Model Curriculum

QP Name: BIM Modeler

Elective:

1. **Mechanical, Electrical and Plumbing (MEP)**

2. **Structural and Formwork**

3. **Architectural and Landscape**

QP Code: CON/Q2110

Version: 1.0

NSQF Level: 4.0

Model Curriculum Version: 1.0

Construction Skill Development Council of India|| Tower 4B, DLF Corporate Park, 201&, 202 4B, Mehrauli-Gurgaon Rd, DLF Phase 3, Gurugram, Haryana 122002

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Training Parameters

Sector	Construction
Sub-Sector	Real Estate and Infrastructure Construction
Occupation	Buildings Information Modeling (BIM)
Country	India
NSQF Level	4.0
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2142.9900
Minimum Educational Qualification and Experience	12th grade pass OR Completed 2nd year of 3-year diploma (after 10th) and pursuing regular diploma OR Pursuing 2nd year of 3-year regular Diploma (after 10th) OR 10th grade pass and pursuing continuous schooling (for 2-year program) OR 11th Grade Pass with 1-year relevant experience OR 10th Grade Pass with 2-year relevant experience OR Previous relevant Qualification of NSQF Level 3.0 with 3-year relevant experience OR Previous relevant Qualification of NSQF Level 3.5 with 1.5-year relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	31/08/2023
Next Review Date	31/08/2026
NSQC Approval Date	31/08/2023

QP Version	1.0
Model Curriculum Creation Date	31/08/2023
Model Curriculum Valid Up to Date	31/08/2026
Model Curriculum Version	1.0
Minimum Duration of the Course	420 Hours
Maximum Duration of the Course	660 Hours

Program Overview

This section summarises the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Discuss how to determine the project requirements, scope, objectives and constraints.
- Explain the procedure of collect all the relevant project information.
- Discuss how to create the BIM model.
- Explain how to perform BIM model review, documentation and detailing.
- Explain how to carry out the documentation for BIM models.
- Explain the importance of following health and safety practices at work.
- Discuss the applicable employability skills.
- Explain the process of preparing for MEP BIM modelling.
- Explain the process of preparing for Structural and Formwork BIM Modeling.
- Explain the process of preparing for Architectural and Landscape BIM Modeling.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
CON/N2123: Determine the BIM modeling requirements **NOS Version- 1.0** **NSQF Level- 4.0**	**30:00**	**60:00**	**30:00**	**00:00**	**120:00**
Module 1: Introduction to the Role of a BIM Modeler	05:00	0:00	0:00	00:00	05:00
Module 2: Process of determining the BIM modeling requirements	25:00	60:00	30:00	00:00	115:00
CON/N2124: Create the BIM model using the appropriate BIM software **NOS Version- 1.0** **NSQF Level- 4.0**	**15:00**	**15:00**	**30:00**	**00:00**	**60:00**
Module 3: Process of creating the BIM model using the BIM software	15:00	15:00	30:00	00:00	60:00
CON/N2125: Carry out documentation and record-keeping for BIM models **NOS Version- 1.0**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**

NOS and Module Details	Theory Duration (Hrs.)	Practical Duration (Hrs.)	On-the-Job Training Duration (Mandatory) (Hrs.)	On-the-Job Training Duration (Recommended) (Hrs.)	Total Duration (Hrs.)
NSQF Level- 4.0					
Module 4: Process of documenting and record keeping for BIM models	10:00	20:00	00:00	00:00	30:00
CON/N9004: Follow health and safety practices at work **NOS Version- 1.0** **NSQF Level- 4.0**	**05:00**	**25:00**	**0:00**	**00:00**	**30:00**
Module 5: Health and Safety at Work	05:00	25:00	0:00	00:00	30:00
DGT/VSQ/N0102: Employability Skills **NOS Version- 1.0** **NSQF Level- 2.0**	**60:00**	**00:00**	**00:00**	**00:00**	**60:00**
Module 6: Employability Skills	60:00	00:00	0:00	00:00	60:00
Total Duration	**120:00**	**120:00**	**60:00**	**00:00**	**300:00**

Elective Modules

The table lists the modules and their duration corresponding to the Elective NOS of the QP.

