L3 - BIM - Unit 3 - Support Design, Structural and Services aspects of a Sustainable Construction Project

Overview

The candidate can plan, create and test a building information model (BIM) of their proposed building. They will design software, preferably industry standard BIM software, to create their basic design. They will then refine their design to add in the structural components to make it function as expected, making sure to apply their understanding of mathematics and science to explain the process. The design will be presented to a critical audience of experts for feedback. They will finally use BIM to produce the services and supplementary requirements to make a functional building, applying their understanding of maths and science to produce reports on energy and resolve structural and performance related issues.

A work activity will typically be 'non-routine or unfamiliar' because the task or context is likely to require some preparation, clarification or research to separate the components and to identify what factors need to be considered. For example, time available, audience needs, accessibility of source, types of content, message and meaning, before an approach can be planned; and the techniques required will involve a number of steps and at times be non-routine or unfamiliar.

Example of context – candidates can create and test a fully functional building using BIM software.

Assessor's guide to interpreting the criteria

General Information

RQF general description for Level 3 qualifications

- Achievement at RQF level 3 (EQF Level 4) reflects the ability to identify and use relevant understanding, methods and skills to complete tasks and address problems that, while well defined, have a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgment within limited parameters. It also reflects awareness of different perspectives or approaches within an area of study or work.
- Use factual, procedural and theoretical understanding to complete tasks and address problems that, while well defined, may be complex and non-routine.
- Identify, select and use appropriate skills, methods and procedures.
- Use appropriate investigation to inform actions.
- Review how effective methods and actions have been.
- Take responsibility for initiating and completing tasks and procedures, including, where relevant, responsibility for supervising or guiding others.
- Exercise autonomy and judgement within limited parameters information and ideas.

Requirements

- Standards must be confirmed by a trained Platinum Level Assessor or higher

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- Assessors must at a minimum record assessment judgements as entries in the on-line mark book on the INGOTs.org certification site.

- Routine evidence of work used for judging assessment outcomes in the candidates' records of their day to day work will be available from their e-portfolios and on-line work. Assessors should ensure that relevant web pages and files are available to their Account Manager on request by supply of the URL.

- When the candidate provides evidence of matching all the criteria to the specification subject to the guidance below, the assessor can request the award using the link on the certification site. The Account Manager will request a random sample of evidence from candidates' work that verifies the assessor's judgment.

- When the Account Manager is satisfied that the evidence is sufficient to safely make an award, the candidate's success will be confirmed and the unit certificate will be printable from the web site.

- This unit should take an average level 3 learner 60 hours GLH to complete.

Assessment Method

Assessors can score each of the criteria N, L, S or H. N indicates no evidence. L indicates some capability but some help still required. S indicates that the candidate can match the criterion to its required specification. H indicates performance that goes beyond the expected in at least some aspects. Candidates are required to achieve at least a S on all the criteria to achieve the full award.

Expansion of the assessment criteria

1. Candidates will use building information modelling techniques to develop the design.

1.1 I can define design elements and operational practicalities to provide key information for the basis of a building information model

Candidates will produce key information to produce a building information model.

Evidence: will be provided directly from portfolios of evidence.

Additional information and guidance

Using information gathering during the completion of previous units, candidates should create a report of key features concerning the architectural and operational principles of the project. They should be able to relate this to scientific and mathematical competence in relevant areas.

1.2 I can create an architectural model using materials with specific properties relevant to a sustainable construction project

Candidates will produce a building information model using appropriate materials and objects.

Evidence: will be provided directly from student portfolios and assessor observations.

Additional information and guidance

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Using information gathering during the completion of previous units, candidates should create a model based on the use of appropriate sustainable materials and objects. Autodesk Revit Architecture offers object libraries and families where candidates can select a range of doors, walls, windows etc. All objects are created in a parametric environment allowing candidates to insert and edit dimensional and geometric constraints (i.e. change the length of a wall and move//rotate it into the required position. A range of objects can also be sourced and downloaded free of charge from the internet.

National BIM Library [1]

BIM Store [2]

Enscape [3]

Construction suppliers are increasingly providing BIM objects, and these can also be sourced from the internet.

1.3 I can validate sustainable design ideas through production of data rich detailed 3D information

Candidates will validate design ideas using building information modelling technology.

Evidence: will be provided directly from student portfolios.

Additional information and guidance

Learners will use a range of building performance analysis tools to assess and validate their design ideas. They should ensure that they have introduced a level of detail that facilitates accurate assessment.

1.4 I can present the model to critical experts

Candidates will present the model to critical experts in the context of architecture.

Evidence: will be provided directly from student portfolios.

Additional information and guidance

Learners should present appropriate information and visualisations to enable a critical audience to assess the model. Professionals should be invited to critique the model and candidates should be assisted in preparing to answer questions.

1.5 I can resolve design errors, clashes and omissions making modifications as a result of feedbac

Candidates will make improvements to their model following professional feedback.

Evidence: will be provided directly from student portfolios.

Additional information and guidance

Learners should act upon professional constructive feedback and demonstrate design, organisation and performance improvements as a result. They should ensure that building systems do not clash and understand the potential outcome of late identification (i.e. at construction/post construction phase). They should be proficient with quantitative measures and understand appropriate precision and use of units and standard form where appropriate.

2. Candidates will

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2.1 I can define and create data rich structural elements including foundations, structural walls, slabs, beams and columns

Candidates will produce a building information model using appropriate structural elements.

Evidence: will be provided directly from portfolios of evidence.

