



# BIM Modeler

Electives: Mechanical, Electrical, and Plumbing (MEP)/ Structural and Formwork/ Architectural and Landscape

QP Code: CON/Q2110

Version: 1.0

NSQF Level: 4.0

Construction Skill Development Council of India || CPB 103 & 104 (1st Floor), Block 4B, DLF Corporate Park, Phase III, MG Road  
Gurgaon-122002 || email:neha@csdcindia.org



## Contents

|  |    |
|--|----|
| CON/Q2110: BIM Modeler .....   | 3  |
| <i>Brief Job Description</i> .....   | 3  |
| Applicable National Occupational Standards (NOS) .....                     | 3  |
| <i>Compulsory NOS</i> .....  | 3  |
| <i>Elective 1: Mechanical, Electrical, and Plumbing (MEP)</i> .....        | 3  |
| <i>Elective 2: Structural and Formwork</i> .....                           | 3  |
| <i>Elective 3: Architectural and Landscape</i> .....                       | 3  |
| <i>Qualification Pack (QP) Parameters</i> .....                            | 4  |
| CON/N2123: Determine the BIM modeling requirements .....                   | 6  |
| CON/N2124: Create the BIM model using the appropriate BIM software .....   | 10 |
| CON/N2125: Carry out documentation and record-keeping for BIM models ..... | 17 |
| CON/N9004: Follow health and safety practices at work .....                | 21 |
| DGT/VSQ/N0102: Employability Skills (60 Hours) .....                       | 26 |
| CON/N2126: Prepare for MEP BIM modeling .....                              | 34 |
| CON/N2127: Carry out modeling for MEP BIM projects .....                   | 38 |
| CON/N2128: Prepare for structural and formwork BIM modeling .....          | 45 |
| CON/N2129: Carry out structural and formwork BIM modeling .....            | 50 |
| CON/N2130: Prepare for architectural and landscape BIM modeling .....      | 57 |
| CON/N2131: Carry out architectural and landscape BIM modeling .....        | 62 |
| Assessment Guidelines and Weightage .....                                  | 69 |
| <i>Assessment Guidelines</i> .....   | 69 |
| <i>Assessment Weightage</i> .....  | 70 |
| Acronyms .....   | 72 |
| Glossary .....   | 73 |



# CON/Q2110: BIM Modeler

## Brief Job Description

A BIM Modeler is responsible for creating and managing digital BIM models of architectural, structural, Mechanical, Electrical and Plumbing (MEP), or landscape elements for construction and infrastructure projects. The individual collaborates with project stakeholders, including architects, engineers, and contractors, to ensure the successful implementation of BIM processes throughout the project lifecycle.

## Personal Attributes

The individual should have excellent technical, computer and problem-solving skills. The person should also have organizational skills along with good verbal and written communication skills.

## Applicable National Occupational Standards (NOS)

### Compulsory NOS:

1. [CON/N2123: Determine the BIM modeling requirements](#)
2. [CON/N2124: Create the BIM model using the appropriate BIM software](#)
3. [CON/N2125: Carry out documentation and record-keeping for BIM models](#)
4. [CON/N9004: Follow health and safety practices at work](#)
5. [DGT/VSQ/N0102: Employability Skills \(60 Hours\)](#)

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

#### Elective 1: Mechanical, Electrical, and Plumbing (MEP)

This is about BIM modeling for MEP elements.

1. [CON/N2126: Prepare for MEP BIM modeling](#)
2. [CON/N2127: Carry out modeling for MEP BIM projects](#)

#### Elective 2: Structural and Formwork

This is about structural and formwork BIM modeling.

1. [CON/N2128: Prepare for structural and formwork BIM modeling](#)
2. [CON/N2129: Carry out structural and formwork BIM modeling](#)



## Qualification Pack



### Elective 3: Architectural and Landscape

This is about architectural and landscape BIM modeling.

1. [CON/N2130: Prepare for architectural and landscape BIM modeling](#)
2. [CON/N2131: Carry out architectural and landscape BIM modeling](#)

### Qualification Pack (QP) Parameters

|   |  |
|---|--|
| <b>Sector</b>   | Construction   |
| <b>Sub-Sector</b>   | Real Estate and Infrastructure construction  |
| <b>Occupation</b>   | Building Information Modeling  |
| <b>Country</b>  | India  |
| <b>NSQF Level</b>   | 4.0  |
| <b>Credits</b>  | 22   |
| <b>Aligned to NCO/ISCO/ISIC Code</b>                      | NCO-2015/2142.9900   |
| <b>Minimum Educational Qualification &amp; Experience</b> | 12th grade Pass<br>OR<br>Completed 2nd year of the 3-year diploma after 10 (and pursuing regular diploma)<br>OR<br>Diploma (Pursuing 2nd year of 3-year regular Diploma (after 10th))<br>OR<br>10th grade pass and pursuing continuous schooling (for 2-year program)<br>OR<br>11th grade pass with 1 Year of experience Relevant Field<br>OR<br>10th grade pass with 2 Years of experience Relevant Field<br>OR<br>Previous relevant Qualification of NSQF Level (3) with 3 Years of experience Relevant Field<br>OR<br>Previous relevant Qualification of NSQF Level (3.5 with 1.5 years of Relevant Field Experience) |
| <b>Minimum Level of Education for Training in School</b>  | Not Applicable   |



## Qualification Pack



|  |          |
|--|----------|
| <b>Pre-Requisite License or Training</b> | NA       |
| <b>Minimum Job Entry Age</b>             | 18 Years |
| <b>Last Reviewed On</b>                  | NA       |
| <b>Next Review Date</b>                  | NA       |
| <b>NSQC Approval Date</b>                |          |
| <b>Version</b>                           | 1.0      |



# CON/N2123: Determine the BIM modeling requirements

## Description

This OS unit is about preparing for MEP BIM modeling which includes determining the project requirements and collecting project information.

## Scope

The scope covers the following :

- Determine the project scope and plan
- Collect project information

## Elements and Performance Criteria

### *Determine the project scope and plan*

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

- PC1.** determine the project requirements, scope, objectives and constraints before starting BIM modelling
- PC2.** interpret the technical drawings and building plans
- PC3.**
  - analyze the relevant drawings to determine the applicable specifications
  - evaluate the architectural and structural plans for consistency with schematics
  - identify the key stakeholders and their roles in the BIM process
- PC4.** determine the level of detail (LOD) and level of development (LOD) required for the model at different project stages
- PC5.** determine the project timeline and milestones

### *Collect project information*

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

- PC6.** collect all relevant project documentation, including architectural drawings, engineering plans, specifications, and other relevant data
- PC7.** collect the required information concerning the building systems, materials, and equipment
- PC8.** organize and digitize the collected information for easy access during the modeling process

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the benefits of using BIM modeling software in building construction projects
- KU2.** how to interpret technical drawings and building plans
- KU3.** the use of relevant BIM Management software for design review, clash detection, model quality check, COBie data integration, as-built model, attachment document to BIM Model
- KU4.** how to evaluate architectural and structural plans for consistency with schematics
- KU5.** the applicable building standards and codes
- KU6.** relevant Indian Standard Codes of practice as applicable and other relevant standards, e.g. British/German/American Standard



## Qualification Pack



### Generic Skills (GS)

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

- GS1.** communicate clearly and politely with co-workers and clients
- GS2.** coordinate with co-workers to achieve work objectives
- GS3.** maintain work-related notes and records
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information/ instructions being shared by the speaker
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents





## Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Determine the project scope and plan</i>  | <b>17</b>    | <b>33</b>       | -             | <b>6</b>   |
| <b>PC1.</b> determine the project requirements, scope, objectives and constraints before starting BIM modelling  | -            | -               | -             | -          |
| <b>PC2.</b> interpret the technical drawings and building plans  | -            | -               | -             | -          |
| <b>PC3.</b><br><ul style="list-style-type: none"> <li>analyze the relevant drawings to determine the applicable specifications</li> <li>evaluate the architectural and structural plans for consistency with schematics</li> <li>identify the key stakeholders and their roles in the BIM process</li> </ul> | -            | -               | -             | -          |
| <b>PC4.</b> determine the level of detail (LOD) and level of development (LOD) required for the model at different project stages  | -            | -               | -             | -          |
| <b>PC5.</b> determine the project timeline and milestones  | -            | -               | -             | -          |
| <i>Collect project information</i>   | <b>13</b>    | <b>27</b>       | -             | <b>4</b>   |
| <b>PC6.</b> collect all relevant project documentation, including architectural drawings, engineering plans, specifications, and other relevant data   | -            | -               | -             | -          |
| <b>PC7.</b> collect the required information concerning the building systems, materials, and equipment   | -            | -               | -             | -          |
| <b>PC8.</b> organize and digitize the collected information for easy access during the modeling process  | -            | -               | -             | -          |
| <b>NOS Total</b>   | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |





## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |   |
|-------------------------|---|
| <b>NOS Code</b>         | CON/N2123                                   |
| <b>NOS Name</b>         | Determine the BIM modeling requirements     |
| <b>Sector</b>           | Construction                                |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction |
| <b>Occupation</b>       | Building Information Modeling               |
| <b>NSQF Level</b>       | 4   |
| <b>Credits</b>          | 4   |
| <b>Version</b>          | 1.0   |
| <b>Next Review Date</b> | NA  |



# CON/N2124: Create the BIM model using the appropriate BIM software

## Description

This OS unit is about creating the BIM model using appropriate BIM software.

