Qualification Pack


# Construction Fabricator

Masonry/ Woodworking/ Metal working/ Concreting

Sheet Metal Fitting/ Mivan Shuttering: Aluminium Formwork

QP Code: ICE/CON/Q0501

Version: 1.0

NSQF Level: 4

THE INSTITUTION OF CIVIL ENGINEERS SOCIETY || 533-R
Model Town Ludhiana || email:cmswami@ice.net.in

# Contents

Qualification Pack

# ICE/CON/Q0501: 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 1: Masonry

1. ICE/CON/N0503: Plan and Execute Masonry Layouts and Foundations
2. ICE/CON/N0530: Construct Masonry Walls and Blocks
3. ICE/CON/N0504: Construct and Assemble Masonry Staircases
4. ICE/CON/N0505: Apply Plastering and Finishing Techniques
5. ICE/CON/N0506: Install and Maintain Masonry Paving Systems
6. ICE/CON/N0507: Implement Advanced Construction Technologies in Masonry

Elective 2: Woodworking

1. ICE/CON/N0508: Prepare and Construct Timber Frameworks

2. ICE/CON/N0509: Construct Wooden Frames for Structural Elements
3. ICE/CON/N0510: Install Interior Wooden Partitions and Panels
4. ICE/CON/N0511: Assemble and Dismantle Shuttering for Concreting
5. ICE/CON/N0512: Construct and Install Wooden Structural Features

Elective 3: 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

Elective 4: Concreting

1. ICE/CON/N0518: Prepare, Pour and Cure Concrete Structures
2. ICE/CON/N0519: Perform Concreting for Structural Elements
3. ICE/CON/N0520: Carry Out Reinforced Concrete Works
4. ICE/CON/N0521: Repair and Restore Concrete Surfaces
5. ICE/CON/N0522: Construct and Install Precast Concrete Structures

**Options***(Not mandatory)*:

Option 1: Sheet Metal Fitting

1. ICE/CON/N0523: Cut, Shape and Install Sheet Metal Structures
2. ICE/CON/N0524: Assemble and Fabricate Sheet Metal Structures Using Advanced Techniques
3. ICE/CON/N0525: Apply Surface Treatments and Coatings to Sheet Metal
4. ICE/CON/N0526: Ensure Quality Control and Precision in Sheet Metal Fabrication

Option 2: Mivan Shuttering: Aluminium Formwork

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1. ICE/CON/N0527: Assemble Aluminium Formwork Systems
2. ICE/CON/N0528: Install and Secure Aluminium Formwork on Construction Sites
3. ICE/CON/N0529: Perform Concrete Pouring and Removal of Aluminium Formwork

## Qualification Pack (QP) Parameters

| | |
|---|---|
| **Sector** | Construction |
| **Sub-Sector** | Infrastructure Construction |
| **Occupation** | Masonry/Shuttering Carpentry/Bar Bending/Fabrication |
| **Country** | India |
| **NSQF Level** | 4 |
| **Credits** | 41 |
| **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<br>OR<br>10th grade pass with 3 Years of experience Relevant Industry<br>OR<br>8th grade pass with 6 Years of experience Relevant Industry<br>OR<br>Previous relevant Qualification of NSQF Level 3 with 3 Years of experience Relevant Industry<br>OR<br>Previous relevant Qualification of NSQF Level 3.5 with 1.5 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 |

**Qualification Pack**

| | |
|---|---|
| **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 |

# 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 |

# 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 | 07/10/2025 |
| Next Review Date | 07/10/2028 |
| NSQC Clearance Date | 07/10/2025 |

# ICE/CON/N0503: Plan and Execute Masonry Layouts and Foundations

## Description

This unit focuses on planning and executing masonry layouts and foundations by interpreting construction drawings, understanding load-bearing structures, marking site layouts accurately, and using geopolymer concrete applications to ensure durable and structurally sound foundations.

## Scope

The scope covers the following :

- Read and interpret construction drawings
- Measure and mark site layout
- Construct using bricks, blocks, and geopolymer concrete

## Elements and Performance Criteria

*Read and interpret construction drawings*

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

**PC1.** identify symbols, dimensions and specifications in construction drawings related to masonry layouts and foundations.

**PC2.** interpret site plans and elevation drawings to determine material requirements and work sequence.

**PC3.** verify construction details with the supervisor or engineer before execution.

**PC4.** extract information related to load distribution, reinforcement and drainage from construction drawings.

**PC5.** check for any discrepancies in drawings and report them to the supervisor.

*Measure and mark layouts for construction*

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

**PC6.** use tools like spirit levels, plumb bobs and laser measuring devices to mark accurate layouts.

**PC7.** prepare the site for layout marking as per organizational norms.

**PC8.** mark foundation and wall locations based on specified dimensions.

**PC9.** verify squareness of layouts using 3-4-5 or builder's square methods, as appropriate.

**PC10.** establish reference points and levels using optical leveling tools.

**PC11.** identify and address site-specific constraints impacting layout accuracy.

*Construct using bricks, blocks and geopolymer concrete*

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

**PC12.** mix geopolymer concrete and monitor its properties for structural use.

**PC13.** set up formwork for foundation masonry using geopolymer concrete with proper alignment and stability.

**PC14.** lay and align bricks, blocks or stones using thin joint technology, mortar or adhesives.

**PC15.** maintain consistent joint thickness for bricks and blocks to enhance stability.

**PC16.** construct corners, walls and openings ensuring alignment and plumb.

PC17. use AAC blocks with prefabricated insulation inserts to enhance thermal efficiency.
PC18. ensure water-cement ratio and proper curing techniques.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of construction drawings (site plans, foundation plans, elevation drawings) and their symbols, dimensions and specifications.
KU2. methods for extracting information on load distribution, reinforcement and drainage from drawings.
KU3. tools and techniques for marking layouts (spirit level, plumb bob, laser measuring devices, optical leveling tools).
KU4. methods for verifying squareness using the 3-4-5 method or builders square.
KU5. site preparation steps for accurate layout marking as per safety norms.
KU6. properties, mixing and application of geopolymer concrete in masonry foundations.
KU7. techniques for setting up formwork with proper alignment and stability.
KU8. methods for laying and aligning bricks, blocks and stones using thin joint technology, mortar or adhesives.
KU9. importance of joint thickness, alignment and plumb in masonry construction.
KU10. use of AAC blocks with prefabricated insulation inserts for thermal efficiency.
KU11. importance of water-cement ratio and proper curing techniques for structural durability.

## 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 |
|---|---|---|---|---|
| *Read and interpret construction drawings* | 10 | 20 | - | 2 |
| PC1. identify symbols, dimensions and specifications in construction drawings related to masonry layouts and foundations. | - | - | - | - |
| PC2. interpret site plans and elevation drawings to determine material requirements and work sequence. | - | - | - | - |
| PC3. verify construction details with the supervisor or engineer before execution. | - | - | - | - |
| PC4. extract information related to load distribution, reinforcement and drainage from construction drawings. | - | - | - | - |
| PC5. check for any discrepancies in drawings and report them to the supervisor. | - | - | - | - |
| *Measure and mark layouts for construction* | 10 | 20 | - | 4 |
| PC6. use tools like spirit levels, plumb bobs and laser measuring devices to mark accurate layouts. | - | - | - | - |
| PC7. prepare the site for layout marking as per organizational norms. | - | - | - | - |
| PC8. mark foundation and wall locations based on specified dimensions. | - | - | - | - |
| PC9. verify squareness of layouts using 3-4-5 or builder's square methods, as appropriate. | - | - | - | - |
| PC10. establish reference points and levels using optical leveling tools. | - | - | - | - |
| PC11. identify and address site-specific constraints impacting layout accuracy. | - | - | - | - |
| *Construct using bricks, blocks and geopolymer concrete* | 10 | 20 | - | 4 |
| PC12. mix geopolymer concrete and monitor its properties for structural use. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. set up formwork for foundation masonry using geopolymer concrete with proper alignment and stability. | - | - | - | - |
| PC14. lay and align bricks, blocks or stones using thin joint technology, mortar or adhesives. | - | - | - | - |
| PC15. maintain consistent joint thickness for bricks and blocks to enhance stability. | - | - | - | - |
| PC16. construct corners, walls and openings ensuring alignment and plumb. | - | - | - | - |
| PC17. use AAC blocks with prefabricated insulation inserts to enhance thermal efficiency. | - | - | - | - |
| PC18. ensure water-cement ratio and proper curing techniques. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0503 |
| NOS Name | Plan and Execute Masonry Layouts and Foundations |
| 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/N0530: Construct Masonry Walls and Blocks

## Description

This unit focuses on the construction of masonry walls and blocks using traditional and modern techniques. It includes laying bricks and blocks, using thin joint technology, and installing AAC blocks with prefabricated insulation inserts to enhance structural strength, efficiency, and durability.

## Scope

The scope covers the following :

- Lay bricks and blocks
- Use thin joint technology

## Elements and Performance Criteria

*Lay Bricks and Blocks*

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

**PC1.** Select the appropriate type and size of bricks or blocks based on construction requirements
**PC2.** Inspect bricks and blocks for defects before use
**PC3.** Prepare the mortar mix in the correct ratio as per project specifications
**PC4.** Apply mortar evenly and consistently to ensure proper bonding between bricks/blocks
**PC5.** Lay bricks/blocks in a straight and level manner using a spirit level and plumb bob
**PC6.** Maintain proper joint thickness and alignment throughout the wall construction
**PC7.** Ensure staggered joint placement for added structural strength
**PC8.** Cut bricks or blocks to size using appropriate tools such as a masonry saw or chisel
**PC9.** Check vertical and horizontal alignments at regular intervals to avoid deviations
**PC10.** Construct corners and junctions using proper bonding techniques for added stability
**PC11.** Integrate reinforcement as per structural requirements, such as wire mesh or rebar
**PC12.** Cure the masonry wall for the recommended period to enhance durability

*Use Thin Joint Technology*

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

**PC13.** Prepare high-performance adhesive or thin joint mortar as per manufacturer guidelines
**PC14.** Apply a uniform and thin layer of adhesive to minimize joint thickness
**PC15.** Use a notched trowel to ensure even distribution of the thin joint adhesive
**PC16.** Position blocks with precision to avoid gaps or misalignment
**PC17.** Adjust block placement using light tapping to ensure firm bonding
**PC18.** Check for uniform load distribution across the wall structure
**PC19.** Maintain consistent joint thickness across the entire masonry wall
**PC20.** Remove excess adhesive immediately to prevent weak bonding

*Install AAC Blocks with Prefabricated Insulation Inserts*

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

PC21. Prepare the site and ensure a level surface for AAC block installation
PC22. Use specialized adhesive designed for AAC blocks to ensure optimal bonding
PC23. Install prefabricated insulation inserts accurately within AAC block joints
PC24. Align AAC blocks precisely to maintain a uniform structure
PC25. Trim and shape AAC blocks as required using appropriate cutting tools
PC26. Reinforce AAC block walls where necessary using steel bars or mesh
PC27. Ensure that insulation inserts are securely placed to enhance thermal efficiency
PC28. Verify wall stability and strength by conducting basic quality checks
PC29. Follow curing procedures for AAC block construction to ensure long-term durability

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Types and properties of bricks, blocks, and aac blocks used in masonry construction
KU2. Methods for inspecting bricks and blocks for defects before use
KU3. Correct mortar mix ratios and preparation techniques as per project specifications
KU4. Techniques for applying mortar evenly for strong bonding between bricks and blocks
KU5. Methods for ensuring straight and level alignment using a spirit level and plumb bob
KU6. Importance of joint thickness, staggered joint placement, and bonding techniques for structural strength
KU7. Tools and techniques for cutting bricks and blocks to size accurately
KU8. Reinforcement methods such as using wire mesh or rebar for added stability
KU9. Curing procedures for masonry walls to enhance durability
KU10. Properties and application of thin joint mortar and high-performance adhesives
KU11. Techniques for applying and distributing thin joint adhesive evenly using a notched trowel
KU12. Importance of precision placement and light tapping for proper bonding in thin joint technology
KU13. Installation methods for aac blocks with prefabricated insulation inserts for thermal efficiency
KU14. Specialized adhesives and reinforcement techniques for aac block walls
KU15. Quality checks to verify stability, alignment, and strength of masonry structures

## 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 |
|---|---|---|---|---|
| *Lay Bricks and Blocks* | 10 | 28 | - | 4 |
| PC1. Select the appropriate type and size of bricks or blocks based on construction requirements | - | - | - | - |
| PC2. Inspect bricks and blocks for defects before use | - | - | - | - |
| PC3. Prepare the mortar mix in the correct ratio as per project specifications | - | - | - | - |
| PC4. Apply mortar evenly and consistently to ensure proper bonding between bricks/blocks | - | - | - | - |
| PC5. Lay bricks/blocks in a straight and level manner using a spirit level and plumb bob | - | - | - | - |
| PC6. Maintain proper joint thickness and alignment throughout the wall construction | - | - | - | - |
| PC7. Ensure staggered joint placement for added structural strength | - | - | - | - |
| PC8. Cut bricks or blocks to size using appropriate tools such as a masonry saw or chisel | - | - | - | - |
| PC9. Check vertical and horizontal alignments at regular intervals to avoid deviations | - | - | - | - |
| PC10. Construct corners and junctions using proper bonding techniques for added stability | - | - | - | - |
| PC11. Integrate reinforcement as per structural requirements, such as wire mesh or rebar | - | - | - | - |
| PC12. Cure the masonry wall for the recommended period to enhance durability | - | - | - | - |
| *Use Thin Joint Technology* | 10 | 16 | - | 2 |
| PC13. Prepare high-performance adhesive or thin joint mortar as per manufacturer guidelines | - | - | - | - |
| PC14. Apply a uniform and thin layer of adhesive to minimize joint thickness | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC15. Use a notched trowel to ensure even distribution of the thin joint adhesive | - | - | - | - |
| PC16. Position blocks with precision to avoid gaps or misalignment | - | - | - | - |
| PC17. Adjust block placement using light tapping to ensure firm bonding | - | - | - | - |
| PC18. Check for uniform load distribution across the wall structure | - | - | - | - |
| PC19. Maintain consistent joint thickness across the entire masonry wall | - | - | - | - |
| PC20. Remove excess adhesive immediately to prevent weak bonding | - | - | - | - |
| *Install AAC Blocks with Prefabricated Insulation Inserts* | 10 | 16 | - | 4 |
| PC21. Prepare the site and ensure a level surface for AAC block installation | - | - | - | - |
| PC22. Use specialized adhesive designed for AAC blocks to ensure optimal bonding | - | - | - | - |
| PC23. Install prefabricated insulation inserts accurately within AAC block joints | - | - | - | - |
| PC24. Align AAC blocks precisely to maintain a uniform structure | - | - | - | - |
| PC25. Trim and shape AAC blocks as required using appropriate cutting tools | - | - | - | - |
| PC26. Reinforce AAC block walls where necessary using steel bars or mesh | - | - | - | - |
| PC27. Ensure that insulation inserts are securely placed to enhance thermal efficiency | - | - | - | - |
| PC28. Verify wall stability and strength by conducting basic quality checks | - | - | - | - |
| PC29. Follow curing procedures for AAC block construction to ensure long-term durability | - | - | - | - |

Qualification Pack

| 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/N0530 |
| NOS Name | Construct Masonry Walls and Blocks |
| 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/N0504: Construct and Assemble Masonry Staircases

## Description

This unit focuses on the construction and assembly of masonry staircases using precast modular sections and traditional masonry techniques.

