Unit 22: Design Procedures in Construction

Unit code: H/600/0439

QCF Level 3: BTEC Nationals

Credit value: 10

Guided learning hours: 60

Aim and purpose

The aim of this unit is to give learners the opportunity to develop knowledge of the key personnel involved in the different stages of the design process. Learners will also gain an understanding of how a client's design needs are influenced by different constraints, the different stages of the RIBA Architect's Plan of Work and the organisation of design teams to produce design solutions.

Unit introduction

Architectural design may be viewed as an art form, combined with 'buildable' construction technology, that has to comply with building legislation and quality performance standards. Within this complex set of procedures and goals, the design of a building must be controlled. The designer could be a project architect, building surveyor, structural engineer or design manager, and could be in charge of the whole project.

Learners will come to understand that a designer needs a sound understanding of each of the stages involved in the creation of a building, from concept to completion, and the roles of the individuals responsible for these. The designer must be able to communicate effectively with all other key team members of the team, including the client and contractors.

Learners will explore the constitution of the design team and the roles of its members. They will investigate the key stages of the design process. They will be aware of the organisational interactions between members of the design team, the client, contractor and other key players involved in a typical construction project, and of the technical, environmental and legislative constraints that affect the design of buildings.

The Royal Institute of British Architects (RIBA) provides detailed guidance on all stages of the design process in the Architect's Plan of Work, and this provides a framework for delivery of this unit.

Learning outcomes

On completion of this unit a learner should:

1 Know the roles and responsibilities of designers, advisers and regulators

2 Understand how the client's design needs are influenced by technical, environmental and legislative constraints

3 Understand the different stages of the Royal Institute of British Architects Plan of Work

4 Understand how design teams are organised to produce design solutions.

Unit content

1 Know the roles and responsibilities of designers, advisers and regulators

Roles and responsibilities of designers: architect; architectural technologist; building surveyor; structural engineer; mechanical and electrical engineer; lift engineer; interior designer; exterior designer eg landscape architect, highways engineer

Roles and responsibilities of advisers: quantity surveyors; site investigation consultants; town and country planning consultants; environmental consultants; lighting consultants; project managers; management contractors; site managers

Roles and responsibilities of regulators: planning supervisors; health and safety officers; town and country planning officers; building control officers; environmental health officers

2 Understand how the client's design needs are influenced by technical, environmental and legislative constraints

Client's design needs: spatial requirements; aesthetics; quality assurance; budget; best value goals; time constraints

Technical constraints: technical details; buildability; quality issues; health and safety plans; planned maintenance requirements

Environmental constraints: environmental impact of design choices eg materials, methods, service installations, recycling; sustainability eg local, regional, global compliance

Legislative constraints: building regulations; town and country planning; health and safety

3 Understand the different stages of the Royal Institute of British Architects Plan of Work

Stages: design phase; construction phase; post-practical completion phase

Design phase: pre-contract design process; appraisal; strategic brief; outline proposal; detailed proposal; final proposal; production of information (including drawings); tender documentation; tender action; mobilisation

Construction phase: construction to practical completion

Post-practical completion phase: feedback; operation of building; maintenance and repair

4 Understand how design teams are organised to produce design solutions

Organisation of design teams: benefits of working in organised teams; shared expertise; coordination; communication; partnerships; interactions; traditional design-led procurement including role of design team, leading of process from inception to practical completion; modern design procurement methods including role of designer within modern procurement systems, project management, management contracting, design and build, design management within Private Finance Initiative (PFI) and Public and Private Partnering (PPP)

Design solutions: final design agreed with client and planning authorities

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 describe the roles and responsibilities of designers, advisers and regulators associated with building design [IE1, IE2, IE4, SM2, SM3]	**M1** produce job descriptions and person specifications for each member of the design team	**D1** analyse the potential impact of key acts and regulations, which control the design of buildings, on final building designs
P2 identify the design needs of the client [IE1, IE2, IE4, SM2, SM3]	**M2** explain the effects of monetary, legal and environmental constraints on the production of a good building	
P3 explain technical, environmental and legislative constraints on building design [IE1, IE2, IE4, TW1, TW2, SM2, SM3]	**M3** discuss the benefits of developing a design using a series of clearly identified stages	
P4 explain the stages of the design and construction process in terms of the Royal Institute of British Architects Plan of Work [IE1, IE2, IE4, SM2, SM3]		**D2** evaluate the ways in which the client's budgetary limits influence the design of the completed building
P5 explain the purpose of the drawings required to support planning approval [IE1, IE2, IE4, SM2, SM3]	**M4** produce a portfolio of architectural drawings based on a brief for a low-rise domestic or commercial building.	