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

NOS and Module Details	Theory Duration (Hrs.)	Practical Duration (Hrs.)	On-the-Job Training Duration (Mandatory) (Hrs.)	On-the-Job Training Duration (Recommended) (Hrs.)	Total Duration (Hrs.)
CON/N2126: Prepare for MEP BIM modeling **NOS Version - 1.0** **NSQF Level - 4.0**	**20:00**	**40:00**	**00:00**	**00:00**	**60:00**
Module 7: Process of preparing for MEP BIM modeling	20:00	40:00	00:00	00:00	60:00
CON/N2127: Carry out modeling for MEP BIM projects **NOS Version - 1.0** **NSQF Level - 4.0**	**10:00**	**50:00**	**00:00**	**00:00**	**60:00**
Module 8: Process of carrying-out modeling for MEP BIM projects	10:00	50:00	00:00	00:00	60:00
Total Duration	**30:00**	**90:00**	**00:00**	**00:00**	**120:00**

Elective 2: Structural and Formwork

NOS and Module Details	Theory Duration (Hrs.)	Practical Duration (Hrs.)	On-the-Job Training Duration (Mandatory) (Hrs.)	On-the-Job Training Duration (Recommended) (Hrs.)	Total Duration (Hrs.)
CON/N2128: Prepare for structural and formwork BIM modeling NOS Version - 1.0 NSQF Level - 4.0	20:00	40:00	00:00	00:00	60:00
Module 9: Process of preparing for structural and formwork BIM modeling	20:00	40:00	00:00	00:00	60:00
CON/N2129: Carry out structural and formwork BIM modeling NOS Version - 1.0 NSQF Level - 4.0	10:00	50:00	00:00	00:00	60:00
Module 10: Process of carrying-out structural and formwork BIM modeling	10:00	50:00	00:00	00:00	60:00
Total Duration	30:00	90:00	00:00	00:00	120:00

Elective 3: Architectural and Landscape

NOS and Module Details	Theory Duration (Hrs.)	Practical Duration (Hrs.)	On-the-Job Training Duration (Mandatory) (Hrs.)	On-the-Job Training Duration (Recommended) (Hrs.)	Total Duration (Hrs.)
CON/N2130: Prepare for architectural and landscape BIM modeling NOS Version - 1.0 NSQF Level - 4.0	20:00	40:00	00:00	00:00	60:00
Module 11: Process of preparing for architectural and landscape BIM modeling	20:00	40:00	00:00	00:00	60:00
CON/N2131: Carry out architectural and landscape BIM modeling NOS Version - 1.0 NSQF Level - 4.0	10:00	50:00	00:00	00:00	60:00
Module 12: Process of carrying-out for architectural and landscape BIM modeling	10:00	50:00	00:00	00:00	60:00
Total Duration	30:00	90:00	00:00	00:00	120:00

Module Details

Module 1: Introduction to the Role of a BIM Modeler
Mapped to CON/N2123, v1.0

Terminal Outcomes:

- Discuss the job role of a BIM Modeler.

Duration: 05:00	Duration: 0:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Describe the size and scope of the Construction industry and its sub-sectors. - Discuss the role and responsibilities of a BIM Modeler. - Identify various employment opportunities for a BIM Modeler.	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Process of Determining the BIM Modeling Requirements
Mapped to CON/N2123, v1.0

Terminal Outcomes:

- Demonstrate how to determine the project scope and plan.
- Explain the procedure of collecting the project information.

Duration: 25:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the benefits of using BIM modeling software in building construction projects. - Explain how to analyze the relevant drawings to determine the applicable specifications. - Explain how to identify the key stakeholders and their roles in the BIM process. - Discuss 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. - Describe the relevant Indian Standard Codes of practice as applicable and other relevant standards, e.g. British/German/American Standard.	- Show how to determine the project requirements, scope, objectives and constraints before starting BIM modelling. - Demonstrate how to interpret the technical drawings and building plans. - Show how to evaluate the architectural and structural plans for consistency with schematics. - Demonstrate how to determine the level of detail (LOD) and level of development (LOD) required for the model at different project stages. - Show how to determine the project timeline and milestones. - Show how to collect all relevant project documentation, including architectural drawings, engineering plans, specifications, and other relevant data. - Show how to collect the required information concerning the building systems, materials, and equipment. - Demonstrate how to organize and digitize the collected information for easy access during the modeling process.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Revit, AutoCAD, Navisworks, Desktop/Laptop	

Module 3: Process of Creating the BIM Model using the BIM Software
Mapped to CON/N2124, v1.0

Terminal Outcomes:

- Demonstrate how to create the BIM model.
- Show how to perform data input and management and detect and resolve clashes.
- Explain how to perform BIM model review, documentation and detailing.
- Show how to perform visualization, rendering, collaborating and coordinating.
- Explain how to update and maintain the BIM model.

