

Qualification Pack



Stainless Steel Fabricator

QP Code: CSC/Q0307

Version: 2.0

NSQF Level: 5

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CSC/Q0307: Stainless Steel Fabricator

Brief Job Description

A Stainless Steel Fabricator designs, cuts, forms, welds, joins, polishes and finishes the stainless steel structure/component/product as per work requirements. The individual also performs quality checks and ensures correct installation of the fabricated structure at the worksite, as per required standards.

Personal Attributes

The individual must have good communication skills, numerical and computational abilities, planning and organization skills, problem solving skills and as well as a willingness to learn and take initiatives to improve.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

- [1. CSC/N0310: Plan and prepare for stainless steel fabrication](#)
- [2. CSC/N0311: Perform cutting and forming tasks for stainless steel fabrication](#)
- [3. CSC/N0312: Perform pre-welding operations for stainless steel fabrication](#)
- [4. CSC/N0212: Perform basic Tungsten Inert Gas \(TIG\) Welding also known as Gas Tungsten Arc Welding \(GTAW\) Welding](#)
- [5. CSC/N0313: Perform finishing and installation of fabricated stainless steel structure](#)
- [6. CSC/N1335: Use basic health and safety practices at the workplace](#)
- [7. CSC/N0204: Manually weld carbon and low alloy steels by using Metal Arc Welding \(MMAW\)/ Shielded Metal Arc Welding \(SMAW\)](#)
- [8. CSC/N0209: Manually weld metals by using MIG/MAG welding](#)
- [9. DGT/VSQ/N0102: Employability Skills \(60 Hours\)](#)

Qualification Pack (QP) Parameters

Sector	Capital Goods
Sub-Sector	Process Plant Machinery



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Occupation	Fabrication, Fitting and Assembly
Country	India
NSQF Level	5
Credits	20
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7123.9900
Minimum Educational Qualification & Experience	<p>10th Class (with 4 years relevant experience) with 4 Years of experience OR 12th Class (with 1 year (NTC or NAC or NITC)) with NA of experience OR 12th Class (with 2 years relevant experience) with 2 Years of experience OR Certificate-NSQF (Certified in NSQF-L4 Materials - Engineer with 3 years relevant experience) with 3 Years of experience OR Diploma (Completed 3 year diploma (mechanical) after 10th with 1 year relevant experience) with 1 Year of experience OR Diploma (Completed 1st year of 2 year of diploma (after 12th)) with NA of experience OR Graduate (Completed 1st year of UG (UG Certificate)) with NA of experience OR Graduate (Pursuing 2nd year of UG) with NA of experience</p>
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	20 Years
Last Reviewed On	NA
Next Review Date	25/08/2027
NSQF Approval Date	25/08/2022
Version	2.0



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Reference code on NQR	2022/CCM/CGSC/06612
NQR Version	1



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CSC/N0310: Plan and prepare for stainless steel fabrication

Description

This unit is about planning and preparing for stainless steel fabrication in accordance with industry standards and site requirements.

Scope

The scope covers the following :

- Plan and prepare for stainless steel fabrication

Elements and Performance Criteria

Plan and prepare for stainless steel fabrication

To be competent, the user/individual on the job must be able to:

- PC1.** obtain and customize the designs/sketches/drawings/purchase order, to ensure compliance to local conditions, customer and site requirements (Local conditions: e.g. natural drainage, natural cleaning, allows easy reach and access)
- PC2.** identify project requirements by accurately interpreting the CAD drawings and drawing conclusions from sketches
- PC3.** determine the materials, parts, equipment, method and environmental conditions that affect the properties of the fabricated structure and evaluate the feasibility of the structure to be fabricated
- PC4.** identify the type and grade of stainless steel to be used in the fabrication process (Types of stainless steel: austenitic, duplex, ferritic, martensitic, etc.) (Grades of stainless steel: 200,300 and 400 etc. series of stainless steel)
- PC5.** perform measurements at the worksite using correct tools and materials for stainless steel fabrication
- PC6.** determine the process flow and sequence of operations to be performed for fabrication
- PC7.** plan the tasks, and allocate work to be performed as per the project timelines and requirements
- PC8.** prepare bill of materials (BoM) specifying the type, quantity and nature/grade of materials as per task requirements and submit to the concerned department or vendor (Bill of Materials (BoM): part number; description of materials/parts such as size, thickness, length; number of sets; quantity per set; type of operation; weight, rate etc)
- PC9.** design a single-angle truss and use T-sections as per application and site requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** legislation, standards, policies, and procedures followed in the organization related to the employment and performance conditions
- KU2.** health and safety requirements applicable in the workplace



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- KU3.** importance of working in a clean and safe environment
- KU4.** role and responsibilities of a stainless steel fabricator
- KU5.** sources of information pertaining to employment terms, entitlements, job role and responsibilities
- KU6.** reporting structure, inter-dependent functions, production lines and procedures in the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** documentation and related procedures applicable in the context of employment and work
- KU9.** properties of stainless steel such as corrosion resistance, hardness, ductility, malleability etc
- KU10.** types of applications and benefits of stainless steel (Applications: architectural (such as gates, railings, interiors and/or exteriors), stainless steel cladding (such as pillars, walls and cabinets), beams, columns, platforms, railings, cable sheathing, conveyors, chutes, silos, hoppers, expansion joints, curtain walling, roofing, canopies, tunnel lining, gates, utensils, cable ladders and walkways on offshore platforms)
- KU11.** different grades of stainless steel used in fabrication and factor that help in selecting the correct type/grade of stainless steel
- KU12.** usage and suitability of materials, tools, machinery and equipment for the fabrication of stainless steel
- KU13.** fabrication tolerances for various types and grades of stainless steel
- KU14.** elements that help in evaluating the installation feasibility of the stainless steel structure/s such as site limitations, dimensions of the structure, etc
- KU15.** interpretation of designs and CAD drawings such as isometric, sectional, cross-sectional, assembly and dimensional drawings
- KU16.** sequence of operations for fabrication
- KU17.** procedure followed for preparing bill of materials for the fabrication process
- KU18.** considerations for customizing the design as per local conditions, customer requirements and site specifications
- KU19.** importance of ensuring easy reach and access to and from the fabrication work area.
- KU20.** process of natural drainage and natural cleaning

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS2.** undertake arithmetic operations, and calculations/ formulae (Arithmetic operations: e.g. addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS3.** use appropriate measuring techniques and units of measurement
- GS4.** read and correctly assimilate information from manufacturer manuals and guides
- GS5.** read technical drawings and schematics to correctly extract relevant information
- GS6.** convey and share technical information clearly using appropriate language



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- GS7.** express information to individuals or groups taking into account nature of audience and the information
- GS8.** receive, attend to, correctly interpret and respond to verbal messages and other cues
- GS9.** apply active listening skills using reflection, restatement, questioning and clarification
- GS10.** take proper and effective action when necessary without having all the facts at hand
- GS11.** adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyze information relevant to work
- GS14.** allocate resources and time effectively
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** provide prompt and efficient responses to meet requirements, requests and concerns of customers
- GS17.** establish boundaries for as appropriate for unreasonable customer demands
- GS18.** demonstrate awareness of customer goals
- GS19.** provide thorough, accurate information to answer customer questions
- GS20.** identify sources of information and support for problem solving
- GS21.** identify problems with work planning, procedures, output and behavior and their implications
- GS22.** identify effective resolution techniques
- GS23.** communicate problems appropriately to others
- GS24.** seek assistance and support from other sources to solve problems
- GS25.** select and apply resolution techniques
- GS26.** seek evidence for problem resolution
- GS27.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS28.** evaluate reliability of information sourced from suppliers and vendors
- GS29.** balance priorities with constraints in order to propose viable recommendations

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Plan and prepare for stainless steel fabrication</i>	30	70	-	-
PC1. obtain and customize the designs/sketches/drawings/purchase order, to ensure compliance to local conditions, customer and site requirements (Local conditions: e.g. natural drainage, natural cleaning, allows easy reach and access)	3	7	-	-
PC2. identify project requirements by accurately interpreting the CAD drawings and drawing conclusions from sketches	3	8	-	-
PC3. determine the materials, parts, equipment, method and environmental conditions that affect the properties of the fabricated structure and evaluate the feasibility of the structure to be fabricated	3	8	-	-
PC4. identify the type and grade of stainless steel to be used in the fabrication process (Types of stainless steel: austenitic, duplex, ferritic, martensitic, etc.) (Grades of stainless steel: 200,300 and 400 etc. series of stainless steel)	3	7	-	-
PC5. perform measurements at the worksite using correct tools and materials for stainless steel fabrication	3	8	-	-
PC6. determine the process flow and sequence of operations to be performed for fabrication	4	8	-	-
PC7. plan the tasks, and allocate work to be performed as per the project timelines and requirements	3	8	-	-
PC8. prepare bill of materials (BoM) specifying the type, quantity and nature/grade of materials as per task requirements and submit to the concerned department or vendor (Bill of Materials (BoM): part number; description of materials/parts such as size, thickness, length; number of sets; quantity per set; type of operation; weight, rate etc)	4	8	-	-
PC9. design a single-angle truss and use T-sections as per application and site requirements	4	8	-	-



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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	30	70	-	-



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0310
NOS Name	Plan and prepare for stainless steel fabrication
Sector	Capital Goods
Sub-Sector	Process Plant Machinery, Light Engineering Goods
Occupation	Fabrication, Fitting and Assembly
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	25/08/2027
NSQC Clearance Date	25/08/2022



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CSC/N0311: Perform cutting and forming tasks for stainless steel fabrication

Description

This unit is about performing cutting and forming tasks for stainless steel fabrication in compliance with the industry standards and as per task requirements.

Scope

The scope covers the following :

- Prepare for cutting of stainless steel
- Shear stainless steel
- Perform abrasive cutting
- Form stainless steel
- Adhere to industry work practices

Elements and Performance Criteria

Prepare for cutting of stainless steel

To be competent, the user/individual on the job must be able to:

- PC1.** identify the type of cutting method/s to be used for the stainless steel workpiece and the related application/s
- PC2.** mark the cutting line/s as per measurement and estimates using prescribed material
- PC3.** clamp or secure the sheet to ensure perfect cut as per required setup and machinery
- PC4.** cut bulk materials into appropriate work pieces using right machinery and standard industry tools (Standard industry tools: CNC machines, handheld machines, cutting wheels, rotary tools)
- PC5.** obtain First Part Approval (FPA) from the supervisor for the first part cut as per standard operating procedure
- PC6.** perform drilling using stainless steel specified drill bits at right angles, applying adequate pressure and maintaining a steady speed (Drilling: machining (turning, facing); hole drilling, threading, tapping) (Stainless steel specified drill bits: high-speed drill bits, carbide bits etc.)

