CHOBHAM MANOR LLP – QUEEN ELIZABETH OLYMPIC PARK

OVERVIEW

Since our formation in 2008, the Zero Carbon Hub continues to work with Government and industry to identify risks, remove barriers to innovation and help demonstrate that energy efficient, healthy new homes can be delivered by the mainstream house building industry.

This series of building profiles gives examples of manufacturers, developers and clients who have embraced the challenge and are developing practical, commercially viable ways of delivering the next generation of homes in preparation for the nationwide introduction of Nearly Zero Energy Homes from 2020.

SUMMARY

Chobham Manor LLP is a new development on the Queen Elizabeth Olympic Park which will deliver 850 new homes, with additional commercial spaces, as part of the Chobham Manor development over 3 phases. All homes at Chobham Manor are being built to the Code for Sustainable Homes Level 4 with an additional 26 exemplar homes; built to CSH Level 5 being delivered during the first two phases. These homes will achieve Zero Carbon standards through onsite measures alone.

SPECIAL FEATURES

All homes on the development will be designed to:
- Comply with the Fabric Energy Efficiency Standards (FEES)
- Connect to the Queen Elizabeth Olympic Park District Energy Network, as will all non-domestic properties too
- Meet thermal comfort criteria against a medium emissions scenario for the year 2030
- Contain integrated smart meters for residents that display water, heat and electrical consumption data
PROJECT STRATEGY

KEY DEVELOPMENT CHALLENGES

The Chobham Manor development faced a number of key challenges during its conception. Balancing the requirements for meeting the Fabric Energy Efficiency Standard (FEES) alongside the need to achieve good day lighting levels and mitigating any future risk of overheating across a range of construction forms required considerable collaboration across the team. Linked to this focus on high fabric performance was the need to develop a suite of bespoke construction details and associated thermal modelling for both the low rise and higher rise buildings. At the more strategic level, the planning and design teams had to try and overcome the limitations of dense urban environments to provide repeatable and practical Zero Carbon exemplar homes.

DELIVERY PROCESS

In October 2011 the London Legacy Development Corporation was granted approval for a mixed use development 'The Legacy Communities Scheme'. The LLDC partnered with Chobham Manor LLP to deliver the first legacy site on the Olympic Park, Chobham Manor. Phase 1 of the development received planning approval in January 2014 with a second phase being granted approval in November 2014. The development is connected to the Olympic Park District Energy Scheme (OPDES) network which provides low carbon combined cooling, heating and power. Being part of the district heating network has, during the planning submission process, increased the complexity of estimating the CO2 emission rates as the carbon intensity fluctuates due to the different fuels and phased introduction of plant as new developments are connected to the system.

PRODUCTS AND SYSTEMS

FABRIC

- Traditional masonry using cavity construction for the low rise homes; reinforced concrete frame with lightweight rainscreen and cladding system for the apartments
- To meet the FEES levels the design relies on a high levels fabric insulation for all solid elements, in conjunction with a focus on air-tight construction and minimising heat loss through thermal bridging.

BUILDING SERVICES

- All homes are connected to the District Heating Network (DHN) for space heating & hot water
- Mechanical Extract Ventilation (MEV) was installed according to Part F System 2 regulation. The centralised system extracts moisture-laden air from wet rooms. The use of mechanical ventilation with heat recovery (MVHR) was discounted because it utilises high CO2 intensity electricity to recover very low CO2 heat and therefore presents no CO2 benefit given the connection to a low carbon DHN
- The exemplar CSH5 homes are based upon the same building fabric across the development and uplifted by adding on-site renewable (e.g. PVs and biomass) plus rainwater harvesting

CONTROLS

- Space and domestic hot water is provided via Heat Interface Units (HIU) with heat metering, timer & thermostatic radiator valves

Throughout the design and construction process considerable emphasis was placed on the use of Building Information Modelling (BIM) to increase information flow by providing detailed specifications to ensure the design intent was carried through to site and build standards would be met. Achievement of the FEES on all properties was of particular importance as this formed part of the development's planning conditions.

