre-requisites to Training	10th standard with 3 years of working experience under a plasma/gas cutter at construction site or equivalent		
Training Outcomes	**After completing this programme, participants will be able to:** • **Carry out gas cutting of structural steel elements using oxy fuel gas cutting equipment:-** Procedure for conducting cutting operations including relevant knowledge about preparation for cutting, equipments, materials etc. • **Carry out preheating of materials before cutting and welding process:** Procedure for conducting heating operations including relevant knowledge about preparation for heating, equipments, materials etc. • **Identify and mark structural steel elements to assist in fit-up of the same:-** Introduction to measurement and marking on structural section. • **Work effectively in a team to deliver desired results at the workplace:-**Introduction to team working and effective communication procedures to be followed at construction sites • **Work according to personal health, safety and environment protocol at construction site:-** Importance of Health & Safety aspects & measures to be followed while working.		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of "Gas Cutter" Qualification Pack issued by "Construction Skill Development Council of India".

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 the job role • Major responsibilities of a gas cutter. • Major functions and tasks performed by a gas cutter • General hierarchy of fabrication occupation • Growth path a gas cutter • Introduction to trade terminologies like orientation, alignment etc.	• class room • White board • Computer • Projector
2	**Carry out gas cutting of structural steel elements using oxy fuel gas cutting equipment** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 78:00 **Corresponding NOS Code** CON/N1207	**Theory:** • Introduction to gas cutting • Introduction to basic arithmetic • Knowledge to understand hand sketches and simple drawings to compute dimensions, understand the position and orientation of sections for marking etc. • Safety: Knowledge of occupational diseases related to cutting works, safety precautions to be taken while performing oxy-fuel gas cutting operations, general safety precautions to be taken while working in site and in fabrication yard. • Housekeeping: Knowledge of importance of proper housekeeping, effects of cutting on surfaces that are not cleaned properly • Heating: introduction, effects of heating on metals, kindling temperature, methods of heat transfer, how to measure temperature during heating process using various instruments. • Knowledge of various equipment, consumables and tools including auxiliary equipment required while oxy fuel gas cutting • Knowledge of specifications and rage of operations of tools, consumables and equipment (including auxiliary equipment) required while oxy fuel gas cutting	• 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

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Information about common brands, price range and specifications etc. of the same for all equipments, consumables and tools including auxiliary equipment required while oxy fuel gas cutting • Knowledge of components of a gas cutting torch. • Introduction to other methods of cutting steel sections like punching, shearing etc. **Demonstration/ Practical :-** • Read the sketches/ drawings to understand the cutting requirements • Clean the surface appropriately • Identify the components of the cutting torch and assemble the cutting equipment • Perform cutting operation on structural steel sections as per the drawing provided. All quality and tolerance parameters should be met.	• 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
3	**Carry out preheating of materials before cutting and welding process** **Theory Duration** (hh:mm) 19:00 **Practical Duration** (hh:mm) 77:00 **Corresponding NOS Code** CON/N1252	**Theory:** • Knowledge of purpose & procedure of preheating • Knowledge of a neutral flame. How is it achieved • Different gases involved in the heating process and their functions • Knowledge to measure temperature. Different methods for doing the same • What is symmetric and asymmetric heating • Occupational disease related to heating • Importance of correct body posture while performing heating operations • Safety: 1. What are hazardous conditions relating to gas cutting operations and how can these be avoided. 2. Do's and don'ts while working with gas cutting equipment 3. What are the different safety equipments? What are their	• 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

