

QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR CAPITAL GOODS INDUSTRY

What are Occupational Standards(OS) ?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualifications Pack- Stainless Steel Fabricator

SECTOR/S: CAPITAL GOODS

SUB-SECTOR:

- 1.Process Plant Machinery
2. Light Engineering Goods

OCCUPATION: Fabrication, Fitting and Assembly

REFERENCE ID: CSC/Q0307

ALIGNED TO: NCO-2015/7123.9900

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.

Job Details	Qualifications Pack Code	CSC/Q0307		
	Job Role	Stainless Steel Fabricator (Applicable for National Scenarios)		
	Credits	TBD	Version number	1.0
	Sector	Capital Goods	Drafted on	22/04/2019
	Sub-sector	1. Process Plant Machinery 2. Light Engineering Goods	Last reviewed on	15/10/2019
	Occupation	Fabrication, Fitting and Assembly	Next review date	17/10/2022
	NSQC Clearance on	NA		

Job Role	Stainless Steel Fabricator
Role Description	A Stainless Steel Fabricator designs, cuts, forms, welds, joins, polishes and finishes the stainless steel structure/component/product as per work requirements. S/he also performs quality checks and ensures correct installation of the fabricated structure at the worksite, as per required standards.
NSQF level	5
Minimum Educational Qualifications	8 th standard passed
Maximum Educational Qualifications	Not Applicable
Prerequisite License or Training	NA
Minimum Job Entry Age	20 Years
Experience	2 years of experience. In case of 4 years of relevant experience, minimum educational qualification can be 5 th standard passed.
Applicable National Occupational Standards (NOS)	Compulsory: <ol style="list-style-type: none"> CSC/N0310 Plan and prepare for stainless steel fabrication CSC/N0311 Perform cutting and forming tasks for stainless steel fabrication CSC/N0312 Perform pre-welding operations for stainless steel fabrication CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding/ Shielded Metal Arc Welding CSC/N0212 Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW) Welding CSC/N0214 Manually weld stainless steel using Metal Inert Gas (MIG) welding technique CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

	<p>8. CSC/N1335 Use basic health and safety practices at the workplace</p> <p>9. CSC/N1336 Work effectively with others</p>
Performance Criteria	As described in the relevant OS units

Definitions

Keywords /Terms	Description
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 they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria 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 OSs, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
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.
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.
Knowledge and Understanding	Knowledge and understanding are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual need 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.

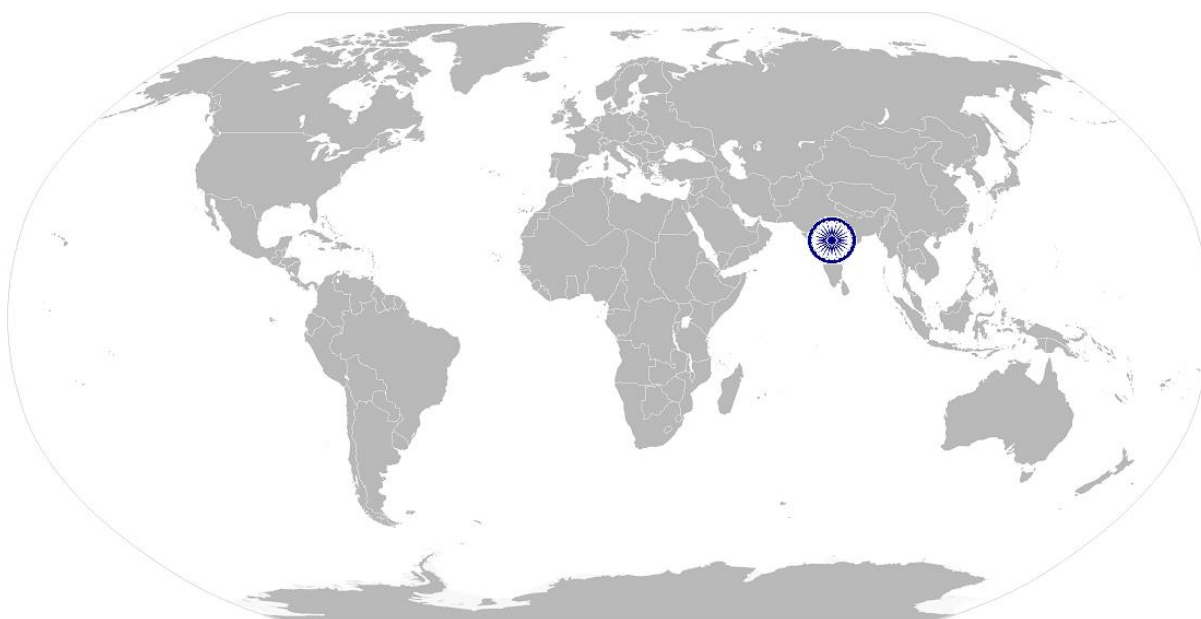
Acronyms

Core Skills/Generic Skills	Core skills or generic skills 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. In the context of the OS, these include communication related skills that are applicable to most job roles.
Keywords /Terms	Description
CO ₂	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
QAP	Quality Assurance Plan

CSC/N0310

Plan and prepare for stainless steel fabrication

National Occupational Standard



Overview

This unit is about planning and preparing for stainless steel fabrication.

CSC/N0310

Plan and prepare for stainless steel fabrication

National Occupational Standard

Unit Code	CSC/N0310
Unit Title (Task)	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	This unit/task covers the following: <ul style="list-style-type: none"> Plan and prepare for stainless steel fabrication
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Plan and prepare for stainless steel fabrication	<p>To be competent, the user/individual on the job must be able to:</p> <p>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</p> <p>PC2. identify project requirements by accurately interpreting the CAD drawings and drawing conclusions from sketches</p> <p>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</p> <p>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</p> <p>PC5. perform measurements at the worksite using correct tools and materials for stainless steel fabrication</p> <p>PC6. determine the process flow and sequence of operations to be performed for fabrication</p> <p>PC7. plan the tasks, and allocate work to be performed as per the project timelines and requirements</p> <p>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.</p> <p>PC9. design a single-angle truss and use T-sections as per application and site requirements</p>

CSC/N0310

Plan and prepare for stainless steel fabrication

Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> KA1. legislation, standards, policies, and procedures followed in the organization related to the employment and performance conditions KA2. health and safety requirements applicable in the workplace KA3. importance of working in a clean and safe environment KA4. role and responsibilities of a stainless steel fabricator KA5. sources of information pertaining to employment terms, entitlements, job role and responsibilities KA6. reporting structure, inter-dependent functions, production lines and procedures in the work area KA7. escalation matrix and procedures for reporting work and employment related issues KA8. documentation and related procedures applicable in the context of employment and work
	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> KB1. properties of stainless steel such as corrosion resistance, hardness, ductility, malleability etc. KB2. types of applications and benefits of stainless steel Applications: architectural (such as gates, railings, interiors and/or exteriors), chequered floors (such as walkways, flooring, automobile and industrial flooring), 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 KB3. different grades of stainless steel used in fabrication and factor that help in selecting the correct type/grade of stainless steel KB4. usage and suitability of materials, tools, machinery and equipment for the fabrication of stainless steel KB5. fabrication tolerances for various types and grades of stainless steel KB6. elements that help in evaluating the installation feasibility of the stainless steel structure/s such as site limitations, dimensions of the structure, etc. KB7. interpretation of designs and CAD drawings such as isometric, sectional, cross-sectional, assembly and dimensional drawings KB8. sequence of operations for fabrication KB9. procedure followed for preparing bill of materials for the fabrication process KB10. considerations for customizing the design as per local conditions, customer requirements and site specifications KB11. importance of ensuring easy reach and access to and from the fabrication

CSC/N0310

Plan and prepare for stainless steel fabrication

	work area KB12. process of natural drainage and natural cleaning
Skills (S)	
A. Core Skills/ Generic Skill	Writing Skills
	The user/individual on the job needs to know and understand how to: SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA2. undertake arithmetic operations, and calculations/ formulae Arithmetic operations: e.g. addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages SA3. use appropriate measuring techniques and units of measurement
	Reading Skills
	The user/ individual on the job needs to know and understand how to: SA4. read and correctly assimilate information from manufacturer manuals and guides SA5. read technical drawings and schematics to correctly extract relevant information
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. convey and share technical information clearly using appropriate language SA7. express information to individuals or groups taking into account nature of audience and the information SA8. receive, attend to, correctly interpret and respond to verbal messages and other cues SA9. apply active listening skills using reflection, restatement, questioning and clarification
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. take proper and effective action when necessary without having all the facts at hand SB2. adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
	Plan and Organize

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Plan and prepare for stainless steel fabrication

	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB3. plan, prioritize and sequence work operations as per job requirements</p> <p>SB4. organize and analyze information relevant to work</p> <p>SB5. allocate resources and time effectively</p>
	Customer Centricity
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB6. exercise restraint while expressing dissent and during conflict situations</p> <p>SB7. provide prompt and efficient responses to meet requirements, requests and concerns of customers</p> <p>SB8. establish boundaries for as appropriate for unreasonable customer demands</p> <p>SB9. demonstrate awareness of customer goals</p> <p>SB10. provide thorough, accurate information to answer customer questions</p>
	Problem Solving
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. identify sources of information and support for problem solving</p> <p>SB2. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB3. identify effective resolution techniques</p> <p>SB4. communicate problems appropriately to others</p> <p>SB5. seek assistance and support from other sources to solve problems</p> <p>SB6. select and apply resolution techniques</p> <p>SB7. seek evidence for problem resolution</p>
	Analytical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB8. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p>
	Critical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB9. evaluate reliability of information sourced from suppliers and vendors</p> <p>SB10. balance priorities with constraints in order to propose viable recommendations</p>

CSC/N0310

Plan and prepare for stainless steel fabrication

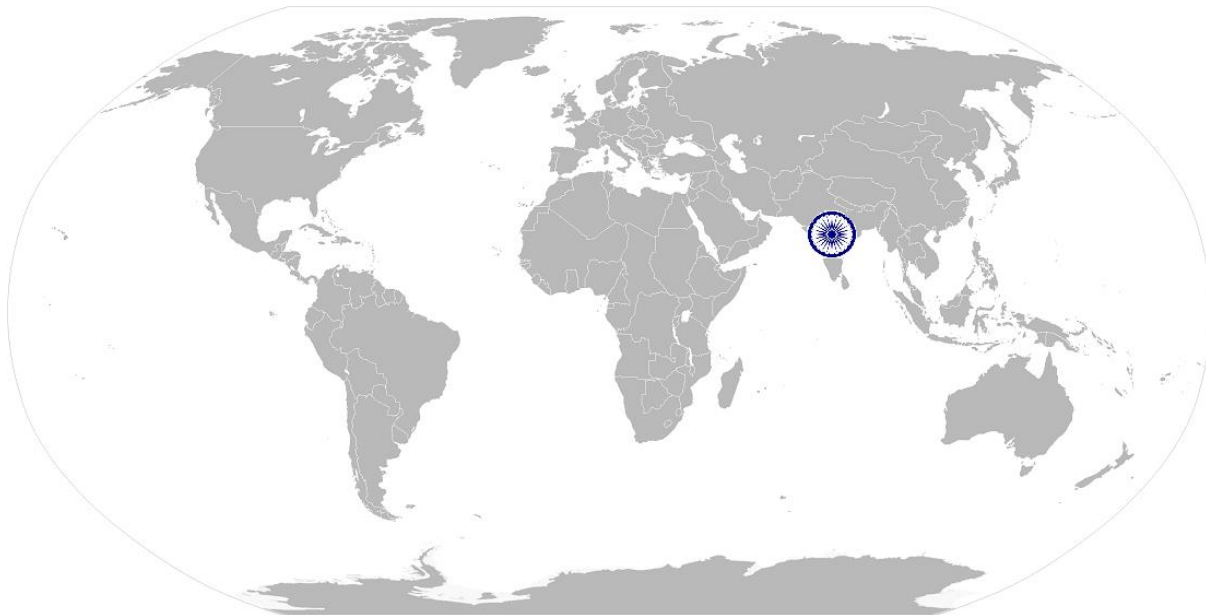
NOS Version Control

NOS Code	CSC/N0310		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	22/04/2019
Industry Sub-sector	1. Process Plant Machinery 2. Light Engineering Goods	Last reviewed on	15/10/2019
Occupation	Fabrication, Fitting and Assembly	Next review date	17/10/2022



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

National Occupational Standard



Overview

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

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

National Occupational Standard	Unit Code	CSC/N0311
	Unit Title (Task)	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	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Prepare for cutting of stainless steel • Shear stainless steel • Perform abrasive cutting • Form stainless steel • Adhere to industry work practices
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Prepare for cutting of stainless steel	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. identify the type of cutting method/s to be used for the stainless steel workpiece and the related application/s Cutting method/s: cutting using a grinder; abrasive cutting; shearing; laser cutting; plasma cutting; manual cutting; blanking; pressing Applications: architectural (such as gates, railings, interiors and/or exteriors), chequered floors (such as walkways, flooring, automobile and industrial flooring), 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</p> <p>PC2. mark the cutting line/s as per measurement and estimates using prescribed material</p> <p>PC3. clamp or secure the sheet to ensure perfect cut as per required setup and machinery</p> <p>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</p> <p>PC5. obtain First Part Approval (FPA) from the supervisor for the first part cut as per standard operating procedure</p> <p>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.</p>

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

Shear stainless steel	<p>To be competent, the user/individual on the job must be able to:</p> <p>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)</p> <p>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</p>
Perform abrasive cutting	<p>To be competent, the user/individual on the job must be able to:</p> <p>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</p>
Form stainless steel	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC10. use a hydraulic bending machine for bending of stainless steel sheets/pipes by applying adequate pressure and as per application requirements</p> <p>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.</p> <p>PC12. apply pressing/stamping technique using appropriate tool and die punches to provide the required shape Pressing technique: punching, blanking, bending, embossing and flanging</p> <p>PC13. cut the workpiece into appropriate blanks</p>
Adhere to industry work practices	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC14. cut stainless steel workpiece using plasma cutting and laser cutting techniques in coordination with concerned personnel</p> <p>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)</p> <p>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</p>

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

Knowledge and Understanding (K)

