D4FC Factsheet 3: Extra Care 4 Exeter

Contact details

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General project information

Name of project:	Extra Care 4 Exeter
Location of project:	Exeter, Devon
Type of project:	New build, 50 unit extra care scheme (including high level dementia care) and associated accommodation and facilities
Cost of project:	Floor area approx 5000 sq m budget £6m

The project is currently at RIBA Workstage C/D

Project team

Exeter City Council:	Client, project manager, structural and civils engineers
Designer:	Gale & Snowden Architects Ltd (architects, mechanical engineers and building physicists)
Contractor:	TBC

Other organisations involved (and their role): Exeter University (building physicists and dissemination), Jenkins Hansford Partnership (quantity surveyors and cost consultants)

Project description

The client project brief is to design and build a new state of the art and non institutional, low energy Extra Care Home including 50 self contained accommodation units plus supporting communal facilities and staff accommodation. The building is:

- to be low in energy and to maintain adequate comfort levels throughout its lifespan with a passive design. Passivhaus standards are to be considered for the accommodation units
- to incorporate healthy building design principles, including reducing VOCs, dust mites, emfs.

The main CCA risks identified, focusing on overheating and comfort levels, are:

- increased internal and external temperatures
- unstable/changing surface temperature levels resulting in uncomfortable internal conditions
- unstable internal temperatures and fluctuating humidity levels.

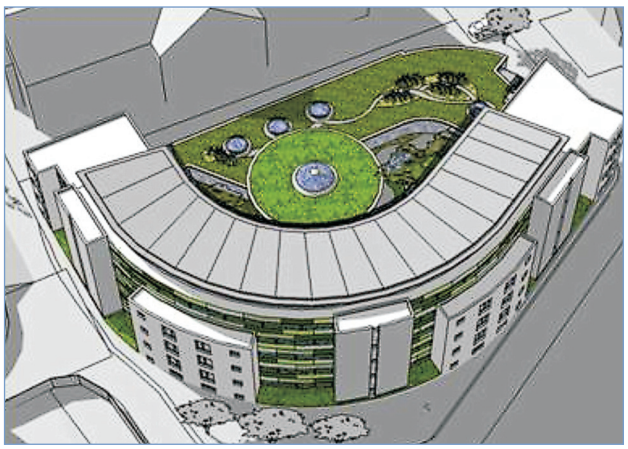
Further CCA risks that are also to be investigated include:

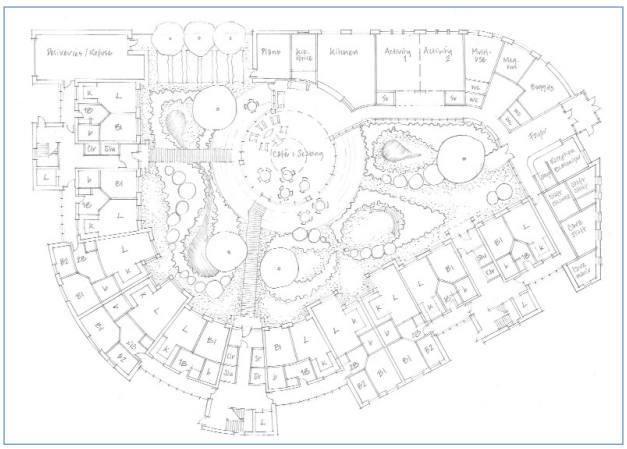
- increased weather severity – wind and rain
- reduced rainfall in summer, increased rainfall in winter
- increased pollen count, airborne particles and manmade pollutants
- flooding.

