

Arch 464
ECS
Spring 2019

Name _____

Quiz #2

"Net Zero Water?"

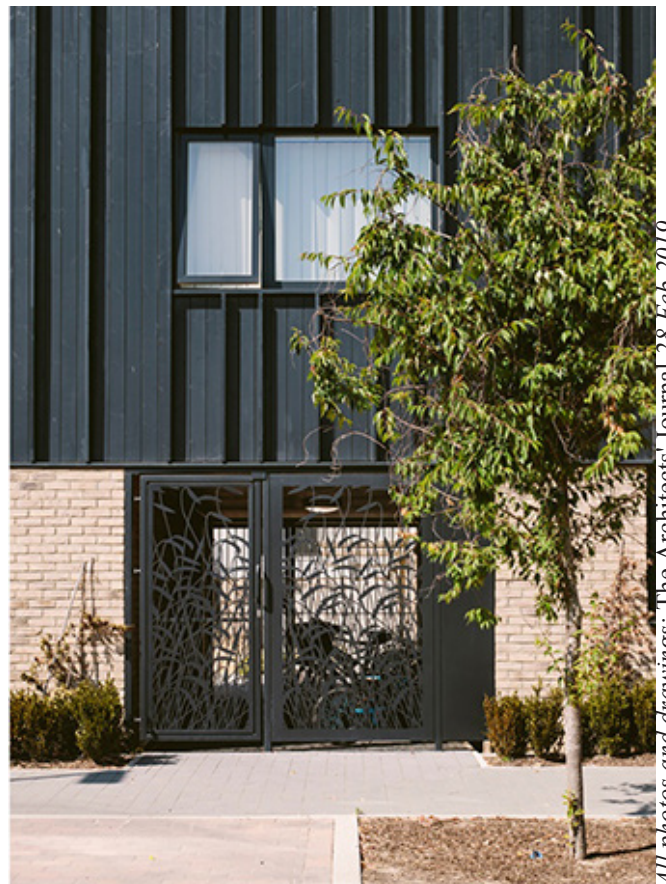


View looking south to one block of Virido housing from the Green Quad, which features a stormwater retention moat.

For this problem you are the water use and conservation consultant for Virido's *Code for Sustainable Homes Level 5* social housing in Cambridge, UK. Your role is to critique Virido's green, educational, and poetic alternatives for water use and treatment in the building and on its site.

Context. Cambridge's climate is classified as warm and temperate. Cambridge has a significant amount of rainfall during the year. This is true even for the driest month. In Bristol, the average winter temperature range is 36 to 45°C. Freezing temperatures are rare. About 552 mm (~46 mm/mon) of precipitation falls annually. The variation in the precipitation between the driest and wettest months is 33 mm in February to 53 mm in August.

READ THE ENTIRE QUIZ BEFORE YOU BEGIN!



Street elevation (south-facing) showing its landscape design.

Zero performance gap: P²TE's Virido development

The Architects' Journal, 28 February, 2019 by Fran Williams

The prototype homes on the southern edge of Cambridge are the first dwellings in the UK where as-built performance has been found to match that of the design. London-based Pollard Thomas Edwards (PTE) is known for its standard but reliable 'affordable' housing design. When I meet Tom Dollard, PTE's head of sustainable design and associate partner, at Virido he also points to the good work-life balance of the large practice and advocates its design-led approach, including in-office sounding boards every Friday. PTE is currently putting together a pattern book for its housing, to give them 'more time spent on the joy of architecture', as Dollard puts it. That said, while Virido achieves *Code for Sustainable Homes Level 5* with no performance gap, it combines this superior environmental sustainability with disappointing aesthetics and an average piece of public realm.

The modules are stacked, linked and arranged in a series of low-rise courtyard buildings containing on average 23 homes, wrapped around large semi-private spaces. A new landscaped square, Green Quad, sits at the heart of the site. The anonymous black timber blocks seem monotonous, only identified by the numbers on their doors and the random colored window frames. It's not obvious how 'each quad is unique, differently decorated and landscaped', as the Design and Access Statement puts it. Lying east of Trumpington Village, the site sits on former arable farmland and forms part of the Southern Fringe Expansion of Cambridge. Positioned next to a Guided Bus route, you can be in the centre of Cambridge within 12 minutes, so the development potential of this site was good.

All nine typology plans have depths of a maximum of 8m (25ft), allowing for good daylighting and cross-ventilation, with dual-aspect kitchen/living spaces. Within the quads, each home has a private garden immediately adjacent, beyond which there is a 'moat' designating its perimeter and serving to define private and shared spaces, as well as providing rainwater storage and attenuation. All apartments have access to either a balcony, terrace or patio garden, but it's hard to tell these apart and they've largely been left bare and unused.

