Qualification Pack



Construction Fabricator

Metal working

QP Code: ICE/CON/Q0501 Instantiated QP Code: ICE/CON/Q0501-SI003

Version: 1.0

NSQF Level: 4

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Qualification Pack

ICE/CON/Q0501-SI003: Construction Fabricator

Brief Job Description

A Construction Fabricator assembles, shapes, and installs materials like metal, wood, masonry, and concrete to create structural elements for buildings and infrastructure. The individual interprets construction drawings, identifies materials, and follows the applicable safety and quality standards. The specializations available in the job include masonry, woodworking, metalworking, and concreting.

Personal Attributes

The individual should be physically fit and mentally alert. The person should have problem-solving, coordination and appropriate verbal and written communication skills.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ICE/CON/N0501: Identify Construction Building Materials and Components
2. ICE/CON/N0502: Follow Environment, Health and Safety (EHS) Guidelines at Construction Sites
3. DGT/VSQ/N0102: Employability Skills (60 Hours)

Electives*(mandatory to select at least one):*

Elective : Metal working

1. ICE/CON/N0513: Plan and Execute Metal Fabrication
2. ICE/CON/N0514: Cut, Bend and Assemble Reinforcement Bars
3. ICE/CON/N0515: Install and Weld Metal Structural Components
4. ICE/CON/N0516: Apply Surface Coatings and Treatments
5. ICE/CON/N0517: Install Energy-Efficient Metal Cladding Systems

Qualification Pack (QP) Parameters

Sector	Construction

Qualification Pack

Sub-Sector	Infrastructure Construction
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
Country	India
NSQF Level	4
Credits	13
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7122.0601, NCO-2015/7112.0200, NCO-2015/7115.0201, NCO-2015/7213.0200, NCO-2015/7114.9900
Minimum Educational Qualification & Experience	12th grade Pass OR 10th grade pass with 2 Years of experience Relevant Industry OR 8th grade pass with 4 Years of experience Relevant Industry
Minimum Level of Education for Training in School	10th Class
Pre-Requisite License or Training	Not Applicable
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	07/10/2028
NSQC Approval Date	07/10/2025
Version	1.0
Reference code on NQR	NCVET-QG-04-CO-046442025-V1-ICES
NQR Version	1.0

Remarks:

The Min. Job Entry Age for this Job Role will be as per Government Norms

Qualification Pack

ICE/CON/N0501: Identify Construction Building Materials and Components

Description

This unit covers identifying, selecting and inspecting various building materials and components required for fabrication tasks. This includes understanding material specifications, properties, and applications to ensure proper use in construction projects.

Scope

The scope covers the following :

- Identify building materials
- Inspect and verify the quality of materials
- Organize and prepare materials

Elements and Performance Criteria

Identify building materials

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

PC1. identify different types of metals, such as steel, aluminium and alloys, used in construction

PC2. explain distinguish between non-metallic materials like concrete, glass, wood and plastics based on their properties and uses

PC3. interpret technical specifications of materials from product catalogues, datasheets and drawings

PC4. identify common building components such as beams, columns, trusses and panels based on drawings and specifications

Inspect and verify the quality materials

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

PC5. check the dimensions, weight and appearance of materials against specifications

PC6. assess the physical condition of materials for defects such as cracks, rust or warping

PC7. confirm material certifications and test reports to ensure compliance with the applicable quality standards

PC8. report any discrepancies or substandard materials to the supervisor

Organize and prepare materials

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

PC9. sort and label materials as per their type, size and intended use

PC10. store materials safely to prevent damage or contamination

PC11. check for the availability of appropriate tools and equipment for material handling during fabrication

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. standard procedures for material identification and handling
KU2. roles involved in ensuring material quality and compliance
KU3. common construction material defects and reporting lines for escalating material-related issues
KU4. types and classifications of construction materials (e.g., ferrous and non-ferrous metals, composites, polymers)
KU5. properties of materials such as strength, durability, and resistance to environmental conditions
KU6. use of material handling equipment, e.g.forklifts, pallet jacks, and trolleys
KU7. relevant material storage techniques
KU8. quality standards and certifications for construction materials (e.g., BIS, ASTM)
KU9. interpret specifications and drawings to identify material requirements
KU10. verify material quality through physical inspection and documentation review
KU11. benefits of sorting and storing materials systematically, e.g. accessibility and safety
KU12. use of measuring tools such as rulers, micrometers, calipers and weighing scales
KU13. material datasheets, product catalogues and technical specifications
KU14. use of relevant Personal Protective Equipment (PPE) for safe construction material handling

Generic Skills (GS)

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

GS1. comprehend technical documents, instructions and specifications accurately
GS2. use basic math skills for measurements, calculations,and verification tasks
GS3. convey information, report issues and coordinate with team members and supervisors with clarity
GS4. identify challenges and inconsistencies in tasks and resolve them effectively or escalate as needed
GS5. plan and prioritize work to ensure efficient task completion
GS6. collaborate effectively with others to meet project requirements and deadlines
GS7. adjust to changing priorities, updates or unexpected challenges in the work environment
GS8. follow safety protocols and guidelines consistently to maintain a secure workplace
GS9. acquire new skills and knowledge to improve work efficiency and adaptability

