

SPD5141 Building Services System Design

<http://ibse.hk/SPD5141/>

Project Brief: Renovation and Upgrade of THEi Building at Tsing Yi Campus

1. Background Information

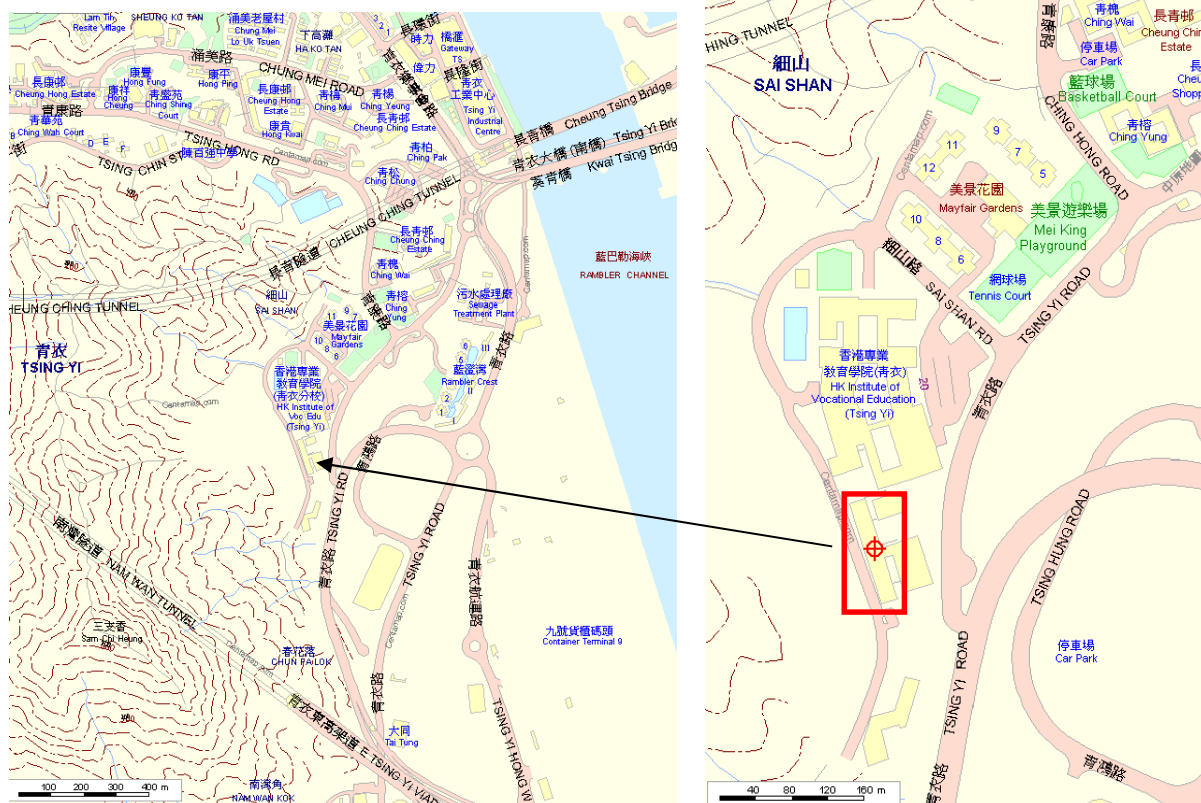


Figure 1. Site and building location (2/F to 10/F with total 7,800 m² usable floor area)



Figure 2. Photos of THEi Building

The THEi Building was formally established in February 2011. The building was initially used by the School of Business and Information Systems of the Vocational Training Council (VTC) in 2004 to 2010. This building and the related THEi Tsing Yi Campus are part of the master plan for an academic campus developed by VTC in Tsing Yi (including the IVE Tsing Yi Campus). Upon the completion of the THEi Chai Wan Campus in 2017, there is a need to renovate and upgrade the Tsing Yi Campus which will be used mainly by the Faculty of Science and Technology of THEi.

2. Purpose and Scope of the Project

The aim of this design project is to investigate/explore possible options and develop the technical design of Building Services systems for the renovation and upgrade of THEi Building at Tsing Yi Campus. The students should study the important factors and limitations affecting the planning and design of the building project and its building services systems so as to develop appropriate design solutions and development strategies for the project. The major building services systems include:

- Heating, ventilating and air conditioning (HVAC)
- Fire services
- Plumbing and drainage
- Electrical services

After the construction, the building will provide space for the functions as described in Table 1. The exact location and arrangement of the rooms shall be proposed by the design team with clear justification. The project development and building design should demonstrate good practices in sustainable and energy efficient design with environmentally-friendly and cost-effective design solutions.