## Scope

The scope covers the following :

- Prepare for Masonry Staircase Construction
- Construct Masonry Staircases Using Bricks and Blocks
- Assemble Staircases Using Precast Modular Sections
- Ensure Structural Integrity of the Staircase
- Align Staircases to Architectural Designs

## Elements and Performance Criteria

*Prepare for Masonry Staircase Construction*

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

**PC1.** read and interpret staircase construction drawings, blueprints and specifications

**PC2.** identify the appropriate staircase type (e.g., straight, spiral, l-shaped) based on design requirements

**PC3.** calculate rise, run and tread dimensions to ensure ergonomic and code-compliant construction

**PC4.** inspect and prepare the site for staircase construction, ensuring a level and stable foundation

**PC5.** select and arrange the required masonry materials such as bricks, blocks and precast sections

**PC6.** determine the load-bearing capacity and reinforcement needs of the staircase structure

*Construct Masonry Staircases Using Bricks and Blocks*

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

**PC7.** lay bricks or blocks to construct staircase steps, risers and landings

**PC8.** use formwork or shuttering to shape and support staircases during construction

**PC9.** apply the correct mortar mix for strong bonding and long-lasting durability

**PC10.** install reinforcement bars (rebar) or mesh within the staircase structure for added strength

**PC11.** ensure proper curing of masonry staircases to prevent cracks and enhance durability

**PC12.** align brick/block steps precisely to maintain uniformity and consistency

*Assemble Staircases Using Precast Modular Sections*

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

**PC13.** handle and position precast modular staircase sections using appropriate lifting techniques

**PC14.** ensure proper alignment of precast components as per design specifications

**PC15.** apply bonding agents or mortar to securely join precast sections

**PC16.** use fasteners or reinforcements such as steel rods or anchors for additional stability
**PC17.** seal joints between precast sections to prevent structural gaps and ensure durability
**PC18.** verify the uniformity of steps and landings to maintain safety and comfort

*Ensure Structural Integrity of the Staircase*

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

**PC19.** conduct load-bearing tests to verify the strength of the constructed staircase
**PC20.** inspect the staircase for cracks, misalignment, or instability and take corrective measures
**PC21.** apply waterproofing and anti-skid treatments to improve safety and longevity
**PC22.** check for proper drainage and ventilation around the staircase to prevent water damage
**PC23.** conduct finishing work such as plastering and polishing for a smooth and professional appearance

*Align Staircases to Architectural Designs*

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

**PC24.** ensure that staircase dimensions and aesthetics match the overall architectural design
**PC25.** verify compliance with building codes and safety regulations for staircase construction
**PC26.** coordinate with engineers, architects, and site supervisors to address design concerns
**PC27.** install handrails, balustrades, or decorative elements as per architectural requirements
**PC28.** conduct final quality checks before handing over the staircase for use

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** methods for reading and interpreting staircase construction drawings and blueprints
**KU2.** types of masonry staircases (e.g., straight, spiral, l-shaped) and their construction requirements
**KU3.** calculation techniques for rise, run, and tread dimensions to ensure ergonomic and code-compliant stairs
**KU4.** site preparation techniques for staircase construction, including foundation leveling and stability checks
**KU5.** selection and arrangement of masonry materials such as bricks, blocks and precast sections
**KU6.** load-bearing capacity and reinforcement requirements for masonry staircases
**KU7.** techniques for laying bricks and blocks to construct steps, risers and landings
**KU8.** importance of using formwork or shuttering to support staircases during construction
**KU9.** correct mortar mix preparation and application for strong bonding and durability
**KU10.** reinforcement methods using rebar or mesh for added staircase strength
**KU11.** curing procedures for masonry staircases to prevent cracks and improve longevity
**KU12.** handling and positioning techniques for precast modular staircase sections
**KU13.** methods for aligning precast components accurately according to design specifications
**KU14.** application of bonding agents, fasteners, and reinforcements to ensure staircase stability
**KU15.** sealing techniques to prevent structural gaps and improve durability of precast staircases
**KU16.** procedures for conducting load-bearing tests and inspecting staircases for defects

KU17. application of waterproofing and anti-skid treatments for safety and longevity
KU18. drainage and ventilation considerations to prevent water damage to staircases
KU19. finishing techniques such as plastering and polishing for a professional appearance
KU20. compliance with building codes and safety regulations for staircase construction
KU21. installation of handrails, balustrades and decorative elements as per architectural designs

## 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 for Masonry Staircase Construction* | 6 | 12 | - | 2 |
| PC1. read and interpret staircase construction drawings, blueprints and specifications | - | - | - | - |
| PC2. identify the appropriate staircase type (e.g., straight, spiral, l-shaped) based on design requirements | - | - | - | - |
| PC3. calculate rise, run and tread dimensions to ensure ergonomic and code-compliant construction | - | - | - | - |
| PC4. inspect and prepare the site for staircase construction, ensuring a level and stable foundation | - | - | - | - |
| PC5. select and arrange the required masonry materials such as bricks, blocks and precast sections | - | - | - | - |
| PC6. determine the load-bearing capacity and reinforcement needs of the staircase structure | - | - | - | - |
| *Construct Masonry Staircases Using Bricks and Blocks* | 6 | 12 | - | 2 |
| PC7. lay bricks or blocks to construct staircase steps, risers and landings | - | - | - | - |
| PC8. use formwork or shuttering to shape and support staircases during construction | - | - | - | - |
| PC9. apply the correct mortar mix for strong bonding and long-lasting durability | - | - | - | - |
| PC10. install reinforcement bars (rebar) or mesh within the staircase structure for added strength | - | - | - | - |
| PC11. ensure proper curing of masonry staircases to prevent cracks and enhance durability | - | - | - | - |
| PC12. align brick/block steps precisely to maintain uniformity and consistency | - | - | - | - |
| *Assemble Staircases Using Precast Modular Sections* | 6 | 12 | - | 2 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. handle and position precast modular staircase sections using appropriate lifting techniques | - | - | - | - |
| PC14. ensure proper alignment of precast components as per design specifications | - | - | - | - |
| PC15. apply bonding agents or mortar to securely join precast sections | - | - | - | - |
| PC16. use fasteners or reinforcements such as steel rods or anchors for additional stability | - | - | - | - |
| PC17. seal joints between precast sections to prevent structural gaps and ensure durability | - | - | - | - |
| PC18. verify the uniformity of steps and landings to maintain safety and comfort | - | - | - | - |
| *Ensure Structural Integrity of the Staircase* | 6 | 12 | - | 2 |
| PC19. conduct load-bearing tests to verify the strength of the constructed staircase | - | - | - | - |
| PC20. inspect the staircase for cracks, misalignment, or instability and take corrective measures | - | - | - | - |
| PC21. apply waterproofing and anti-skid treatments to improve safety and longevity | - | - | - | - |
| PC22. check for proper drainage and ventilation around the staircase to prevent water damage | - | - | - | - |
| PC23. conduct finishing work such as plastering and polishing for a smooth and professional appearance | - | - | - | - |
| *Align Staircases to Architectural Designs* | 6 | 12 | - | 2 |
| PC24. ensure that staircase dimensions and aesthetics match the overall architectural design | - | - | - | - |
| PC25. verify compliance with building codes and safety regulations for staircase construction | - | - | - | - |
| PC26. coordinate with engineers, architects, and site supervisors to address design concerns | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC27. install handrails, balustrades, or decorative elements as per architectural requirements | - | - | - | - |
| PC28. conduct final quality checks before handing over the staircase for use | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0504 |
| NOS Name | Construct and Assemble Masonry Staircases |
| 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/N0505: Apply Plastering and Finishing Techniques

## Description

This unit focuses on carrying out plastering and rendering works to achieve smooth and durable masonry surfaces.

## Scope

The scope covers the following :

- Prepare for Plastering and Finishing Work
- Carry Out Plastering and Rendering Works
- Use Self-Curing Plaster Techniques
- Perform Masonry Repair Using Nano Particle Sealants

## Elements and Performance Criteria

*Prepare for Plastering and Finishing Work*

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

**PC1.** inspect the surface condition to determine the required preparation and treatment

**PC2.** select appropriate plastering materials based on substrate type and environmental conditions

**PC3.** clean the masonry surface to remove dust, debris and loose particles before application

**PC4.** apply bonding agents or primers to improve adhesion of plaster materials

**PC5.** set up tools, mixing equipment and scaffolding safely before starting the work

*Carry Out Plastering and Rendering Works*

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

**PC6.** mix plaster or render to the required consistency using manual or mechanical methods

**PC7.** apply base and finishing coats of plaster evenly using trowels, floats and spraying techniques

**PC8.** use different plastering techniques such as single-coat, two-coat and multi-layer applications

**PC9.** ensure uniform thickness and smooth application by using screeds and levelers

**PC10.** finish plastered surfaces using troweling, polishing or textured finishing techniques

**PC11.** check for hollowness or cracks in the plaster and rectify imperfections before drying

*Use Self-Curing Plaster Techniques*

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

**PC12.** prepare and apply self-curing plaster using polymer-based compounds

**PC13.** ensure even distribution of self-curing agents to reduce water evaporation losses

**PC14.** monitor the curing process and maintain surface hydration without external curing methods

**PC15.** assess the effectiveness of self-curing plaster in different climate conditions

*Perform Masonry Repair using Nano-particle Sealants*

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

**PC16.** identify damaged or deteriorated masonry surfaces requiring repair

PC17. clean cracks, voids and porous surfaces before applying nano-particle sealants
PC18. select the appropriate nano-sealant formulation based on the material type and damage level
PC19. apply nano-sealants using brush, roller or spray techniques to ensure deep penetration
PC20. monitor curing time and effectiveness of the sealant in strengthening and waterproofing masonry
PC21. check for any remaining weak spots or gaps and reapply sealant as needed

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. surface inspection techniques for determining preparation and treatment needs
KU2. selection of appropriate plastering materials based on substrate type and environmental factors
KU3. cleaning methods for masonry surfaces before plastering
KU4. application of bonding agents or primers to enhance plaster adhesion
KU5. safe setup of tools, mixing equipment and scaffolding for plastering work
KU6. mixing techniques for plaster or render to achieve the correct consistency
KU7. methods for applying base and finishing coats using trowels, floats and spraying
KU8. plastering techniques such as single-coat, two-coat and multi-layer applications
KU9. use of screeds and levelers for uniform thickness and smooth application
KU10. finishing techniques like troweling, polishing, and texturing
KU11. identification and rectification of hollowness or cracks in plaster before drying
KU12. application of self-curing plaster using polymer-based compounds
KU13. monitoring and maintaining surface hydration without external curing methods
KU14. identification and preparation of damaged masonry surfaces for repair
KU15. selection and application of nano-particle sealants for strengthening and waterproofing masonry
KU16. techniques for monitoring curing time and effectiveness of nano-sealants

## 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 for Plastering and Finishing Work* | 5 | 13 | - | 2 |
| PC1. inspect the surface condition to determine the required preparation and treatment | - | - | - | - |
| PC2. select appropriate plastering materials based on substrate type and environmental conditions | - | - | - | - |
| PC3. clean the masonry surface to remove dust, debris and loose particles before application | - | - | - | - |
| PC4. apply bonding agents or primers to improve adhesion of plaster materials | - | - | - | - |
| PC5. set up tools, mixing equipment and scaffolding safely before starting the work | - | - | - | - |
| *Carry Out Plastering and Rendering Works* | 10 | 17 | - | 3 |
| PC6. mix plaster or render to the required consistency using manual or mechanical methods | - | - | - | - |
| PC7. apply base and finishing coats of plaster evenly using trowels, floats and spraying techniques | - | - | - | - |
| PC8. use different plastering techniques such as single-coat, two-coat and multi-layer applications | - | - | - | - |
| PC9. ensure uniform thickness and smooth application by using screeds and levelers | - | - | - | - |
| PC10. finish plastered surfaces using troweling, polishing or textured finishing techniques | - | - | - | - |
| PC11. check for hollowness or cracks in the plaster and rectify imperfections before drying | - | - | - | - |
| *Use Self-Curing Plaster Techniques* | 10 | 17 | - | 3 |
| PC12. prepare and apply self-curing plaster using polymer-based compounds | - | - | - | - |
| PC13. ensure even distribution of self-curing agents to reduce water evaporation losses | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. monitor the curing process and maintain surface hydration without external curing methods | - | - | - | - |
| PC15. assess the effectiveness of self-curing plaster in different climate conditions | - | - | - | - |
| *Perform Masonry Repair using Nano-particle Sealants* | 5 | 13 | - | 2 |
| PC16. identify damaged or deteriorated masonry surfaces requiring repair | - | - | - | - |
| PC17. clean cracks, voids and porous surfaces before applying nano-particle sealants | - | - | - | - |
| PC18. select the appropriate nano-sealant formulation based on the material type and damage level | - | - | - | - |
| PC19. apply nano-sealants using brush, roller or spray techniques to ensure deep penetration | - | - | - | - |
| PC20. monitor curing time and effectiveness of the sealant in strengthening and waterproofing masonry | - | - | - | - |
| PC21. check for any remaining weak spots or gaps and reapply sealant as needed | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0505 |
| NOS Name | Apply Plastering and Finishing Techniques |
| 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 |

Qualification Pack

# ICE/CON/N0506: Install and Maintain Masonry Paving Systems

## Description

This unit focuses on the installation, maintenance, and repair of masonry paving systems, ensuring stability, durability, and alignment while incorporating modern techniques like permeable paving for sustainable construction.

## Scope

The scope covers the following :

- Prepare site for paving
- Install masonry paving systems
- Apply permeable paving technology
- Repair and maintain paving systems

## Elements and Performance Criteria

*Prepare Site for Paving*

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

**PC1.** assess the site conditions, including soil type, drainage and load-bearing capacity

**PC2.** clear debris, vegetation and obstructions from the paving area

**PC3.** mark layout and levels based on construction drawings and specifications

**PC4.** compact and level the base using appropriate techniques for a stable foundation

*Install Masonry Paving Systems*

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

**PC5.** select suitable paving materials based on site requirements and design specifications

**PC6.** lay pavers in the prescribed pattern, ensuring uniform alignment and spacing

**PC7.** use appropriate jointing materials such as polymeric sand or mortar to secure pavers

**PC8.** compact and stabilize the pavers using a plate compactor or manual tamping

*Apply Permeable Paving Technology*

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

**PC9.** install permeable paving materials to facilitate stormwater drainage and reduce runoff

**PC10.** incorporate gravel layers and drainage channels to enhance water infiltration

**PC11.** ensure proper spacing and grading to maintain permeability and prevent clogging

*Repair and Maintain Paving Systems*

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

**PC12.** inspect paving surfaces for defects such as sinking, cracking or misalignment

**PC13.** replace damaged pavers without disturbing the surrounding layout

**PC14.** re-level and compact loose or uneven sections to restore stability

**PC15.** remove weeds, debris, and sediment buildup from paved surfaces and joints

**PC16.** handle and transport pavers safely to avoid injuries and breakage

PC17. conduct final inspection to ensure proper alignment, durability and compliance with design specifications

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. standard procedures for preparing, laying and maintaining masonry paving systems
KU2. applicable building codes, industry standards and safety regulations for paving works
KU3. quality standards for different types of paving materials and their application
KU4. workplace policies related to waste disposal, environmental compliance and material handling
KU5. documentation and reporting procedures for completed paving work and repairs
KU6. types of paving materials, including concrete blocks, stone pavers, clay bricks and permeable pavers
KU7. properties and durability of various paving materials under different climatic conditions
KU8. selection criteria for appropriate paving materials based on load-bearing capacity and aesthetics
KU9. methods of site assessment for drainage, soil conditions and stability
KU10. techniques for grading, compacting and leveling the base for a stable foundation
KU11. importance of geotextile membranes and bedding layers in paving systems
KU12. laying patterns and techniques, such as herringbone, running bond and basket weave
KU13. methods for aligning, spacing and securing pavers to maintain uniformity
KU14. role of jointing materials like polymeric sand and mortar in enhancing stability
KU15. working principles of permeable paving for stormwater management and eco-friendly construction
KU16. types of permeable paving materials and their water infiltration capacity
KU17. techniques for maintaining permeability by preventing clogging and sediment buildup
KU18. common paving defects, including sinking, cracking and weed growth
KU19. procedures for replacing damaged or misaligned pavers without affecting the entire surface
KU20. techniques for re-leveling, compacting and sealing joints for long-term stability
KU21. occupational hazards related to masonry paving including lifting injuries and tripping risks
KU22. proper usage and maintenance of paving tools and equipment, such as plate compactors and rubber mallets

