D4FC Factsheet 1: The London School of Hygiene and Tropical Medicine

Contact details
Name: Andrew Cripps
Company: AECOM
Email: andrew.cripps@aecom.com
Tel: 01727 535635

General project information
Name of project: The London School of Hygiene and Tropical Medicine
Location of project: London
Type of project: Major retrofit of the Keppel St building
Cost of project: About £10m

Project team
Client: LSHTM
Architect: Day England Stevenson Marsh (DESM)
Engineering design: AECOM
Cost consultant: Davis Langdon (an AECOM company)

Project description
The LSHTM is a world-renowned educational and research facility with over 3000 students. The case study building (Keppel Street) is Grade II listed and situated within the Bloomsbury Conservation Area of London. It comprises a multi-storeyed block with laboratories, teaching and research facilities and social space, and is in constant use. The building is therefore heavily serviced and major elements of the mechanical and electrical service infrastructure now require significant replacement and modernisation due to their poor condition and inability to meet the School's requirements.

The School commissioned AECOM to undertake a feasibility study to assess the current performance of the building's service infrastructure and identify opportunities for improvement, to be presented as a suite of options taking account of planning, building fabric and structural constraints. In parallel, AECOM are developing a climate change adaptation strategy for the School, in order to future proof its operations against projected climate change.

Project timescales and dates
Design and assessment period (pre-planning): RIBA Stages A–B: September 2010 to May 2011, RIBA Stages C–D: to be determined based on results of feasibility study
Construction period (post-consent): TBD
Operation and monitoring period: TBD
Further project details

1 What approach did you take in assessing risks and identifying adaptation measures to mitigate the risks?
- externally, the building currently experiences and adds to the effects of the urban heat island due to its central London location. Internally the building already suffers from overheating and adapting the building to be able to withstand future hotter summers without imposing greater quantities of air-conditioning will be a challenge
- the Prometheus probabilistic design summer year weather tapes developed by Exeter University were used to assess future climate in terms of temperature, cloud cover, radiation, precipitation and air moisture. Analysis of this data in an IES model of the building using cooling degree days and hours above a baseline temperature showed that overheating will continue to be the key future risk for many occupied spaces in the building
- using the IES models we conducted detailed analysis of alternative strategies to mechanical cooling to reduce the risk of overheating. In terms of climate adaptation artificial cooling should be seen as last resort and can be considered ‘maladaptation’ because of the increased energy use and the extraction of excess heat into external environment, increasing the urban heat island effect, if heat recovery is not used
- the first step was to minimise solar and internal gains by improving the window glazing and reducing energy consumption of lighting and equipment in offices. We modelled the potential reductions in overheating using natural ventilation and the following design solutions:
  - improved glazing (reduce g-value from 0.87 to 0.38)
  - improved lighting (from 15W/m² to 10.8W/m² including occupancy sensing)
  - less small power (from 25W/m² to 10W/m²)
  - the use of night purge to ventilate and cool building over night
- the building is also subject to risks associated with scarcity of water, surface water flooding from roof, further facade damage and maybe even structural damage due to soil shrinkage. Discussion with AECOM technical experts in these areas has helped informed understanding of these risks and how best to mitigate them.

2 How have you communicated the risks and recommendations with your client? What methods worked well?
- we have used a range of graphical representations and tables to communicate the extensive data to the client
- we have also carried out an interim presentation and plan to deliver a full presentation highlighting the key findings and recommendations upon completion of the project.

3 What tools have you used to assess overheating and flood risks?
- IES Virtual Environment thermal modelling software
- Prometheus weather files (based on UKCP09)
- in-house modelling tool for assessing flooding (developed by one of our PHD research students).

4 What has the client agreed to implement as a result of your adaptation work?
- the strategy is still under development, however it is anticipated that recommended measures will be adopted as part of the School's refurbishment programme, which includes a requirement to achieve a BREEAM Very Good to Excellent rating
- it is also anticipated that measures relating to reducing small power will be incorporated into the School’s strategic procurement policies.

5 What were the major challenges so far in doing this adaptation work?
- working within the significant physical and planning constraints of the building. Many solutions that could normally be applied to a new building (or a less constrained existing building) were not suitable for this building
- the programme for the CCA work was dependent on the programme of the parallel feasibility study. Delays to the feasibility study (due largely to understating the complexity of the building and the client's needs) resulted in delays to the CCA work
- the overheating modelling took far longer than first anticipated due to the number of runs required for modelling such a complex building and the testing required for each adaptive solution.
6 What advice would you give others undertaking adaptation strategies?

- get to understand the building (if existing) or design (if new build) and its likely complexities as much as possible, and as soon on in the programme as possible
- allow for flexibility in your programme if your work is dependent on other projects being carried out in parallel.