Shear stainless steel

To be competent, the user/individual on the job must be able to:

- PC7.** select and use manual shears and shearing machines for cutting stainless steel sheets as per the grade and thickness of Stainless steel sheet/plate (Shears: guillotine shears and swing-type shears) (Shearing machines: Hydraulic shearing machine; mechanical shearing machine (upper drive and lower drive))
- PC8.** set the shears, adjust for blade clearance and derate the shears against their nominal capacity to compensate for the power requirements as per the thickness of stainless steel (Blade clearance: depends on plate thickness and material strength)

Perform abrasive cutting

To be competent, the user/individual on the job must be able to:

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- PC9.** perform abrasive cutting using appropriate discs for cut-off operations on small section sizes, thin plate material and applications involving straight-line cutting (Discs: aluminium oxide discs, rubber-based discs, vitrified/resinous-bonded discs, dedicated discs)

Form stainless steel

To be competent, the user/individual on the job must be able to:

- PC10.** use a hydraulic bending machine for bending of stainless steel sheets/pipes by applying adequate pressure and as per application requirements
- PC11.** use manual bending technique by applying adequate pressure to form the required shape and nature of application (Nature of application: pipe, sheet, solid section etc.)
- PC12.** apply pressing/stamping technique using appropriate tool and die punches to provide the required shape (Pressing technique: punching, blanking, bending, embossing and flanging)
- PC13.** cut the workpiece into appropriate blanks

Adhere to industry work practices

To be competent, the user/individual on the job must be able to:

- PC14.** cut stainless steel workpiece using plasma cutting and laser cutting techniques in coordination with concerned personnel
- PC15.** remove the chips and bursts completely after cutting operations to avoid gaps between joints (Chips and bursts: deburring; adjustment of fitments, hand files, rotating machine, hand tools (such as grinder))
- PC16.** use an appropriate industry accepted lubricant for blanking, piercing and punching and rotating parts of machinery used in stainless steel fabrication (Lubricant: Emulsifiable chlorinated waxes/oils, wax based pastes, soluble oils, or soap plus borax)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** legislation, standards, policies, and Procedures followed in the company relevant to own employment and performance conditions
- KU2.** health and safety requirements applicable in the workplace
- KU3.** importance of working in clean and safe environment
- KU4.** roles and responsibilities of a stainless steel fabricator
- KU5.** sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU6.** reporting structure, inter-dependent functions, production lines and procedures in the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** various grades of stainless steel, their properties and applications
- KU9.** tools, equipment, machinery, materials and techniques used in marking, cutting, bending and forming
- KU10.** measurements and estimations performed during marking and cutting
- KU11.** process and precautions for marking, Clamping, drilling, cutting, bending and forming stainless steel as per requirements



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- KU12.** considerations for ensuring a perfect cut (such as use of cutting fluid, cutting angle, positive feed, cutting pressure, cutting angle and direction, cutting speed, blade sharpness, back clearance/rake angle, tooth spacing, overheating of the workpiece, etc.)
- KU13.** derating of shears as per material thickness
- KU14.** fabrication tolerances for various types and grades of stainless steel
- KU15.** steps and precautions involved in abrasive cutting technique
- KU16.** applications, specifications and quality parameters associated with plasma cutting and laser cutting
- KU17.** tools, machinery, precautions and considerations associated with stainless steel pressing/stamping process
- KU18.** appropriate lubricants for blanking, piercing and punching
- KU19.** tools, steps, precautions and considerations for measuring and checking the output against the quality parameters of the desired stainless steel product
- KU20.** contaminants that may impact tools and materials and their removal techniques
- KU21.** industry procedure for cleaning, maintenance, handling and stocking of stainless steel
- KU22.** techniques and tools used for removing the chips and bursts after cutting
- KU23.** health and safety practices to be followed during cutting and forming
- KU24.** industry regulations, legislations, codes and work practices to be applied during work process

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS2.** use appropriate measuring techniques and units of measurement
- GS3.** translate practical problems into useful mathematical expressions
- GS4.** read and correctly assimilate information from manufacturer manuals and guides
- GS5.** read technical drawings and schematics to correctly extract relevant information
- GS6.** convey and share technical information clearly using appropriate language
- GS7.** express information to individuals or groups taking into account nature of audience and the information
- GS8.** receive, attend to, correctly interpret and respond to verbal messages and other cues
- GS9.** apply active listening skills using reflection, restatement, questioning and clarification
- GS10.** take proper and effective action when necessary without having all the facts at hand
- GS11.** adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyze information relevant to work
- GS14.** allocate resources and time effectively
- GS15.** exercise restraint while expressing dissent and during conflict situations
- GS16.** provide prompt and efficient responses to meet requirements, requests and concerns of customers



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- GS17.** establish boundaries for as appropriate for unreasonable customer demands
- GS18.** demonstrate awareness of customer goals
- GS19.** provide thorough, accurate information to answer customer questions
- GS20.** identify problems with work planning, procedures, output and behavior and their implications
- GS21.** prioritize and plan for problem solving
- GS22.** communicate problems appropriately to others
- GS23.** identify sources of information and support for problem solving
- GS24.** seek assistance and support from other sources to solve problems
- GS25.** identify effective resolution techniques
- GS26.** select and apply resolution techniques
- GS27.** seek evidence for problem resolution
- GS28.** undertake and express new ideas and initiatives to others
- GS29.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS30.** enhance ones competencies in new and different situations and contexts to achieve more
- GS31.** distinguish fact from opinion
- GS32.** evaluate reliability of information sourced from suppliers and vendors
- GS33.** balance priorities with constraints in order to propose viable recommendations

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for cutting of stainless steel</i>	10	25	-	-
PC1. identify the type of cutting method/s to be used for the stainless steel workpiece and the related application/s	1	4	-	-
PC2. mark the cutting line/s as per measurement and estimates using prescribed material	2	4	-	-
PC3. clamp or secure the sheet to ensure perfect cut as per required setup and machinery	2	4	-	-
PC4. cut bulk materials into appropriate work pieces using right machinery and standard industry tools (Standard industry tools: CNC machines, handheld machines, cutting wheels, rotary tools)	2	5	-	-
PC5. obtain First Part Approval (FPA) from the supervisor for the first part cut as per standard operating procedure	1	4	-	-
PC6. perform drilling using stainless steel specified drill bits at right angles, applying adequate pressure and maintaining a steady speed (Drilling: machining (turning, facing); hole drilling, threading, tapping) (Stainless steel specified drill bits: high-speed drill bits, carbide bits etc.)	2	4	-	-
<i>Shear stainless steel</i>	4	8	-	-
PC7. select and use manual shears and shearing machines for cutting stainless steel sheets as per the grade and thickness of Stainless steel sheet/plate (Shears: guillotine shears and swing-type shears) (Shearing machines: Hydraulic shearing machine; mechanical shearing machine (upper drive and lower drive))	2	4	-	-
PC8. set the shears, adjust for blade clearance and derate the shears against their nominal capacity to compensate for the power requirements as per the thickness of stainless steel (Blade clearance: depends on plate thickness and material strength)	2	4	-	-
<i>Perform abrasive cutting</i>	2	5	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. perform abrasive cutting using appropriate discs for cut-off operations on small section sizes, thin plate material and applications involving straight-line cutting (Discs: aluminium oxide discs, rubber-based discs, vitrified/resinous-bonded discs, dedicated discs)	2	5	-	-
<i>Form stainless steel</i>	8	19	-	-
PC10. use a hydraulic bending machine for bending of stainless steel sheets/pipes by applying adequate pressure and as per application requirements	2	5	-	-
PC11. use manual bending technique by applying adequate pressure to form the required shape and nature of application (Nature of application: pipe, sheet, solid section etc.)	2	5	-	-
PC12. apply pressing/stamping technique using appropriate tool and die punches to provide the required shape (Pressing technique: punching, blanking, bending, embossing and flanging)	2	5	-	-
PC13. cut the workpiece into appropriate blanks	2	4	-	-
<i>Adhere to industry work practices</i>	6	13	-	-
PC14. cut stainless steel workpiece using plasma cutting and laser cutting techniques in coordination with concerned personnel	2	5	-	-
PC15. remove the chips and bursts completely after cutting operations to avoid gaps between joints (Chips and bursts: deburring; adjustment of fitments, hand files, rotating machine, hand tools (such as grinder))	2	4	-	-
PC16. use an appropriate industry accepted lubricant for blanking, piercing and punching and rotating parts of machinery used in stainless steel fabrication (Lubricant: Emulsifiable chlorinated waxes/oils, wax based pastes, soluble oils, or soap plus borax)	2	4	-	-
NOS Total	30	70	-	-



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National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0311
NOS Name	Perform cutting and forming tasks for stainless steel fabrication
Sector	Capital Goods
Sub-Sector	Process Plant Machinery, Light Engineering Goods
Occupation	Fabrication, Fitting and Assembly
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	25/08/2027
NSQC Clearance Date	25/08/2022



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CSC/N0312: Perform pre-welding operations for stainless steel fabrication

Description

This unit is about performing pre-welding operations for stainless steel fabrication in compliance with the industry standards and as per task requirements.

Scope

The scope covers the following :

- Perform pre-welding operations for stainless steel fabrication

Elements and Performance Criteria

Perform pre-welding operations for stainless steel fabrication

To be competent, the user/individual on the job must be able to:

- PC1.** select a weld procedure/technique that allows minimum penetration of weld metal into carbon (steel and adequate fusion (Weld procedure/technique: tungsten inert gas (TIG) welding; metal inert gas (MIG) welding, shielded metal arc welding (SMAW))
- PC2.** select a filler rod with required alloy content as per the type of weld, properties of the weld metal and grade of stainless steel being used (Properties of the weld metal: corrosion-resistance, strength of the material, chemical composition)
- PC3.** bevel and provide slopes at the edge of stainless steel plate as per task requirements
- PC4.** clean the weld surface thoroughly to avoid contamination that could result in hot cracking (Methods for cleaning the weld surface: using industry approved cleaning solution such as acetone or a chloride free cleaner; manual cleaning using steel wire brush, stainless steel wool or a chemical solvent; vapour degreasing or tank cleaning for large assemblies; single/multiple swipes as per need)
- PC5.** clamp or secure the stainless steel plate/sheet tightly to ensure accurate welding as per task requirements
- PC6.** set the amperage machine at the required temperature as per type of welding and scope of application
- PC7.** perform tacking to ensure proper jointing of the structures to be fabricated
- PC8.** ensure correct dilution levels and composition of filler metal with base material
- PC9.** apply appropriate backing technique for stainless steel to avoid crevices, voids and oxidation using copper, aluminium, argon (in GTAW) and/or nitrogen
- PC10.** maintain the carbon steel dilution of the stainless steel weld metal to a minimum
- PC11.** wear appropriate personal protective equipment (PPE) while working for stainless steel fabrication

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:



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- KU1.** legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** health and safety requirements applicable in the workplace
- KU3.** importance of working in clean and safe environment
- KU4.** role and responsibilities of a stainless steel fabricator
- KU5.** sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU6.** reporting structure, inter-dependent functions, production lines and procedures in the work area
- KU7.** escalation matrix and procedures for reporting work and employment related issues
- KU8.** various types and grades of stainless steel, their properties and applications
- KU9.** considerations for selecting a filler rod with required alloy content
- KU10.** importance of ensuring correct dilution levels of filler metal as per base material
- KU11.** welding techniques used in stainless steel fabrication
- KU12.** factors responsible for selecting the correct weld procedure for fabrication
- KU13.** manufacturer instructions in welding and filler metal recommendations for a dissimilar weld
- KU14.** edge preparation for stainless steel
- KU15.** various types of joints and methods of preparation
- KU16.** standard practice to clean, rinse and dry the stainless steel workpiece to remove contaminants, if any, before welding
- KU17.** standard practice to clamp and secure the workpiece before starting to weld
- KU18.** factors that are responsible in selecting the correct amperage for welding
- KU19.** process and equipment used for tacking the stainless steel workpiece
- KU20.** process for backing the stainless steel using appropriate sources
- KU21.** areas where consultation with a welding specialist/distributor is required
- KU22.** fabrication tolerances for various types and grades of stainless steel
- KU23.** factors that can lead to weld defects
- KU24.** safety measures to be undertaken as per the task being performed

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS2.** use appropriate measuring techniques and units of measurement
- GS3.** write in a manner appropriate for business
- GS4.** read and correctly assimilate information from manufacturer manuals and guides
- GS5.** read technical drawings and schematics to correctly extract relevant information
- GS6.** convey and share technical information clearly using appropriate language
- GS7.** express information to individuals or groups taking into account nature of audience and the information



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- GS8.** receive, attend to, correctly interpret and respond to verbal messages and other cues
- GS9.** apply active listening skills using reflection, restatement, questioning and clarification
- GS10.** take proper and effective action when necessary without having all the facts at hand
- GS11.** adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
- GS12.** plan, prioritize and sequence work operations as per job requirements
- GS13.** organize and analyze information relevant to work
- GS14.** allocate resources and time effectively
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- GS16.** provide prompt and efficient responses to meet requirements, requests and concerns of customers
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- GS21.** prioritize and plan for problem solving
- GS22.** communicate problems appropriately to others
- GS23.** identify sources of information and support for problem solving
- GS24.** seek assistance and support from other sources to solve problems
- GS25.** identify effective resolution techniques
- GS26.** select and apply resolution techniques
- GS27.** seek evidence for problem resolution
- GS28.** undertake and express new ideas and initiatives to others
- GS29.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS30.** enhance ones competencies in new and different situations and contexts to achieve more
- GS31.** distinguish fact from opinion
- GS32.** evaluate reliability of information sourced from suppliers and vendors
- GS33.** balance priorities with constraints in order to propose viable recommendations

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Perform pre-welding operations for stainless steel fabrication</i>	28	64	-	-
PC1. select a weld procedure/technique that allows minimum penetration of weld metal into carbon (steel and adequate fusion (Weld procedure/technique: tungsten inert gas (TIG) welding; metal inert gas (MIG) welding, shielded metal arc welding (SMAW))	-	-	-	-
PC2. select a filler rod with required alloy content as per the type of weld, properties of the weld metal and grade of stainless steel being used (Properties of the weld metal: corrosion-resistance, strength of the material, chemical composition)	2	6	-	-
PC3. bevel and provide slopes at the edge of stainless steel plate as per task requirements	3	7	-	-
PC4. clean the weld surface thoroughly to avoid contamination that could result in hot cracking (Methods for cleaning the weld surface: using industry approved cleaning solution such as acetone or a chloride free cleaner; manual cleaning using steel wire brush, stainless steel wool or a chemical solvent; vapour degreasing or tank cleaning for large assemblies; single/multiple swipes as per need)	3	7	-	-
PC5. clamp or secure the stainless steel plate/sheet tightly to ensure accurate welding as per task requirements	3	6	-	-
PC6. set the amperage machine at the required temperature as per type of welding and scope of application	2	6	-	-
PC7. perform tacking to ensure proper jointing of the structures to be fabricated	3	7	-	-
PC8. ensure correct dilution levels and composition of filler metal with base material	3	6	-	-



Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. apply appropriate backing technique for stainless steel to avoid crevices, voids and oxidation using copper, aluminium, argon (in GTAW) and/or nitrogen	3	7	-	-
PC10. maintain the carbon steel dilution of the stainless steel weld metal to a minimum	3	6	-	-
PC11. wear appropriate personal protective equipment (PPE) while working for stainless steel fabrication	3	6	-	-
NOS Total	28	64	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0312
NOS Name	Perform pre-welding operations for stainless steel fabrication
Sector	Capital Goods
Sub-Sector	Process Plant Machinery, Light Engineering Goods
Occupation	Fabrication, Fitting and Assembly
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	25/08/2027
NSQC Clearance Date	25/08/2022



Qualification Pack

CSC/N0212: Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding

Description

This unit covers the performing of basic manual TIG (GTAW) welding for a range of standard welding job requirements. This involves welding different materials (carbon steel, low alloy steel) in various positions.

Elements and Performance Criteria

Work Safely

To be competent, the user/individual on the job must be able to:

- PC1.** work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
- PC2.** take necessary safety precautions for TIG welding operations

Prepare for welding operations

To be competent, the user/individual on the job must be able to:

- PC3.** interpret weld procedure data sheets specifications interpreting the WPS: welding process (ISO Codes); parent metal; consumables; pre welding joint preparation (cleaning, edge preparation, assembly, pre-heat); welding parameters; welding positions (EN ISO 6947 PA, PB, PC, PD, PE, PF, PG; ASME IX I-6 G/1-6 F); number and arrangement of runs to fully fill/weld joints; electrode (W); filler wire; electrical conditions required (type of current, alternating [A.C.] direct [D.C.], electrode polarity (negative), welding current ranges; methods of arc ignition (scratch, high frequency, lift start); shielding gas (type, flow rate, pre-weld gas flow, post weld gas flow); techniques (including autogenous); control of heat input; interpass/run cleaning/back gouging methods; root pass with back purging of gases on the root side of the welding; post welding activities (wiring brushing, removal of excess weld metal where required); post-weld heat treatment (normalising, stress relief)
- PC4.** check that all measuring equipment is within calibration date
- PC5.** check if welding machines e.g.. transformer, inverters (AC/DC), rectifiers and generators have been made available by the authorized person
- PC6.** check if welding torch, tungsten electrode and filler wire have been made available by the authorized person
- PC7.** prepare for the TIG welding process
- PC8.** prepare the materials and joint in readiness for welding (Material and joint preparation: made rust free; cleaned free from scaling, paint, oil/grease; chemical cleaning; made dry and free from moisture; edges to be welded prepared as per job requirement (e.g.. flat, square or bevelled); use various machines and techniques for the above (e.g.. chamfering machine, grinding and stripping, etc.); correctly positioned (Positioning: devices and techniques; jigs and fixtures; setting up the joint in the correct position and alignment)
- PC9.** fit the welding shielding gases given by the authorised person, for a range of given applications
- PC10.** plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS (Activities checks: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters)

Qualification Pack

- PC11.** connect torches and the components (Torch components: cables, water carrying tubes, ceramic nozzle, collet, collet holder, gas lens, teflon washers, bakelite cap, ceramic shields/nozzles)
- PC12.** connect and adjust regulators and flow meters to cylinders
- PC13.** read, set and adjust current (amperage) as required
- PC14.** set pre-purge with shielding gas as required
- PC15.** prepare tungsten by sharpening or balling it to desired tip shape
- PC16.** set and verify gas flow rates
- PC17.** prepare and support the joint, using the appropriate methods
- PC18.** tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding
- PC19.** match feed and travel speed as required

Carry out welding operations

To be competent, the user/individual on the job must be able to:

- PC20.** perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements (Welding techniques: fine adjustment of parameters (current and gas flow); selection of gas nozzle if required; selection of the outer nozzle; correct manipulation of the torch; blending in stops/starts and tack welds; starting techniques)
- PC21.** use correct technique for starting the arc (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material)
- PC22.** use correct angle of torch and filler wire
- PC23.** weld the joint to the specified quality, dimensions and profile
- PC24.** use manual welding and related equipment, to carry out TIG welding processes
- PC25.** produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817 (Weld quality check standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joints at stop/start positions merge smoothly; weld surface is (free from cracks; substantially free) from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; substantially free from arcing or chipping marks); fillet welds are: equal in leg length, slightly convex in profile (where applicable), size of the fillet equivalent to the thickness of the material welded; weld contour is (of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formation); welds are adequately fused, and there is minimal undercut, overlap and surface inclusions; tack welds are blended in to form part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint or, where appropriate)
- PC26.** use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)
- PC27.** produce joints from various materials in different forms (Materials: carbon steel, low alloy steel; Forms: sheet (less than 1.5 mm), plate (8 mm), pipe/tube)
- PC28.** weld joints in good access situations, in select positions
- PC29.** make sure that the work area is maintained and left in a safe and tidy condition

Test for quality

To be competent, the user/individual on the job must be able to:

Qualification Pack

- PC30.** use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification
- PC31.** check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection (Quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; NDT/DT tested defects; Types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges, usage at temperature chalk)
- PC32.** identify various weld defects (Types of weld defects: lack of continuity of the weld ; uneven and irregular ripple formation; incorrect weld size or profile; undercutting; overlap; inclusions; porosity; internal cracks; surface cracks; lack of fusion; lack of penetration; welding spatter; gouges; stray arc strikes; sharp edges)
- PC33.** detect surface imperfections and deal with them appropriately
- PC34.** report any defect or imperfection identified to the authorised person
- PC35.** shut down and make safe the welding equipment on completion of the welding activities

Deal with contingencies

To be competent, the user/individual on the job must be able to:

- PC36.** detect equipment malfunctions and deal with them appropriately
- PC37.** 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

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company
- KU2.** key purpose of the organization
- KU3.** department structure and hierarchy protocols
- KU4.** work flow and own role in the workflow
- KU5.** dependencies and interdependencies in the workflow
- KU6.** support functions and types of support available for incumbents in this role
- KU7.** the types of fire extinguishers and their suitable uses in case of welding related fires
- KU8.** the effects of exposure to welding fume
- KU9.** range of welding equipment available Welding equipment: transformer (variable wave forms and wave balancing); rectifier (pulsing); inverter; generator; measuring equipment for electrical output and continuity (voltmeter/multi-meter, ammeter/shunts/coils, tong tester); equipment for current regulation; high frequency unit; torches; electrodes; filler wires; water cooling and circulation system for TIG torch (water cooled torch); return clamps; foot pedal; ancillary equipment (table grinders for tungsten electrode, wire brushes, linishers, hammer, power saw, angle, pedestal and straight grinders, chisel); other equipment; Shielding gases equipment: cylinders; manifold systems; regulators (fixed, single stage, two-stage); gas flow meters; gas tubes and connectors; solenoid valves; economisers)

