

LDA

Gallions Park

Gallions Park
Performance
Specification

September 2006

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1 Development Aims

Previous work has demonstrated that a zero carbon development is technically feasible at the Gallions Park site and for little extra cost.

The work has also demonstrated that with appropriate specification of building components and technologies leading to high levels of energy efficiency, the form of the development (layout and height) can be made largely independent of energy use. These building energy efficiency measures are expected to lead to reductions in building carbon dioxide emissions (compared to 2006 Building Regulations) of up to 40%.

Energy supply systems in the form of a site-wide heat and private wire network will be used to supply all development sites within the Albert Basin to be brought forward by the London Development Agency (LDA), and the signage and other street furniture as necessary, for the associated roads. These site wide energy supply systems will be operated to ensure net zero carbon emissions on an annual basis as described later.

This performance specification lays out the required design code to ensure that the performance improvements in both the buildings and energy systems are met. The developer(s) and energy supply company (ESCo) shall use their best endeavours to meet both the standard and intent of this performance specification.

2 Building Performance

2.1 General

In order to create a development that is socially, economically and environmentally sustainable, the design of the development must respond to both the local and global environmental issues.

Buildings will be constructed to meet the specified performance targets, set out below.

The developer's proposals are required to show a rational approach to the energy hierarchy, passive means, active means, and renewable means.

2.1.1 Assessment Requirements; Dwellings (apartments, townhouses and apartments mixed commercial building)

SAP 2005

Dwellings development target CO₂ emissions rate (DTER): 40% reduction from Part L1A 2006 TER, assessed with SAP 2005.

EcoHomes credit categories

Ene 2	Average Heat Loss Parameter (HLP) Across the Whole Site < 1.1	Credits required 2
Ene 3	Drying Space provided	Credits required 1
Ene 4	Eco Labelled White Goods	Credits required 2

Commercial buildings (or relevant parts of mixed use buildings)

Commercial buildings target CO₂ emissions rate (DTER):

40% reduction from Part L2A 2006 TER

	Rating Scheme	Standard
Schools	BREEAM for Schools	Excellent
Retail	BREEAM for Retail	Excellent

2.1.2 Notes to Building Performance Standards

Where, by virtue of differing calculation methodologies, the above standards yield divergent carbon dioxide production, the indicator producing the lowest carbon dioxide production shall take precedent.

To ensure compliance with the specification targets in the sections above, the Development Target Emissions Rate (DTER) SAP calculation shall be calculated for each dwelling without considering the benefit of combined heat and power (CHP). In other words, for the purposes of the compliance calculation for each dwelling **only**, individual boiler system with the fuel factor for natural gas must be assumed, and any renewable energy generation or CHP should be ignored.

The developers will propose the means of achieving these performance standards with their tender returns

2.2 Insulation

In order to achieve the above performance requirements, the fabric of the buildings will be constructed with the following limiting U-Value standards, as seen in the table below:

Element	Area weighted average minimum U-Value (W/m ² K)
External Wall	0.11
Roof	0.10
Ground Floor	0.11
Windows	1.2 Frame 0.9 Glazing
Roof Window	
Roof Lights	
External Doors	

Table 2.2.1 Construction standards

The inclusion of the specified levels of insulation will greatly improve the ability of the residential units to reduce their heating energy and improve comfort conditions in both winter and summer. It is expected that the storage effects of the buildings' thermal mass will be such that dwellings with normal levels of occupancy will be largely self heating in cold weather, by virtue of internal heat gains. This will have direct effects on reducing the installed capacity of heating systems and operating costs. Particular consideration will be required to avoid cold bridging.

2.3 Sound Insulation

The dwelling to dwelling sound insulation will be to the standards set out in the current version of the Scottish Building Regulations.

Airborne Sound (minimum values)

Minimum values of weighted standardised level difference ($D_{nT,w}$):

	Mean value (dB)	Individual value (dB)
Walls	53	49
Floors	52	48

Impact sound (maximum values)

Maximum values of weighted standardised impact sound pressure level ($L_{nT,w}$):

	Mean value (dB)	Individual value (dB)
Floors	61	65

2.4 Shading

To avoid over heating, manually operated external shutters / blinds shall be fitted with a maximum shading factor of 0.2, such that the maximum overall solar transmittance factor with the glazing is $g = 0.1$.

2.5 Air Permeability

Air permeability shall be limited to $2\text{m}^3/\text{hr}/\text{m}^2$ @ 50Pa of façade area. Careful coordination of the architecture, sealing of the joints and good workmanship will be necessary to achieve this. Testing shall be as per the Building Regulations.

2.6 Water

Water conservation techniques will be used as part of a holistic natural resource strategy. These will include:

- Internal taps generally to have spring loaded flow regulators fitted giving a maximum flow rate of 3 litres/minute.
- Showers where fitted should be high performance with a maximum flow rate of 8 litres/minute.
- Baths and sinks should have spring loaded flow regulators fitted giving a maximum flow rate of 8 litres/minute.
- Toilets to be water efficient, dual flush, low capacity (2 /4 litres)
- Shower attachments to bath fittings to be provided.
- To be related to EcoHomes targets
 - WAT 1 Appliances 5 Credits
 - WAT 2 External Water Use 1 Credit

2.7 Passive building features

The following passive building features shall be used to develop the buildings in order to assist in meeting the standards required by the assessment schemes and to reduce the carbon impact of the buildings.

2.7.1 Thermal Mass

The thermal mass of the buildings shall be consistent with a Thermal Mass Parameter (TMP) of 19, calculated as set out in Appendix P4 of SAP 2005.