## 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 Site for Paving* | 5 | 5 | - | 2 |
| PC1. assess the site conditions, including soil type, drainage and load-bearing capacity | - | - | - | - |
| PC2. clear debris, vegetation and obstructions from the paving area | - | - | - | - |
| PC3. mark layout and levels based on construction drawings and specifications | - | - | - | - |
| PC4. compact and level the base using appropriate techniques for a stable foundation | - | - | - | - |
| *Install Masonry Paving Systems* | 5 | 10 | - | 2 |
| PC5. select suitable paving materials based on site requirements and design specifications | - | - | - | - |
| PC6. lay pavers in the prescribed pattern, ensuring uniform alignment and spacing | - | - | - | - |
| PC7. use appropriate jointing materials such as polymeric sand or mortar to secure pavers | - | - | - | - |
| PC8. compact and stabilize the pavers using a plate compactor or manual tamping | - | - | - | - |
| *Apply Permeable Paving Technology* | 10 | 25 | - | 3 |
| PC9. install permeable paving materials to facilitate stormwater drainage and reduce runoff | - | - | - | - |
| PC10. incorporate gravel layers and drainage channels to enhance water infiltration | - | - | - | - |
| PC11. ensure proper spacing and grading to maintain permeability and prevent clogging | - | - | - | - |
| *Repair and Maintain Paving Systems* | 10 | 20 | - | 3 |
| PC12. inspect paving surfaces for defects such as sinking, cracking or misalignment | - | - | - | - |
| PC13. replace damaged pavers without disturbing the surrounding layout | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. re-level and compact loose or uneven sections to restore stability | - | - | - | - |
| PC15. remove weeds, debris, and sediment buildup from paved surfaces and joints | - | - | - | - |
| PC16. handle and transport pavers safely to avoid injuries and breakage | - | - | - | - |
| PC17. conduct final inspection to ensure proper alignment, durability and compliance with design specifications | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0506 |
| NOS Name | Install and Maintain Masonry Paving 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 |

# ICE/CON/N0507: Implement Advanced Construction Technologies in Masonry

## Description

This unit focuses on the integration of modern construction technologies in masonry, including 3D printing, automated fabrication, and digital construction techniques

## Scope

The scope covers the following :

- Understand and apply 3D printing technology in masonry
- Apply automated and digital fabrication methods

## Elements and Performance Criteria

*Understand and Apply 3D Printing Technology in Masonry*

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

**PC1.** identify the principles and working mechanisms of 3D printing in masonry construction

**PC2.** interpret 3D digital models and convert them into printable masonry structures

**PC3.** set up and calibrate masonry-specific 3D printers for on-site and off-site applications

**PC4.** prepare raw materials such as geopolymer concrete and specialized mortar for 3D printing

**PC5.** monitor the printing process to ensure structural accuracy and material consistency

**PC6.** troubleshoot printing defects such as layer misalignment, cracking or material inconsistencies

*Apply Automated and Digital Methods in Masonry Activities*

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

**PC7.** operation of robotic bricklaying and automated block assembly systems

**PC8.** program and control robotic masonry systems for efficient and precise construction

**PC9.** implement prefabricated masonry components using digital design and CNC-cutting methods

**PC10.** utilize BIM (Building Information Modeling) to optimize masonry layouts and workflow efficiency

**PC11.** integrate sensor-based monitoring systems to track construction accuracy and material usage

*Follow Sustainability and Efficiency in Modern Masonry Techniques*

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

**PC12.** assess the environmental impact of traditional versus advanced masonry techniques

**PC13.** optimize material usage by reducing waste through automated and digital fabrication methods

**PC14.** implement energy-efficient masonry solutions such as self-healing concrete and smart insulation

**PC15.** evaluate the cost-effectiveness and return on investment (ROI) of using advanced construction technologies

PC16. follow green building standards and certifications when applying digital masonry techniques

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. principles of 3D printing and its applications in masonry construction and repairs
KU2. types of 3D printing materials suitable for masonry, including geopolymer concrete and specialized mortars
KU3. workflow of digital modeling, slicing, and printing for masonry structures
KU4. troubleshooting common issues in 3D-printed masonry structures
KU5. fundamentals of robotic bricklaying and automated block assembly techniques
KU6. benefits and limitations of digital fabrication in masonry
KU7. use of prefabricated masonry components in modular construction
KU8. integration of BIM (Building Information Modeling) in masonry construction for efficiency and precision
KU9. role of AI and IoT in optimizing automated masonry processes
KU10. sustainability principles related to modern masonry construction methods
KU11. environmental impact of traditional masonry versus advanced construction technologies
KU12. strategies for reducing waste and improving resource efficiency through automation
KU13. advanced masonry materials such as self-healing concrete and nanotechnology-based coatings
KU14. importance of adhering to green building standards and certification programs
KU15. occupational health and safety considerations when working with automated machinery
KU16. standard safety procedures for operating 3D printers and robotic masonry equipment
KU17. maintenance practices for prolonging the life of digital and automated masonry tools
KU18. latest trends and innovations in masonry automation and construction technology

## 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 |
|---|---|---|---|---|
| *Understand and Apply 3D Printing Technology in Masonry* | 10 | 15 | - | 2 |
| PC1. identify the principles and working mechanisms of 3D printing in masonry construction | - | - | - | - |
| PC2. interpret 3D digital models and convert them into printable masonry structures | - | - | - | - |
| PC3. set up and calibrate masonry-specific 3D printers for on-site and off-site applications | - | - | - | - |
| PC4. prepare raw materials such as geopolymer concrete and specialized mortar for 3D printing | - | - | - | - |
| PC5. monitor the printing process to ensure structural accuracy and material consistency | - | - | - | - |
| PC6. troubleshoot printing defects such as layer misalignment, cracking or material inconsistencies | - | - | - | - |
| *Apply Automated and Digital Methods in Masonry Activities* | 10 | 25 | - | 4 |
| PC7. operation of robotic bricklaying and automated block assembly systems | - | - | - | - |
| PC8. program and control robotic masonry systems for efficient and precise construction | - | - | - | - |
| PC9. implement prefabricated masonry components using digital design and CNC-cutting methods | - | - | - | - |
| PC10. utilize BIM (Building Information Modeling) to optimize masonry layouts and workflow efficiency | - | - | - | - |
| PC11. integrate sensor-based monitoring systems to track construction accuracy and material usage | - | - | - | - |
| *Follow Sustainability and Efficiency in Modern Masonry Techniques* | 10 | 20 | - | 4 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC12. assess the environmental impact of traditional versus advanced masonry techniques | - | - | - | - |
| PC13. optimize material usage by reducing waste through automated and digital fabrication methods | - | - | - | - |
| PC14. implement energy-efficient masonry solutions such as self-healing concrete and smart insulation | - | - | - | - |
| PC15. evaluate the cost-effectiveness and return on investment (ROI) of using advanced construction technologies | - | - | - | - |
| PC16. follow green building standards and certifications when applying digital masonry techniques | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0507 |
| NOS Name | Implement Advanced Construction Technologies in Masonry |
| 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/N0508: Prepare and Construct Timber Frameworks

## Description

This unit covers the skills and knowledge required to prepare, construct, and install timber frameworks used in formwork and structural applications.

## Scope

The scope covers the following :

- Read and interpret construction drawings for timber frameworks
- Select and prepare timber for framework construction
- Construct timber frameworks using traditional techniques
- Construct timber frameworks using modern techniques

## Elements and Performance Criteria

*Read and Interpret Construction Drawings for Timber Frameworks*

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

**PC1.** identify structural requirements and load-bearing specifications from construction drawings

**PC2.** interpret different types of timber framework designs, including traditional, prefabricated and CLT structures

**PC3.** analyze measurements, dimensions, and specifications for framework assembly

**PC4.** identify key framework elements such as beams, posts and connectors

**PC5.** ensure alignment and accuracy of construction plans before material preparation

*Select and Prepare Timber for Framework Construction*

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

**PC6.** determine the appropriate type of timber based on strength, durability and environmental conditions

**PC7.** inspect timber for defects such as warping, knots and cracks

**PC8.** cut, shape, and size timber as per framework specifications using appropriate tools

**PC9.** treat and coat timber to enhance durability and resistance to moisture, pests and decay

**PC10.** assemble and reinforce joints using screws, nails, bolts or adhesives

**PC11.** comply with industry standards and best practices when working with timber

*Construct Timber Frameworks using Traditional Techniques*

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

**PC12.** measure and mark locations for beams, posts and supports according to drawings

**PC13.** assemble framework structures using traditional joinery techniques such as mortise and tenon, lap joints and dowel joints

**PC14.** secure framework components using manual nailing, screwing and bolting methods

**PC15.** use hand tools such as chisels, saws, and drills for shaping and assembling timber parts

**PC16.** ensure accurate spacing and reinforcement of framework components for stability

PC17. install timber bracing and supports to enhance structural integrity

PC18. inspect and correct any misalignment or structural inconsistencies in the framework

*Construct Timber Frameworks using Modern Techniques*

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

PC19. use prefabricated timber components for faster and more efficient construction

PC20. integrate engineered wood products such as plywood and LVL (Laminated Veneer Lumber) in framework assembly

PC21. apply Cross-Laminated Timber (CLT) for structural strength and sustainability

PC22. use digital tools such as laser levels and CAD-based measurements for precise framework installation

PC23. install prefabricated connectors and fasteners for quicker and more secure assembly

PC24. ensure proper alignment and weight distribution when working with large-scale prefabricated timber elements

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of timber used in framework construction and their properties

KU2. classification of softwood and hardwood for structural applications

KU3. engineered wood products such as plywood, LVL (Laminated Veneer Lumber), and CLT (Cross-Laminated Timber)

KU4. principles of timber joinery, including mortise and tenon, lap joints and dowel joints

KU5. techniques for cutting, shaping, and assembling timber frameworks

KU6. importance of timber treatment for durability and weather resistance

KU7. reading and interpreting technical construction drawings for timber framework assembly

KU8. structural integrity requirements for different types of timber frameworks

KU9. prefabrication techniques in timber construction for improved efficiency

KU10. safe handling and usage of woodworking tools, including saws, drills and chisels

KU11. methods for reinforcing timber structures to improve load-bearing capacity

KU12. environmental impact of timber construction and sustainable sourcing of wood materials

KU13. standards and best practices for timber framework construction

KU14. quality control measures in timber framework installation

KU15. occupational health and safety practices related to timber framework assembly

KU16. fire resistance properties of different timber types and treatments

KU17. advanced timber framing techniques used in modern construction

## 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 |
|---|---|---|---|---|
| *Read and Interpret Construction Drawings for Timber Frameworks* | 8 | 10 | - | 2 |
| PC1. identify structural requirements and load-bearing specifications from construction drawings | - | - | - | - |
| PC2. interpret different types of timber framework designs, including traditional, prefabricated and CLT structures | - | - | - | - |
| PC3. analyze measurements, dimensions, and specifications for framework assembly | - | - | - | - |
| PC4. identify key framework elements such as beams, posts and connectors | - | - | - | - |
| PC5. ensure alignment and accuracy of construction plans before material preparation | - | - | - | - |
| *Select and Prepare Timber for Framework Construction* | 8 | 15 | - | 2 |
| PC6. determine the appropriate type of timber based on strength, durability and environmental conditions | - | - | - | - |
| PC7. inspect timber for defects such as warping, knots and cracks | - | - | - | - |
| PC8. cut, shape, and size timber as per framework specifications using appropriate tools | - | - | - | - |
| PC9. treat and coat timber to enhance durability and resistance to moisture, pests and decay | - | - | - | - |
| PC10. assemble and reinforce joints using screws, nails, bolts or adhesives | - | - | - | - |
| PC11. comply with industry standards and best practices when working with timber | - | - | - | - |
| *Construct Timber Frameworks using Traditional Techniques* | 7 | 15 | - | 3 |
| PC12. measure and mark locations for beams, posts and supports according to drawings | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. assemble framework structures using traditional joinery techniques such as mortise and tenon, lap joints and dowel joints | - | - | - | - |
| PC14. secure framework components using manual nailing, screwing and bolting methods | - | - | - | - |
| PC15. use hand tools such as chisels, saws, and drills for shaping and assembling timber parts | - | - | - | - |
| PC16. ensure accurate spacing and reinforcement of framework components for stability | - | - | - | - |
| PC17. install timber bracing and supports to enhance structural integrity | - | - | - | - |
| PC18. inspect and correct any misalignment or structural inconsistencies in the framework | - | - | - | - |
| *Construct Timber Frameworks using Modern Techniques* | 7 | 20 | - | 3 |
| PC19. use prefabricated timber components for faster and more efficient construction | - | - | - | - |
| PC20. integrate engineered wood products such as plywood and LVL (Laminated Veneer Lumber) in framework assembly | - | - | - | - |
| PC21. apply Cross-Laminated Timber (CLT) for structural strength and sustainability | - | - | - | - |
| PC22. use digital tools such as laser levels and CAD-based measurements for precise framework installation | - | - | - | - |
| PC23. install prefabricated connectors and fasteners for quicker and more secure assembly | - | - | - | - |
| PC24. ensure proper alignment and weight distribution when working with large-scale prefabricated timber elements | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0508 |
| NOS Name | Prepare and Construct Timber Frameworks |
| 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/N0509: Construct Wooden Frames for Structural Elements

## Description

This unit focuses on the construction of wooden frames used in structural elements such as foundations, flooring, doors, and windows.

## Scope

The scope covers the following :

- Construct Wooden Frames for Foundations and Flooring
- Use prefabricated timber systems
- Use CNC precision cutting

## Elements and Performance Criteria

*Construct Wooden Frames for Foundations and Flooring*

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

**PC1.** identify structural requirements for wooden frame foundations and flooring.

**PC2.** select appropriate timber based on strength, load-bearing capacity, and environmental conditions.

**PC3.** measure, cut, and assemble wooden beams, joists, and subfloor components.

**PC4.** secure foundation frames using nails, screws, bolts, or brackets.

**PC5.** ensure accurate spacing and alignment of wooden floor joists to support load distribution.

**PC6.** install moisture barriers or protective coatings to prevent wood degradation.

**PC7.** reinforce connections using bracing or additional support elements.

**PC8.** conduct inspections to verify stability and structural integrity before installation.

*Use Prefabricated Timber Systems*

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

**PC9.** select and prepare engineered wood products such as cross-laminated timber (CLT) and laminated veneer lumber (LVL).

**PC10.** assemble prefabricated timber frames using modular construction techniques.

**PC11.** apply advanced fastening systems such as metal connectors and adhesives for enhanced durability.

**PC12.** align and position prefabricated components using laser levels and digital measuring tools.

**PC13.** integrate prefabricated frames into structural elements with minimal modifications.

*Use CNC Precision Cutting*

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

**PC14.** determine the dimensions and specifications of wooden door and window frames.

**PC15.** select high-quality timber suitable for frame construction.

**PC16.** use CNC (computer numerical control) machines for precision cutting and shaping of wooden components.

PC17. ensure accurate mortise and tenon joints, grooves, and notches for seamless assembly.
PC18. assemble door and window frames using clamps, fasteners, and adhesives.
PC19. align frames precisely within wall openings to prevent warping or misalignment.
PC20. install reinforcements such as weatherproofing strips and insulation materials.
PC21. conduct finishing operations such as sanding, sealing, and varnishing for durability.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of timber used for structural framing and their load-bearing properties.
KU2. traditional joinery techniques such as mortise and tenon, dowel joints, and half-lap joints.
KU3. modern timber framing methods, including prefabricated and engineered wood systems.
KU4. CNC machining and its application in precision cutting for wooden frames.
KU5. installation techniques for wooden foundations, flooring, doors, and windows.
KU6. fastening systems such as nails, screws, bolts, and adhesives for wooden structures.
KU7. importance of moisture resistance and protective coatings in timber construction.
KU8. digital tools for accurate measurement and alignment of prefabricated components.
KU9. quality control measures in wooden frame construction.