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the BIM and construction management. - Explain the basics of coding. - Discuss the process of building information modeling to create a digital representation of physical spaces or systems. - Explain different BIM software used for different/ specific purposes. - Elucidate the use of appropriate BIM tools for the creation and rendering of 3D models of a building, structures, etc. - Explain the process of using the pre-existing families from the libraries in the BIM software. - Discuss the process of applying appropriate modifications to the BIM model and drawings. - Explain the importance of ensuring updated and accurate BIM documentation before their release to the client. - Explain the use of BIM to produce functional designs containing the necessary data. - Discuss how to convert 3D BIM models into precise 2D drawings using BIM landscape architecture, for the use of site staff. - Discuss the process of carrying out detailing for the relevant elements in the BIM model. - Describe the applicable documentation requirements.	- Show how to select the appropriate BIM software that suits the project's requirements and the team's expertise. - Demonstrate how to set up the project in the selected BIM software, defining project parameters, units, and coordinate systems. - Show how to build the 3D model based on the architectural and engineering drawings. - Demonstrate how to create a digital representation of physical spaces or systems. - Demonstrate how to identify and use the appropriate tools for creating and rendering the 3D model of a building, structure, etc. - Show how to integrate structural elements, such as columns, beams, and foundations, and specialized systems e.g. fire protection, lighting, and Heating, Ventilation, and Air Conditioning (HVAC). - Show how to enter the relevant information, such as material properties, dimensions, manufacturer details, and equipment specifications into the model's elements. - Demonstrate how to utilize parametric modeling techniques to create smart objects that adjust automatically to changes. - Show how to perform clash detection analysis to identify potential clashes or conflicts between different

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building elements and systems and how to resolve them.

● Demonstrate how to conduct regular model reviews with the project team to ensure accuracy, completeness, and compliance with project requirements and standards.

● Demonstrate how to create schedules and quantity take-offs based on the BIM data.

● Show how to prepare construction drawings using the data extracted from the BIM model.

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

● Show how to deliver the final BIM model to the client at project completion for their facility management and maintenance purposes.

● Show how to how to create and maintain the relevant families and libraries in the BIM software.

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Classroom Aids

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements

Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 4: Process of Documenting and Record Keeping for BIM Models
Mapped to CON/N2125, v1.0

Terminal Outcomes:

- Explain how to carry out the documentation for BIM models.
- Show how to collaborate and coordinate with project stakeholders.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the benefits of documentation and record keeping for BIM models. - Explain the appropriate features and capabilities of the BIM software to navigate and extract information from the BIM model efficiently. - Describe the industry-specific BIM standards and protocols, such as National BIM Standards (e.g., NBIMS-US), ISO 19650, or regional BIM guidelines. - Discuss the guidelines for model organization, naming conventions, data exchange formats, and documentation procedures. - Explain the 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. - Explain the role of BIM models in different project stages concerning the information that needs to be documented at each phase. - Explain the document management systems and procedures for organizing, storing, and retrieving BIM-related documentation. - Explain the different information exchange formats. - Elucidate the legal and contractual obligations related to BIM documentation and record-keeping, including intellectual property rights, confidentiality agreements, and handover requirements.	- Show how to document the BEP, outlining the project's BIM requirements, responsibilities of team members, data exchange protocols, etc. - Demonstrate how to perform conceptual design, analysis, detailing, and documentation for informing logistics and schedules. - Show how to document the design decisions, changes, and approvals using a Common Data Environment (CDE) that allows for collaboration and coordination among different disciplines. - Show how to metadata and relevant data to BIM elements within the model, including specifications, manufacturer information, installation guidelines, maintenance schedules, etc. - Show how to document the construction progress, issues, and resolutions using a CDE that allows for tracking and reporting. - Show the procedure of collecting and documenting the necessary data for the BIM model. - Show how to share the BIM model with project stakeholders through collaborative platforms for real-time collaboration and coordination - Demonstrate the recording and implementation of the feedback of project stakeholders. - Demonstrate how to perform data validation and quality control checks on the BIM model and associated documentation.
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	

Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 5: Health and Safety at Work
Mapped to CON/N9004, v1.0

Terminal Outcomes:

- Explain the applicable practices to maintain health and safety at work.
- Discuss workplace emergency procedures.

