Unit 1: Construction Technology

Delivery guidance

Your focus during delivery of this unit will be on forms and methods used in the construction of low-rise buildings along with associated external works. This unit is mandatory for all qualification sizes and, throughout the delivery, you should (where possible) relate the content of this unit to the relevant units across the qualification, which will help to motivate learners.

Approaching the unit

You should utilise site visits in the delivery of this unit, as this will enable learners to develop their understanding of the key elements, processes and materials being used. The number and frequency of such site visits would vary according to your delivery schedule and availability of site(s).

Tutor-led delivery of the topics can be enhanced by the use of illustrations, images, animations and video clips to explain construction forms and processes, as well as external works, including drainage, roads and footpaths. Such resources are often freely available online, and you may find your construction learners engage well with these resources over other delivery approaches.

This unit allows plenty of opportunities to forge links with local businesses. You could invite guest speakers – either from your local authorities, building firms, utility companies or design consultancies. Learners will be interested and inspired to hear first hand about the current practices from local professionals.

Learning aim A is about construction forms of low-rise buildings. It introduces framed, traditional and modular forms typically used for low-rise buildings. The focus is to develop an understanding of their suitability for a given project scenario. Throughout delivery, engage your learners with knowledge quiz, paired/group activities, class discussions and presentations as these give opportunities for peer learning in addition to motivating the learners.

You may wish to introduce various construction forms using animations, DVDs, pictures, illustrations or web-based videos – some suggested resources have been given. With the basic principles understood, you can then follow up with more in-depth group activities and class discussions, such as learners supplying the rationale behind the specific construction forms that have been used in a given scenario. Further activities to explore could include an interactive Lego game on modular construction, or independent research and small group presentations on various forms of low-rise construction.

Learning aim B is about foundation design and construction including site investigations, design principles and foundation types, and combines research and practical tasks such as investigating the subsoil conditions of a site with a detailed desk study and walkover survey. You would require access to project drawings, especially related to component details, as well as site investigation data to be used as learning resources. You could contact the construction companies who are always willing to help.

Invite a guest speaker who is a geotechnical design engineer, structural engineer or

technical staff member working at the local council. The guest speaker should be able to share with learners some examples of design principles currently in practice.

Learners will need to consolidate their knowledge on the many considerations of foundation design and construction, and the use of case studies can present an interesting problem-solving challenge for learners. For example, you could task learners to explore the impact of building regulations on foundation design for a number of given scenarios.

A well-planned site visit will provide a useful means of delivery for learning aim C, which is about the construction of superstructures. You should ensure the appropriate safeguards are in place during the site visit. Coordinate with site staff before the visit so that all parties are aware of the learning opportunities during the visit. Reinforce this learning in class using project drawings, especially those related to component details.

Learning aim D is about the external works associated with construction projects. You could use the same site visit to deliver part of this learning aim related to roads and footpaths. A guest speaker – a services engineer or professional from a utility company – could give learners an informed presentation, drawing on their experience and the interesting challenges faced.

To give access to additional case studies about sustainable drainage systems, you could either approach companies for this information or download examples from the web using the suggested links at the end of this document. Additionally, you could use class discussions and group research activities to deliver this learning aim.

Assessment model

Learning aim	Key content areas	Assessment approach
A Understand common forms of low-rise construction	**A1** Forms of low-rise construction	A report to a client that covers: • the use of different structural forms for the proposed project, considering the effectiveness of each structural form • the foundation design and different methods that can be used for the design and construction of the foundations, superstructures and external works • a report for a given project scenario that covers the design and construction of the external works, including the incorporation of sustainable drainage systems.
B Examine foundation design and construction	**B1** Subsoil investigation **B2** Subsoil improvement **B3** Design principles **B4** Types of foundation	
C Examine superstructure design and construction	**C1** Walls **C2** Floors **C3** Roofs **C4** Internal finishes	
D Examine external works associated with construction projects	**D1** Foul and surface water drainage **D2** Utility services **D3** Roads and footpaths **D4** Sustainable urban drainage systems	

Assessment guidance

This unit is assessed using a Pearson Set Assignment Brief. Tutors are **not** permitted to create their own assessments.

The Pearson Set Assignment will be assessed internally against the requirements of the Assessment Criteria and Essential Information for Assessment Decisions given in the unit specification.

Submitted assessment evidence will be in the form of an extended written report.

Getting started

This provides you with a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Unit 1: Construction Technology

Introduction

Introduce learners to the unit using animations, DVDs, pictures, illustrations or web- based videos relating to various construction forms. Engage your learners during delivery through knowledge quizzes, paired/group activities, class discussions and presentations as well as through site visits and guest speakers.

Well-organised site visits – where learners can see both substructure and superstructure as well as external works – are invaluable to the delivery of this unit. They will need to be timetabled carefully to ensure learners have sufficient knowledge across the learning aims to fully benefit from the experience. They could also be undertaken in conjunction with other unit site visits requirements. You would need to coordinate with the site staff to ascertain the:

- health and safety requirements
- type of project
- construction stage
- extent to which site staff could engage (project presentation, access to drawings, site investigation data, design data).