## 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 |
|---|---|---|---|---|
| *Construct Wooden Frames for Foundations and Flooring* | 5 | 15 | - | 2 |
| PC1. identify structural requirements for wooden frame foundations and flooring. | - | - | - | - |
| PC2. select appropriate timber based on strength, load-bearing capacity, and environmental conditions. | - | - | - | - |
| PC3. measure, cut, and assemble wooden beams, joists, and subfloor components. | - | - | - | - |
| PC4. secure foundation frames using nails, screws, bolts, or brackets. | - | - | - | - |
| PC5. ensure accurate spacing and alignment of wooden floor joists to support load distribution. | - | - | - | - |
| PC6. install moisture barriers or protective coatings to prevent wood degradation. | - | - | - | - |
| PC7. reinforce connections using bracing or additional support elements. | - | - | - | - |
| PC8. conduct inspections to verify stability and structural integrity before installation. | - | - | - | - |
| *Use Prefabricated Timber Systems* | 15 | 25 | - | 4 |
| PC9. select and prepare engineered wood products such as cross-laminated timber (CLT) and laminated veneer lumber (LVL). | - | - | - | - |
| PC10. assemble prefabricated timber frames using modular construction techniques. | - | - | - | - |
| PC11. apply advanced fastening systems such as metal connectors and adhesives for enhanced durability. | - | - | - | - |
| PC12. align and position prefabricated components using laser levels and digital measuring tools. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. integrate prefabricated frames into structural elements with minimal modifications. | - | - | - | - |
| *Use CNC Precision Cutting* | 10 | 20 | - | 4 |
| PC14. determine the dimensions and specifications of wooden door and window frames. | - | - | - | - |
| PC15. select high-quality timber suitable for frame construction. | - | - | - | - |
| PC16. use CNC (computer numerical control) machines for precision cutting and shaping of wooden components. | - | - | - | - |
| PC17. ensure accurate mortise and tenon joints, grooves, and notches for seamless assembly. | - | - | - | - |
| PC18. assemble door and window frames using clamps, fasteners, and adhesives. | - | - | - | - |
| PC19. align frames precisely within wall openings to prevent warping or misalignment. | - | - | - | - |
| PC20. install reinforcements such as weatherproofing strips and insulation materials. | - | - | - | - |
| PC21. conduct finishing operations such as sanding, sealing, and varnishing for durability. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0509 |
| NOS Name | Construct Wooden Frames for Structural Elements |
| 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/N0510: Install Interior Wooden Partitions and Panels

## Description

This unit covers the installation of interior wooden partitions and panels used for both structural and decorative purposes.

## Scope

The scope covers the following :

- Set up interior wooden partitions
- Install wooden panels
- Install modular and prefabricated partition systems
- Apply finishing and surface treatments

## Elements and Performance Criteria

*Set Up Interior Wooden Partitions*

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

**PC1.** select appropriate timber, plywood, MDF or engineered wood for partition construction.

**PC2.** measure and mark partition dimensions using precision tools.

**PC3.** cut wooden sections using saws, routers and CNC machines for accuracy.

**PC4.** assemble and secure wooden partition frames with mortise and tenon, dowel or screw joints.

**PC5.** integrate steel or aluminum reinforcements for enhanced durability.

**PC6.** align and fix partitions to walls, floors, and ceilings using brackets, adhesives and mechanical fasteners.

**PC7.** install adjustable or removable wooden partitions for flexible space management.

**PC8.** integrate soundproofing and insulation materials within partition cavities.

**PC9.** check vertical alignment and structural stability before finalizing installation.

*Install Wooden Panels*

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

**PC10.** select and source high-quality wooden panels suited for interior applications.

**PC11.** prepare and treat wooden panels with sanding, priming or moisture-proof coatings.

**PC12.** measure and cut panels to fit designated wall, ceiling or partition surfaces.

**PC13.** install panels using concealed clips, adhesives, mechanical fasteners or interlocking systems.

**PC14.** align and secure panels to maintain uniformity, stability and smooth finishing.

**PC15.** integrate acoustic panels for enhanced sound absorption in designated spaces.

**PC16.** incorporate decorative woodwork such as moldings, carvings or laminated finishes.

**PC17.** apply expansion gaps to prevent warping due to temperature or humidity changes.

**PC18.** install fire-retardant or anti-bacterial coatings where required.

*Install Modular and Prefabricated Partition Systems*

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

PC19. assemble modular wooden partition panels in workshop settings for on-site installation.
PC20. use prefabricated interlocking wooden sections for quicker assembly.
PC21. incorporate built-in storage or shelving units within partition designs.
PC22. align and install modular partitions with minimal on-site cutting or modifications.
PC23. integrate sliding, folding, or movable partitions for adaptable interior layouts.

*Apply Finishing and Surface Treatments*

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

PC24. sand and smooth wooden partitions and panels before applying finishes.
PC25. apply stains, paints, polishes or sealants for enhanced durability and aesthetics.
PC26. integrate protective coatings for fire resistance, waterproofing or anti-termite protection.
PC27. ensure even coating application using brushes, rollers or spray techniques.
PC28. inspect final surface finish for defects, inconsistencies or unevenness.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of wood and engineered wood materials suitable for partitions and panels.
KU2. measuring and marking techniques for accurate layout and alignment.
KU3. fastening methods such as concealed clips, adhesives, nails and screws.
KU4. soundproofing and insulation techniques for interior wooden partitions.
KU5. finishing techniques including sanding, polishing and protective coatings.
KU6. expansion and contraction properties of wood in different environmental conditions.
KU7. safety precautions in handling and installing wooden components.
KU8. tools and equipment used for cutting, fastening and finishing wooden partitions.
KU9. structural reinforcement techniques for stability and durability.
KU10. quality control measures for inspecting alignment, durability and aesthetics.
KU11. sustainable wood sourcing and waste management practices in interior construction.

## 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 |
|---|---|---|---|---|
| *Set Up Interior Wooden Partitions* | 6 | 12 | - | 2 |
| PC1. select appropriate timber, plywood, MDF or engineered wood for partition construction. | - | - | - | - |
| PC2. measure and mark partition dimensions using precision tools. | - | - | - | - |
| PC3. cut wooden sections using saws, routers and CNC machines for accuracy. | - | - | - | - |
| PC4. assemble and secure wooden partition frames with mortise and tenon, dowel or screw joints. | - | - | - | - |
| PC5. integrate steel or aluminum reinforcements for enhanced durability. | - | - | - | - |
| PC6. align and fix partitions to walls, floors, and ceilings using brackets, adhesives and mechanical fasteners. | - | - | - | - |
| PC7. install adjustable or removable wooden partitions for flexible space management. | - | - | - | - |
| PC8. integrate soundproofing and insulation materials within partition cavities. | - | - | - | - |
| PC9. check vertical alignment and structural stability before finalizing installation. | - | - | - | - |
| *Install Wooden Panels* | 12 | 24 | - | 4 |
| PC10. select and source high-quality wooden panels suited for interior applications. | - | - | - | - |
| PC11. prepare and treat wooden panels with sanding, priming or moisture-proof coatings. | - | - | - | - |
| PC12. measure and cut panels to fit designated wall, ceiling or partition surfaces. | - | - | - | - |
| PC13. install panels using concealed clips, adhesives, mechanical fasteners or interlocking systems. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. align and secure panels to maintain uniformity, stability and smooth finishing. | - | - | - | - |
| PC15. integrate acoustic panels for enhanced sound absorption in designated spaces. | - | - | - | - |
| PC16. incorporate decorative woodwork such as moldings, carvings or laminated finishes. | - | - | - | - |
| PC17. apply expansion gaps to prevent warping due to temperature or humidity changes. | - | - | - | - |
| PC18. install fire-retardant or anti-bacterial coatings where required. | - | - | - | - |
| *Install Modular and Prefabricated Partition Systems* | 6 | 12 | - | 2 |
| PC19. assemble modular wooden partition panels in workshop settings for on-site installation. | - | - | - | - |
| PC20. use prefabricated interlocking wooden sections for quicker assembly. | - | - | - | - |
| PC21. incorporate built-in storage or shelving units within partition designs. | - | - | - | - |
| PC22. align and install modular partitions with minimal on-site cutting or modifications. | - | - | - | - |
| PC23. integrate sliding, folding, or movable partitions for adaptable interior layouts. | - | - | - | - |
| *Apply Finishing and Surface Treatments* | 6 | 12 | - | 2 |
| PC24. sand and smooth wooden partitions and panels before applying finishes. | - | - | - | - |
| PC25. apply stains, paints, polishes or sealants for enhanced durability and aesthetics. | - | - | - | - |
| PC26. integrate protective coatings for fire resistance, waterproofing or anti-termite protection. | - | - | - | - |
| PC27. ensure even coating application using brushes, rollers or spray techniques. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC28. inspect final surface finish for defects, inconsistencies or unevenness. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0510 |
| NOS Name | Install Interior Wooden Partitions and Panels |
| 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/N0511: Assemble and Dismantle Shuttering for Concreting

## Description

This unit covers the process of assembling and dismantling wooden and prefabricated formwork systems used in concreting.

## Scope

The scope covers the following :

- Construct wooden formwork for concrete structures
- Install formwork for various structural elements
- Use prefabricated shuttering methods
- Dismantle formwork after concrete curing

## Elements and Performance Criteria

*Construct Wooden Formwork for Concrete Structures*

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

**PC1.** select appropriate timber, plywood, or engineered wood for formwork construction.

**PC2.** measure and cut formwork components to required dimensions using hand tools and power tools.

**PC3.** assemble wooden panels, beams, and braces to create a sturdy framework for pouring concrete.

**PC4.** secure formwork components with nails, screws, or clamps to maintain shape and strength.

**PC5.** install bracing and support structures to prevent deformation during concreting.

*Install Formwork for Various Structural Elements*

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

**PC6.** position and secure wooden formwork for columns, beams, slabs, and walls.

**PC7.** ensure proper alignment and leveling using spirit levels and measuring tools.

**PC8.** adjust and reinforce joints to prevent leakage or displacement of concrete.

**PC9.** apply release agents to the inner surfaces of the formwork for easy removal.

*Use Prefabricated Shuttering Methods*

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

**PC10.** select and assemble modular prefabricated shuttering panels for rapid installation.

**PC11.** use aluminum, steel, or plastic-coated formwork for repeated usage.

**PC12.** integrate interlocking formwork systems for faster setup and dismantling.

**PC13.** adjust prefabricated panels to suit varying dimensions and design specifications.

*Dismantle Formwork after Concrete Curing*

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

**PC14.** remove temporary supports and fasteners systematically to avoid structural damage.

**PC15.** carefully detach wooden or prefabricated panels without chipping or cracking concrete.

PC16. clean and store reusable shuttering components for future use.
PC17. inspect formwork materials for wear and damage before reassembly.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. types of wood and engineered materials used in shuttering and formwork construction.
KU2. properties of concrete, including setting time, curing requirements, and load-bearing capacity.
KU3. methods for measuring, cutting, and assembling wooden formwork components.
KU4. techniques for securing and stabilizing formwork for different concrete structures.
KU5. prefabricated shuttering systems and their advantages in construction projects.
KU6. methods for adjusting prefabricated shuttering to suit project specifications.
KU7. common defects in formwork and their impact on concrete quality.
KU8. handling, maintenance, and storage of wooden and prefabricated formwork for reuse.
KU9. types of release agents and their application in preventing concrete adhesion to formwork.
KU10. tools and equipment used for cutting, assembling, and dismantling formwork.
KU11. different types of fasteners, connectors, and supports used in formwork assembly.
KU12. best practices for efficient dismantling to avoid damage to cured concrete.
KU13. techniques for inspecting formwork for signs of damage or deterioration.
KU14. factors affecting the reusability of shuttering materials.

## 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 |
|---|---|---|---|---|
| *Construct Wooden Formwork for Concrete Structures* | 6 | 15 | - | 2 |
| PC1. select appropriate timber, plywood, or engineered wood for formwork construction. | - | - | - | - |
| PC2. measure and cut formwork components to required dimensions using hand tools and power tools. | - | - | - | - |
| PC3. assemble wooden panels, beams, and braces to create a sturdy framework for pouring concrete. | - | - | - | - |
| PC4. secure formwork components with nails, screws, or clamps to maintain shape and strength. | - | - | - | - |
| PC5. install bracing and support structures to prevent deformation during concreting. | - | - | - | - |
| *Install Formwork for Various Structural Elements* | 8 | 15 | - | 3 |
| PC6. position and secure wooden formwork for columns, beams, slabs, and walls. | - | - | - | - |
| PC7. ensure proper alignment and leveling using spirit levels and measuring tools. | - | - | - | - |
| PC8. adjust and reinforce joints to prevent leakage or displacement of concrete. | - | - | - | - |
| PC9. apply release agents to the inner surfaces of the formwork for easy removal. | - | - | - | - |
| *Use Prefabricated Shuttering Methods* | 8 | 15 | - | 3 |
| PC10. select and assemble modular prefabricated shuttering panels for rapid installation. | - | - | - | - |
| PC11. use aluminum, steel, or plastic-coated formwork for repeated usage. | - | - | - | - |
| PC12. integrate interlocking formwork systems for faster setup and dismantling. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. adjust prefabricated panels to suit varying dimensions and design specifications. | - | - | - | - |
| *Dismantle Formwork after Concrete Curing* | 8 | 15 | - | 2 |
| PC14. remove temporary supports and fasteners systematically to avoid structural damage. | - | - | - | - |
| PC15. carefully detach wooden or prefabricated panels without chipping or cracking concrete. | - | - | - | - |
| PC16. clean and store reusable shuttering components for future use. | - | - | - | - |
| PC17. inspect formwork materials for wear and damage before reassembly. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0511 |
| NOS Name | Assemble and Dismantle Shuttering for Concreting |
| 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/N0512: Construct and Install Wooden Structural Features

## Description

This unit covers the construction and installation of various wooden structural elements, including staircases, railings, beams, and decorative wooden frameworks.

## Scope

The scope covers the following :

- Construct wooden staircases and landings
- Install wooden railings and balustrades
- Install wooden beams and load-bearing elements
- Assemble decorative wooden frameworks

## Elements and Performance Criteria

*Construct Wooden Staircases and Landings*

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

**PC1.** select appropriate wood types for staircase treads, risers, and stringers.

**PC2.** measure and cut wooden components according to staircase design and dimensions.

**PC3.** assemble and secure staircases using joinery techniques such as mortise and tenon or dovetail joints.

**PC4.** install supporting framework and reinforcements to ensure staircase stability.

*Install Wooden Railings and Balustrades*

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

**PC5.** measure and mark positions for railing posts, handrails, and balusters.

**PC6.** cut and shape wooden components to match the design specifications.

**PC7.** assemble and secure railings using wooden dowels, screws, or adhesives.

**PC8.** align and fasten balustrades to staircases or balconies with proper anchoring.

*Install Wooden Beams and Load-Bearing Elements*

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

**PC9.** cut and join wooden beams using traditional and modern woodworking methods.

**PC10.** assemble and install wooden load-bearing structures for ceilings and partitions.

**PC11.** reinforce beams with metal brackets or engineered wood supports for additional strength.

**PC12.** integrate prefabricated wooden structural components for faster installation.

*Assemble Decorative Wooden Frameworks*

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

**PC13.** cut and shape wooden components for aesthetic and architectural designs.

**PC14.** assemble wooden frameworks for ceilings, archways, and wall paneling.

**PC15.** install decorative wooden panels and moldings to enhance visual appeal.

**PC16.** use CNC precision cutting for intricate and customized wooden designs.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** basic properties of wood: grain structure, hardness, moisture content, and workability.
**KU2.** classification of wood types: hardwoods (e.g., teak, oak, mahogany) vs. softwoods (e.g., pine, cedar).
**KU3.** factors affecting wood selection for different applications.
**KU4.** seasoning and treatment of wood to improve durability.
**KU5.** measurement tools and techniques for accurate wood cutting and assembly.
**KU6.** methods for marking and layout for precision woodworking.
**KU7.** different types of saws (hand saws, circular saws, band saws) and their applications.
**KU8.** traditional woodworking joints: mortise and tenon, dovetail, lap joint, and tongue and groove.
**KU9.** modern joinery techniques using adhesives, dowels, and screws.
**KU10.** CNC precision cutting and assembly techniques for high-accuracy joinery.
**KU11.** fastening methods for securing structural wooden components.
**KU12.** load-bearing properties of wooden elements and their applications.
**KU13.** reinforcement techniques for wooden staircases, railings, and beams.
**KU14.** integration of engineered wood products such as laminated veneer lumber (LVL) and cross-laminated timber (CLT).
**KU15.** prefabricated wooden structural components for efficient installation.