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Identify building materials	**10**	**20**	**-**	**4**
PC1. identify different types of metals, such as steel, aluminium and alloys, used in construction	-	-	-	-
PC2. explain distinguish between non-metallic materials like concrete, glass, wood and plastics based on their properties and uses	-	-	-	-
PC3. interpret technical specifications of materials from product catalogues, datasheets and drawings	-	-	-	-
PC4. identify common building components such as beams, columns, trusses and panels based on drawings and specifications	-	-	-	-
Inspect and verify the quality materials	**10**	**20**	**-**	**4**
PC5. check the dimensions, weight and appearance of materials against specifications	-	-	-	-
PC6. assess the physical condition of materials for defects such as cracks, rust or warping	-	-	-	-
PC7. confirm material certifications and test reports to ensure compliance with the applicable quality standards	-	-	-	-
PC8. report any discrepancies or substandard materials to the supervisor	-	-	-	-
Organize and prepare materials	**10**	**20**	**-**	**2**
PC9. sort and label materials as per their type, size and intended use	-	-	-	-
PC10. store materials safely to prevent damage or contamination	-	-	-	-
PC11. check for the availability of appropriate tools and equipment for material handling during fabrication	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0501
NOS Name	Identify Construction Building Materials and Components
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
NSQF Level	4
Credits	4
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

ICE/CON/N0502: Follow Environment, Health and Safety (EHS) Guidelines at Construction Sites

Description

This unit focuses on implementing Environment, Health and Safety (EHS) guidelines to minimize risks and ensure compliance with legal and organizational standards.

Scope

The scope covers the following :

- Identify hazards and risks
- Comply with safety standards
- Follow health and hygiene guidelines
- Follow environmental protection measures
- Handle emergencies

Elements and Performance Criteria

Identify hazards and risks

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

PC1. identify common construction site hazards, including falling objects, slippery surfaces and electrical risks

PC2. evaluate the potential risks

PC3. report the identified hazards to the supervisor or safety officer

Comply with safety standards

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

PC4. use and maintain personal protective equipment (PPE) such as helmets, gloves, safety boots and harnesses

PC5. follow signage and barricading instructions to avoid restricted or hazardous areas

PC6. adhere to safe lifting techniques and tools to minimize strain and injuries

Follow health and hygiene guidelines

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

PC7. maintain personal hygiene by using clean drinking water and designated rest areas

PC8. report health symptoms (e.g., respiratory issues, heatstroke) promptly to the designated authority

PC9. ensure proper handling and disposal of materials that may pose health risks such as asbestos or chemicals

Follow environmental protection measures

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

PC10. follow appropriate measures to prevent the spillage of construction materials and chemicals that may harm the environment

PC11. carry out waste segregation activities into biodegradable and non-biodegradable for recycling and disposal

PC12. follow protocols for conserving water and energy at the construction site

Handle emergencies

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

PC13. identify emergency alarms and evacuation routes

PC14. use firefighting equipment (fire extinguishers, sand buckets) proper, when necessary

PC15. assist in first-aid or CPR procedures, if required

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. importance of EHS guidelines and company policies

KU2. reporting structure for safety incidents or concerns

KU3. roles of key personnel such as the safety officer and site engineer

KU4. types of construction hazards (e.g. chemical, physical, ergonomic)

KU5. correct use and maintenance of PPE

KU6. first aid and basic firefighting techniques

KU7. environmental regulations related to construction, e.g. dust control, waste disposal etc.

KU8. safe operation of construction tools and equipment

Generic Skills (GS)

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

GS1. effectively report hazards or safety violations

GS2. read safety signage and instructions

GS3. carry out appropriate documentation concerning workplace safety

GS4. apply basic problem-solving skills to manage minor risks or incidents

GS5. collaborate with the team during emergencies or environmental protection activities

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Identify hazards and risks	**6**	**12**	**-**	**2**
PC1. identify common construction site hazards, including falling objects, slippery surfaces and electrical risks	-	-	-	-
PC2. evaluate the potential risks	-	-	-	-
PC3. report the identified hazards to the supervisor or safety officer	-	-	-	-
Comply with safety standards	**6**	**12**	**-**	**2**
PC4. use and maintain personal protective equipment (PPE) such as helmets, gloves, safety boots and harnesses	-	-	-	-
PC5. follow signage and barricading instructions to avoid restricted or hazardous areas	-	-	-	-
PC6. adhere to safe lifting techniques and tools to minimize strain and injuries	-	-	-	-
Follow health and hygiene guidelines	**6**	**12**	**-**	**2**
PC7. maintain personal hygiene by using clean drinking water and designated rest areas	-	-	-	-
PC8. report health symptoms (e.g., respiratory issues, heatstroke) promptly to the designated authority	-	-	-	-
PC9. ensure proper handling and disposal of materials that may pose health risks such as asbestos or chemicals	-	-	-	-
Follow environmental protection measures	**6**	**12**	**-**	**2**
PC10. follow appropriate measures to prevent the spillage of construction materials and chemicals that may harm the environment	-	-	-	-
PC11. carry out waste segregation activities into biodegradable and non-biodegradable for recycling and disposal	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. follow protocols for conserving water and energy at the construction site	-	-	-	-
Handle emergencies	**6**	**12**	**-**	**2**
PC13. identify emergency alarms and evacuation routes	-	-	-	-
PC14. use firefighting equipment (fire extinguishers, sand buckets) proper, when necessary	-	-	-	-
PC15. assist in first-aid or CPR procedures, if required	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0502
NOS Name	Follow Environment, Health and Safety (EHS) Guidelines at Construction Sites
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication, MEP Supervison - Maintenance
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