Table 1. Proposed space requirements (total usable floor area = 7,800 m² for 2/F to 10/F)

Space	Area (m ²)	Description
Laboratories	3,000	For experiments, research projects and demonstrations
Classrooms	1,000	For teaching, examination and seminars
Staff offices	2,000	For academic, administrative and supporting staff
Computer rooms	1,000	For computer-aided learning and student working
Plant rooms	800	For the Building Services systems

The initial estimate of the total cost for this project is HK\$80 millions. The preliminary timeline for the project is 18 months. It is expected that the construction work may commence in 2018. The design team might also propose some reasonable assumptions for the design and construction of the project. These assumptions should be confirmed with the design tutors.

3. Client Requirements

The project should include effective and flexible spaces for use by the Faculty of Science and Technology and other related units of THEi. The complex is scheduled for completion in the middle of 2019. The design and construction of the project will follow the requirements of the BEAM Plus assessment method for new buildings and major renovations (see the weblink below for details). The major assessment categories are shown below. Planning and design for obtaining a suitable level of BEAM Plus certification should be demonstrated.

BEAM Plus <http://www.hkgbc.org.hk/eng/BEAMPlus.aspx>



[Platinum – Gold – Silver – Bronze]



Site Aspects



Materials Aspects



Energy Use



Water Use



Indoor Environmental Quality



Innovations and Additions

4. Design Process and Tasks

Students will form groups of 4 to 5 members to work as a team on the design project. The design process is divided into three main stages (see Appendix I for details) and the major design tasks are shown to give guidelines for the students to develop their design solutions in a systematic way.

(a) Appraisal

- Analysis of site environment
- Study of client requirements and objectives
- Evaluation of constraints, feasibility and options

(b) Design Brief

- Confirmation of key requirements, criteria and scope
- Consideration of design strategies for building services systems
- Development of design brief and preparation for interim review

(c) Concept

- Implementation of design brief and preparation of additional data
- Preparation of concept design (outline proposals, specifications, cost plan)
- Writing of design report and preparation for final presentation

At each design stage, students are required to search and collect information, carry out assessments and evaluations, perform design analyses and calculations, prepare technical drawings, etc. for developing the design solutions. Seminars and design tutorials will be arranged to allow students to interact and discuss with the design tutors and other professionals. This will enhance their understanding and arouse their interest in the building design process.

Students should consider the specific types of design information appropriate to their project and try to organize them in a logical and systematic way. Common types of building design information include:

- Site conditions and environment (site access, circulation, surroundings, climate, etc.)
- Architectural design drawings (site plan, floor plan, elevations, sections)
- Building services design drawings and conceptual diagrams
 - System schematic diagrams
 - Plant room location and services distribution plans
 - Conceptual utility connection diagrams
 - Conceptual zoning and coordination diagrams
- Design requirements (the client, local regulations, authorities) and design criteria
- Initial design calculations (load estimation and assessment, basic assumptions)
- System descriptions and design concepts
- Cost implications and project duration

5. Assessment Methods

Assessment will be based on the following components (total 100 marks):

(a) Presentations (20 marks)

Interim review oral presentation = 10 marks
Final presentation = 10 marks

(b) Design Reports (80 marks)

Interim report = 30 marks
Final report = 50 marks

Submissions of reports should be punctual. Late submission may receive reduction in marks. The general assessment criteria include quality of the content, organization, clarity of thought, teamwork

skills, communication skills (oral, graphic and written), report writing, innovation and creativity.

Useful References (on Building Services Design):

- Churcher, D., 2009. *A Design Framework for Building Services: Design Activities and Drawing Definitions*, 2nd ed., Building Services Research and Information Association, Bracknell, Berkshire, England.
- Hall, F. and Greeno, R., 2013. *Building Services Handbook*, 7th ed., Butterworth-Heinemann, Oxford, U.K.
- Pennycook, K., 2007. *Design Checks for HVAC: A Quality Control Framework*, BSRIA Guide BG 4/2007, 2nd ed., Building Services Research and Information Association, Bracknell, Berkshire, England.
- Pennycook, K. 2006. *Design Checks for Electrical Services*, Application Guide BG 3/2006, Building Services Research and Information Association, Bracknell, Berkshire, England.
- Pennycook, K. 2006. *Design Checks for Public Health Engineering*, Application Guide BG 2/2006, Building Services Research and Information Association, Bracknell, Berkshire, England.