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		functions and operations? Why are they necessary? 4. What are unsafe acts w.r.t cutting works, consequence of unsafe acts 5. Different fire protection equipments and their use (based upon the type of fire) • Preparatory works for preheating: 1. Interpreting Information regarding temperature of preheat, location of preheat etc. 2. Different components of heating equipment, their purpose and proper working conditions 3. Why is cleaning important before applying heat. Adverse effects of heating on unclean surface. Methods of cleaning the surface 4. Different tools and instruments used during the heating operation 5. Why should the movement of joint be restricted while heating. How is it done 6. • Preheating: 1. Procedure for lighting heating torch 2. Distance of torch to be maintained form the surface of the metal 3. Procedure for preheating the sections 4. Procedure for shutting down the heating equipment 5. Methods of carrying out basic maintenance of the heating equipment **Demonstration/ practical: -** • Demonstrate preparation activities including 1. Wearing proper PPE's 2. Checking and confirming that safety equipments are present and operational 3. Cleaning the surface to be heated as per instructed procedure 4. Make and check all the connections in the equipment • Demonstrate Heating of steel sections including	• Acetylene Gas Pressure regulator • Portable gas cutting machine • Trolley for cylinder • Oxy Acetylene Gas cutting blow pipe • Oxygen, Acetylene Cylinders • Flashback arrestors

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		1. Ascertaining the location and temperature of heating 2. Striking the flame 3. Performing symmetric heating on sections, pipes and plates 4. Shutting down the equipment and storing the same.	
4	**Identify and mark structural steel elements to assist in the fitup of the same** **Theory Duration** (hh:mm) 16:00 **Practical Duration** (hh:mm) 62:00 **Corresponding NOS Code** **CON/N1203**	**Theory:-** • Different types of steel sections based upon shape and size (I, C, H, angle, sheet, plate, tubes, pipes etc.) • Understanding hand sketches and simple drawings to compute dimensions, understand the position and orientation of sections for marking etc. • Different methods of performing a measurements and markings on structural steels • Different instruments and tools required for measuring and marking on structural sections and their applications • Classification of materials based upon the weight (light, medium and heavy materials) • Introduction for shifting of materials and ergonomics involved in material shifting • Methods of shifting and stacking heavy materials • Safety hazards involved in sifting of heavy materials • What are undulations and their effect on the quality of overall output. **Demonstration/ Practical :-** • Identify various sections on bases of shape and differentiate between sheet and plate based on size • Identify the sections (I, C, H, UC) from the hand sketches or fabrication shop drawings. Also, describe the orientation and position of the depicted section. • Identify measuring instruments and describe their applications	

Sr. No.	Module	Key Learning Outcomes	Equipment Required

		• Perform linear measurements (length, width, depth and thickness) on various sections (I, C, H and Angle)
		• Read and understand the hand sketches to interpret
		  ○ The type of sections
		  ○ Orientation of sections
		  ○ Dimensions to be marked on the sections
		And perform measurement using appropriate methods and mark the same as per the sketch provided.	

5	**Work effectively in a team to deliver desired results at the workplace** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 19:00 **Corresponding NOS Code** CON/N8001	Theory: - • Method of oral and written communication skills with co-workers, trade seniors • Reading and interpretation of grinding works formats, permits, protocols, checklists • How to interpret scope of grinding activities, material/ tools handling by adhering to instructions or consulting with seniors • Method of providing instruction to subordinates or 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 in a predictable and familiar working condition • Carrying out measurements and markings • Carrying out cutting works as per drawings • Carrying out preheating works	
6	**Work according to personal health, safety and environment protocol at construction site**	**Theory:-** • Types of hazards involved in Fabrication yard • Types of hazards involved in working at heights, lifting & shifting of heavy	• Leather Hand Gloves • Jump suit • Wire brush • Hand & Leg guards leather

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Theory Duration (hh:mm) 09:00 **Practical Duration** (hh:mm) 37:00 **Corresponding NOS Code** CON/N9001	materials, fitup activities, edge preparation works etc. • Emergency safety control measures and actions to be taken under emergency situation • Identification of unsafe act and unsafe condition • Concept of :- 1. First Aid process 2. Use of fire extinguisher 3. Classification of fires and fire extinguisher 4. Safety drills 5. Types and use of PPEs required for cutting, fit-up and other fabrication works • Safety protocols and practices • Reporting procedure to the concerned authority in emergency situations • Standard procedure of handling, storing and stacking material • What is safe disposal of waste, type of waste and their disposal • basic ergonomic principles as per applicability **Demonstration/ Practical :-** 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 fabrication works, handling, storing, stacking and shifting of material, tools and equipment 2. Identification of locations, situations/ circumstances, malpractices which can be hazardous for fabrication works 4. Selection of fire extinguisher based on classification of fire, standard practice of storing & stacking fire fighting equipments/ materials at work locations 5. Disposal of waste materials as per their nature and effects on weather	• Safety goggles • Nose mask • Ear protection • Fire extinguishers • Sand buckets Flashback arrestors • Welding helmet • Welding glass
	Total Duration **Theory Duration** **76:00**	**Unique Equipment Required:** class room, White board , Computer, Projector, Charts and displays regarding MIG and SMAW welding	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration 274:00	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	