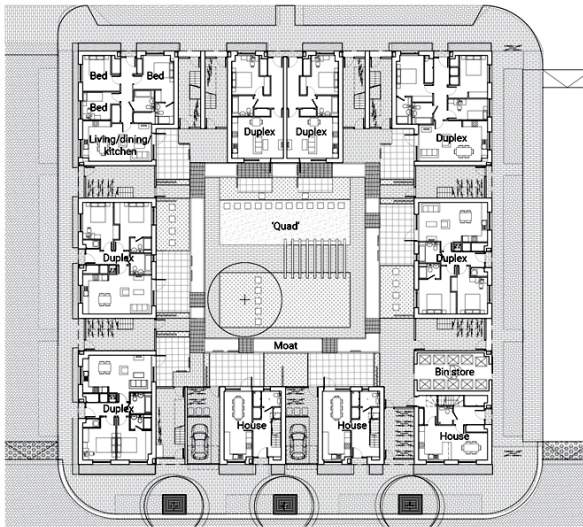
On the whole, the residents seem happy with the development. Managed by L&Q Housing Trust, three-bedroom flats can be rented for £1,200 a month and, with near-zero heating bills, this reflects the view that good location, newness and high thermal standards within dwellings are valued far higher than attractiveness and design by the general public.

From an ecological perspective, there is almost no performance gap and the properties approach Passivhaus standards (the 200mm (8") Kingspan TEK SIP panels couldn't eliminate air leakage completely). As an exercise in compliance and meeting criteria for eco-housing, it's high-achieving, but in other respects it seems lackluster, an unambitious scheme in a sector where we need architects to create real change in housing provision.

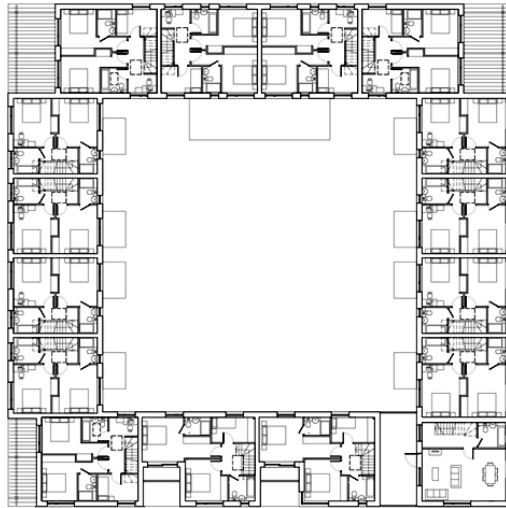
Virido was completed following a year-long analysis of two four-bedroom concept houses constructed in 2014. Research was conducted by Leeds Beckett University's Sustainability Institute and led by Dollard and professors Chris Gorse and David Johnson, the purpose being to gain as much information as possible about how to best harness the benefits of an eco-house. Dollard describes the exercise as 'a nice process to go through; designing a prototype and then the main scheme'.

The key thing to be adopted in view of the experimentation was the use of a Vent Axia Sentinel Kinetic MVHR system to circulate air and get rid of any humidity, stuffiness, damp and smells, meaning windows don't need to be regularly opened, helping to maintain a pleasant temperature. One private and one affordable house were built – for which energy performance monitoring was carried out on utility cost analysis, air quality, internal and external air temperature, MVHR effectiveness, rainwater harvesting and health and wellbeing.

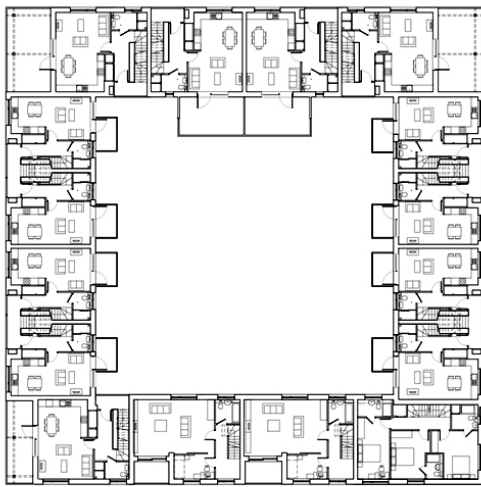
A biodiverse green roof attenuates and collects rainwater. Solar PV panels are installed above these and benefit from the cooling effect of the green roof.