Assessment and grading criteria			
To achieve a pass grade the evidence must show that the learner is able to:		**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P6	explain how design teams are organised [IE1, IE2, IE4, SM2, SM3]		
P7	explain the use of design processes to achieve final design solutions. [IE1, IE2, IE4, TW1, TW2, SM2, SM3]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Tutors can use a wide range of techniques to deliver this unit. Lectures, discussions, seminar presentations, site visits, supervised practicals, research using the internet and/or library resources and use of personal and/or industrial experience are all suitable. Delivery should stimulate, motivate, educate and enthuse learners. Visiting expert speakers could add to the relevance of the subject.

An overview of the roles of the client, design team, construction team, and the technical, environmental and legal aspects involved in construction projects, must be given at an early stage in the delivery of the unit in order to place the design process into context.

Learners should develop an understanding of the traditional progressive development of an architect-led design process and the modern project management-led approach to design associated with larger, more complex projects, using systems such as the Private Finance Initiative or Public and Private Partnering.

Learners must be made aware of the legislation and guidance that regulates and underpins the design process. At this stage of learners development it is necessary to provide a broad understanding of the acts and regulations that affect building design. However, there is no requirement for a deeper understanding and a detailed treatment of the legislation should be avoided.

Health and safety, environmental and quality issues are all of major importance in the design process and should be embedded throughout delivery of the unit.

Wherever possible, case studies of real or simulated construction projects should be used to contextualise the learning process and learners should be encouraged to use suitable examples from their own workplaces. In addition, centres should develop links with design practices and/or contractors to provide relevant learning materials, deliver guest lectures and organise site visits.

Learners should be encouraged to use their homes, workplaces, or other suitable case studies, as a basis to review good and bad aspects of design and whether these design issues relate to pure aesthetics, spatial layout, human comfort, sustainability, health and safety or maintenance.

There are numerous websites relating to design processes and the Royal Institution of British Architects and the Chartered Institute of Architectural Technologists are particularly useful.

Group activities are permissible, but tutors will need to ensure that individual learners have equal experiential and assessment opportunities.

Health, safety and welfare issues are paramount and should be reinforced through close supervision of all workshops and activity areas, and risk assessments must be undertaken before practical activities are taken. Centres are advised to read the *Delivery approach* section in the specification, and *Annexe H: Provision and Use of Work Equipment Regulations 1998 (PUWER).*

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction – tutor presentation/class discussion
Roles and responsibilities of designers, advisers and regulators
Talks by practitioners
Group research
Presentation of findings
Assignment 1: Careers Brochure
Production of a careers brochure
Design needs of clients and constraints on these
Technical constraints on building design – group research
Technical constraints – external speakers presenting a case study
Environmental constraints on building design – group research
Environmental constraints – external speakers presenting a case study
Legislative constraints on building design – group research
Legislative constraints – external speaker presenting a case study
Assignment 2: Client Report
Report on a client's building requirements including drawings
Design and construction processes
Design phase – group research and visiting experts
Construction phase – group research and visiting experts
Post-practical completion – group research and visiting experts
Class discussion and note making
Design process and teams
Traditional design-led procurement projects – case study, employer talks
Modern project management-led projects
Assignment 3: Plan of Work and the Design Process
Produce a plan of work for the design of a specified building
Production of a report on the design process and the organisation of the teams involved
Review of unit and assignment feedback

Assessment

Evidence for this unit may be gathered from a variety of sources, including well-planned investigative assignments, case studies or reports of practical assignments.

There are many suitable forms of assessment that could be used. Some example assessment approaches are suggested below. However, these are not intended to be prescriptive or restrictive, and are provided as an illustration of the alternative forms of assessment evidence that would be acceptable.

Some criteria could be assessed directly by the tutor during practical activities. If this approach is used, suitable evidence would be observation records or witness statements. Guidance on their use is provided on the Edexcel website.

The structure of the unit suggests that the grading criteria could be addressed fully by using three assignments. The first of these would cover criteria P1 and M1, the second would cover P2, P3, M2, M3 and D1, and the third P4, P5, P6, P7, M4 and D2

To achieve a pass grade learners must meet the seven pass criteria listed in the grading grid.