Qualification Pack

- KU10.** concepts and mechanisms of welding (Welding concepts and mechanisms: relationship between wire feed speed control and welding current; power source characteristics (volt/ampere graph, flat characteristic, constant voltage output); types of current AC and DC and polarity; AC welding (square wave forms and wave balancing); DC pulsed TIG welding; return; earth; wire feed control (variable speed motor, direct control of wire feed rate))
- KU11.** basic principles of TIG welding and functions of welding equipment (Principles: the arc burns between a non- consumable tungsten electrode and the work piece; exclusively inert gases (Argon, Helium) are used as shielding gases; TIG welding installation; for most applications an electrode with a negative polarity is used; for welding of aluminium, alternating current must be used; for arc ignition a high-frequency high voltage is used)
- KU12.** different types of power source
- KU13.** safe working practice, precautions and procedures to be followed when preparing and using TIG welding equipment (Safety precautions (TIG Welding): protection from live and other electrical components, including insulation, proper earthing, proper loading, etc.; proper handling and placement of hot metal; taking account of splatter and related safe distance; adequate lighting; appropriate personal protective equipment (suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles); protection of self and others from the effects of the welding arc; fume extraction/control measures; safety measures for elevated and trench working reduction in the local air concentration due to release of argon gas during welding in confined places)
- KU14.** hazards associated with TIG welding and safety precautions to minimize risk (Safety precautions (general): general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; surface conditions; stability of surrounding structures, furniture, etc.)
- KU15.** personal protective equipment to be worn for the welding activities
- KU16.** correct handling and storage of gas cylinders
- KU17.** manual TIG welding process
- KU18.** type and thickness of base metals
- KU19.** current types and polarity
- KU20.** reasons for using shielding gases, and the types and application of the various gases (Shielding gases: shielding gases for GTAW; applications for shielding gases/gas mixtures (argon, argon/helium mixtures, argon/hydrogen mixtures, nitrogen argon/nitrogen mixtures); gas pressure requirements; flow rates for applications; back purging)
- KU21.** impact of shielding gas composition and purity on welding quality
- KU22.** use, impact and importance of gas pressures and flow rates in relationship to the type of material being welded and the consumables used (Welding consumables: filler wires for different base materials, shielding gas)
- KU23.** pre- and post-flow purge and its importance
- KU24.** importance and application of back purging
- KU25.** types of welded joints to be produced (Types of joints: fillet lap joints, tee fillet joints, corner joints, butt joints (square, single vee, double vee, single j (for higher thickness), double j))
- KU26.** terminology used for the appropriate welding positions (Welding Positions: 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, Pipe to Pipe 5G, Pipe welding at inclined position 6G)
- KU27.** how to prepare the materials in readiness for the welding activity
- KU28.** how to set up and restrain the joint, and the tools and techniques to be used



Qualification Pack

- KU29.** appropriate tack welding size and spacing (in relationship to material thickness)
- KU30.** checks to be made prior to welding (Activities checks: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters)
- KU31.** techniques of operating the welding equipment to produce a range of joints in the various joint positions
- KU32.** effects of the electrical characteristics of the TIG welding arc
- KU33.** purpose and importance of pre-heating requirements for base metals
- KU34.** purpose and importance of post-heating in welding
- KU35.** methods to achieve pre-heat and post heat requirements
- KU36.** tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.
- KU37.** how to control distortion (such as welding sequence; deposition technique)
- KU38.** problems that can occur with the welding activities
- KU39.** how to close down the welding equipment safely and correctly
- KU40.** how to prepare the welds for examination
- KU41.** various procedures for visual examination of the welds (Types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges, usage at temperature chalk)
- KU42.** handling of specimens for tests and methods of removing a test piece of weld from a suitable position in the joint Handling specimens for tests: handling hot materials; using chemicals for cleaning and etching; using equipment to fracture welds
- KU43.** safe working practices and procedures to be adopted when preparing the welds for examination
- KU44.** importance of leaving the work area and equipment in a safe condition on completion of the welding activities

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS2.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS3.** undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)
- GS4.** use appropriate measuring techniques
- GS5.** use and convert imperial and metric systems of measurements
- GS6.** apply appropriate degree of accuracy to express numbers
- GS7.** use and understand tolerance in terms of limits of size
- GS8.** check measurements, angles, orientation and slopes



Qualification Pack

- GS9.** types of reference lines such as tangent lines, datum lines, centre lines and work points
- GS10.** check square of material using corner-to-corner dimensions and triangulation (3-4-5) method
- GS11.** select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers
- GS12.** ability to check dimensions of components
- GS13.** calculate the value of angles in a triangle
- GS14.** convey and share technical information clearly using appropriate language
- GS15.** check and clarify task-related information
- GS16.** liaise with appropriate authorities using correct protocol
- GS17.** communicate with people in respectful form and manner in line with organizational protocol
- GS18.** plan, prioritize and sequence work operations as per job requirements
- GS19.** organize and analyse information relevant to work
- GS20.** basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
- GS21.** exercise restraint while expressing dissent and during conflict situations
- GS22.** avoid and manage distractions to be disciplined at work
- GS23.** manage own time for achieving better results
- GS24.** work in a team in order to achieve better results
- GS25.** identify and clarify work roles within a team
- GS26.** communicate and cooperate with others in the team for better results
- GS27.** seek assistance from fellow team members
- GS28.** identify problems with work planning, procedures, output and behaviour and their implications
- GS29.** prioritize and plan for problem solving
- GS30.** communicate problems appropriately to others
- GS31.** identify sources of information and support for problem solving
- GS32.** seek assistance and support from other sources to solve problems
- GS33.** identify effective resolution techniques
- GS34.** select and apply resolution techniques
- GS35.** seek evidence for problem resolution
- GS36.** undertake and express new ideas and initiatives to others
- GS37.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS38.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS39.** enhance ones competencies in new and different situations and contexts to achieve more
- GS40.** participate in on-the-job and other learning, training and development interventions and assessments
- GS41.** clarify task related information with appropriate personnel or technical adviser
- GS42.** seek to improve and modify own work practices



Qualification Pack

GS43. maintain current knowledge of application standards, legislation, codes of practice and product/process developments

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work Safely</i>	1	4	-	-
PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	1	2	-	-
PC2. take necessary safety precautions for TIG welding operations	-	2	-	-
<i>Prepare for welding operations</i>	10	29	-	-
PC3. interpret weld procedure data sheets specifications interpreting the WPS: welding process (ISO Codes); parent metal; consumables; pre welding joint preparation (cleaning, edge preparation, assembly, pre-heat); welding parameters; welding positions (EN ISO 6947 PA, PB, PC, PD, PE, PF, PG; ASME IX I-6 G/1-6 F); number and arrangement of runs to fully fill/weld joints; electrode (W); filler wire; electrical conditions required (type of current, alternating [A.C.] direct [D.C.], electrode polarity (negative), welding current ranges; methods of arc ignition (scratch, high frequency, lift start); shielding gas (type, flow rate, pre-weld gas flow, post weld gas flow); techniques (including autogenous); control of heat input; interpass/run cleaning/back gouging methods; root pass with back purging of gases on the root side of the welding; post welding activities (wiring brushing, removal of excess weld metal where required); post-weld heat treatment (normalising, stress relief)	1	2	-	-
PC4. check that all measuring equipment is within calibration date	-	2	-	-
PC5. check if welding machines e.g.. transformer, inverters (AC/DC), rectifiers and generators have been made available by the authorized person	1	1	-	-
PC6. check if welding torch, tungsten electrode and filler wire have been made available by the authorized person	1	1	-	-
PC7. prepare for the TIG welding process	1	1	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC8. prepare the materials and joint in readiness for welding (Material and joint preparation: made rust free; cleaned free from scaling, paint, oil/grease; chemical cleaning; made dry and free from moisture; edges to be welded prepared as per job requirement (e.g.. flat, square or bevelled); use various machines and techniques for the above (e.g.. chamfering machine, grinding and stripping, etc.); correctly positioned (Positioning: devices and techniques; jigs and fixtures; setting up the joint in the correct position and alignment)	-	2	-	-
PC9. fit the welding shielding gases given by the authorised person, for a range of given applications	-	2	-	-
PC10. plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS (Activities checks: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters)	-	2	-	-
PC11. connect torches and the components (Torch components: cables, water carrying tubes, ceramic nozzle, collet, collet holder, gas lens, teflon washers, bakelite cap, ceramic shields/nozzles)	-	2	-	-
PC12. connect and adjust regulators and flow meters to cylinders	1	2	-	-
PC13. read, set and adjust current (amperage) as required	1	2	-	-
PC14. set pre-purge with shielding gas as required	1	1	-	-
PC15. prepare tungsten by sharpening or balling it to desired tip shape	1	2	-	-
PC16. set and verify gas flow rates	1	1	-	-
PC17. prepare and support the joint, using the appropriate methods	1	2	-	-
PC18. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding	-	2	-	-
PC19. match feed and travel speed as required	-	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Carry out welding operations</i>	10	26	-	-
PC20. perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements (Welding techniques: fine adjustment of parameters (current and gas flow); selection of gas nozzle if required; selection of the outer nozzle; correct manipulation of the torch; blending in stops/starts and tack welds; starting techniques	1	4	-	-
PC21. use correct technique for starting the arc (using HF (high frequency) unit, scratching the electrode on the job material, lifting the electrode immediately after touching the job material)	2	2	-	-
PC22. use correct angle of torch and filler wire	1	3	-	-
PC23. weld the joint to the specified quality, dimensions and profile	1	3	-	-
PC24. use manual welding and related equipment, to carry out TIG welding processes	1	3	-	-
PC25. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817 (Weld quality check standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joints at stop/start positions merge smoothly; weld surface is (free from cracks; substantially free) from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; substantially free from arcing or chipping marks); fillet welds are: equal in leg length, slightly convex in profile (where applicable), size of the fillet equivalent to the thickness of the material welded; weld contour is (of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formation); welds are adequately fused, and there is minimal undercut, overlap and surface inclusions; tack welds are blended in to form part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint or, where appropriate	1	3	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)	2	2	-	-
PC27. produce joints from various materials in different forms (Materials: carbon steel, low alloy steel; Forms: sheet (less than 1.5 mm), plate (8 mm), pipe/tube)	-	2	-	-
PC28. weld joints in good access situations, in select positions	1	2	-	-
PC29. make sure that the work area is maintained and left in a safe and tidy condition	-	2	-	-
<i>Test for quality</i>	5	11	-	-
PC30. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification	2	2	-	-
PC31. check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection (Quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; NDT/DT tested defects; Types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges, usage at temperature chalk)	1	2	-	-
PC32. identify various weld defects (Types of weld defects: lack of continuity of the weld ; uneven and irregular ripple formation; incorrect weld size or profile; undercutting; overlap; inclusions; porosity; internal cracks; surface cracks; lack of fusion; lack of penetration; welding spatter; gouges; stray arc strikes; sharp edges)	1	2	-	-
PC33. detect surface imperfections and deal with them appropriately	1	1	-	-
PC34. report any defect or imperfection identified to the authorised person	-	2	-	-
PC35. shut down and make safe the welding equipment on completion of the welding activities	-	2	-	-
<i>Deal with contingencies</i>	-	4	-	-



Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC36. detect equipment malfunctions and deal with them appropriately	-	2	-	-
PC37. 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	-	-
NOS Total	26	74	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0212
NOS Name	Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Welding and Cutting
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	25/08/2027
NSQ Clearance Date	25/08/2022



Qualification Pack

CSC/N0313: Perform finishing and installation of fabricated stainless steel structure

Description

This unit is about performing finishing and installation of fabricated stainless steel structures at the worksite as per standard operating procedures.