Qualification Pack

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

Description

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

Scope

The scope covers the following :

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

Elements and Performance Criteria

Introduction to Employability Skills

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

PC1. identify employability skills required for jobs in various industries

PC2. identify and explore learning and employability portals

Constitutional values – Citizenship

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

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

PC4. follow environmentally sustainable practices

Becoming a Professional in the 21st Century

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

PC5. recognize the significance of 21st Century Skills for employment

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

Basic English Skills

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

PC7. use basic English for everyday conversation in different contexts, in person and over the telephone

PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English

PC9. write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

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

PC10. understand the difference between job and career

PC11. prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

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

PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings

PC13. work collaboratively with others in a team

Diversity & Inclusion

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

PC14. communicate and behave appropriately with all genders and PwD

PC15. escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

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

PC16. select financial institutions, products and services as per requirement

PC17. carry out offline and online financial transactions, safely and securely

PC18. identify common components of salary and compute income, expenses, taxes, investments etc

PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

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

PC20. operate digital devices and carry out basic internet operations securely and safely

PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively

PC22. use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

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

PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion

PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

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

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

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

PC29. create a professional Curriculum vitae (Résumé)

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

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

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

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

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

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

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

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

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

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

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

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

KU11. how to compute income and expenditure

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

KU13. different legal rights and laws

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

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

KU16. how to identify business opportunities

KU17. types and needs of customers

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

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

Generic Skills (GS)

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

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

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

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

Assessment Criteria

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

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

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

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	22/09/2026
Next Review Date	22/09/2031
NSQC Clearance Date	22/09/2026

ICE/CON/N0513: Plan and Execute Metal Fabrication

Description

This unit focuses on planning and executing metal fabrication processes. It covers fundamental metalworking techniques, material selection, and fabrication methods from basic manual operations to advanced automated systems.

Scope

The scope covers the following :

- Read and interpret fabrication drawings
- Prepare metal components for fabrication

Elements and Performance Criteria

Read and Interpret Fabrication Drawings

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

PC1. read and interpret technical drawings, blueprints and material specifications.

PC2. identify dimensions, tolerances and material requirements for metal fabrication.

PC3. prepare fabrication plans based on project requirements and structural integrity.

Prepare Metal Components for Fabrication

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

PC4. select appropriate metal types based on strength, corrosion resistance and application.

PC5. measure, mark and cut metal sheets, rods and beams according to specifications.

PC6. apply shaping techniques such as bending, rolling and pressing for component preparation.

Use CAD and CAM Software for Precision Fabrication

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

PC7. design metal components and assemblies using CAD software.

PC8. generate CNC machining programs using CAM software for automated cutting and shaping.

PC9. simulate and verify machining operations to ensure accuracy before production.

Apply Automation for Efficient Fabrication

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

PC10. operate CNC machines for precision metal cutting, drilling and shaping.

PC11. integrate robotic welding and automated assembly systems in fabrication.

PC12. monitor and adjust automated fabrication processes for consistency and efficiency.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. fundamental properties of metals: strength, ductility, malleability and corrosion resistance.

KU2. classification of metals: ferrous (steel, cast iron) and non-ferrous (aluminum, copper, brass).

KU3. methods of cutting and shaping metal: sawing, shearing, plasma cutting, laser cutting, bending and rolling.

KU4. welding techniques: MIG, TIG, Arc Welding and Spot Welding.

KU5. understand fabrication drawings, symbols and geometric dimensioning and tolerancing (GD&T).

KU6. use of CAD software (AutoCAD, SolidWorks, Fusion 360) for metal design and drafting.

KU7. application of CAM software for generating tool paths and CNC programming.

KU8. CNC Machining principles, including milling, turning, and laser cutting.

KU9. automation in metal fabrication: robotic welding, automated bending and precision assembly.

KU10. quality control methods in metal fabrication, including dimensional checks and tolerance inspections.

Generic Skills (GS)