A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. health and safety requirements applicable in the workplace KA3. importance of working in clean and safe environment KA4. roles and responsibilities of a stainless steel fabricator KA5. sources for information pertaining to employment terms, entitlements, job role and responsibilities KA6. reporting structure, inter-dependent functions, production lines and procedures in the work area KA7. escalation matrix and procedures for reporting work and employment related issues
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> KB1. various grades of stainless steel, their properties and applications KB2. tools, equipment, machinery, materials and techniques used in marking, cutting, bending and forming KB3. measurements and estimations performed during marking and cutting KB4. process and precautions for marking, clamping, drilling, cutting, bending and forming stainless steel as per requirements KB5. 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.) KB6. derating of shears as per material thickness KB7. fabrication tolerances for various types and grades of stainless steel KB8. steps and precautions involved in abrasive cutting technique KB9. applications, specifications and quality parameters associated with plasma cutting and laser cutting KB10. tools, machinery, precautions and considerations associated with stainless steel pressing/stamping process KB11. appropriate lubricants for blanking, piercing and punching KB12. tools, steps, precautions and considerations for measuring and checking the output against the quality parameters of the desired stainless steel product KB13. contaminants that may impact tools and materials and their removal techniques KB14. industry procedure for cleaning, maintenance, handling and stocking of stainless steel KB15. techniques and tools used for removing the chips and bursts after cutting KB16. health and safety practices to be followed during cutting and forming

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

	KB17. industry regulations, legislations, codes and work practices to be applied during work process
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The user/individual on the job needs to know and understand how to: SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA2. use appropriate measuring techniques and units of measurement SA3. translate practical problems into useful mathematical expressions
	Reading Skills
	The user/ individual on the job needs to know and understand how to: SA4. read and correctly assimilate information from manufacturer manuals and guides SA5. read technical drawings and schematics to correctly extract relevant information
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. convey and share technical information clearly using appropriate language SA7. express information to individuals or groups taking into account nature of audience and the information SA8. receive, attend to, correctly interpret and respond to verbal messages and other cues SA9. apply active listening skills using reflection, restatement, questioning and clarification
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. take proper and effective action when necessary without having all the facts at hand SB2. adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB3. plan, prioritize and sequence work operations as per job requirements SB4. organize and analyze information relevant to work SB5. allocate resources and time effectively
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. exercise restraint while expressing dissent and during conflict situations

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

	<p>SB7. provide prompt and efficient responses to meet requirements, requests and concerns of customers</p> <p>SB8. establish boundaries for as appropriate for unreasonable customer demands</p> <p>SB9. demonstrate awareness of customer goals</p> <p>SB10. provide thorough, accurate information to answer customer questions</p>
	<p>Problem Solving</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB12. prioritize and plan for problem solving</p> <p>SB13. communicate problems appropriately to others</p> <p>SB14. identify sources of information and support for problem solving</p> <p>SB15. seek assistance and support from other sources to solve problems</p> <p>SB16. identify effective resolution techniques</p> <p>SB17. select and apply resolution techniques</p> <p>SB18. seek evidence for problem resolution</p>
	<p>Analytical Thinking</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. undertake and express new ideas and initiatives to others</p> <p>SB20. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB21. enhance one's competencies in new and different situations and contexts to achieve more</p>
	<p>Critical Thinking</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB22. distinguish fact from opinion</p> <p>SB23. evaluate reliability of information sourced from suppliers and vendors</p> <p>SB24. balance priorities with constraints in order to propose viable recommendations</p>

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

NOS Version Control

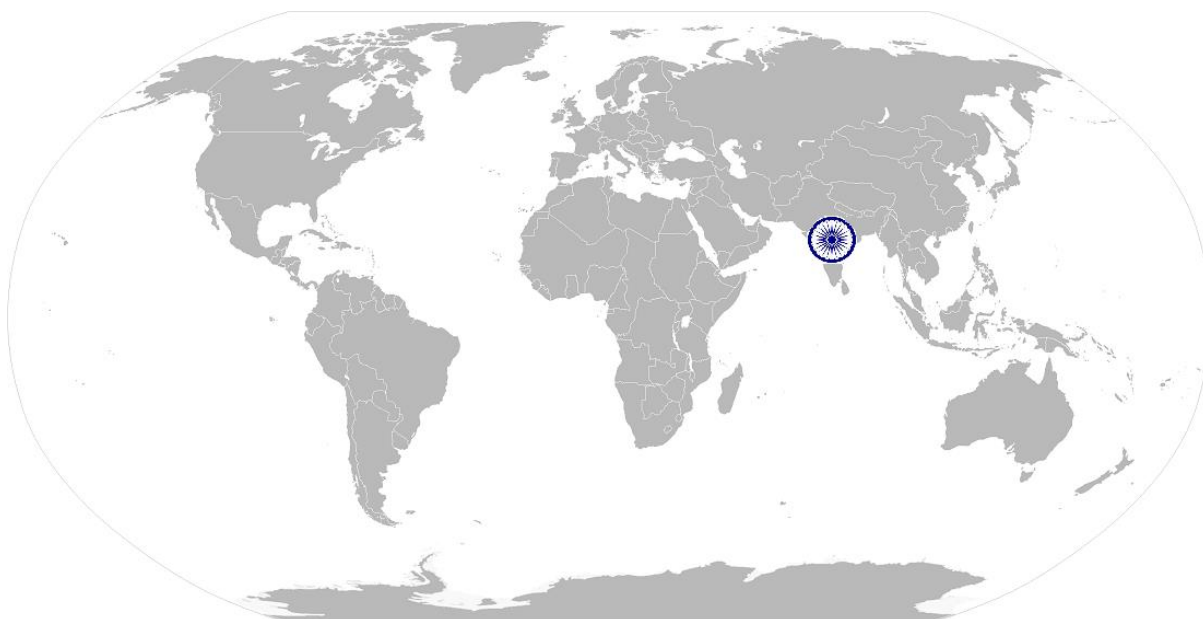
NOS Code	CSC/N0311		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	22/04/2019
Industry Sub-sector	1. Process Plant Machinery 2. Light Engineering Goods	Last reviewed on	15/10/2019
Occupation	Fabrication, Fitting and Assembly	Next review date	17/10/2022



CSC/N0312

Perform pre-welding operations for stainless steel fabrication

National Occupational Standard



Overview

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

CSC/N0312

Perform pre-welding operations for stainless steel fabrication

National Occupational Standard

Unit Code	CSC/N0312
Unit Title (Task)	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	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> Perform pre-welding operations for stainless steel fabrication
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Perform pre-welding operations for stainless steel fabrication	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. 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</p> <p>PC2. 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)</p> <p>PC3. bevel and provide slopes at the edge of stainless steel plate as per task requirements</p> <p>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</p> <p>PC5. clamp or secure the stainless steel plate/sheet tightly to ensure accurate welding as per task requirements</p> <p>PC6. set the amperage machine at the required temperature as per type of welding and scope of application</p> <p>PC7. perform tacking to ensure proper jointing of the structures to be fabricated</p> <p>PC8. ensure correct dilution levels and composition of filler metal with base material</p> <p>PC9. apply appropriate backing technique for stainless steel to avoid crevices, voids and oxidation using copper, aluminium, argon (in GTAW) and/or nitrogen</p> <p>PC10. maintain the carbon steel dilution of the stainless steel weld metal to a</p>

CSC/N0312

Perform pre-welding operations for stainless steel fabrication

	<p>minimum</p> <p>PC11. wear appropriate personal protective equipment (PPE) while working for stainless steel fabrication</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p> <p>KA2. health and safety requirements applicable in the workplace</p> <p>KA3. importance of working in clean and safe environment</p> <p>KA4. role and responsibilities of a stainless steel fabricator</p> <p>KA5. sources for information pertaining to employment terms, entitlements, job role and responsibilities</p> <p>KA6. reporting structure, inter-dependent functions, production lines and procedures in the work area</p> <p>KA7. escalation matrix and procedures for reporting work and employment related issues</p> <p>KA8. issues</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. various types and grades of stainless steel, their properties and applications</p> <p>KB2. considerations for selecting a filler rod with required alloy content</p> <p>KB3. importance of ensuring correct dilution levels of filler metal as per base material</p> <p>KB4. welding techniques used in stainless steel fabrication</p> <p>KB5. factors responsible for selecting the correct weld procedure for fabrication</p> <p>KB6. manufacturer instructions in welding and filler metal recommendations for a dissimilar weld</p> <p>KB7. edge preparation for stainless steel</p> <p>KB8. various types of joints and methods of preparation</p> <p>KB9. standard practice to clean, rinse and dry the stainless steel workpiece to remove contaminants, if any, before welding</p> <p>KB10. standard practice to clamp and secure the workpiece before starting to weld</p> <p>KB11. factors that are responsible in selecting the correct amperage for welding</p> <p>KB12. process and equipment used for tacking the stainless steel workpiece</p> <p>KB13. process for backing the stainless steel using appropriate sources</p> <p>KB14. areas where consultation with a welding specialist/distributor is required</p> <p>KB15. fabrication tolerances for various types and grades of stainless steel</p> <p>KB16. factors that can lead to weld defects</p> <p>KB17. safety measures to be undertaken as per the task being performed</p>

CSC/N0312

Perform pre-welding operations for stainless steel fabrication

Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The user/individual on the job needs to know and understand how to: SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language SA2. use appropriate measuring techniques and units of measurement SA3. write in a manner appropriate for business
	Reading Skills
	The user/ individual on the job needs to know and understand how to: SA4. read and correctly assimilate information from manufacturer manuals and guides SA5. read technical drawings and schematics to correctly extract relevant information
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA6. convey and share technical information clearly using appropriate language SA7. express information to individuals or groups taking into account nature of audience and the information SA8. receive, attend to, correctly interpret and respond to verbal messages and other cues SA9. apply active listening skills using reflection, restatement, questioning and clarification
	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. take proper and effective action when necessary without having all the facts at hand SB2. adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB3. plan, prioritize and sequence work operations as per job requirements SB4. organize and analyze information relevant to work SB5. allocate resources and time effectively
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. exercise restraint while expressing dissent and during conflict situations SB7. provide prompt and efficient responses to meet requirements, requests and concerns of customers

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Perform pre-welding operations for stainless steel fabrication

	<p>SB8. establish boundaries for as appropriate for unreasonable customer demands</p> <p>SB9. demonstrate awareness of customer goals</p> <p>SB10. provide thorough, accurate information to answer customer questions</p>
	<p>Problem Solving</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB12. prioritize and plan for problem solving</p> <p>SB13. communicate problems appropriately to others</p> <p>SB14. identify sources of information and support for problem solving</p> <p>SB15. seek assistance and support from other sources to solve problems</p> <p>SB16. identify effective resolution techniques</p> <p>SB17. select and apply resolution techniques</p> <p>SB18. seek evidence for problem resolution</p>
	<p>Analytical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. undertake and express new ideas and initiatives to others</p> <p>SB20. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB21. enhance one's competencies in new and different situations and contexts to achieve more</p>
	<p>Critical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB22. distinguish fact from opinion</p> <p>SB23. evaluate reliability of information sourced from suppliers and vendors</p> <p>SB24. balance priorities with constraints in order to propose viable recommendations</p>

CSC/N0312

Perform pre-welding operations for stainless steel fabrication

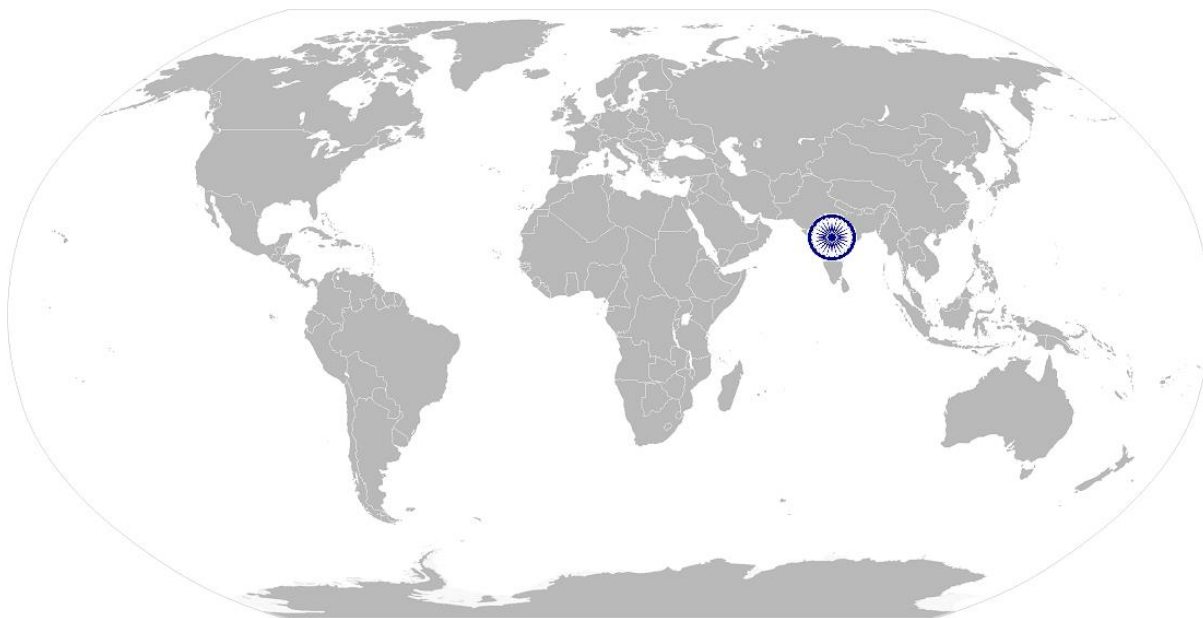
NOS Version Control

NOS Code	CSC/N0312		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	22/04/2019
Industry Sub-sector	1. Process Plant Machinery 2. Light Engineering Goods	Last reviewed on	15/10/2019
Occupation	Fabrication, Fitting and Assembly	Next review date	17/10/2022



CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

National Occupational Standard



Overview

This unit covers the performing of manual metal arc welding (MMAW) also known as shielded metal arc welding (SMAW) for producing a range of joints on various forms of metal and metal alloys including carbon steels, low alloy steels and austenitic stainless steel as per welding specification procedures (WPS).