Duration: 05:00	Duration: 25:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Discuss the regulations concerning workplace health and safety. - List the appropriate Personal Protective Equipment (PPE) to be used for workplace health and safety. - Discuss the appropriate practices to maintain hygiene at work. - Explain how to identify and mitigate potential hazards at work. - Discuss the importance of participating in safety drills at work. - Elaborate on the appropriate practices to be followed during workplace emergencies. - Explain the documentation requirements concerning workplace emergencies.	- Demonstrate the use of relevant PPE. - Show how to lift heavy items safely to prevent any injuries. - Demonstrate the use of appropriate emergency equipment, e.g. use of fire extinguishers for different types of fire. - Show how to administer first aid to injured or unwell personnel. - Demonstrate the relevant practices for effective waste management.
Classroom Aids:	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
Safety Gloves, Face Mask, Soap/ Hand Sanitizer, Safety goggles, Fire extinguishers, Sand buckets, Fire prevention kit, First Aid box, Safety Tags, Safety Notice Board	

Module 6: Employability Skills
Mapped to DGT/VSQ/N0102 v1.0

Duration: 60:00
Key Learning Outcomes

Introduction to Employability Skills Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss the importance of relevant 21st-century skills.
6. Exhibit 21st-century skills like Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration:5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely
19. List the common components of salary and compute income, expenditure, taxes, investments etc.

20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours
21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours
26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours
30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs Duration: 8 Hours
33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Module 7: Process of Preparing for MEP BIM Modeling
Mapped to CON/N2126, v1.0

Terminal Outcomes:

- Explain how to determine the project scope and objectives
- Describe the Level of Development (LOD).

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the 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. - Explain the relevant building codes, regulations, and industry standards related to MEP systems. - Discuss the commonly used BIM software for MEP modeling and relevant specialized MEP BIM tools. - Explain the procedure of determining the MEP BIM requirements. - Discuss the benefit and procedure of defining the LOD. - Explain the principles of BIM collaboration and coordination between different disciplines, such as architecture, structural engineering, and MEP. - Discuss the fundamentals of MEP design and calculations, including load calculations, duct and pipe sizing, electrical circuit design, lighting calculations, etc. - Explain the construction workflow and the role of MEP BIM modeling in the overall project management process. - Elucidate different data exchange formats used in the industry, such as IFC (Industry Foundation Classes), to facilitate collaboration and data sharing between different software platforms. - Explain how to identify the building type, size, and complexity, to determine the level of detail required in the MEP BIM model. - Define the naming conventions, parameters, and families to be used in the	- Show how to determine the project's scope, objectives, and specific requirements related to MEP systems. - Show how to 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. - Show how to determine the appropriate Level of Development (LOD) for MEP elements in the BIM model at various project stages - Demonstrate how to 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. - Show how to determine the specific data requirements for each MEP system component, such as manufacturer information, technical specifications, performance data, and maintenance requirements - Show how to how to create parametric families and components in BIM software, allowing for flexibility and adaptability in designing MEP systems. - Show the specifications and technical details of MEP equipment, fixtures, and products commonly used in building projects. - Demonstrate how to perform clash detection and coordination between MEP systems and other building elements to avoid conflicts during construction. - Demonstrate the coordination requirements for MEP systems and define the clash detection processes to identify

BIM model.	and resolve conflicts.

Classroom Aids
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films
Tools, Equipment and Other Requirements
Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 8: Process of Carrying-out Modeling for MEP BIM Projects
Mapped to CON/N2127, v1.0

Terminal Outcomes:

- Explain how to Create MEP BIM model
- Show how to perform scheduling and phasing.
- Show how to coordinate with other disciplines.
- Explain how to perform BIM model review.
- Demonstrate how to update and maintain the MEP BIM model.

