

Overview

This Unit recognises, in addition to your technical competence as a designer, the paramount importance of health, safety and welfare requirements and environmental sustainability issues. It is about ensuring that all aspects of the production and installation design are integrated. You must understand the overall design approach, and be able to apply agreed techniques that will produce a holistic design that is coherent and consistent. It is about deciding what materials, components and systems will make up the finished product. You must have a sound knowledge of the available options, and be able to make informed choices.

This unit will challenge your technical competence. It is about producing the details of the design. It is about agreeing with stakeholders what you have done so far. You must be able to report on progress to date, justify the decisions that you have taken, and gain the trust and support of stakeholders for the next phase of the work.

It is also about identifying the hazards arising from the design, eliminating them where possible, and minimising the risks arising from the residual hazards. For the purposes of this Unit, a hazard is something with the potential to cause harm, and a risk is the likelihood of harm being caused, and the degree of its severity. The strategy for managing risk uses a hierarchy of eliminate/reduce/inform/control. You must be able to identify hazards associated with the design, eliminate them where possible, and inform people about the residual risks.

Performance criteria

You must be able to:

Confirm the purpose, methods and techniques for preparing detailed design solutions

- P1 confirm the purpose of production and installation information and the **format** to be used appropriate to the **project stage**
- P2 identify and confirm the **aspects of the overall project design** which interact with each other and which require production and installation information
- P3 **maintain coherence and consistency** between the production and installation solutions and the overall design concept
- P4 apply agreed **techniques** for investigating, calculating, testing, developing and specifying production and installation solutions

Confirm and select materials, components and systems

You must be able to:

- P5 investigate the **production and installation requirements** which are significant to the overall design
- P6 confirm the priorities for the **production and installation requirements** of the agreed design relevant to the **project stage**
- P7 select materials, components and systems which meet the identified **production and installation requirements** and **standards and guidance**
- P8 assess whether existing design solutions which contain similar **production and installation requirements** might be relevant
- P9 agree the solutions which best meet the significant **production and installation requirements**, and keep records of them for the project team

Produce and recommend detailed design solutions

You must be able to:

- P10 identify, and confirm the **technical, environmental, production and installation factors** and **data** which will influence the production and installation solutions, and seek guidance where required
- P11 agree **design parameters** for selecting and producing production and installation solutions appropriate to the **project stage**
- P12 produce production and installation solutions by applying agreed **design parameters**
- P13 record the **data** from **calculations, investigations** and analyses and pass them on for checking
- P14 check the production and installation solutions against relevant **technical, environmental, production and installation factors**
- P15 **justify** the features and benefits of the recommended production and installation solutions
- P16 provide decision makers with relevant and accurate information at the right time and agree production and installation solutions

Performance criteria

P17 maintain records of production and installation solutions

Make design choices to address health and safety hazards and risks

You must be able to:

P18 collaborate with **interested parties** to ensure the compliance of designs with **relevant health and safety regulations and legal framework**

P19 identify **operations and individual activities** that may give rise to **hazards**

P20 identify and prioritise the **hazards** arising from **operations and individual activities**

P21 obtain accurate information on any **potential consequences** resulting from the **hazards**

P22 **assess** the **hazards** to identify **risks** on an iterative basis throughout the development process

P23 eliminate identified **hazards** whilst **developing and modifying** production and installation solutions

P24 reduce identified levels of **risk** arising from **hazards** that are not eliminated when **developing and modifying** production and installation information

P25 identify collective and individual **measures** for reducing levels of **risk**

P26 record in **design documentation** any information needed by **interested parties** so that they can comply with their duties under **relevant health and safety regulations**

Knowledge and understanding

You need to know and understand:

Confirm the purpose, methods and techniques for preparing detailed designs

- K1 how to confirm the purpose of production and installation information and the **format** to be used appropriate to the **project stage** (application)
- K2 how to identify which **aspects** of the **overall project design** interact with each other and require production and installation information (understanding)
- K3 how to confirm which **aspects** of the **overall project design** interact with each other and require production and installation information (application)
- K4 how and why to **maintain coherence and consistency** between the production and installation solutions and the overall design concept (synthesis)
- K5 how to apply agreed **techniques** for investigating, calculating, testing, developing and specifying production and installation solutions (application)