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

National Occupational Standard	Unit Code	CSC/N0208
	Unit Title (Task)	Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding/ Shielded Metal Arc Welding
	Description	This OS unit is about performing manual metal arc welding (MMAW) also known as Shielded Metal Arc Welding (SMAW) for a range of standard welding job requirements. This is for a skilled welder who can weld different materials (carbon steel, low alloy steel and austenitic stainless steel) in 1G/1F, 2G/2F, 3G/3F, 4G/4F, 5G/5F and 6G positions.
	Scope	<p>This unit/ task covers the following:</p> <ul style="list-style-type: none"> • Work safely • Prepare for welding operations • Carry out welding operations • Test for quality • Post-welding activities • Deal with contingencies
Performance Criteria(PC) w.r.t. the Scope		
Element	Performance Criteria	
Work safely	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations</p> <p>Safety precautions (general): general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; shopfloor housekeeping including surface conditions; waste disposal; stability of surrounding structures, furniture etc.</p> <p>PC3. check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder</p> <p>PC4. deal with any faults or differential as per laid procedures</p> <p>PC5. follow fume extraction safety procedures</p>	
Prepare for welding operations	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC6. read and interpret routine information on written job instructions, welding procedure specifications (WPS) and standard operating procedures</p> <p>WPS: e.g. welding process (ISO codes); parent metal; consumables; pre welding joint preparation (edge preparation, assembly, pre-heat); welding parameters; welding positions (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 sizes for joint thicknesses; electrode and covering; electrical conditions required (type of current, alternating [A.C.] direct [D.C.], electrode</p>	

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	<p>polarity (positive or negative), welding current ranges); welding techniques; sequence of welding; control of heat input; preheat/post heat; interpass/run cleaning/back gouging methods; post welding activities (wire brushing and grinding, removal of excess weld metal where required); post-weld heat treatment (normalising, stress relief), etc.</p> <p>PC7. select welding machines (e.g. transformers, rectifiers, inverters and generators, etc.) according to the task</p> <p>PC8. select type and size of electrodes according to classification and specifications</p> <p>PC9. re-dry electrodes as per electrode classification requirement</p> <p>PC10. prepare the work area for the welding activities</p> <p>PC11. perform measurements for joint preparation and routine MMAW</p> <p>PC12. prepare the various forms of materials and the joint in readiness for welding</p> <p>Materials: Carbon steel, low alloy steel and stainless steels</p> <p>Forms: plate, sheet (1.5mm), structural section, other forms (hollow tubes, sections, shapes, etc.)</p> <p>Joint preparation: 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; restraining devices such as clamps and weights/blocks; setting up the joint in the correct position and alignment</p> <p>PC13. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding</p> <p>PC14. use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment</p> <p>MMAW equipment: e.g. transformers; rectifiers; generators; invertors; consumables – electrodes, dyes; welding accessories - holders, cables and accessories; ancillary equipment - (power saw, angle, pedestal and straight grinders, tong tester, etc.); electrode drying oven, etc.</p> <p>PC15. connect equipment to power source</p> <p>PC16. connect cables, electrode holders, return leads and ground clamps to appropriate terminal</p> <p>PC17. set, read and adjust amperage controls</p> <p>PC18. verify setup by running test and appropriately handle weld specimen/scrap plate</p> <p>PC19. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding</p>
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CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

<p>Carry out welding operations</p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC20. strike and maintain a stable arc</p> <p>PC21. stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques)</p> <p>PC22. manipulate electrode angle using various methods as per WPS</p> <p>PC23. maintain constant puddle by using appropriate travel speed</p> <p>PC24. remove slag in an appropriate manner (e.g. wire brush, hammer, etc.)</p> <p>PC25. weld the joint to the specified quality, dimensions and profile applicable to range of material</p> <p>PC26. produce range of welded joints to within the mentioned standard using single or multi-run welds (as appropriate)</p> <p>Joints: fillet and groove</p> <p>PC27. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817</p> <p>Weld 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 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</p> <p>PC28. produce range of welded joints in various positions as per the WPS specified</p> <p>Positions: flat (PA) 1G/1F, horizontal vertical (PB) 2F, horizontal (PC) 2G, vertical upwards (PF) 3F / 3G, vertical downwards (PG) 3F / 3G, 4G Plate (overhead) Plate to Pipe (Fixed) 5F, pipe welding 5G/5F and 6G</p> <p>PC29. shut down and make safe the welding equipment on completion of the welding activities</p>
<p>Test for quality</p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC30. identify various weld defects, use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification</p> <p>Weld defects: lack of continuity of the weld; uneven and irregular ripple formation; excessive spatter; incorrect weld size or profile; burn through;</p>

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	<p>undercutting; overlap; inclusions; distortion; porosity; internal cracks; surface penetration; gouges; stray arc strikes; sharp edges; excessive convexity</p> <p>PC31. check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection</p> <p>Quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; NDT/DT tested defects</p> <p>Visual inspections: e.g. use of visual techniques, distance from workpiece, angle of observation, adequate lighting, low powered magnification, fillet weld gauges, etc.</p> <p>PC32. detect surface imperfections and deal with them appropriately</p> <p>PC33. carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)</p>
Post-welding activities	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC34. assist in preparation for non-destructive testing of the welds, for a range of tests</p> <p>Non-destructive tests (NDT): Penetrant testing- dye penetrant (DPT), fluorescent penetrant (FPT); magnetic particle (MPT); radiographic (RT); ultrasonic (UT)</p> <p>PC35. prepare for destructive tests on weld specimens for fillet, butt and corner</p> <p>Destructive tests (DT): macro examination; fractured test- nick break test; bend tests (such as face, root or side, as appropriate); mechanical (tensile and shear, impact); chemical</p>
Deal with contingencies	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC36. 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</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. relevant legislation, standards, policies, and procedures followed in the company</p> <p>KA2. key purpose of the organization</p> <p>KA3. department structure and hierarchy protocols</p> <p>KA4. workflow and own role in the workflow</p> <p>KA5. dependencies and interdependencies in the workflow</p> <p>KA6. support functions and types of support available for incumbents in this role</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. health and safety, hazards and precautions associated with MMAW/SMAW welding</p> <p>Safety precautions (MMAW/SMAW Welding): protection from live and other</p>

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	<p>electrical components, including insulation, proper earthing, etc.; proper handling and placement of hot metal; taking account of spatter and related safe distance; adequate lighting; appropriate personal protective equipment suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles, hard hat/helmet; protection of self and others from the effects of the welding arc; fume extraction/control measures; safety measures for elevated and trench workings (e.g. harness, etc.)</p> <p>KB2. applications of manual metal arc welding</p> <p>KB3. effects of exposure to the electric arc</p> <p>KB4. types of fire extinguishers and their suitable uses</p> <p>KB5. effects of exposure to welding fume</p> <p>KB6. methods of managing welding fume hazards</p> <p>KB7. personal protective equipment (PPE) and clothing to be worn during MMAW/SMAW welding</p> <p>Personal protective equipment (PPE): (suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles, hard hat/helmet</p> <p>KB8. welding specific equipment requirements for MMAW/SMAW welding</p> <p>MMAW equipment: e.g. transformers, rectifiers; generators; invertors; consumables – electrodes, dyes; welding accessories - holders, cables and accessories; ancillary equipment - (power saw, angle, pedestal and straight grinders, tong tester, etc.); electrode drying oven, etc.</p> <p>KB9. main components and controls of welding equipment</p> <p>KB10. how to connect electrical components correctly</p> <p>KB11. type of current used and implication</p> <p>KB12. welding symbols used and their correct interpretation</p> <p>KB13. consumables used for MMAW/SMAW welding</p> <p>KB14. various types of electrodes (classification) based on covering</p> <p>Electrodes: rutile, basic, cellulosic, acid</p> <p>KB15. function of covering</p> <p>KB16. various defects associated with the MMAW/SMAW welding process</p> <p>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</p> <p>KB17. types of joint configurations</p> <p>Joints: fillet and groove (lap joints, tee fillet joints, corner joints, butt joints square, single vee, double vee)</p>
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CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	<p>KB18. 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)</p> <p>KB19. types of beads, their characteristics and uses (stringer, weave, weave patterns) Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap</p> <p>KB20. factors that affect weld quality Quality standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joins 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; tack welds are blended into form part of the finished weld, without excessive hump; corner joints have minimal burn through to the underside of the joint or, where appropriate</p> <p>KB21. weld positions such as flat, horizontal, vertical and overhead</p> <p>KB22. types of equipment components such as electrode holders, work leads cables and ground clamps</p> <p>KB23. awareness and importance of cable size and length</p> <p>KB24. types of polarity such as AC and DC electrode negative and DC electrode positive for welding purposes</p> <p>KB25. various types of base metals used in welding and their implications</p> <p>KB26. type and thickness of base metals to be welded Base metals: e.g. mild or low carbon steel, austenitic stainless steel, etc.</p> <p>KB27. distortion and how to control distortion Distortion (causes and control methods): Causes: improper sequence of weld runs; direction of weld runs; heat input errors; lack of inaccuracy of jigs and fixture; Control Methods: sequence of welding as materials; proper direction; tacking and its frequency (where applicable; use clamping and jigs and fixtures (where applicable)</p> <p>KB28. magnetic arc blow or arc deflection, causes and methods to avoid or compensate</p> <p>KB29. storage requirements for consumable electrodes</p>
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CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	<p>KB30. electrode classifications such as tensile strength, position and composition</p> <p>KB31. electrode types based on covering, their characteristics and uses</p> <p>KB32. purpose of re-drying and procedure for different classification of electrode</p> <p>KB33. welding process and method specification sheet, process qualification record (PQR) and related essential variables</p> <p>KB34. travel speed and heat inputs</p> <p>KB35. amperage requirements for different classification of electrodes and positions</p> <p>KB36. importance and implications of various diameters of electrodes</p> <p>KB37. gouging and back gouging principles, methods and procedures</p> <p>KB38. purpose and importance of pre-heating requirements for base metals</p> <p>KB39. purpose and importance of post-heating in welding</p> <p>KB40. methods to achieve pre-heat and post heat requirements</p> <p>KB41. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.</p> <p>KB42. significance of diffusible hydrogen for welds</p> <p>KB43. importance of maintaining welding standards specified for the job</p> <p>KB44. impact of a welding job done right, acceptable or non-acceptable</p> <p>KB45. types of visual inspection indicators and methods Visual inspections: e.g. use of visual techniques, distance from workpiece, angle of observation, adequate lighting, low powered magnification, fillet weld gauges, etc.</p> <p>KB46. types of NDT and DT inspection methods</p> <p>KB47. procedure to conduct DP testing</p> <p>KB48. common welder testing codes and their purpose Testing codes: ASME section IX, EN 287, ISO 9606, IS 731</p>
Skills (S)	
A. Core Skills/ Generic Skills	<p>Writing Skills</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA2. undertake numerical operations, geometry and calculations/ formulae arithmetic: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages</p> <p>SA3. use appropriate measuring techniques</p> <p>SA4. use and convert imperial and metric systems of measurements</p> <p>SA5. apply appropriate degree of accuracy to express numbers</p> <p>SA6. calculate tolerance in terms of limits of size</p> <p>SA7. check measurements, angles, orientation and slopes</p>

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	SA8. types of reference lines such as tangent lines, datum lines, centre lines and work points
	SA9. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method
	SA10. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers
	SA11. ability to check dimensions of components
	SA12. calculate the value of angles in a triangle
	SA13. interpret straight line graphs using given data
	Reading Skills
	The user/ individual on the job needs to know and understand how to: SA14. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA15. convey and share technical information clearly using appropriate language SA16. check and clarify task-related information SA17. liaise with appropriate authorities using correct protocol SA18. communicate with people in respectful form and manner in line with organizational protocol
B. Professional Skills	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB1. plan, prioritize and sequence work operations as per job requirements SB2. organize and analyze information relevant to work basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. exercise restraint while expressing dissent and during conflict situations SB4. avoid and manage distractions to be disciplined at work SB5. manage own time for achieving better results SB6. work in a team in order to achieve better results SB7. identify and clarify work roles within a team SB8. communicate and cooperate with others in the team for better results SB9. seek assistance from fellow team members

CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

	Problem Solving
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB10. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB11. prioritize and plan for problem solving</p> <p>SB12. communicate problems appropriately to others</p> <p>SB13. identify sources of information and support for problem solving</p> <p>SB14. seek assistance and support from other sources to solve problems</p> <p>SB15. identify effective resolution techniques</p> <p>SB16. select and apply resolution techniques</p> <p>SB17. seek evidence for problem resolution</p>
	Analytical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB18. undertake and express new ideas and initiatives to others</p> <p>SB19. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB20. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB21. enhance one's competencies in new and different situations and contexts to achieve more</p>
	Critical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB22. participate in on-the-job and other learning, training and development interventions and assessments</p> <p>SB23. clarify task related information with appropriate personnel or technical adviser</p> <p>SB24. seek to improve and modify own work practices</p> <p>SB25. maintain current knowledge of application standards, legislation, codes of practice and product/process developments</p>

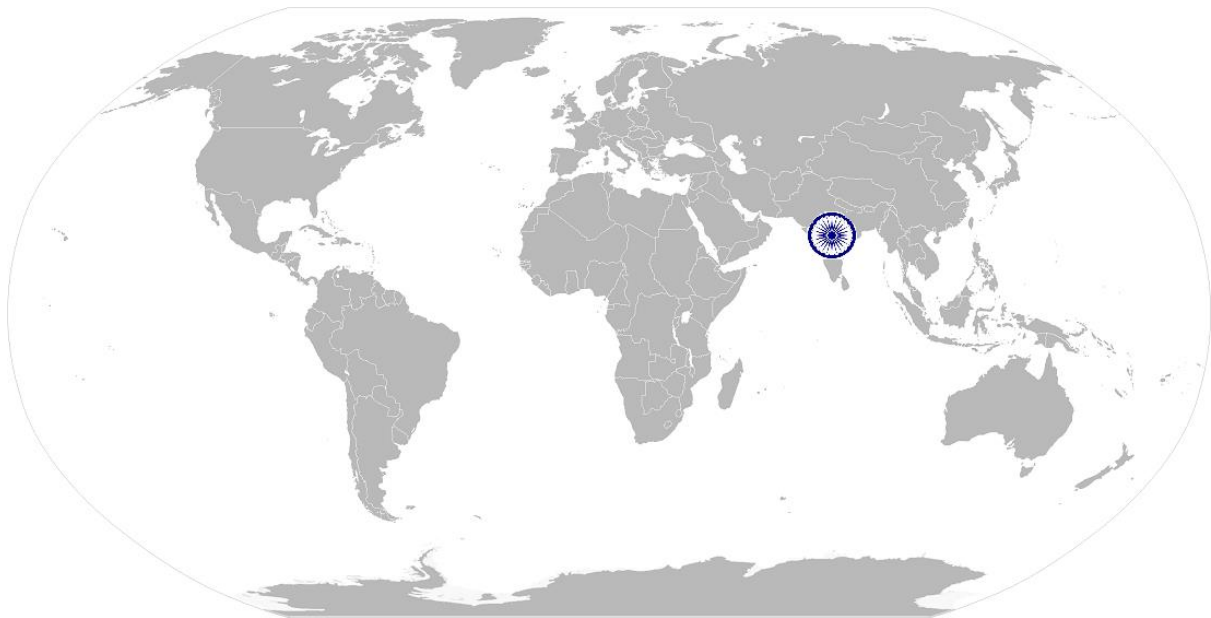
CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding /Shielded Metal Arc Welding

NOS Version Control

NOS Code	CSC/N0208		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	<ol style="list-style-type: none"> 1. Machine Tools 2. Process Plant Machinery 3. Dies, Moulds and Press Tools 4. Electrical and Power Machinery 5. Plastic Manufacturing Machinery 6. Light Engineering Goods 7. Textile Manufacturing Machinery 	Last reviewed on	24/11/2017
Occupation	Welding and Cutting	Next review date	24/11/2021

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

National Occupational Standard



Overview

This unit is about manual operations for performing basic tungsten inert gas (TIG) welding also known as gas tungsten arc welding (GTAW). The person would be able to independently carry out TIG (GTAW) weld operations for some welding joints in basic positions as per Welding Procedure Specification (WPS).