Useful Websites:

Resources (for the Building Services System Design) <http://ibse.hk/SPD5141/resources.htm>

Student Notes for Building Services Engineering <http://www.arca53.dsl.pipex.com/>

Sustainable Design for Buildings [ArchSD] <http://www.archsd.gov.hk/archsd/html/teachingkits/TK1/>

Whole Building Design Guide (WBDG) Sustainable <http://www.wbdg.org/design/sustainable.php>

Appendix I

Stages of Design Process

(a) Appraisal:

1. Identify client's needs and objectives
2. Evaluate business case and possible constraints on development
3. Prepare feasibility studies and assess options

(b) Design Brief:

4. Develop initial statement of requirements
5. Confirm key requirements and constraints
6. Identify procurement method and organisational structure

(c) Concept:

7. Implement design brief and prepare additional data
8. Prepare concept design (outline proposals, specifications, cost plan)
9. Review procurement route

RIBA Outline Plan of Work (Work Stages A to E and Key Tasks)*

RIBA Work Stages		Description of key tasks	OGC Gateways
Preparation	A	<p>Appraisal</p> <p>Identification of client's needs and objectives, business case and possible constraints on development.</p> <p>Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.</p>	1 Business Justification
	B	<p>Design Brief</p> <p>Development of initial statement of requirements into the Design Brief by or on behalf of the client confirming key requirements and constraints. Identification of procurement method, procedures, organisational structure and range of consultants and others to be engaged for the project.</p>	2 Procurement strategy
Design	C	<p>Concept</p> <p>Implementation of Design Brief and preparation of additional data.</p> <p>Preparation of Concept Design including outline proposals for structural and building services systems, outline specifications and preliminary cost plan.</p> <p>Review of procurement route.</p>	3A Design Brief and Concept Approval
	D	<p>Design Development</p> <p>Development of concept design to include structural and building services systems, updated outline specifications and cost plan.</p> <p>Completion of Project Brief.</p> <p><i>Application for detailed planning permission.</i></p>	
	E	<p>Technical Design</p> <p>Preparation of technical design(s) and specifications, sufficient to co-ordinate components and elements of the project and <i>information for statutory standards and construction safety.</i></p>	3B Detailed Design

* Source: Royal Institute of British Architects (RIBA)

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Schedule of Activities (2016-2017 from Semester 2 to Summer Semester)

Date, Time and Venue: Friday, 19:00-22:00, Room 811, 8/F THEi Building

Work Stages	Week	Date	Description
Appraisal	1	10-Mar-2017 (Fri)	<ul style="list-style-type: none"> • 19:00-20:30 Introduction of the Design Project • 20:30-22:00 Student Grouping and Division of Works
	2	17-Mar-2017 (Fri)	Design Seminar <ul style="list-style-type: none"> • 19:00-22:00 Seminar: Green Building Design/Assessment
	3	24-Mar-2017 (Fri)	Design Seminar <ul style="list-style-type: none"> • 19:00-22:00 Seminar: Building Services Design Guides
	4	31-Mar-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
Design Brief	5	7-Apr-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	6	14-Apr-2017 (Fri)	[Good Friday Public Holiday]
	7	21-Apr-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	8	28-Apr-2017 (Fri)	Design Review and Tutorials <ul style="list-style-type: none"> • 19:00-22:00 Design Review and Tutorials
	9	5-May-2017 (Fri)	Interim Review <ul style="list-style-type: none"> • 19:00-22:00 (oral presentation + report submission)
Concept Design	10	12-May-2017 (Fri)	<Examination period for Semester 2>
	11	19-May-2017 (Fri)	<Examination period for Semester 2>
	12	26-May-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	13	2-Jun-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	14	9-Jun-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	15	16-Jun-2017 (Fri)	Design Review and Tutorials <ul style="list-style-type: none"> • 19:00-22:00 Design Review and Tutorials
	16	23-Jun-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	17	30-Jun-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	18	7-Jul-2017 (Fri)	Design Development <ul style="list-style-type: none"> • Student team working
	19	14-Jul-2017 (Fri)	Final Presentation <ul style="list-style-type: none"> • 19:00-22:00 (oral presentation + report submission)