Duration: 10:00	Duration: 50:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the applicable modeling guidelines and standards for the MEP BIM elements to ensure consistency and uniformity across the model. - Explain how to plan for temporary systems or installations if needed during construction. - Explain the applicable national and international HVAC, electrical and plumbing codes and standards. - Discuss the appropriate BIM techniques and software to be used for designing and detailing MEP systems. - Discuss the importance of preparing drawings as per the specifications provided by the client and the engineer's instructions. - Discuss the importance and process of applying appropriate modifications to the MEP BIM model and drawings according to the site-based changes. - Explain the appropriate procedure to communicate and resolve clashes among different disciplines. - Explain the importance of evaluating the BIM model for conflicts and clashes between the architectural elements and the MEP systems. - Explain how to identify design errors, issues and inter or intra-disciplinary 3D geometrical conflicts in the MEP BIM model. - Explain how to document all MEP BIM requirements in a comprehensive BIM Execution Plan (BEP) or BIM Scope of Work document.	- Demonstrate how to create a 3D BIM model for the building's MEP elements based on the MEP design drawings, including the architectural and structural framework of the building. - Demonstrate how to set up HVAC equipment, e.g. air handlers, chillers, and fans within the building's designated mechanical rooms or spaces. - Show how to create the ductwork system by routing ducts from the equipment to supply and return air outlets and registers. - Show how to position electrical panels, transformers, and switchgear in the designated electrical rooms. - Show how to create electrical conduits and cable trays to route electrical wires and cables throughout the building. - Demonstrate how to create piping systems to connect the fixtures to water supply and drainage networks. - Demonstrate how to prepare pipe size for internal water supply and drainage system in the building. - Demonstrate how to prepare the shaft/duct sizes for the HVAC system. - Show how to prepare detailed shop drawings for the sanitary water supply and drainage. - Show how to design and detail the plumbing and electrical outlets. - Show how to ensure the MEP BIM model complies with the relevant building codes, regulations, and industry standards related to MEP systems in the project

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- Demonstrate how to incorporate scheduling and phasing information for MEP systems to reflect the construction sequence and installation timeline.
- Show how to incorporate sustainability and energy efficiency requirements for MEP systems.
- Show how to coordinate with architectural and structural teams to ensure proper integration of MEP systems into the overall building design.
- Demonstrate how to identify potential clashes or conflicts between MEP elements and other building components to resolve them during the design phase.
- Show how to review the MEP BIM model with MEP engineers and other stakeholders.
- Show how to update the MEP BIM model continuously throughout the design and construction phases to reflect changes and revisions.
- Demonstrate the process of creating designs, models, and prototypes using 3D printers and other rapid prototyping equipment.
- Show how to prepare the Bill of Quantities (BOQ) as per the given instructions.
- Demonstrate the process of maintaining the appropriate records as per the organizational procedures.

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Classroom Aids

Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films

Tools, Equipment and Other Requirements

Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 9: Process of Preparing for Structural and Formwork BIM Modeling
Mapped to CON/N2128, v1.0

Terminal Outcomes:

- Explain how to determine the structural and formwork modeling requirements
- Demonstrate how to plan structural and formwork modeling.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the basic principles and concepts of BIM. - Discuss the relevant BIM software for structural and formwork BIM modelling. - Explain the benefits of carrying out formwork modeling and detailing. - Discuss the use of appropriate software for structure and formwork modelling. - Explain the process of building information modeling to create a digital representation of physical spaces or systems. - Elucidate the importance of determining the project requirements before starting BIM modelling. - Discuss the process of planning structural and formwork BIM modelling. - Define standard workflows and practices for structural and formwork modeling to ensure consistency in the modeling process. - Explain how to identify appropriate BIM standards and templates for the project, e.g. standardized families and templates to maintain consistency in the project.	- Show how to interpret the technical drawings and building plans. - Show how to review the architectural and engineering drawings, structural calculations, and any other relevant design documents to understand the building's structural layout and design intent. - Demonstrate how to determine the type of structural systems used in the building (e.g., reinforced concrete, steel, timber) and understand their specific design and construction considerations. - Show how to collect the structural design data and formwork design details and specifications. - Demonstrate how to select an appropriate BIM software, ensuring it has the appropriate modeling tools and capabilities for structural and formwork modelling. - Show how to identify the BIM modeling standards for the project, including naming conventions, layer organization, object properties, and annotation styles. - Demonstrate how to identify the Level of Development (LOD) and Level of Information (LOI) requirements for the BIM model. - Show how tp check the BIM Execution Plan (BEP) for the BIM implementation strategy, data exchange formats, project milestones, etc.
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
Revit, AutoCAD, Navisworks, Desktop/Laptop	

Module 10: Process of Carrying-out Structural and Formwork BIM Modeling
Mapped to CON/N2129, v1.0

Terminal Outcomes:

- Explain how to model the structural elements and the formwork elements.
- Show how to perform clash detection and sequencing
- Discuss how to coordinate with other disciplines and review the model.

