

**For discussion
on 9 February 2011**

PWSC(2010-11)36

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 708 - CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT

Universities

The Hong Kong University of Science and Technology

14EL – Research and Academic Building

Members are invited to recommend to the Finance Committee the upgrading of **14EL** to Category A at an estimated cost of \$360.2 million in money-of-the-day prices for the construction of a new research and academic building by The Hong Kong University of Science and Technology within its campus in Clear Water Bay.

PROBLEM

The Hong Kong University of Science and Technology (HKUST) needs additional space and facilities to support its research and teaching activities.

PROPOSAL

2. The Secretary-General, University Grants Committee (SG, UGC), on the advice of the University Grants Committee (UGC) and the Director of Architectural Services (D Arch S) as UGC's Technical Adviser, and with the support of the Secretary for Education, proposes to upgrade **14EL** to Category A at an estimated cost of \$360.2 million in money-of-the-day (MOD) prices for the construction of a new research and academic building by HKUST within its campus in Clear Water Bay.

/PROJECT

PROJECT SCOPE AND NATURE

3. The scope of **14EL** comprises the construction of an eight-storey research and academic building providing approximately 10 000 square metres (m²) in net operational floor area (NOFA). The following facilities will be provided under the project—

- (a) classrooms of about 1 000 m² in NOFA;
- (b) teaching laboratories of about 2 622 m² in NOFA;
- (c) research laboratories of about 4 700 m² in NOFA;
- (d) offices of about 1 000 m² in NOFA; and
- (e) support facilities of about 678 m² in NOFA, such as store rooms and meeting space.

4. The project also involves the construction of an access road leading from the existing road outside the project site to the new research and academic building, two link bridges connecting the new building to an adjoining building, and landscaping works. A site plan is at Enclosure 1. An artist impression and sectional plans of the new building and a list of facilities provided therein are at Enclosures 2 to 4 respectively. Subject to Finance Committee's funding approval, HKUST plans to commence the construction works in the third quarter of 2011 for completion in the third quarter of 2013.

JUSTIFICATION

5. According to the results of the Review of Space Requirements Formula and Standards of the UGC-funded institutions carried out by the UGC in 2006 and taking into account projects under construction¹, HKUST will have an estimated space shortfall of some 7 500 m² in NOFA by the 2012/13 academic year. The space shortfall lies mainly in teaching and research laboratories.

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¹ Other publicly-funded capital works projects currently under construction in HKUST's campus in Clear Water Bay to provide additional academic space include **10EL** New Academic Building (upgraded to Category A in April 2009), **11EL** Extension to the existing Academic Building (upgraded to Category A in January 2008), and **12EL** Institute for Advanced Study (upgraded to Category A in April 2009).

6. Currently, the teaching and research laboratories in HKUST are very congested. The project will address HKUST's requirement for both teaching space and research facilities. New facilities provided by the project will allow HKUST to pursue new research and educational initiatives, and facilitate research-based teaching, the search for new discoveries, the application as well as transfer of knowledge. To HKUST, the project is also a valuable opportunity to enhance its research and teaching environment.

7. Against the above background, HKUST proposes to construct a new research and academic building to provide some 10 000 m² of modern teaching and research facilities. Of the 10 000 m², government will fund the construction of 7 500 m² to meet HKUST's space shortfall as referred to in paragraph 5 above. While the remaining 2 500 m² will be met by HKUST's own funding source to provide additional space to accommodate a growing population of non-local students and expansion of privately-funded activities, e.g. self-financed academic programmes. The split of the total project cost between government and HKUST will therefore be 75%:25%.

FINANCIAL IMPLICATIONS

8. The total estimated cost of the project is \$480.3 million in MOD prices. The Government will fund up to \$360.2 million, i.e. 75% of the estimated construction cost. HKUST will contribute \$120.1 million through its private sources of funding for the remaining 25% of the estimated construction cost.