Confirm and select materials, components and systems

You need to know and understand:

- K6 how and why to investigate the **production and installation requirements** which are significant to the overall design (analysis)
- K7 how to confirm the priorities for the **production and installation requirements** of the agreed design relevant to the **project stage** (application)
- K8 how and why to select materials, components and systems which meet the identified **production and installation requirements** and **standards and guidance** (evaluation)
- K9 how and why to assess whether existing design solutions which contain similar **production and installation requirements** might be relevant (analysis)
- K10 how and why to agree the solutions which best meet the significant **production and installation requirements** (evaluation)
- K11 how to keep records of solutions that best meet the significant **production and installation requirements** (application)

Produce and recommend detailed design solutions/production and installation solutions

You need to know and understand:

- K12 how to identify the **technical, environmental, production and installation factors** and **data** which will influence the production and installation solutions (understanding)
- K13 how to confirm the **technical, environmental, production and installation factors** and **data** which will influence the production and installation solutions, and seek guidance where required (application)
- K14 how and why to agree **design parameters** for selecting and producing production and installation solutions appropriate to the **project stage** (evaluation)
- K15 how to produce production and installation solutions by applying the agreed **design parameters** (application)

Knowledge and understanding

- K16 how to record and pass on the **data** from **calculations, investigations** and analyses (application)
- K17 how to check the production and installation solutions against relevant **factors** (application)
- K18 how and why to **justify** the features and benefits of the recommended production and installation solutions (evaluation)
- K19 how to provide relevant and accurate information to decision makers (application)
- K20 how and why to agree production and installation solutions (evaluation)
- K21 how to maintain records of production and installation solutions (application)

Make design choices to address health and safety hazards and risks

You need to know and understand:

- K22 how and why to collaborate with **interested parties** to ensure the compliance of designs with **relevant health and safety regulations and legal framework** (synthesis)
- K23 how to identify **operations and individual activities** that may give rise to **hazards** (understanding)
- K24 how to identify **hazards** arising from **operations and individual activities** (understanding)
- K25 how and why to prioritise the **hazards** arising from **operations and individual activities** (analysis)
- K26 how to obtain accurate information on any **potential consequences** resulting from the **hazards** (application)
- K27 how and why to **assess** the **hazards** to identify **risks** on an iterative basis throughout the development process (analysis)
- K28 how to eliminate identified **hazards** whilst **developing and modifying** production and installation solutions (application)
- K29 how to reduce identified levels of **risk** arising from **hazards** that are not eliminated when **developing and modifying production and installation information** (application)
- K30 how to identify collective and individual **measures** for reducing levels of **risk** (understanding)
- K31 how to record in **design documentation** any information needed by **interested parties** so that they can comply with their duties under **relevant health and safety regulations** (application)

Scope/range

Confirm the purpose, methods and techniques for preparing detailed designs solutions

- 1 Format:
 - 1.1 in writing
 - 1.2 graphically
 - 1.3 electronically
- 2 Project stages:
 - 2.1 Stage 4 (Design)
 - 2.2 Stage 5 (Build and Commission)
- 3 Aspects of the overall project design:
 - 3.1 location and size
 - 3.2 assembly and construction
 - 3.3 components and systems
 - 3.4 environmental assessment objectives
- 4 Maintain coherence and consistency:
 - 4.1 visual performance
 - 4.2 technical performance
 - 4.3 operation and maintenance
 - 4.4 requirements of relevant legislation and codes
 - 4.5 cost
 - 4.6 health and safety
 - 4.7 environmental quality and sustainability
 - 4.8 buildability/disassembly
 - 4.9 value management
 - 4.10 concurrent design and construction
 - 4.11 comparison of costs of new and renewable energy systems in buildings
 - 4.12 building services systems & controls
 - 4.13 minimise thermal bridging and air leakage
 - 4.14 minimise emissions and waste
 - 4.15 water usage
 - 4.16 energy use (U Value Calculations, Building Energy Assessment & Carbon Rating)
 - 4.17 protect archaeological and historically valuable resources

Scope/range

- 4.18 carbon footprint
- 5 Techniques
 - 5.1 data research
 - 5.2 conformity with regulations
 - 5.3 specialist guidance and good practice
 - 5.4 relevant previous solutions and feedback
 - 5.5 computer modelling
 - 5.6 Building Information Modelling
 - 5.7 survey and investigation
 - 5.8 performance dynamic modelling

