WorldSkills Malaysia (WSM)
University Challenge 2021

TECHNICAL DESCRIPTION

Building Information Modelling (BIM)

ORGANIZED BY:
JABATAN PEMBANGUNAN KEMAHIRAN, KEMENTERIAN SUMBER MANUSIA
UNIVERSITI KUALA LUMPUR – MALAYSIA FRANCE INSTITUTE (UNIKL MFI)

THE TECHNICAL DESCRIPTION CONSISTS OF THE FOLLOWING

1. INTRODUCTION

1.1 NAME AND DESCRIPTION OF THE SKILL GAMES

1.1.1 The name of the skill trade is

Building Information Modelling (BIM)

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

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 Building Information Model, the digital description of every aspect of the built asset. This 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 optimize their actions, resulting in a greater whole life value for the asset. With the new BIM era, the design and construction industry are dealing with an explosion of software technologies made available under the umbrella of "BIM". As a result, approaching the design, engineering and construction of buildings is changing exponentially from design storytelling to engineering calculation and delivery of a finished building. This means that existing professions face different demands, new workflows, and new skills in performing the role of a Building Information Modeller.

Collaboration is vital to the success of this role, BIM demands, more than ever, a high level of people- skills in the form of communication, collaboration, and proactivity. BIM requires the recruitment of professionals with better people skills. To bring architects, architectural technologists, engineers, and contractors together, to combine and enhance their collective output, calls for the complex interplay of technical skills, BIM, and communication skills, all of which must be at a professional standard. Computer aided design is the use of computer systems as a tool to assist in the creation, modification, analysis, and optimization of a BIM model. CAD software is used to increase the productivity of the BIM modeller, improve the quality of design, improve communication through documentation, and create a database for project implementation. The CAD output is often in the form of electronic files for cloud sharing, cloud collaboration, Investigation, manufacturing, or other Construction processes. The technical and architectural models and images must convey information such as Project location, building organizing elements, structured data, according to application-specific conventions. CAD is also used to produce computer animation, VR and AR experiences during the whole BIM cycle including advertising and technical manuals.

CAD is an important industrial tool for BIM implementation and is the way construction projects come true. Its process and outputs are essential to successful solutions for construction, engineering, and manufacturing problems, with the ability to create a federated model by merging multiple models to allow soft and hard clash detection analysis. CAD software helps us explore ideas, visualize concepts through photorealistic renderings and movies, and simulates how the BIM project will perform in the real world.

New technologies are creating new occupations through enhancement, additions, and alterations. The role of Building Information Modeller is an emerging occupation with exciting implications for future career pathways.

1.1.3 Number of Competitors per team

Building Information Modelling (BIM) is a single Competitor skill games.

2. THE WORLDSKILLS OCCUPATIONAL STANDARDS (WSOS)

2.1 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.

2.2 STANDARD SPECIFICATION

	Section	Relative important (%)
1.	**Work organization and management**	**10**
	The individual needs to know and understand: • The various purposes and uses for BIM Modelling • Standards currently used and recognized 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 • Recognized 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 (LOD's). • 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 recognized standards and standards currently used and recognized by industry • Apply and promote health and safety legislation and best practice in the workplace • Access and recognize 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 • Provide a range of Visualizations 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 BIM process • Specific specialist technical operations within design software • The workflow for BIM 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 CAD 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 the client's brief to be able to determine:
	  • Outline requirements of the project
	  • Client goals
	  • Location
	• Work from a BEP and from the client Brief and EIR to address the client and project requirements
	• Create and edit BIM information within the CDE as per the BEP across the lifecycle of the construction project and provide access/ set permissions to the necessary folders to the BIM team.	

4.	**Modelling**	**40**
	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 organizing BIM objects into meaningful groups of disciplinary information that can be managed visually • How to create BIM Models (Structural/ Architectural)	

	• Principles of technical drawing • 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 • 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	
	The individual shall be able to: • Open an appropriate Project Information Model from the relevant directory within the CDE • Populate the Project Properties with given information • Set the model up as a collaborative file • Create work set • Set the project Location • Create a structural grid. • Create a BIM model as per given drawings • Save the BIM model with a prescribed starting View • Save the Project Information Model within the CDE for use by the other disciplines • Adhere to the requirements of the BEP to ensure Data drops are made to the relevant folders as per the client's requirements.	
5.	**Data extraction**	**15**
	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 Project Parameter 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 • How to create a visualisation that express's statutory regulations around fire and or thermal u values or similar	
	The individual shall be able to: • Create a Project Parameter with custom parameters for selected building elements • Create Custom Tags to visually express technical information from the 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	
6.	**Corrective modelling**	**15**
	The individual needs to know and understand: • Current Documentation standards to Building Information Modelling	

