Model Curriculum

Draughtsman-Piping

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:	**Design**
REF ID:	**CSC/Q0403, v1.0**
NSQF LEVEL:	**4**

Skill India
कौशल भारत-कुशल भारत

CGSC
CAPITAL GOODS SKILL COUNCIL

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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: **'Draughtsman - Piping'** QP No. **'CSC/ Q 0403, NSQF Level 4'**

Date of Issuance: Nov 24th, 2017

Valid up to : Nov 24th, 2021

**Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)*

Authorised Signatory
(Capital Goods Skill Council)

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Draughtsman-Piping

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Draughtsman-Piping", in the "Capital Goods" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Draughtsman-Piping**		
Qualification Pack Name & Reference ID.	CSC/Q0403, v1.0		
Version No.	1.0	**Version Update Date**	21/12/2018
Pre-requisites to Training	Diploma in Mechanical Engineering 2D Computer Aided Design System Training		
Training Outcomes	**After completing this programme, participants will be able to:** • Make or modify 2D piping drawings using computer aided design (CAD) design. • Follow basic health and safety practices at the workplace. • Work effectively with colleagues and supervisors.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Draughtsman-Piping" Qualification Pack issued by "Capital Goods Skill Council".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction** **Theory Duration** (hh:mm) 3:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** CSC/N0403	• Describe the role and responsibilities of a Draughtsman- Piping. • Describe the reporting structure, inter-dependent functions, lines and procedures in the work area. • Explain drafting standards and procedures.	Training kit (Trainer guide, Presentation).
2	**Introduction to 2D piping drawings using computer aided design (CAD) system** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 25:00 **Corresponding NOS Code** CSC/N0403	• Describe the procedure for customizing variables. • Identify system defaults. • Define 'Macros' and explain their features. • Interpret 'First angle' and 'Third angle' engineering drawing. • Interpret commonly used symbols of engineering drawing. • Differentiate between component, layout and assembly drawings. • Distinguish between Orthographic and Isometric drawings. • Analyse standard specifications of pipes, fittings and flanges. • List auxiliary equipment used in industrial piping. • Explain different types of industrial pipe systems. • Identify types of pipe fitting and components. • Identify various peripheral devices. • List drawing template parameters such as layers, line types, colour, text styles, etc. • List various drawing tools. • Explore range of standard components and symbols from the CAD library.	Training kit (Trainer guide, Presentation), Computer of latest configuration with all peripheral devices (Light pen, digitizer/tablet, scanner, printer, plotter), pipe fittings and components, various types of pipes, commonly used pipe fittings and flanges, Latest version of CAD template.
3	**Determining work requirements** **Theory Duration** (hh:mm) 5:00	• Extract technical information such as drawing brief; specifications (overall dimensions, materials, special procedures for manufacturing); drawing change or modification request; regulations; existing drawings/designs; sketches; notes from meetings/discussions; standards reference documents (e.g.	Training kit (Trainer guide, Presentation), Computer of latest configuration with all peripheral devices (Light pen, digitizer/tablet, scanner, printer, plotter), pipe fittings and components, various

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 10:00 **Corresponding NOS Code** CSC/N0403	limits and fits, tapping drill charts, contraction allowances); Design features, as appropriate to the drawing being produced: function, materials, clearance, operating environment, quality, aesthetics, interfaces, physical space, ergonomics and tolerances relevant to the drawing to be created from authorised sources. • Interpret drawings using first angle orthographic projections, isometric/ oblique projections, third angle orthographic projections, sectional elevations. • Interpret piping and instrumentation diagrams and specifications. • Identify various pipe fittings and flanges and specify their application. • Describe the function and application of valves and auxiliary equipment. • Identify components used in piping project such as ball, stop, gate, angle, cocks, flanges, t-pieces, elbows, plugs, caps, unions, connectors, reducers. • Identify occupational health and safety (OHS) factors applying to piping system.	types of pipes, commonly used pipe fittings and flanges, Latest version of CAD template.
4	**Making 2D piping drawings using computer aided design (CAD) system** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 65:00 **Corresponding NOS Code** CSC/N0403	• Ensure the availability of the latest version of CAD software. • Connect all peripheral devices such as keyboard, mouse, light pen, digitizer/tablet, scanner, printer, plotter, etc. to the CPU. • Set the drawing datum at a convenient point. • Setup all drawing parameters such as layers, line types, color, text styles, etc. as per source document. • Customize system variables, menus and drawing defaults to produce the drawing to the appropriate scale. • Develop macros as per approved procedures. • Develop a drawing template to the required standards, which includes all necessary detail. • Produce drawings such as lines (straight, curved/contour, angled); symbols and abbreviations; hidden detail; dimensions; circles or ellipses; parts lists; text; geometrical and dimensional tolerance; insertion of	Training kit (Trainer guide, Presentation), computer of latest configuration with all peripheral devices (Light pen, digitizer/tablet, scanner, printer, plotter), pipe fittings and components, various types of pipes, commonly used pipe fittings and flanges, Latest version of CAD template; storage medium (e.g. hard drive, CD/DVD, external storage device).