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

National Occupational Standard	Unit Code	CSC/N0212
	Unit Title (Task)	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.
	Scope	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Work Safely • Prepare for welding operations • Carry out welding operations • Test for quality • Deal with contingencies
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Work Safely	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>PC2. take necessary safety precautions for TIG welding operations</p>
	Prepare for welding operations	<p>To be competent, the user/individual on the job must be able to:</p> <p>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 weldgas 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)</p> <p>PC4. check that all measuring equipment is within calibration date</p> <p>PC5. check if welding machines e.g. transformer, inverters (AC/DC), rectifiers and generators have been made available by the authorized person</p> <p>PC6. check if welding torch, tungsten electrode and filler wire have been made available by the authorized person</p>

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	<p>PC7. prepare for the TIG welding process</p> <p>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 beveled); 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)</p> <p>PC9. fit the welding shielding gases given by the authorised person, for a range of given applications</p> <p>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</p> <p>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</p> <p>PC12. connect and adjust regulators and flow meters to cylinders</p> <p>PC13. read, set and adjust current (amperage) as required</p> <p>PC14. set pre-purge with shielding gas as required</p> <p>PC15. prepare tungsten by sharpening or balling it to desired tip shape</p> <p>PC16. set and verify gas flow rates</p> <p>PC17. prepare and support the joint, using the appropriate methods</p> <p>PC18. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding</p> <p>PC19. match feed and travel speed as required</p>
<p>Carry out welding operations</p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>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</p> <p>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)</p> <p>PC22. use correct angle of torch and filler wire</p>

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	<p>PC23. weld the joint to the specified quality, dimensions and profile</p> <p>PC24. use manual welding and related equipment, to carry out TIG welding processes</p> <p>PC25. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level B of ISO 5817</p> <p>Weld quality check standards: required parameters for dimensional accuracy; weld finishes are built up to the full section of the weld; joins 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</p> <p>PC26. use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)</p> <p>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</p> <p>PC28. weld joints in good access situations, in select positions</p> <p>PC29. make sure that the work area is maintained and left in a safe and tidy condition</p>
<p>Test for quality</p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC30. use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification</p> <p>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</p> <p>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</p>

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	<p>penetration; welding spatter; gouges; stray arc strikes; sharp edges</p> <p>PC33. detect surface imperfections and deal with them appropriately</p> <p>PC34. report any defect or imperfection identified to the authorised person</p> <p>PC35. shut down and make safe the welding equipment on completion of the welding activities</p>
Deal with contingencies	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC36. detect equipment malfunctions and deal with them appropriately</p> <p>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</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. relevant legislation, standards, policies, and procedures followed in the company</p> <p>KA2. key purpose of the organization</p> <p>KA3. department structure and hierarchy protocols</p> <p>KA4. workflow and own role in the workflow</p> <p>KA5. dependencies and interdependencies in the workflow</p> <p>KA6. support functions and types of support available for incumbents in this role</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. the types of fire extinguishers and their suitable uses in case of welding related fires</p> <p>KB2. the effects of exposure to welding fume</p> <p>KB3. range of welding equipment available</p> <p>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</p> <p>Shielding gases equipment: cylinders; manifold systems; regulators (fixed, single stage, two-stage); gas flow meters; gas tubes and connectors; solenoid valves; economisers</p> <p>KB4. concepts and mechanisms of welding</p> <p>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</p>

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	<p>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)</p> <p>KB5. basic principles of TIG welding and functions of welding equipment Principles: the arc burns between a non- consumable tungsten electrode and the workpiece; 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 aluminum, alternating current must be used; for arc ignition a high-frequency high voltage is used</p> <p>KB6. different types of power source</p> <p>KB7. 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</p> <p>KB8. 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.</p> <p>KB9. personal protective equipment to be worn for the welding activities</p> <p>KB10. correct handling and storage of gas cylinders</p> <p>KB11. manual TIG welding process</p> <p>KB12. type and thickness of base metals</p> <p>KB13. current types and polarity</p> <p>KB14. 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</p> <p>KB15. impact of shielding gas composition and purity on welding quality</p> <p>KB16. use, impact and importance of gas pressures and flow rates in relationship to</p>
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	<p>the type of material being welded and the consumables used</p> <p>Welding consumables: filler wires for different base materials, shielding gas</p> <p>KB17. pre- and post-flow purge and its importance</p> <p>KB18. importance and application of back purging</p> <p>KB19. types of welded joints to be produced</p> <p>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)</p> <p>KB20. terminology used for the appropriate welding positions</p> <p>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</p> <p>KB21. how to prepare the materials in readiness for the welding activity</p> <p>KB22. how to set up and restrain the joint, and the tools and techniques to be used</p> <p>KB23. appropriate tack welding size and spacing (in relationship to material thickness)</p> <p>KB24. checks to be made prior to welding</p> <p>Activities checks: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters</p> <p>KB25. techniques of operating the welding equipment to produce a range of joints in the various joint positions</p> <p>KB26. effects of the electrical characteristics of the TIG welding arc</p> <p>KB27. purpose and importance of pre-heating requirements for base metals</p> <p>KB28. purpose and importance of post-heating in welding</p> <p>KB29. methods to achieve pre-heat and post heat requirements</p> <p>KB30. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.</p> <p>KB31. how to control distortion (such as welding sequence; deposition technique)</p> <p>KB32. problems that can occur with the welding activities</p> <p>KB33. how to close down the welding equipment safely and correctly</p> <p>KB34. how to prepare the welds for examination</p> <p>KB35. various procedures for visual examination of the welds</p> <p>Types of visual inspections: use of visual techniques, lighting, low powered magnification, fillet weld gauges, usage at temperature chalk</p> <p>KB36. handling of specimens for tests and methods of removing a test piece of weld from a suitable position in the joint</p> <p>Handling specimens for tests: handling hot materials; using chemicals for cleaning and etching; using equipment to fracture welds</p> <p>KB37. safe working practices and procedures to be adopted when preparing the</p>
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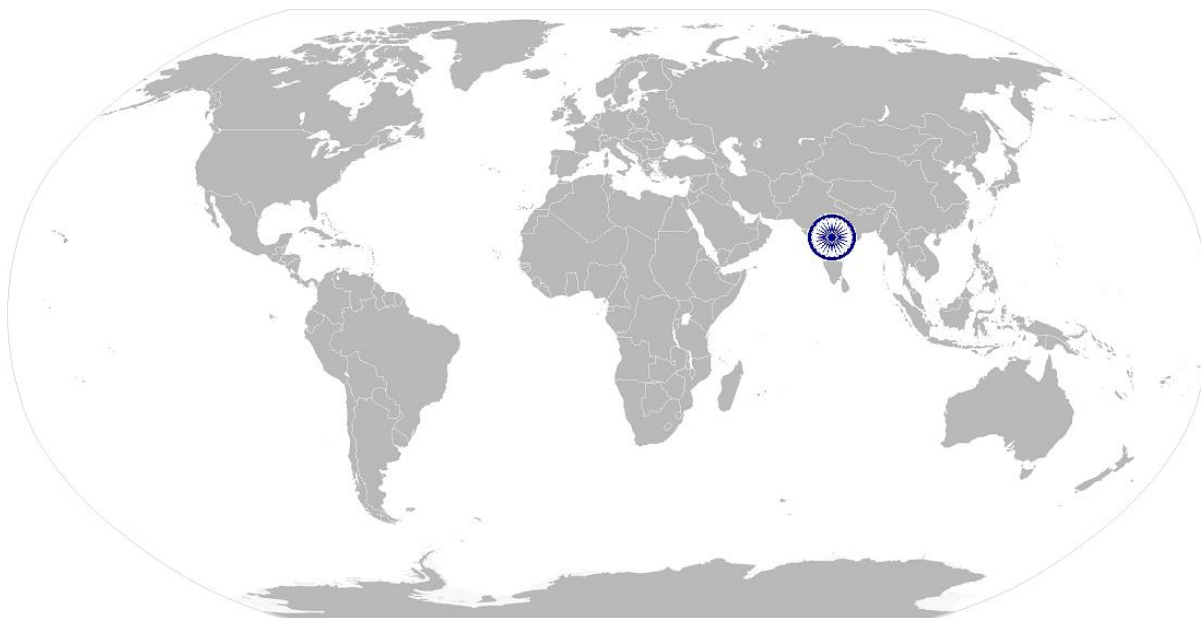
	<p>welds for examination</p> <p>KB38. importance of leaving the work area and equipment in a safe condition on completion of the welding activities</p>
Skills (S)	
A. Core Skills / Generic Skill	<p>Writing Skills</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA2. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)</p> <p>SA3. use appropriate measuring techniques</p> <p>SA4. use and convert imperial and metric systems of measurements</p> <p>SA5. apply appropriate degree of accuracy to express numbers</p> <p>SA6. use and understand tolerance in terms of limits of size</p> <p>SA7. check measurements, angles, orientation and slopes</p> <p>SA8. types of reference lines such as tangent lines, datum lines, centre lines and work points</p> <p>SA9. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method</p> <p>SA10. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers</p> <p>SA11. ability to check dimensions of components</p> <p>SA12. calculate the value of angles in a triangle</p>
	<p>Reading Skills</p> <p>The user/ individual on the job needs to know and understand how to:</p> <p>SA13. 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</p>
	<p>Oral Communication (Listening and Speaking Skills)</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA14. convey and share technical information clearly using appropriate language</p> <p>SA15. check and clarify task-related information</p> <p>SA16. liaise with appropriate authorities using correct protocol</p> <p>SA17. communicate with people in respectful form and manner in line with organizational protocol</p>
	<p>B. Professional Skills</p> <p>Plan and Organize</p> <p>The user/individual on the job needs to know and understand how to:</p>

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	<p>SB1. plan, prioritize and sequence work operations as per job requirements</p> <p>SB2. organize and analyze information relevant to work</p> <p>SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time</p>
	Customer Centricity
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB4. exercise restraint while expressing dissent and during conflict situations</p> <p>SB5. avoid and manage distractions to be disciplined at work</p> <p>SB6. manage own time for achieving better results</p> <p>SB7. work in a team in order to achieve better results</p> <p>SB8. identify and clarify work roles within a team</p> <p>SB9. communicate and cooperate with others in the team for better results</p> <p>SB10. seek assistance from fellow team members</p>
	Problem Solving
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. identify problems with work planning, procedures, output and behavior and their implications</p> <p>SB12. prioritize and plan for problem solving</p> <p>SB13. communicate problems appropriately to others</p> <p>SB14. identify sources of information and support for problem solving</p> <p>SB15. seek assistance and support from other sources to solve problems</p> <p>SB16. identify effective resolution techniques</p> <p>SB17. select and apply resolution techniques</p> <p>SB18. seek evidence for problem resolution</p>
	Analytical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. undertake and express new ideas and initiatives to others</p> <p>SB20. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses</p> <p>SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships</p> <p>SB22. enhance one's competencies in new and different situations and contexts to achieve more</p>
	Critical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB23. participate in on-the-job and other learning, training and development interventions and assessments</p> <p>SB24. clarify task related information with appropriate personnel or technical adviser</p>

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	<p>SB25. seek to improve and modify own work practices</p> <p>SB26. maintain current knowledge of application standards, legislation, codes of practice and product/process developments</p>
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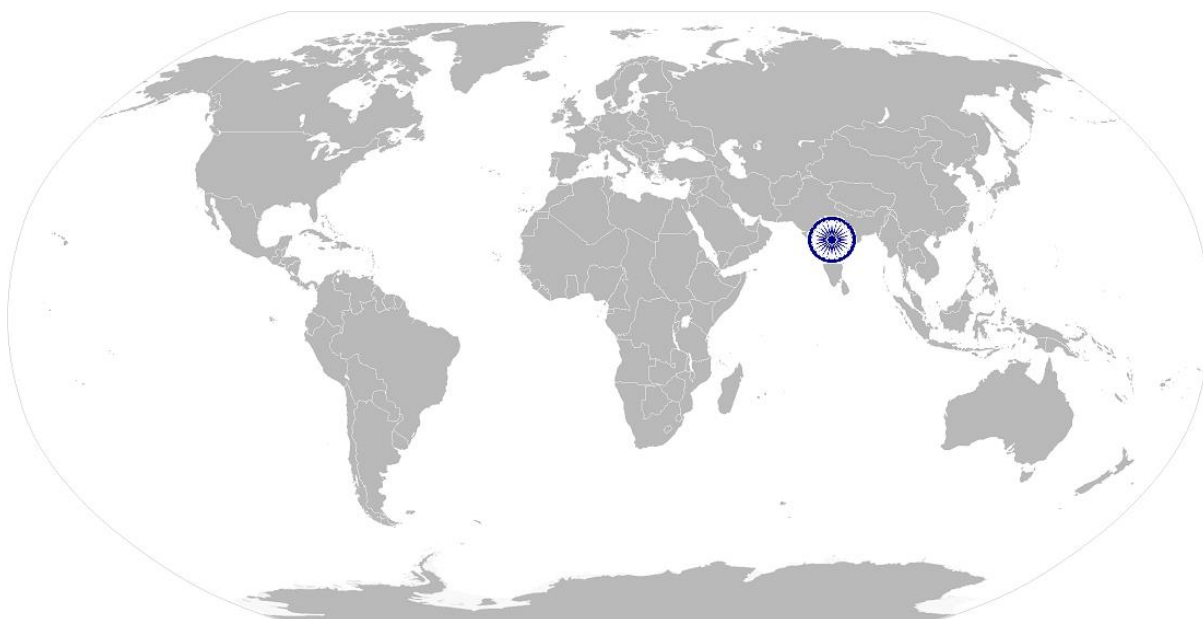
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NOS Version Control

NOS Code	CSC/N0212		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	15/01/2016
Industry Sub-sector	<ol style="list-style-type: none"> 1. Machine Tools 2. Process Plant Machinery 3. Dies, Moulds and Press Tools 4. Electrical and Power Machinery 5. Plastic Manufacturing Machinery 6. Light Engineering Goods 7. Textile Manufacturing Machinery 	Last reviewed on	24/11/2017
Occupation	Welding and Cutting	Next review date	24/11/2021

CSC/N0214 Manually weld stainless steel using Metal Inert Gas (MIG) welding technique

National Occupational Standard



Overview

This unit is about performing manual (semi-automatic) operations for metal inert gas welding (MIG) for welding joints in all positions as per welding procedure specification (WPS).