Learners could prepare checklists before the visit so they can record details of elements, components and processes. If finding appropriate sites proves difficult, you could instead use project examples through DVDs or other project data.

Learning aim A - Understand common forms of low-rise construction

Learning aim A1

- You could introduce this topic with a tutor presentation, showing images/illustrations demonstrating various forms (framed, traditional, modular) of low-rise construction. This would allow you to then engage learners in class discussion, asking them about the advantages of using a certain construction form.
- The use of DVD/web-based video resources could enhance a presentation on framed, traditional and modular construction forms. You could then task learners to work in pairs to summarise the advantages of using various types of construction forms. Points could be fed back to the class for group discussion.
- You could run a knowledge quiz as a paired activity to use as a learning check. Share answers and ask learners to self-assess their work. Explain any questions learners have.
- Working in small groups, task learners to justify the selection of construction forms suitable for modular, traditional and framed construction. The groups could present their reasoning to the class.
- Based on the result of the group activity, initiate a class discussion about the suitability of construction forms and associated materials. Draw on the key points and explain any questions learners have.
- Discuss with the class how such evaluation could be presented in a report to the client.

Learning aim B – Examine foundation design and construction

Learning aim B1

Introduce learners to the importance of data and information to be used for foundation design, explaining concepts such as bearing capacity and subsoil classification. To help learners understand its significance, you could look at various case studies of construction projects that have suffered due to errors or inaccuracies in the application of such data.

- In a tutor presentation using video resources as appropriate, give learners an overview of various site investigation methods. Introduce the techniques to improve the bearing capacity of the ground and various foundation types.
- Following this, learners could work independently looking at examples of investigation data to allow them to develop their understanding of the information and its use. To consolidate their learning, they could summarise findings in a brief report of the possible advantages and disadvantages of various investigation methods.
- In a paired practical activity, learners could carry out a site investigation, first in a desk study followed by a walkover survey, and identify any evidence of soil shrinkage, ground heave, differential settlement, and effects of tree growth and tree removal. Ask learners to share their results with the class and, in a tutor-led discussion, summarise findings and highlight any variations.

Learning aim B2

- Working in pairs or small groups, learners could investigate and then present various methods of subsoil improvement.
- For an individual activity, give learners foundation sketches. Ask them to re- draw one of these, examining its characteristics and the various elements of a foundation.

Learning aim B3

- Bring learners together in groups (so that each member has a similar foundation type from the activity in B2). Ask learners to discuss among their group members details of foundation, materials used, potential advantages and disadvantages, and factors affecting the choice of each foundation type. In a tutor-led discussion, ask groups to share their findings and draw on the key points raised.

Learning aim B4

- You will need to introduce learners to building regulations. In a tutor-led activity, you could run through the relevant sections of appropriate documents with learners before setting them a number of worksheet-based activities to check parameters such as width and thickness of foundations and overlaps.
- You could invite geotechnical design engineers, structural engineers or technical staff working at the local council to share with learners some examples of design principles currently in practice. Prior to the visit by the guest speaker, prepare learners to ask questions to ensure they maximise this opportunity.

Learning aim C – Examine superstructure design and construction

- The second assignment will cover both learning aims B and C, so you may wish to restate the expectations for this report with your learners.
- This learning aim would benefit from a site visit for learners to examine both substructure and superstructure. If a visit is not possible, targeted use of online resources and video clips can enhance tutor-led presentations and classroom- based activities.
- To establish the learners' prior knowledge, you could lead a discussion on common types of construction methods and materials used. This could take the form of interactive brainstorming activity with the learners working together to compile lists and categories (using flipcharts, or sticky notes for example).

Learning aims C1, C2, C3 and C4

- **(C1)** Engage learners in a class discussion about details, construction and performance requirements of external and internal walls and partitions. You could compare the traditional versus new technologies, e.g. new building envelope technologies/cladding that may offer advantages in terms of cost and energy efficiency performance and/or use of prefabricated panels.
- **(C2)** Ask learners to investigate a particular ground or intermediate floor type. Provide them the detailed drawings, so that learners could then further research and prepare presentations for the class on construction methods and techniques, materials used, support, detailing, finishes, performance requirements, advantages and disadvantages.
- **(C3)** In a similar format, you could allocate small groups of learners a particular roof type to investigate and present back to the class. Presentations should be made accessible to the whole class via the VLE or a group server.
- **(C4)** Divide learners into three groups and allocate each group either wall finishes, ceiling finishes or floor finishes. Ask each group to research their topic covering the application, characteristics, properties and advantages/disadvantages. Each group should summarise their findings and present them to the group followed by a Q&A session on each topic.
- In a final consolidation exercise, the class could collaborate to evaluate the construction of a new low-rise building, which has been constructed with new technologies such as building envelope technologies/cladding, and how much cost saving it has realised (both in construction and ongoing energy costs). Allocate each group a specific area covered in this learning aim. Ask all groups to use the site visit data as well as their own research to present their findings. You would lead a whole group discussion sharing their findings, drawing on key points and summarising.
- There is an opportunity to holistically deliver this content with *Unit 2: Construction Design* when discussing sustainability in the design/manufacturing process and associated technologies.