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		standard components; elevation; views (plane, side, sectional, detail) using first angle orthographic projections, isometric/oblique projections, third angle orthographic projections, sectional elevations. • Produce process flow, piping and instrumentation (P&ID) diagrams and isometric and spool drawings. • Produce orthogonal single and double line arrangement drawings of pipe installation systems in accordance with engineer's sketches. • Draw piping layouts, dimension and label the drawing as per approved procedures, which are organizational guidelines and procedures, recognized compliance agency/body standards, directives or codes of practice, CAD software standards/protocols, national and/or International standards or directives, customer standards and requirements, health, safety and environmental requirements. • Ensure that drawings are correctly titled, referenced and approved by the appropriate person • Save the drawing to an appropriate storage medium. • Produce a hard copy printout of the drawing for file purposes. • Shut down the CAD system to a safe condition on completion of the drawing activities.	
5	**Health and safety** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 08:00 **Corresponding NOS Code** CSC/N1335	• Explain the importance of Personal Protective Equipment (PPE). • Identify appropriate PPE for the various tasks performed. • Identify job site hazards at the workplace such as sharp edged and heavy tools; heated metals; gas cylinders; welding radiation; hazardous surfaces (sharp, slippery, uneven, chipped, broken, etc.); hazardous substances (chemicals, gas, fumes, dust, etc.); physical hazards (working at heights, large and heavy objects and machines, sharp and piercing objects, tools and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.), electrical hazards (power supply and	Training kit (Trainer guide, Presentation), leather gloves, leather apron, welding screen – helmet types, hand screen welding and safety shoes.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		points, loose and naked cables and wires, electrical machines and appliances, etc.) to avoid accidents at the work place. • Identify possible causes of risk and accidents at the workplace such as: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness). • Identify the names and locations of people responsible for health and safety in the workplace. • Identify documents that refer to health and safety in the workplace and where they are located. • Carry out safe working practices such as using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner, store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc. while dealing with hazards to ensure the safety of self and others. • Inspect steps and ladders for faults such as corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc., set them at firm/level base, clip/lash down, leaning at the correct angle, etc. and use them safely. • Work safely in and around trenches, elevated places and confined areas. • Lift heavy objects safely using correct procedures. • Apply good housekeeping practices	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		such as clean/tidy work areas, removal/disposal of waste products, protect surfaces at all times. • Identify common hazard signs displayed in various areas such as on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.	
6	**Fire Safety** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** CSC/N1335	• Identify causes of fire accidents. • Recognise required fire extinguisher based on the types of fire such as class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (these categories of fires become class A, B and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); class D: combustible metals such as magnesium, titanium, and sodium (these fires burn at extremely high temperatures and require special suppression agents). • Use the appropriate fire extinguishers on different types of fires correctly. • Interpret fire safety signs. • Inspect evacuation plan in case of fire. • Identify the location of assembly point, fire exit and fire alarm. • Follow reporting procedure in case of a fire. • Participate in fire safety drills at the workplace. • Demonstrate good housekeeping in order to prevent fire hazards.	Training kit (Trainer guide, Presentation), Class A, B, C and D fire extinguishers.
7	**Emergencies, rescue and first aid procedure** **Theory Duration** (hh:mm) 09:00 **Practical Duration** (hh:mm) 18:00 **Corresponding NOS**	• Follow electrical safety procedures. • Use approved method to rescue a person from electrocution. • State the importance of first aid. • Identify the contents of a first aid kit. • Administer first aid in case of minor injuries, bleeding, burns, choking, electrical shock, poisoning, etc. • Demonstrate the artificial respiration and CPR process. • Follow correct method to move injured people and others during an emergency.	Training kit (Trainer guide, Presentation), First aid kit with all contents.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Code CSC/N1335	• Explain stages of crisis and crisis management. • Participate in emergency procedures such as raising alarm, safe/efficient evacuation, identifying correct means of escape, identifying correct assembly point, attending roll call, correct return to work as per role. • Prepare an accident/incident report including details of name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified or dictate a report to another person and send report to person responsible.	
8	**Working effectively with others** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** CSC/N1336	• State various categories of people that one is required to communicate and co-ordinate within the organization. • Explain the importance of effective communication in the workplace. • Explain the importance of teamwork in organizational and individual success. • Describe various components of effective communication and active listening. • Describe the barriers to effective communication. • Provide and receive information to and from authorized persons accurately and within agreed timescale. • Communicate information to others clearly, at a pace and in a manner that helps them to understand. • Work with colleagues in a positive and helpful manner, where required and possible. • Take measures to maximize effectiveness and efficiency in carrying out tasks by consulting with and assisting others. • Follow appropriate communication etiquette while working such as not using abusive language; usage of appropriate titles and terms of respect; not eating or chewing while talking (vice versa), using appropriate tone, pitch and language to convey	Training kit (Trainer guide, Presentation).