## Scope

The scope covers the following :

- Create the BIM model
- Perform data input and management
- Detect and resolve clashes
- Perform BIM model review, documentation and detailing
- Perform visualization and rendering
- Collaborate and coordinate
- Update and maintain the BIM model
- Perform handover

## Elements and Performance Criteria

### *Create the BIM model*

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

- PC1.** select the appropriate BIM software that suits the project's requirements and the team's expertise
- PC2.** set up the project in the selected BIM software, defining project parameters, units, and coordinate systems
- PC3.** use reference files or CAD drawings to establish the initial layout of the building
- PC4.** build the 3D model based on the architectural and engineering drawings
- PC5.** create a digital representation of physical spaces or systems
- PC6.** identify and use the appropriate tools for creating and rendering the 3D model of a building, structure, etc.
- PC7.** integrate structural elements, such as columns, beams, and foundations, and specialized systems e.g. fire protection, lighting, and Heating, Ventilation, and Air Conditioning (HVAC)
- PC8.** add walls, floors, roofs, doors, windows, and other building components
- PC9.** integrate the Mechanical, Electrical, Plumbing (MEP) systems and other building systems into the model
- PC10.** use the appropriate pre-existing BIM families from the libraries in the selected BIM software
- PC11.** follow the appropriate BIM templates available in the selected BIM software
- PC12.** create and maintain the relevant families and libraries in the BIM software
- PC13.** apply appropriate modifications to the BIM model and drawings
- PC14.** use the appropriate BIM techniques to be used for designing and detailing
- PC15.** use the BIM to produce functional designs containing the necessary data
- PC16.** convert 3D BIM models into precise 2D drawings using BIM landscape architecture, for the use of site staff



## Qualification Pack



**PC17.** carry out detailing for the relevant elements in the BIM model

### *Perform data input and management*

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

**PC18.** enter the relevant information, such as material properties, dimensions, manufacturer details, and equipment specifications into the model's elements

**PC19.** utilize parametric modeling techniques to create smart objects that adjust automatically to changes

**PC20.** organize the model in a hierarchical structure, using layers, groups, and assemblies for convenient navigation and management

### *Detect and resolve clashes*

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

**PC21.** perform clash detection analysis to identify potential clashes or conflicts between different building elements and systems

**PC22.** resolve clashes by adjusting the model components or coordinating with other team members to modify their design

### *Perform BIM model review, documentation and detailing*

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

**PC23.** conduct regular model reviews with the project team to ensure accuracy, completeness, and compliance with project requirements and standards

**PC24.** add annotations, dimensions, and other relevant information to the model for documentation purposes

**PC25.** create schedules and quantity take-offs based on the BIM data

**PC26.** prepare construction drawings using the data extracted from the BIM model

### *Perform visualization and rendering*

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

**PC27.** generate 3D visualizations and renderings to present the model to clients and stakeholders, aiding in better project understanding and communication

**PC28.** use advanced rendering techniques to create realistic images of the building

### *Update and maintain the BIM model*

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

**PC29.** update the BIM model continuously to reflect changes during the design and construction phases

**PC30.** maintain appropriate version control and ensure data integrity throughout the project lifecycle

### *Perform handover*

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

**PC31.** deliver the final BIM model to the client at project completion for their facility management and maintenance purposes

**PC32.** assist in future building renovations or expansions using the BIM model

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** BIM and construction management



## Qualification Pack



- KU2.** integrated BIM management
- KU3.** basics of coding
- KU4.** the process of building information modeling to create a digital representation of physical spaces or systems
- KU5.** different BIM software used for different/ specific purposes
- KU6.** the use of appropriate BIM tools for the creation and rendering of 3D models of a building, structures, etc.
- KU7.** the process of using the pre-existing families from the libraries in the BIM software
- KU8.** how to create and maintain the relevant families and libraries in the BIM software
- KU9.** the appropriate BIM techniques for designing and detailing
- KU10.** the process of applying appropriate modifications to the BIM model and drawings
- KU11.** the applicable documentation requirements
- KU12.** the importance of ensuring updated and accurate BIM documentation before their release to the client
- KU13.** the use of BIM to produce functional designs containing the necessary data
- KU14.** how to convert 3D BIM models into precise 2D drawings using BIM landscape architecture, for the use of site staff
- KU15.** the process of carrying out detailing for the relevant elements in the BIM model
- KU16.** the applicable documentation requirements

### Generic Skills (GS)

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

- GS1.** communicate clearly and politely with co-workers and clients
- GS2.** coordinate with co-workers to achieve work objectives
- GS3.** maintain work-related notes and records
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information/ instructions being shared by the speaker
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents

### Assessment Criteria

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Create the BIM model</i>   | <b>12</b>    | <b>24</b>       | -             | <b>4</b>   |
| <b>PC1.</b> select the appropriate BIM software that suits the project's requirements and the team's expertise  | -            | -               | -             | -          |
| <b>PC2.</b> set up the project in the selected BIM software, defining project parameters, units, and coordinate systems   | -            | -               | -             | -          |
| <b>PC3.</b> use reference files or CAD drawings to establish the initial layout of the building   | -            | -               | -             | -          |
| <b>PC4.</b> build the 3D model based on the architectural and engineering drawings  | -            | -               | -             | -          |
| <b>PC5.</b> create a digital representation of physical spaces or systems   | -            | -               | -             | -          |
| <b>PC6.</b> identify and use the appropriate tools for creating and rendering the 3D model of a building, structure, etc.   | -            | -               | -             | -          |
| <b>PC7.</b> integrate structural elements, such as columns, beams, and foundations, and specialized systems e.g. fire protection, lighting, and Heating, Ventilation, and Air Conditioning (HVAC) | -            | -               | -             | -          |
| <b>PC8.</b> add walls, floors, roofs, doors, windows, and other building components   | -            | -               | -             | -          |
| <b>PC9.</b> integrate the Mechanical, Electrical, Plumbing (MEP) systems and other building systems into the model  | -            | -               | -             | -          |
| <b>PC10.</b> use the appropriate pre-existing BIM families from the libraries in the selected BIM software  | -            | -               | -             | -          |
| <b>PC11.</b> follow the appropriate BIM templates available in the selected BIM software  | -            | -               | -             | -          |
| <b>PC12.</b> create and maintain the relevant families and libraries in the BIM software  | -            | -               | -             | -          |
| <b>PC13.</b> apply appropriate modifications to the BIM model and drawings  | -            | -               | -             | -          |

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <b>PC14.</b> use the appropriate BIM techniques to be used for designing and detailing   | -            | -               | -             | -          |
| <b>PC15.</b> use the BIM to produce functional designs containing the necessary data   | -            | -               | -             | -          |
| <b>PC16.</b> convert 3D BIM models into precise 2D drawings using BIM landscape architecture, for the use of site staff  | -            | -               | -             | -          |
| <b>PC17.</b> carry out detailing for the relevant elements in the BIM model  | -            | -               | -             | -          |
| <i>Perform data input and management</i>   | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC18.</b> enter the relevant information, such as material properties, dimensions, manufacturer details, and equipment specifications into the model's elements | -            | -               | -             | -          |
| <b>PC19.</b> utilize parametric modeling techniques to create smart objects that adjust automatically to changes   | -            | -               | -             | -          |
| <b>PC20.</b> organize the model in a hierarchical structure, using layers, groups, and assemblies for convenient navigation and management                         | -            | -               | -             | -          |
| <i>Detect and resolve clashes</i>  | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC21.</b> perform clash detection analysis to identify potential clashes or conflicts between different building elements and systems                           | -            | -               | -             | -          |
| <b>PC22.</b> resolve clashes by adjusting the model components or coordinating with other team members to modify their design                                      | -            | -               | -             | -          |
| <i>Perform BIM model review, documentation and detailing</i>   | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC23.</b> conduct regular model reviews with the project team to ensure accuracy, completeness, and compliance with project requirements and standards          | -            | -               | -             | -          |
| <b>PC24.</b> add annotations, dimensions, and other relevant information to the model for documentation purposes   | -            | -               | -             | -          |



## Qualification Pack



| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <b>PC25.</b> create schedules and quantity take-offs based on the BIM data  | -            | -               | -             | -          |
| <b>PC26.</b> prepare construction drawings using the data extracted from the BIM model  | -            | -               | -             | -          |
| <i>Perform visualization and rendering</i>  | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC27.</b> generate 3D visualizations and renderings to present the model to clients and stakeholders, aiding in better project understanding and communication | -            | -               | -             | -          |
| <b>PC28.</b> use advanced rendering techniques to create realistic images of the building   | -            | -               | -             | -          |
| <i>Update and maintain the BIM model</i>  | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC29.</b> update the BIM model continuously to reflect changes during the design and construction phases   | -            | -               | -             | -          |
| <b>PC30.</b> maintain appropriate version control and ensure data integrity throughout the project lifecycle  | -            | -               | -             | -          |
| <i>Perform handover</i>   | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC31.</b> deliver the final BIM model to the client at project completion for their facility management and maintenance purposes                               | -            | -               | -             | -          |
| <b>PC32.</b> assist in future building renovations or expansions using the BIM model  | -            | -               | -             | -          |
| <b>NOS Total</b>  | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |





## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |   |
|-------------------------|---|
| <b>NOS Code</b>         | CON/N2124   |
| <b>NOS Name</b>         | Create the BIM model using the appropriate BIM software |
| <b>Sector</b>           | Construction  |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction             |
| <b>Occupation</b>       | Building Information Modeling                           |
| <b>NSQF Level</b>       | 4   |
| <b>Credits</b>          | 2   |
| <b>Version</b>          | 1.0   |
| <b>Next Review Date</b> | NA  |



# CON/N2125: Carry out documentation and record-keeping for BIM models

## Description

This OS unit is about carrying out documentation and record-keeping for BIM models.

## Scope

The scope covers the following :

- Carry out documentation
- Collaborate and coordinate

## Elements and Performance Criteria

### *Carry out documentation*

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

- PC1.** document the BEP, outlining the project's BIM requirements, responsibilities of team members, data exchange protocols, etc.
- PC2.** perform conceptual design, analysis, detailing, and documentation for informing logistics and schedules
- PC3.** document the design decisions, changes, and approvals using a Common Data Environment (CDE) that allows for collaboration and coordination among different disciplines
- PC4.** document the construction progress, issues, and resolutions using a CDE that allows for tracking and reporting
- PC5.** document the operation and maintenance activities, costs, and outcomes using a CDE that allows for analysis and optimization

### *Collaborate and coordinate*

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

- PC6.** share the BIM model with project stakeholders through collaborative platforms for real-time collaboration and coordination
- PC7.** participate in BIM coordination meetings to resolve any remaining issues and ensure seamless integration among various disciplines
- PC8.** record and implement the feedback of project stakeholders
- PC9.** ensuring updated and accurate documentation before their release to the client

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the benefits of documentation and record keeping for BIM models
- KU2.** the appropriate features and capabilities of the BIM software to navigate and extract information from the BIM model efficiently
- KU3.** the industry-specific BIM standards and protocols, such as National BIM Standards (e.g., NBIMS-US), ISO 19650, or regional BIM guidelines



## Qualification Pack



- KU4.** the guidelines for model organization, naming conventions, data exchange formats, and documentation procedures
- KU5.** data management principles and version control systems to maintain accurate records of changes made to the BIM model over time to ensure traceability and prevents data loss
- KU6.** how to attach metadata and relevant data to BIM elements within the model, including specifications, manufacturer information, installation guidelines, maintenance schedules, etc.
- KU7.** the role of BIM models in different project stages concerning the information that needs to be documented at each phase
- KU8.** document management systems and procedures for organizing, storing, and retrieving BIM-related documentation
- KU9.** the procedure of collecting and documenting the necessary data for the BIM model
- KU10.** different information exchange formats, such as IFC (Industry Foundation Classes), COBie (Construction Operations Building Information Exchange), and other open standards to facilitate data sharing and collaboration among different software platforms
- KU11.** how to perform data validation and quality control checks on the BIM model and associated documentation
- KU12.** the legal and contractual obligations related to BIM documentation and record-keeping, including intellectual property rights, confidentiality agreements, and handover requirements