Additional information and guidance

Using information gathering during the completion of previous units, candidates should create a report of key features concerning structural performance of the project. They should create a model based on the use of appropriate structural elements and objects. Autodesk Revit Architecture offers object libraries and families where candidates can select a range of foundations, structural walls, beams, columns etc. All objects are created in a parametric environment allowing candidates to insert and edit dimensional and geometric constraints (i.e. change the length of a beam and move//rotate it into the required position. A range of objects can also be sourced and downloaded free of charge from the internet.

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2.2 I can apply science and mathematics to structural specifications

Candidates will understand and apply mathematical techniques to process data for a variety of structural design and engineering related problems.

Evidence: will be provided directly from student portfolios and internal testing

Additional information and guidance

Learners will calculate structural elements of their project. Classwork should involve theory, worked examples and practice to produce evidence as methodical worked calculations, graphical solutions and other scientific and mathematical exercises. Every attempt should be made to provide industry based scenarios relevant to learners' vocational aims, and the introduction of professionals to support learners in the classroom is hugely beneficial and should be considered. Candidates will understand algebraic and trigonometric relationships, simple addition and resolution of vectors, exponential and logarithmic functions, and will understand fundamental scientific principles within structural engineering including moments of inertia, load, shear, tension, forces, loads, elasticity, stress and strain and thermal expansion.

2.3 I can validate structural engineering methods through production of data rich detailed 3D information

Candidates will validate structural design ideas using building information modelling technology.

Evidence: will be provided directly from student portfolios.

Additional information and guidance

Learners will use a range of building performance analysis tools to assess and validate their design ideas. They should ensure that they have introduced a level of detail that facilitates accurate and meaningful assessment in realistic real world scenarios. They should be able to explain the physical properties of their construction using evidence from the data in the model.

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2.4 I can present the structural model to critical structural experts

Candidates will present the model to critical experts in the context of structural engineering.

Evidence: will be provided directly from student portfolios with assessor observations.

Additional information and guidance

Learners should present appropriate information and visualisations to enable a critical audience to assess their model. Professionals should be invited to critique the model and candidates should be assisted in preparing to answer questions.

2.5 I can resolve structural errors, clashes and omissions and making modifications as a result of feedback

Candidates will make improvements to their model following professional feedback.

Evidence: will be provided directly from student portfolios and assessor observations.

Additional information and guidance

Learners should act upon professional constructive feedback and demonstrate design, organisation and performance improvements as a result. They should ensure that building systems do not clash and understand the potential outcome of late identification (i.e. at construction/post construction phase)

3. Candidates will use building information modelling techniques to develop building services elements of a building project.

3.1 I can define and create appropriate systems from prior research, concept analysis and operational practicalities and constraints

Candidates will produce a building information model using appropriate building services systems.

Evidence: will be provided directly from portfolios of evidence and assessor observations.

Additional information and guidance

Using information gathering during the completion of previous units, candidates should create a report of key features concerning structural performance of the project. They should create a model based on the use of appropriate structural elements and objects. Autodesk Revit Architecture offers object libraries and families where candidates can select a range of foundations, structural walls, beams, columns etc. All objects are created in a parametric environment allowing candidates to insert and edit dimensional and geometric constraints (i.e. change the length of a beam and move//rotate it into the required position. A range of objects can also be sourced and downloaded free of charge from the internet.

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3.2 I can apply science and mathematics to assess and calculate energy efficiency in a

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range of scenarios

Candidates will understand and apply mathematical techniques to process data for a variety of building services engineering related problems.

Evidence: will be provided directly from student portfolios.

Additional information and guidance

Learners will calculate the efficiency of a system using project data and classwork should involve theory, worked examples and practice to produce evidence as methodical worked calculations, graphical solutions and other scientific and mathematical exercises. Every attempt should be made to provide industry based scenarios relevant to learners' vocational aims, and the introduction of professionals to support learners in the classroom is hugely beneficial and should be considered. Candidates will understand algebraic and trigonometric relationships, vectors, exponential and logarithmic functions, and will understand fundamental scientific principles within building services engineering including thermodynamics, heat transfer, thermodynamics, electricity, combustion and psychrometry, acoustics and light levels.

3.3 I can validate building services proposals through production of data rich detailed 3D information

Candidates will validate building services design ideas using building information modelling technology.

Evidence: will be provided directly from student portfolios and assessor observations.

Additional information and guidance

Learners will use a range of building performance analysis tools to assess and validate their design ideas. They should ensure that they have introduced a level of detail that facilitates accurate assessment

3.4 I can present the services model to critical services experts

Candidates will present the model to critical experts in the context of building services engineering.

Evidence: will be provided directly from student portfolios and assessor observations.

Additional information and guidance

Learners should present appropriate information and visualisations to enable a critical audience to assess the model. Professionals should be invited to critique the model and candidates should be assisted in preparing to answer questions.

3.5 I can resolve service related errors, clashes and omissions making modifications as a result of feedback

Candidates will make improvements to their model following professional feedback.

Evidence: will be provided directly from student portfolios and assessor observations.

Additional information and guidance

Learners should act upon professional constructive feedback and demonstrate design, organisation and performance improvements as a result. They should ensure that building systems do not clash and understand the potential outcome of late identification (i.e. at construction/post construction phase).

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Moderation/verification

The assessor should keep a record of assessment judgements made for each candidate and make notes of any significant issues for any candidate. They must be prepared to enter into dialog with their Account Manager and provide their assessment records to the Account Manager through the on-line mark book. They should be prepared to provide evidence as a basis for their judgements through reference to candidate e-portfolios and through signed witness statements associated with the criteria matching marks in the on-line markbook. Before authorizing certification, the Account Manager must be satisfied that the assessors judgements are sound.

Source URL: https://theingots.org/community/decl3u3x

Links
[1] https://www.nationalbimlibrary.com/en-gb/
[2] https://www.bimstore.co.uk
[3] https://enscape3d.com/free-sample-projects/

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