SUMPM14
Develop, test and agree building services engineering project designs

Overview

This standard is for people who manage the development, testing and agreement of building service engineering project design solutions.

The person carrying out the work must be able obtain and analyse information on project options and project design parameters and identify significant opportunities and constraints. They will be able to identify and select resources which will balance cost and quality, and consider how they will influence the design solutions. They will calculate, analyse and test the effectiveness of different design solutions. They must be able to present the recommended building services engineering design clearly and objectively to justify the choice in line with the project brief. They must also discuss the choice of design and agree any changes with the client, and record these changes. They will also be able to interpret how the overall design concept can be met and advise all stakeholders on the implications and constraints of accepting, modifying or rejecting design proposals.

Performance criteria

Assess significant factors affecting the project design

You must be able to:

P1 obtain **information**, options and **design** parameters which are relevant to the development of the **design** brief

P2 identify which parts of the project require detailed **design**

P3 analyse the findings of **investigations** and identify **factors**, **criteria** and **procedures** which may influence **design** and **work activities**

P4 collate **data** and conclusions from all areas of specialist research and **design** evaluation, and circulate the **documentation** to project team members

P5 analyse the **information** available with the project team, and produce realistic **design** parameters which recognise significant **opportunities and constraints**, including **resources** available and **opportunities and constraints** to the use of **environmental technologies**

P6 assess the **design** parameters and communicate the assessment to the people responsible for the project **design**, planning and scheduling

P7 advise the client on the most appropriate course of action, including the cost and **resource** implications of the project **design**

P8 identify and analyse the **work activities** contained in the project brief considering their significance to the overall **design** and what potential **opportunities and constraints** there might be in completing them

P9 select **design** concepts, as appropriate, for further development by the project team, which appear to meet the requirements of the **design** brief and also resolve a significant number of **opportunities and constraints** on development

Select, test and refine design options

You must be able to:

P10 identify and select from existing **design** options which are consistent with the brief, and likely to contribute to appropriate solutions and **design** ideas

P11 obtain new sources of **information** and ideas, where existing **design** options do not meet the brief and suggest new and innovative **design** options

P12 evaluate **design** options against the requirements of the project brief and keep records of them

P13 discuss the selected **design** options with project team members, assessing their observations and noting them for future reference

P14 develop the **design** options which appear to have the greatest potential for success

P15 select appropriate **tests** which will give valid and relevant **information** about the **design** options

P16 implement and monitor **tests** so that the validity of the **design** options is maintained, and match the result to the parameters of the project brief

P17 refine **design** options which meet the **opportunities and constraints** of the project brief and **test** them until their ability to meet the **design** parameters is established

P18 reject any **design** options which fail to meet the **design** parameters and identify possible alternatives

P19 record **test** results

Present project design recommendations

You must be able to:

P20 select and agree the purpose and methods to **present design** options

P21 **present** the recommendations, proposals and **design** options and show how they are justified by the **requirements** of the project brief

P22 **present information** in a way which promotes goodwill and trust

P23 provide evidence, as appropriate, to support changes to the agreed criteria in cases where the **design** proposal or options that do not meet the project brief

P24 encourage **stakeholders** to ask questions and make comments at appropriate stages in the presentation of the **design** options

P25 agree, recommend and record any amendments and variations from the original project brief

Advise and negotiate on the selection and modification of a design recommendation

You must be able to:

P26 identify any changes in the project that are not reflected in the formal variations to the project brief

P27 assess and justify the features and benefits of the recommended design

solution, including any **environmental technologies** selected for use

P28 inform **stakeholders** how well the **design** concept proposals match the criteria in the project brief

P29 inform **stakeholders** about the designer's creative interpretation of the project brief and overall **design** concept

P30 explain how the overall **design** concept can meet the **opportunities and constraints** in the project brief, the aesthetic requirements of the **client** and approved **procedures**

P31 inform **stakeholders** about the implications and constraints of accepting, modifying or rejecting **design** proposals