### Generic Skills (GS)

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

- GS1.** communicate clearly and politely with co-workers and clients
- GS2.** coordinate with co-workers to achieve work objectives
- GS3.** maintain work-related notes and records
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information/ instructions being shared by the speaker
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents



**Assessment Criteria**

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Carry out documentation</i>   | <b>17</b>    | <b>33</b>       | -             | <b>6</b>   |
| <b>PC1.</b> document the BEP, outlining the project's BIM requirements, responsibilities of team members, data exchange protocols, etc.  | -            | -               | -             | -          |
| <b>PC2.</b> perform conceptual design, analysis, detailing, and documentation for informing logistics and schedules  | -            | -               | -             | -          |
| <b>PC3.</b> document the design decisions, changes, and approvals using a Common Data Environment (CDE) that allows for collaboration and coordination among different disciplines | -            | -               | -             | -          |
| <b>PC4.</b> document the construction progress, issues, and resolutions using a CDE that allows for tracking and reporting   | -            | -               | -             | -          |
| <b>PC5.</b> document the operation and maintenance activities, costs, and outcomes using a CDE that allows for analysis and optimization   | -            | -               | -             | -          |
| <i>Collaborate and coordinate</i>  | <b>13</b>    | <b>27</b>       | -             | <b>4</b>   |
| <b>PC6.</b> share the BIM model with project stakeholders through collaborative platforms for real-time collaboration and coordination   | -            | -               | -             | -          |
| <b>PC7.</b> participate in BIM coordination meetings to resolve any remaining issues and ensure seamless integration among various disciplines                                     | -            | -               | -             | -          |
| <b>PC8.</b> record and implement the feedback of project stakeholders  | -            | -               | -             | -          |
| <b>PC9.</b> ensuring updated and accurate documentation before their release to the client   | -            | -               | -             | -          |
| <b>NOS Total</b>   | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |



## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |   |
|-------------------------|---|
| <b>NOS Code</b>         | CON/N2125   |
| <b>NOS Name</b>         | Carry out documentation and record-keeping for BIM models |
| <b>Sector</b>           | Construction  |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction               |
| <b>Occupation</b>       | Building Information Modeling                             |
| <b>NSQF Level</b>       | 4   |
| <b>Credits</b>          | 1   |
| <b>Version</b>          | 1.0   |
| <b>Next Review Date</b> | NA  |



### CON/N9004: Follow health and safety practices at work

#### Description

This occupational standards unit is about following health and safety practices at work.

#### Scope

The scope covers the following :

- Maintain health and safety at work
- Follow workplace emergency procedures

#### Elements and Performance Criteria

##### *Maintain health and safety at work*

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

- PC1.** select and use the appropriate Personal Protective Equipment (PPE) according to the nature of work
- PC2.** follow the appropriate practices to ensure personal hygiene, e.g. use of soap and sanitizer to maintain hand hygiene
- PC3.** follow the recommended safety practices to avoid physical harm, e.g. maintaining the appropriate body posture while lifting heavy items
- PC4.** assist in identifying and mitigating potential hazards at the workplace, e.g. fire hazards or the spread of infectious diseases
- PC5.** follow the applicable regulations in the handling, recycling and disposal of waste at the workplace

##### *Follow workplace emergency procedures*

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

- PC6.** prepare to deal with workplace emergencies by participating in regular safety drills
- PC7.** follow the recommended practices during workplace emergencies, e.g. exiting to the safe assembly area
- PC8.** coordinate with the firefighters and medical professionals during critical emergencies
- PC9.** use the appropriate fire extinguisher and other emergency equipment as per the manufacturer's instructions
- PC10.** assist in administering first aid to the injured or unwell personnel
- PC11.** assist in preparing the relevant reports by providing appropriate details to notify the relevant authority about workplace health and safety incidents

#### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the importance of personal protection in the workplace
- KU2.** the use of appropriate PPE at the workplace
- KU3.** the relevant practices to maintain hygiene at work



## Qualification Pack



- KU4.** the benefits of identifying and mitigating potential hazards
- KU5.** the applicable waste management practices
- KU6.** the applicable practices for sanitizing the workplace
- KU7.** the appropriate practices to be followed during workplace emergencies, such as fire, accidents, disease outbreaks or natural calamities
- KU8.** how to administer first aid
- KU9.** the use of relevant emergency equipment
- KU10.** the documentation requirements concerning workplace emergencies

### Generic Skills (GS)

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

- GS1.** maintain the appropriate data and records
- GS2.** read the appropriate reports and literature concerning the field of work
- GS3.** communicate professionally with all the stakeholders
- GS4.** listen attentively to understand the information/ instructions being shared and take appropriate action
- GS5.** coordinate with co-workers to achieve the work objectives
- GS6.** plan and execute tasks based on priority
- GS7.** identify possible disruptions to work and take appropriate mitigation measures
- GS8.** take prompt action to deal with workplace emergencies and accidents
- GS9.** evaluate all possible solutions to work-related problems and select the best one
- GS10.** follow the recommended practices for the timely completion of work and achievement of organizational objectives



Assessment Criteria

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Maintain health and safety at work</i>   | <b>15</b>    | <b>40</b>       | -             | -          |
| <b>PC1.</b> select and use the appropriate Personal Protective Equipment (PPE) according to the nature of work  | -            | -               | -             | -          |
| <b>PC2.</b> follow the appropriate practices to ensure personal hygiene, e.g. use of soap and sanitizer to maintain hand hygiene                                    | -            | -               | -             | -          |
| <b>PC3.</b> follow the recommended safety practices to avoid physical harm, e.g. maintaining the appropriate body posture while lifting heavy items                 | -            | -               | -             | -          |
| <b>PC4.</b> assist in identifying and mitigating potential hazards at the workplace, e.g. fire hazards or the spread of infectious diseases                         | -            | -               | -             | -          |
| <b>PC5.</b> follow the applicable regulations in the handling, recycling and disposal of waste at the workplace   | -            | -               | -             | -          |
| <i>Follow workplace emergency procedures</i>  | <b>15</b>    | <b>30</b>       | -             | -          |
| <b>PC6.</b> prepare to deal with workplace emergencies by participating in regular safety drills  | -            | -               | -             | -          |
| <b>PC7.</b> follow the recommended practices during workplace emergencies, e.g. exiting to the safe assembly area   | -            | -               | -             | -          |
| <b>PC8.</b> coordinate with the firefighters and medical professionals during critical emergencies  | -            | -               | -             | -          |
| <b>PC9.</b> use the appropriate fire extinguisher and other emergency equipment as per the manufacturer’s instructions  | -            | -               | -             | -          |
| <b>PC10.</b> assist in administering first aid to the injured or unwell personnel   | -            | -               | -             | -          |
| <b>PC11.</b> assist in preparing the relevant reports by providing appropriate details to notify the relevant authority about workplace health and safety incidents | -            | -               | -             | -          |



## Qualification Pack



| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|----------------------------------|--------------|-----------------|---------------|------------|
| <b>NOS Total</b>                 | <b>30</b>    | <b>70</b>       | -             | -          |



## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                            |  |
|----------------------------|--|
| <b>NOS Code</b>            | CON/N9004                                  |
| <b>NOS Name</b>            | Follow health and safety practices at work |
| <b>Sector</b>              | Construction                               |
| <b>Sub-Sector</b>          | Generic                                    |
| <b>Occupation</b>          | Generic Safety                             |
| <b>NSQF Level</b>          | 4  |
| <b>Credits</b>             | 1  |
| <b>Version</b>             | 1.0  |
| <b>Last Reviewed Date</b>  | 31/08/2023                                 |
| <b>Next Review Date</b>    | 31/08/2026                                 |
| <b>NSQC Clearance Date</b> | 31/08/2023                                 |



### 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:



## Qualification Pack



- 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



## Qualification Pack



### *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



## Qualification Pack



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



## Qualification Pack



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

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



## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                            |                                 |
|----------------------------|---------------------------------|
| <b>NOS Code</b>            | DGT/VSQ/N0102                   |
| <b>NOS Name</b>            | Employability Skills (60 Hours) |
| <b>Sector</b>              | Cross Sectoral                  |
| <b>Sub-Sector</b>          | Professional Skills             |
| <b>Occupation</b>          | Employability                   |
| <b>NSQF Level</b>          | 4                               |
| <b>Credits</b>             | 2                               |
| <b>Version</b>             | 1.0                             |
| <b>Last Reviewed Date</b>  | 31/08/2023                      |
| <b>Next Review Date</b>    | 31/08/2026                      |
| <b>NSQC Clearance Date</b> | 31/08/2023                      |



# CON/N2126: Prepare for MEP BIM modeling

## Description

This OS unit is about preparing for MEP BIM modeling which includes determining the project requirements and defining the Level of Development (LOD).