Duration: 10:00	Duration: 50:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain 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. - Discuss the 3D models and model-extracted shop drawings. - Explain the importance and process of planning formwork workflows for quick and secure construction. - Explain the importance of having accurately designed formwork panels and modules at the required location. - Elucidate the benefit of using model-driven shop drawings in documentation, fabrication, and installation. - Explain the process of 3D formwork visualization, and formwork component mapping and annotation. - Explain how to create and maintain the relevant families and libraries in the BIM software. - Discuss the importance of ensuring updated and accurate documentation before their release to the client. - Explain how to collaborate with other team members to resolve any clashes found during the clash detection process.	- Show how to create 3D models of basic building elements, such as walls, floors, roofs, and foundations, using the BIM software's modeling tools. - Demonstrate how to use the structural design data to accurately place and size the structural elements in the model. - Show how to integrate reinforcement bars into the structural elements based on engineering specifications and design requirements. - Show how to create more intricate structural elements like curved beams, cantilevers, and complex connections using advanced modeling techniques. - Show how to model steel elements, e.g. steel columns, beams, and their connections considering their interaction with concrete elements. - Show how to create formwork components, such as form panels, supports, braces, and tie systems to represent the temporary structures used to mould concrete during construction. - Demonstrate how to model formwork for slabs, walls, and columns as per the construction sequence and formwork requirements. - Demonstrate how to model different types of formwork used in the project, including wall formwork, slab formwork, column formwork, and foundation formwork.

	● Demonstrate how to create 3D visualization and design horizontal panels for floors, slabs, beams, etc., and vertical panels for columns, walls, etc.
	● Show how to use the BIM software's clash detection tools to identify potential interferences or conflicts between structural components and other building elements.
	● Show how to collaborate with architects, MEP designers, and other stakeholders to ensure proper coordination between structural elements and other building systems.
	● Demonstrate how to update the BIM model continuously as the design progresses and changes are made to the structural or formwork components.

Classroom Aids

Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films

Tools, Equipment and Other Requirements

Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 11: Process of Preparing for Architectural and Landscape BIM Modeling

Mapped to CON/N2130, v1.0

Terminal Outcomes:

- Explain how to determine the project requirements.
- Demonstrate how to set up the BIM software for use.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the benefits and use of BIM to streamline architectural and landscape project administration and design. - Discuss the commonly used BIM software for architectural and landscape modelling. - Explain the process of building information modeling to create a digital representation of physical spaces or systems. - Explain the importance of determining the project requirements before starting BIM modelling. - Discuss how to identify the BIM modeling standards for the project, including naming conventions, layer organization, object properties, and annotation styles. - Explain how to identify standard workflows and practices to follow to ensure consistency across the modeling team.	- Show how to interpret the technical drawings and building plans. - Show how to check the BIM Execution Plan that outlines the project's BIM requirements, responsibilities, deliverables, and coordination procedures. - Demonstrate how to determine the project scope, objectives, and design intent by reviewing architectural drawings, landscape designs, and any other project documentation. - Demonstrate how to determine the Level of Detail (LOD) and Level of Development (LOD) required for the BIM model at different project stages. - Show how to collect architectural drawings, landscape plans, site surveys, and any other relevant data needed for modelling. - Show how to select the appropriate BIM software appropriate for architectural and landscape modelling. - Demonstrate how to create or customize modeling templates that include standard architectural and landscape elements to speed up the modeling process. - Demonstrate how to set up cloud-based collaboration tools for use to enable real-time communication and coordination among team members working on the BIM model.
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	

Tools, Equipment and Other Requirements
Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 12: Process of Carrying-out for Architectural and Landscape BIM Modeling

Mapped to CON/N2131, v1.0

Terminal Outcomes:

- Explain how to model the architectural elements.
- Discuss the model the landscape elements.
- Show how to perform clash detection, sequencing and review.