Learning aim D – Examine external works associated with construction projects

Learning aim D1

- A site visit to examine external works would ideally be incorporated earlier in the unit. Learners should prepare checklists for the visit to record details of the external works.
- A tutor presentation could introduce learners to the differences between separate and combined drainage systems, along with the associated advantages and disadvantages of

each system. You could then move onto group work and discussion activities around detailed layout and component drawings for these systems.

Learning aim D2

- You could invite a guest speaker who is either a services engineer or from a utility company background, to present to class. The guest speaker should cover some real-world examples of utility services in terms of their layout, depth, colour coding of ducts, positioning, and building entry of water, gas, electricity and telecommunications. Prior to the visit by the guest speaker, prepare learners to ask questions to ensure they maximise on this opportunity.

Learning aim D3

- Moving on, you could split the class into groups and allocate each group a research topic related to roads and paths. Ask all groups to consider construction methods and techniques, materials used, edge details, performance requirements, specifications and finishes. Ask all groups to use the site visit data as well as their own research to present their findings.
- The groups could share their findings with their peers and you could facilitate the collation of summary and key points, and then summarise.

Learning aim D4

- A tutor presentation, incorporating suggested resources and online videos, could help to emphasise the significance of sustainable urban drainage systems, both in environmental terms and cost implications. Discuss the various methods used for both temporary storage and that allow water to percolate, encouraging learners to identify their characteristics, advantages and disadvantages.
- Following this introduction, you could assign each small group a specific sustainable urban drainage system to research, considering methods, use, characteristics, advantages and disadvantages of using such systems. Following feedback of findings from the groups, you could then lead a class discussion to summarise key points and collate information for class reference.
- Allow time in the teaching of this learning aim for discussion with learners on the related assignment.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

- Unit 2: Construction Design
- Unit 4: Safe Working Practices
- Unit 7: Graphical Detailing
- Unit 12: Building Surveying in Construction
- Unit 13: Site Engineering for Construction
- Unit 14: Low Temperature Hot Water Systems in Building Services
- Unit 15: Measurement Techniques in Construction
- Unit 16: Provision of Primary Services in Buildings

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Internationals in Construction. Check the Pearson website at http://qualifications.pearson.com/endorsed-resources for more information as titles achieve endorsement.

Textbooks

Chudley R and Greeno R, *Building Construction Handbook* (11th Edition), Routledge, 2016, ISBN 9781138907096 – this handbook has been used by construction learners over number of years; it covers construction forms, processes and external works in a concise manner

Chudley R, Greeno R, Hurst M and Topliss S, *Construction Technology* (5th Edition), Pearson, 2011, ISBN 9780435046828 – this book gives excellent illustrative content and some useful descriptions that are very relevant to the unit

Pitman P, *External Works, Roads and Drainage: A Practical Guide: A Practitioner's Guide*, Taylor and Francis, 2001, ISBN 9780419257608 – this book gives a practical and hands-on learning to understand external works

Smith R and Timberlake J, *Prefab Architecture: A Guide to Modular Design and Construction,* John Wiley & Sons, 2011, ISBN 9780470275610 – a very good resource to learn about both modular and pre-fabricated buildings

Journal

Construction Manager (The Chartered Institute of Building) – this journal contains updates on construction projects, methods and materials

Journal of Green Building (College Publishing) – the journal addresses sustainability, new materials and modern methods of construction

Videos

'7:1 Site investigation – drilling, sampling and profiling' – a resource explaining site investigation techniques
'Basic pile installation' – resources to understand pile foundations and their installation
'Bottom sill flashing – slab to bottom plate connection' – best practice for sealing bottom plates
'Brick and block cavity wall' – shows details of a cavity wall
'Frame Wise build timber frame house at Timber Expo' – show has details of timber frame

construction
'How to build a partition wall beginner's guide' – a resource to help understand internal wall construction
'How to install insulation block and beam floors, TETRiS eco-friendly thermal flooring system' – best practice
'How to put steel RSJ lintels into a supporting wall' – building in lintels using acro props
'IWS fast timber floor' – gives practical information
'Load bearing and frame structure' – has details of load bearing and frame structures
'Metal building construction in 2 days' – explains the construction of a building and is a good resource for explaining construction processes
'Pile foundation' – a resource on these types of foundations
'Platform flooring system' – components and erection procedure
'Precast concrete stairs' – a resource for fitting
'Raft foundation construction method' – a good resource for raft foundations
'Steel frame construction 3D animation' – a good resource for understanding portal frame construction
'Vibro replacement (stone columns) – bottom feed' – a resource for vibro replacement
'What are the advantages of modular construction?' and 'Yorkon modular construction – the UK's largest modular health contract' – these videos explain the modular construction techniques

Websites

Buildoffsite – an important and respected organisation promoting all types of offsite construction, including modular and prefab; the website contains wealth of information and industry updates

Portakabin – this Yorkon website is an excellent resource for modular construction

Self-build-guide (search 'house construction methods') – the website explains traditional and modern construction processes in a structured way

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling learners to access them through the school/college intranet.