## Scope

The scope covers the following :

- Determine the project scope and plan
- Define the Level of Development (LOD)

## Elements and Performance Criteria

### *Determine the project scope and plan*

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

- PC1.** determine the project's scope, objectives, and specific requirements related to MEP systems
- PC2.** identify the building type, size, and complexity, to determine the level of detail required in the MEP BIM model
- PC3.** collaborate with MEP engineers, architects, contractors, and other relevant stakeholders to determine their specific needs and expectations from the MEP BIM model, conducting meetings and workshops, as required

### *Define the Level of Development (LOD)*

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

- PC4.** determine the appropriate Level of Development (LOD) for MEP elements in the BIM model at various project stages
- PC5.** identify the MEP system components that need to be included in the BIM model, such as HVAC equipment, ductwork, piping, lighting fixtures, electrical panels, etc.
- PC6.** determine the specific data requirements for each MEP system component, such as manufacturer information, technical specifications, performance data, and maintenance requirements
- PC7.** define the naming conventions, parameters, and families to be used in the BIM model
- PC8.** specify the coordination requirements for MEP systems and define the clash detection processes to identify and resolve conflicts

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** various Mechanical, Electrical, and Plumbing systems and components used in buildings, including Heating, Ventilation, and Air Conditioning (HVAC), electrical distribution, lighting, plumbing, fire protection, etc.
- KU2.** the relevant building codes, regulations, and industry standards related to MEP systems
- KU3.** commonly used BIM software for MEP modeling and relevant specialized MEP BIM tools



## Qualification Pack



- KU4.** the procedure of determining the MEP BIM requirements
- KU5.** the benefit and procedure of defining the LOD
- KU6.** the principles of BIM collaboration and coordination between different disciplines, such as architecture, structural engineering, and MEP
- KU7.** how to create parametric families and components in BIM software, allowing for flexibility and adaptability in designing MEP systems
- KU8.** the specifications and technical details of MEP equipment, fixtures, and products commonly used in building projects
- KU9.** the appropriate energy-efficient MEP systems and sustainable building practices
- KU10.** the fundamentals of MEP design and calculations, including load calculations, duct and pipe sizing, electrical circuit design, lighting calculations, etc.
- KU11.** how to perform clash detection and coordination between MEP systems and other building elements to avoid conflicts during construction
- KU12.** the construction workflow and the role of MEP BIM modeling in the overall project management process
- KU13.** different data exchange formats used in the industry, such as IFC (Industry Foundation Classes), to facilitate collaboration and data sharing between different software platforms

### Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to learn about the latest developments in the field of work
- GS3.** listen attentively to understand the information/ instructions being shared by the speaker
- GS4.** communicate clearly and politely with co-workers and clients
- GS5.** coordinate with co-workers to achieve work objectives
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents
- GS9.** evaluate all possible solutions to a problem to select the best one

## Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Determine the project scope and plan</i>  | <b>13</b>    | <b>27</b>       | -             | <b>4</b>   |
| <b>PC1.</b> determine the project's scope, objectives, and specific requirements related to MEP systems  | -            | -               | -             | -          |
| <b>PC2.</b> identify the building type, size, and complexity, to determine the level of detail required in the MEP BIM model   | -            | -               | -             | -          |
| <b>PC3.</b> collaborate with MEP engineers, architects, contractors, and other relevant stakeholders to determine their specific needs and expectations from the MEP BIM model, conducting meetings and workshops, as required | -            | -               | -             | -          |
| <i>Define the Level of Development (LOD)</i>   | <b>17</b>    | <b>33</b>       | -             | <b>6</b>   |
| <b>PC4.</b> determine the appropriate Level of Development (LOD) for MEP elements in the BIM model at various project stages   | -            | -               | -             | -          |
| <b>PC5.</b> identify the MEP system components that need to be included in the BIM model, such as HVAC equipment, ductwork, piping, lighting fixtures, electrical panels, etc.   | -            | -               | -             | -          |
| <b>PC6.</b> determine the specific data requirements for each MEP system component, such as manufacturer information, technical specifications, performance data, and maintenance requirements                                 | -            | -               | -             | -          |
| <b>PC7.</b> define the naming conventions, parameters, and families to be used in the BIM model  | -            | -               | -             | -          |
| <b>PC8.</b> specify the coordination requirements for MEP systems and define the clash detection processes to identify and resolve conflicts   | -            | -               | -             | -          |
| <b>NOS Total</b>   | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |





## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |   |
|-------------------------|---|
| <b>NOS Code</b>         | CON/N2126                                   |
| <b>NOS Name</b>         | Prepare for MEP BIM modeling                |
| <b>Sector</b>           | Construction                                |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction |
| <b>Occupation</b>       | Building Information Modeling               |
| <b>NSQF Level</b>       | 4   |
| <b>Credits</b>          | 2   |
| <b>Version</b>          | 1.0   |
| <b>Next Review Date</b> | NA  |



# CON/N2127: Carry out modeling for MEP BIM projects

## Description

This OS unit is about carrying out modeling for MEP BIM projects.

## Scope

The scope covers the following :

- Create MEP BIM model
- Perform scheduling and phasing
- Incorporate sustainability and energy analysis information
- Coordinate with other disciplines
- Perform BIM model review
- Update and maintain the MEP BIM model

## Elements and Performance Criteria

### *Create MEP BIM model*

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

- PC1.** develop or use pre-existing MEP families (parametric objects) from the software's library for various system components such as HVAC equipment, ductwork, pipes, electrical fixtures, and plumbing fixtures
- PC2.** set up HVAC equipment, e.g. air handlers, chillers, and fans within the building's designated mechanical rooms or spaces
- PC3.** create the ductwork system by routing ducts from the equipment to supply and return air outlets and registers
- PC4.** position electrical panels, transformers, and switchgear in the designated electrical rooms
- PC5.** create electrical conduits and cable trays to route electrical wires and cables throughout the building
- PC6.** place plumbing fixtures, e.g. sinks, toilets, and showers in bathrooms and other relevant spaces
- PC7.** create piping systems to connect the fixtures to water supply and drainage networks
- PC8.** prepare pipe size for internal water supply and drainage system in the building
- PC9.** prepare the shaft/duct sizes for the HVAC system
- PC10.** design the external sewerage system with invert levels
- PC11.** prepare detailed shop drawings for the sanitary water supply and drainage
- PC12.** design and detail the plumbing and electrical outlets
- PC13.** ensure all the MEP elements are accurately connected and coordinated with each other, also with the architectural and structural elements of the building
- PC14.** incorporate additional details, such as insulation for pipes, equipment specifications, and access panels for maintenance, to enhance the model's accuracy
- PC15.** ensure the inclusion of relevant data within the BIM objects for accurate quantity take-offs and cost estimation



## Qualification Pack



**PC16.** follow the applicable modeling guidelines and standards for the MEP BIM elements to ensure consistency and uniformity across the model

**PC17.** ensure the MEP BIM model complies with the relevant building codes, regulations, and industry standards related to MEP systems in the project location

### *Perform scheduling and phasing*

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

**PC18.** incorporate scheduling and phasing information for MEP systems to reflect the construction sequence and installation timeline

**PC19.** plan for temporary systems or installations if needed during construction

### *Incorporate sustainability and energy analysis information*

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

**PC20.** incorporate sustainability and energy efficiency requirements for MEP systems

**PC21.** incorporate information for energy analysis and simulation within the BIM model to evaluate system performance

### *Coordinate with other disciplines*

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

**PC22.** coordinate with architectural and structural teams to ensure proper integration of MEP systems into the overall building design

**PC23.** identify potential clashes or conflicts between MEP elements and other building components to resolve them during the design phase

**PC24.** follow the appropriate procedure to communicate and resolve clashes among different disciplines

### *Perform BIM model review*

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

**PC25.** review the MEP BIM model with MEP engineers and other stakeholders

**PC26.** ensure the MEP BIM model accurately represents the intended design and meets all the applicable requirements

### *Update and maintain the MEP BIM model*

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

**PC27.** update the MEP BIM model continuously throughout the design and construction phases to reflect changes and revisions

**PC28.** maintain the model's accuracy and ensure that it aligns with the latest design decisions

**PC29.** document all MEP BIM requirements in a comprehensive BIM Execution Plan (BEP) or BIM Scope of Work document

**PC30.** share the document with all stakeholders to ensure they are aware of the MEP BIM requirements

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** how to create 3D BIM models for a building's MEP elements, e.g. firefighting, water supply and drainage, pipe, shaft/ duct size, sewerage system, etc.

**KU2.** how to prepare shop drawings

**KU3.** design and detail the plumbing and electrical outlets



## Qualification Pack



- KU4.** the importance of evaluating the BIM model for conflicts and clashes between the architectural elements and the MEP systems
- KU5.** how to identify design errors, issues and inter or intra-disciplinary 3D geometrical conflicts in the MEP BIM model
- KU6.** the appropriate changes to be implemented to resolve the conflicts and clashes in the MEP BIM model
- KU7.** the applicable national and international HVAC, electrical and plumbing codes and standards
- KU8.** the appropriate BIM techniques and software to be used for designing and detailing MEP systems
- KU9.** the importance of preparing drawings as per the specifications provided by the client and the engineer's instructions
- KU10.** the importance and process of applying appropriate modifications to the MEP BIM model and drawings according to the site-based changes
- KU11.** how to create designs, models, and prototypes using 3D printers and other rapid prototyping equipment
- KU12.** the importance of ensuring updated and accurate documentation before their release to the client
- KU13.** the process of preparing proposals and BOQ for BIM MEP projects

### Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to learn about the latest developments in the field of work
- GS3.** listen attentively to understand the information/ instructions being shared by the speaker
- GS4.** communicate clearly and politely with co-workers and clients
- GS5.** coordinate with co-workers to achieve work objectives
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents
- GS9.** evaluate all possible solutions to a problem to select the best one

## Assessment Criteria

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Create MEP BIM model</i>   | <b>12</b>    | <b>24</b>       | -             | <b>4</b>   |
| <b>PC1.</b> develop or use pre-existing MEP families (parametric objects) from the software's library for various system components such as HVAC equipment, ductwork, pipes, electrical fixtures, and plumbing fixtures | -            | -               | -             | -          |
| <b>PC2.</b> set up HVAC equipment, e.g. air handlers, chillers, and fans within the building's designated mechanical rooms or spaces  | -            | -               | -             | -          |
| <b>PC3.</b> create the ductwork system by routing ducts from the equipment to supply and return air outlets and registers   | -            | -               | -             | -          |
| <b>PC4.</b> position electrical panels, transformers, and switchgear in the designated electrical rooms   | -            | -               | -             | -          |
| <b>PC5.</b> create electrical conduits and cable trays to route electrical wires and cables throughout the building   | -            | -               | -             | -          |
| <b>PC6.</b> place plumbing fixtures, e.g. sinks, toilets, and showers in bathrooms and other relevant spaces  | -            | -               | -             | -          |
| <b>PC7.</b> create piping systems to connect the fixtures to water supply and drainage networks   | -            | -               | -             | -          |
| <b>PC8.</b> prepare pipe size for internal water supply and drainage system in the building   | -            | -               | -             | -          |
| <b>PC9.</b> prepare the shaft/duct sizes for the HVAC system  | -            | -               | -             | -          |
| <b>PC10.</b> design the external sewerage system with invert levels   | -            | -               | -             | -          |
| <b>PC11.</b> prepare detailed shop drawings for the sanitary water supply and drainage  | -            | -               | -             | -          |
| <b>PC12.</b> design and detail the plumbing and electrical outlets  | -            | -               | -             | -          |