Confirm and select materials, components and systems

- 6 Production and installation requirements:
 - 6.1 construction requirements and compatibility with site constraints
 - 6.2 adaptation of existing structural elements
 - 6.3 practicality, buildability and disassembly
 - 6.4 standardisation and component co-ordination
 - 6.5 production and installation processes, scheduling, lead-in times, construction programming/sequencing and quality control
 - 6.6 expertise including experienced crafts people
 - 6.7 fit and tolerances
 - 6.8 production resources availability and performance (plant/equipment/people/skills)
 - 6.9 materials, components and systems availability and capability
 - 6.10 strategies to address interface issues on and off-site
 - 6.11 access/transportation/traffic management
 - 6.12 health and safety
 - 6.13 system commissioning
 - 6.14 operation and maintenance information
- 7 Project Stage:
 - 7.1 Stage 4 (Design)
 - 7.2 Stage 5 (Build and Commission)
- 8 Standards and guidance:
 - 8.1 British Standards

Scope/range

- 8.2 Assessment Schemes
- 8.3 codes of practice
- 8.4 BBA Certificates
- 8.5 EU Standards
- 8.6 trade and industry advisory guidance publications
- 8.7 client standards

Produce and recommend detailed design solutions

- 9 Technical factors:
 - 9.1 structural forms
 - 9.2 materials and component performance standards and fitness for purpose (form, performance, appearance, availability, sustainability, efficiency of use, component life, durability)
 - 9.3 available and projected technology (including renewable energy)
 - 9.4 prefabricated components and system options
 - 9.5 performance, quality, operation and maintenance requirements
 - 9.6 building physics (energy performance of structures, insulation, fire protection)
 - 9.7 materials form, performance, appearance, availability, sustainability, efficiency of use
 - 9.8 building services integration and control
- 10 Environmental factors:
 - 10.1 local ecology
 - 10.2 hydrology (tides and currents and flood risk)
 - 10.3 water use
 - 10.4 exposure/shelter/shading
 - 10.5 heating, ventilation and cooling (solar gain, temperature range, natural ventilation, thermal and ventilation performance, thermal flows)
 - 10.6 thermal properties (heat loss and SAP variables, U values, thermal bridging, air tightness)
 - 10.7 daylight and illumination
 - 10.8 acoustics
 - 10.9 energy & natural resource use and management
 - 10.10 interaction of users and buildings,
 - 10.11 carbon (embodied and in-use) and carbon rating

Scope/range

- 10.12 resource/waste management
- 10.13 pollution risk and reduction of emissions and waste
- 11 Production and installation factors:
 - 11.1 construction requirements and compatibility with site constraints
 - 11.2 adaptation of existing structural elements
 - 11.3 practicality, buildability and disassembly
 - 11.4 standardisation and component co-ordination
 - 11.5 production and installation processes, scheduling, lead-in times, construction programming/sequencing and quality control
 - 11.6 expertise including experienced crafts people
 - 11.7 fit and tolerances
 - 11.8 production resources availability and performance (plant/equipment/people/skills)
 - 11.9 materials, components and systems availability and capability
 - 11.10 strategies to address interface issues on and off-site
 - 11.11 access/transportation/traffic management
 - 11.12 health and safety
 - 11.13 system commissioning
 - 11.14 operation and maintenance information
- 12 Data:
 - 12.1 identified construction criteria
 - 12.2 existing detailed design solutions
- 13 Design parameters:
 - 13.1 client, user and community requirements, expectations, options and preferences
 - 13.2 project type/purpose/use
 - 13.3 site, location and surrounding environment
 - 13.4 geology (seismology, ground movements and soil type)
 - 13.5 transport and infrastructure
 - 13.6 planning, urban & social integration
 - 13.7 design form (architectural, structural, civil, services)
 - 13.8 design quality (character/scale/aesthetics)
 - 13.9 function/spatial planning (occupancy/room information/access and egress incl. DDA, security)