Grand Total Course Duration: 350 **Hours, 0 Minutes**

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

Trainer Prerequisites for Job role: "Gas Cutter" mapped to Qualification Pack: "CON/Q1204, 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/Q1204".
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 standard pass
4a	**Domain Certification**	Trainer/Assessor- 50% in each NOS of Qualification Pack "CON/Q1204" & 80% overall , Lead trainer/Lead Assessors- 50% in each NOS of Qualification Pack "CON/Q1204" & 90% overall
4b	**Platform Certification**	Trainer/Assessor-80% in each NOS of Qualification Pack "MEP/Q0102" or "MEP/Q0104", Lead trainer/ Lead Assessors- 90% 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	Gas Cutter - Construction
Qualification Pack	CON/Q1204
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. To pass the Qualification Pack, every trainee should score a minimum of 70% in each NOS with minimum 70% score in practical and 50% in theory.
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 NOSs, the trainee is eligible to take subsequent assessment on the balance NOSs 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.

				Marks Allocation	
Assessment outcomes	Assessment Criteria for outcomes	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
CON/1207: Carry out gas cutting of structural steel elements using oxy fuel gas cutting equipment	PC1. keep the gas cylinders upright and strapped with safety chains at all times	**100**	5	1	4
	PC2. connect the gas pipes to the torch securely		5	1	4
	PC3. ensure that flash back arrestor is installed		5	1	4
	PC4. check that all gauges are correctly working		5	1	4
	PC5. clean the surface before applying heat		5	1	4
	PC6. read and interpret hand sketches/ drawings and markings to identify the location of cutting		7	1	6
	PC7. select proper body position so that hand movements are comfortable and smooth		5	1	4
	PC8. strike the flame using gas cutting torch lighter		5	1	4
	PC9. adjust the fuel gas flow to obtain desired length of flame		5	1	4
	PC10. adjust oxygen flow to concentrate the flame into desired thickness for heat transfer		6	1	5
	PC11. maintain a consistent distance from material such that the cutting is done by the point of flame		7	1	6
	PC12. move the torch over the markings at required speed such that cut is clean and thorough		7	1	6
	PC13. ensure that the movement of torch should be such that the cut on the metal is uniform and does not affect the dimensions of the members		7	1	6
	PC14. extinguish flame by first closing Fuel gas and then oxygen at mixer		7	1	6
	PC15. close shut-off valves for oxygen & acetylene by turning clockwise		7	1	6
	PC16. allow tip or attachments to cool before disconnecting all attachments		7	1	6
	PC17. disconnect and clean all equipment after use		5	1	4
		Total	**100**	**20**	**80**
CON/N1252: Carry out preheating of	PC1. identify any hazardous conditions in the work place relevant to work	**100**	4	1	3