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <b>PC13.</b> ensure all the MEP elements are accurately connected and coordinated with each other, also with the architectural and structural elements of the building  | -            | -               | -             | -          |
| <b>PC14.</b> incorporate additional details, such as insulation for pipes, equipment specifications, and access panels for maintenance, to enhance the model's accuracy | -            | -               | -             | -          |
| <b>PC15.</b> ensure the inclusion of relevant data within the BIM objects for accurate quantity take-offs and cost estimation   | -            | -               | -             | -          |
| <b>PC16.</b> follow the applicable modeling guidelines and standards for the MEP BIM elements to ensure consistency and uniformity across the model                     | -            | -               | -             | -          |
| <b>PC17.</b> ensure the MEP BIM model complies with the relevant building codes, regulations, and industry standards related to MEP systems in the project location     | -            | -               | -             | -          |
| <i>Perform scheduling and phasing</i>   | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC18.</b> incorporate scheduling and phasing information for MEP systems to reflect the construction sequence and installation timeline                              | -            | -               | -             | -          |
| <b>PC19.</b> plan for temporary systems or installations if needed during construction  | -            | -               | -             | -          |
| <i>Incorporate sustainability and energy analysis information</i>   | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC20.</b> incorporate sustainability and energy efficiency requirements for MEP systems  | -            | -               | -             | -          |
| <b>PC21.</b> incorporate information for energy analysis and simulation within the BIM model to evaluate system performance   | -            | -               | -             | -          |
| <i>Coordinate with other disciplines</i>  | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC22.</b> coordinate with architectural and structural teams to ensure proper integration of MEP systems into the overall building design                            | -            | -               | -             | -          |



## Qualification Pack



| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <b>PC23.</b> identify potential clashes or conflicts between MEP elements and other building components to resolve them during the design phase | -            | -               | -             | -          |
| <b>PC24.</b> follow the appropriate procedure to communicate and resolve clashes among different disciplines                                    | -            | -               | -             | -          |
| <i>Perform BIM model review</i>   | <b>3</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC25.</b> review the MEP BIM model with MEP engineers and other stakeholders   | -            | -               | -             | -          |
| <b>PC26.</b> ensure the MEP BIM model accurately represents the intended design and meets all the applicable requirements                       | -            | -               | -             | -          |
| <i>Update and maintain the MEP BIM model</i>  | <b>6</b>     | <b>12</b>       | -             | <b>2</b>   |
| <b>PC27.</b> update the MEP BIM model continuously throughout the design and construction phases to reflect changes and revisions               | -            | -               | -             | -          |
| <b>PC28.</b> maintain the model's accuracy and ensure that it aligns with the latest design decisions   | -            | -               | -             | -          |
| <b>PC29.</b> document all MEP BIM requirements in a comprehensive BIM Execution Plan (BEP) or BIM Scope of Work document                        | -            | -               | -             | -          |
| <b>PC30.</b> share the document with all stakeholders to ensure they are aware of the MEP BIM requirements                                      | -            | -               | -             | -          |
| <b>NOS Total</b>  | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |



## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |   |
|-------------------------|---|
| <b>NOS Code</b>         | CON/N2127                                   |
| <b>NOS Name</b>         | Carry out modeling for MEP BIM projects     |
| <b>Sector</b>           | Construction                                |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction |
| <b>Occupation</b>       | Building Information Modeling               |
| <b>NSQF Level</b>       | 4   |
| <b>Credits</b>          | 2   |
| <b>Version</b>          | 1.0   |
| <b>Next Review Date</b> | NA  |





# CON/N2128: Prepare for structural and formwork BIM modeling

## Description

This OS unit is about preparing for structural and formwork BIM modeling.

## Scope

The scope covers the following :

- Determine the structural and formwork modeling requirements
- Plan structural and formwork modeling

## Elements and Performance Criteria

### *Determine the structural and formwork modeling requirements*

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

- PC1.** collect the relevant project information, including architectural and engineering drawings, construction plans, specifications, etc.
- PC2.** review the architectural and engineering drawings, structural calculations, and any other relevant design documents to understand the building's structural layout and design intent
- PC3.** determine the type of structural systems used in the building (e.g., reinforced concrete, steel, timber) and understand their specific design and construction considerations
- PC4.** collect the structural design data, such as load calculations, beam and column sizes, foundation details, and any specific requirements for reinforcement
- PC5.** collect formwork design details and specifications, including formwork materials, construction sequence, and temporary structures used for moulding concrete
- PC6.** collaborate with the architectural and engineering design teams to ensure the availability of the latest and most accurate information

### *Plan structural and formwork modeling*

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

- PC7.** select an appropriate BIM software, ensuring it has the appropriate modeling tools and capabilities for structural and formwork modeling
- PC8.** identify the BIM modeling standards for the project, including naming conventions, layer organization, object properties, and annotation styles
- PC9.** identify the Level of Development (LOD) and Level of Information (LOI) requirements for the BIM model
- PC10.** divide the project into different construction phases, such as foundation, superstructure, and finishing to manage the BIM model efficiently
- PC11.** define standard workflows and practices for structural and formwork modeling to ensure consistency in the modeling process
- PC12.** check the BIM Execution Plan (BEP) for the BIM implementation strategy, data exchange formats, project milestones, etc.
- PC13.** identify appropriate BIM standards and templates for the project, e.g. standardized families and templates to maintain consistency in the project



### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the basic principles and concepts of BIM
- KU2.** the relevant BIM software for structural and formwork BIM modeling
- KU3.** LOD specifies the level of detail and accuracy of the model elements, while LOI outlines the information attached to each model element
- KU4.** the benefits of carrying out formwork modeling and detailing
- KU5.** the importance of achieving consistency in formwork placement
- KU6.** the use of appropriate software for structure and formwork modeling
- KU7.** how to interpret the technical drawings and building plans
- KU8.** the process of building information modeling to create a digital representation of physical spaces or systems
- KU9.** the importance of determining the project requirements before starting BIM modeling
- KU10.** the process of planning structural and formwork BIM modeling

### Generic Skills (GS)

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

- GS1.** communicate clearly and politely with co-workers and clients
- GS2.** coordinate with co-workers to achieve work objectives
- GS3.** maintain work-related notes and records
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information/ instructions being shared by the speaker
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents

## Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Determine the structural and formwork modeling requirements</i>   | <b>13</b>    | <b>27</b>       | -             | <b>4</b>   |
| <b>PC1.</b> collect the relevant project information, including architectural and engineering drawings, construction plans, specifications, etc.   | -            | -               | -             | -          |
| <b>PC2.</b> review the architectural and engineering drawings, structural calculations, and any other relevant design documents to understand the building's structural layout and design intent | -            | -               | -             | -          |
| <b>PC3.</b> determine the type of structural systems used in the building (e.g., reinforced concrete, steel, timber) and understand their specific design and construction considerations        | -            | -               | -             | -          |
| <b>PC4.</b> collect the structural design data, such as load calculations, beam and column sizes, foundation details, and any specific requirements for reinforcement                            | -            | -               | -             | -          |
| <b>PC5.</b> collect formwork design details and specifications, including formwork materials, construction sequence, and temporary structures used for moulding concrete                         | -            | -               | -             | -          |
| <b>PC6.</b> collaborate with the architectural and engineering design teams to ensure the availability of the latest and most accurate information   | -            | -               | -             | -          |
| <i>Plan structural and formwork modeling</i>   | <b>17</b>    | <b>33</b>       | -             | <b>6</b>   |
| <b>PC7.</b> select an appropriate BIM software, ensuring it has the appropriate modeling tools and capabilities for structural and formwork modeling   | -            | -               | -             | -          |
| <b>PC8.</b> identify the BIM modeling standards for the project, including naming conventions, layer organization, object properties, and annotation styles                                      | -            | -               | -             | -          |
| <b>PC9.</b> identify the Level of Development (LOD) and Level of Information (LOI) requirements for the BIM model  | -            | -               | -             | -          |



## Qualification Pack



| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <b>PC10.</b> divide the project into different construction phases, such as foundation, superstructure, and finishing to manage the BIM model efficiently      | -            | -               | -             | -          |
| <b>PC11.</b> define standard workflows and practices for structural and formwork modeling to ensure consistency in the modeling process                        | -            | -               | -             | -          |
| <b>PC12.</b> check the BIM Execution Plan (BEP) for the BIM implementation strategy, data exchange formats, project milestones, etc.                           | -            | -               | -             | -          |
| <b>PC13.</b> identify appropriate BIM standards and templates for the project, e.g. standardized families and templates to maintain consistency in the project | -            | -               | -             | -          |
| <b>NOS Total</b>   | <b>30</b>    | <b>60</b>       | <b>-</b>      | <b>10</b>  |



## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |  |
|-------------------------|--|
| <b>NOS Code</b>         | CON/N2128  |
| <b>NOS Name</b>         | Prepare for structural and formwork BIM modeling |
| <b>Sector</b>           | Construction                                     |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction      |
| <b>Occupation</b>       | Building Information Modeling                    |
| <b>NSQF Level</b>       | 4  |
| <b>Credits</b>          | 2  |
| <b>Version</b>          | 1.0  |
| <b>Next Review Date</b> | NA   |



# CON/N2129: Carry out structural and formwork BIM modeling

## Description

This OS unit is about preparing for structural and formwork BIM modeling which includes determining the project requirements and ensuring software preparedness.