9. SG, UGC, on the advice of D Arch S, recommends a capital funding of \$360.2 million in MOD prices to be provided by the Government (please see paragraph 12 below), made up as follows –

	\$ million
(a) Site formation and development	7.2
(b) Building	163.1
(c) Building services	123.6
(d) Drainage and external works	14.1
(e) Additional energy conservation measures	7.7

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		\$ million	
(f)	Consultants' fees for contract administration	6.7	
(g)	Remuneration of resident site staff	6.1	
(h)	Furniture and equipment ²	23.4	
(i)	Specialist equipment for laboratories ³	39.8	
(j)	Contingencies	31.5	
	Sub-total	423.2	(in September 2010 prices)
(k)	Provision for price adjustment	57.1	
	Sub-total	480.3	(in MOD prices)
(l)	Less contribution by HKUST	120.1	
	Total	360.2	(in MOD prices)

10. HKUST will engage consultants to undertake tender assessment, contract administration and site supervision of the project. A detailed breakdown of the estimated consultants' fee is at Enclosure 5.

11. The construction floor area (CFA) of this project is approximately 18 858 m². The estimated construction unit cost, represented by the building and building services costs, is \$15,203 per m² of CFA in September 2010 prices. A detailed account of the CFA vis-à-vis the construction unit cost is at Enclosure 6. D Arch S considers the estimated construction unit cost reasonable and comparable to those of similar projects such as 52EF "Centralized general research laboratory complex (block 1) in Area 39", The Chinese University of Hong Kong (with an estimated construction unit cost of \$15,298 per m² of CFA in September 2010 prices).

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² Based on an indicative list of furniture and equipment required by HKUST.

³ Based on an indicative list of specialist equipment required by HKUST for the laboratories. Examples of specialist equipment include fume cupboards, bio-safety cabinets, cold rooms, laboratory cabinets and benches.

12. Subject to approval, HKUST will phase the expenditure as follows –

Year	\$ million (in Sept 2010 prices)	Price adjustment factor	\$ million (MOD)	Contribution by HKUST \$ million (MOD)	14EL \$ million (MOD)
2011 – 12	22.8	1.04250	23.8	23.8	-
2012 – 13	129.4	1.09463	141.6	96.3	45.3
2013 – 14	222.6	1.14936	255.8	-	255.8
2014 – 15	36.5	1.20682	44.0	-	44.0
2015 – 16	11.9	1.27169	15.1	-	15.1
	<u>423.2</u>		<u>480.3</u>	<u>120.1</u>	<u>360.2</u>

13. We have derived the MOD estimate on the basis of the Government's latest set of assumptions on the trend rate of change in the prices of public sector building and construction output for the period 2011 to 2016. HKUST will tender the works through a lump-sum contract because it can clearly define the scope of works in advance. The contract will provide for price adjustment.

14. The project has no impact on tuition fees. The additional recurrent costs associated with this project will be funded by HKUST. The proposal has no additional recurrent implications on the Government.

PUBLIC CONSULTATION

15. The project is located within the HKUST campus. There are no residential developments nearby, and the project will not affect residents in the vicinity. HKUST has consulted its staff and students, who expressed support to the project. On 17 September 2010, Members of the Sai Kung District Council attended a briefing on the progress of HKUST's Campus Development Plan and were briefed on the construction of the new research and academic building.

16. We submitted a paper on the project to the Legislative Council Panel on Education for discussion on 10 January 2011. Members did not raise any objection to the proposal.

/ENVIRONMENTAL

ENVIRONMENTAL IMPLICATIONS

17. This is not a designated project under the Environmental Impact Assessment Ordinance (Cap. 499). The project will not cause long term environmental impact. HKUST has included in the project estimates the cost to implement suitable mitigation measures to control short term environmental impacts.

18. During construction, HKUST will control noise, dust and site run-off nuisances to within established standards and guidelines through the implementation of mitigation measures in the relevant contract. These include the use of silencers, mufflers, acoustic linings or shields for noisy construction activities, frequent cleaning and watering of the site, and the provision of wheel-washing facilities.

19. At the planning and design stages, HKUST has considered adjusting the building layout and foundation system to cope with the topography to reduce the generation of construction waste where possible. In addition, HKUST will require the contractor to reuse inert construction waste (e.g. excavated soil) on site or in other suitable construction sites as far as possible, in order to minimize the disposal of inert construction waste at public fill reception facilities⁴. HKUST will encourage the contractor to maximize the use of recycled / recyclable inert construction waste, and the use of non-timber formwork to further reduce the generation of construction waste.