For P1, learners must describe the roles and responsibilities of designers, advisers and regulators associated with building design. This should include a description of what they do, who is responsible to them and they are responsible to in their turn.

For P2, learners are required to identify the design needs of the client. They should identify the key needs such as aesthetics, spatial arrangements and functional layout in particular.

For P3, learners must explain the technical, environmental and legislative constraints affecting the design. They should consider how these constraints interact.

For P4, learners must explain the stages of the design and construction processes in terms of the Royal Institute of British Architects Plan of Work. They should review each stage of the Royal Institute of British Architects Plan of Work and within each stage discuss the issues being covered by the design team and the action they take. It is essential that the three types of briefing, 'initial', 'strategic' and 'project', are identified and discussed.

For P5, learners must explain the purpose of the drawings required for town and country planning and Building Regulations approval. After identifying the required drawings, learners should discuss the number and combination of drawings, scales, dimensions and technical information requirements, and explain their specific purposes.

For P6, learners must explain the organisation of the design teams associated with building design. They could produce an organisational chart for the client, design and construction team members for both traditional and modern design projects and explain their operation.

For P7, learners must explain the use of design processes to achieve final design solutions. This should include evidence of how the design process works within the team, and how designs are altered, amended and improved as a result of the requirements and conditions of the planning authorities. The stage at which the iterative process of design produces a final design solution should be recognised, and typical changes that can be made during the design process should be explained.

To achieve a merit grade learners must meet all of the pass grade criteria and the four merit grade criteria.

For M1, learners must produce job descriptions and person specifications for each member of the design team. They should identify and explain the essential and desirable characteristics of each member in terms of their skills and qualifications. Using a standard job description format learners should generate person specifications suitable for recruitment purposes.

For M2, learners must explain the effects of monetary, legal and environmental constraints on the production of good building aesthetics and internal spatial layout. They should include the compromise that is required

in order to achieve a successful building design when financial limitations, time, legislative and environmental issues have to be taken into account.

For M3, learners must discuss the benefits of developing the design using a series of clearly identified stages. This should include an explanation of the advantages of following a structured, formalised process but without restricting the designer's need for artistic freedom.

For M4, learners must produce a portfolio of architectural drawings based upon a brief for a low-rise domestic or commercial building. The drawings should be suitable to submit for town and country planning and Building Regulations approval.

To achieve a distinction grade learners must meet all of the pass and merit grade criteria and the two distinction grade criteria.

For D1, learners must analyse the potential impact of key acts and regulations, which control the design of buildings, on final designs. The Town and Country Planning Act, Building Regulations and other key legislation affecting the design process should be reviewed in broad terms followed by a discussion of how they control and influence the final building design.

For D2, learners have to evaluate the ways in which the client's budgetary limits influence the process of design and the design of the completed building. This should convey a clear understanding that the client's budgetary limit is of crucial importance in the design process. Learners should allude to elemental cost planning which facilitates the control of costs through design changes which are feasible and appropriate.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1	Careers Brochure	A careers office has asked you to produce a careers brochure to inform students about the roles and responsibilities of designers, advisers and regulators.	Brochure.
P2, P3, M2, M3, D1	Client Report	As a designer, you have been asked to report on the constraints on the design needs for a local school and to produce drawings to support your report.	Report with drawings.
P4, P5, P6, P7, M4, D2	Plan of Work and the Design Process	As a designer you have been asked to produce a Plan of Work for a project, including drawings. In your role as project manager, you have also been asked to consider whether to use a traditional or modern approach to a project and to organise the team needed for the project.	Plan of work and drawings, and a report on the design process.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Construction and the Built Environment sector suite. This unit has particular links with the following unit titles in the Construction and the Built Environment suite:

Level 1	Level 2	Level 3
	Construction Drawing Techniques	Construction Technology and Design in Construction and Civil Engineering
		Building Technology in Construction
		Building Surveying in Construction
		Building Regulations and Control in Construction

This unit links to the Edexcel Level 3 NVQ in Technical Design (Construction Environment) and the Edexcel Level 4 NVQ in Site Inspection.