## Scope

The scope covers the following :

- Model the structural elements
- Model the formwork elements
- Perform clash detection and sequencing
- Coordinate with other disciplines and review the model

## Elements and Performance Criteria

### *Model the structural elements*

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

- PC1.** set up the BIM environment with the appropriate units, coordinate system, and project settings
- PC2.** create 3D models of basic building elements, such as walls, floors, roofs, and foundations, using the BIM software's modeling tools
- PC3.** integrate structural components like columns, beams, trusses, and slabs into the model based on the structural design information set up the 3D model based on the architectural design, including walls, floors, columns, and other building elements
- PC4.** integrate structural components like columns, beams, trusses, and slabs into the model based on the structural design information
- PC5.** use the structural design data to accurately place and size the structural elements in the model
- PC6.** integrate reinforcement bars into the structural elements based on engineering specifications and design requirements
- PC7.** ensure proper cover, spacing, and configuration of rebars within the model
- PC8.** assign appropriate material properties and structural parameters to the elements to reflect their real-world behaviour
- PC9.** create more intricate structural elements like curved beams, cantilevers, and complex connections using advanced modeling techniques
- PC10.** model steel elements, e.g. steel columns, beams, and their connections considering their interaction with concrete elements

### *Model the formwork elements*

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

- PC11.** create formwork components, such as form panels, supports, braces, and tie systems to represent the temporary structures used to mould concrete during construction
- PC12.** model formwork for slabs, walls, and columns as per the construction sequence and formwork requirements



## Qualification Pack



- PC13.** utilize parametric modeling techniques to create intelligent formwork objects that can adapt to changes in the model
- PC14.** use adaptive designs to adapt to factors that may affect formwork load, e.g. concrete loading, pressure on the formwork structure, site loads, and other environmental aspects
- PC15.** model different types of formwork used in the project, including wall formwork, slab formwork, column formwork, and foundation formwork
- PC16.** place formwork components in their correct locations based on the architectural and structural drawings
- PC17.** align formwork systems with the building's structural elements accurately
- PC18.** create 3D visualization and design horizontal panels for floors, slabs, beams, etc., and vertical panels for columns, walls, etc.
- PC19.** ensure the formwork components are appropriately connected and coordinated with each other to accurately represent the formwork system
- PC20.** integrate temporary elements like scaffolding and shoring, which support the formwork during the construction process
- PC21.** assign appropriate data and properties to the formwork components, such as material type, formwork class, and surface finish
- PC22.** add annotations, dimensions, and information tags to the structural and formwork elements for documentation and construction purposes

### *Perform clash detection and sequencing*

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

- PC23.** use the BIM software's clash detection tools to identify potential interferences or conflicts between structural components and other building elements.
- PC24.** collaborate with other team members to resolve any clashes found during the clash detection process
- PC25.** generate construction drawings, schedules, and reports based on the BIM model data for use in construction and fabrication.
- PC26.** Incorporate phasing and sequencing information into the model to represent the construction sequence and enable better construction planning

### *Coordinate with other disciplines and review the model*

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

- PC27.** collaborate with architects, MEP designers, and other stakeholders to ensure proper coordination between structural elements and other building systems
- PC28.** utilize the BIM model for structural analysis and simulation to evaluate the structural integrity and performance of the building
- PC29.** review the structural and formwork BIM model regularly with the project team to ensure accuracy, compliance with design requirements, and adherence to construction standards
- PC30.** update the BIM model continuously as the design progresses and changes are made to the structural or formwork components

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the appropriate BIM software features to be used to achieve precision in formwork detailing



## Qualification Pack



- KU2.** the importance of effective coordination among the stakeholders in the preconstruction stage for quality formwork
- KU3.** the applicable building codes and standards
- KU4.** the appropriate formwork planning and detailing tasks
- KU5.** the benefits of using BIM modeling software in building construction projects
- KU6.** the applicable building standards and codes
- KU7.** the benefit of in-depth visualization in 3D using appropriate tools for the creation of pour geometry and its components, e.g. clamps and ties
- KU8.** the use of pour geometry modeled in 3D to pinpoint the right angles and location to speed up installation
- KU9.** the 3D models and model-extracted shop drawings
- KU10.** the importance and process of planning formwork workflows for quick and secure construction
- KU11.** the importance of having accurately designed formwork panels and modules at the required location
- KU12.** the benefit of using model-driven shop drawings in documentation, fabrication, and installation
- KU13.** the process of 3D formwork visualization, and formwork component mapping and annotation
- KU14.** how to coordinate and resolve clashes using BIM
- KU15.** the importance of having precise model data and schedule forecasts in improving the overall consistency and reducing project delivery time
- KU16.** the importance of using adaptive formwork design to achieve sustainability throughout the entire lifecycle of the project
- KU17.** the benefit and process of using the pre-existing families from the libraries in the BIM software
- KU18.** how to create and maintain the relevant families and libraries in the BIM software
- KU19.** the common challenges experienced during structural and formwork designing and how to overcome them
- KU20.** the applicable documentation requirements
- KU21.** the importance of ensuring updated and accurate documentation before their release to the client

### Generic Skills (GS)

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

- GS1.** communicate clearly and politely with co-workers and clients
- GS2.** coordinate with co-workers to achieve work objectives
- GS3.** maintain work-related notes and records
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information/ instructions being shared by the speaker
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents



Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Model the structural elements</i>   | <b>10</b>    | <b>20</b>       | -             | <b>4</b>   |
| <b>PC1.</b> set up the BIM environment with the appropriate units, coordinate system, and project settings   | -            | -               | -             | -          |
| <b>PC2.</b> create 3D models of basic building elements, such as walls, floors, roofs, and foundations, using the BIM software's modeling tools  | -            | -               | -             | -          |
| <b>PC3.</b> integrate structural components like columns, beams, trusses, and slabs into the model based on the structural design information set up the 3D model based on the architectural design, including walls, floors, columns, and other building elements | -            | -               | -             | -          |
| <b>PC4.</b> integrate structural components like columns, beams, trusses, and slabs into the model based on the structural design information  | -            | -               | -             | -          |
| <b>PC5.</b> use the structural design data to accurately place and size the structural elements in the model   | -            | -               | -             | -          |
| <b>PC6.</b> integrate reinforcement bars into the structural elements based on engineering specifications and design requirements  | -            | -               | -             | -          |
| <b>PC7.</b> ensure proper cover, spacing, and configuration of rebars within the model   | -            | -               | -             | -          |
| <b>PC8.</b> assign appropriate material properties and structural parameters to the elements to reflect their real-world behaviour   | -            | -               | -             | -          |
| <b>PC9.</b> create more intricate structural elements like curved beams, cantilevers, and complex connections using advanced modeling techniques   | -            | -               | -             | -          |
| <b>PC10.</b> model steel elements, e.g. steel columns, beams, and their connections considering their interaction with concrete elements   | -            | -               | -             | -          |
| <i>Model the formwork elements</i>   | <b>12</b>    | <b>28</b>       | -             | <b>4</b>   |



## Qualification Pack



| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <b>PC11.</b> create formwork components, such as form panels, supports, braces, and tie systems to represent the temporary structures used to mould concrete during construction            | -            | -               | -             | -          |
| <b>PC12.</b> model formwork for slabs, walls, and columns as per the construction sequence and formwork requirements  | -            | -               | -             | -          |
| <b>PC13.</b> utilize parametric modeling techniques to create intelligent formwork objects that can adapt to changes in the model   | -            | -               | -             | -          |
| <b>PC14.</b> use adaptive designs to adapt to factors that may affect formwork load, e.g. concrete loading, pressure on the formwork structure, site loads, and other environmental aspects | -            | -               | -             | -          |
| <b>PC15.</b> model different types of formwork used in the project, including wall formwork, slab formwork, column formwork, and foundation formwork  | -            | -               | -             | -          |
| <b>PC16.</b> place formwork components in their correct locations based on the architectural and structural drawings  | -            | -               | -             | -          |
| <b>PC17.</b> align formwork systems with the building's structural elements accurately  | -            | -               | -             | -          |
| <b>PC18.</b> create 3D visualization and design horizontal panels for floors, slabs, beams, etc., and vertical panels for columns, walls, etc.  | -            | -               | -             | -          |
| <b>PC19.</b> ensure the formwork components are appropriately connected and coordinated with each other to accurately represent the formwork system   | -            | -               | -             | -          |
| <b>PC20.</b> integrate temporary elements like scaffolding and shoring, which support the formwork during the construction process  | -            | -               | -             | -          |
| <b>PC21.</b> assign appropriate data and properties to the formwork components, such as material type, formwork class, and surface finish   | -            | -               | -             | -          |
| <b>PC22.</b> add annotations, dimensions, and information tags to the structural and formwork elements for documentation and construction purposes  | -            | -               | -             | -          |

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Perform clash detection and sequencing</i>  | <b>4</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC23.</b> use the BIM software's clash detection tools to identify potential interferences or conflicts between structural components and other building elements.                      | -            | -               | -             | -          |
| <b>PC24.</b> collaborate with other team members to resolve any clashes found during the clash detection process   | -            | -               | -             | -          |
| <b>PC25.</b> generate construction drawings, schedules, and reports based on the BIM model data for use in construction and fabrication.   | -            | -               | -             | -          |
| <b>PC26.</b> Incorporate phasing and sequencing information into the model to represent the construction sequence and enable better construction planning                                  | -            | -               | -             | -          |
| <i>Coordinate with other disciplines and review the model</i>  | <b>4</b>     | <b>6</b>        | -             | <b>1</b>   |
| <b>PC27.</b> collaborate with architects, MEP designers, and other stakeholders to ensure proper coordination between structural elements and other building systems                       | -            | -               | -             | -          |
| <b>PC28.</b> utilize the BIM model for structural analysis and simulation to evaluate the structural integrity and performance of the building   | -            | -               | -             | -          |
| <b>PC29.</b> review the structural and formwork BIM model regularly with the project team to ensure accuracy, compliance with design requirements, and adherence to construction standards | -            | -               | -             | -          |
| <b>PC30.</b> update the BIM model continuously as the design progresses and changes are made to the structural or formwork components  | -            | -               | -             | -          |
| <b>NOS Total</b>   | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |



## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |  |
|-------------------------|--|
| <b>NOS Code</b>         | CON/N2129                                      |
| <b>NOS Name</b>         | Carry out structural and formwork BIM modeling |
| <b>Sector</b>           | Construction                                   |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction    |
| <b>Occupation</b>       | Building Information Modeling                  |
| <b>NSQF Level</b>       | 4  |
| <b>Credits</b>          | 2  |
| <b>Version</b>          | 1.0  |
| <b>Next Review Date</b> | NA   |



# CON/N2130: Prepare for architectural and landscape BIM modeling

## Description

This OS unit is about preparing for architectural and landscape BIM modeling which includes determining the project requirements and ensuring software preparedness.

