CONSTRUCTION AND BUILDING TECHNOLOGY

Digital Construction

WorldSkills Occupational Standards

 WSC2022_WSOS58_Digital_Construction

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WorldSkills Occupational Standards (WSOS)

Occupation description and WSOS

The name of the occupation is

Digital Construction

Description of the associated work role(s) or occupation(s)

Digital Construction using Building Information Modelling (BIM) is a process for creating and managing information on a construction project across the project lifecycle. One of the key outputs of this process is the digital Building Information Model, the digital description of every aspect of the built asset. This digital model draws on information assembled collaboratively and updated at key stages of a project. Creating a digital Building Information Model enables those who interact with the building to optimise their actions, resulting in a more excellent whole life value for the asset.

With the new Digital Construction era, the design and construction industry is embracing new software technologies that collectively come under the heading of BIM. As a result, existing processes in the design, engineering and construction (AEC) industry are changing exponentially. This means that existing professions are facing new challenges and new workflows which require new skills. New industry roles are emerging with more commonly used titles of BIM Manager, BIM Coordinator, and BIM Technician.

Collaboration is an essential ingredient to the success of a BIM based project. Digital Construction demands a high level of people skills in the form of communication, collaboration and proactivity. Digital Construction requires the recruitment of professionals with better people skills. The new processes provide a platform for architects, architectural technologists, engineers and contractors to work together and enhance their collective output. This requires for the complex interplay of technical skills, modelling and communication skills, all of which must be at a professional standard.

Building Information Modelling can be defined as using computer systems to assist in the creation, modification, analysis, and optimisation of graphically simulated building information. BIM-based software is used to increase the Digital Construction professionals' productivity, improve the quality of design, improve communication through documentation, and create a database for project implementation. The BIM output in the form of a digital databases can be shared and collaboratively worked on using cloud-based platforms. The digital models can convey information such as real-world project location while simulating building elements and construction data compiled in accordance with international standards.

The AEC industry is embracing BIM, and it is becoming the industry standard for procuring buildings. The associated process and outputs are becoming essential to successful solutions for construction, engineering, and manufacturing problems. BIM's ability to federated digital models by merging multiple models allow soft and hard clash detection analysis. BIM software helps us explore ideas, visualise concepts through photorealistic renderings and movies, and simulates how the BIM driven project will perform in the real world.

The new roles emerging from the embedding of BIM in the industry have exciting implications for future career pathways. These new skills are demonstrated in the Digital Constructioncompetition.

General notes on the WSOS

The WSOS specifies the knowledge, understanding, and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSOS).

The skill competition is intended to reflect international best practice as described by the WSOS, and to the extent that it is able to. The Standard is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standard is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards. This is often referred to as the "weighting". The sum of all the percentage marks is 100. The weightings determine the distribution of marks within the Marking Scheme.

Through the Test Project, the Marking Scheme will assess only those skills that are set out in the Standards Specification. They will reflect the Standards as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme will follow the allocation of marks within the Standards to the extent practically possible. A variation of up to five percent is allowed, provided that this does not distort the weightings assigned by the Standards.

WorldSkills Occupational Standards

Section		Relative importance (%)
1	**Digital Construction: Project Setup**	**10**

The individual needs to know and understand:

- The various purposes and uses for BIM Modelling
- Standards currently used and recognised by industry (ISO 19650-1 and 19650-2)
- Health and safety legislation and best practice including specific safety precautions when using a visual display unit (VDU) and in a workstation environment
- Technical terminology and symbols
- Recognised IT systems and related professional design software
- The correlation between the purpose of the information and level of detail needed to communicate design intent with accuracy and clarity, referring to the Levels of Detail (LODs).
- The importance of effective communications and inter-personal skills between co-workers, clients and other related professionals
- The importance of maintaining knowledge and skill in new and developing technologies
- The role of providing innovative and creative solutions to technical and design problems and challenges
- The importance of working to the deliverables and deadlines of the BEP (BIM execution plan)
- The importance of working to the client brief.