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		politeness, assertiveness, care and professionalism, etc. • Apply active listening skills while interacting with others at work. • Explain the importance of ethics and discipline for professional success. • Describe common reasons for interpersonal conflict and ways of managing interpersonal conflict effectively. • Explain the importance of developing effective working relationships for professional success. • Display responsible and disciplined behaviors at the workplace such as punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. • Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict.	
	Total Duration **Theory Duration 84:00** **Practical Duration 216:00**	**Unique Equipment Required:** Computer of latest configuration with all peripheral devices (Light pen, digitizer/tablet, scanner, printer, plotter), pipe fittings and components, various types of pipes, commonly used pipe fittings and flanges, Latest version of CAD template, Storage medium (e.g. hard drive, CD/DVD, external storage device), Personal Protective Equipment (PPE), Class A, B, C and D 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: "Draughtsman-Piping" mapped to Qualification Pack: "CSC/Q0403 v1.0"

Sr. No.	Area	Details
1	**Description**	The Trainer trains the learners on the occupational standards, using pre-set lesson plans and training materials. They plan for and conduct sessions to impart competency based skills and knowledge. The trainer for 'Draughtsman-Piping' trains the learner to create and modify drawings for piping and piping systems design using CAD system and to draft in detail the drawings of piping and piping systems.
2	**Personal Attributes**	The individual must have expertise in the technical/vocational domain of instruction. They must have strong communication, organisational and interpersonal skills. They must be quality focused and encourage learner engagement. Additionally, they should remain abreast with the latest trends in their domain and upgrade their facilitation skills.
3	**Minimum Educational Qualifications**	Diploma /Degree in Mechanical Engineering
4a	**Domain Certification**	Certified for Job Role: "Draughtsman-Piping" mapped to QP: "CSC/Q0403, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q0102". Minimum accepted score as per MEPSC guidelines is 70%.
5	**Experience**	• 3-4 years of industry experience in the relevant field • 3-4 years of teaching experience

Annexure: Assessment Criteria

Criteria For Assessment Of Trainees

Job Role: Draughtsman-Piping

Qualification Pack: CSC/Q0403

Sector Skill Council: Capital Goods Skill Council

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Total Marks: 300	**Compulsory NOS**			**Marks Allocation**	
Assessment outcomes	**Assessment Criteria for outcomes**	**Total Marks**	**Out of**	**Theory**	**Skills Practical**
CSC/N0403 Make or modify 2D piping drawings using computer aided design (CAD) system	PC1.use appropriate sources to obtain the technical information relevant to the drawing to be created	**100**	2	0	2
	PC2.ensure that the data and information received is complete and correct		1	0	1
	PC3.establish the drawing requirements from the data and information received		2	0	2
	PC4.report and rectify incorrect and inconsistent information in job specification documents as per organization procedures		4	2	2
	PC5.interpret and produce drawings using first angle orthographic projections, isometric/oblique projections, third angle orthographic projections, sectional elevations		3	0	3
	PC6.interpret piping and instrumentation diagrams and specifications		4	2	2
	PC7.identify various pipe fittings and flanges and specify their application		2	0	2