## Scope

The scope covers the following :

- Determine the project requirements
- Set up the BIM software for use

## Elements and Performance Criteria

### *Determine the project requirements*

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

- PC1.** check the BIM Execution Plan that outlines the project's BIM requirements, responsibilities, deliverables, and coordination procedures
- PC2.** determine the project scope, objectives, and design intent by reviewing architectural drawings, landscape designs, and any other project documentation
- PC3.** determine the Level of Detail (LOD) and Level of Development (LOD) required for the BIM model at different project stages
- PC4.** collaborate with architects, landscape designers, structural engineers, and other stakeholders to understand their requirements and coordinate the BIM process
- PC5.** collect architectural drawings, landscape plans, site surveys, and any other relevant data needed for modeling
- PC6.** structure the collected design data and information in a logical and accessible manner for easy reference during the modeling process
- PC7.** establish the construction phasing and sequencing for the project to align the modeling process with the construction timeline

### *Set up the BIM software for use*

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

- PC8.** select the appropriate BIM software appropriate for architectural and landscape modeling
- PC9.** identify the BIM modeling standards for the project, including naming conventions, layer organization, object properties, and annotation styles
- PC10.** identify standard workflows and practices to follow to ensure consistency across the modeling team
- PC11.** create or customize modeling templates that include standard architectural and landscape elements to speed up the modeling process
- PC12.** set up cloud-based collaboration tools for use to enable real-time communication and coordination among team members working on the BIM model

## Knowledge and Understanding (KU)



## Qualification Pack



The individual on the job needs to know and understand:

- KU1.** the benefits of using BIM modeling software in building construction projects
- KU2.** the applicable building standards and codes
- KU3.** the benefits and use of BIM to streamline architectural and landscape project administration and design
- KU4.** the appropriate software to be used for landscape architecture
- KU5.** how to interpret the technical drawings and building plans
- KU6.** the process of building information modeling to create a digital representation of physical spaces or systems
- KU7.** the importance of determining the project requirements before starting BIM modeling

### Generic Skills (GS)

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

- GS1.** communicate clearly and politely with co-workers and clients
- GS2.** coordinate with co-workers to achieve work objectives
- GS3.** maintain work-related notes and records
- GS4.** read the relevant literature to learn about the latest developments in the field of work
- GS5.** listen attentively to understand the information/ instructions being shared by the speaker
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents

Assessment Criteria

| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Determine the project requirements</i>  | <b>13</b>    | <b>27</b>       | -             | <b>4</b>   |
| <b>PC1.</b> check the BIM Execution Plan that outlines the project's BIM requirements, responsibilities, deliverables, and coordination procedures                         | -            | -               | -             | -          |
| <b>PC2.</b> determine the project scope, objectives, and design intent by reviewing architectural drawings, landscape designs, and any other project documentation         | -            | -               | -             | -          |
| <b>PC3.</b> determine the Level of Detail (LOD) and Level of Development (LOD) required for the BIM model at different project stages                                      | -            | -               | -             | -          |
| <b>PC4.</b> collaborate with architects, landscape designers, structural engineers, and other stakeholders to understand their requirements and coordinate the BIM process | -            | -               | -             | -          |
| <b>PC5.</b> collect architectural drawings, landscape plans, site surveys, and any other relevant data needed for modeling   | -            | -               | -             | -          |
| <b>PC6.</b> structure the collected design data and information in a logical and accessible manner for easy reference during the modeling process                          | -            | -               | -             | -          |
| <b>PC7.</b> establish the construction phasing and sequencing for the project to align the modeling process with the construction timeline                                 | -            | -               | -             | -          |
| <i>Set up the BIM software for use</i>   | <b>17</b>    | <b>33</b>       | -             | <b>6</b>   |
| <b>PC8.</b> select the appropriate BIM software appropriate for architectural and landscape modeling   | -            | -               | -             | -          |
| <b>PC9.</b> identify the BIM modeling standards for the project, including naming conventions, layer organization, object properties, and annotation styles                | -            | -               | -             | -          |
| <b>PC10.</b> identify standard workflows and practices to follow to ensure consistency across the modeling team  | -            | -               | -             | -          |



## Qualification Pack



| Assessment Criteria for Outcomes   | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <b>PC11.</b> create or customize modeling templates that include standard architectural and landscape elements to speed up the modeling process            | -            | -               | -             | -          |
| <b>PC12.</b> set up cloud-based collaboration tools for use to enable real-time communication and coordination among team members working on the BIM model | -            | -               | -             | -          |
| <b>NOS Total</b>   | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |





## Qualification Pack



### National Occupational Standards (NOS) Parameters

|                         |  |
|-------------------------|--|
| <b>NOS Code</b>         | CON/N2130  |
| <b>NOS Name</b>         | Prepare for architectural and landscape BIM modeling |
| <b>Sector</b>           | Construction   |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction          |
| <b>Occupation</b>       | Building Information Modeling                        |
| <b>NSQF Level</b>       | 4  |
| <b>Credits</b>          | 2  |
| <b>Version</b>          | 1.0  |
| <b>Next Review Date</b> | NA   |



# CON/N2131: Carry out architectural and landscape BIM modeling

## Description

This OS unit is about carrying out architectural and landscape BIM modeling as per the client's requirements.

## Scope

The scope covers the following :

- Model the architectural elements
- Model the landscape elements
- Perform clash detection, sequencing and review

## Elements and Performance Criteria

### *Model the architectural elements*

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

- PC1.** set up the BIM environment with the appropriate units, coordinate system, and project settings
- PC2.** create a 3D model of the building's exterior shell, including walls, floors, roofs, and windows
- PC3.** use the BIM software's modeling tools to accurately represent the building's design
- PC4.** model the interior components, such as doors, stairs, railings, and partitions to enhance the model's visual representation
- PC5.** add architectural details such as cornices, mouldings, and trim to provide a more realistic representation of the building
- PC6.** create more intricate architectural elements, such as curved walls, domes, and special facades, using advanced modeling techniques
- PC7.** utilize BIM libraries or content provided by manufacturers for an accurate representation of components
- PC8.** use the relevant modeling techniques for architecture and landscape elements in the BIM software
- PC9.** assign appropriate material properties to the architectural elements to reflect their real-world appearance
- PC10.** incorporate furniture, fixtures, and equipment (FF&E) into the model to represent the building's interior design
- PC11.** collaborate with structural engineers, MEP designers, and other stakeholders to ensure proper coordination between architectural elements and other building systems

### *Model the landscape elements*

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

- PC12.** check the landscape plans, site surveys, planting schedules, and any other relevant documentation to understand the landscape design intent
- PC13.** create a 3D model of the site's topography and terrain, accurately representing the contours and elevation changes



## Qualification Pack



- PC14.** model the hardscape elements, such as pathways, walkways, patios, and driveways using the BIM software's modeling tools
- PC15.** integrate site features, such as retaining walls, terraces, steps, and ramps as per the landscape design
- PC16.** create planting areas for trees, shrubs, and other vegetation in the model based on the landscape plan
- PC17.** model individual landscape elements like trees, shrubs, plants, flowers, and other vegetation using appropriate BIM components or families
- PC18.** assign appropriate plant properties to the landscape elements, such as species, size, and planting details
- PC19.** model water features, such as ponds, fountains, waterfalls, and irrigation systems, as applicable
- PC20.** incorporate outdoor furniture, such as benches, tables, and seating areas, to enhance the model's visual representation
- PC21.** assign appropriate material properties to hardscape elements, such as pavers, tiles, and gravel, to reflect their real-world appearance
- PC22.** add annotations, dimensions, and information tags to the architectural and landscape elements to aid in documentation and construction processes
- PC23.** collaborate with architects, MEP designers, and other stakeholders to ensure proper coordination between landscape elements and other building systems

### *Perform clash detection, sequencing and review*

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

- PC24.** merge the architecture and landscape BIM models to produce a master BIM model to facilitate interoperability between architecture and landscaping disciplines
- PC25.** utilize BIM software's clash detection tools to identify any interferences or conflicts between architectural and landscape elements and other building components
- PC26.** identify and implement the appropriate changes to resolve the identified conflicts and clashes
- PC27.** incorporate phasing and sequencing information into the model to represent the construction sequence accurately
- PC28.** utilize the BIM model for 3D visualization and rendering to better understand the building's design and appearance
- PC29.** review the architectural and landscape BIM model regularly with the project team to ensure accuracy and compliance with design requirements
- PC30.** update the BIM model regularly as the design progresses and changes are made to the architectural and landscape elements

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the architectural design principles, including space planning, building typologies, aesthetics, circulation, and functional requirements
- KU2.** the landscape design principles, such as site analysis, grading, planting, hardscape elements, water features, and sustainable design practices
- KU3.** the commonly used BIM software for architectural and landscape modeling



## Qualification Pack



- KU4.** the applicable building codes, regulations, and zoning requirements that impact architectural and landscape design
- KU5.** the parametric modeling concepts and how to create and use families in BIM software to build flexible and reusable components
- KU6.** different visualization techniques, such as rendering, lighting, and shading, to create realistic and visually appealing representations of architectural and landscape designs
- KU7.** how to collaborate with other disciplines, such as structural engineering and MEP, to ensure coordinated BIM models and clash-free designs
- KU8.** different construction materials and construction methods used in architecture and landscape projects
- KU9.** sustainable design practices and green building principles
- KU10.** the BIM standards and best practices for architectural and landscape modeling
- KU11.** site analysis techniques and how to incorporate site topography into a BIM model for accurate landscape designs
- KU12.** the project management processes to effectively manage architectural and landscape BIM projects, including setting project milestones and deadlines
- KU13.** data exchange formats like IFC to facilitate coordination and collaboration with other project stakeholders
- KU14.** the appropriate 3D modeling techniques and how to apply textures to architectural and landscape elements to enhance the visual representation
- KU15.** the benefit and process of using the pre-existing families from the libraries in the BIM software
- KU16.** how to create and maintain the relevant families and libraries in the BIM software
- KU17.** the common challenges experienced during architectural and landscape BIM designing and how to overcome them
- KU18.** the landscape architecture workflow in the BIM process, i.e. pre-design, schematic design, development of design, and the development of design construction documents
- KU19.** the benefit of using purpose-built tools and features for landscape and site design workflows
- KU20.** the process of carrying out detailing in architectural landscaping projects
- KU21.** the importance of evaluating the BIM model for conflicts and clashes
- KU22.** the appropriate changes to be implemented to resolve the conflicts and clashes in the BIM model
- KU23.** the appropriate BIM techniques to be used for designing and detailing
- KU24.** the importance and process of applying appropriate modifications to the BIM model and drawings according to the site-based changes
- KU25.** the applicable documentation requirements
- KU26.** the importance of ensuring updated and accurate documentation before their release to the client

### Generic Skills (GS)

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

- GS1.** maintain work-related notes and records
- GS2.** read the relevant literature to learn about the latest developments in the field of work



## Qualification Pack



- GS3.** listen attentively to understand the information/ instructions being shared by the speaker
- GS4.** communicate clearly and politely with co-workers and clients
- GS5.** coordinate with co-workers to achieve work objectives
- GS6.** plan and prioritize tasks to ensure timely completion
- GS7.** identify possible disruptions to work and take appropriate preventive measures
- GS8.** take quick decisions to deal with workplace emergencies/ accidents
- GS9.** evaluate all possible solutions to a problem to select the best one