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

GS1. communicate effectively with team members, supervisors, and stakeholders

GS2. communicate effectively with team members, supervisors, and stakeholders

GS3. communicate effectively with team members, supervisors, and stakeholders

GS4. communicate effectively with team members, supervisors, and stakeholders

GS5. plan tasks to optimize time and resources

GS6. organize tools, equipment and materials efficiently

GS7. operate modern tools and equipment with basic proficiency

GS8. adapt to new construction technologies and methods

GS9. follow health and safety guidelines to minimize workplace risks

GS10. identify and mitigate workplace hazards promptly

GS11. ensure compliance with environmental sustainability practices

GS12. assess work challenges and make informed decisions

GS13. evaluate feedback to implement process improvements

GS14. maintain a professional attitude and ethical behaviour

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Read and Interpret Fabrication Drawings	**6**	**12**	**-**	**2**
PC1. read and interpret technical drawings, blueprints and material specifications.	-	-	-	-
PC2. identify dimensions, tolerances and material requirements for metal fabrication.	-	-	-	-
PC3. prepare fabrication plans based on project requirements and structural integrity.	-	-	-	-
Prepare Metal Components for Fabrication	**6**	**12**	**-**	**2**
PC4. select appropriate metal types based on strength, corrosion resistance and application.	-	-	-	-
PC5. measure, mark and cut metal sheets, rods and beams according to specifications.	-	-	-	-
PC6. apply shaping techniques such as bending, rolling and pressing for component preparation.	-	-	-	-
Use CAD and CAM Software for Precision Fabrication	**10**	**20**	**-**	**3**
PC7. design metal components and assemblies using CAD software.	-	-	-	-
PC8. generate CNC machining programs using CAM software for automated cutting and shaping.	-	-	-	-
PC9. simulate and verify machining operations to ensure accuracy before production.	-	-	-	-
Apply Automation for Efficient Fabrication	**8**	**16**	**-**	**3**
PC10. operate CNC machines for precision metal cutting, drilling and shaping.	-	-	-	-
PC11. integrate robotic welding and automated assembly systems in fabrication.	-	-	-	-
PC12. monitor and adjust automated fabrication processes for consistency and efficiency.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0513
NOS Name	Plan and Execute Metal Fabrication
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

ICE/CON/N0514: Cut, Bend and Assemble Reinforcement Bars

Description

This unit covers the process of cutting, bending, and assembling reinforcement bars (rebars) for construction projects.

Scope

The scope covers the following :

- Cut reinforcement bars
- Bend reinforcement bars
- Assemble and tie reinforcement structures

Elements and Performance Criteria

Cut Reinforcement Bars

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

PC1. measure and mark rebar lengths according to structural drawings.

PC2. use manual tools like hacksaws, bolt cutters and rebar shears for small-scale cutting.

PC3. operate automated rebar cutting machines for precise and efficient processing.

Bend Reinforcement Bars

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

PC4. apply manual bending techniques using rebar bending levers and hydraulic benders.

PC5. set up and operate CNC-controlled bending machines for precision bends.

PC6. shape rebars to required angles and curves based on reinforcement detailing.

Assemble and Tie Reinforcement Structures

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

PC7. position rebars in the correct layout based on structural reinforcement plans.

PC8. use binding wire and mechanical couplers for secure connections.

PC9. install reinforcement mesh, cages and columns for concrete structures.

Advanced Shuttering and Alignment Techniques

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

PC10. assemble steel formwork using Mivan shuttering methods for faster construction.

PC11. apply laser alignment techniques to ensure accurate reinforcement placement.

PC12. inspect and adjust reinforcement structures before concrete pouring.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of reinforcement bars: mild steel, deformed bars, epoxy-coated bars and fiber-reinforced polymer (FRP) bars.

KU2. reinforcement cutting techniques: manual cutting, machine cutting, plasma cutting and shear cutting.

KU3. bending methods: cold bending, hot bending and CNC-controlled bending.

KU4. reinforcement tying techniques: binding wire method, welded reinforcement cages and mechanical couplers.

KU5. rebar placement patterns: single-layer, double-layer, spiral and grid patterns.

KU6. mivan shuttering system: aluminum formwork assembly, modular design and efficiency benefits.

KU7. laser alignment principles: using laser levels for precise rebar positioning and vertical alignment.

KU8. impact of reinforcement detailing on structural integrity and load-bearing capacity.

KU9. role of reinforcement in seismic-resistant and high-rise constructions.

Generic Skills (GS)

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

GS1. communicate effectively with team members, supervisors and stakeholders

GS2. listen actively to understand instructions and feedback

GS3. perform basic arithmetic calculations and take measurements accurately

GS4. analyze project specifications to identify potential risks or challenges

GS5. plan tasks to optimize time and resources

GS6. organize tools, equipment and materials efficiently

GS7. operate modern tools and equipment with basic proficiency

GS8. adapt to new construction technologies and methods

GS9. follow health and safety guidelines to minimize workplace risks

GS10. identify and mitigate workplace hazards promptly

GS11. ensure compliance with environmental sustainability practices

GS12. assess work challenges and make informed decisions

GS13. evaluate feedback to implement process improvements

GS14. maintain a professional attitude and ethical behaviour

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Cut Reinforcement Bars	**6**	**12**	**-**	**2**
PC1. measure and mark rebar lengths according to structural drawings.	-	-	-	-
PC2. use manual tools like hacksaws, bolt cutters and rebar shears for small-scale cutting.	-	-	-	-
PC3. operate automated rebar cutting machines for precise and efficient processing.	-	-	-	-
Bend Reinforcement Bars	**6**	**12**	**-**	**2**
PC4. apply manual bending techniques using rebar bending levers and hydraulic benders.	-	-	-	-
PC5. set up and operate CNC-controlled bending machines for precision bends.	-	-	-	-
PC6. shape rebars to required angles and curves based on reinforcement detailing.	-	-	-	-
Assemble and Tie Reinforcement Structures	**10**	**20**	**-**	**3**
PC7. position rebars in the correct layout based on structural reinforcement plans.	-	-	-	-
PC8. use binding wire and mechanical couplers for secure connections.	-	-	-	-
PC9. install reinforcement mesh, cages and columns for concrete structures.	-	-	-	-
Advanced Shuttering and Alignment Techniques	**8**	**16**	**-**	**3**
PC10. assemble steel formwork using Mivan shuttering methods for faster construction.	-	-	-	-
PC11. apply laser alignment techniques to ensure accurate reinforcement placement.	-	-	-	-
PC12. inspect and adjust reinforcement structures before concrete pouring.	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0514
NOS Name	Cut, Bend and Assemble Reinforcement Bars
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

ICE/CON/N0515: Install and Weld Metal Structural Components

Description

This unit focuses on installing and welding metal structural components for various construction and industrial applications.