P32 inform **stakeholders** how much more advice, research and consultancy will be necessary to produce a project **design** which is acceptable

P33 confirm with **relevant person(s)** what the recommended **design** solution will cost and how long it will take to implement

P34 agree the detailed **design** solution with **relevant person(s)**

Knowledge and understanding

You need to know and understand:

K1 **information**, options and **design** parameters which are relevant to the development of a project brief

K2 which parts of a project require detailed **design**

K3 **factors**, **criteria** and **procedures** which influence **design** and **work activities**, including **resource** availability

K4 **documentation** and other methods to **present** research and **design** evaluation **data** and conclusions

K5 **design** parameters, concepts and approaches and how to assess them against a project brief considering relevant **factors**, **criteria** and **procedures**

K6 **resource** implications of different **design** options

K7 opportunities for and constraints on the use of **environmental technologies**

K8 methods for effective **communication** around **design**

K9 implications of modifying a project brief

K10 **design** approaches that are likely to contribute to **design** ideas

K11 sources of **information** and ideas, where existing **design** options do not meet a project brief

K12 how to develop **design** options

K13 **tests** which give relevant **information** about the **design** options

K14 methods to refine and **test design** options

K15 how to identify and reject **design** options which fail to meet design parameters

K16 how to identify alternative **design** options

K17 techniques to record **test** results

K18 methods to **present** recommendations, proposals, **design** options and associated **information**

K19 the features and benefits of **design** solutions, including any **environmental technologies**

K20 how recommendations, proposals and **design** options can be justified by the requirements of a project brief

K21 what evidence may be valid to support changes to agreed criteria

K22 effective approaches to encourage **stakeholders** to ask questions and make comments at appropriate stages in a presentation

K23 how to agree and record any amendments and variations from an original project brief

K24 how a **design** concept can meet implications and constraints in a project brief, the aesthetic requirements of the **client** and approved **procedures**

K25 effective methods to inform **stakeholders** about:

K25.1 how well **design** concept proposals match criteria in a project brief

K25.2 a designer's creative interpretation of a project brief and overall **design** concept

K25.3 **implications and constraints** of accepting, modifying or rejecting **design** proposals

K25.4 how much more advice, research and consultancy will be necessary to produce a detailed **design** which is acceptable

K26 the costs involved in a detailed **design** solution

Additional information

Scope related to performance criteria

1 **Information**

1.1 technical (design documentation, plans, installation specifications, equipment specifications, manufacturers' data, manufacturer's instructions, tender documents, surveys, BIM data, physical models)

1.2 functional (user instructions, including the circumstances when professional expertise should be called upon)

1.3 client information (provided by the client including the invitation to tender, any drawings and specifications)

1.4 contractual

1.5 statutory consents

1.6 quotations

1.7 health and safety

1.8 planning and pre-planning

1.9 instructions (verbal, written)

2 **Factors**

2.1 physical (e.g. hydrology, geology, exposure, solar gain, light levels, temperature range, wind speed)

2.2 technical (e.g. resource availability, materials and equipment performance structural forms, component life, heating and cooling, health and safety, fire protection, access, transportation, traffic generation)

2.3 environmental (e.g. sustainability, energy use, local ecology, emissions, pollution risk)

2.4 requirements (e.g. client and user needs, regulatory, legal, timescales, BIM protocols, contractual, cost, management of hazards and risks)

3 **Criteria**

3.1 delivery (e.g. installation processes, schedule, resource availability, quality control, initial cost, performance)

3.2 design and in use performance (e.g. aesthetics, structural forms, heating and cooling, component life, whole life cost)

3.3 environmental (e.g. energy in use, embedded energy, water use and

recycling, carbon emissions, pollution)
3.4 access
3.5 heritage protection
3.6 fire protection

4 **Procedures**
4.1 information management
4.2 project management
4.3 risk assessment and management
4.4 communication with relevant person(s)
4.5 implementing and monitoring requirements related to listed buildings or conservation areas
4.6 estimating