Scope

The scope covers the following :

- Finish stainless steel structures
- Install fabricated structures
- Perform post installation activities

Elements and Performance Criteria

Finish stainless steel structures

To be competent, the user/individual on the job must be able to:

- PC1.** assemble the fabricated components as per design drawings and specifications
- PC2.** inspect the welded joints in the fabricated structure to check for welding imperfections
- PC3.** clean the weld area using mechanical, chemical and other standard cleaning methods as per standard operating procedure (SOP)
- PC4.** use flapper wheel abrasives for deburring and finishing the fabricated structures
- PC5.** apply relevant treatment techniques in the areas of hot weld deposit to restore the full passivity and corrosion resistance of the weld
- PC6.** test the weldments and their tensile strength using appropriate techniques
- PC7.** perform buffing to smoothen the surface of the workpiece and ensure fine finishing as per the required application
- PC8.** operate appropriate grinding and polishing equipment to achieve desired finishing on the structure
- PC9.** dispatch the fabricated structure as per standard practice and/or organisational SOP

Install fabricated structures

To be competent, the user/individual on the job must be able to:

- PC10.** check if the site ready for installation
- PC11.** assemble and join the parts and/or structures to be installed at the worksite in co-ordination with installation team
- PC12.** erect, align and level the stainless steel structure/s

Perform post installation activities

To be competent, the user/individual on the job must be able to:

- PC13.** provide instructions and guidelines for the upkeep of the stainless steel structure/s to the user/customer
- PC14.** secure and maintain the fabrication equipment and machinery



Qualification Pack

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** legislation, standards, policies, and procedures followed in the company
- KU2.** employment and performance conditions for the job role
- KU3.** health and safety requirements applicable in the workplace
- KU4.** importance of working in clean and safe environment
- KU5.** role and responsibilities of a stainless steel fabricator
- KU6.** sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU7.** reporting structure, inter-dependent functions, production lines and procedures in the work area
- KU8.** escalation matrix and procedures for reporting work and employment related issues
- KU9.** properties and applications of various types and grades of stainless steel
- KU10.** use of various tools, equipment and materials for finishing the stainless steel structure/s
- KU11.** interpretation of design drawings to facilitate installation process
- KU12.** elements of a quality assurance plan (QAP) for stainless steel fabrication
- KU13.** deburring, buffing techniques and requirements for stainless steel structures
- KU14.** methods and materials used to clean the stainless steel structures
- KU15.** water chilling methodology with respect to stainless steel fabrication
- KU16.** treatment processes such as mechanical methods, blast cleaning etc.
- KU17.** welding imperfections, their causes and possible countermeasures
- KU18.** considerations to be kept in mind while testing the weldments and checking the structure to ascertain appropriateness for installation
- KU19.** installation requirements for fabricated stainless steel
- KU20.** types of templates for marking for stainless steel and how to source them
- KU21.** considerations to ensure proper alignment and levelling for stainless steel structures while installation
- KU22.** guidelines for upkeep and maintenance of stainless steel structures as well as fabrication tools and equipment
- KU23.** correct practices for handling, storing, packing and transporting stainless steel
- KU24.** risks and precautions to be taken against them while engaged in fabrication activities

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
- GS2.** write in a manner appropriate for business
- GS3.** read and correctly assimilate information from manufacturer manuals and guides
- GS4.** convey and share technical information clearly using appropriate language



Qualification Pack

- GS5.** express information to individuals or groups taking into account nature of audience and the information
- GS6.** receive, attend to, correctly interpret and respond to verbal messages and other cues
- GS7.** apply active listening skills using reflection, restatement, questioning and clarification
- GS8.** take proper and effective action when necessary without having all the facts at hand
- GS9.** adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
- GS10.** plan, prioritize and sequence work operations as per job requirements
- GS11.** organize and analyze information relevant to work
- GS12.** allocate resources and time effectively
- GS13.** share information with the customer about the upkeep of the stainless steel structures/materials
- GS14.** listen to customer queries and concerns and provide an appropriate response to it
- GS15.** identify problems with work planning, procedures, output and behavior and their implications
- GS16.** prioritize and plan for problem solving
- GS17.** communicate problems appropriately to others
- GS18.** identify sources of information and support for problem solving
- GS19.** seek assistance and support from other sources to solve problems
- GS20.** identify effective resolution techniques
- GS21.** select and apply resolution techniques
- GS22.** seek evidence for problem resolution
- GS23.** undertake and express new ideas and initiatives to others
- GS24.** modify work plan to overcome unforeseen difficulties or developments that occur as work progresses
- GS25.** participate in improvement procedures including process, quality and internal/external customer/supplier relationships
- GS26.** enhance one's competencies in new and different situations and contexts to achieve more
- GS27.** distinguish fact from opinion
- GS28.** evaluate reliability of information sourced from suppliers and vendors
- GS29.** balance priorities with constraints in order to propose viable recommendations

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Finish stainless steel structures</i>	19	45	-	-
PC1. assemble the fabricated components as per design drawings and specifications	2	5	-	-
PC2. inspect the welded joints in the fabricated structure to check for welding imperfections	2	5	-	-
PC3. clean the weld area using mechanical, chemical and other standard cleaning methods as per standard operating procedure (SOP)	2	5	-	-
PC4. use flapper wheel abrasives for deburring and finishing the fabricated structures	2	5	-	-
PC5. apply relevant treatment techniques in the areas of hot weld deposit to restore the full passivity and corrosion resistance of the weld	3	5	-	-
PC6. test the weldments and their tensile strength using appropriate techniques	2	5	-	-
PC7. perform buffing to smoothen the surface of the workpiece and ensure fine finishing as per the required application	2	5	-	-
PC8. operate appropriate grinding and polishing equipment to achieve desired finishing on the structure	2	5	-	-
PC9. dispatch the fabricated structure as per standard practice and/or organisational SOP	2	5	-	-
<i>Install fabricated structures</i>	6	15	-	-
PC10. check if the site ready for installation	2	5	-	-
PC11. assemble and join the parts and/or structures to be Installed at the worksite in co-ordination with installation team	2	5	-	-
PC12. erect, align and level the stainless steel structure/s	2	5	-	-
<i>Perform post installation activities</i>	5	10	-	-



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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. provide instructions and guidelines for the upkeep of the stainless steel structure/s to the user/customer	3	5	-	-
PC14. secure and maintain the fabrication equipment and machinery	2	5	-	-
NOS Total	30	70	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0313
NOS Name	Perform finishing and installation of fabricated stainless steel structure
Sector	Capital Goods
Sub-Sector	Process Plant Machinery, Light Engineering Goods
Occupation	Fabrication, Fitting and Assembly
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	NA
Next Review Date	25/08/2027
NSQC Clearance Date	25/08/2022



Qualification Pack

CSC/N1335: Use basic health and safety practices at the workplace

Description

This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace. It covers responsibilities towards self, others, assets and the environment.

Elements and Performance Criteria

Health and safety

To be competent, the user/individual on the job must be able to:

- PC1.** use protective clothing/equipment for specific tasks and work conditions (Protective clothing: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors
Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator)
- PC2.** state the name and location of people responsible for health and safety in the workplace
- PC3.** state the names and location of documents that refer to health and safety in the workplace
- PC4.** identify job-site hazardous work and state possible causes of risk or accident in the workplace (Hazards: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls 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 points, loose and naked cables and wires, electrical machines and appliances, etc.) Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness))
- PC5.** carry out safe working practices while dealing with hazards to ensure the safety of self and others (Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and 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.)
- PC6.** state methods of accident prevention in the work environment of the job role (Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors)
- PC7.** state location of general health and safety equipment in the workplace (General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans))

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- PC8.** inspect for faults, set up and safely use steps and ladders in general use (Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc.) (Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.)
- PC9.** work safely in and around trenches, elevated places and confined areas
- PC10.** lift heavy objects safely using correct procedures
- PC11.** apply good housekeeping practices at all times (Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces)
- PC12.** identify common hazard signs displayed in various areas (Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.)
- PC13.** retrieve and/or point out documents that refer to health and safety in the workplace (Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices))

Fire safety

To be competent, the user/individual on the job must be able to:

- PC14.** use the various appropriate fire extinguishers on different types of fires correctly (Types of fires: Class A: eg. 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: eg. 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))
- PC15.** demonstrate rescue techniques applied during fire hazard
- PC16.** demonstrate good housekeeping in order to prevent fire hazards
- PC17.** demonstrate the correct use of a fire extinguisher

Emergencies, rescue and first-aid procedures

To be competent, the user/individual on the job must be able to:

- PC18.** demonstrate how to free a person from electrocution
- PC19.** administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.
- PC20.** demonstrate basic techniques of bandaging
- PC21.** respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments
- PC22.** perform and organize loss minimization or rescue activity during an accident in real or simulated environments
- 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
- PC24.** demonstrate the artificial respiration and the CPR Process
- PC25.** participate in emergency procedures (Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work)
- PC26.** complete a written accident/incident report or dictate a report to another person, and send report to person responsible (Incident Report includes 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)



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Emergencies, rescue and first-aid procedures

To be competent, the user/individual on the job must be able to:

PC27. demonstrate correct method to move injured people and others during an emergency

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace
- KU2.** names and location of documents that refer to health and safety in the workplace
- KU3.** meaning of hazards and risks
- KU4.** health and safety hazards commonly present in the work environment and related precautions
- KU5.** possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible
- KU6.** possible causes of risk and accident (Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness))
- KU7.** methods of accident prevention (Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors)
- KU8.** safe working practices when working with tools and machines
- KU9.** safe working practices while working at various hazardous sites
- KU10.** where to find all the general health and safety equipment in the workplace
- KU11.** various dangers associated with the use of electrical equipment
- KU12.** preventative and remedial actions to be taken in the case of exposure to toxic materials (Exposure: ingested, contact with skin, inhaled); (Preventative action: ventilation, masks, protective clothing/ equipment); (Remedial action: immediate first aid, report to supervisor Toxic materials: solvents, flux, lead)
- KU13.** importance of using protective clothing/equipment while working
- KU14.** precautionary activities to prevent the fire accident
- KU15.** various causes of fire (Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.)
- KU16.** techniques of using the different fire extinguishers
- KU17.** different methods of extinguishing fire
- KU18.** different materials used for extinguishing fire (Materials: sand, water, foam, CO₂, dry powder)
- KU19.** rescue techniques applied during a fire hazard
- KU20.** various types of safety signs and what they mean
- KU21.** appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
- KU22.** content of written accident report
- KU23.** potential injuries and ill health associated with incorrect manual handling