20. At the construction stage, HKUST will require the contractor to submit for approval a plan setting out the waste management measures, which will include appropriate mitigation means to avoid, reduce, reuse and recycle inert construction waste. HKUST will ensure that the day-to-day operations on site comply with the approved plan. HKUST will require the contractor to separate the inert portion from non-inert construction waste on site for disposal at appropriate facilities. HKUST will control the disposal of inert construction waste and non-inert construction waste at public fill reception facilities and landfills respectively through a trip-ticket system.

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⁴ Public fill reception facilities are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Disposal of inert construction waste in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

21. HKUST estimates that the project will generate in total about 43 184 tonnes of construction waste. Of these, HKUST will reuse about 24 097 tonnes (55.8%) of inert construction waste on site and deliver 12 998 tonnes (30.1%) of inert construction waste to public fill reception facilities⁴ for subsequent reuse. HKUST will dispose of the remaining 6 089 tonnes (14.1%) of non-inert construction waste at landfills. The total cost for accommodating construction waste at public fill reception facilities and landfill sites is estimated to be \$1.1 million for this project (based on a unit cost of \$27 per tonne for disposal at public fill reception facilities and \$125 per tonne⁵ at landfills).

ENERGY CONSERVATION MEASURES

22. This project will adopt various forms of energy efficient features, including –

- (a) water-cooled chillers (evaporative cooling tower using fresh-water);
- (b) automatic demand control of chilled water circulation system;
- (c) automatic condenser tube cleaning equipment;
- (d) automatic demand control of supply air;
- (e) demand control of fresh air supply with carbon dioxide sensors;
- (f) heat wheels for heat energy reclaim of exhaust air;
- (g) T5 energy efficient fluorescent tubes with electronic ballast and lighting control by occupancy sensors and daylight sensors;
- (h) light-emitting diode (LED) type exit signs;
- (i) services-on-demand control for escalators (on-off control);

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⁵ This estimate has taken into account the cost for developing, operating and restoring the landfills after they are filled and the aftercare required. It does not include the land opportunity cost for existing landfill sites (which is estimated at \$90 per m³), nor the cost to provide new landfills, (which is likely to be more expensive) when the existing ones are filled.

- (j) automatic on/off switching of lighting and ventilation fan inside lifts; and
- (k) building energy management system for large installations.

23. For renewable energy technologies, this project will adopt self-contained type of photovoltaic landscape lighting in the landscape area.

24. For greening features, this project will provide greening at walkways, the podium and the rooftop as well as vertical greening.

25. The total estimated additional cost for adoption of the above features is around \$7.7 million (including \$5.5 million for energy efficient features), which has been included in the cost estimate of the project. The energy efficient features will achieve 11.9% energy savings in the annual energy consumption with a payback period at about 5.9 years.

HERITAGE IMPLICATIONS

26. This project will not affect any heritage site, i.e. all declared monuments, proposed monuments, graded historic sites/ buildings, site of archaeological interests and Government historic sites identified by the Antiquities and Monument Office.

LAND ACQUISITION

27. The project does not require any land acquisition.

BACKGROUND INFORMATION

28. Under existing procedures, UGC-funded institutions submit capital works proposals to the UGC annually. The UGC examines all these proposals carefully, with professional advice provided by D Arch S who acts as UGC's Technical Adviser, and refers those supported proposals to the Government for consideration of bidding of funds under the established mechanism. Having examined HKUST's proposal, SG, UGC has, in consultation with D Arch S, adjusted the project estimate proposed by HKUST to arrive at the project estimate set out in paragraph 9 above.