## 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 |
|---|---|---|---|---|
| *Construct Wooden Staircases and Landings* | 6 | 15 | - | 2 |
| PC1. select appropriate wood types for staircase treads, risers, and stringers. | - | - | - | - |
| PC2. measure and cut wooden components according to staircase design and dimensions. | - | - | - | - |
| PC3. assemble and secure staircases using joinery techniques such as mortise and tenon or dovetail joints. | - | - | - | - |
| PC4. install supporting framework and reinforcements to ensure staircase stability. | - | - | - | - |
| *Install Wooden Railings and Balustrades* | 8 | 15 | - | 3 |
| PC5. measure and mark positions for railing posts, handrails, and balusters. | - | - | - | - |
| PC6. cut and shape wooden components to match the design specifications. | - | - | - | - |
| PC7. assemble and secure railings using wooden dowels, screws, or adhesives. | - | - | - | - |
| PC8. align and fasten balustrades to staircases or balconies with proper anchoring. | - | - | - | - |
| *Install Wooden Beams and Load-Bearing Elements* | 8 | 15 | - | 3 |
| PC9. cut and join wooden beams using traditional and modern woodworking methods. | - | - | - | - |
| PC10. assemble and install wooden load-bearing structures for ceilings and partitions. | - | - | - | - |
| PC11. reinforce beams with metal brackets or engineered wood supports for additional strength. | - | - | - | - |
| PC12. integrate prefabricated wooden structural components for faster installation. | - | - | - | - |
| *Assemble Decorative Wooden Frameworks* | 8 | 15 | - | 2 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. cut and shape wooden components for aesthetic and architectural designs. | - | - | - | - |
| PC14. assemble wooden frameworks for ceilings, archways, and wall paneling. | - | - | - | - |
| PC15. install decorative wooden panels and moldings to enhance visual appeal. | - | - | - | - |
| PC16. use CNC precision cutting for intricate and customized wooden designs. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0512 |
| NOS Name | Construct and Install Wooden Structural Features |
| 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/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 |

Qualification Pack

## 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 |

Qualification Pack

# 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** |

Qualification Pack

## 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 |

Qualification Pack

# 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** |

Qualification Pack

## 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 |

# ICE/CON/N0518: Prepare, Pour and Cure Concrete Structures

## Description

This unit covers the process of preparing, pouring, and curing concrete structures using both traditional and advanced concreting techniques.

## Scope

The scope covers the following :

- Read and interpret construction drawings
- Prepare materials and mix concrete
- Pour and place concrete
- Compact concrete
- Cure concrete

## Elements and Performance Criteria

*Read and Interpret Construction Drawings*

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

**PC1.** analyze structural blueprints to determine concrete specifications and reinforcement details.

**PC2.** identify load-bearing sections and reinforcement placements as per project requirements.

**PC3.** calculate the quantity of concrete required based on mix proportions and structural dimensions.

**PC4.** mark layout points for formwork placement using leveling tools and total stations.

*Prepare Materials and Mix Concrete*

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

**PC5.** select appropriate cement, aggregates, and admixtures based on strength and workability requirements.

**PC6.** measure and batch materials using weigh batching and volumetric batching methods.

**PC7.** mix concrete manually, mechanically, or using ready-mix concrete (RMC) plants for uniform consistency.

**PC8.** adjust water-cement ratios and incorporate plasticizers or retarders to improve workability.

**PC9.** test slump, workability, and consistency of concrete before pouring.

*Pour and Place Concrete*

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

**PC10.** transport concrete using wheelbarrows, pumps, or conveyors for efficient placement.

**PC11.** pour concrete in layers to avoid segregation and cold joints.

**PC12.** use self-compacting concrete (SCC) technology to eliminate the need for vibration.

**PC13.** apply slip-form and jump-form techniques for continuous concreting in high-rise structures.

**PC14.** embed reinforcement bars, anchor bolts, and conduits while placing concrete.

*Compact Concrete*

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

PC15. use mechanical vibrators such as needle, surface, and form vibrators to remove air voids.
PC16. ensure uniform compaction to prevent honeycombing and weak zones.
PC17. apply pressure grouting techniques for filling voids in hardened concrete.

*Cure Concrete*

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

PC18. apply traditional curing methods such as ponding, wet covering, and water spraying.
PC19. use curing compounds and self-curing concrete additives for moisture retention.
PC20. cover concrete with plastic sheets or wet burlap to prevent rapid moisture loss.
PC21. implement steam curing and accelerated curing methods for precast concrete elements.
PC22. monitor curing temperatures and maintain optimal moisture levels for hydration.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. properties and classification of different types of concrete, including normal, high-strength, and self-compacting concrete.
KU2. components of concrete mixtures and their roles, including cement, aggregates, water, and admixtures.
KU3. principles of mix design, including water-cement ratio, workability, and slump testing.
KU4. traditional and modern methods of concrete placement, including pumping and slip-form techniques.
KU5. importance of proper compaction in eliminating air pockets and increasing strength.
KU6. different curing techniques and their impact on concrete strength and durability.
KU7. impact of weather conditions on concrete setting and how to mitigate issues like shrinkage and cracking.
KU8. technological advancements in concrete construction, including high-performance concrete (HPC) and geopolymer concrete.
KU9. use of non-destructive testing methods such as ultrasonic pulse velocity (UPV) and rebound hammer for assessing concrete quality.
KU10. environmental considerations in concrete production, including the use of recycled aggregates and carbon capture technologies.

## 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 |
|---|---|---|---|---|
| *Read and Interpret Construction Drawings* | 6 | 12 | - | 2 |
| PC1. analyze structural blueprints to determine concrete specifications and reinforcement details. | - | - | - | - |
| PC2. identify load-bearing sections and reinforcement placements as per project requirements. | - | - | - | - |
| PC3. calculate the quantity of concrete required based on mix proportions and structural dimensions. | - | - | - | - |
| PC4. mark layout points for formwork placement using leveling tools and total stations. | - | - | - | - |
| *Prepare Materials and Mix Concrete* | 6 | 12 | - | 2 |
| PC5. select appropriate cement, aggregates, and admixtures based on strength and workability requirements. | - | - | - | - |
| PC6. measure and batch materials using weigh batching and volumetric batching methods. | - | - | - | - |
| PC7. mix concrete manually, mechanically, or using ready-mix concrete (RMC) plants for uniform consistency. | - | - | - | - |
| PC8. adjust water-cement ratios and incorporate plasticizers or retarders to improve workability. | - | - | - | - |
| PC9. test slump, workability, and consistency of concrete before pouring. | - | - | - | - |
| *Pour and Place Concrete* | 6 | 12 | - | 2 |
| PC10. transport concrete using wheelbarrows, pumps, or conveyors for efficient placement. | - | - | - | - |
| PC11. pour concrete in layers to avoid segregation and cold joints. | - | - | - | - |
| PC12. use self-compacting concrete (SCC) technology to eliminate the need for vibration. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. apply slip-form and jump-form techniques for continuous concreting in high-rise structures. | - | - | - | - |
| PC14. embed reinforcement bars, anchor bolts, and conduits while placing concrete. | - | - | - | - |
| *Compact Concrete* | 6 | 12 | - | 2 |
| PC15. use mechanical vibrators such as needle, surface, and form vibrators to remove air voids. | - | - | - | - |
| PC16. ensure uniform compaction to prevent honeycombing and weak zones. | - | - | - | - |
| PC17. apply pressure grouting techniques for filling voids in hardened concrete. | - | - | - | - |
| *Cure Concrete* | 6 | 12 | - | 2 |
| PC18. apply traditional curing methods such as ponding, wet covering, and water spraying. | - | - | - | - |
| PC19. use curing compounds and self-curing concrete additives for moisture retention. | - | - | - | - |
| PC20. cover concrete with plastic sheets or wet burlap to prevent rapid moisture loss. | - | - | - | - |
| PC21. implement steam curing and accelerated curing methods for precast concrete elements. | - | - | - | - |
| PC22. monitor curing temperatures and maintain optimal moisture levels for hydration. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0518 |
| NOS Name | Prepare, Pour and Cure Concrete Structures |
| 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/N0519: Perform Concreting for Structural Elements

## Description

This unit covers the process of constructing reinforced concrete structural elements, including floors, walls, and other load-bearing components.

## Scope

The scope covers the following :

- Construct reinforced concrete floors
- Use insulated concrete formwork (ICF)
- Construct beams and columns
- Apply high-performance concrete (HPC

## Elements and Performance Criteria

*Construct Reinforced Concrete Floors*

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

**PC1.** prepare formwork and reinforcement layout as per structural design.

**PC2.** place reinforcement bars, mesh, or fiber reinforcement for strength and crack resistance.

**PC3.** mix and pour concrete using appropriate workability and slump control.

**PC4.** compact concrete using mechanical vibrators to eliminate air pockets.

**PC5.** level and finish the surface using trowels, screeds, or power floaters

*Use Insulated Concrete Formwork (ICF)*

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

**PC6.** assemble insulated concrete formwork (ICF) for wall construction.

**PC7.** place reinforcement bars within ICF systems for structural integrity.

**PC8.** pour concrete into the ICF framework, ensuring uniform flow and consolidation.

**PC9.** remove excess air using vibration techniques to prevent voids and segregation.

**PC10.** allow concrete to cure within the insulated formwork for enhanced thermal efficiency.

*Construct Beams and Columns*

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

**PC11.** install temporary supports and scaffolding for load-bearing elements.

**PC12.** fix reinforcement cages inside beam and column formworks.

**PC13.** pour concrete in layers while ensuring even distribution around reinforcements.

**PC14.** monitor alignment and positioning using plumb bobs and laser levels.

**PC15.** cure concrete beams and columns using wet hessian cloth or membrane curing

*Apply High-Performance Concrete (HPC)*

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

**PC16.** mix high-performance concrete with silica fume, fly ash, or polymer additives.

**PC17.** use self-compacting concrete (SCC) to enhance workability and reduce segregation.

PC18. implement post-tensioning techniques for structural stability.
PC19. conduct non-destructive testing (NDT) to assess concrete strength and uniformity.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. structural behavior and load-bearing capacity of reinforced concrete elements.
KU2. properties of concrete and reinforcement materials used in floors, beams, columns, and walls.
KU3. techniques for installing insulated concrete formwork (ICF) and its advantages in thermal efficiency.
KU4. formwork types and best practices for constructing walls, floors, beams, and columns.
KU5. role of reinforcement in preventing tensile failures and improving durability.
KU6. principles of concrete pouring, leveling, and finishing for smooth and strong surfaces.
KU7. compaction techniques to eliminate voids and enhance strength.
KU8. curing methods and their impact on long-term performance of structural elements.
KU9. advanced concreting techniques, including self-compacting concrete (SCC) and high-performance concrete (HPC).
KU10. use of non-destructive testing (NDT) such as ultrasonic testing and core sampling to verify concrete quality

## 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 |
|---|---|---|---|---|
| *Construct Reinforced Concrete Floors* | 6 | 12 | - | 2 |
| PC1. prepare formwork and reinforcement layout as per structural design. | - | - | - | - |
| PC2. place reinforcement bars, mesh, or fiber reinforcement for strength and crack resistance. | - | - | - | - |
| PC3. mix and pour concrete using appropriate workability and slump control. | - | - | - | - |
| PC4. compact concrete using mechanical vibrators to eliminate air pockets. | - | - | - | - |
| PC5. level and finish the surface using trowels, screeds, or power floaters | - | - | - | - |
| *Use Insulated Concrete Formwork (ICF)* | 6 | 12 | - | 2 |
| PC6. assemble insulated concrete formwork (ICF) for wall construction. | - | - | - | - |
| PC7. place reinforcement bars within ICF systems for structural integrity. | - | - | - | - |
| PC8. pour concrete into the ICF framework, ensuring uniform flow and consolidation. | - | - | - | - |
| PC9. remove excess air using vibration techniques to prevent voids and segregation. | - | - | - | - |
| PC10. allow concrete to cure within the insulated formwork for enhanced thermal efficiency. | - | - | - | - |
| *Construct Beams and Columns* | 10 | 20 | - | 3 |
| PC11. install temporary supports and scaffolding for load-bearing elements. | - | - | - | - |
| PC12. fix reinforcement cages inside beam and column formworks. | - | - | - | - |
| PC13. pour concrete in layers while ensuring even distribution around reinforcements. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. monitor alignment and positioning using plumb bobs and laser levels. | - | - | - | - |
| PC15. cure concrete beams and columns using wet hessian cloth or membrane curing | - | - | - | - |
| *Apply High-Performance Concrete (HPC)* | 8 | 16 | - | 3 |
| PC16. mix high-performance concrete with silica fume, fly ash, or polymer additives. | - | - | - | - |
| PC17. use self-compacting concrete (SCC) to enhance workability and reduce segregation. | - | - | - | - |
| PC18. implement post-tensioning techniques for structural stability. | - | - | - | - |
| PC19. conduct non-destructive testing (NDT) to assess concrete strength and uniformity. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0519 |
| NOS Name | Perform Concreting for Structural Elements |
| 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/N0520: Carry Out Reinforced Concrete Works

## Description

This unit covers the process of executing reinforced concrete works to construct structural components such as beams, columns, slabs, and foundations.

## Scope

The scope covers the following :

- Prepare for reinforced concrete works
- Install and secure reinforcement materials
- Use fiber-reinforced concrete (FRC)
- Implement reinforcement techniques

## Elements and Performance Criteria

*Prepare for Reinforced Concrete Works*

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

**PC1.** select appropriate reinforcement materials, including steel bars, mesh, and fiber reinforcements.

**PC2.** measure and cut reinforcement bars and mesh to required lengths using cutting tools.

**PC3.** install shuttering and temporary supports for reinforced concrete components.

*Install and Secure Reinforcement Materials*

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

**PC4.** position reinforcement bars as per structural design and spacing requirements.

**PC5.** tie reinforcement bars using binding wire to maintain structural layout.

**PC6.** fix stirrups, spacers, and chairs to maintain proper concrete cover and alignment.

**PC7.** install reinforcement mesh or cages for slabs, beams, and columns.

**PC8.** apply mechanical couplers and lapping techniques for extended reinforcement bars.

*Use Fiber-Reinforced Concrete (FRC)*

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

**PC9.** select appropriate fiber types such as steel, glass, synthetic, or natural fibers.

**PC10.** mix fibers into concrete at specified proportions using manual or mechanical methods.

**PC11.** pour and place fiber-reinforced concrete in slabs, beams, and foundations.

**PC12.** compact fiber-reinforced concrete using vibrators to eliminate air voids.

**PC13.** monitor fiber distribution and ensure uniform dispersion during pouring.

*Implement Reinforcement Techniques*

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

**PC14.** apply post-tensioning systems for added strength in large structural elements.

**PC15.** use welded wire mesh for enhanced crack resistance in slabs and walls.

**PC16.** reinforce joints and corners with additional rebar or mesh layers.

PC17. integrate shear reinforcement for beams and columns to prevent failure.
PC18. inspect reinforcement layout before concreting to ensure compliance with design.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. properties of reinforcement materials such as steel bars, wire mesh, and fibers.
KU2. different types of fibers used in concrete, including steel, glass, polypropylene, and natural fibers.
KU3. principles of reinforcement placement to improve tensile strength and crack resistance.
KU4. methods of cutting, bending, and tying reinforcement bars.
KU5. importance of concrete cover and bar spacing for corrosion protection and structural stability.
KU6. techniques for mixing, placing, and compacting fiber-reinforced concrete (FRC).
KU7. applications of post-tensioning systems in structural concrete works.
KU8. quality control procedures for reinforcement installation and concrete pouring.
KU9. common defects in reinforced concrete works and corrective measures.
KU10. safety considerations in handling and installing reinforcement materials.