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KU24. safe lifting and carrying practices

KU25. personal safety, health and dignity issues relating to the movement of a person by others

KU26. potential impact to a person who is moved incorrectly

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and comprehend basic content to read labels, charts, signages

GS2. read and comprehend basic English to read manuals of operations

GS3. read an accident/incident report in local language or English

GS4. write an accident/incident report in local language or English

GS5. question co-workers appropriately in order to clarify instructions and other issues

GS6. give clear instructions to coworkers, subordinates others

GS7. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines

GS8. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity

GS9. remain congenial while discussing and debating issues with co-workers

GS10. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice

GS11. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives

GS12. thank co-workers for any assistance received

GS13. offer appropriate respect based on mutuality and respect for fellow workmanship and authority

GS14. identify immediate or temporary solutions to resolve delays

GS15. identify sources of support that can be availed of for problem solving for various kind of problems

GS16. seek appropriate assistance from other sources to resolve problems

GS17. report problems that you cannot resolve to appropriate authority

GS18. identify cause and effect relations in their area of work

GS19. use cause and effect relations to anticipate potential problems and their solution

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Health and safety</i>	21	32	-	-
PC1. use protective clothing/equipment for specific tasks and work conditions (Protective clothing: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors Equipment: hand shields, machine guards, residual current devices, shields, dust sheets, respirator)	1	3	-	-
PC2. state the name and location of people responsible for health and safety in the workplace	1	2	-	-
PC3. state the names and location of documents that refer to health and safety in the workplace	1	2	-	-
PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace (Hazards: sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tolls 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 points, loose and naked cables and wires, electrical machines and appliances, etc.) Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness))	2	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others (Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and 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.)	2	2	-	-
PC6. state methods of accident prevention in the work environment of the job role (Methods of accident prevention: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors)	2	1	-	-
PC7. state location of general health and safety equipment in the workplace (General health and safety equipment: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(eg fire exits, exhaust fans))	2	3	-	-
PC8. inspect for faults, set up and safely use steps and ladders in general use (Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/unfixed nuts or bolts, etc.) (Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.)	2	3	-	-
PC9. work safely in and around trenches, elevated places and confined areas	2	3	-	-
PC10. lift heavy objects safely using correct procedures	2	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. apply good housekeeping practices at all times (Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces)	2	3	-	-
PC12. identify common hazard signs displayed in various areas (Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc.)	1	2	-	-
PC13. retrieve and/or point out documents that refer to health and safety in the workplace (Documents: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (eg government notices))	1	3	-	-
<i>Fire safety</i>	4	10	-	-
PC14. use the various appropriate fire extinguishers on different types of fires correctly (Types of fires: Class A: eg. 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: eg. 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))	1	2	-	-
PC15. demonstrate rescue techniques applied during fire hazard	1	2	-	-
PC16. demonstrate good housekeeping in order to prevent fire hazards	1	3	-	-
PC17. demonstrate the correct use of a fire extinguisher	1	3	-	-
<i>Emergencies, rescue and first-aid procedures</i>	9	20	-	-
PC18. demonstrate how to free a person from electrocution	1	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19. administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.	1	2	-	-
PC20. demonstrate basic techniques of bandaging	1	2	-	-
PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments	1	2	-	-
PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments	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	1	2	-	-
PC24. demonstrate the artificial respiration and the CPR Process	1	2	-	-
PC25. participate in emergency procedures (Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work)	1	3	-	-
PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible (Incident Report includes 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)	1	2	-	-
<i>Emergencies, rescue and first-aid procedures</i>	2	2	-	-
PC27. demonstrate correct method to move injured people and others during an emergency	2	2	-	-
NOS Total	36	64	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N1335
NOS Name	Use basic health and safety practices at the workplace
Sector	Capital Goods
Sub-Sector	Machine Tools, Process Plant Machinery, Dies, Moulds and Press Tools, Electrical and Power Machinery, Plastics Manufacturing Machinery, Light Engineering Goods, Textile Manufacturing Machinery
Occupation	Machining
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	24/11/2017
Next Review Date	25/08/2027
NSQC Clearance Date	25/08/2022



Qualification Pack

CSC/N0204: Manually weld carbon and low alloy steels by using Metal Arc Welding (MMAW)/ Shielded Metal Arc Welding (SMAW)

Description

This unit is about performing manual metal arc welding (MMAW) for producing various types of joints on carbon and low alloy steels as per the given specifications and standards specified by the organisation.

Scope

The scope covers the following :

- Prepare for welding operations
- Perform MMAW/SMAW operations
- Perform post-welding operations

Elements and Performance Criteria

Prepare for welding operations

To be competent, the user/individual on the job must be able to:

- PC1.** identify the work to be done and product specifications by interpreting the product drawing, Welding Procedure Specification (WPS) and job orders
- PC2.** identify the tools, welding machines, measuring instruments, accessories, consumables and input materials (i.e. carbon, low alloy steel etc.) as per the requirements mentioned in WPS or drawing
- PC3.** select and arrange the right material, equipment, fixtures, accessories, welding torch and consumables i.e. electrode, filler wire, shielding gas etc. as per the SOP and job requirements
- PC4.** check the input material, tools and equipment for any defects and that they are as per the required quality standards
- PC5.** prepare the work area for the welding activities
- PC6.** prepare the materials (i.e. plate(1.5 - 24mm)/ sheet (1.5mm)) and joint for welding process
- PC7.** set the MMAW machine and its parameters as per the WPS and SOP
- PC8.** re-dry electrodes as per electrode classification requirement
- PC9.** install the work pieces and fixture on the apparatus and align them with the electrodes as per the job requirements
- PC10.** verify set up by running test weld specimen (scrap plate)

Perform MMAW/SMAW operations

To be competent, the user/individual on the job must be able to:

- PC11.** follow safety precautions during welding work as per SOP and organizational guidelines
- PC12.** start the MMAW machine for welding operations
- PC13.** strike and maintain a stable arc by applying correct technique (i.e. scratch start, tapping techniques) and to avoid welding defects
- PC14.** perform MMAW welding process as per SOP and tack weld the joint at appropriate intervals to produce joints of the specified quality, dimensions and profile

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- PC15.** produce fillet and groove joints in 1F/1G, 2F/2G and 3F/ 3G welding positions as specified in WPS by using single or multi-run welds
- PC16.** ensure correct angle of torch, travel speed, direction of weld and feed during the welding operation
- PC17.** maintain proper bead sequence with respect to groove/fillet configurations and positions
- PC18.** monitor the welding process parameters (air pressure, electrode force, electrode distance, gas flow etc.) are within standards by reading the various gauges and correct them if not within standards
- PC19.** measure the final welded piece and compare with the dimensional and geometrical aspects of the weld as prescribed in the WPS and engineering drawing
- PC20.** remove extra material, slag etc. by using brush, chipping hammers, grinders etc., from the welded piece
- PC21.** hammer the work piece to get the desired shape, if there are any welding bulges/distortions
- PC22.** shut down the welding equipment and remove the workpiece after completion of welding activities

Perform post-welding operations

To be competent, the user/individual on the job must be able to:

- PC23.** check the work pieces as per the work instructions for product quality
- PC24.** identify various weld defects by conducting visual inspection, destructive and non-destructive tests on the work pieces
- PC25.** separate the defective pieces which can be repaired/ reworked and pieces which are beyond repair
- PC26.** clean and store all the tools, machine and equipment after completion of work
- PC27.** dispose scrap or waste material in accordance with the company policies and environmental regulations
- PC28.** report to the supervisor about any problems faced or anticipated during the complete process

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the organization
- KU2.** the basic principle of welding process
- KU3.** MMAW welding and its process flow
- KU4.** various types of welding joints (i.e. fillet lap joints, tee fillet joints, corner joints, butt joints (square, single, vee, double vee)) and welding positions (i.e. flat (PA) 1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, Plate to Pipe (Fixed) 5F)
- KU5.** how to read and interpret WPS, welding drawings and symbols
- KU6.**
 - welding specific equipment requirements for MMAW/SMAW welding
 - MMAW equipment: transformers, rectifiers, generators, invertors;
 - Consumables - electrodes, dyes;
 - Welding accessories - holders, cables, welding torch and accessories;
 - Ancillary equipment - power saw, angle, pedestal and straight grinders, tong tester; etc.



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- KU7.** SOP recommended by the manufacturer for using tools, measuring instruments, accessories, MMAW welding machine etc. during the welding process
- KU8.** main components and controls of welding equipment
- KU9.** type of current used and implication
- KU10.** ISO colour codes for welding apparatus such as gas cylinder, hoses, electric cables, etc.
- KU11.** joint preparation process: made rust free; cleaned – free from scaling, paint, oil/grease; made dry and free from moisture; edges to be welded prepared as per job requirement - such as flat, square or bevelled; use various machines and techniques for the above (e.g. chamfering machine, grinding and stripping, gas or plasma cutting, etc.); correctly positioned (positioning: devices and techniques; jigs and fixtures; setting up joint in correct position & alignment)
- KU12.** Impact of various welding parameters like voltage, current, gas flow rate, speed, pressure, torch angle, cycle time, electrode distance etc. on the quality and quantity of welding
- KU13.** welding techniques i.e. drag, weave, whip
- KU14.** various materials used for MMAW welding and their properties
- KU15.** SOP recommended by the organisation for operating MMAW welding machine and its accessories
- KU16.** purpose and importance of pre-heating requirements for base metals
- KU17.** • factors that determine weld bead shape
• Factors: electrode angles and welding technique (push, perpendicular, drag); arc length; thickness of base metal; travel speed (slow, normal, fast)
- KU18.** • types of beads, characteristics and uses (stringer, weave, weave patterns)
• Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap
- KU19.** SOP recommended by the organisation for checking irregularities in the product/work piece
- KU20.** • factors that affect weld quality standards
• Quality standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joints at stop/start positions merge smoothly; weld surface is (free from cracks; substantially free from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; substantially free from trapped slag; substantially free from arcing or chipping marks); fillet welds are (equal in leg length, slightly convex in profile (where applicable), size of the fillet equivalent to the thickness of the material welded); weld contour is (of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formations); welds are adequately fused, and there is minimal undercut, overlap and surface inclusions etc.
- KU21.** • various defects associated with the MMAW/SMAW welding process
• Weld defects: lack of continuity of the weld; uneven and irregular ripple formation; excessive spatter; incorrect weld size or profile; burn through; undercutting; overlap; inclusions; distortion; porosity; internal cracks; surface cracks; lack of fusion or incomplete fusion; lack of penetration; excessive penetration; gouges; stray arc strikes; sharp edges; excessive convexity
- KU22.** how to control distortion (such as welding sequence; deposition technique)
- KU23.** magnetic arc blow or arc deflection, causes and methods to avoid or compensate
- KU24.** Various testing techniques like visual, destructive and non-destructive
- KU25.** common welder testing codes i.e. ASME section IX, EN 287, ISO 9606, IS 7310 and their purpose
- KU26.** safety requirements during the welding work