materials before cutting and welding process	PC2. avoid wearing loose clothing and wear welding jumpsuits or any other uniform issued on site		3	1	2
	PC3. ensure that there is no leakage in gas pipelines		3	1	2
	PC4. ensure that proper purging is done prior to welding the pipelines or tube sections		2	1	1
	PC5. ensure that flash arrestor is installed and functioning properly		4	1	3
	PC6. avoid presence of moisture in vicinity of the working area and work piece		4	1	3
	PC7. strike the flame with prescribed lighters and not using open flames		3	1	2
	PC8. avoid any unsafe act by self particularly while working in workplace		3	1	2
	PC9. identify and use the fire protection tools and equipment based upon the type of fire		3	1	2
	PC10. participate in safety drills organized in workplace		3	1	2
	PC11. participate in tool box talks as organized in workplace				
	PC12. ascertain the location of pre heat		8	1	7
	PC13. ascertain the required temperature				
	PC14. ensure that gas cylinders are in upright position		3	1	2
	PC15. ensure that all knobs, values, switches and gauges of equipment are in working condition		4	1	3
	PC16. clean the surface of base metal prior to pre heat		3	1	2
	PC17. ensure that temperature measurement instrument is available				
	PC18. ensure that joint is secure clamped and immovable		3	1	2
	PC19. ensure that nozzle of torch is clean		3	1	2
	PC20. strike the flame using gas cutting torch lighter		3	1	2
	PC21. adjust the fuel gas flow to obtain desired length of flame		8	2	6
	PC22. adjust oxygen flow to concentrate the flame into desired thickness for heat transfer		8	2	6
	PC23. hold the torch above the metal joint such that it is not too close to overheat the material and not too far to cause heat loss		8	2	6
	PC24. move the torch above and around the joint for symmetrical heat transfer		8	2	6
	PC25. check the temperature of the metal regularly to avoid overheating of metal		3	1	2

	PC26. close the fuel gas flow before turning off oxygen while closing the torch.		3	1	2
	PC27. carry out basic maintenance of torch and other apparatus as per requirements		3	1	2
		Total	**100**	**20**	**80**
CON/1203: Identify and mark structural steel elements to assist in fit-up of the same	PC1. identify and distinguish the materials based on their shape, size and thickness	**100**	10	2	8
	PC2. select materials as per requirements and instructions		10	2	8
	PC3. conduct liner measurements like length, width, diameter, using proper measuring tools like tapers, rulers, calipers etc.		25	5	20
	PC4. read and understand hand sketches/ drawings to interpret fit up requirements		10	2	8
	PC5. place the sections, plates, pipes or tubes in position as per instructions		10	2	8
	PC6. mark on the surface of sections the position of bolts, plates or sections for fit-up as per instruction		20	4	16
	PC7. recheck the markings w.r.t hand sketches/ drawings to confirm its correctness		10	2	8
	PC8. report any undulations or bends encountered during measurements to superiors		5	1	4
		Total	**100**	**20**	**80**
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**	10	2	8
	PC2. inform co-workers and superiors about any kind of deviations from work		5	1	4
	PC3. address the problems effectively and report if required to immediate supervisor appropriately		5	1	4
	PC4. receive instructions clearly from superiors and respond effectively on same		5	1	4
	PC5. communicate to team members / subordinates for appropriate work technique and method		5	1	4
	PC6. seek clarification and advice as per requirement and applicability		10	2	8
	PC7. hand over the required material, tools tackles, equipment and work fronts timely to interfacing teams		30	6	24
	PC8. work together with co-workers in a synchronized manner		30	6	24
		Total	**100**	**20**	**80**
CON/N9001: Work according to personal health,	PC1. identify and report any hazards, risks or breaches in site safety to the appropriate authority	100	5	1	4

safety and environment protocol at construction site	PC2. follow emergency and evacuation procedures in case of accidents, fires, natural calamities		5	1	4
	PC3. follow recommended safe practices in handling construction materials, including chemical and hazardous material whenever applicable		10	2	8
	PC4. participate in safety awareness programs like Tool Box Talks, safety demonstrations, mock drills, conducted at site		5	1	4
	PC5. identify near miss , unsafe condition and unsafe act		5	1	4
	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	2	8
	PC7. handle all required tools, tackles , materials & equipment safely		5	1	4
	PC8. follow safe disposal of waste, harmful and hazardous materials as per EHS guidelines		5	1	4
	PC9. install and apply properly all safety equipment as instructed		15	3	12
	PC10. follow safety protocol and practices as laid down by site EHS department		15	3	12
	PC11. collect and deposit construction waste into identified containers before disposal, separate containers that may be needed for disposal of toxic or hazardous wastes		10	2	8
	PC12. apply ergonomic principles wherever required		10	2	8
		Total	**100**	**20**	**80**