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National Occupational Standard	Unit Code	CSC/N0214
	Unit Title (Task)	Manually weld stainless steel using MIG welding technique
	Description	This unit is about performing manual (semi-automatic) operations for metal inert gas welding (MIG) for welding joints in all positions as per welding procedure specification (WPS).
	Scope	<p>This unit/ task covers the following:</p> <ul style="list-style-type: none"> • Work Safely • Prepare for welding operations • Carry out welding operations • Test for quality • Post welding activities • Deal with contingencies
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Work safely	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines</p> <p>PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations for MIG welding operations</p> <p>Safety precautions: e.g. general workshop safety; fire prevention; general hazards; manual lifting; overhead lifting; shopfloor housekeeping including surface conditions; waste disposal; stability of surrounding structures, furniture, etc.</p> <p>PC3. check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder</p> <p>PC4. report any faults or potential hazards to appropriate authority</p>
	Prepare for welding operations	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC5. interpret weld procedure data sheets specifications, PQR and WPS</p> <p>Interpreting WPS: e.g. welding process (ISO codes); parent metal; consumables; pre welding joining 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 sizes for joint thicknesses; electrode/filler wire; electrical conditions required (direct [D.C.], electrode polarity (positive, negative), welding current and voltage ranges; methods of arc ignition (scratch, high frequency, lift start); shielding gas (type, flow rate,</p>

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	<p>pre-weld gas flow, post-weld gas flow); welding techniques; sequence of welding; control of heat input; interpass/run cleaning/back gouging methods; post welding activities (wiring brushing, removal of excess weld metal where required); post-weld heat treatment; etc.</p> <p>PC6. select welding machines such as inverters, rectifiers and generators, according to the task</p> <p>PC7. select electrodes according to classification and specifications</p> <p>PC8. prepare the materials and joint in readiness for welding of stainless steel Material and joint preparation: 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, gas and plasma cutting, grinding and stripping, etc.); correctly positioned-positioning: devices and techniques- jigs and fixtures; restraining devices such as clamps and weights/blocks; setting up the joint in the correct position and alignment</p> <p>PC9. check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms Welding concepts and mechanisms: rated output (duty cycle); measurement of electrical output and continuity; relationship between wire feed speed control and welding current; power source characteristics (volt/ampere graph, flat characteristic, constant voltage output); function of induction (principle, effect, fixed, stepped, variable control, return; earth; wire feed control (variable speed motor, direct control of wire feed rate); indirect control of welding current; relay for electrical power</p> <p>PC10. prepare the welding equipment for a range of given applications Welding 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</p> <p>PC11. select the welding shielding gases and equipment for a range of given applications Shielding gases: applications for shielding gases/gas mixtures (argon, helium, helium/argon mixtures); flowrates for applications; identify percentage of</p>
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	<p>purity and mixture with respect to WPS (Welding Procedure Specification)/PQR (Process Qualification Record)</p> <p>Shielding gas equipment: cylinders; manifold systems; regulators (fixed, single stage, two-stage); gas flow meters; gas tubes and connectors; use of solenoid valves</p> <p>PC12. plan the welding activities before they start effectively and efficiently for achieving specifications as per WPS</p> <p>PC13. clean wire feeder and torch tip</p> <p>PC14. connect torches and components</p> <p>PC15. connect and adjust regulators and flow meters to cylinders</p> <p>PC16. adjust wire feed rate and read and set current as required</p> <p>PC17. set other welding parameters (e.g. voltage, slope of current versus voltage curve where required)</p> <p>Parameters: correct set-up of the joint; proper condition of electrical connections; welding return and earthing arrangements; operating parameters</p> <p>PC18. set pre-purge with shielding gas as required</p> <p>PC19. set and verify gas flow rates</p> <p>PC20. prepare and support the joint, using appropriate methods</p> <p>PC21. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding</p>
<p>Carry out welding operations</p>	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC22. use manual welding and related equipment, to carry out MIG welding processes</p> <p>PC23. perform MIG welding operations using various welding techniques to meet welding procedure specification requirements</p> <p>Welding techniques: 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.</p> <p>PC24. adjust wire stick-out as per requirement</p> <p>PC25. use welding consumables appropriate to the material and application to DC current types</p> <p>Welding consumables: wire electrodes, wires and rods for arc welding; shielding gases; welding spools and drum packs; anti-spatter compound</p> <p>PC26. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817</p> <p>Weld 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</p>

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	<p>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 stainless steel to be 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</p> <p>PC27. produce joints from stainless steel in different forms</p> <p>PC28. weld joints in good access situations, in select positions</p> <p>Welding positions: 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</p> <p>PC29. make sure that the work area is maintained and left in a safe and tidy condition</p>
Test for quality	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC30. identify various weld defects use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification</p> <p>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</p> <p>PC31. check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection</p> <p>Quality parameters: dimensional accuracy; alignment/squareness; size and profile of weld; visual defects; NDT/DT tested defects</p> <p>Visual inspections: use of visual techniques, distance of observation, angle of observation, adequate lighting, low powered magnification, fillet weld gauges</p> <p>PC32. detect surface imperfections and deal with them appropriately</p> <p>PC33. carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)</p>
Post welding activities	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC34. prepare for conducting of non-destructive testing of the welds, for a range of tests</p> <p>Non-destructive tests (NDT): dye penetrant (DPT), fluorescent penetrant</p>

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	<p>(FPT), magnetic particle (MPT)</p> <p>PC35. prepare for destructive tests on weld specimens for fillet, butt and corner Destructive tests (DT): macro examination, nick break test, bend tests (such as face, root or side, as appropriate), mechanical (peel, tensile and shear, fatigue, impact tests), chemical</p> <p>PC36. shut down and make safe the welding equipment on completion of the welding activities</p> <p>PC37. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.</p>
Deal with contingencies	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC38. detect equipment malfunctions and deal with them safely and as per organisation procedures</p> <p>PC39. deal promptly and effectively with problems within own control, and seek timely and appropriate help and guidance from relevant personnel where required</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. relevant legislation, standards, policies, and procedures followed in the company</p> <p>KA2. key purpose of the organization</p> <p>KA3. department structure and hierarchy protocols</p> <p>KA4. workflow and own role in the workflow</p> <p>KA5. dependencies and interdependencies in the workflow</p> <p>KA6. support functions and types of support available for incumbents in this role</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. types of fire extinguishers and their suitable uses in case of welding related fires</p> <p>KB2. effects of exposure to welding fume and related safety practices</p> <p>KB3. range of welding equipment available for MIG welding</p> <p>Welding 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</p>

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	<p>KB4. functions of welding equipment</p> <p>KB5. principles and techniques of MIG welding 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.</p> <p>KB6. relationship between wire feed, speed control and welding current</p> <p>KB7. selection of welding consumables by comparing for suitability for a range of given applications Welding consumables: wire electrodes, wires and rods for arc welding; shielding gases; welding spools and drum packs; anti-spatter compound</p> <p>KB8. welding consumables classification as applicable to MIG welding</p> <p>KB9. safe working practices and procedures to be followed when preparing and using MIG welding equipment</p> <p>KB10. hazards associated with MIG welding and safety precautions to minimize risk Safety precautions (MIG Welding): protection from live and other electrical components, including insulation, proper earthing, etc; proper handling and placement of hot metal taking account of spatter and related safe distance; adequate lighting; appropriate personal protective equipment: suitable aprons, welding gloves, respirators, safety boots, correctly fitting overalls, suitable eye shields/goggles (higher grade of glasses DIN 13); protection of self and others from the effects of the welding arc; fume extraction/control measures; safety measures for working in enclosed spaces</p> <p>KB11. personal protective equipment to be worn for the welding activities</p> <p>KB12. correct handling and storage of gas cylinders for welding purposes</p> <p>KB13. manual MIG welding process</p> <p>KB14. type and thickness of stainless steel for welding purposes</p> <p>KB15. types (availability, typical sizes), storage (storage, identification, segregation (classification, size) of ferrous metals</p> <p>KB16. current and polarity required for MIG welding</p> <p>KB17. types, selection and application of filler wires and welding electrodes</p> <p>KB18. reasons for using shielding gases, and the types and application of the various gases Shielding gases: applications for shielding gases/gas mixtures (argon, helium, argon/helium mixtures); flow rates for applications; identify percentage of purity and mixture with respect to WPS/PQR</p> <p>KB19. use, impact and importance of gas pressures and flow rates for welding of stainless steel</p> <p>KB20. types of welded joints to be produced</p>
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	<p>Types of joints: fillet lap joints, tee fillet joints, corner joints, butt joints: square, single vee, double vee</p> <p>KB21. terminology used for the appropriate welding positions</p> <p>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</p> <p>KB22. type, components and features of a manual gas shielded arc welding torch</p> <p>Components of torch: handle; neck; trigger; hose package; shielding gas nozzle; contact tip and tip fixture; insulator; wire guide tube (liner); shielding gas supply lead; welding current supply lead</p> <p>KB23. steps involved in preparing the materials in readiness for the welding activity</p> <p>KB24. purpose and correct use of anti-spatter compound</p> <p>KB25. importance and procedure to clean torch tip and liner</p> <p>KB26. how to set up and restrain the joint, and the tools and techniques to be used</p> <p>KB27. appropriate tack welding size and spacing (in relationship to material thickness)</p> <p>KB28. checks to be made prior to welding</p> <p>KB29. factors that determine weld bead shape</p> <p>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</p> <p>KB30. types of weld beads and uses (stringer, weave, weave patterns)</p> <p>KB31. weld bead quality characteristics</p> <p>Bead characteristics: spatter deposits, roughness, evenness, fill, crater, overlap, contour - convex, concave, mitre</p> <p>KB32. techniques of operating the welding equipment to produce a range of joints in the various joint positions</p> <p>KB33. effects of the electrical characteristics of the MIG welding arc</p> <p>KB34. methods to control distortion (such as welding sequence; deposition technique)</p> <p>Distortion (causes and control methods): Causes- improper sequence of weld runs; direction of weld runs; heat input errors; lack of inaccuracy of jigs and fixture, Control Methods: sequence of welding as materials; proper direction; tacking and its frequency (where applicable); use clamping and jigs and fixtures (where applicable)</p> <p>KB35. problems that can occur with the welding activities and how to address them</p> <p>KB36. standard practices to close down the welding equipment safely and correctly</p> <p>KB37. own responsibility to assist in preparation of the welds and weld pieces for examination</p>
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	<p>KB38. procedure to check the welded joints for uniformity, alignment, position, weld size and profile</p> <p>KB39. gouging and back gouging, its importance, principles, methods and procedures in welding</p> <p>KB40. purpose and importance of pre-heating requirements for base metals in preparation for welding</p> <p>KB41. purpose and importance of post-heating in welding</p> <p>KB42. methods to achieve pre-heat and post heat requirements for welding purposes</p> <p>KB43. tools and methods to measure temperature for pre-heat and post-heat requirements such as thermal chalk, thermocouple, etc.</p> <p>KB44. significance of diffusible hydrogen for welds and how it is measured</p> <p>KB45. procedure to conduct dye penetrant test to assess weld quality</p> <p>KB46. various procedures for visual examination of the welds for cracks Visual inspections: use of visual techniques, distance of observation, angle of observation, adequate lighting, low powered magnification, fillet weld gauges</p> <p>KB47. types of non-destructive and destructive tests for assessing weld quality Non-destructive tests (NDT): dye penetrant (DPT), fluorescent penetrant (FPT), magnetic particle (MPT) Destructive tests (DT): macro examination, nick break test, bend tests (such as face, root or side, as appropriate), mechanical (peel, tensile and shear, fatigue, impact tests), chemical</p> <p>KB48. methods of removing a test piece of weld from a suitable position in the joint</p> <p>KB49. safe working practices, handling and procedures to be adopted when preparing the welds for examination Handling specimens for tests: handling hot materials; using chemicals for cleaning and etching; using equipment to fracture welds</p> <p>KB50. importance of leaving the work area and equipment in a safe condition on completion of the welding activities</p>
Skills (S)	
A. Core Skills / Generic Skill	<p>Writing Skills</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language</p> <p>SA2. undertake numerical operations, geometry and calculations/ formulae (including addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages)</p> <p>SA3. use appropriate measuring techniques</p> <p>SA4. use and convert imperial and metric systems of measurements</p> <p>SA5. apply appropriate degree of accuracy to express numbers</p>

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	Units and number systems representing degree of accuracy: decimals places, significant figures, fractions as a decimal quantity
	SA6. use and understand tolerance in terms of limits of size
	SA7. check measurements, angles, orientation and slopes
	SA8. types of reference lines such as tangent lines, data lines, centre lines and work points
	SA9. check square of material using corner-to-corner dimensions and triangulation (3-4-5) method
	SA10. select and use tools and equipment such as measuring tapes, levels, squares, protractors and dividers
	SA11. ability to check dimensions of components
	SA12. calculate the value of angles in a triangle
	Reading Skills
	The user/ individual on the job needs to know and understand how to:
	SA13. read and interpret information correctly from various job specification documents, health and safety instructions, memos, etc. applicable to the job in English and/or local language
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to:
	SA14. convey and share technical information clearly using appropriate language
	SA15. check and clarify task-related information
	SA16. liaise with appropriate authorities using correct protocol
	SA17. communicate with people in respectful form and manner in line with organizational protocol
B. Professional Skills	Decision Making
	NA
	Plan and Organize
	The user/individual on the job needs to know and understand how to:
	SB1. plan, prioritize and sequence work operations as per job requirements
	SB2. organize and analyze information relevant to work
	SB3. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Customer Centricity
	The user/individual on the job needs to know and understand how to:
	SB4. exercise restraint while expressing dissent and during conflict situations
	SB5. avoid and manage distractions to be disciplined at work
	SB6. manage own time for achieving better results
	SB7. work in a team in order to achieve better results
	SB8. identify and clarify work roles within a team