	• How to populate the Model with structural asset data • Classification information for model elements • How to produce scaled detailed drawings to the required Standard • How to produce a given detail to current standards.	
	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 the model elements – referring to the project BEP • From the now corrected federated project model, produce dimensioned Floor Plan drawings and elevation drawing	
7.	**Visualization**	**5**
	The individual needs to know and understand: • The importance of being able to produce renderings of a model to a suitable quality for the client • How to produce a fully rendered animation on the model • The use of Composition, background and other components in a visualisation to provide a more realistic representation of the model to the client • How to create a visualisation that demonstrates the effects of solar movement and the time of day on the model	
	The individual shall be able to: • Using appropriate software, create a highly accurate representation of the federated project Information Model for marketing purposes including animations and VR models • Use of Composition, lighting, background to optimal effect • Consider and determine the placement of entourage and other components from the library.	
	Total	**100**

3. SKILL ASSESMENT

3.1 SKILL ASSESMENT SPECIFICATION

This Skill Skills game is classed as “fault finding” on all days, therefore no Expert and Competitor communication during the Skills game time including breaks and lunch period will be allowed.

Module 1 – Understanding a BIM Execution Plan and Setting up of CDE (5 Marks)

- Project workspace within a cloud based Common Data Environment
- File structure as per Current BIM standard
- Project Information Model
- Project properties
- Project location and orientation

Module 2 – Architectural Modelling (50 Marks)

- Architectural worksets
- Coordination / linking of geospatial grids into architectural project information model
- Wall and floor styles
- Architectural Modelling
- Drawing views and presentation (Part judgement)

Module 3 – Data Extraction (15 Marks)

- Custom parameters
- Custom Tags
- Schedules of Information
- Use of Filters on view
- Drawing views and presentation (Part Judgement)

Module 4 – Corrective modelling (20 Marks)

- Modify models
- Identify the issues
- Structured asset data to current standards
- Drawing views and presentation (Part Judgement)

Module 5 – Visualisation (10 Marks)

- Photo rendering
- Animation

4. THE TEST PROJECT

4.1 GENERAL NOTES

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the skills in each section of the WSOS. The purpose of the Test Project is to provide full, balanced, and authentic opportunities for assessment and marking across the Standards Specification, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme and Standards Specification will be a key indicator of quality, as will be its relationship with actual work performance.

The Test Project will not cover areas outside the Standards Specification or affect the balance of marks within the Standards Specification other than in the circumstances indicated by Section 2. The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work. The Test Project will not assess knowledge of WorldSkills rules and regulations. This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards Specification. Section 2.1 refers.

4.2 TEST PROJECT DESIGN REQUIREMENTS

The competition is divided into six modules total of **12 HOURS** covering the following categories:

4.2.1 Understanding a BIM Execution Plan and Setting up of CDE

Data:

- BIM Execution Plan
- Clients Brief
- Current Industry standards

Work requested:

- To Create a project workspace within a cloud based Common Data Environment;
- To set up file structure as per Current BIM standards;
- To set up a Project Information Model;
- To populate project properties;
- To set project location and orientation;
- To invite the project collaborators and set their required access rights

Results expected:

- A Cloud based Common Data Environment using Autodesk BIM360 for the project;
- The site location and orientation in the project environment is set to the requirements of the client brief;
- The document management file structure in the cloud based Common Data environment is set up as per current BIM standards;
- The collaboration team invited to the project with the required access rights;

4.2.3 Architectural Modelling

Data:

- Geospatial grid details;
- BIM Execution Plan;
- Wall style drawing(s);
- Floor style drawing(s);
- Architectural Plans, elevations, sections and detail drawings;

Work requested:

- Creation of architectural worksets;
- Coordination / linking of geospatial grids into architectural project information model;
- To produce the Wall and floor styles;
- To produce an Architectural Modelling;
- Saving of the Architectural project information to the CDE;
- Drawing views and presentation as per required standards and the BIM execution plan (Part judgement);

Results expected:

- Architectural file set up as a collaborative file in the appropriate directory on the CDE;
- Worksets created as per the requirement of the BIM Execution Plan;
- Correct linking of the CAD Ordinance Survey tile to the Architectural model;
- External wall style created;
- Floor style created;
- Architectural levels created;
- Structural grid copied into Architectural project model;
- Plans, elevations, sections and details drawings;
- Save the Architectural project file within the CDE for use by other disciplines;

4.2.4 Data extraction and corrective modelling

Data:

- Model change requirements from client;
- Architectural models;
- Nomenclature;
- All necessary additional information;

Work requested:

- To Modify models;
- To Provide solutions to issues;
- To Provide structured asset data to current standards;
- To Provide schedules of data
- Drawing views and presentation (Part Judgement);

Results expected:

- Client changes to structural and architectural models;
- A creative solution to the issue highlighted by the client;
- Structured asset Data drop of information model;
- Schedules of Data with custom fields and associated views
- Dimensioned Floor plan drawings with tagged data on selected elements
- Elevations of the federated model with tagged data on selected elements

4.2.5 Visualization

Data:

- Completed federated model;
- Client visualisation requirements;
- BIM execution plan;

Work requested:

- To produce Photo rendered images;
- To produce an internal and external Animation of the Federated model;
- To produce a VR experience for the client of the federated model;

Results expected:

- External and internal rendered images;
- External and internal animation;

4.3 TEST PROJECT SUBMISSION STANDARD

- Use of Autodesk Revit 2022.
- PDF Print are required to all Drawing for online marking.
- PDF Drawing on sizes A1 and smaller;
- PDF Charts, table and documents on paper sizes A3;
- Screenshots, rendering to a maximum size of A3;
- Files, components, assemblies, etc. according to the instructions for the test;

4.5 TEST PROJECT CIRCULATION

The test project is not circulated

5. MATERIALS AND EQUIPMENT

5.1 INFRASTRUCTURE LIST

The Infrastructure List details all equipment, materials and facilities provided by the Skills game Organizer.

The detail of Infrastructure List is show in **Appendix 1**

The Infrastructure List specifies the items and quantities requested by the chief expert on behalf of the Experts for the next Skills game. The Skills game Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Items supplied by the Skills game Organizer are shown in a separate column.

5.2 MATERIALS, EQUIPMENT, AND TOOLS PREPARED BY COMPETITORS

- Compendium of standards

5.3 MATERIALS AND EQUIPMENT PROHIBITED IN THE SKILL AREA

All materials and equipment brought by Competitors will have to be presented to the Judges.

5.4 PROPOSED COMPETITOR WORKSTATION LAYOUTS

The detail of proposed competitor workstation layout is show in **Appendix 2**

6. SKILL-SPECIFIC RULES

Skill-specific rules cannot contradict or take priority over the skills game Rules. They do provide specific details and clarity in areas that may vary from skill game to skill game. This includes but is not limited to personal IT equipment, data storage devices, internet access, procedures and workflow, and documentation management and distribution.

TOPIC/TASK	SKILL-SPECIFIC RULE
Use of technology – USB, memory sticks	No external memory devices are to be connected to the Skills game computer unless under the supervision of the Chief Judge Competitors are not allowed to load any digital data to their Skills game computers others than stated in Infrastructure List.
Communication and contact between compatriot judge, Digital Workshop Manager and Competitor	Judge can be in the host station or at home. Digital Workshop Manager and competitor must be in online throughout the competition. No communication between Workshop Manager and Competitor all the time unless required. No communication during breaks or lunch time between Instructor/Coach/Interpreter/observer and Competitor.