The individual shall be able to:

- Apply the internationally recognised standards and standards currently used and recognised by industry
- Apply and promote health and safety legislation and best practice in the workplace
- Access and recognise standard component and symbol libraries
- Use and interpret technical terminology and symbols used in preparing and presenting Information Models, Structural and Architectural drawings
- Use recognized IT systems and related professional design software to consistently produce high quality designs and interpretations
- Deal with co-ordination problems such as alerts received due to shared elements that have been modified
- Produce work that consistently meets high standards of accuracy and clarity in the design and presentation of designs and Model information to potential users
- Use effective communications and inter-personal skills with and between co-workers, clients, and other related professionals to ensure that the BIM model process meets requirements of the BEP
- Describe to clients and other professionals the role and purposes of BIM
- Explain complex technical images to experts and non-experts, highlighting key elements
- Maintain proactive continuous professional development in order to maintain current knowledge and skill in new and developing technologies and practices
- Provide and apply innovative and creative solutions to technical and design problems and challenges

Section		Relative importance (%)
	• Provide a range of visualisations of the desired project in order to fulfil the client's brief accurately	
2	**Software and hardware**	**5**
	The individual needs to know and understand: • Computer operating systems to be able to use and manage computer files and software correctly • Peripheral devices used in the digital construction process • Specific specialist technical operations within design software • The workflow for digital construction projects • The limitations of the design software • Formats and resolutions	
	The individual shall be able to: • Power up the equipment and activate the appropriate modelling software • Set up and check peripheral devices such as keyboard, and mouse • Use computer operating systems and specialist software to create and manage and store files proficiently both locally and to the Common Data environment BIM project • Select correct drawing packages from an on-screen menu or graphical equivalent • Use various techniques for accessing and using BIM software such as a mouse, menu, or tool bar • Configure the parameters of the software	
3	**Interpretation of the client brief**	**10**
	The individual needs to know and understand: • What information is provided in a client's brief • The importance of the Exchange Information Requirements (EIR) • The importance of the Asset Information Requirements (AIR) of the project • The relevant and current industry standards • How to work from a BIM Execution Plan (BEP) from the EIR • How to create and edit BIM information within a Common Data Environment (CDE) across the lifecycle of construction. • The importance of file structures and sharing protocols within the CDE	

	The individual shall be able to:
	• Interpret clients' briefs to determine:
	  • Outline requirements of each project
	  • Client goals
	  • Locations
	• Work from BEPs and client Briefs and EIR to address client and project requirements	

Section		Relative importance (%)
	• Create and edit BIM information within CDEs as per BEPs across the lifecycle of construction projects and provide access/ set permissions to the necessary folders to the BIM team.	
4	**Digital Construction: BIM Modelling**	20
	The individual needs to know and understand: • Programmes used in the BIM modelling and collaboration process • Computer operating systems in order to use and manage computer files and software • The importance of organising BIM objects into meaningful groups of disciplinary information that can be managed visually • How to create BIM Models (Structural and Architectural) • Principles of Technical Design • How to access and use documentation in a BIM project • How to set up a BIM model as a collaborative file • How to set up a project location, orientation and level datum • The use of Work in Progress (WIP) folders • The importance of Information exchanges (Data drops) at key project stages and of working to the requirements of the BEP • How to produce a given detail to current standards. • Use 3D visualisation tools	
	The individual shall be able to: • Open an appropriate Project Information Model from the relevant directory within the CDE • Populate Project Properties with given information • Set each model up as collaborative files • Create work sets • Set each project Location, orientation and level datum • Create each structural grid. • Create BIM models as per given drawings • Save each BIM model with a prescribed starting View • Save each Project Information Model within the CDE for use by the other disciplines via Construction Cloud software • Adhere to the requirements of the BEP to ensure Data drops are made via the Construction Cloud software • Produce scaled detailed drawings to the required Standard using callout and details items • Create 3D visuals to illustrate each building form different viewpoints	

Section		Relative importance (%)
5	**Digital Construction: Model Coordination**	15

The individual needs to know and understand:

- How to Federate different discipline models with the same model format
- What a hard clash is and how to use the BEP to ensure requirements/ responsibilities are achieved and perform a Hard clash inspection
- How to upload and report hard issues to BIM project and the CDE
- How to perform and record details of a Soft Clash inspection

The individual shall be able to:

- Federate structural, Architectural and specialist designer project models
- Perform Hard Clash Inspections as per the BEP
- Export all tests as per the BEP and issue to the CDE
- Save and issue federated files as per the BEP
- Quality assure each federated project model by "Walk around" each CDE hosted model.
- Identify issues with coordination in each new build that haven't shown up in the three hard clash tests. For each issue discovered
  - Create the issue
  - Add annotation describing the issue
  - Assign the Issue to the BIM Manager on the project
- Name each view as per the BEP

6	**Digital Construction: Asset Information Modelling**	15

The individual needs to know and understand:

- How to use Current Documentation standards for Building Information Modelling
- How to populate each model with structural asset data
- How to apply Classification Standards for model elements
- How to create COBie data sheets

The individual shall be able to:

- Update Project Information Models from the published directory
- Ensure all required assets have the required data populated as per the latest standard
- Add classification information to each model elements – referring to the project BEP
- Create COBie data from BIM model elements

7	**Digital Construction: Data Creation and Management**	20

The individual needs to know and understand:

- The importance of data creation and extraction from the digital model for use by stakeholders in the project
- How to create a Shared Parameter file for custom data requirements
- How to create schedules of project information with customised data fields
- How to use filters with parameters to visually express custom data requirements

Section		Relative importance (%)
	• How to create a visualisation that express's statutory regulations around fire and or thermal u values or similar. • How to plot a sheet to PDF format • Basic understanding and ability in visual scripting • Understand the use ACC Insight to visualise data within the CDE • Ability to use quantity take off tools	
	The individual shall be able to: • Create Shared Parameter files with custom parameters for selected building elements • Create Custom Tags to visually express technical information from custom parameters • Create colour filters to visually express technical information from the custom parameters on duplicate plans, sections and 3D cut sections • Create schedules of project information including custom parameters • Plot PDF sheet sets of combined PDFs to correct sale & correct sheet sizes. • Run visual scripts to automate data extraction • Visualise data with dashboards within the CDE • Take off quantities from PDF and 3D models	
8	**Digital Construction: Site Execution**	**5**
	The individual needs to know and understand: • How to publish construction documents for construction • How to create and complete digital safety checklists for Construction Sites • How to Track Construction Site Issues and assign them to Stakeholders • How to Set up Meetings, protocol and outcomes, and assign Action Items to meeting attendees • How to manage assets and track assets for construction sites	
	The individual shall be able to: • publish construction documents for construction • create and complete digital safety checklists for Construction Site • Track Construction Site Issues and assign them to Stakeholders. • Set up Meetings, protocol outcomes, and assign Action Items to meeting attendees • Manage assets and track assets for construction sites	
	Total	**100**

References for industry consultation

WorldSkills is committed to ensuring that the WorldSkills Occupational Standards fully reflect the dynamism of internationally recognised best practice in industry and business. To do this WorldSkills approaches a number of organisations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Occupational Standards on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (http://www.ilo.org/public/english/bureau/stat/isco/isco08/); ICT Operations and and User Support Technicians: 351
- ESCO: (https://ec.europa.eu/esco/portal/home)
- O*NET OnLine (www.**onet**online.org/)

This WSOS (Section 2) falls with the following broad category: ICT Information and Knowledge Manager: http://data.europa.eu/esco/occupation/810e5e67-acd5-499a-b307-cf5bea330859, and aligns more closely with Computer User Support Specialists: https://www.onetonline.org/link/summary/15-1232.00.

The following table indicates which organisations were approached and provided valuable feedback for the Description of the Associated Role and WorldSkills Occupational Standards in place for WorldSkills Shanghai 2022.

Organisation	Contact name
Autodesk	John Herridge, AEC Technical Marketing Manager Autodesk Education Experiences
Autodesk	Philipp Mueller, Program Manager AEC, EMEA, Autodesk Educational Experiences
New College Lanarkshire	Michael McGuire, Chair of the Qualifications Support Team PDA BIM, Computer Aided Architectural Design and Technology at SQA
Technological University Dublin	Malachy Mathews, MSc, Senior Lecturer, School of Architecture TU Dublin: Chair- International Congress Architectural Technology ICAT
Waterford Institute of Technology	Gordon Chisholm MCIAT, MRIAI; Lecturer & Researcher, Dept. of Architecture and Co-founder of The BIM Collective Research Group