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	SB9. communicate and cooperate with others in the team for better results SB10. seek assistance from fellow team members
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB11. identify problems with work planning, procedures, output and behavior and their implications SB12. prioritize and plan for problem solving SB13. communicate problems appropriately to others SB14. identify sources of information and support for problem solving SB15. seek assistance and support from other sources to solve problems SB16. identify effective resolution techniques SB17. select and apply resolution techniques SB18. seek evidence for problem resolution
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB19. undertake and express new ideas and initiatives to others SB20. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB21. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB22. enhance one's competencies in new and different situations and contexts to achieve more
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB23. participate in on-the-job and other learning, training and development interventions and assessments SB24. clarify task related information with appropriate personnel or technical adviser SB25. seek to improve and modify own work practices SB26. maintain current knowledge of application standards, legislation, codes of practice and product/process developments

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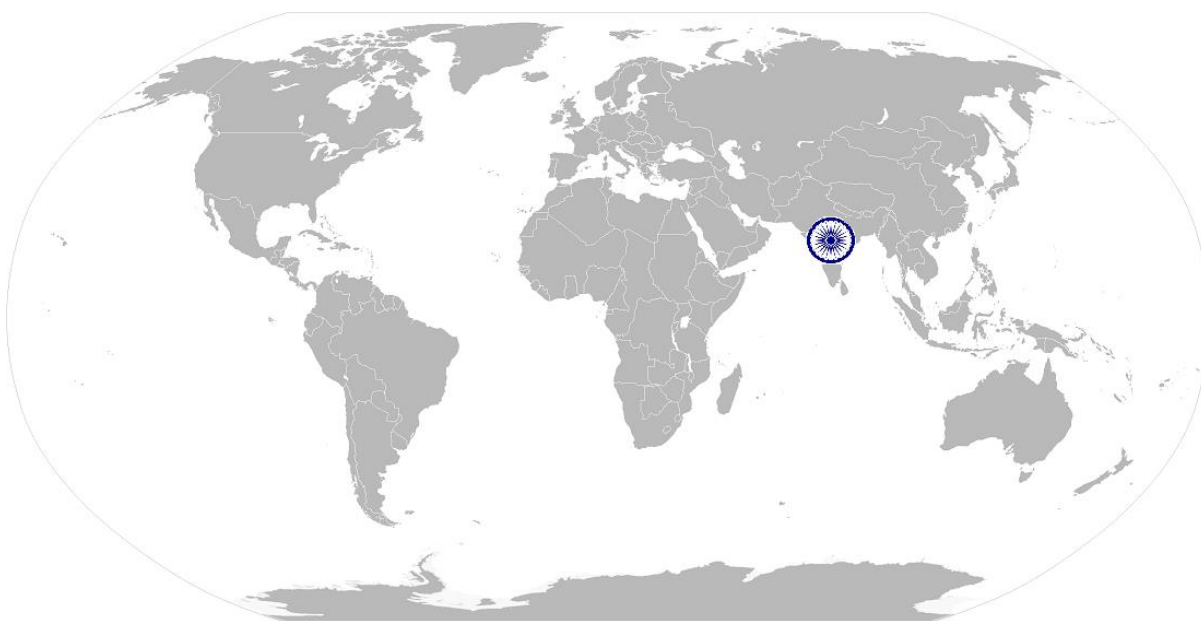
NOS Version Control

NOS Code	CSC/N0214		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	22/04/2019
Industry Sub-sector	<ol style="list-style-type: none"> 1. Process Plant Machinery 2. Light Engineering Goods 	Last reviewed on	19/06/2019
Occupation	Fabrication, Fitting and Assembly	Next review date	19/06/2022



CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

National Occupational Standard



Overview

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

CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

Unit Code	CSC/N0313
Unit Title (Task)	Perform finishing and installation of fabricated stainless steel structures
Description	This unit is about performing finishing and installation of fabricated stainless steel structures at the worksite as per standard operating procedures.
Scope	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Finish stainless steel structures • Install fabricated structures • Perform post installation activities
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Finish stainless steel structures	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. assemble the fabricated components as per design drawings and specifications</p> <p>PC2. inspect the welded joints in the fabricated structure to check for welding imperfections Imperfections: blow holes, porosity, underfill, weld penetration, distortion, undercut, misalignment, spatter, gaps etc.</p> <p>PC3. clean the weld area using mechanical, chemical and other standard cleaning methods as per standard operating procedure (SOP) Mechanical cleaning methods: brushing with stainless steel wires to remove discoloration from weld areas Chemical cleaning methods: acetone, methylated spirit to remove oil, paint or grease, etc. Other standard cleaning methods: for e.g. jute wheel, cloth wheel, flap wheel, chisel scaler; soaps such as wax/cleaning soap, cutting soap etc.</p> <p>PC4. use flapper wheel abrasives for deburring and finishing the fabricated structures Flapper wheel abrasives: cartridge rolls, cross pads, drum sleeves and flap discs made from coated or nonwoven abrasives</p> <p>PC5. apply relevant treatment techniques in the areas of hot weld deposit to restore the full passivity and corrosion resistance of the weld Treatment techniques: mechanical methods (wire brushing for loose scale and flux); grinding (to dress the welds); blast cleaning (using glass beads, copper slags, stainless steel cut wire)</p> <p>PC6. test the weldments and their tensile strength using appropriate techniques Technique: chisel/shear test, load test etc.</p> <p>PC7. perform buffing to smoothen the surface of the workpiece and ensure fine</p>

CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

	<p>finishing as per the required application Buffing: fibre wheel for stainless steel, minor grinding, matt or satin</p> <p>PC8. operate appropriate grinding and polishing equipment to achieve desired finishing on the structure</p> <p>Finishing: mirror finish, hairline finish etc.</p> <p>PC9. dispatch the fabricated structure as per standard practice and/or organisational SOP</p>
Install fabricated structures	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC10. check if the site ready for installation</p> <p>PC11. assemble and join the parts and/or structures to be installed at the worksite in co-ordination with installation team</p> <p>PC12. erect, align and level the stainless steel structure/s</p>
Perform post installation activities	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC13. provide instructions and guidelines for the upkeep of the stainless steel structure/s to the user/customer</p> <p>PC14. secure and maintain the fabrication equipment and machinery</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company</p> <p>KA2. employment and performance conditions for the job role</p> <p>KA3. health and safety requirements applicable in the workplace</p> <p>KA4. importance of working in clean and safe environment</p> <p>KA5. role and responsibilities of a stainless steel fabricator</p> <p>KA6. sources for information pertaining to employment terms, entitlements, job role and responsibilities</p> <p>KA7. reporting structure, inter-dependent functions, production lines and procedures in the work area</p> <p>KA8. escalation matrix and procedures for reporting work and employment related</p> <p>KA9. Issues</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. properties and applications of various types and grades of stainless steel</p> <p>KB2. use of various tools, equipment and materials for finishing the stainless steel structure/s</p> <p>KB3. interpretation of design drawings to facilitate installation process</p> <p>KB4. elements of a quality assurance plan (QAP) for stainless steel fabrication</p> <p>KB5. deburring, buffing techniques and requirements for stainless steel structures</p> <p>KB6. methods and materials used to clean the stainless steel structures</p> <p>KB7. water chilling methodology with respect to stainless steel fabrication</p> <p>KB8. treatment processes such as mechanical methods, blast cleaning etc.</p>

CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

	<p>KB9. welding imperfections, their causes and possible countermeasures</p> <p>KB10. considerations to be kept in mind while testing the weldments and checking the structure to ascertain appropriateness for installation</p> <p>KB11. installation requirements for fabricated stainless steel</p> <p>KB12. types of templates for marking for stainless steel and how to source them</p> <p>KB13. considerations to ensure proper alignment and levelling for stainless steel structures while installation</p> <p>KB14. guidelines for upkeep and maintenance of stainless steel structures as well as fabrication tools and equipment</p> <p>KB15. correct practices for handling, storing, packing and transporting stainless steel</p> <p>KB16. risks and precautions to be taken against them while engaged in fabrication activities</p>
Skills (S)	
A. Core Skills / Generic Skill	Writing Skills
	The user/individual on the job needs to know and understand how to:
	SA1. fill up appropriate technical forms, process charts, activity logs as per organizational format in English and/or local language
	SA2. write in a manner appropriate for business
	Reading Skills
	The user/ individual on the job needs to know and understand how to:
	SA3. read and correctly assimilate information from manufacturer manuals and guides
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to:
	SA4. convey and share technical information clearly using appropriate language
	SA5. express information to individuals or groups taking into account nature of audience and the information
	SA6. receive, attend to, correctly interpret and respond to verbal messages and other cues
	SA7. apply active listening skills using reflection, restatement, questioning and clarification
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to:
	SB1. take proper and effective action when necessary without having all the facts at hand
	SB2. adapt plans, goals, actions and priorities in response to unpredictable or unexpected events
	Plan and Organize

CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB3. plan, prioritize and sequence work operations as per job requirements SB4. organize and analyze information relevant to work SB5. allocate resources and time effectively
	Customer Centricity
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB6. share information with the customer about the upkeep of the stainless steel structures/materials SB7. listen to customer queries and concerns and provide an appropriate response to it
	Problem Solving
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB8. identify problems with work planning, procedures, output and behavior and their implications SB9. prioritize and plan for problem solving SB10. communicate problems appropriately to others SB11. identify sources of information and support for problem solving SB12. seek assistance and support from other sources to solve problems SB13. identify effective resolution techniques SB14. select and apply resolution techniques SB15. seek evidence for problem resolution
	Analytical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB16. undertake and express new ideas and initiatives to others SB17. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB18. participate in improvement procedures including process, quality and internal/external customer/supplier relationships SB19. enhance one's competencies in new and different situations and contexts to achieve more
	Critical Thinking
	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SB20. distinguish fact from opinion SB21. evaluate reliability of information sourced from suppliers and vendors SB22. balance priorities with constraints in order to propose viable recommendations

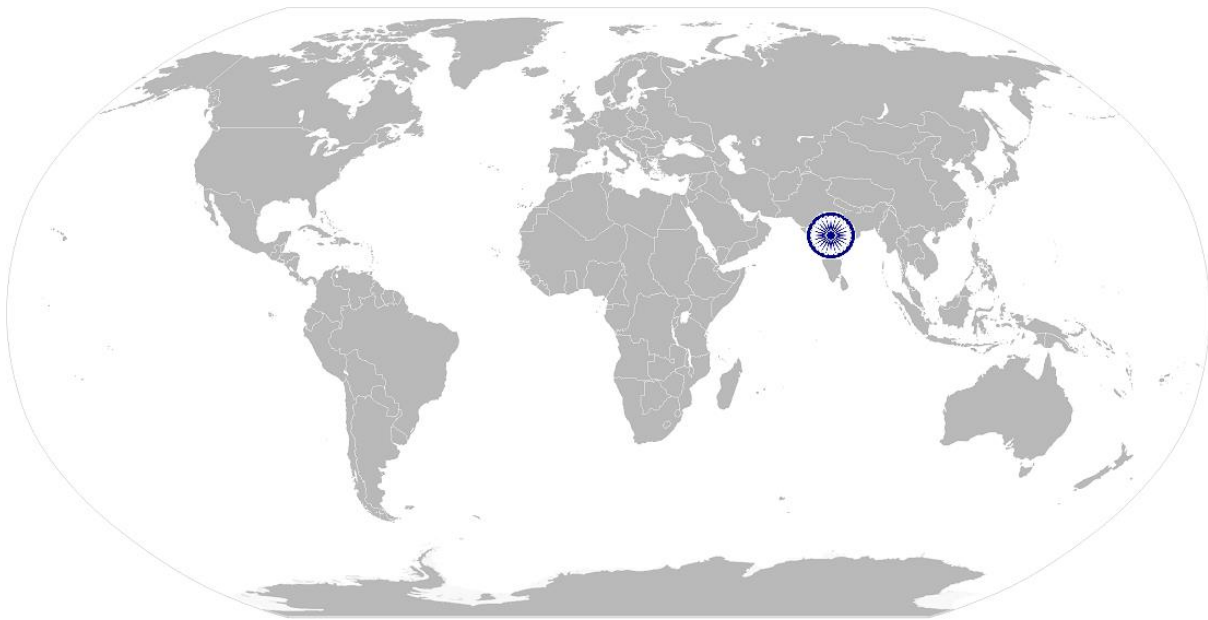
CSC/N0313 Perform finishing and installation of fabricated stainless steel structures

NOS Version Control

NOS Code	CSC/N0313		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	22/04/2019
Industry Sub-sector	1. Process Plant Machinery 2. Light Engineering Goods	Last reviewed on	15/10/2019
Occupation	Fabrication, Fitting and Assembly	Next review date	17/10/2022



National Occupational Standard



Overview

This unit covers health, safety and security at the workplace. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment.