## Assessment Criteria

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Model the architectural elements</i>   | <b>11</b>    | <b>22</b>       | -             | <b>4</b>   |
| <b>PC1.</b> set up the BIM environment with the appropriate units, coordinate system, and project settings  | -            | -               | -             | -          |
| <b>PC2.</b> create a 3D model of the building's exterior shell, including walls, floors, roofs, and windows   | -            | -               | -             | -          |
| <b>PC3.</b> use the BIM software's modeling tools to accurately represent the building's design   | -            | -               | -             | -          |
| <b>PC4.</b> model the interior components, such as doors, stairs, railings, and partitions to enhance the model's visual representation   | -            | -               | -             | -          |
| <b>PC5.</b> add architectural details such as cornices, mouldings, and trim to provide a more realistic representation of the building  | -            | -               | -             | -          |
| <b>PC6.</b> create more intricate architectural elements, such as curved walls, domes, and special facades, using advanced modeling techniques                                    | -            | -               | -             | -          |
| <b>PC7.</b> utilize BIM libraries or content provided by manufacturers for an accurate representation of components   | -            | -               | -             | -          |
| <b>PC8.</b> use the relevant modeling techniques for architecture and landscape elements in the BIM software  | -            | -               | -             | -          |
| <b>PC9.</b> assign appropriate material properties to the architectural elements to reflect their real-world appearance   | -            | -               | -             | -          |
| <b>PC10.</b> incorporate furniture, fixtures, and equipment (FF&E) into the model to represent the building's interior design   | -            | -               | -             | -          |
| <b>PC11.</b> collaborate with structural engineers, MEP designers, and other stakeholders to ensure proper coordination between architectural elements and other building systems | -            | -               | -             | -          |
| <i>Model the landscape elements</i>   | <b>12</b>    | <b>26</b>       | -             | <b>4</b>   |

| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <b>PC12.</b> check the landscape plans, site surveys, planting schedules, and any other relevant documentation to understand the landscape design intent            | -            | -               | -             | -          |
| <b>PC13.</b> create a 3D model of the site's topography and terrain, accurately representing the contours and elevation changes                                     | -            | -               | -             | -          |
| <b>PC14.</b> model the hardscape elements, such as pathways, walkways, patios, and driveways using the BIM software's modeling tools                                | -            | -               | -             | -          |
| <b>PC15.</b> integrate site features, such as retaining walls, terraces, steps, and ramps as per the landscape design   | -            | -               | -             | -          |
| <b>PC16.</b> create planting areas for trees, shrubs, and other vegetation in the model based on the landscape plan   | -            | -               | -             | -          |
| <b>PC17.</b> model individual landscape elements like trees, shrubs, plants, flowers, and other vegetation using appropriate BIM components or families             | -            | -               | -             | -          |
| <b>PC18.</b> assign appropriate plant properties to the landscape elements, such as species, size, and planting details   | -            | -               | -             | -          |
| <b>PC19.</b> model water features, such as ponds, fountains, waterfalls, and irrigation systems, as applicable  | -            | -               | -             | -          |
| <b>PC20.</b> incorporate outdoor furniture, such as benches, tables, and seating areas, to enhance the model's visual representation                                | -            | -               | -             | -          |
| <b>PC21.</b> assign appropriate material properties to hardscape elements, such as pavers, tiles, and gravel, to reflect their real-world appearance                | -            | -               | -             | -          |
| <b>PC22.</b> add annotations, dimensions, and information tags to the architectural and landscape elements to aid in documentation and construction processes       | -            | -               | -             | -          |
| <b>PC23.</b> collaborate with architects, MEP designers, and other stakeholders to ensure proper coordination between landscape elements and other building systems | -            | -               | -             | -          |



## Qualification Pack



| Assessment Criteria for Outcomes  | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Perform clash detection, sequencing and review</i>   | <b>7</b>     | <b>12</b>       | -             | <b>2</b>   |
| <b>PC24.</b> merge the architecture and landscape BIM models to produce a master BIM model to facilitate interoperability between architecture and landscaping disciplines      | -            | -               | -             | -          |
| <b>PC25.</b> utilize BIM software's clash detection tools to identify any interferences or conflicts between architectural and landscape elements and other building components | -            | -               | -             | -          |
| <b>PC26.</b> identify and implement the appropriate changes to resolve the identified conflicts and clashes   | -            | -               | -             | -          |
| <b>PC27.</b> incorporate phasing and sequencing information into the model to represent the construction sequence accurately  | -            | -               | -             | -          |
| <b>PC28.</b> utilize the BIM model for 3D visualization and rendering to better understand the building's design and appearance   | -            | -               | -             | -          |
| <b>PC29.</b> review the architectural and landscape BIM model regularly with the project team to ensure accuracy and compliance with design requirements                        | -            | -               | -             | -          |
| <b>PC30.</b> update the BIM model regularly as the design progresses and changes are made to the architectural and landscape elements   | -            | -               | -             | -          |
| <b>NOS Total</b>  | <b>30</b>    | <b>60</b>       | -             | <b>10</b>  |





### National Occupational Standards (NOS) Parameters

|                         |  |
|-------------------------|--|
| <b>NOS Code</b>         | CON/N2131  |
| <b>NOS Name</b>         | Carry out architectural and landscape BIM modeling |
| <b>Sector</b>           | Construction                                       |
| <b>Sub-Sector</b>       | Real Estate and Infrastructure construction        |
| <b>Occupation</b>       | Building Information Modeling                      |
| <b>NSQF Level</b>       | 4  |
| <b>Credits</b>          | 2  |
| <b>Version</b>          | 1.0  |
| <b>Next Review Date</b> | NA   |

### Assessment Guidelines and Assessment Weightage

#### Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC)/ Elements will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC/ Elements.
2. The assessment for the knowledge part will be based on knowledge bank of questions created by Assessment Bodies subject to approval by SSC.
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. The passing percentage for each QP will be 70%. To pass the Qualification Pack, every trainee should score a minimum of 70% individually in each NOS.
6. The Assessor shall check the final outcome of the practices while evaluating the steps performed to achieve the final 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 SSC the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.



## Qualification Pack



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 SSC.

10. Minimum duration of Assessment of each QP shall be of 4hrs/trainee.

### 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 |
|---|--------------|-----------------|---------------|------------|-------------|-----------|
| CON/N2123.Determine the BIM modeling requirements                   | 30           | 60              | 0             | 10         | 100         | 20        |
| CON/N2124.Create the BIM model using the appropriate BIM software   | 30           | 60              | 0             | 10         | 100         | 20        |
| CON/N2125.Carry out documentation and record-keeping for BIM models | 30           | 60              | 0             | 10         | 100         | 20        |
| CON/N9004.Follow health and safety practices at work                | 30           | 70              | 0             | 0          | 100         | 5         |
| DGT/VSQ/N0102.Employability Skills (60 Hours)                       | 20           | 30              | -             | -          | 50          | 5         |
| <b>Total</b>  | <b>140</b>   | <b>280</b>      | <b>-</b>      | <b>30</b>  | <b>450</b>  | <b>70</b> |

### Elective: 1 Mechanical, Electrical, and Plumbing (MEP)

| National Occupational Standards                   | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---|--------------|-----------------|---------------|------------|-------------|-----------|
| CON/N2126.Prepare for MEP BIM modeling            | 30           | 60              | 0             | 10         | 100         | 15        |
| CON/N2127.Carry out modeling for MEP BIM projects | 30           | 60              | 0             | 10         | 100         | 15        |



## Qualification Pack



| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|---------------------------------|--------------|-----------------|---------------|------------|-------------|-----------|
| <b>Total</b>                    | <b>60</b>    | <b>120</b>      | <b>-</b>      | <b>20</b>  | <b>200</b>  | <b>30</b> |

Elective: 2 Structural and Formwork

| National Occupational Standards                            | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|--|--------------|-----------------|---------------|------------|-------------|-----------|
| CON/N2128.Prepare for structural and formwork BIM modeling | 30           | 60              | 0             | 10         | 100         | 15        |
| CON/N2129.Carry out structural and formwork BIM modeling   | 30           | 60              | 0             | 10         | 100         | 15        |
| <b>Total</b>   | <b>60</b>    | <b>120</b>      | <b>-</b>      | <b>20</b>  | <b>200</b>  | <b>30</b> |

Elective: 3 Architectural and Landscape

| National Occupational Standards                                | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|--|--------------|-----------------|---------------|------------|-------------|-----------|
| CON/N2130.Prepare for architectural and landscape BIM modeling | 30           | 60              | 0             | 10         | 100         | 15        |
| CON/N2131.Carry out architectural and landscape BIM modeling   | 30           | 60              | 0             | 10         | 100         | 15        |
| <b>Total</b>   | <b>60</b>    | <b>120</b>      | <b>-</b>      | <b>20</b>  | <b>200</b>  | <b>30</b> |



## Qualification Pack



### Acronyms

|             |   |
|-------------|---|
| <b>NOS</b>  | National Occupational Standard(s)               |
| <b>NSQF</b> | National Skills Qualifications Framework        |
| <b>QP</b>   | Qualifications Pack                             |
| <b>TVET</b> | Technical and Vocational Education and Training |
| <b>BIM</b>  | Buildings Information Modeling                  |
| <b>LOD</b>  | Level Of Development                            |
| <b>HVAC</b> | Heating, Ventilation, and Air Conditioning      |
| <b>CDE</b>  | Common Data Environment                         |
| <b>MEP</b>  | Mechanical, Electrical, and Plumbing            |
| <b>BEP</b>  | BIM Execution Plan                              |
| <b>BOQ</b>  | Bill of Quantities                              |
| <b>LOI</b>  | Level of Information                            |



### Glossary

|  |  |
|--|--|
| <b>Sector</b>                                | 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.  |
| <b>Sub-sector</b>                            | Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.   |
| <b>Occupation</b>                            | Occupation is a set of job roles, which perform similar/ related set of functions in an industry.  |
| <b>Job role</b>                              | Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.  |
| <b>Occupational Standards (OS)</b>           | 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. |
| <b>Performance Criteria (PC)</b>             | Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.  |
| <b>National Occupational Standards (NOS)</b> | NOS are occupational standards which apply uniquely in the Indian context.   |
| <b>Qualifications Pack (QP)</b>              | 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.   |
| <b>Unit Code</b>                             | Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'  |
| <b>Unit Title</b>                            | Unit title gives a clear overall statement about what the incumbent should be able to do.  |
| <b>Description</b>                           | 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.   |
| <b>Scope</b>                                 | 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.  |
| <b>Knowledge and Understanding (KU)</b>      | 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.   |



## Qualification Pack



|   |   |
|---|---|
| <b>Organisational Context</b>           | <p>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.</p>   |
| <b>Technical Knowledge</b>              | <p>Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.</p>   |
| <b>Core Skills/ Generic Skills (GS)</b> | <p>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.</p> |
| <b>Electives</b>                        | <p>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.</p>  |
| <b>Options</b>                          | <p>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.</p>  |