Duration: 10:00	Duration: 50:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the architectural design principles, including space planning, building typologies, aesthetics, circulation, and functional requirements. - Discuss the landscape design principles, such as site analysis, grading, planting, hardscape elements, water features, and sustainable design practices. - Explain how to collaborate with other disciplines, such as structural engineering and MEP, to ensure coordinated BIM models and clash-free designs. - Elucidate the site analysis techniques and how to incorporate site topography into a BIM model for accurate landscape designs. - Discuss the appropriate 3D modeling techniques and how to apply textures to architectural and landscape elements to enhance the visual representation. - Explain the landscape architecture workflow in the BIM process, i.e. pre-design, schematic design, development of design, and the development of design construction documents. - Explain the importance and process of applying appropriate modifications to the BIM model and drawings according to the site-based changes.	- Show how to set up the BIM environment with the appropriate units, coordinate system, and project settings. - Demonstrate how to create a 3D model of the building's exterior shell, including walls, floors, roofs, and windows. - Show how to model the interior components, such as doors, stairs, railings, and partitions to enhance the model's visual representation. - Demonstrate how to create more intricate architectural elements, such as curved walls, domes, and special facades, using advanced modeling techniques. - Show how to assign appropriate material properties to the architectural elements to reflect their real-world appearance. - Show how to incorporate furniture, fixtures, and equipment (FF&E) into the model to represent the building's interior design. - Demonstrate how to create a 3D model of the site's topography and terrain, accurately representing the contours and elevation changes. - Show how to model the hardscape elements, such as pathways, walkways, patios, and driveways using the BIM software's modeling tools. - Show how to model individual landscape elements like trees, shrubs, plants, flowers, and other vegetation using appropriate BIM components or families. - Show how to incorporate outdoor

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furniture, such as benches, tables, and seating areas, to enhance the model's visual representation.

● Demonstrate how to identify and implement the appropriate changes to resolve the identified conflicts and clashes.

● Show how to incorporate phasing and sequencing information into the model to represent the construction sequence accurately.

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Classroom Aids

Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films

Tools, Equipment and Other Requirements

Revit, AutoCAD, Navisworks, Desktop/Laptop

Module 13: On-the-Job Training

Mapped to BIM Modeler

Mandatory Duration: 60:00	Recommended Duration: 00:00

Location: On-Site

Terminal Outcomes

- Demonstrate how to determine the project scope and plan.
- Show the procedure of collecting the project information.
- Demonstrate how to create the BIM model.
- Show how to perform data input and management and detect and resolve clashes.
- Demonstrate how to perform BIM model review, documentation and detailing.
- Show how to perform visualization, rendering, collaborating and coordinating.
- Demonstrate how to update and maintain the BIM model.
- Show how to determine the project scope and objectives
- Demonstrate how to Create MEP BIM model
- Show how to perform scheduling and phasing.
- Show how to coordinate with other disciplines.
- Show how to perform BIM model review.
- Demonstrate how to update and maintain the MEP BIM model.
- Show how to determine the structural and formwork modeling requirements
- Demonstrate how to plan structural and formwork modeling.
- Demonstrate how to model the structural elements and the formwork elements.
- Show how to perform clash detection and sequencing in structural and formwork modeling.
- Demonstrate how to coordinate with other disciplines and review the model.
- Show how to determine the project requirements.
- Demonstrate how to set up the BIM software for use.
- Demonstrate how to model the architectural elements.
- Show how to model the landscape elements.
- Show how to perform clash detection, sequencing and review in architectural and landscape BIM modeling.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialisation**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	Specialization	Years	Specialization	
ITI/12th	Any domain	6	Buildings Information Modeling (BIM)	0	-	
Diploma in Engineering	Civil Engineering/ Mechanical Engineering/ Manufacturing/ Mathematics/ Physics degree	3	Buildings Information Modeling (BIM)	0	-	
Graduate	Civil Engineering/ Mechanical Engineering	2	Buildings Information Modeling (BIM)	0	-	

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role "BIM Modeler" in any one Elective from Mechanical, Electrical and Plumbing (MEP)/ Structural and Formwork/ Architectural and Landscape: mapped to QP: "CON/Q2110, v1.0", Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer (Vet and Skills)", mapped to the Qualification Pack: "MEP/Q2601, v2.0". The minimum accepted score as per MEPSC guidelines is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	*Specialization*	*Years*	*Specialization*	
ITI/12th	Any domain	7	Buildings Information Modeling (BIM)	0	-	
Diploma in Engineering	Civil Engineering/ Mechanical Engineering/ Manufacturing/ Mathematics/ Physics degree	5	Buildings Information Modeling (BIM)	0	-	
Graduate	Civil Engineering/ Mechanical Engineering	3	Buildings Information Modeling (BIM)	0	-	