## 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 for Reinforced Concrete Works* | 6 | 12 | - | 2 |
| PC1. select appropriate reinforcement materials, including steel bars, mesh, and fiber reinforcements. | - | - | - | - |
| PC2. measure and cut reinforcement bars and mesh to required lengths using cutting tools. | - | - | - | - |
| PC3. install shuttering and temporary supports for reinforced concrete components. | - | - | - | - |
| *Install and Secure Reinforcement Materials* | 6 | 12 | - | 2 |
| PC4. position reinforcement bars as per structural design and spacing requirements. | - | - | - | - |
| PC5. tie reinforcement bars using binding wire to maintain structural layout. | - | - | - | - |
| PC6. fix stirrups, spacers, and chairs to maintain proper concrete cover and alignment. | - | - | - | - |
| PC7. install reinforcement mesh or cages for slabs, beams, and columns. | - | - | - | - |
| PC8. apply mechanical couplers and lapping techniques for extended reinforcement bars. | - | - | - | - |
| *Use Fiber-Reinforced Concrete (FRC)* | 10 | 20 | - | 3 |
| PC9. select appropriate fiber types such as steel, glass, synthetic, or natural fibers. | - | - | - | - |
| PC10. mix fibers into concrete at specified proportions using manual or mechanical methods. | - | - | - | - |
| PC11. pour and place fiber-reinforced concrete in slabs, beams, and foundations. | - | - | - | - |
| PC12. compact fiber-reinforced concrete using vibrators to eliminate air voids. | - | - | - | - |
| PC13. monitor fiber distribution and ensure uniform dispersion during pouring. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| *Implement Reinforcement Techniques* | 8 | 16 | - | 3 |
| PC14. apply post-tensioning systems for added strength in large structural elements. | - | - | - | - |
| PC15. use welded wire mesh for enhanced crack resistance in slabs and walls. | - | - | - | - |
| PC16. reinforce joints and corners with additional rebar or mesh layers. | - | - | - | - |
| PC17. integrate shear reinforcement for beams and columns to prevent failure. | - | - | - | - |
| PC18. inspect reinforcement layout before concreting to ensure compliance with design. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0520 |
| NOS Name | Carry Out Reinforced Concrete Works |
| 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/N0521: Repair and Restore Concrete Surfaces

## Description

This unit covers the techniques and processes involved in repairing and restoring concrete surfaces to maintain their structural integrity and aesthetics.

## Scope

The scope covers the following :

- Prepare concrete surfaces for repair
- Repair concrete surfaces using traditional methods
- Apply nano-concrete technology for surface repairs
- Perform crack sealing and surface refinishing

## Elements and Performance Criteria

*Prepare Concrete Surfaces for Repair*

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

**PC1.** inspect concrete surfaces for cracks, spalling, erosion and other defects.

**PC2.** identify causes of concrete deterioration such as water ingress, chemical exposure or structural stress.

**PC3.** clean damaged areas using mechanical or chemical methods to remove loose material.

**PC4.** mark and outline repair zones according to structural repair plans.

*Repair Concrete Surfaces Using Traditional Methods*

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

**PC5.** mix and apply cementitious repair mortar for minor surface damages.

**PC6.** perform patch repairs using rapid-setting concrete for small cracks and voids.

**PC7.** apply bonding agents and primers to enhance adhesion before repairs.

**PC8.** use formwork and shuttering techniques for deep repairs and re-casting damaged sections.

*Apply Nano-Concrete Technology for Surface Repairs*

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

**PC9.** mix and apply nano-concrete materials for enhanced durability and crack resistance.

**PC10.** use self-healing concrete mixtures infused with nano-particles for micro-crack sealing.

**PC11.** reinforce repaired areas with nano-coatings to improve water resistance and longevity.

**PC12.** apply advanced polymer-modified concrete for enhanced surface performance

*Perform Crack Sealing and Surface Refinishing*

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

**PC13.** inject epoxy or polyurethane sealants into deep cracks for structural reinforcement.

**PC14.** apply flexible sealants for expansion joints and surface movement cracks.

**PC15.** grind and smooth repaired areas to match surrounding surfaces.

**PC16.** use high-performance coatings and resurfacing compounds for final finishing.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** types and causes of concrete damage, including cracking, spalling, and surface wear.
**KU2.** properties of cementitious and polymer-based repair materials.
**KU3.** techniques for assessing structural damage in concrete.
**KU4.** methods of crack repair, including epoxy injection, routing, and sealing.
**KU5.** principles of nano-concrete technology and its applications in concrete restoration.
**KU6.** advantages of self-healing concrete and nano-modified repair materials.
**KU7.** importance of surface preparation for effective adhesion of repair materials.
**KU8.** different types of concrete coatings and finishing techniques for durability and aesthetics.
**KU9.** tools and equipment used for repairing and refinishing concrete surfaces.
**KU10.** factors affecting the longevity of repaired concrete surfaces and methods to enhance durability.

## 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 Concrete Surfaces for Repair* | 6 | 12 | - | 2 |
| PC1. inspect concrete surfaces for cracks, spalling, erosion and other defects. | - | - | - | - |
| PC2. identify causes of concrete deterioration such as water ingress, chemical exposure or structural stress. | - | - | - | - |
| PC3. clean damaged areas using mechanical or chemical methods to remove loose material. | - | - | - | - |
| PC4. mark and outline repair zones according to structural repair plans. | - | - | - | - |
| *Repair Concrete Surfaces Using Traditional Methods* | 6 | 12 | - | 2 |
| PC5. mix and apply cementitious repair mortar for minor surface damages. | - | - | - | - |
| PC6. perform patch repairs using rapid-setting concrete for small cracks and voids. | - | - | - | - |
| PC7. apply bonding agents and primers to enhance adhesion before repairs. | - | - | - | - |
| PC8. use formwork and shuttering techniques for deep repairs and re-casting damaged sections. | - | - | - | - |
| *Apply Nano-Concrete Technology for Surface Repairs* | 10 | 20 | - | 3 |
| PC9. mix and apply nano-concrete materials for enhanced durability and crack resistance. | - | - | - | - |
| PC10. use self-healing concrete mixtures infused with nano-particles for micro-crack sealing. | - | - | - | - |
| PC11. reinforce repaired areas with nano-coatings to improve water resistance and longevity. | - | - | - | - |
| PC12. apply advanced polymer-modified concrete for enhanced surface performance | - | - | - | - |
| *Perform Crack Sealing and Surface Refinishing* | 8 | 16 | - | 3 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. inject epoxy or polyurethane sealants into deep cracks for structural reinforcement. | - | - | - | - |
| PC14. apply flexible sealants for expansion joints and surface movement cracks. | - | - | - | - |
| PC15. grind and smooth repaired areas to match surrounding surfaces. | - | - | - | - |
| PC16. use high-performance coatings and resurfacing compounds for final finishing. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0521 |
| NOS Name | Repair and Restore Concrete Surfaces |
| 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/N0522: Construct and Install Precast Concrete Structures

## Description

This unit focuses on the processes involved in manufacturing, transporting, and installing precast concrete structures.

## Scope

The scope covers the following :

- Construct precast concrete elements
- Transport and handle precast elements
- Install precast concrete structures
- Ensure quality control in precast installation

## Elements and Performance Criteria

*Construct Precast Concrete Elements*

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

**PC1.** prepare and assemble formwork for casting precast concrete components.

**PC2.** mix and pour concrete into molds, ensuring proper vibration to remove air pockets.

**PC3.** use high-performance concrete mixes for strength and durability.

**PC4.** apply curing techniques such as steam curing to enhance early strength.

**PC5.** demold precast components safely without causing surface damage.

*Transport and Handle Precast Elements*

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

**PC6.** lift and move precast components using cranes, slings, and lifting anchors.

**PC7.** ensure proper stacking and securing of precast elements during transportation.

**PC8.** use protective coverings and supports to prevent damage during handling.

**PC9.** follow weight distribution guidelines to maintain load balance during transit.

*Install Precast Concrete Structures*

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

**PC10.** position precast elements using laser alignment and precision measurement tools.

**PC11.** secure precast components using dowels, grout, or mechanical connections.

**PC12.** apply post-installation finishing, including joint sealing and surface treatments.

**PC13.** ensure structural alignment and level adjustments before final fixing.

*Ensure Quality Control in Precast Installation*

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

**PC14.** inspect precast components for cracks, voids, or dimensional deviations.

**PC15.** verify reinforcement placement and curing compliance before installation.

**PC16.** test load-bearing capacity of installed precast structures.

**PC17.** document installation procedures and maintain records for compliance.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** types of precast concrete elements, including panels, beams, slabs, and columns.
**KU2.** properties of precast concrete and advantages over in-situ concrete.
**KU3.** formwork design and casting techniques for precast manufacturing.
**KU4.** methods of reinforcement placement and curing in precast production.
**KU5.** handling and lifting procedures for heavy precast elements.
**KU6.** principles of alignment, leveling, and joining in precast installation.
**KU7.** different types of precast connection systems, including grouted and mechanical joints.
**KU8.** quality control measures to assess strength, durability, and finish of precast elements.
**KU9.** tools and machinery used for installing and securing precast components.
**KU10.** safety procedures related to lifting, transportation, and installation of precast structures.

## 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 |
|---|---|---|---|---|
| *Construct Precast Concrete Elements* | 6 | 12 | - | 2 |
| PC1. prepare and assemble formwork for casting precast concrete components. | - | - | - | - |
| PC2. mix and pour concrete into molds, ensuring proper vibration to remove air pockets. | - | - | - | - |
| PC3. use high-performance concrete mixes for strength and durability. | - | - | - | - |
| PC4. apply curing techniques such as steam curing to enhance early strength. | - | - | - | - |
| PC5. demold precast components safely without causing surface damage. | - | - | - | - |
| *Transport and Handle Precast Elements* | 6 | 12 | - | 2 |
| PC6. lift and move precast components using cranes, slings, and lifting anchors. | - | - | - | - |
| PC7. ensure proper stacking and securing of precast elements during transportation. | - | - | - | - |
| PC8. use protective coverings and supports to prevent damage during handling. | - | - | - | - |
| PC9. follow weight distribution guidelines to maintain load balance during transit. | - | - | - | - |
| *Install Precast Concrete Structures* | 10 | 20 | - | 3 |
| PC10. position precast elements using laser alignment and precision measurement tools. | - | - | - | - |
| PC11. secure precast components using dowels, grout, or mechanical connections. | - | - | - | - |
| PC12. apply post-installation finishing, including joint sealing and surface treatments. | - | - | - | - |
| PC13. ensure structural alignment and level adjustments before final fixing. | - | - | - | - |
| *Ensure Quality Control in Precast Installation* | 8 | 16 | - | 3 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. inspect precast components for cracks, voids, or dimensional deviations. | - | - | - | - |
| PC15. verify reinforcement placement and curing compliance before installation. | - | - | - | - |
| PC16. test load-bearing capacity of installed precast structures. | - | - | - | - |
| PC17. document installation procedures and maintain records for compliance. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0522 |
| NOS Name | Construct and Install Precast Concrete Structures |
| 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 |

Qualification Pack

# ICE/CON/N0523: Cut, Shape and Install Sheet Metal Structures

## Description

This unit covers the essential processes involved in cutting, shaping, and assembling sheet metal components for construction and structural applications.

## Scope

The scope covers the following :

- Interpret drawings and prepare sheet metal material
- Cut and shape sheet metal components
- Assemble and join sheet metal structures
- Install and finish sheet metal structures

## Elements and Performance Criteria

*Interpret Drawings and Prepare Sheet Metal Materials*

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

**PC1.** read and interpret technical drawings and blueprints for sheet metal fabrication.

**PC2.** measure and mark metal sheets using scribers, calipers, and templates.

**PC3.** select appropriate sheet metal materials based on project requirements.

**PC4.** ensure surface preparation, including cleaning and deburring before fabrication.

*Cut and Shape Sheet Metal Components*

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

**PC5.** cut sheet metal using hand tools such as snips, shears, and hacksaws.

**PC6.** operate CNC plasma, laser, or waterjet cutting machines for precision cutting.

**PC7.** bend and form sheet metal using press brakes and rolling machines.

**PC8.** use jigs, molds, and templates for shaping curved and complex components.

*Assemble and Join Sheet Metal Structures*

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

**PC9.** align and position sheet metal components according to specifications.

**PC10.** perform mechanical fastening using rivets, bolts, and screws.

**PC11.** weld sheet metal parts using TIG, MIG, and spot welding techniques.

**PC12.** apply soldering and brazing for non-ferrous sheet metal joints.

*Install and Finish Sheet Metal Structures*

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

**PC13.** secure sheet metal panels onto structural frames using adhesive bonding or fasteners.

**PC14.** apply surface treatments such as galvanizing, powder coating, or anti-rust sprays.

**PC15.** inspect and test fabricated sheet metal components for alignment and durability.

**PC16.** carry out minor repairs and adjustments for proper fitting.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** types of sheet metals, including aluminum, stainless steel, and galvanized sheets.
**KU2.** properties of different sheet metals and their applications in construction.
**KU3.** blueprint reading and interpretation for fabrication processes.
**KU4.** measurement techniques and tools used in sheet metal work.
**KU5.** cutting methods, including manual, mechanical, and CNC-based techniques.
**KU6.** bending and forming techniques using press brakes and rollers.
**KU7.** joining methods such as welding, riveting, soldering, and bolting.
**KU8.** fastening systems and adhesive bonding for sheet metal structures.
**KU9.** finishing techniques, including polishing, coating, and rust prevention.
**KU10.** handling, storage, and safety precautions in sheet metal fitting.

## 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 |
|---|---|---|---|---|
| *Interpret Drawings and Prepare Sheet Metal Materials* | 6 | 12 | - | 2 |
| PC1. read and interpret technical drawings and blueprints for sheet metal fabrication. | - | - | - | - |
| PC2. measure and mark metal sheets using scribers, calipers, and templates. | - | - | - | - |
| PC3. select appropriate sheet metal materials based on project requirements. | - | - | - | - |
| PC4. ensure surface preparation, including cleaning and deburring before fabrication. | - | - | - | - |
| *Cut and Shape Sheet Metal Components* | 6 | 12 | - | 2 |
| PC5. cut sheet metal using hand tools such as snips, shears, and hacksaws. | - | - | - | - |
| PC6. operate CNC plasma, laser, or waterjet cutting machines for precision cutting. | - | - | - | - |
| PC7. bend and form sheet metal using press brakes and rolling machines. | - | - | - | - |
| PC8. use jigs, molds, and templates for shaping curved and complex components. | - | - | - | - |
| *Assemble and Join Sheet Metal Structures* | 10 | 20 | - | 3 |
| PC9. align and position sheet metal components according to specifications. | - | - | - | - |
| PC10. perform mechanical fastening using rivets, bolts, and screws. | - | - | - | - |
| PC11. weld sheet metal parts using TIG, MIG, and spot welding techniques. | - | - | - | - |
| PC12. apply soldering and brazing for non-ferrous sheet metal joints. | - | - | - | - |
| *Install and Finish Sheet Metal Structures* | 8 | 16 | - | 3 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. secure sheet metal panels onto structural frames using adhesive bonding or fasteners. | - | - | - | - |
| PC14. apply surface treatments such as galvanizing, powder coating, or anti-rust sprays. | - | - | - | - |
| PC15. inspect and test fabricated sheet metal components for alignment and durability. | - | - | - | - |
| PC16. carry out minor repairs and adjustments for proper fitting. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0523 |
| NOS Name | Cut, Shape and Install Sheet Metal Structures |
| 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 |

Qualification Pack

# ICE/CON/N0524: Assemble and Fabricate Sheet Metal Structures Using Advanced Techniques

## Description

This unit focuses on assembling sheet metal components to create structural and non structural assemblies using traditional and advanced welding and joining techniques.