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Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret drawings, work instructions, equipment manuals and process documents
- GS2.** communicate the welding process requirements to the supervisor and co-workers
- GS3.** attentively listen and comprehend the information given by the supervisor/team members
- GS4.** write any work related information in English/regional language
- GS5.** recognise a workplace problem and take suitable action
- GS6.** analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently
- GS7.** plan and organize tools, machines and consumables for carrying out welding job
- GS8.** complete the assigned tasks with minimum supervision
- GS9.** report to the supervisor or deal with a colleague individually, depending on the type of concern

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for welding operations</i>	13	19	-	7
PC1. identify the work to be done and product specifications by interpreting the product drawing, Welding Procedure Specification (WPS) and job orders	1	2	-	1
PC2. identify the tools, welding machines, measuring instruments, accessories, consumables and input materials (i.e. carbon, low alloy steel etc.) as per the requirements mentioned in WPS or drawing	3	2	-	2
PC3. select and arrange the right material, equipment, fixtures, accessories, welding torch and consumables i.e. electrode, filler wire, shielding gas etc. as per the SOP and job requirements	2	3	-	1
PC4. check the input material, tools and equipment for any defects and that they are as per the required quality standards	2	4	-	1
PC5. prepare the work area for the welding activities	1	1	-	-
PC6. prepare the materials (i.e. plate(1.5 - 24mm)/ sheet (1.5mm)) and joint for welding process	1	1	-	1
PC7. set the MMAW machine and its parameters as per the WPS and SOP	1	2	-	1
PC8. re-dry electrodes as per electrode classification requirement	1	1	-	-
PC9. install the work pieces and fixture on the apparatus and align them with the electrodes as per the job requirements	1	2	-	-
PC10. verify set up by running test weld specimen (scrap plate)	-	1	-	-
<i>Perform MMAW/SMAW operations</i>	11	20	-	8
PC11. follow safety precautions during welding work as per SOP and organizational guidelines	-	1	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. start the MMAW machine for welding operations	1	2	-	-
PC13. strike and maintain a stable arc by applying correct technique (i.e. scratch start, tapping techniques) and to avoid welding defects	1	2	-	1
PC14. perform MMAW welding process as per SOP and tack weld the joint at appropriate intervals to produce joints of the specified quality, dimensions and profile	2	4	-	2
PC15. produce fillet and grove joints in 1F/1G, 2F/2G and 3F/ 3G welding positions as specified in WPS by using single or multi-run welds	2	4	-	2
PC16. ensure correct angle of torch, travel speed, direction of weld and feed during the welding operation	1	1	-	1
PC17. maintain proper bead sequence with respect to groove/fillet configurations and positions	-	1	-	-
PC18. monitor the welding process parameters (air pressure, electrode force, electrode distance, gas flow etc.) are within standards by reading the various gauges and correct them if not within standards	1	1	-	1
PC19. measure the final welded piece and compare with the dimensional and geometrical aspects of the weld as prescribed in the WPS and engineering drawing	1	1	-	1
PC20. remove extra material, slag etc. by using brush, chipping hammers, grinders etc., from the welded piece	1	1	-	-
PC21. hammer the work piece to get the desired shape, if there are any welding bulges/distortions	1	1	-	-
PC22. shut down the welding equipment and remove the workpiece after completion of welding activities	-	1	-	-
<i>Perform post-welding operations</i>	6	11	-	5

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. check the work pieces as per the work instructions for product quality	1	2	-	1
PC24. identify various weld defects by conducting visual inspection, destructive and non-destructive tests on the work pieces	2	4	-	2
PC25. separate the defective pieces which can be repaired/ reworked and pieces which are beyond repair	1	1	-	1
PC26. clean and store all the tools, machine and equipment after completion of work	1	2	-	1
PC27. dispose scrap or waste material in accordance with the company policies and environmental regulations	1	1	-	-
PC28. report to the supervisor about any problems faced or anticipated during the complete process	-	1	-	-
NOS Total	30	50	-	20



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0204
NOS Name	Manually weld carbon and low alloy steels by using Metal Arc Welding (MMAW)/ Shielded Metal Arc Welding (SMAW)
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery
Occupation	Welding and Cutting
NSQF Level	3
Credits	TBD
Version	2.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQF Clearance Date	31/03/2022



Qualification Pack

CSC/N0209: Manually weld metals by using MIG/MAG welding

Description

This unit is about performing MIG/MAG welding for producing various types of joints on metal and metal alloys as per the given specifications and standards specified by the organisation.

Scope

The scope covers the following :

- Prepare for welding operations
- Perform MIG/MAG welding operations
- Perform post-welding operations

Elements and Performance Criteria

Prepare for welding operations

To be competent, the user/individual on the job must be able to:

- PC1.** identify the work to be done and product specifications by interpreting the product drawing, Welding Procedure Specification (WPS) and job orders
- PC2.** identify the tools, MIG welding machines, measuring instruments, accessories, consumables and input materials (i.e. ferrous metals/materials: carbon steel, stainless steel etc.) as per the requirements mentioned in WPS or drawing
- PC3.** select and arrange the right material, equipment, fixtures, accessories, welding torch and consumables i.e. electrode, filler wire, shielding gas etc. as per the SOP and job requirements
- PC4.** check the input material, tools and equipment for any defects and that they are as per the required quality standards
- PC5.** prepare the work area for welding activities
- PC6.** prepare the materials (i.e. sheet (less than 1.5 mm), plate, structural section, pipe/tube, other forms) and joint for welding process
- PC7.** clean wire feeder and torch tip
- PC8.** set the MIG welding machine and its parameters i.e. wire feed rate, amperage, gas flow rate etc. as per the WPS and SOP
- PC9.** connect and adjust regulators and flow meters to cylinders
- PC10.** choose appropriate mode of metal transfer
- PC11.** set pre-purge with shielding gas as required
- PC12.** install the work pieces and fixture on the apparatus and align them with the electrodes as per the job requirements
- PC13.** verify set up by running test weld on the specimen (scrap plate)

Perform MIG/MAG welding operations

To be competent, the user/individual on the job must be able to:

- PC14.** follow safety precautions during welding work as per SOP and organizational guidelines
- PC15.** start the MIG welding machine for welding operations

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- PC16.** perform MIG welding process in all welding positions as per SOP and tack weld the joint at appropriate intervals to produce joints of the specified quality, dimensions and profile
- PC17.** adjust wire stick-out as per requirement
- PC18.** produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817
- PC19.** ensure correct angle of torch, travel speed, direction of weld and feed during the welding operation
- PC20.** monitor the welding process parameters (air pressure, electrode force, electrode distance, gas flow etc.) are within standards by reading the various gauges and correct them if not within standards
- PC21.** measure the final welded piece and compare with the dimensions as prescribed in the WPS and engineering drawing
- PC22.** remove extra material, slag etc. by using brush, chipping hammers, grinders etc., from the welded piece
- PC23.** shut down the welding equipment and remove the workpiece after completion of welding activities

Perform post-welding operations

To be competent, the user/individual on the job must be able to:

- PC24.** check the work pieces as per the work instructions for product quality
- PC25.** identify various weld defects by conducting visual inspection, destructive and non-destructive tests on the work pieces
- PC26.** separate the defective pieces which can be repaired/ reworked and pieces which are beyond repair
- PC27.** clean and store all the tools, machine and equipment after completion of work
- PC28.** dispose scrap or waste material in accordance with the company policies and environmental regulations
- PC29.** check the machine operations for any malfunctions/defects in the component and immediately inform the supervisor/maintenance team for correction
- PC30.** report to the supervisor about any problems faced or anticipated during the complete process

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the organization
- KU2.** MIG welding and its process flow
- KU3.** various types of welding joints i.e. fillet lap joints, tee fillet joints, corner joints, butt joints (square, single, vee, double vee)
- KU4.** various welding positions i.e. 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
- KU5.** how to read and interpret WPS, welding drawings and symbols

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- KU6.**
- welding specific equipment requirements for MIG/MAG welding
 - MIG equipment: rectifier (diode, thyristor/transistor), inverter, generator; wire feed system; measurement equipment for measuring; electrical output and continuity (voltmeter/multi-meter, ammeter/shunts/coils, tong tester); welding cables - wire feed to torch (air cooled, harness construction); welding guns/torches (air cooled, construction, types [push, pull, reel-on-gun] swan neck design, pistol design); nozzles (dip, spray); return clamps (types, clamping mechanisms) and cables; solenoid valves (shielding gas); jog-feed control, gas purge control; ancillary equipment (angle grinders, wire brushes, linishers, hammer, power saw, angle, pedestal and straight grinders, chisel); other tools and equipment such as wrenches, wire cutters and MIG pliers
- KU7.** SOP recommended by the manufacturer for using tools, measuring instruments, accessories, MMAW welding machine etc. during the welding process
- KU8.** main components and controls of welding equipment
- KU9.** ISO colour codes for welding apparatus such as gas cylinder, hoses, electric cables, etc.
- KU10.** joint preparation process: made rust free; cleaned - free from scaling, paint, oil/grease; made dry and free from moisture; edges to be welded prepared as per job requirement - such as flat, square or bevelled; use various machines and techniques for the above (e.g. chamfering machine, grinding and stripping, gas or plasma cutting, etc.); correctly positioned (positioning: devices and techniques; jigs and fixtures; setting up joint in correct position & alignment)
- KU11.** impact of various welding parameters like voltage, current, gas flow rate, speed, pressure, torch angle, cycle time, electrode distance etc. on the quality and quantity of welding
- KU12.** relationship between wire feed, speed control and welding current
- KU13.** MIG/MAG welding technique: e.g. fine adjustment of parameters, correct manipulation of the torch, blending in stops/starts, tack welds, angle of the torch, setting of individual parameters like wire feed speed, voltage, gas flow rate, stick-out, etc. various materials used for GMAW welding and their properties
- KU14.** SOP recommended by the organisation for operating MIG welding machine and its accessories
- KU15.** current and polarity required for GMAW
- KU16.** types, selection and application of filler wires and welding electrodes
- KU17.**
- reasons for using shielding gases, and the types and application of the various gases
 - Shielding gases: applications for shielding gases/gas mixtures (argon, mixture, helium, argon/helium mixtures, helium/argon mixtures, argon/hydrogen mixtures, nitrogen argon/nitrogen mixtures, CO₂ and CO₂ mixtures); flow rates for applications; identify percentage of purity and mixture with respect to WPS/PQR
- KU18.**
- use, impact and importance of gas pressures and flow rates (in relationship to the type of material being welded)
 - Types of ferrous metals/materials: carbon steel, stainless steel
- KU19.**
- methods/modes of metal transfer and their uses
 - Methods: globular, short circuit transfer, spray arc, pulse, surface tension transfer (STT)
- KU20.** purpose and correct use of anti-spatter compound
- KU21.** importance and procedure to clean torch tip and liner
- KU22.**
- factors that determine weld bead shape
 - Factors: gun angles and weld bead profiles (push, perpendicular, drag); electrode extensions stick out (short, normal, long); fillet weld electrode extension stick out (short, normal, long); gun travel speed (slow, normal, fast); current and voltage