Scope

The scope covers the following :

- Prepare and install metal structural components
- Install sheet metal for structural and finishing applications
- Perform welding techniques
- Use robotic and automated welding systems

Elements and Performance Criteria

Prepare and Install Metal Structural Components

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

PC1. measure, mark and cut metal sheets and structural sections to required dimensions using hand tools and CNC cutting machines.

PC2. position and secure metal components using clamps, jigs and tack welding.

PC3. drill and fasten structural metal sections using bolts, rivets and welding.

PC4. align and level metal structures using laser-guided tools.

PC5. install temporary supports to hold structural components in place during assembly.

Install Sheet Metal for Structural and Finishing Applications

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

PC6. assemble sheet metal for walls, roofing and facade applications.

PC7. use riveting, bolting and welding methods to secure sheet metal structures.

PC8. shape and bend sheet metal using hydraulic press brakes and rollers.

PC9. install expansion joints to accommodate structural movement.

PC10. apply corrosion-resistant coatings such as galvanization and powder coating.

PC11. reinforce sheet metal structures with internal bracing and stiffeners.

Perform Welding Techniques

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

PC12. execute shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) for standard joints.

PC13. apply tungsten inert gas (TIG) welding for precision and non-ferrous metals.

PC14. perform submerged arc welding (SAW) for large-scale structural components.

PC15. select appropriate filler metals and shielding gases for different welding applications.

PC16. inspect welds for defects such as porosity, cracks and incomplete fusion.

PC17. repair defective welds using grinding, rewelding and filler techniques.

PC18. operate oxy-fuel cutting and welding equipment for onsite modifications.

Use Robotic and Automated Welding Systems

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

PC19. operate CNC-controlled and robotic welding systems for high-precision welding.

PC20. program automated welding machines for repetitive production tasks.

PC21. inspect and adjust weld parameters such as heat input, speed and electrode angle.

PC22. perform laser welding and friction stir welding for specialized applications.

PC23. integrate automated welding processes with real-time monitoring and quality control systems.

PC24. troubleshoot robotic welding system errors and recalibrate equipment.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of metal structural components: beams, columns, trusses and sheet metal.

KU2. metal fabrication techniques: shearing, punching, rolling and bending.

KU3. welding processes: SMAW, GMAW, TIG, SAW and Friction Stir Welding (FSW).

KU4. welding materials: mild steel, stainless steel, aluminum and alloys.

KU5. heat treatment and metallurgical effects on welded joints.

KU6. robotic welding systems: programming, automation benefits and applications.

KU7. welding defect detection and corrective measures.

KU8. structural reinforcement methods using welded connections.

KU9. importance of metal finishing for corrosion resistance and durability.

KU10. application of welding codes and standards in structural fabrication.

KU11. principles of load-bearing metal structures and their assembly.

KU12. integration of welding automation with CAD/CAM software for precision work.

Generic Skills (GS)

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

GS1. communicate effectively with team members, supervisors and stakeholders

GS2. listen actively to understand instructions and feedback

GS3. perform basic arithmetic calculations and take measurements accurately

GS4. analyze project specifications to identify potential risks or challenges

GS5. plan tasks to optimize time and resources

GS6. organize tools, equipment and materials efficiently

GS7. operate modern tools and equipment with basic proficiency

GS8. adapt to new construction technologies and methods

GS9. follow health and safety guidelines to minimize workplace risks

GS10. identify and mitigate workplace hazards promptly

GS11. ensure compliance with environmental sustainability practices
GS12. assess work challenges and make informed decisions
GS13. evaluate feedback to implement process improvements
GS14. maintain a professional attitude and ethical behaviour

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare and Install Metal Structural Components	**6**	**12**	**-**	**2**
PC1. measure, mark and cut metal sheets and structural sections to required dimensions using hand tools and CNC cutting machines.	-	-	-	-
PC2. position and secure metal components using clamps, jigs and tack welding.	-	-	-	-
PC3. drill and fasten structural metal sections using bolts, rivets and welding.	-	-	-	-
PC4. align and level metal structures using laser-guided tools.	-	-	-	-
PC5. install temporary supports to hold structural components in place during assembly.	-	-	-	-
Install Sheet Metal for Structural and Finishing Applications	**6**	**12**	**-**	**2**
PC6. assemble sheet metal for walls, roofing and facade applications.	-	-	-	-
PC7. use riveting, bolting and welding methods to secure sheet metal structures.	-	-	-	-
PC8. shape and bend sheet metal using hydraulic press brakes and rollers.	-	-	-	-
PC9. install expansion joints to accommodate structural movement.	-	-	-	-
PC10. apply corrosion-resistant coatings such as galvanization and powder coating.	-	-	-	-
PC11. reinforce sheet metal structures with internal bracing and stiffeners.	-	-	-	-
Perform Welding Techniques	**10**	**20**	**-**	**3**
PC12. execute shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) for standard joints.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. apply tungsten inert gas (TIG) welding for precision and non-ferrous metals.	-	-	-	-
PC14. perform submerged arc welding (SAW) for large-scale structural components.	-	-	-	-
PC15. select appropriate filler metals and shielding gases for different welding applications.	-	-	-	-
PC16. inspect welds for defects such as porosity, cracks and incomplete fusion.	-	-	-	-
PC17. repair defective welds using grinding, rewelding and filler techniques.	-	-	-	-
PC18. operate oxy-fuel cutting and welding equipment for onsite modifications.	-	-	-	-
Use Robotic and Automated Welding Systems	**8**	**16**	**-**	**3**
PC19. operate CNC-controlled and robotic welding systems for high-precision welding.	-	-	-	-
PC20. program automated welding machines for repetitive production tasks.	-	-	-	-
PC21. inspect and adjust weld parameters such as heat input, speed and electrode angle.	-	-	-	-
PC22. perform laser welding and friction stir welding for specialized applications.	-	-	-	-
PC23. integrate automated welding processes with real-time monitoring and quality control systems.	-	-	-	-
PC24. troubleshoot robotic welding system errors and recalibrate equipment.	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0515
NOS Name	Install and Weld Metal Structural Components
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