5 **Documentation**
5.1 graphical
5.2 none graphical

6 **Test(s)**
6.1 physical
6.2 simulation
6.3 comparative
6.4 statistical
6.5 computer modeling

7 **Present**
7.1 verbally
7.2 visually
7.3 electronically
7.4 written reports
7.5 data

8 **Environmental technologies**
8.1 solar photovoltaic

8.2 solar thermal
8.3 heat pumps (air and ground source)
8.4 combined heat and power installations (CHP)
8.5 grey water recycling
8.6 rainwater harvesting
8.7 biomass
8.8 micro-wind turbine
8.9 micro hydro

9 **Stakeholders**

9.1 clients
9.2 occupiers/users
9.3 regulatory authorities
9.4 employees
9.5 colleagues
9.6 investors
9.7 contractors and subcontractors
9.8 consultants
9.9 local people who may be affected by the work
9.10 financers

10 **Client**

10.1 architect
10.2 contract manager
10.3 main/sub-contractor
10.4 consultant(s)
10.5 purchaser of installation and/or maintenance services or their representative
10.6 other trades and services at the work site

11 **Relevant person(s)**

11.1 customers/clients/client representatives/users
11.2 supervisors/site manager(s)/contract manager(s)
11.3 other contractors/trades/consultants
11.4 health and safety officers/managers

11.5 planning advisors/officers

Range related to performance criteria

1 **Design(s)**

1.1 programming
1.2 drawings
1.3 computer generated data
1.4 diagrams
1.5 written reports
1.6 graphical models
1.7 none graphical models

2 **Resources**

2.1 labour
2.2 plant and equipment
2.3 finance
2.4 IT
2.5 materials and other consumables

3 **Data**

3.1 design data
3.2 performance calculations
3.3 configuration
3.4 graphical models
3.5 none graphical models

Range related to knowledge and understanding

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Glossary

Investigations

Research, specialist guidance and good practice, relevant previous solutions and feedback

Work activities

Work in progress, work planned, response to changed circumstances, work that affects others

Opportunities and constraints

Customer consideration, work details, resource availability, technical, timescales, legal and regulatory, cost, site/work location

External Links Links correct at time of NOS approval

- Health & Safety Executive Documents http://www.hse.gov.uk/pubns
- The quality of buildings and building work in England https://www.gov.uk/government/policies/providing-effective-building-regulations-so-that-new-and-altered-buildings-are-safe-accessible-and-efficient
- The quality of buildings and building work in Wales http://wales.gov.uk/topics/planning/buildingregs/?lang=en
- The quality of buildings and building work in Northern Ireland www.buildingcontrol-ni.com/
- The quality of buildings and building work in Scotland http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards
- British Standard 7671: – Requirements for Electrical Installations http://www.theiet.org/resources/wiring-regulations/
- Carriage of dangerous goods authorisations https://www.gov.uk/government/publications/carriage-of-dangerous-goods-authorisations
- The requirements and information on microgeneration https://www.gov.uk/government/publications/microgeneration-strategy
- Refrigeration and Air Conditioning Standards http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=50356
- F-Gas guidance - https://www.gov.uk/managing-fluorinated-gases-and-ozone-depleting-substances
- BRA Jointing of Copper Pipework Guide http://www.feta.co.uk/associations/bra/downloads
- Waste Electrical and Electronic Equipment recycling (WEEE): www.hse.gov.uk/waste/waste-electrical.htm
- Control of Substances Hazardous to Health (COSHH): www.hse.gov.uk/coshh
- Construction (Design and Management) Regulations: http://www.hse.gov.uk/construction/cdm.htm

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Status	Original
Originating organisation	SummitSkills
Original URN	STE6/7/8 & EVTS10/11/12
Relevant occupations	Building Services Engineering Design Technician; Building Services Engineering Technician; Supervisor; Team Leader; Project Manager; Managers; Owner/Manager; Contract Manager; Air conditioning and Refrigeration Engineers; Electricians; Heating and Ventilation Engineers; Plumbers; Plumbing
Suite	Building Services Engineering Technology & Project Management
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