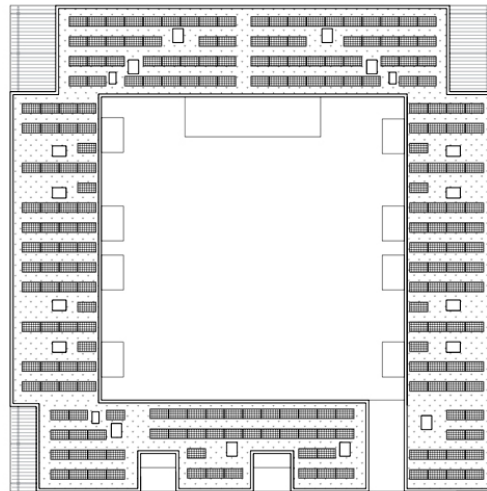
Ground floor plan



Second floor plan



First floor plan



Roof plan



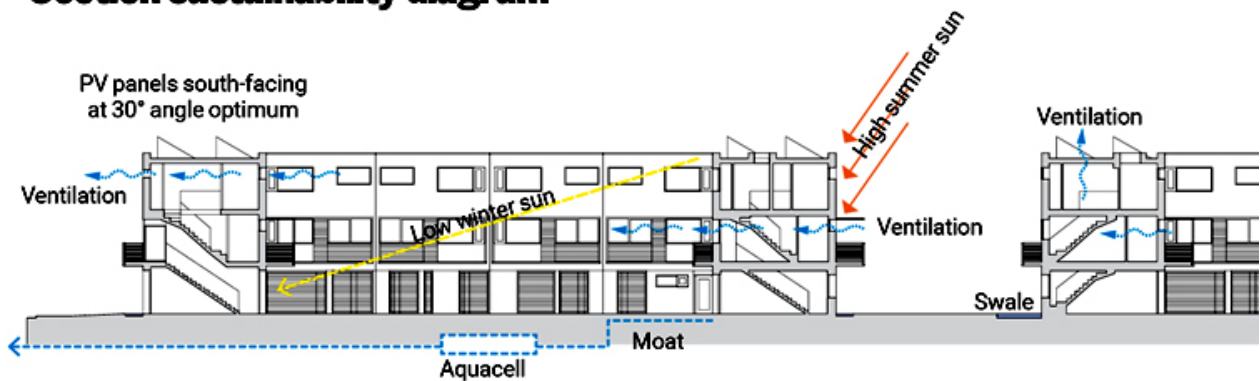
Site, floor, and roof plans for one of the several courtyard buildings.



View of the south facade showing trees and planting strips.

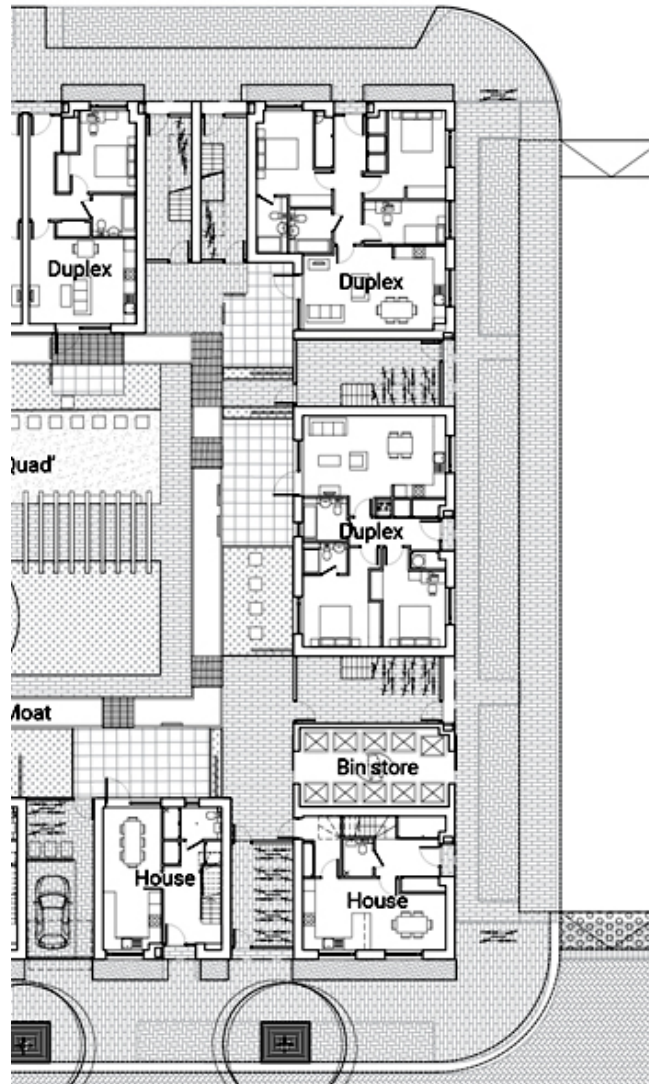
- 4 pts. 1. **Critique** four strategies that do or could demonstrate management of **stormwater** on the site. Cite evidence from the section below as well as in plans and photos throughout the quiz to **validate** your critique. **Fully explain each strategy** for its merits, aesthetics, and missed opportunities.

Section sustainability diagram



North to south section through the courtyard of one of the buildings showing summer sun blocking, winter sun penetration, cross- and stack-ventilation, stormwater system (swale, moat, and aquacell), and PV and skylight locations.

- 3 pts. 2. Critique three possible strategies for management of **gray water** in the building or on the site. Cite evidence from the plan below as well as in plans and photos throughout the quiz to **validate** your critique. **Fully explain each strategy** for its merits, aesthetics, and missed opportunities.



Typical plan. Kitchens and bathrooms are **not** stacked.

3 pts. 3. The units have dual flush toilets (HETs). **Discuss** the possibility of installing **three** options for producing less black water than the HETs produce. **Fully explain each option** for its merits, aesthetics, and feasibility.