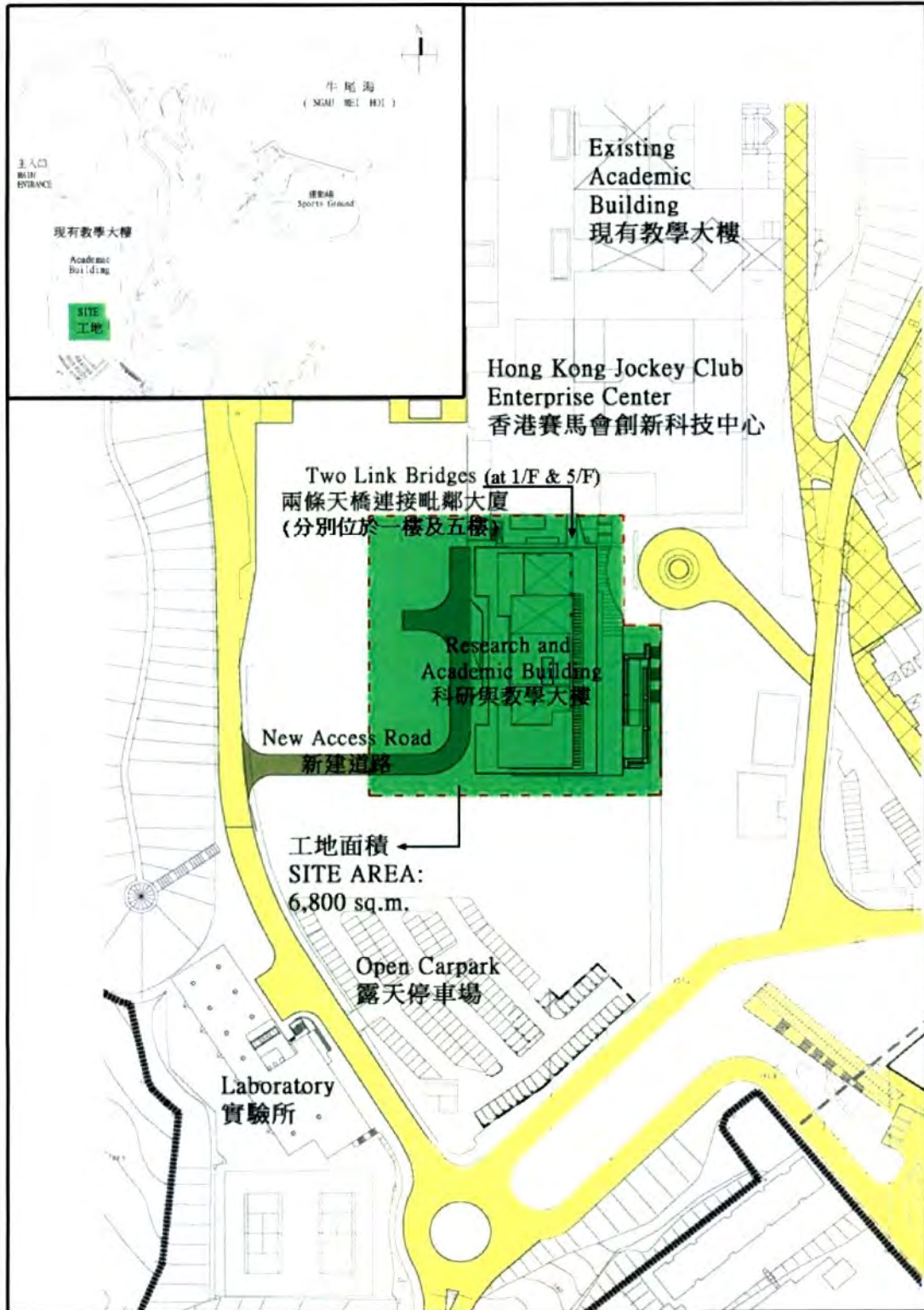
29. We upgraded **14EL** to Category B in November 2008. HKUST engaged consultants in March 2009 to carry out topographical survey, site investigation, and to prepare preliminary design, detailed design and tender documents for the project at a total estimated cost of \$11.7 million. We charged \$8.8 million out of the \$11.7 million to block allocation **Subhead 8100EX** “Alterations, additions, repairs and improvements to the campuses of the UGC-funded institutions”. The remaining amount of \$2.9 million was funded by HKUST’s private sources of funding. The consultants have completed topographical survey, site investigation, preliminary design and detailed design for the project. HKUST is finalizing the relevant tender documents.

30. The proposed construction works will not involve any tree removal and tree planting proposal, but will involve the pruning of four trees within the campus to facilitate the construction of soil retaining wall and landscaped area. The reduction in lawn area will be compensated by provision of two landscaped areas at the ground level, a roof garden at the podium level and vertical greening along the walls of plant room at the roof level.