CSC/N1335

Use basic health and safety practices at the workplace

National Occupational Standard

Unit Code	CSC/N1335
Unit Title (Task)	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.
Scope	<p>This unit/ task covers the following:</p> <ul style="list-style-type: none"> • Health and safety • Fire safety • Emergencies, rescue and first-aid procedure
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Health and safety	<p>To be competent, the user/individual on the job must be able to:</p> <p>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</p> <p>PC2. state the name and location of people responsible for health and safety in the workplace</p> <p>PC3. state the names and location of documents that refer to health and safety in the workplace</p> <p>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)</p> <p>PC5. carry out safe working practices while dealing with hazards to ensure the</p>

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Use basic health and safety practices at the workplace

	<p>safety of self and others</p> <p>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.</p> <p>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</p> <p>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 (e.g. fire exits, exhaust fans)</p> <p>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.</p> <p>PC9. work safely in and around trenches, elevated places and confined areas</p> <p>PC10. lift heavy objects safely using correct procedures</p> <p>PC11. apply good housekeeping practices at all times Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces</p> <p>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.</p> <p>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 (e.g. government notices)</p>
Fire safety	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC14. use the various appropriate fire extinguishers on different types of fires</p>

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Use basic health and safety practices at the workplace

	<p>correctly</p> <p>Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents)</p> <p>PC15. demonstrate rescue techniques applied during fire hazard</p> <p>PC16. demonstrate good housekeeping in order to prevent fire hazards</p> <p>PC17. demonstrate the correct use of a fire extinguisher</p>
Emergencies, rescue and first-aid procedures	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC18. demonstrate how to free a person from electrocution</p> <p>PC19. administer appropriate first aid to victims where required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc.</p> <p>PC20. demonstrate basic techniques of bandaging</p> <p>PC21. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments</p> <p>PC22. perform and organize loss minimization or rescue activity during an accident in real or simulated environments</p> <p>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</p> <p>PC24. demonstrate the artificial respiration and the CPR Process</p> <p>PC25. participate in emergency procedures</p> <p>Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work</p> <p>PC26. complete a written accident/incident report or dictate a report to another person, and send report to person responsible</p> <p>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</p> <p>PC27. demonstrate correct method to move injured people and others during an emergency</p>
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company /	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace</p> <p>KA2. names and location of documents that refer to health and safety in the</p>

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Use basic health and safety practices at the workplace

organization and its processes)	workplace
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. meaning of “hazards” and “risks”</p> <p>KB2. health and safety hazards commonly present in the work environment and related precautions</p> <p>KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible</p> <p>KB4. 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)</p> <p>KB5. 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</p> <p>KB6. safe working practices when working with tools and machines</p> <p>KB7. safe working practices while working at various hazardous sites</p> <p>KB8. where to find all the general health and safety equipment in the workplace</p> <p>KB9. various dangers associated with the use of electrical equipment</p> <p>KB10. 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</p> <p>KB11. importance of using protective clothing/equipment while working</p> <p>KB12. precautionary activities to prevent the fire accident</p> <p>KB13. various causes of fire Causes of fires: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc.</p> <p>KB14. techniques of using the different fire extinguishers</p> <p>KB15. different methods of extinguishing fire</p> <p>KB16. different materials used for extinguishing fire Materials: sand, water, foam, CO₂, dry powder</p> <p>KB17. rescue techniques applied during a fire hazard</p> <p>KB18. various types of safety signs and what they mean</p> <p>KB19. appropriate basic first aid treatment relevant to the condition eg. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation,</p>

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Use basic health and safety practices at the workplace

	<p>poisoning, eye injuries</p> <p>KB20. content of written accident report</p> <p>KB21. potential injuries and ill health associated with incorrect manual handling</p> <p>KB22. safe lifting and carrying practices</p> <p>KB23. personal safety, health and dignity issues relating to the movement of a person by others</p> <p>KB24. potential impact to a person who is moved incorrectly</p>
Skills (S)	
A. Core Skills / Generic Skill	Writing Skills
	The user/individual on the job needs to know and understand how to:
	SA1. write an accident/incident report in local language or English
	Reading Skills
	The user/ individual on the job needs to know and understand how to:
	SA2. read and comprehend basic content to read labels, charts, signages SA3. read and comprehend basic English to read manuals of operations SA4. read an accident/incident report in local language or English
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to:
	SA5. question coworkers appropriately in order to clarify instructions and other issues
	SA6. give clear instructions to coworkers, subordinates others
	Decision Making
	The user/individual on the job needs to know and understand how to:
B. Professional Skills	SB1. 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
	Plan and Organize
	The user/individual on the job needs to know and understand how to:
	SB2. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity
	Customer Centricity
	The user/individual on the job needs to know and understand how to:
B. Professional Skills	SB3. remain congenial while discussing and debating issues with co-workers
	SB4. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice
	SB5. ask for, provide and receive required assistance where possible to ensure achievement of work-related objectives
	SB6. thank coworkers for any assistance received
	SB7. offer appropriate respect based on mutuality and respect for fellow workmanship and authority

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Use basic health and safety practices at the workplace

	Problem Solving
	The user/individual on the job needs to know and understand how to:
	SB8. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)
	SB9. identify immediate or temporary solutions to resolve delays
	SB10. identify sources of support that can be availed of for problem solving for various kind of problems
	SB11. seek appropriate assistance from other sources to resolve problems
	SB12. report problems that you cannot resolve to appropriate authority
	Analytical Thinking
	The user/individual on the job needs to know and understand how to:
	SB13. identify cause and effect relations in their area of work
	SB14. use cause and effect relations to anticipate potential problems and their solution



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Use basic health and safety practices at the workplace

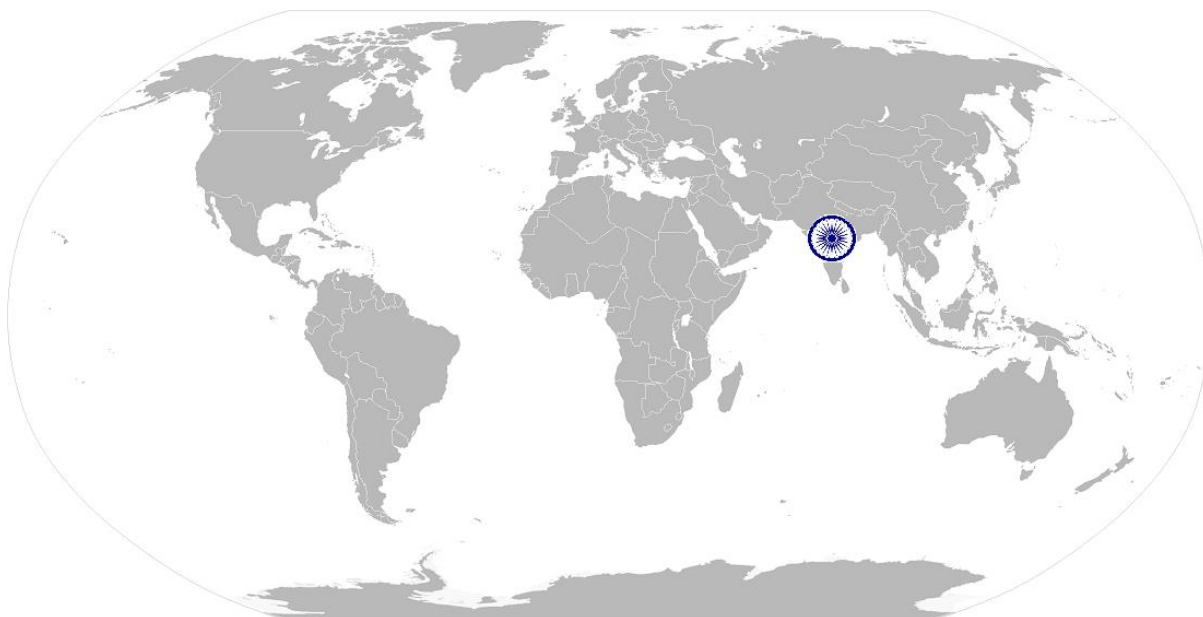
NOS Version Control

NOS Code	CSC/N1335		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	1. Machine Tools 2. Process Plant Machinery 3. Dies, Moulds and Press Tools 4. Electrical and Power Machinery 5. Plastic Manufacturing Machinery 6. Light Engineering Goods 7. Textile Manufacturing Machinery	Last reviewed on	24/11/2017
Occupation	Fabrication, Fitting and Assembly	Next review date	24/11/2021

CSC/N1336

Work effectively with others

National Occupational Standard



Overview

This unit covers basic practices that improve effectiveness of working with others in an organizational set-up.

CSC/N1336

Work effectively with others

National Occupational Standard	Unit Code	CSC/N1336
	Unit Title (Task)	Work effectively with others
	Description	This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace. These cover areas such as communication etiquette, discipline, listening etc.
	Scope	This unit/task covers the following: <ul style="list-style-type: none"> Work effectively with others
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Work effectively with others	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. receive information accurately and instructions from the supervisor and fellow workers, getting clarification where required</p> <p>PC2. pass information accurately to authorized persons who require it and within agreed timescale and confirm its receipt</p> <p>PC3. give information to others clearly, at a pace and in a manner that helps them to understand</p> <p>PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible</p> <p>PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks</p> <p>PC6. display appropriate communication etiquette while working Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc.</p> <p>PC7. display active listening skills while interacting with others at work</p> <p>PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism</p> <p>PC9. demonstrate responsible and disciplined behaviors at the workplace Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc.</p> <p>PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict</p>
Knowledge and Understanding (K)		
A. Organizational Context (Knowledge of the		<p>The user/individual on the job needs to know and understand:</p> <p>KA1. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions</p>

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Work effectively with others	
company / organization and its processes)	<p>KA2. reporting structure, inter-dependent functions, lines and procedures in the work area</p> <p>KA3. relevant people and their responsibilities within the work area</p> <p>KA4. escalation matrix and procedures for reporting work and employment related issues</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. various categories of people that one is required to communicate and co-ordinate within the organization</p> <p>KB2. importance of effective communication in the workplace</p> <p>KB3. importance of teamwork in organizational and individual success</p> <p>KB4. various components of effective communication</p> <p>KB5. key elements of active listening</p> <p>KB6. value and importance of active listening and assertive communication</p> <p>KB7. barriers to effective communication</p> <p>KB8. importance of tone and pitch in effective communication</p> <p>KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles</p> <p>KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer</p> <p>KB11. importance of ethics for professional success</p> <p>KB12. importance of discipline for professional success</p> <p>KB13. what constitutes disciplined behavior for a working professional</p> <p>KB14. common reasons for interpersonal conflict</p> <p>KB15. importance of developing effective working relationships for professional success</p> <p>KB16. expressing and addressing grievances appropriately and effectively</p> <p>KB17. importance and ways of managing interpersonal conflict effectively</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA1. write clear and legible notes to self, colleagues and seniors to pass messages, keep records, prepare to-do lists, take down instructions</p> <p>SA2. write basic numbers, quantities and work related terminology for operational requirements in the local language</p>
	Reading Skills
	<p>The user/ individual on the job needs to know and understand how to:</p> <p>SA3. read basic terms and terminologies to accurately interpret work related documents, labels, supervisor instructions in the local language</p> <p>SA4. read and interpret accurate information from various relevant work</p>

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Work effectively with others

	instructions and records
	Oral Communication (Listening and Speaking skills)
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SA5. interact with the supervisor appropriately (correct protocol and manner of speaking) in order to understand the basic requirements of the product, production plans and other associated requirements</p> <p>SA6. give clear instructions to co-workers about the type of output required and answer queries</p> <p>SA7. display active listening skills while interacting with co-workers and other in the workplace</p>
B. Professional Skills	Plan and Organize
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. use appropriate planning to maintain a smooth relationship with fellow team members</p> <p>SB2. take steps within one's limits of authority to initiate modification in plan if the circumstances require it</p>
	Customer Centricity
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB3. check that work meets customer requirements</p> <p>SB4. deliver consistent and reliable service to internal and external customers</p>
	Problem Solving
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB5. work with co-workers and supervisor to resolve any issues that threaten disruption, increase risk, cause delays or under-achievement of quality and targets as per the planned schedule</p>

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Work effectively with others

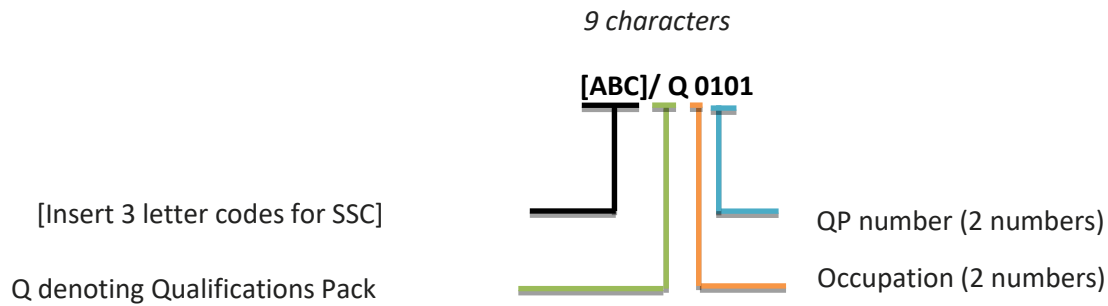
NOS Version Control

NOS Code	CSC/N1336		
Credits	TBD	Version number	1.0
Industry	Capital Goods	Drafted on	14/04/2014
Industry Sub-sector	<ol style="list-style-type: none"> 1. Machine Tools 2. Process Plant Machinery 3. Dies, Moulds and Press Tools 4. Electrical and Power Machinery 5. Plastic Manufacturing Machinery 6. Light Engineering Goods 7. Textile Manufacturing Machinery 	Last reviewed on	24/11/2017
Occupation	Fabrication, Fitting and Assembly	Next review date	24/11/2021

Annexure

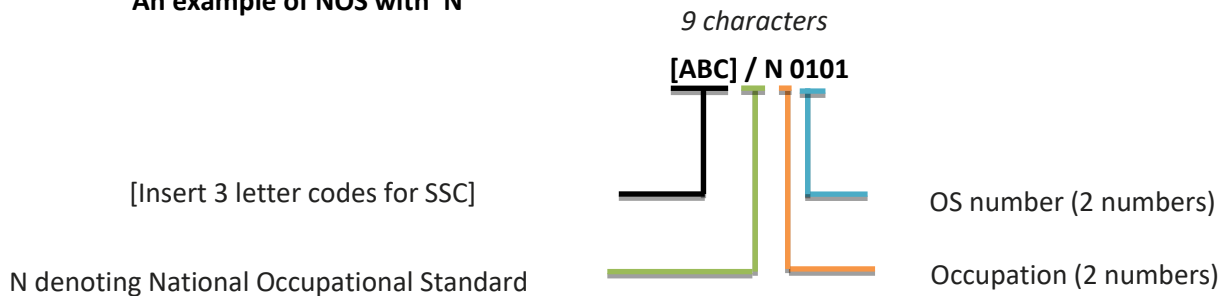
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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The following acronyms/ codes have been used in the nomenclature above:

Sub-sector	Range of Occupation numbers
Machine Tools	01-13
Dies, Moulds and Press Tools	01-13
Plastic Manufacturing Machinery	01-13
Textile Manufacturing Machinery	01-13
Process Plant Machinery	01-13
Electrical and Power Machinery	01-13
Light Engineering Goods	01-13

Sequence	Description	Example
Three letters	Industry Name	CSC
Slash	/	/
Next letter	Whether QP or NOS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

Criteria for Assessment of Trainees

Job Role: Stainless Steel Fabricator

Qualification Pack: CSC/Q0307

Sector Skill Council: Capital Goods Skill Council

Guidelines for Assessment:

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. 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.