There were a number of key decisions to be made by the design and construction teams. These included the impacts of detailing on different forms of construction, the supply chain risks associated with varying component specifications across the site; the impact of a DHN and associated CO2 intensities; and the aesthetic impacts of PV panels compared to their proportionate role in achieving lower carbon emissions. It is interesting to note that both double glazing and triple glazing windows were included in the original design proposal. However, after considering the scale of the project and the need for close site control to ensure the performance requirements are delivered, triple glazing has been specified for all property type.
BIM was used to help the design and construction team better understand the technical and process challenges of each property type.

**PART L 2010**

**Fabric Energy Efficiency**

**ACHIEVED**
- 39 kWh/m²/yr  
  Flats and Apartments
- 46 kWh/m²/yr  
  Detached/Semi-Detached

**Windows**
- U = 0.8 W/m²K
  Triple Glazed

**Roof**
- U = 0.12-0.13 W/m²K
- Thermal Bridging
  Ψ-Value = 0.18 W/mK

**Walls**
- U = 0.13 W/m²K

**Overheating**

A mixture of passive and engineered features have been used alongside the highly insulated fabric of the dwellings to reduce any risk associated with overheating. These include: natural cross ventilation (openable windows); High density thermal mass; solar controlled glazing (0.5 Gvalue); shading from balconies & terraces; To future proof the buildings for thermal comfort, property types with a potentially higher risk of overheating were dynamically modeled, using projected weather profiles for 2030.

**Airtightness and Ventilation and Air**

**Airtightness Design Target**
- 4 m³/m²/h at 50 Pa

- Continuous mechanical extract from kitchen, bathroom, en-suite, utility cupboards. (Specific fan power - 0.41 w/l/s)
- Continuous intake from over-window trickle vents.
- Extract terminates through walls through double brick sized cast iron air bricks, or through the roofs where applicable through appropriate terminations.

**Space and Hot Water Heating**

The DHN breakdown of CO₂ intensity varies depending on the Phase of construction.

**2015 Phase**
- Gas CHP (58%)
- Biomass (24%)
- Gas (18%)
- Overall CO₂ intensity = 0.103Kg CO₂/kWh

**2033 Future**
- CHP (69%)
- Biomass (20%)
- Gas (11%)
- Overall CO₂ intensity = 0.074 Kg CO₂/kWh

Any carbon emission associated with Phase 1 of the Chobham Manor development will be offset via the LDDC. The method of offsetting this carbon has yet to be decided although preliminary framework is being developed.
KEY LESSONS

CONSTRUCTION AND COMMISSIONING STAGE

The development team’s focus on the practicality of delivering FEES levels of fabric performance, at scale, has led them to use BIM throughout the design, procurement and construction phases. 3D cross sections and assembly sequences were generated by the design team to help communicate the critical areas to site management and operatives.

In the original design, concrete lintels were specified for the homes. However, the contractor found that due to the weight of these elements additional lifting aids were required, slowing the construction process. Their proposed solution was to revert to a continuous metal lintel. In the past, this type of substitution would typically go ahead without detailed discussion with the design team, however on this project it raised a flag to the wider team due to the strict FEES requirements. Subsequently, the environment consultant remodelled the buildings with high performance metal lintels and approved the change in products.

POST OCCUPANCY EVALUATION / DEMONSTRATING PERFORMANCE

Upon completion and occupation Chobham Manor will be subject to extensive Post Occupancy monitoring with reporting on the use of electricity, gas, heat and water usage. This information will be aggregated and submitted to the London Legacy Development Corporation (LLDC) to ensure the predicted energy relates to energy usage.

Post occupancy performance and energy use will be monitored at two levels, first using the integrated household smart meters to allow the users/residents to gain a better understanding of their energy usage and how to operate their home more efficiently. Secondly at a larger scale, the smart meters are capable of exporting data for aggregated analysis and performance comparison with other developments.

PROJECT PARTNERS

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