31. HKUST estimates that the project will create about 240 jobs (215 for labourers and another 25 for professional/technical staff) providing a total employment of 5 900 man-months.

The Hong Kong University of Science and Technology
Research and Academic Building
香港科技大學科研與教學大樓

Site Plan 工地平面圖



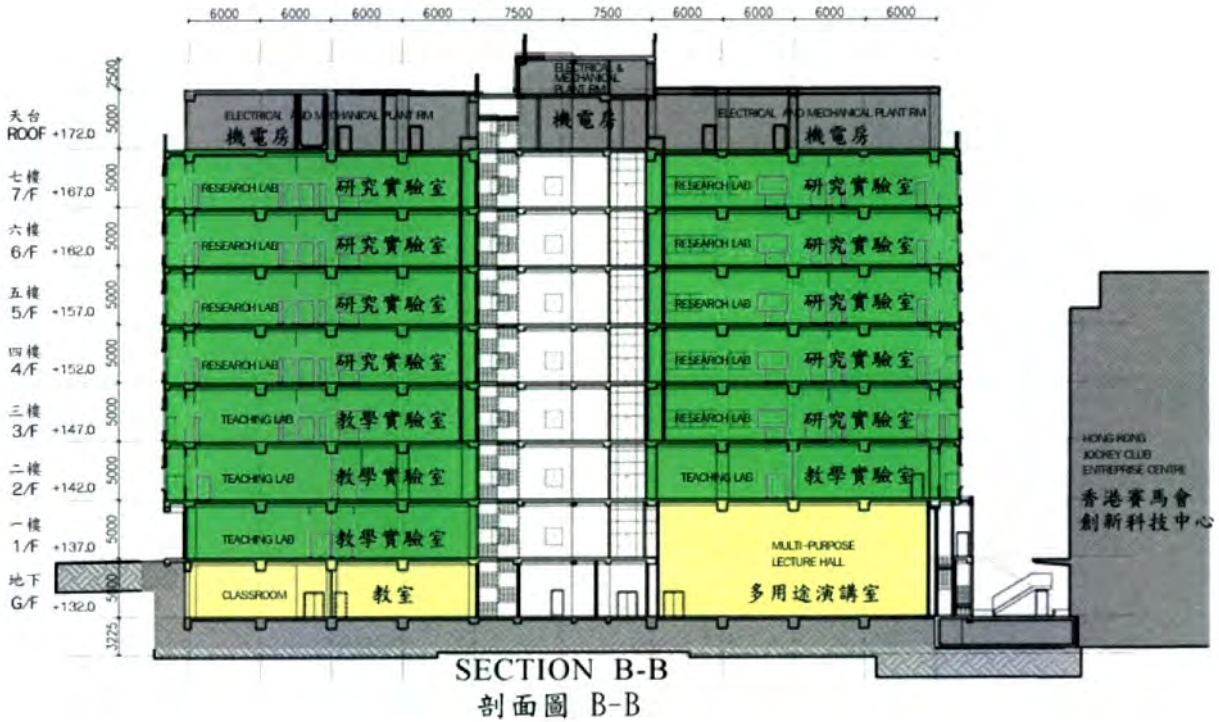
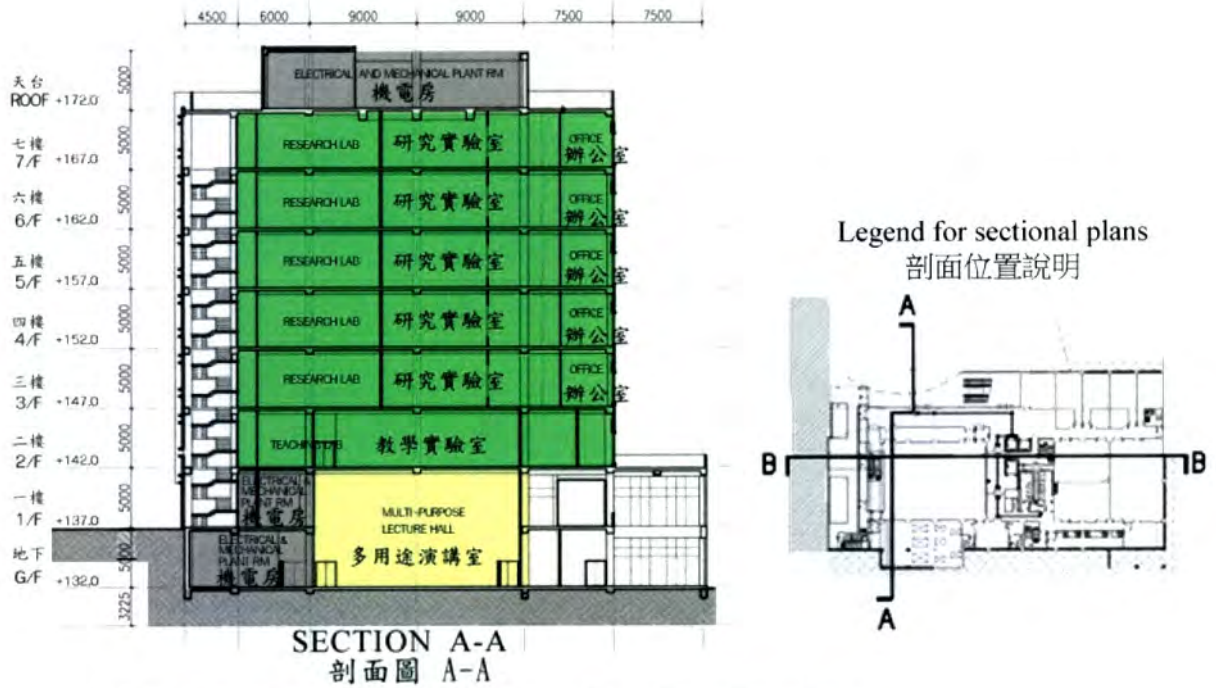
**The Hong Kong University of Science and Technology
Research and Academic Building
香港科技大學科研與教學大樓**