ICE/CON/N0516: Apply Surface Coatings and Treatments

Description

This unit covers the application of surface coatings and treatments on metal components to enhance durability, corrosion resistance, and aesthetic appeal.

Scope

The scope covers the following :

- Prepare metal surfaces for coating applications
- Apply protective coatings to metal surfaces
- Use corrosion-resistant materials and treatments
- Perform advanced metal surface treatment methods

Elements and Performance Criteria

Prepare Metal Surfaces for Coating Applications

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

PC1. clean metal surfaces using chemical and mechanical methods to remove rust, grease and contaminants.

PC2. use abrasive blasting, wire brushing and sanding to create an optimal surface profile.

PC3. apply etching and priming treatments for better adhesion of coatings.

PC4. inspect surfaces for defects such as pitting, scaling and oxidation before coating.

PC5. mask off areas that should not be coated using tapes, stencils or temporary coverings.

Apply Protective Coatings to Metal Surfaces

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

PC6. apply liquid coatings such as primers, paints, and varnishes using spray, brush and dip methods.

PC7. use powder coating techniques for durable and uniform surface finishes.

PC8. apply industrial coatings such as epoxy, polyurethane and fluoropolymers for enhanced protection.

PC9. ensure even distribution and proper curing of coatings using heat or UV treatments.

PC10. check coating thickness and adhesion using testing tools such as micrometers and adhesion testers.

Use Corrosion-Resistant Materials and Treatments

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

PC11. apply galvanization techniques, including hot-dip and electro-galvanization to protect steel structures.

PC12. use anodizing for aluminum components to enhance wear and corrosion resistance.

PC13. perform passivation treatments for stainless steel to prevent oxidation.

PC14. apply cathodic protection methods using sacrificial anodes and impressed current systems.

PC15. use chemical conversion coatings such as chromating and phosphating for improved surface properties.

Perform Advanced Metal Surface Treatment Methods

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

PC16. apply thermal spraying techniques, including plasma, arc and flame spraying for high-performance coatings.

PC17. use physical vapor deposition (PVD) and chemical vapor deposition (CVD) for specialized coatings.

PC18. perform electroplating with metals like zinc, nickel and chromium for functional and decorative purposes.

PC19. conduct nano-coating applications for enhanced scratch resistance and self-cleaning properties.

PC20. integrate robotic and automated coating systems for precision and efficiency in large-scale production.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of surface coatings: organic (paints, varnishes) and inorganic (metallic, ceramic).

KU2. preparation techniques for metal surfaces before coating application.

KU3. methods of applying protective coatings: spray, dip, brush, electrostatic.

KU4. role of primers and adhesion promoters in coating durability.

KU5. corrosion mechanisms and how protective treatments counteract them.

KU6. advanced coating technologies such as powder coating, anodizing and electroplating.

KU7. advantages and applications of thermal spray coatings in industrial settings.

KU8. principles of cathodic protection and its use in metal preservation.

KU9. testing methods for coating thickness, adhesion and durability.

KU10. environmental considerations in surface treatment processes, including waste management and emission control.

KU11. benefits of automation in coating and treatment applications for precision and efficiency.

Generic Skills (GS)

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

GS1. communicate effectively with team members, supervisors, and stakeholders

GS2. communicate effectively with team members, supervisors, and stakeholders

GS3. perform basic arithmetic calculations and take measurements accurately

GS4. analyze project specifications to identify potential risks or challenges

GS5. plan tasks to optimize time and resources

GS6. organize tools, equipment and materials efficiently

GS7. operate modern tools and equipment with basic proficiency

GS8. adapt to new construction technologies and methods
GS9. follow EHS guidelines to minimize workplace risks
GS10. identify and mitigate workplace hazards promptly
GS11. ensure compliance with environmental sustainability practices
GS12. assess work challenges and make informed decisions
GS13. evaluate feedback to implement process improvements
GS14. maintain a professional attitude and ethical behaviour