## Scope

The scope covers the following :

- Prepare sheet metal components for assembly
- Assemble sheet metal components
- Ensure structural integrity and alignment of assembled components
- Optimize automated welding and assembly systems

## Elements and Performance Criteria

*Prepare Sheet Metal Components for Assembly*

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

**PC1.** measure, mark, and cut sheet metal parts according to specifications.

**PC2.** remove burrs, rust, and surface contaminants for proper fitting.

**PC3.** align and position components using jigs, clamps, and fixtures.

**PC4.** select appropriate joining methods based on material type and application.

*Assemble Sheet Metal Components*

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

**PC5.** use mechanical fastening methods such as riveting, bolting, and clinching.

**PC6.** apply adhesive bonding techniques for non-welded assembly.

**PC7.** perform manual welding techniques such as MIG, TIG, and spot welding.

**PC8.** integrate robotic welding systems for precision and efficiency in large-scale assembly.

*Ensure Structural Integrity and Alignment of Assembled Components*

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

**PC9.** check for dimensional accuracy and fitment before final joining.

**PC10.** use laser alignment tools and digital measurement techniques.

**PC11.** reinforce joints with additional support structures when required.

**PC12.** conduct non-destructive testing (NDT) such as ultrasonic or X-ray inspection.

*Optimize Automated Welding and Assembly Systems*

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

**PC13.** set up and calibrate robotic welding equipment for automated operations.

**PC14.** monitor real-time data and adjust settings for quality control.

**PC15.** apply AI-assisted welding techniques to enhance precision and reduce material wastage.

**PC16.** troubleshoot common issues in automated welding and assembly processes.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** principles of sheet metal assembly and fabrication.
**KU2.** types of welding techniques, including MIG, TIG, spot welding, and robotic welding.
**KU3.** mechanical fastening methods such as riveting, bolting, and clinching.
**KU4.** adhesive bonding technologies for metal-to-metal and composite joining.
**KU5.** robotic and automated welding systems and their applications.
**KU6.** laser alignment and precision measurement techniques in metal assembly.
**KU7.** non-destructive testing (NDT) methods for evaluating joint integrity.
**KU8.** metal properties and their impact on welding and joining methods.
**KU9.** quality control parameters and troubleshooting in automated metal fabrication.

## 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 Sheet Metal Components for Assembly* | 6 | 12 | - | 2 |
| PC1. measure, mark, and cut sheet metal parts according to specifications. | - | - | - | - |
| PC2. remove burrs, rust, and surface contaminants for proper fitting. | - | - | - | - |
| PC3. align and position components using jigs, clamps, and fixtures. | - | - | - | - |
| PC4. select appropriate joining methods based on material type and application. | - | - | - | - |
| *Assemble Sheet Metal Components* | 6 | 12 | - | 2 |
| PC5. use mechanical fastening methods such as riveting, bolting, and clinching. | - | - | - | - |
| PC6. apply adhesive bonding techniques for non-welded assembly. | - | - | - | - |
| PC7. perform manual welding techniques such as MIG, TIG, and spot welding. | - | - | - | - |
| PC8. integrate robotic welding systems for precision and efficiency in large-scale assembly. | - | - | - | - |
| *Ensure Structural Integrity and Alignment of Assembled Components* | 10 | 20 | - | 3 |
| PC9. check for dimensional accuracy and fitment before final joining. | - | - | - | - |
| PC10. use laser alignment tools and digital measurement techniques. | - | - | - | - |
| PC11. reinforce joints with additional support structures when required. | - | - | - | - |
| PC12. conduct non-destructive testing (NDT) such as ultrasonic or X-ray inspection. | - | - | - | - |
| *Optimize Automated Welding and Assembly Systems* | 8 | 16 | - | 3 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. set up and calibrate robotic welding equipment for automated operations. | - | - | - | - |
| PC14. monitor real-time data and adjust settings for quality control. | - | - | - | - |
| PC15. apply AI-assisted welding techniques to enhance precision and reduce material wastage. | - | - | - | - |
| PC16. troubleshoot common issues in automated welding and assembly processes. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0524 |
| NOS Name | Assemble and Fabricate Sheet Metal Structures Using Advanced Techniques |
| 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/N0525: Apply Surface Treatments and Coatings to Sheet Metal

## Description

This unit covers the processes involved in applying surface treatments and protective coatings to sheet metal components.

## Scope

The scope covers the following :

- Prepare sheet metal surfaces for coating applications
- Apply protective coatings to sheet metal
- Ensure even application and curing of coatings
- Enhance sheet metal properties using nanotechnology

## Elements and Performance Criteria

*Prepare Sheet Metal Surfaces for Coating Applications*

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

**PC1.** clean and remove dirt, grease and oxides from metal surfaces.

**PC2.** use mechanical, chemical or abrasive methods for surface preparation.

**PC3.** apply primers and base coatings to enhance coating adhesion.

**PC4.** ensure proper surface roughness and profile before coating.

*Apply Protective Coatings to Sheet Metal*

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

**PC5.** use traditional coating methods such as painting, powder coating, and anodizing.

**PC6.** apply nano coatings for enhanced surface properties such as hydrophobicity and UV resistance.

**PC7.** perform electroplating and galvanizing to improve corrosion resistance.

**PC8.** coat metal surfaces with heat-reflective and self-cleaning materials.

*Ensure Even Application and Curing of Coatings*

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

**PC9.** operate spray guns, dip-coating systems or automated application equipment.

**PC10.** control coating thickness and uniformity for functional and aesthetic requirements.

**PC11.** ensure proper curing through air drying, baking or UV exposure.

**PC12.** inspect finished coatings for defects such as bubbles, cracks or uneven layers.

*Enhance Sheet Metal Properties Using Nano-Technology*

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

**PC13.** apply nano-polymer coatings for improved chemical and mechanical resistance.

**PC14.** use anti-fingerprint and self-healing coatings for high-traffic surfaces.

**PC15.** integrate conductive coatings for electromagnetic shielding applications.

**PC16.** test coated surfaces for adherence, wear resistance and environmental durability.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** principles of surface treatment and coating applications for sheet metal.
**KU2.** types of coatings, including paint, powder coat, anodized finishes and electroplating.
**KU3.** properties of nanocoatings and their advantages over conventional coatings.
**KU4.** surface preparation techniques, including chemical cleaning, sandblasting and etching.
**KU5.** application methods such as spray, dip, electrostatic and roll-coating.
**KU6.** curing methods and their impact on coating durability.
**KU7.** methods for testing adhesion, wear resistance and environmental exposure of coatings.
**KU8.** safety precautions for handling coating chemicals and operating application equipment.
**KU9.** maintenance and reapplication of protective coatings over time.

## 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 Sheet Metal Surfaces for Coating Applications* | 6 | 12 | - | 2 |
| PC1. clean and remove dirt, grease and oxides from metal surfaces. | - | - | - | - |
| PC2. use mechanical, chemical or abrasive methods for surface preparation. | - | - | - | - |
| PC3. apply primers and base coatings to enhance coating adhesion. | - | - | - | - |
| PC4. ensure proper surface roughness and profile before coating. | - | - | - | - |
| *Apply Protective Coatings to Sheet Metal* | 6 | 12 | - | 2 |
| PC5. use traditional coating methods such as painting, powder coating, and anodizing. | - | - | - | - |
| PC6. apply nano coatings for enhanced surface properties such as hydrophobicity and UV resistance. | - | - | - | - |
| PC7. perform electroplating and galvanizing to improve corrosion resistance. | - | - | - | - |
| PC8. coat metal surfaces with heat-reflective and self-cleaning materials. | - | - | - | - |
| *Ensure Even Application and Curing of Coatings* | 10 | 20 | - | 3 |
| PC9. operate spray guns, dip-coating systems or automated application equipment. | - | - | - | - |
| PC10. control coating thickness and uniformity for functional and aesthetic requirements. | - | - | - | - |
| PC11. ensure proper curing through air drying, baking or UV exposure. | - | - | - | - |
| PC12. inspect finished coatings for defects such as bubbles, cracks or uneven layers. | - | - | - | - |
| *Enhance Sheet Metal Properties Using Nano-Technology* | 8 | 16 | - | 3 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. apply nano-polymer coatings for improved chemical and mechanical resistance. | - | - | - | - |
| PC14. use anti-fingerprint and self-healing coatings for high-traffic surfaces. | - | - | - | - |
| PC15. integrate conductive coatings for electromagnetic shielding applications. | - | - | - | - |
| PC16. test coated surfaces for adherence, wear resistance and environmental durability. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0525 |
| NOS Name | Apply Surface Treatments and Coatings to Sheet Metal |
| 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/N0526: Ensure Quality Control and Precision in Sheet Metal Fabrication

## Description

This unit covers quality control measures and precision techniques in sheet metal fabrication to ensure defect-free production.

## Scope

The scope covers the following :

- Perform checks on fabricated sheet metal components
- Conduct visual and non-destructive testing
- Apply precision techniques

## Elements and Performance Criteria

*Perform Checks on Fabricated Sheet Metal Components*

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

**PC1.** measure and verify dimensions using calipers, micrometers and coordinate measuring machines (CMM).

**PC2.** ensure sheet metal parts meet specified tolerances and geometric accuracy.

**PC3.** inspect edges, bends, and weld joints for consistency.

**PC4.** adjust fabrication processes based on measurement deviations.

*Conduct Visual and Non-Destructive Testing*

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

**PC5.** inspect surfaces for scratches, dents and corrosion.

**PC6.** perform ultrasonic, X-ray and dye penetrant testing for weld integrity.

**PC7.** detect micro-cracks, porosity and structural weaknesses.

**PC8.** use thermal imaging techniques to assess material stress and defects.

*Apply Precision Techniques*

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

**PC9.** calibrate and maintain CNC cutting, bending and punching machines.

**PC10.** use laser and waterjet cutting for precision edge finishing.

**PC11.** implement AI-based quality inspection systems for real-time error detection.

**PC12.** optimize robotic welding processes to reduce defects and rework.

*Maintain Quality Control Documentation and Compliance Records*

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

**PC13.** record inspection data and deviations in digital quality logs.

**PC14.** analyze production reports for process improvements.

**PC15.** ensure compliance as per Bureau of Indian Standards Code (e.g: ISO 9001).

**PC16.** implement corrective actions for recurring fabrication issues.

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** principles of quality control in sheet metal fabrication.
**KU2.** types of measurement tools: calipers, micrometers, laser scanners, and CMM.
**KU3.** non-destructive testing (NDT) methods for weld and surface inspections.
**KU4.** precision cutting techniques: CNC, laser, and waterjet cutting.
**KU5.** AI-based inspection systems and real-time defect detection.
**KU6.** common defects in sheet metal fabrication and their causes.
**KU7.** industry standards and compliance requirements for quality assurance.
**KU8.** documentation and reporting procedures for quality control records.
**KU9.** Corrective And Preventive Action (CAPA) methodologies in metalworking.

## 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 |
|---|---|---|---|---|
| *Perform Checks on Fabricated Sheet Metal Components* | 6 | 12 | - | 2 |
| PC1. measure and verify dimensions using calipers, micrometers and coordinate measuring machines (CMM). | - | - | - | - |
| PC2. ensure sheet metal parts meet specified tolerances and geometric accuracy. | - | - | - | - |
| PC3. inspect edges, bends, and weld joints for consistency. | - | - | - | - |
| PC4. adjust fabrication processes based on measurement deviations. | - | - | - | - |
| *Conduct Visual and Non-Destructive Testing* | 6 | 12 | - | 2 |
| PC5. inspect surfaces for scratches, dents and corrosion. | - | - | - | - |
| PC6. perform ultrasonic, X-ray and dye penetrant testing for weld integrity. | - | - | - | - |
| PC7. detect micro-cracks, porosity and structural weaknesses. | - | - | - | - |
| PC8. use thermal imaging techniques to assess material stress and defects. | - | - | - | - |
| *Apply Precision Techniques* | 10 | 20 | - | 3 |
| PC9. calibrate and maintain CNC cutting, bending and punching machines. | - | - | - | - |
| PC10. use laser and waterjet cutting for precision edge finishing. | - | - | - | - |
| PC11. implement AI-based quality inspection systems for real-time error detection. | - | - | - | - |
| PC12. optimize robotic welding processes to reduce defects and rework. | - | - | - | - |
| *Maintain Quality Control Documentation and Compliance Records* | 8 | 16 | - | 3 |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC13. record inspection data and deviations in digital quality logs. | - | - | - | - |
| PC14. analyze production reports for process improvements. | - | - | - | - |
| PC15. ensure compliance as per Bureau of Indian Standards Code (e.g: ISO 9001). | - | - | - | - |
| PC16. implement corrective actions for recurring fabrication issues. | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0526 |
| NOS Name | Ensure Quality Control and Precision in Sheet 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 |

Qualification Pack

# ICE/CON/N0527: Assemble Aluminium Formwork Systems

## Description

This unit covers the assembly of aluminium formwork systems (Mivan shuttering) using automated alignment and positioning tools.

## Scope

The scope covers the following :

- Prepare and organize aluminium formwork components
- Assemble aluminium formwork panels into modular units
- Use automated tools for precise alignment and positioning
- Secure and reinforce aluminium formwork structures

## Elements and Performance Criteria

*Prepare and Organize Aluminium Formwork Components*

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

**PC1.** inspect and sort formwork panels based on design specifications.

**PC2.** transport and position panels using mechanical lifting aids.

**PC3.** align formwork panels according to layout drawings.

**PC4.** ensure interlocking and secure connections between panels.

*Assemble Aluminium Formwork Panels into Modular Units*

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

**PC5.** align panels according to design specifications using manual and mechanical positioning.

**PC6.** connect panels using locking pins, wedges, and tie rods for structural stability.

**PC7.** verify interlocking mechanisms to prevent misalignment during handling.

**PC8.** ensure proper joint sealing to prevent concrete leakage during later stages.

*Use Automated Tools for Precise Alignment and Positioning*

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

**PC9.** operate laser alignment systems for vertical and horizontal accuracy.

**PC10.** adjust formwork panels using hydraulic and pneumatic positioning tools.

**PC11.** integrate digital levelling sensors for real-time monitoring.

**PC12.** ensure proper spacing for reinforcement bars and concrete pouring.

*Perform Preliminary Stability and Alignment Checks*

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

**PC13.** inspect completed formwork modules for alignment accuracy.

**PC14.** adjust panel spacing to accommodate reinforcement bars.

**PC15.** verify that all fasteners and support systems are securely attached.

**PC16.** prepare assembled units for transport to the construction site.

**PC17.** verify panel dimensions, surface finish, and locking mechanisms before assembly

PC18. inspect automated alignment and positioning tool calibration to ensure precision
PC19. conduct trial assembly to check panel fitment before final installation

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. fundamentals of aluminium formwork (Mivan shuttering) systems.
KU2. components and interlocking mechanisms of modular aluminium formwork.
KU3. principles of alignment and positioning in formwork assembly.
KU4. tools and equipment for assembling aluminium panels.
KU5. laser-guided and automated alignment techniques.
KU6. hydraulic and pneumatic adjustment methods.
KU7. pre-installation checks for formwork stability.
KU8. importance of modular assembly for efficient site installation.