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role "BIM Modeler" in any one Elective from Mechanical, Electrical and Plumbing (MEP)/ Structural and Formwork/ Architectural and Landscape: mapped to QP: "CON/Q2110, v1.0",Minimum accepted score is 80%	Certified for the Job Role: "Assessor (Vet and Skills)", mapped to the Qualification Pack: "MEP/Q2701, v2.0", with a minimum score of 80%.

Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SIP
- The batch allocation Matrix prepared for each month based on previous months' performance of AAs, which determines the quantum of Assessment which can be allocated to each AA for a month
- Post allocation of assessment, Assessment agencies send the assessment confirmation to SSC
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- SSC monitors the assessment process.

2. Testing Environment:

- A combination of Theory and practical/demonstration test is deployed to assess knowledge and Skill respectively of Learners.
- Assessment is conducted at Training center in   in-person/offline mode
- For Skill assessment, environment is simulated to create a realistic Working Environment that should replicate the key features of the workplace. In job roles, where it is difficult to replicate the same, the OJT assessment is implemented.
- During the practical task, trainees are assessed on their workmanship, quality of finished product, time management, etc., based on the performance criteria (PC), knowledge and understanding and their professional and soft skills as specified in the qualification pack.
- Knowledge assessment is done through closed ended questions up to level 4 and from level 5 onwards, it is mixture of open ended and closed ended questions

3. Assessment Quality Assurance levels/Framework

- Assessment criteria is developed for each QP which acts as a guide for developing question set /banks
- Sample questions aligned with Assessment criteria for each QP are developed by SSC and validated by industry
- Taking reference of Assessment criteria and Sample Questions, AAs create the question bank which is further validated by SSC
- Questions are mapped to the specified assessment criteria
- It is mandatory that Assessor and Trainer must be ToA certified & ToT Certified respectively
- Continuous Monitoring through virtual and In-person mode are conducted to ensure the assessment is conducted as per stipulated process
- Process and Technical audit of assessment batches by quality team are conducted to avoid the errors in assessment process
- A well -defined comprehensive framework of NON-COMPLIANCE MATRIX is defined and implemented to identify the non-compliance made by assessor and AA and punitive actions are taken correspondingly.

- The capacity building sessions are conducted regularly for assessors and assessment agencies to update them about best practices in assessment

4. Types of evidence or evidence-gathering protocol:

- Post Assessment, the evidences are uploaded by Assessor to assessment agency and further assessment agency to SSC as per stipulated TAT
- Evidences are broadly the photographic and video graphic in nature
- Assessment agencies upload the evidence on SIP and detailed evidence on SSC digital platform (ZoHO)
- Evidences are; NOS wise-Geotagged photographs and videos of Theory Test &Practical Tasks, Attendance sheet, result summary sheet, group photographs.

5. Method of verification or validation:

- The process and technical audit of assessment batches are done by SSC
- Attendance of each candidate is verified and it is ensured that only those candidates are assessed by assessors who are meeting the stipulated minimum percentage of attendance
- The result of each candidate is verified, it is verified that that result on SIP are matching with respect to summary sheet submitted by AAs
- Under detailed technical audit for sample of batches, the knowledge and skill assessment results for each candidate is checked in technical aspect.
- All the evidences of batches are preserved on server of SSC digital platform

On the Job:

- On job training (OJT), candidates undergo training and leaning at actual workplace for a fixed period of time and a certain weightage of assessment is allocated out of total skill weightage of Qualification Pack for undergoing OJT as stipulated by CSDCI. This OJT score and assessors' end point score are combined to arrive at final Marking/grading of trainees' skill test. The OJT score is determined by Supervisor of company under which candidates undergo on job training.

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
CSDCI	Construction Skill Development Council of India
MCQ	Multiple Choice Question
EHS	Environment Health and Safety
BIM	Building Information Modeling
HVAC	Heating, Ventilation, and Air Conditioning
LOD	Level of Development
MEP	Mechanical, Electrical and Plumbing
FF&E	Furniture, Fixtures, and Equipment