	PC8.describe the function and application of valves and auxiliary equipment		4	2	2
	PC9.identify components used in piping project		2	0	2
	PC10.identify occupational health and safety (OHS) factors applying to piping system		2	0	2
	PC11.power up the equipment and activate the appropriate drawing software		3	0	3
	PC12.set up and check that all peripheral devices are connected and correctly operating		2	0	2
	PC13.set the drawing datum at a convenient point		2	0	2
	PC14.set up drawing parameters to suit the drawing produced		1	0	1
	PC15.check that all the equipment is correctly connected and in a safe and usable working condition		2	0	2
	PC16.power up the equipment and activate the appropriate drawing software		3	1	2
	PC17.customize system variables, menus and drawing defaults to produce the drawing to the appropriate scale		4	2	2
	PC18.develop macros as per approved procedures		4	2	2
	PC19.set up drawing parameters to company procedures or to suit the drawing produced		3	1	2
	PC20.apply drafting principles to produce a drawing that is consistent with standard operating procedures within the organization		2	0	2
	PC21.apply operating principles and specifications of piping systems and equipment to drawing		3	0	3
	PC22.detail pipes, valves and auxiliary equipment		3	1	2
	PC23.indicate vertical and horizontal offsets and hand wheel orientation		4	2	2
	PC24.apply health and safety and environmental factors to drawing detail		2	0	2
	PC25.ensure drawing/model accurately reflects specifications, is presented according to organizational requirements and contains all relevant information		2	0	2
	PC26.create a drawing template to the required standards, which includes all necessary detail		4	2	2
	PC27. use appropriate terminologies, codes and other references and techniques to create drawings, in the required formats, that are sufficiently and clearly detailed		4	1	3
	PC28.use keyboard command and pull down menus available in common CAD systems		3	1	2
	PC29.produce process flow, piping and instrumentation (P&ID) diagrams and isometric		5	2	3

	and spool drawings				
	PC30.produce orthogonal single and double line arrangement drawings of pipe installation systems in accordance with engineer's sketches		4	1	3
	PC31.draw piping layouts, dimension and label the drawing as per approved procedures		3	1	2
	PC32.ensure that drawings are checked and approved by the appropriate person		1	0	1
	PC33.produce hard copies of the finished drawings and check that the drawing is correctly titled and referenced		1	0	1
	PC34.save the drawing to an appropriate storage medium (e.g. hard drive, CD/DVD, external storage device)		2	0	2
	PC35.produce a hard copy printout of the drawing for file purposes		2	0	2
	PC36.deal promptly and effectively with problems within learner's control and seek help and guidance from the relevant people if you have problems that they cannot resolve		3	1	2
	PC37.shut down the CAD system to a safe condition on completion of the drawing activities		2	0	2
		Total	**100**	**24**	**76**
CSC/N1335 Use basic health and safety practices at the workplace	PC1.use protective clothing/equipment for specific tasks and work conditions	**100**	4	1	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		4	2	2
	PC6.state methods of accident prevention in the work environment of the job role		3	2	1
	PC7.state location of general health and safety equipment in the workplace		5	2	3
	PC8.inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC9.work safely in and around trenches, elevated places and confined areas		5	2	3
	PC10.lift heavy objects safely using correct procedures		4	2	2
	PC11.apply good housekeeping practices at all times		5	2	3

	PC12.identify common hazard signs displayed in various areas		3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		4	1	3
	PC14.use the various appropriate fire extinguishers on different types of fires correctly		3	1	2
	PC15.demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards		4	1	3
	PC17.demonstrate the correct use of a fire extinguisher		4	1	3
	PC18.demonstrate how to free a person from electrocution		4	1	3
	PC19.administer appropriate first aid to victims where required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC20.demonstrate basic techniques of bandaging		3	1	2
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC23.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
	PC24.demonstrate the artificial respiration and the CPR Process		3	1	2
	PC25.participate in emergency procedures		4	1	3
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		4	2	2
		Total	**100**	**36**	**64**
CSC/N1336 Work effectively with others	PC1.receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required	**100**	10	3	7
	PC2.pass information accurately 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 behaviour 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 behaviours 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
		Total	**100**	**30**	**70**