Scope/range

- 13.10 programme budget
- 13.11 cost (including whole life)
- 13.12 development timetable
- 13.13 risk assessment and mitigation
- 13.14 cost planning (including life cycle cost) and value management
- 13.15 procurement
- 13.16 in-use performance
- 13.17 environmental quality and sustainability
- 13.18 environmental assessment/certification schemes
- 13.19 protection of archaeological, architectural, cultural and historically valuable resources (significance/status)
- 13.20 statutory, regulatory and legal constraints
- 13.21 standards and codes of practice
- 13.22 health and safety
- 13.23 form, function, materials, components and systems
- 13.24 loose fit design - for flexibility/adaptability/deconstruction/disassembly
- 13.25 buildability
- 13.26 operation and maintenance
- 14 Project Stage:
 - 14.1 Stage 4 (Design)
 - 14.2 Stage 5 (Build and Commission)
- 15 Calculations:
 - 15.1 manual
 - 15.2 computer aided
- 16 Investigations:
 - 16.1 data research
 - 16.2 survey
 - 16.3 conformity with regulations
 - 16.4 specialist guidance and good practice
 - 16.5 relevant previous solutions and feedback
 - 16.6 computer/simulation modelling
 - 16.7 calculation
 - 16.8 Building Information Modelling

Scope/range

- 16.9 computer aided analysis
- 17 Justify - by using:
 - 17.1 sketches
 - 17.2 drawings
 - 17.3 physical models
 - 17.4 computer models
 - 17.5 diagrams
 - 17.6 calculations
 - 17.7 written reports
 - 17.8 cost estimates
 - 17.9 programming
 - 17.10 specifications
 - 17.11 outline approvals from regulatory authorities

Make design choices to address health and safety hazards and risks

- 18 Interested parties:
 - 18.1 clients
 - 18.2 CDM
 - 18.3 HSE
 - 18.4 other designers
 - 18.5 project and construction managers
 - 18.6 contractors and specialist contractors
 - 18.7 operators and maintainers
- 19 Relevant health and safety regulations and legal framework:
 - 19.1 CDM regulations and Approved Codes of Practice
 - 19.2 current health, safety and welfare regulations
 - 19.3 Construction and Building Regulations
 - 19.4 civil law and criminal law
 - 19.5 duty of care
- 20 Operations and individual activities:
 - 20.1 survey and investigation
 - 20.2 construction phase
 - 20.3 operation and maintenance

Scope/range

- 20.4 altering
- 20.5 demolition/disassembly
- 20.6 commissioning and decommissioning
- 21 Hazards:
 - 21.1 falls from height
 - 21.2 slips, trips and falls
 - 21.3 hit by falling or moving objects
 - 21.4 manual handling
 - 21.5 health issues
 - 21.6 power sources
 - 21.7 hazardous substances
 - 21.8 trapped by something collapsing or overturning
 - 21.9 confined spaces
 - 21.10 fire
 - 21.11 obstructions
 - 21.12 moving vehicles
 - 21.13 public access
- 22 Potential consequences:
 - 22.1 injury
 - 22.2 causing ill health
 - 22.3 fatality
 - 22.4 damaging property
 - 22.5 adversely affecting the natural and built environment
 - 22.6 contravening legislative requirements
 - 22.7 litigation and prosecution
 - 22.8 working conditions and circumstances
 - 22.9 buildability
- 23 Assess:
 - 23.1 likelihood of occurrence
 - 23.2 severity of harm incurred
- 24 Risks:
 - 24.1 high
 - 24.2 medium

Scope/range

- 24.3 low
- 25 Develop and modify:
 - 25.1 analysis
 - 25.2 identifying interactions
 - 25.3 calculation
 - 25.4 testing
 - 25.5 selecting materials, components and systems detailing and specifying consideration of costs and benefits (including whole life costing)
 - 25.6 identifying project requirements
 - 25.7 planning investigation
 - 25.8 verifying competence and resources analysis
 - 25.9 identifying interactions assessing buildability
- 26 Measures:
 - 26.1 eliminate
 - 26.2 reduce
 - 26.3 inform
 - 26.4 control
- 27 Design documentation:
 - 27.1 drawings
 - 27.2 specifications
 - 27.3 calculations
 - 27.4 Health and Safety Plans and Files

COSBEDO01- SQA Unit Code H6A4 04

Produce and recommend detailed design solutions in
built environment design



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Produce and recommend detailed design solutions in built environment design



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