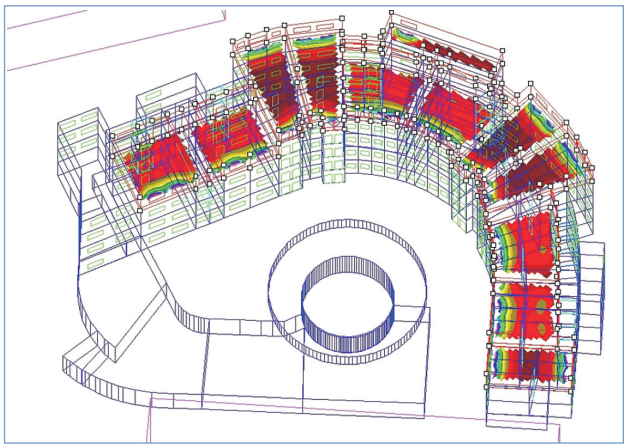
CIBSE Engineering a sustainable built environment

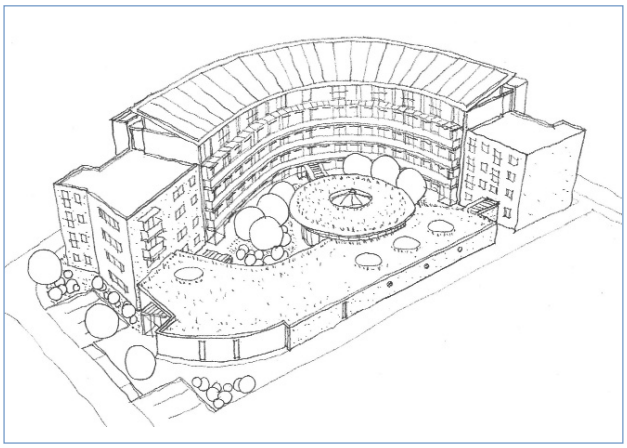
Technology Strategy Board Driving Innovation

Knowledge Transfer Network Modern Built Environment









Project timescales and dates

Design and assessment period: November 2010 to July 2011

Construction period: 2013 TBC

Operation and monitoring period: TBC

Further project details

1 What approach did you take in assessing risks and identifying adaptation measures to mitigate the risks?

The following methodology has been used to assess risks so far:

Overheating and comfort

- review of the team's previous projects including:
  - thermal modeling a current project using future climate change files 2030, 2050, 2080 at 50 and 90 percentiles
  - cost and construction matrix information for a range of projects were used to assess heavy versus light weight construction.

  Before design, this identified the levels of CCA risk and allowed the design team to agree on the levels of future weather climate risk to be designed to (50 percentile). The key passive and low cost design criteria were established before commencing design work.
- literature review – guidance on overheating (CIBSE), internal and external planting, green roofs and façade greening in terms of temperature and water attenuation, effect of plants internally and externally (NASA), heat stress papers and current research (ASHRAE)
- case studies UK and abroad (including German Passivhaus elderly care projects)
- various forms of thermal modelling of design throughout the design process from initial concept
- establish a sensible way forward based on the way people are currently treated in buildings to ensure that in the future this building (as currently designed) would pass future regulations.

Changing rainfall patterns:

- assess existing ground conditions, characteristics, topography, and environmental impact on sub-soils
- assess flood risk using EA maps and ECC SFRA
- review construction techniques/options
- awareness of peripheral development and future access requirements.

Adaptation measures to mitigate the potential climate change risks under consideration at present are as follows:

- overheating internally including unstable internal temperatures. Mitigation building strategies include: introduction of natural summer cross ventilation, super-insulation and air tight building fabric. Other occupant orientated strategies include: introduction of water

drinking points throughout the communal areas (to aid respiration/cooling evaporation), future introduction of ceiling room fans to accommodation units, introduction of plants, staff heat stress training, providing the café reduces the need for cooking in individual apartments in sustained hot periods. Heavy weight construction appears to perform better provided that night cooling can take place. Lightweight structure can also be made to work with good ventilation control and shading

- overheating external areas. Mitigation strategies include: shading from structures and deciduous leaf cover and use of non hard landscape surfaces including green roof – to create reduced temperature micro-climate adjacent building
- changing rainfall patterns. Mitigation strategies include attenuation measures to hold rainfall on site – currently under consideration
- localised air pollution. The effects and mitigation strategies are currently under consideration
- flooding. Mitigation strategies are currently under consideration.