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare Metal Surfaces for Coating Applications	**6**	**12**	**-**	**2**
PC1. clean metal surfaces using chemical and mechanical methods to remove rust, grease and contaminants.	-	-	-	-
PC2. use abrasive blasting, wire brushing and sanding to create an optimal surface profile.	-	-	-	-
PC3. apply etching and priming treatments for better adhesion of coatings.	-	-	-	-
PC4. inspect surfaces for defects such as pitting, scaling and oxidation before coating.	-	-	-	-
PC5. mask off areas that should not be coated using tapes, stencils or temporary coverings.	-	-	-	-
Apply Protective Coatings to Metal Surfaces	**6**	**12**	**-**	**2**
PC6. apply liquid coatings such as primers, paints, and varnishes using spray, brush and dip methods.	-	-	-	-
PC7. use powder coating techniques for durable and uniform surface finishes.	-	-	-	-
PC8. apply industrial coatings such as epoxy, polyurethane and fluoropolymers for enhanced protection.	-	-	-	-
PC9. ensure even distribution and proper curing of coatings using heat or UV treatments.	-	-	-	-
PC10. check coating thickness and adhesion using testing tools such as micrometers and adhesion testers.	-	-	-	-
Use Corrosion-Resistant Materials and Treatments	**10**	**20**	**-**	**3**
PC11. apply galvanization techniques, including hot-dip and electro-galvanization to protect steel structures.	-	-	-	-
PC12. use anodizing for aluminum components to enhance wear and corrosion resistance.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. perform passivation treatments for stainless steel to prevent oxidation.	-	-	-	-
PC14. apply cathodic protection methods using sacrificial anodes and impressed current systems.	-	-	-	-
PC15. use chemical conversion coatings such as chromating and phosphating for improved surface properties.	-	-	-	-
Perform Advanced Metal Surface Treatment Methods	**8**	**16**	**-**	**3**
PC16. apply thermal spraying techniques, including plasma, arc and flame spraying for high-performance coatings.	-	-	-	-
PC17. use physical vapor deposition (PVD) and chemical vapor deposition (CVD) for specialized coatings.	-	-	-	-
PC18. perform electroplating with metals like zinc, nickel and chromium for functional and decorative purposes.	-	-	-	-
PC19. conduct nano-coating applications for enhanced scratch resistance and self-cleaning properties.	-	-	-	-
PC20. integrate robotic and automated coating systems for precision and efficiency in large-scale production.	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0516
NOS Name	Apply Surface Coatings and Treatments
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

ICE/CON/N0517: Install Energy-Efficient Metal Cladding Systems

Description

This unit covers the installation of energy-efficient metal cladding systems.

Scope

The scope covers the following :

- Prepare surfaces for cladding installation
- Fit metal cladding panels
- Ensure energy efficiency in metal structures
- Advanced installation and finishing techniques

Elements and Performance Criteria

Prepare Surfaces for Cladding Installation

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

PC1. inspect and prepare the substrate by cleaning and leveling surfaces for cladding installation.

PC2. select appropriate metal cladding materials such as aluminum, steel or composite panels based on project specifications.

PC3. measure and mark the installation area using laser leveling tools for accurate alignment.

PC4. cut and shape metal panels using mechanical and automated cutting tools for precision.

PC5. apply primers and protective coatings to metal surfaces before installation.

Fit Metal Cladding Panels

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

PC6. install metal cladding panels using direct fixing, rail systems or concealed fasteners.

PC7. integrate insulation materials such as mineral wool, polyurethane foam or vacuum-insulated panels (VIP) for thermal efficiency.

PC8. use composite metal panels with pre-attached insulation layers for faster installation and improved performance.

PC9. ensure airtight sealing of joints using high-performance sealants, tapes and thermal breaks.

PC10. apply vapor barriers and breather membranes to prevent condensation and thermal bridging.

Ensure Energy Efficiency in Metal Structures

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

PC11. use cool metal roofing and cladding systems to enhance energy efficiency and reduce heat absorption.

PC12. apply reflective coatings and surface treatments for solar heat reduction.

PC13. integrate ventilated façade systems to improve thermal comfort and air circulation.

PC14. install photovoltaic (PV) cladding systems to generate renewable energy from building exteriors.

PC15. conduct thermal imaging tests to identify and rectify insulation gaps or heat leaks.

Advanced Installation and Finishing Techniques

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

PC16. use pre-fabricated modular metal cladding systems for faster and more efficient installation.

PC17. apply 3D laser scanning and BIM (Building Information Modeling) for precise placement and material optimization.

PC18. install self-healing and nano-coated metal cladding for enhanced durability and reduced maintenance.

PC19. integrate smart building sensors into metal cladding for real-time thermal performance monitoring.

PC20. ensure proper drainage and water management by incorporating weep holes and flashing systems.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. properties and types of metal cladding materials, including aluminum, zinc, copper, and steel.

KU2. principles of thermal insulation and energy efficiency in building envelopes.

KU3. advanced insulation technologies such as vacuum insulation panels (VIPs) and phase-change materials.

KU4. importance of air and vapor barriers in preventing condensation and thermal bridging.

KU5. installation methods for various metal cladding systems, including standing seam, interlocking panels, and cassette systems.

KU6. role of cool roofing and solar reflective coatings in energy-efficient buildings.

KU7. techniques for integrating solar panels into metal cladding systems.

KU8. impact of ventilated facades on energy performance and indoor comfort

KU9. use of advanced tools such as laser levels, thermal imaging cameras, and BIM software for precision installation.

KU10. environmental sustainability considerations in metal cladding, including recyclability and embodied carbon reduction.