Compulsory NOS				Marks Allocation	
Total Marks: 900				Theory	Skills Practical
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of		
CSC/N0310 Plan and prepare for stainless steel fabrication	PC1. obtain and customize the designs/sketches/drawings/purchase order, to ensure compliance to local conditions, customer and site requirements	100	10	3	7
	PC2. identify project requirements by accurately interpreting the CAD drawings and drawing conclusions from sketches		11	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		11	3	8
	PC4. identify the type and grade of stainless steel to be used in the fabrication process		10	3	7
	PC5. perform measurements at the worksite using correct tools and materials for stainless steel fabrication		11	3	8
	PC6. determine the process flow and sequence of operations to be performed for fabrication		12	4	8

	PC7. plan the tasks, and allocate work to be performed as per the project timelines and requirements		11	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		12	4	8
	PC9. design a single-angle truss and use T-sections as per application and site requirements		12	4	8
		Total	100	30	70
CSC/N0311 Perform cutting and forming tasks for stainless steel fabrication	PC1. identify the type of cutting method/s to be used for the stainless steel workpiece and the related application/s	100	5	1	4
	PC2. mark the cutting line/s as per measurement and estimates using prescribed material		6	2	4
	PC3. clamp or secure the sheet to ensure perfect cut as per required setup and machinery		6	2	4
	PC4. cut bulk materials into appropriate work pieces using right machinery and standard industry tools		7	2	5
	PC5. obtain First Part Approval (FPA) from the supervisor for the first part cut as per standard operating procedure		5	1	4
	PC6. perform drilling using stainless steel specified drill bits at right angles, applying adequate pressure and maintaining a steady speed		6	2	4
	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		6	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		6	2	4
	PC9. perform abrasive cutting using appropriate discs for cut-off operations on small section sizes, thin plate material and applications involving straight-line cutting		7	2	5
	PC10. use a hydraulic bending machine for bending of stainless steel sheets/pipes by applying adequate pressure and as per application requirements		7	2	5
	PC11. use manual bending technique by applying adequate pressure to form the required shape and nature of application		7	2	5
	PC12. apply pressing/stamping technique using appropriate tool and die punches to provide the required shape		7	2	5
	PC13. cut the workpiece into appropriate blanks		6	2	4
	PC14. cut stainless steel workpiece using plasma cutting and laser cutting techniques in coordination with concerned personnel		7	2	5
	PC15. remove the chips and bursts completely after cutting operations to avoid gaps between joints		6	2	4

	PC16. use an appropriate industry accepted lubricant for blanking, piercing and punching and rotating parts of machinery used in stainless steel fabrication		6	2	4
		Total	100	30	70
CSC/N0312 Perform pre-welding operations for stainless steel fabrication	PC1. 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	100	8	2	6
	PC2. select a weld procedure/technique that allows minimum penetration of weld metal into carbon steel and adequate fusion		8	2	6
	PC3. bevel and provide slopes at the edge of stainless steel plate as per task requirements		10	3	7
	PC4. clean the weld surface thoroughly to avoid contamination that could result in hot cracking		10	3	7
	PC5. clamp or secure the stainless steel plate/sheet tightly to ensure accurate welding as per task requirements		9	3	6
	PC6. set the amperage machine at the required temperature as per type of welding and scope of application		8	2	6
	PC7. perform tacking to ensure proper jointing of the structures to be fabricated		10	3	7
	PC8. ensure correct dilution levels and composition of filler metal with base material		9	3	6
	PC9. apply appropriate backing technique for stainless steel to avoid crevices, voids and oxidation using copper, aluminium, argon (in GTAW) and/or nitrogen		10	3	7
	PC10. maintain the carbon steel dilution of the stainless steel weld metal to a minimum		9	3	6
	PC11. wear appropriate personal protective equipment (PPE) while working for stainless steel fabrication		9	3	6
		Total	100	30	70
CSC/N0208 Manually weld carbon steel/ low alloy steel and austenitic stainless steel using Metal Arc Welding / Shielded Metal Arc Welding	PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	100	3	1	2
	PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations		4	1	3
	PC3. check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder		2	0	2
	PC4. deal with any faults or differential as per laid procedures		2	0	2
	PC5. follow fume extraction safety procedures		3	1	2
	PC6. read and interpret routine information on written job instructions, welding procedure specifications (WPS) and standard operating procedures		3	1	2

PC7.select welding machines (e.g. transformers, rectifiers, inverters and generators, etc.) according to the task	2	0	2
PC8.select type and size of electrodes according to classification and specifications	3	1	2
PC9.re-dry electrodes as per electrode classification requirement	3	1	2
PC10.prepare the work area for the welding activities	2	0	2
PC11.perform measurements for joint preparation and routine MMAW	3	0	3
PC12.prepare the various forms of materials and the joint in readiness for welding	2	0	2
PC13.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding	3	0	3
PC14.use manual metal-arc welding and related equipment to include a. alternating current (AC) equipment b. direct current (DC) equipment	3	0	3
PC15.connect equipment to power source	2	0	2
PC16.connect cables, electrode holders, return leads and ground clamps to appropriate terminal	3	1	2
PC17.set, read and adjust amperage controls	3	1	2
PC18.verify setup by running test and appropriately handle weld specimen/scrap plate	3	0	3
PC19.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding	2	0	2
PC20.strike and maintain a stable arc	2	0	2
PC21.stop and properly re-start arc to avoid welding defects (scratch start, tapping techniques)	3	1	2
PC22.manipulate electrode angle using various methods as per WPS	2	0	2
PC23.maintain constant puddle by using appropriate travel speed	2	0	2
PC24.remove slag in an appropriate manner (eg. wire brush, hammer, etc.)	3	1	2
PC25.weld the joint to the specified quality, dimensions and profile applicable to range of material	4	1	3
PC26.produce range of welded joints to within the mentioned standard using single or multi-run welds (as appropriate)	4	1	3
PC27.produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817	3	0	3
PC28.produce range of welded joints in various positions as per the WPS specified	2	0	2
PC29.shut down and make safe the welding equipment on completion of the welding activities	4	1	3

	PC30.identify various weld defects, use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification		4	1	3
	PC31.check that the welded joint conforms to the specification, by checking various		2	0	2
	PC32.detect surface imperfections and deal with them appropriately		3	1	2
	PC33.carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)		3	1	2
	PC34.assist in preparation for non-destructive testing of the welds, for a range of tests		2	0	2
	PC35.prepare for destructive tests on weld specimens for fillet, butt and corner		3	0	3
	PC36.deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		3	1	2
		Total	100	17	83
CSC/N0212 Perform basic Tungsten Inert Gas (TIG) Welding also known as Gas Tungsten Arc Welding (GTAW)	PC1.work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	100	3	1	2
	PC2.take necessary safety precautions for TIG welding operations		2	0	2
	PC3.interpret weld procedure data sheets specifications		3	1	2
	PC4.check that all measuring equipment is within calibration date		2	0	2
	PC5.check if welding machines e.g. transformer, inverters (AC/DC), rectifiers and generators have been made available by the authorized person		2	1	1
	PC6.check if welding torch, tungsten electrode and filler wire have been made available by the authorized person		2	1	1
	PC7.prepare for the TIG welding process		2	1	1
	PC8.prepare the materials and joint in readiness for welding		2	0	2
	PC9.fit the welding shielding gases given by the authorised person, for a range of given applications		2	0	2
	PC10.plan the welding activities before they start them effectively and efficiently for achieving specifications as per WPS		2	0	2
	PC11.connect torches and the components		2	0	2
	PC12.connect and adjust regulators and flow meters to cylinders		3	1	2
	PC13.read, set and adjust current (amperage) as required		3	1	2
	PC14.set pre-purge with shielding gas as required		2	1	1
	PC15.prepare tungsten by sharpening or balling it to desired tip shape		3	1	2

	PC16.set and verify gas flow rates		2	1	1
	PC17.prepare and support the joint, using the appropriate methods		3	1	2
	PC18.tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		2	0	2
	PC19.match feed and travel speed as required		2	0	2
	PC20.perform TIG welding operations using appropriate welding techniques to meet welding procedure specification requirements		5	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)		4	2	2
	PC22.use correct angle of torch and filler wire		4	1	3
	PC23.weld the joint to the specified quality, dimensions and profile		4	1	3
	PC24.use manual welding and related equipment, to carry out TIG welding processes		4	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		4	1	3
	PC26.use both methods to produce the various joints a) with filler wire b) without filler wire (autogenously)		4	2	2
	PC27.produce joints from various materials in different forms		2	0	2
	PC28.weld joints in good access situations, in select positions		3	1	2
	PC29.make sure that the work area is maintained and left in a safe and tidy condition		2	0	2
	PC30.use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification		4	2	2
	PC31.check that the welded joint conforms to the specification, by checking various quality parameters using visual inspection		3	1	2
	PC32.identify various weld defects		3	1	2
	PC33.detect surface imperfections and deal with them appropriately		2	1	1
	PC34.report any defect or imperfection identified to the authorised person		2	0	2
	PC35.shut down and make safe the welding equipment on completion of the welding activities		2	0	2
	PC36.detect equipment malfunctions and deal with them appropriately		2	0	2
	PC37. deal promptly and effectively with problems within their control, and seek		2	0	2
		Total	100	26	74

CSC/N0214 Manually weld stainless steel using Metal Inert Gas (MIG) welding technique	PC1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines	100	2	1	1
	PC2. adhere to procedures or systems in place for health and safety, personal protective equipment (PPE) and other relevant safety regulations for MIG welding operations		2	1	1
	PC3. check the condition of welding leads, gas connection arrangements, earthing arrangements and electrode holder		2	1	1
	PC4. report any faults or potential hazards to appropriate authority		2	1	1
	PC5. interpret weld procedure data sheets specifications, PQR and WPS		3	1	2
	PC6. select welding machines such as inverters, rectifiers and generators, according to the task		2	1	1
	PC7. select electrodes according to classification and specifications		2	1	1
	PC8. prepare the materials and joint in readiness for welding of stainless steel		3	1	2
	PC9. check the condition of, and correctly connect, welding leads/cables, hoses, shielding gas supply and wire feed mechanisms		2	1	1
	PC10. prepare the welding equipment for a range of given applications		3	1	2
	PC11. select the welding shielding gases and equipment for a range of given applications		3	1	2
	PC12. plan the welding activities before they start effectively and efficiently for achieving specifications as per WPS		2	1	1
	PC13. clean wire feeder and torch tip		3	1	2
	PC14. connect torches and components		3	1	2
	PC15. connect and adjust regulators and flow meters to cylinders		3	1	2
	PC16. adjust wire feed rate and read and set current as required		3	1	2
	PC17. set other welding parameters (e.g. voltage, slope of current versus voltage curve where required)		3	1	2
	PC18. set pre-purge with shielding gas as required		3	1	2
	PC19. set and verify gas flow rates		3	1	2
	PC20. prepare and support the joint, using appropriate methods		3	1	2
	PC21. tack weld the joint at appropriate intervals, and check the joint for accuracy before final welding		3	1	2
	PC22. use manual welding and related equipment, to carry out MIG welding processes		3	1	2

	PC23. perform MIG welding operations using various welding techniques to meet welding procedure specification requirements		3	1	2
	PC24. adjust wire stick-out as per requirement		2	1	1
	PC25. use welding consumables appropriate to the material and application to DC current types		3	1	2
	PC26. produce joints of the required quality and of specified dimensional accuracy which achieve a weld quality equivalent to Level C of ISO 5817		3	1	2
	PC27. produce joints from stainless steel in different forms		3	1	2
	PC28. weld joints in good access situations, in select positions		2	1	1
	PC29. make sure that the work area is maintained and left in a safe and tidy condition		2	1	1
	PC30. identify various weld defects use appropriate methods and equipment to check the quality, and that all dimensional and geometrical aspects of the weld are to the specification		2	1	1
	PC31. check that the welded joint conforms to the specification, by checking various quality parameters by visual inspection		2	1	1
	PC32. detect surface imperfections and deal with them appropriately		3	1	2
	PC33. carry out DPT tests to assess fine defect open to the surface not detected by visual inspection (VT)		3	1	2
	PC34. prepare for conducting of non-destructive testing of the welds, for a range of tests		3	1	2
	PC35. prepare for destructive tests on weld specimens for fillet, butt and corner		3	1	2
	PC36. shut down and make safe the welding equipment on completion of the welding activities		2	1	1
	PC37. follow the established organisational process for dealing with the welded pieces including handover, storage, safety and security, record keeping, etc.		2	1	1
	PC38. detect equipment malfunctions and deal with them safely and as per organisation procedures		2	1	1
	PC39. deal promptly and effectively with problems within own control, and seek timely and appropriate help and guidance from relevant personnel where required		2	1	1
		Total	100	39	61
CSC/N0313 Perform finishing and installation of fabricated stainless	PC1. assemble the fabricated components as per design drawings and specifications	100	7	2	5
	PC2. inspect the welded joints in the fabricated structure to check for welding imperfections		7	2	5

steel structures	PC3. clean the weld area using mechanical, chemical and other standard cleaning methods as per standard operating procedure (SOP)		7	2	5
	PC4. use flapper wheel abrasives for deburring and finishing the fabricated structures		7	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		8	3	5
	PC6. test the weldments and their tensile strength using appropriate techniques		7	2	5
	PC7. perform buffing to smoothen the surface of the workpiece and ensure fine finishing as per the required application		7	2	5
	PC8. operate appropriate grinding and polishing equipment to achieve desired finishing on the structure		7	2	5
	PC9. dispatch the fabricated structure as per standard practice and/or organisational SOP		7	2	5
	PC10. check if the site ready for installation		7	2	5
	PC11. assemble and join the parts and/or structures to be installed at the worksite in co-ordination with installation team		7	2	5
	PC12. erect, align and level the stainless steel structure/s		7	2	5
	PC13. provide instructions and guidelines for the upkeep of the stainless steel structure/s to the user/customer		8	3	5
	PC14. secure and maintain the fabrication equipment and machinery		7	2	5
	Total		100	30	70
CSC/N1335 Use basic health and safety practices at the workplace	PC1. use protective clothing/equipment for specific tasks and work conditions	100	5	2	3
	PC2. state the name and location of people responsible for health and safety in the workplace		3	1	2
	PC3. state the names and location of documents that refer to health and safety in the workplace		3	1	2
	PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace		5	2	3
	PC5. carry out safe working practices while dealing with hazards to ensure the safety of self and others		4	2	2
	PC6. state methods of accident prevention in the work environment of the job role		3	2	1
	PC7. state location of general health and safety equipment in the workplace		5	2	3
	PC8. inspect for faults, set up and safely use steps and ladders in general use		5	2	3
	PC9. work safely in and around trenches, elevated places and confined areas		5	2	3
	PC10. lift heavy objects safely using correct procedures		4	2	2
	PC11. apply good housekeeping practices at all times		5	2	3

	PC12.identify common hazard signs displayed in various areas		3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace		4	1	3
	PC14.use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC15.demonstrate rescue techniques applied during fire hazard		3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards		4	1	3
	PC17.demonstrate the correct use of a fire extinguisher		4	1	3
	PC18.demonstrate how to free a person from electrocution		4	1	3
	PC19.administer appropriate first aid to victims wherever required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	1	2
	PC20.demonstrate basic techniques of bandaging		4	1	3
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC23.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC24.demonstrate the artificial respiration and the CPR Process		3	2	1
	PC25.participate in emergency procedures		2	1	1
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		3	1	2
		Total	100	37	63
CSC/N1336 Work effectively with others	PC1.accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7
	PC2.accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behaviour by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7

	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviour at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
		Total	100	30	70