7. APPENDICES

7.1 APPENDIX 1 – INFRASTURCTURE LIST

Skill Work Area	Category	Quantity	Description
Competitors Work Area	Work Area	1 for workplace	In webcam view angle
	Power requirements	4 sockets for workplace	220 V (2 kW)
	IT (Equipment)	1 set per Competitor	Computer - refer spec for detail
			Keyboard (QWERTY)
			Wired /wireless Mouse
			Network / Internet (Stable internet connection of competitor's PC and 2nd cameras)
			Backup power supply (optional)
			1 unit's camera / webcam
			A4 / A3 Printer (optional)
		1 set For Workshop Digital Manager	Desktop Computer C/W Monitor 24"
			1 unit's camera / webcam
		Internet / Network	Stable internet connection of competitor's PC and 2nd cameras (Workshop Manager Computer)
	IT (Software)	1 set per Competitor	Autodesk Revit 2022
			Microsoft Office (doc/docx, xls/xlsx)
			Acrobat Reader / PDFViewer
			Autodesk A360 (online account)
			Screen capture software (OBS Studio)
			Zoom Software for web meetings
			WinRAR (or WinZip, 7zip etc.
		1 set For Workshop Digital Manager	Zoom Software for web meetings
	Stationery (as request by competitor)	1 set per Competitor	Steel ruler
			80g A3 Paper / 80g A4 Paper
			Calculator
			Pencil 2B - Staedtler (c/w sharpener)
Computer Workstation (Recommended Specification)	IT Software	1 set per competitor	CPU TYPE 3.0 GHz or greater, 4 or more cores
			MEMORY 16GB RAM or higher / HDD/SDD 256Gb or higher
			GRAPHICS 4 GB GPU with 106 GB/S Bandwidth and

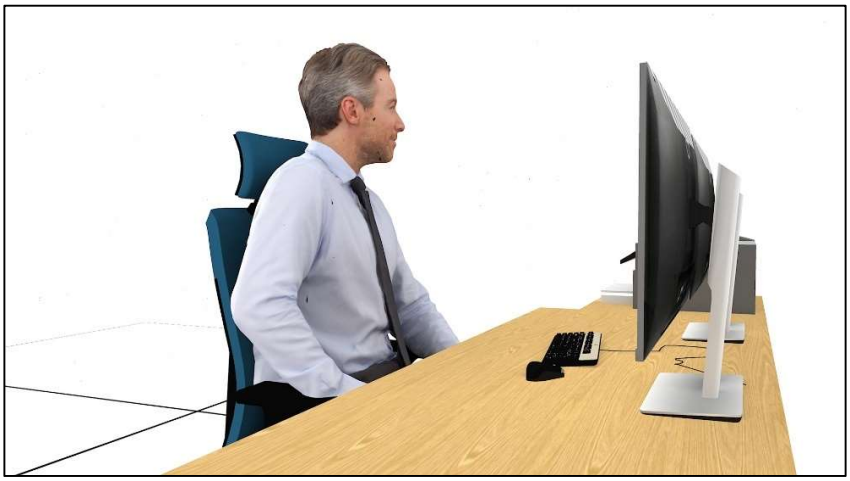
			DirectX 11 compliant
			HARD DRIVE 1 TB 7200 rpm SATA
			Monitor LED x 2 (Dual Monitor)
			Display Resolution 1920 x 1080 (FHD) or higher
			OS 64-bit Microsoft® Windows® 10 Professional
			Spreadsheet Full local install of Microsoft® Excel 2010, 2013, 2016 or 2019

7.2 APPENDIX 2 – WORKSTATION SETUP

7.2.1 Competitor camera view

Position competitor camera according to items must be visible in the list below:

- Competitor Keyboard
- Competitor face and hand
- Monitor
- Surrounding area

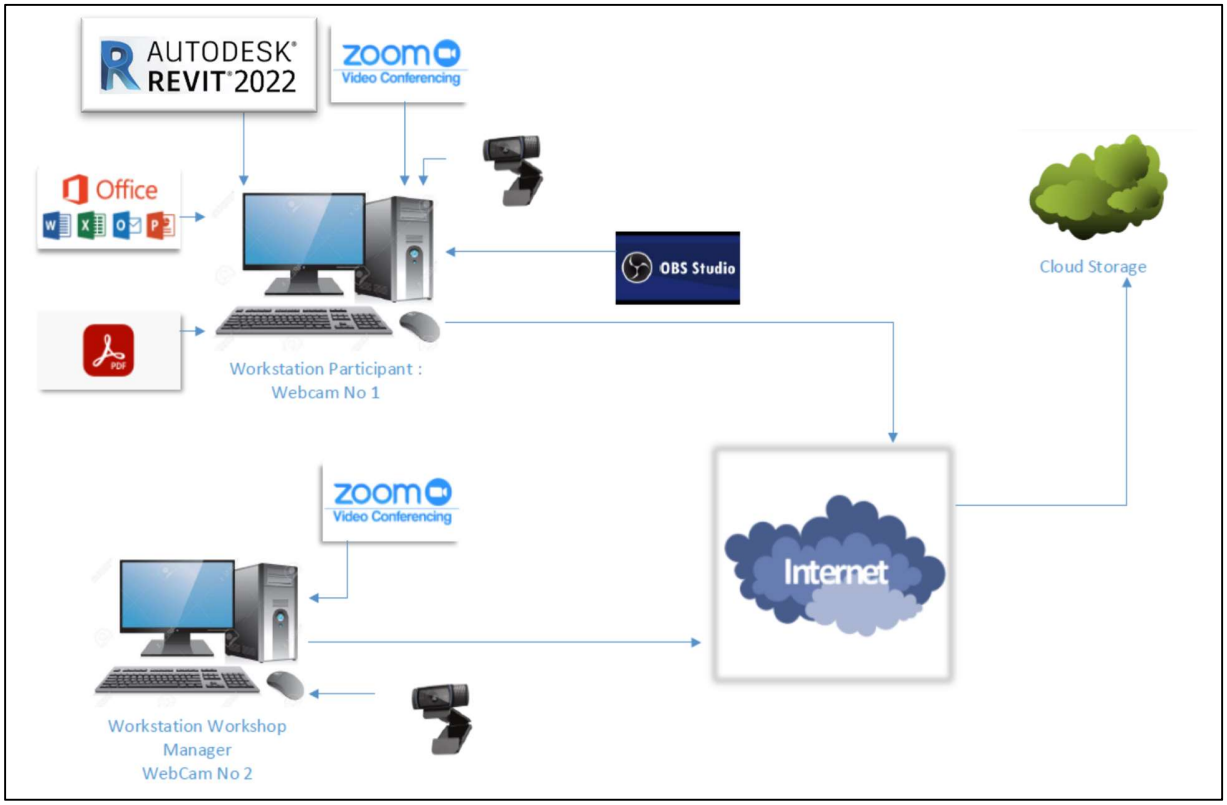


7.2.2 Workshop manager camera view (Second camera)

Position competitor camera according to items must be visible in the list below:

- Competitor Keyboard
- Competitor whole body
- Both monitors must be visible without blocking
- Printer (if available)
- Surrounding area

7.3 APPENDIX 3 – VIRTUAL CONNECTION SETUP



7.4 APPENDIX 4 - COMPETITION FORMAT

7.4.1 Competition briefing

Will be held 30 minutes to 1 hour before competition start. Link will be given through registered email provided 1 day before competition.

Scop covered:

- Competitor's registration and validation
- Hardware and software checking
- Submission of test project procedure

7.4.2 Preparation before competition start

i. Competitors need to turn on webcam 30 minutes before competition start or during competition briefing.

ii. OBS studio start to record screen 30 minutes before competition start or instructed by the judge

iii. Competitors require to check on their hardware, software, and the given link for receiving and submitting competition files.

7.4.3 During competition

i. Webcam on front and back must always turn on throughout the competition

ii. Competitor must remain seated at their workstation unless instructed by the judge.

iii. Save project & database all the time to avoid any circumstances.

7.4.4 After competition end

i. Submit all the file in zip folder to avoid any missing item to judge through A360 or share folder given link.

7.4.5 After all files has been transferred

i. Send OBS screen recorded video to share folder.

7.5 APPENDIX 5 - SKILL MANAGEMENT PLAN

UNIVERSITY CHALLENGE 2021
SKILLS TRADE: BUILDING INFORMATION MODELLING (BIM)
SKILLS MANAGEMENT PLAN (Time Table)

DATE	TIMELINE											
TBC	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
DAY (C-1)		Zoom comm.	Familiarization of network							OBS submission		
			Competition briefing		Break	cont						

TBC	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
DAY (C1)		Zoom comm. / TP Briefing / TP download / Comp. & Inst. Comm.	Competition Day 1 (Module 1&2) (2 hrs)		Break	Competition Day 1 (Module 1&2) (4 hrs)			TP & answers submission	OBS submission		
			Judge time keeper & monitoring									

TBC	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
DAY (C2)		Zoom comm. / TP Briefing / TP download / Comp. & Inst. Comm.	Competition Day 2 (Module 3,4&5) (2 hrs)		Break	Competition Day 2 (Module 3,4&5) (4 hrs)			TP & answers submission	OBS submission		
			Judge time keeper & monitoring									

TBC	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
DAY (C+1)		Zoom comm.	Assesment marking									

TBC	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
DAY (C+2)		Zoom comm.	Assesment marking							CIS LOCK		