Generic Skills (GS)

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

GS1. communicate effectively with team members, supervisors, and stakeholders

GS2. listen actively to understand instructions and feedback

GS3. perform basic arithmetic calculations and take measurements accurately

GS4. analyze project specifications to identify potential risks or challenges

GS5. plan tasks to optimize time and resources

GS6. organize tools, equipment, and materials efficiently

GS7. operate modern tools and equipment with basic proficiency

GS8. adapt to new construction technologies and methods

GS9. follow health and safety guidelines to minimize workplace risks
GS10. identify and mitigate workplace hazards promptly
GS11. ensure compliance with environmental sustainability practices
GS12. assess work challenges and make informed decisions
GS13. evaluate feedback to implement process improvements
GS14. maintain a professional attitude and ethical behaviour

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare Surfaces for Cladding Installation	**6**	**12**	**-**	**2**
PC1. inspect and prepare the substrate by cleaning and leveling surfaces for cladding installation.	-	-	-	-
PC2. select appropriate metal cladding materials such as aluminum, steel or composite panels based on project specifications.	-	-	-	-
PC3. measure and mark the installation area using laser leveling tools for accurate alignment.	-	-	-	-
PC4. cut and shape metal panels using mechanical and automated cutting tools for precision.	-	-	-	-
PC5. apply primers and protective coatings to metal surfaces before installation.	-	-	-	-
Fit Metal Cladding Panels	**6**	**12**	**-**	**2**
PC6. install metal cladding panels using direct fixing, rail systems or concealed fasteners.	-	-	-	-
PC7. integrate insulation materials such as mineral wool, polyurethane foam or vacuum-insulated panels (VIP) for thermal efficiency.	-	-	-	-
PC8. use composite metal panels with pre-attached insulation layers for faster installation and improved performance.	-	-	-	-
PC9. ensure airtight sealing of joints using high-performance sealants, tapes and thermal breaks.	-	-	-	-
PC10. apply vapor barriers and breather membranes to prevent condensation and thermal bridging.	-	-	-	-
Ensure Energy Efficiency in Metal Structures	**10**	**20**	**-**	**3**
PC11. use cool metal roofing and cladding systems to enhance energy efficiency and reduce heat absorption.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. apply reflective coatings and surface treatments for solar heat reduction.	-	-	-	-
PC13. integrate ventilated façade systems to improve thermal comfort and air circulation.	-	-	-	-
PC14. install photovoltaic (PV) cladding systems to generate renewable energy from building exteriors.	-	-	-	-
PC15. conduct thermal imaging tests to identify and rectify insulation gaps or heat leaks.	-	-	-	-
Advanced Installation and Finishing Techniques	**8**	**16**	**-**	**3**
PC16. use pre-fabricated modular metal cladding systems for faster and more efficient installation.	-	-	-	-
PC17. apply 3D laser scanning and BIM (Building Information Modeling) for precise placement and material optimization.	-	-	-	-
PC18. install self-healing and nano-coated metal cladding for enhanced durability and reduced maintenance.	-	-	-	-
PC19. integrate smart building sensors into metal cladding for real-time thermal performance monitoring.	-	-	-	-
PC20. ensure proper drainage and water management by incorporating weep holes and flashing systems.	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0517
NOS Name	Install Energy-Efficient Metal Cladding Systems
Sector	Construction
Sub-Sector	
Occupation	Masonry/Shuttering Carpentry/Bar Bending/Fabrication
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Awarding Body. Each Performance Criteria (PC)/ Element will be assigned marks proportional to its importance in NOS. AB will also lay down proportion of marks for Theory and Practical Skills for each PC/ Element.

2. The assessment of the knowledge part will be based on knowledge bank of questions created by Assessment Bodies subject to approval by AB.

3. Individual assessment agencies will create unique question papers for knowledge/theory part for assessment of candidates as per assessment criteria given below.

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on assessment criteria.

5. To pass the Qualification Pack, every trainee must score 70% on overall QP.

6. The Assessor shall check the outcome of the practices while evaluating the steps performed to achieve the outcome.

7. The trainee shall be provided with a chance to repeat the test to correct his procedures in case of

improper performance, with a deduction of marks for each iteration.

8. After the certain number of iterations as decided by AB the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.

9. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack within the specified time frame set by AB.

10. Minimum duration of Assessment of each QP shall be 8hrs/batch (max. 30 candidates).

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/CON/N0501.Identify Construction Building Materials and Components	30	60	-	10	100	15
ICE/CON/N0502.Follow Environment, Health and Safety (EHS) Guidelines at Construction Sites	30	60	-	10	100	10
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5
Total	**80**	**150**	**-**	**20**	**250**	**30**

Elective: 1 Metal working

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/CON/N0513.Plan and Execute Metal Fabrication	30	60	-	10	100	10
ICE/CON/N0514.Cut, Bend and Assemble Reinforcement Bars	30	60	-	10	100	15

Qualification Pack

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/CON/N0515.Install and Weld Metal Structural Components	30	60	-	10	100	15
ICE/CON/N0516.Apply Surface Coatings and Treatments	30	60	-	10	100	15
ICE/CON/N0517.Install Energy-Efficient Metal Cladding Systems	30	60	-	10	100	15
Total	**150**	**300**	**-**	**50**	**500**	**70**