This unit has particular links with the following units in the Edexcel Higher Nationals in Construction:

- *Unit 1: Design Principles and Application*
- *Unit 5: Group Project*
- *Unit 12: Refurbishment and Adaptation*
- *Unit 26: Design Procedures*
- *Unit 27: Design Technology*
- *Unit 32: IT Applications: Computer-aided Design.*

Essential resources

Learners should be encouraged to provide their own basic drawing equipment for use at home and in the centre. Learners will need guidance in making purchases and should be encouraged to obtain good quality equipment. Drawing facilities should also be provided by the centre, together with access to CAD facilities, to enable learners to produce drawings using CAD if they choose. Learners will also need access to real examples of industry-standard design information including drawings. Local professional practices are a useful source of information, provided the necessary copyright permissions are sought. The use of design team information, procedures and documentation for live or completed construction projects as a basis for assessment tasks would enhance the learning experience by contextualising the study of design procedures.

Employer engagement and vocational contexts

Support to enable centres to initiate and establish links to industry, and to networks arranging visits to industry and from property practitioners is given below:

- Learning and Skills Network – *www.vocationallearning.org.uk*
- National Education and Business Partnership Network – *www.nebpn.org*
- The Royal Institution of Chartered Surveyors – *www.rics.org*
- Work Experience/Workplace learning frameworks – Centre for Education and Industry (CEI University of Warwick) – *www.warwick.ac.uk/wie/cei/*

Indicative reading for learners

Textbooks

Adler D – *Metric Handbook, 2nd Edition* (Butterworth Architecture, 1999) ISBN 0750608994

Bisharat K – *Construction Graphics: A Practical Guide to Interpreting Working Drawings* (Wiley, 2004) ISBN 978-0471219835

Chappell D and Willis A – *The Architect in Practice 9th Edition* (Blackwell, 2005) ISBN 1405124679

Collier T – *Design, Technology and the Development Process in the Built Environment* (Spon Press UK, 1995) ISBN 0419195505

Kirkpatrick B and Kirkpatrick J – *AutoCAD Architectural Drawing Using AutoCAD 2002* (Prentice Hall, 2002) ISBN 0130971049

Phillips R – *Architect's Plan of Work* (RIBA Publishing, 2000) ISBN 1859460682

Rekit A and Langford D – *Computer Integrated Planning and Design in Construction* (Thomas Telford Ltd, 2001) ISBN 9780727730077

RIBA – *Architect's Job Book* (RIBA Publishing, 1995) ISBN 1859460070

Tunstall G – *Managing the Building Design Process* (Butterworth-Heinemann Ltd, 2000) ISBN 0750650699

Journals

AJ Journal – Emap

AT Architectural Technology – Chartered Institute of Architectural Technologists

Building Design – United Business Media

Building Magazine – CMP

Contract Journal – Reed Business Publishing

Websites

www.architecture.com	Royal Institute of British Architects (RIBA)
www.bre.com	Building Research Establishment Limited
www.ciat.org.uk	Chartered Institute of Architectural Technologists
www.ciob.org.uk	Chartered Institute of Building

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	investigating the roles and responsibilities of people associated with building design
Team workers	researching technical, environmental and legislative constraints on building design, as part of a team
Self-managers	investigating stages of the design and construction processes for design projects.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	developing a careers brochure producing a plan of work reporting on a client's building requirements
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	producing a plan of work
Manage information storage to enable efficient retrieval	researching internet for data on sustainability, legislation, etc
Follow and understand the need for safety and security practices	developing mult-imedia presentations
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	drafting utility and road layout schemes
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using the internet and other electronic media to research and gather information on construction design methods
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	developing a careers brochure producing a plan of work reporting on a client's building requirements
Bring together information to suit content and purpose	researching sustainability
Present information in ways that are fit for purpose and audience	presenting findings on roles and responsibilities of designers, advisers and regulators
Evaluate the selection and use of ICT tools and facilities used to present information	

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	doing a case study on certificates
Identify the situation or problem and the mathematical methods needed to tackle it	using key performance indicators
Select and apply a range of skills to find solutions	drafting out utility and road layout scheme
Use appropriate checking procedures and evaluate their effectiveness at each stage	drafting out utility and road layout scheme
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	preparing sketch scheme and design solutions for client approval
Draw conclusions and provide mathematical justifications	extracting performance indicators for a discussion on value of KPIs
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	developing a careers brochure
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	developing a careers brochure producing a plan of work reporting on a client's building requirements.