2 How have you communicated the risks and recommendations with your client? What methods worked well?

CCA risks and communication have been communicated to the clients as follows:

- the clients are part of the design team and attend all meetings and therefore are fully informed on all aspects of the project
- notes of meetings and building precedent case studies are disseminated to the team including the clients.

The presentation of thermal modelling using computer graphics has worked well to graphically show the client what effects future climates could have on the building design.

3 What tools have you used to assess overheating and flood risks?

- IES: to thermally assess building design and fabric options
- PHPP: to assess the building design against Passivhaus criteria and cross reference the IES findings to compare results
- IES to assess the impact external planting can have on internal temperatures
- thermal modeling exercise and analysis is still ongoing
- flood risks: consulted with EA regarding flood risk from the main river
- review of strategic flood risk assessment to identify flood zone.

This is a small site (about 0.3 hectare) so manual and spreadsheet calculations allowing for climate change have also been used.

4 What has the client agreed to implement as a result of your adaptation work?

At present the project costs are under consideration therefore no decisions have been made to what is or is not to be incorporated into the building. Subject to the above, it has been agreed that the following will be implemented:

- cross ventilation layout for accommodation units
- solar shading to double up as access way and balconies
- deciduous planting for external landscaping for creating reduced micro climate adjacent the building in summer
- super insulated envelope to reduce solar gain and maintain stable and consistent internal temperatures
- localised extract (via MVHR) in spaces where high internal heat gains occur, ie the kitchen and appliances
- to minimise internal heat gains to the apartments by locating equipment such as boilers, hot water cylinders, washing machines etc in centralised plant rooms outside the habitable space.

5 What were the major challenges so far in doing this adaptation work?

- to determine the most appropriate construction technique. The client and team have experience of building a super heavy weight building which had its pros and cons when being built. Three construction techniques have been investigated: heavy weight, medium weight and light weight. They all have various pros and cons and costs associated with them. One method might appear cost effective in terms of materials but may take longer to build, and achieve weather tightness, and to dry out during construction. Another may introduce acoustic issues and associated on costs. The IES assessment indicates that thermal mass performs better with the future climate data, but this is reliant upon good ventilation control
- the client has a fixed budget and the team's experience of similar apartment buildings means they are fully aware that there is limited funding to invest in adaptation strategies at the outset. The strategies investigated are ones that are simple and cost effective
- compatibility with building regulations. Achieving cross ventilation in achieving building regulations and innovative solutions were required in both the layout of the building and the detail of the design
- previous planning requirements. Outline planning approval restricted the building and landscape design including the massing of the building
- site restrictions. The limited size of the site restricted the design of the building and restricted the use of certain CCA strategies, eg ground cooling
- planting is a living building material. When considering the climate change scenarios to 2080, it is unclear on how plant species will or not adapt or succumb to pest and diseases with gradual change. So it was considered

appropriate to concentrate on the structure and principles of the external design and associated characteristics of the plants, for future climate change and adaptation/management strategies

- specific plant species were considered based on their required use, location and likely growing conditions resulting from climate change. There is more opportunity to adapt planting over the buildings life time through regular maintenance, provided the infrastructure is in place
- incorporating the surface water storage needs of future extreme events
- other people's perceptions with not wanting to deal with future climate change as it currently is not part of the building regulations
- lack of clear guidance (building regulations, CIBSE, government) on what weather files and overheating criteria building designs should adhere to.

6 What advice would you give others doing similar projects in 2011–2012?

- a simple passive approach at concept stage can provide a high degree of CCA mitigation, eg layout of the building to allow cross ventilation
- consider simple people orientated measures to help reduce apparent heat in buildings by, for example, encouraging users to drink sufficient water, incorporating plant and room fans to increase people cooling via evaporation
- passivhaus principles provides a robust approach to future climate change
- incorporate controllable solar shading devices where necessary
- if the site and budget allow it, build in the possibility for using active cooling systems. For example. MVHR systems can use ground cooling to reduce excessive heat build up in prolonged periods of high external temperatures
- introduce thermal modelling at concept stage and use it as a design tool and not a compliance tool
- consider the role the landscape and external planting can play at introducing micro-climates and dealing with changing rain fall patterns at the outset.