View of the building (artist's impression) 外觀構思圖



The Hong Kong University of Science and Technology
 Research and Academic Building
 香港科技大學科研與教學大樓

Sectional Plan 剖面圖



**The Hong Kong University of Science and Technology
14EL – Research and Academic Building**

List of facilities

Facilities	Estimated floor area in net operational floor area (NOFA) (m²)
(a) Classrooms	1 000
(b) Teaching laboratories	2 622
(c) Research laboratories	4 700
(d) Office facilities	1 000
(e) Support facilities	
(i) Store Rooms	608
(ii) Meeting Space	70
Total	<hr/> 10 000 <hr/>

Enclosure 5 to PWSC(2010-11)36

The Hong Kong University of Science and Technology 14EL – Research and Academic Building

Breakdown of the estimate for consultants' fees and resident site staff costs (in September 2010 prices)

		Estimated man- months	Average MPS* salary point	Multiplier (Note 1)	Estimated fees (\$ million)
(a) Consultants' fees for contract administration (Note 2)	Professional	-	-	-	6.7
(b) Remuneration of resident site staff (Note 3)	Technical	191	14	1.6	6.1
				Total	<u>12.8</u>

* MPS = Master Pay Scale

Notes

1. A multiplier of 1.6 is applied to the average MPS point to estimate the costs of site supervision staff to be employed by the consultant. (As at now, MPS point 14 = \$19,945 per month.)
2. The consultants' fees for contract administration are calculated in accordance with the existing consultancy agreements for the design and construction of **14EL**. The construction phase of the assignment will only be executed subject to Finance Committee's approval to upgrade **14EL** to Category A.
3. HKUST will only know the actual man-months and actual costs for resident site staff after completion of the construction works.

**The Hong Kong University of Science and Technology
14EL – Research and Academic Building**

Breakdown of the construction floor area (CFA) vis-à-vis the construction unit cost

(a) Breakdown of CFA

	Estimated floor area (m²)
Net operational floor area (NOFA)	10 000
Circulation areas and toilets	6 629
Mechanical and electrical plants	2 229
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Total	18 858
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(b) NOFA / CFA ratio 53.0%

(c) Estimated construction unit cost (represented by the building and building services costs) \$15,203 per m² of CFA
(in September 2010 prices)