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- KU23.** • types of beads, characteristics and uses (stringer, weave, weave patterns)
• Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap
- KU24.** • weld bead quality characteristics
• Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap, contour - convex, concave, mitre
- KU25.** SOP recommended by the organisation for checking irregularities in the product/work piece
- KU26.** • factors that affect weld quality standards
• Quality standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joints at stop/start positions merge smoothly; weld surface is (free from cracks; substantially free from porosity; free from any pronounced hump or crater; substantially free from shrinkage cavities; substantially free from trapped slag; substantially free from arcing or chipping marks); fillet welds are (equal in leg length, slightly convex in profile (where applicable), size of the fillet equivalent to the thickness of the material welded); weld contour is (of linear and of uniform profile; smooth and free from excessive undulations; regular and has an even ripple formations); welds are adequately fused, and there is minimal undercut, overlap and surface inclusions etc.
- KU27.** various defects associated with the MIG welding process
- KU28.** how to control distortion (such as welding sequence; deposition technique)
- KU29.** various testing techniques like visual, destructive and non-destructive
- KU30.** safety requirements during the welding work

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret drawings, work instructions, equipment manuals and process documents
- GS2.** communicate the welding process requirements to the supervisor and co-workers
- GS3.** attentively listen and comprehend the information given by the supervisor/team members
- GS4.** write any work related information in English/regional language
- GS5.** recognise a workplace problem and take suitable action
- GS6.** analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently
- GS7.** plan and organize tools, machines and consumables for carrying out welding job
- GS8.** complete the assigned tasks with minimum supervision
- GS9.** report to the supervisor or deal with a colleague individually, depending on the type of concern

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for welding operations</i>	15	21	-	7
PC1. identify the work to be done and product specifications by interpreting the product drawing, Welding Procedure Specification (WPS) and job orders	1	2	-	1
PC2. identify the tools, MIG welding machines, measuring instruments, accessories, consumables and input materials (i.e. ferrous metals/materials: carbon steel, stainless steel etc.) as per the requirements mentioned in WPS or drawing	3	2	-	1
PC3. select and arrange the right material, equipment, fixtures, accessories, welding torch and consumables i.e. electrode, filler wire, shielding gas etc. as per the SOP and job requirements	2	3	-	1
PC4. check the input material, tools and equipment for any defects and that they are as per the required quality standards	2	3	-	1
PC5. prepare the work area for welding activities	1	1	-	-
PC6. prepare the materials (i.e. sheet (less than 1.5 mm), plate, structural section, pipe/tube, other forms) and joint for welding process	1	1	-	1
PC7. clean wire feeder and torch tip	-	1	-	-
PC8. set the MIG welding machine and its parameters i.e. wire feed rate, amperage, gas flow rate etc. as per the WPS and SOP	1	2	-	1
PC9. connect and adjust regulators and flow meters to cylinders	1	1	-	-
PC10. choose appropriate mode of metal transfer	1	1	-	-
PC11. set pre-purge with shielding gas as required	1	1	-	1
PC12. install the work pieces and fixture on the apparatus and align them with the electrodes as per the job requirements	1	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. verify set up by running test weld on the specimen (scrap plate)	-	1	-	-
<i>Perform MIG/MAG welding operations</i>	8	17	-	8
PC14. follow safety precautions during welding work as per SOP and organizational guidelines	-	1	-	-
PC15. start the MIG welding machine for welding operations	1	2	-	-
PC16. perform MIG welding process in all welding positions as per SOP and tack weld the joint at appropriate intervals to produce joints of the specified quality, dimensions and profile	2	4	-	2
PC17. adjust wire stick-out as per requirement	1	1	-	1
PC18. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817	1	4	-	2
PC19. ensure correct angle of torch, travel speed, direction of weld and feed during the welding operation	1	1	-	1
PC20. monitor the welding process parameters (air pressure, electrode force, electrode distance, gas flow etc.) are within standards by reading the various gauges and correct them if not within standards	1	1	-	1
PC21. measure the final welded piece and compare with the dimensions as prescribed in the WPS and engineering drawing	1	1	-	1
PC22. remove extra material, slag etc. by using brush, chipping hammers, grinders etc., from the welded piece	-	1	-	-
PC23. shut down the welding equipment and remove the workpiece after completion of welding activities	-	1	-	-
<i>Perform post-welding operations</i>	7	12	-	5
PC24. check the work pieces as per the work instructions for product quality	1	2	-	1

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC25. identify various weld defects by conducting visual inspection, destructive and non-destructive tests on the work pieces	2	3	-	2
PC26. separate the defective pieces which can be repaired/ reworked and pieces which are beyond repair	1	1	-	1
PC27. clean and store all the tools, machine and equipment after completion of work	1	2	-	1
PC28. dispose scrap or waste material in accordance with the company policies and environmental regulations	1	1	-	-
PC29. check the machine operations for any malfunctions/defects in the component and immediately inform the supervisor/maintenance team for correction	1	2	-	-
PC30. report to the supervisor about any problems faced or anticipated during the complete process	-	1	-	-
NOS Total	30	50	-	20



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0209
NOS Name	Manually weld metals by using MIG/MAG welding
Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Welding and Cutting
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	31/03/2022
Next Review Date	31/03/2025
NSQC Clearance Date	31/03/2022



Qualification Pack

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

- PC1.** identify employability skills required for jobs in various industries
- PC2.** identify and explore learning and employability portals

Constitutional values - Citizenship

To be competent, the user/individual on the job must be able to:

- PC3.** recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.
- PC4.** follow environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

- PC5.** recognize the significance of 21st Century Skills for employment
- PC6.** practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

To be competent, the user/individual on the job must be able to:



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- PC7.** use basic English for everyday conversation in different contexts, in person and over the telephone
- PC8.** read and understand routine information, notes, instructions, mails, letters etc. written in English
- PC9.** write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

To be competent, the user/individual on the job must be able to:

- PC10.** understand the difference between job and career
- PC11.** prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

To be competent, the user/individual on the job must be able to:

- PC12.** follow verbal and non-verbal communication etiquette and active listening techniques in various settings
- PC13.** work collaboratively with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

- PC14.** communicate and behave appropriately with all genders and PwD
- PC15.** escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

- PC16.** select financial institutions, products and services as per requirement
- PC17.** carry out offline and online financial transactions, safely and securely
- PC18.** identify common components of salary and compute income, expenses, taxes, investments etc
- PC19.** identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

- PC20.** operate digital devices and carry out basic internet operations securely and safely
- PC21.** use e-mail and social media platforms and virtual collaboration tools to work effectively
- PC22.** use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

To be competent, the user/individual on the job must be able to:

- PC23.** identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research
- PC24.** develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion
- PC25.** identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

To be competent, the user/individual on the job must be able to:

- PC26.** identify different types of customers
- PC27.** identify and respond to customer requests and needs in a professional manner.



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PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write different types of documents/instructions/correspondence

GS2. communicate effectively using appropriate language in formal and informal settings



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- GS3.** behave politely and appropriately with all
- GS4.** how to work in a virtual mode
- GS5.** perform calculations efficiently
- GS6.** solve problems effectively
- GS7.** pay attention to details
- GS8.** manage time efficiently
- GS9.** maintain hygiene and sanitization to avoid infection

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Introduction to Employability Skills</i>	1	1	-	-
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
<i>Constitutional values - Citizenship</i>	1	1	-	-
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
<i>Becoming a Professional in the 21st Century</i>	2	4	-	-
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
<i>Basic English Skills</i>	2	3	-	-
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
<i>Career Development & Goal Setting</i>	1	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
<i>Communication Skills</i>	2	2	-	-
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
<i>Diversity & Inclusion</i>	1	2	-	-
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
<i>Financial and Legal Literacy</i>	2	3	-	-
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
<i>Essential Digital Skills</i>	3	4	-	-
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Entrepreneurship</i>	2	3	-	-
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
<i>Customer Service</i>	1	2	-	-
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
<i>Getting ready for apprenticeship & Jobs</i>	2	3	-	-
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	20	30	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	NA
Next Review Date	24/02/2025
NSQC Clearance Date	24/02/2022

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

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 these 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 NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to

Qualification Pack

successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N0310.Plan and prepare for stainless steel fabrication	30	70	-	-	100	7
CSC/N0311.Perform cutting and forming tasks for stainless steel fabrication	30	70	-	-	100	5
CSC/N0312.Perform pre-welding operations for stainless steel fabrication	28	64	-	-	92	7
CSC/N0212.Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding	26	74	-	-	100	18
CSC/N0313.Perform finishing and installation of fabricated stainless steel structure	30	70	-	-	100	18
CSC/N1335.Use basic health and safety practices at the workplace	36	64	-	-	100	6
CSC/N0204.Manually weld carbon and low alloy steels by using Metal Arc Welding (MMAW)/ Shielded Metal Arc Welding (SMAW)	30	50	-	20	100	17
CSC/N0209.Manually weld metals by using MIG/MAG welding	30	50	-	20	100	17
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5
Total	260	542	-	40	842	100

Qualification Pack

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
CO₂	Carbon Dioxide
PPE	Personal Protective Equipment
NOS	National Occupational Standard(S)
OS	Occupational Standard(S)
NSQF	National Skill Qualification Framework
BOM	Bill of Materials
SOP	Standard Operating Procedure
TIG	Tungsten Inert Gas
MIG	Metal Inert Gas
SMAW	Shielded Metal Arc Welding
AC	Alternating Current
DC	Direct Current
MMAW	Manual Metal Arc Welding
HF	High Frequency
PQR	Process Qualification Record
VI	Visual Inspection
NDT	Non-Destructive Tests
DPT	Dye Penetrant
FPT	Fluorescent Penetrant
MPT	Magnetic Particle
DT	Destructive Tests



Qualification Pack

QAP	Quality Assurance Plan
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Qualification Pack

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

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Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
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Qualification Pack

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