## 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 Organize Aluminium Formwork Components* | 6 | 12 | - | 2 |
| PC1. inspect and sort formwork panels based on design specifications. | - | - | - | - |
| PC2. transport and position panels using mechanical lifting aids. | - | - | - | - |
| PC3. align formwork panels according to layout drawings. | - | - | - | - |
| PC4. ensure interlocking and secure connections between panels. | - | - | - | - |
| *Assemble Aluminium Formwork Panels into Modular Units* | 6 | 12 | - | 2 |
| PC5. align panels according to design specifications using manual and mechanical positioning. | - | - | - | - |
| PC6. connect panels using locking pins, wedges, and tie rods for structural stability. | - | - | - | - |
| PC7. verify interlocking mechanisms to prevent misalignment during handling. | - | - | - | - |
| PC8. ensure proper joint sealing to prevent concrete leakage during later stages. | - | - | - | - |
| *Use Automated Tools for Precise Alignment and Positioning* | 10 | 20 | - | 3 |
| PC9. operate laser alignment systems for vertical and horizontal accuracy. | - | - | - | - |
| PC10. adjust formwork panels using hydraulic and pneumatic positioning tools. | - | - | - | - |
| PC11. integrate digital levelling sensors for real-time monitoring. | - | - | - | - |
| PC12. ensure proper spacing for reinforcement bars and concrete pouring. | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| *Perform Preliminary Stability and Alignment Checks* | 8 | 16 | - | 3 |
| PC13. inspect completed formwork modules for alignment accuracy. | - | - | - | - |
| PC14. adjust panel spacing to accommodate reinforcement bars. | - | - | - | - |
| PC15. verify that all fasteners and support systems are securely attached. | - | - | - | - |
| PC16. prepare assembled units for transport to the construction site. | - | - | - | - |
| PC17. verify panel dimensions, surface finish, and locking mechanisms before assembly | - | - | - | - |
| PC18. inspect automated alignment and positioning tool calibration to ensure precision | - | - | - | - |
| PC19. conduct trial assembly to check panel fitment before final installation | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0527 |
| NOS Name | Assemble Aluminium Formwork 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 |

Qualification Pack

# ICE/CON/N0528: Install and Secure Aluminium Formwork on Construction Sites

## Description

This unit covers the process of installing and securing Mivan aluminium formwork for walls, columns, beams, and slabs at construction sites.

## Scope

The scope covers the following :

- Prepare the site and position formwork panels
- Assemble and secure formwork components
- Apply necessary treatments and reinforcements
- Inspect and finalize installation

## Elements and Performance Criteria

*Prepare the Site and Position Formwork Panels*

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

**PC1.** prepare the site by ensuring clean, level, and stable ground conditions

**PC2.** transport and handle Mivan aluminium panels using safe lifting techniques

**PC3.** position formwork panels according to construction drawings and alignment marks

*Assemble and Secure Formwork Components*

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

**PC4.** interlock panels securely using tie rods, pins, wedges, and props

**PC5.** install formwork supports, kicker plates, and braces for stability

**PC6.** ensure proper vertical and horizontal alignment using laser-guided tools

*Apply Necessary Treatments and Reinforcements*

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

**PC7.** apply release agents to prevent concrete adhesion to aluminium panels

**PC8.** check and reinforce joints and panel connections to prevent leakage

**PC9.** integrate service conduits, openings, and inserts within the formwork system

*Inspect and Finalize Installation*

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

**PC10.** verify the rigidity and strength of the installed formwork before concrete pouring

**PC11.** conduct final alignment checks and adjustments using precision measuring tools

**PC12.** confirm compliance with construction drawings and load-bearing requirements

**PC13.** check panel-to-panel connections, tie rods, and bracing systems for stability

**PC14.** use laser alignment tools to ensure proper verticality and leveling

**PC15.** verify sealing of form joints to prevent concrete leakage and misalignment

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** principles of Mivan aluminium formwork technology and its benefits over conventional shuttering
**KU2.** different components of Mivan formwork (panels, beams, decks, kickers, pins, wedges, etc.)
**KU3.** methods for handling, assembling, and securing aluminium formwork panels
**KU4.** techniques for alignment, leveling, and bracing to ensure structural stability
**KU5.** application and benefits of form release agents to prevent concrete adhesion
**KU6.** troubleshooting common issues like deflection, leakage, or misalignment
**KU7.** integration of service conduits and embedded components within the formwork
**KU8.** procedures for final inspection and necessary adjustments before pouring concrete
**KU9.** operation and usage of mechanized lifting tools for positioning aluminium panels

## 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 the Site and Position Formwork Panels* | 6 | 12 | - | 2 |
| PC1. prepare the site by ensuring clean, level, and stable ground conditions | - | - | - | - |
| PC2. transport and handle Mivan aluminium panels using safe lifting techniques | - | - | - | - |
| PC3. position formwork panels according to construction drawings and alignment marks | - | - | - | - |
| *Assemble and Secure Formwork Components* | 6 | 12 | - | 2 |
| PC4. interlock panels securely using tie rods, pins, wedges, and props | - | - | - | - |
| PC5. install formwork supports, kicker plates, and braces for stability | - | - | - | - |
| PC6. ensure proper vertical and horizontal alignment using laser-guided tools | - | - | - | - |
| *Apply Necessary Treatments and Reinforcements* | 10 | 20 | - | 3 |
| PC7. apply release agents to prevent concrete adhesion to aluminium panels | - | - | - | - |
| PC8. check and reinforce joints and panel connections to prevent leakage | - | - | - | - |
| PC9. integrate service conduits, openings, and inserts within the formwork system | - | - | - | - |
| *Inspect and Finalize Installation* | 8 | 16 | - | 3 |
| PC10. verify the rigidity and strength of the installed formwork before concrete pouring | - | - | - | - |
| PC11. conduct final alignment checks and adjustments using precision measuring tools | - | - | - | - |
| PC12. confirm compliance with construction drawings and load-bearing requirements | - | - | - | - |
| PC13. check panel-to-panel connections, tie rods, and bracing systems for stability | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. use laser alignment tools to ensure proper verticality and leveling | - | - | - | - |
| PC15. verify sealing of form joints to prevent concrete leakage and misalignment | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

Qualification Pack

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0528 |
| NOS Name | Install and Secure Aluminium Formwork on Construction Sites |
| 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/N0529: Perform Concrete Pouring and Removal of Aluminium Formwork

## Description

This unit covers the systematic pouring of concrete into Mivan aluminium formwork and its safe removal after curing.

## Scope

The scope covers the following :

- Prepare for concrete pouring
- Execute concrete pouring operations

## Elements and Performance Criteria

*Prepare for Concrete Pouring*

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

**PC1.** inspect and ensure formwork is secured, aligned, and free from gaps

**PC2.** apply form release agents to prevent concrete adhesion to aluminium panels

**PC3.** check for installed reinforcements, service conduits, and embedded components

*Execute Concrete Pouring Operations*

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

**PC4.** ensure concrete mix consistency and workability before pouring

**PC5.** pour concrete uniformly using pumps or direct discharge, ensuring proper flow

**PC6.** use vibrators (mechanical or needle) to remove air pockets and enhance strength

**PC7.** monitor concrete consistency, setting time, and surface level during pouring

*Curing and Monitoring*

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

**PC8.** cover and protect freshly poured concrete from premature drying and shrinkage

**PC9.** apply moist curing methods or chemical curing compounds for strength development

**PC10.** conduct early-stage strength tests to determine safe removal timing

**PC11.** Monitor form stability and alignment during concrete vibration

*Remove Aluminium Formwork Safely*

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

**PC12.** check concrete strength and curing progress before dismantling

**PC13.** loosen and remove panels, tie rods, and bracings in a sequence to avoid damage

**PC14.** use panel extractors, hydraulic jacks, or manual tools to detach formwork

**PC15.** inspect concrete surfaces for defects and carry out necessary touch-ups

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** properties of self-compacting concrete (SCC) and traditional concrete mixtures
**KU2.** methods of concrete pouring, flow control, and vibration techniques
**KU3.** importance of uniform compaction and air pocket removal for structural strength
**KU4.** curing processes, including moist curing, membrane curing, and steam curing
**KU5.** stripping time for walls, slabs, beams, and columns based on concrete strength
**KU6.** safe dismantling techniques to avoid concrete surface damage or cracking
**KU7.** use of hydraulic jacks, lever bars, and extractors for formwork removal
**KU8.** defect identification, including honeycombing, cracks, and uneven finishes
**KU9.** post-removal surface treatment and finishing techniques for a smooth appearance

## 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 for Concrete Pouring* | 6 | 12 | - | 2 |
| PC1. inspect and ensure formwork is secured, aligned, and free from gaps | - | - | - | - |
| PC2. apply form release agents to prevent concrete adhesion to aluminium panels | - | - | - | - |
| PC3. check for installed reinforcements, service conduits, and embedded components | - | - | - | - |
| *Execute Concrete Pouring Operations* | 6 | 12 | - | 2 |
| PC4. ensure concrete mix consistency and workability before pouring | - | - | - | - |
| PC5. pour concrete uniformly using pumps or direct discharge, ensuring proper flow | - | - | - | - |
| PC6. use vibrators (mechanical or needle) to remove air pockets and enhance strength | - | - | - | - |
| PC7. monitor concrete consistency, setting time, and surface level during pouring | - | - | - | - |
| *Curing and Monitoring* | 10 | 20 | - | 3 |
| PC8. cover and protect freshly poured concrete from premature drying and shrinkage | - | - | - | - |
| PC9. apply moist curing methods or chemical curing compounds for strength development | - | - | - | - |
| PC10. conduct early-stage strength tests to determine safe removal timing | - | - | - | - |
| PC11. Monitor form stability and alignment during concrete vibration | - | - | - | - |
| *Remove Aluminium Formwork Safely* | 8 | 16 | - | 3 |
| PC12. check concrete strength and curing progress before dismantling | - | - | - | - |
| PC13. loosen and remove panels, tie rods, and bracings in a sequence to avoid damage | - | - | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| PC14. use panel extractors, hydraulic jacks, or manual tools to detach formwork | - | - | - | - |
| PC15. inspect concrete surfaces for defects and carry out necessary touch-ups | - | - | - | - |
| **NOS Total** | **30** | **60** | **-** | **10** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| NOS Code | ICE/CON/N0529 |
| NOS Name | Perform Concrete Pouring and Removal of Aluminium Formwork |
| 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 |

# 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 Masonry

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0503.Plan and Execute Masonry Layouts and Foundations | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0530.Construct Masonry Walls and Blocks | 30 | 60 | - | 10 | 100 | 10 |

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0504.Construct and Assemble Masonry Staircases | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0505.Apply Plastering and Finishing Techniques | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0506.Install and Maintain Masonry Paving Systems | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0507.Implement Advanced Construction Technologies in Masonry | 30 | 60 | - | 10 | 100 | 15 |
| **Total** | **180** | **360** | **-** | **60** | **600** | **70** |

Elective: 2 Woodworking

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0508.Prepare and Construct Timber Frameworks | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0509.Construct Wooden Frames for Structural Elements | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0510.Install Interior Wooden Partitions and Panels | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0511.Assemble and Dismantle Shuttering for Concreting | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0512.Construct and Install Wooden Structural Features | 30 | 60 | - | 10 | 100 | 15 |
| **Total** | **150** | **300** | **-** | **50** | **500** | **70** |

Elective: 3 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 |
| 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** |

Elective: 4 Concreting

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0518.Prepare, Pour and Cure Concrete Structures | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0519.Perform Concreting for Structural Elements | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0520.Carry Out Reinforced Concrete Works | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0521.Repair and Restore Concrete Surfaces | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0522.Construct and Install Precast Concrete Structures | 30 | 60 | - | 10 | 100 | 15 |

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| Total | 150 | 300 | - | 50 | 500 | 70 |

Optional: 1 Sheet Metal Fitting

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0523.Cut, Shape and Install Sheet Metal Structures | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0524.Assemble and Fabricate Sheet Metal Structures Using Advanced Techniques | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0525.Apply Surface Treatments and Coatings to Sheet Metal | 30 | 60 | - | 10 | 100 | 15 |
| ICE/CON/N0526.Ensure Quality Control and Precision in Sheet Metal Fabrication | 30 | 60 | - | 10 | 100 | 10 |
| Total | 120 | 240 | - | 40 | 400 | 50 |

Optional: 2 Mivan Shuttering: Aluminium Formwork

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0527.Assemble Aluminium Formwork Systems | 30 | 60 | - | 10 | 100 | 10 |
| ICE/CON/N0528.Install and Secure Aluminium Formwork on Construction Sites | 30 | 60 | - | 10 | 100 | 20 |

Qualification Pack

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|---|---|---|---|---|---|
| ICE/CON/N0529.Perform Concrete Pouring and Removal of Aluminium Formwork | 30 | 60 | - | 10 | 100 | 20 |
| Total | 90 | 180 | - | 30 | 300 | 50 |

## Acronyms

| | |
|---|---|
| **NOS** | National Occupational Standard(s) |
| **NSQF** | National Skills Qualifications Framework |
| **QP** | Qualifications Pack |
| **TVET** | Technical and Vocational Education and Training |
| **MSDE** | Ministry of Skill Development and Entrepreneurship |
| **NCVET** | National Council for Vocational Education and Training |
| **NSDC** | National Skill Development Corporation |
| **ICES** | Integrated Council for Entrepreneurship and Skilling (erstwhile The Institution of Civil Engineers Society) |
| **AB** | Awarding Body |
| **AA** | Assessment Agency |
| **TP** | Training Partner |
| **TC** | Training Centre |
| **ITI** | Industrial Training Institute |
| **ISCO** | International Standard Classification of Occupations |
| **NCO** | National Classification of Occupations |
| **NCrF** | National Credit Framework |
| **NEP** | New Education Policy |
| **Q-File** | Qualification File |
| **MC** | Model Curriculum |
| **PC** | Performance Criteria |
| **KU** | Knowledge and Understanding |
| **GS** | Generic Skills |
| **PMKVY** | Pradhan Mantri Kaushal Vikas Yojana |
| **DDUGKY** | Deen Dayal Upadhyaya Grameen Kaushalya Yojana |

| | |
|---|---|
| **STT** | Short Term Training |
| **RPL** | Recognition of Prior Learning |
| **NAPS** | National Apprenticeship Promotion Scheme |
| **NQR** | National Qualification Register |
| **OJT** | On the Job Training |
| **NSQC** | National Skill Qualification Committee |
| **IS** | Indian Standard |
| **BBS** | Bar Bending Schedule |
| **RCC** | Reinforced Cement Concrete |
| **AAC** | Autoclaved Aerated Concrete |
| **CLC** | Cellular Lightweight Concrete |
| **PVC** | Polyvinyl Chloride |
| **HDPE** | High-Density Polyethylene |
| **GI** | Galvanized Iron |
| **MS** | Mild Steel |
| **SS** | Stainless Steel |
| **FRP** | Fiber Reinforced Plastic |
| **HSS** | High-Speed Steel |
| **MDF** | Medium Density Fibreboard |
| **HDF** | High Density Fibreboard |
| **WBP** | Waterproof Boiling Proof (Plywood Grade) |
| **MR** | Moisture Resistant |
| **CP** | Commercial Plywood |
| **LVL** | Laminated Veneer Lumber |
| **OSB** | Oriented Strand Board |
| **CNC** | Computer Numerical Control |

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| **MIG** | Metal Inert Gas Welding |
| **TIG** | Tungsten Inert Gas Welding |
| **SMAW** | Shielded Metal Arc Welding |
| **GMAW** | Gas Metal Arc Welding |
| **GTAW** | Gas Tungsten Arc Welding |
| **FCAW** | Flux Cored Arc Welding |
| **NDT** | Non-Destructive Testing |
| **UT** | Ultrasonic Testing |
| **RT** | Radiographic Testing |
| **PT** | Penetrant Testing |
| **MT** | Magnetic Particle Testing |
| **W/C Ratio** | Water Cement Ratio |
| **OPC** | Ordinary Portland Cement |
| **PPC** | Pozzolanic Portland Cement |
| **ISMC** | Indian Standard Medium Channel |
| **ISMB** | Indian Standard Medium Beam |
| **ISJB** | Indian Standard Junior Beam |
| **CIS** | Cast-in-Situ |
| **PCC** | Plain Cement Concrete |
| **AFS** | Aluminium Formwork System |
| **WTF** | Wall Tie Fixture |
| **DFC** | Deck Formwork Component |
| **TFP** | Tie Rod Fixing Pin |
| **EHS** | Environment, Health and Safety |
| **SOP** | Standard Operating Procedure |
| **PPE** | Personal Protective Equipment |

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| TRA | Task Risk Assessment |
| JSA | Job Safety Analysis |
| QA | Quality Assurance |
| QC | Quality Control |
| HIRA | Hazard Identification and Risk Assessment |
| HPT | High Potential Task |
| BOQ | Bill of Quantities |
| DPR | Detailed Project Report |
| CAD | Computer-Aided Design |
| DWG | Drawing File Format |
| CL | Center Line |
| FGL | Finished Ground Level |
| FFL | Finished Floor Level |
| DL | Datum Level |
| RL | Reduced Level |

## Glossary

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

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