2.8 Systems

All buildings will be required to connect into the local CHP network which provides heating and electrical connections. Specific details of the system requirements can be found in the sections below.

2.8.1 Buildings Containing Apartments Only

The buildings in the Gallions Park development containing apartments only shall be required to have the following:

- a. Given the low level of air infiltration specified dwellings will require a means of ventilation which shall include heat recovery. Where dwellings are mechanically ventilated, heat recovery for the ventilation systems, with efficiency not less than 80%, and specific fan power not exceeding 1.5 W//s.
- b. A heating system using the site wide district heating mains for providing space heating and domestic hot water.

- c. A connection to the site-wide private wire electrical distribution, to supplement the electrical power provided by any building integrated photovoltaic and wind generating systems.
- d. All light fittings to be capable of taking only low energy lamps.
- e. All white goods to be class A rated (or better), for water, electrical consumption, and other relevant performance metric (e.g. cleaning performance).
- f. Locks to be provided on windows to allow them to be securely left open (50mm ground floor, 100mm upper floors) to provide cool night time ventilation.
- g. Consumers shall be individually metered for electricity, heat and water. Meters shall be located to be easily visible, and enabled for remote monitoring. The meters shall be smart meters with visual displays to allow consumers to monitor their consumption.
- h. The maximum instantaneous combined solar and internal casual gains (people, lighting, equipment) per unit floor area shall be not greater than 35W/m².
- i. Mechanical comfort cooling systems shall not be installed.

2.8.2 Buildings Containing Apartments and Ground Floor Flexible Space

The buildings in the Gallions Park development containing both apartments and flexible space (commercial, healthcare, other) shall be required to have the following:

- a. Given the low level of air infiltration specified dwellings will require a means of ventilation which shall include heat recovery. Where dwellings are mechanically ventilated, heat recovery for the ventilation systems, with efficiency not less than 80%, and specific fan power not exceeding 1.5 W/l/s.
- b. A heating system using the site wide district heating mains for providing comfort heating and domestic hot water, if this cannot be provided by the ground source heat pumps alone.
- c. A connection to the site wide private wire electrical distribution, to supplement the electrical power provided by any building integrated photovoltaic and wind generating systems.
- d. All light fittings to be capable of taking only low energy lamps.
- e. All white goods to be class A rated (or better), for water, electrical consumption, and other relevant performance metric (e.g. cleaning performance).
- f. Locks to be provided on windows to allow them to be securely left open (50mm ground floor, 100mm upper floors) to provide cool night time ventilation.
- g. Consumers shall be individually metered for electricity, heat and water. Meters shall be located to be easily visible, and enabled for remote monitoring. The meters shall be smart meters with visual displays to allow consumers to monitor their consumption.
- h. The maximum instantaneous combined solar and internal casual gains (people, lighting, equipment) per unit floor area in the dwellings shall be not greater than 35W/m².
- i. Mechanical comfort cooling systems shall not be installed.
- j. A system which is common to both the apartments and flexible commercial space, capable of recovering heat or cooling for use in the other parts of the building.
- k. Ground Coupled Heat pumps, capable of providing all heat rejection requirements for the flexible space's cooling requirements.

3 Site-wide Systems

This section describes the heat and electricity generation plant required to supply the heat and electricity demands of the development as well as the distribution infrastructure which has a net annual carbon dioxide emission rate of zero.

3.1 Definition of Zero Carbon

It is the intention that the means of heat and power production within the powerhouse(s) be zero carbon on a net annual basis. It is a matter for the ESCo to satisfy itself that it can produce net zero carbon supply for all the demands of the development.

Only part of the energy demand of a development in use is controllable through the building specification. The occupant will contribute to the demand through their use of consumer durables and the like as will site wide systems.

For the avoidance of doubt, renewable heat and power production is taken as using those prime movers and technologies accepted as renewable in the London Energy Partnership's Guidelines "Integrating renewable energy into new developments: Toolkit for planners, developers and consultants". (The Renewables Toolkit)

The Renewables Toolkit suggests Baseline Carbon Emissions of 8.62 kgC/m²a for a residential tower, which is the currently foreseen as the predominant form for the development. The zero carbon development (ZCD) proposals are therefore to be made on the basis that they can fully mitigate **at least** that figure when supplying heat and power to the development under the proposed operating regime.

It is anticipated that equipment proposed within the powerhouse(s) may comprise a mixture of technology, some of which generates renewable heat and power, some of which does not. It is a requirement of this specification that equipment is operated in such a way that net zero carbon impact results. That is if non renewable means of heat and power production are used, their carbon impact is to be mitigated fully by the use of renewable means of heat and power production at other times, with appropriate export of these off-site.

An agreed audit trail is to be established which demonstrates that net zero carbon heat and power has been delivered on an annual basis. Should net zero carbon not be achieved in any annual reporting period, supplementary power (an heat if applicable) will be exported from site in the next year sufficient to mitigate shortfall in the preceding year. See also the "Ensuring Carbon Neutrality" section.

3.2 General

Complete and fully functional site wide heating and power systems will be designed, procured, installed, commissioned, operated and maintained by the ESCo. The ESCo will ensure that all site wide systems are fully compliant with all applicable regulations and standards, and that they are safe to install, operate and maintain.

The ESCo is to use its best endeavours to assist and cooperate with the LDA and its agents and consultants, site developers, consumers and others affected by its installation.

3.3 Generation Plant

As stated above, the heating requirements of the development will be generated using a combination of local centralised heat and power plant, supplied and operated by the ESCo, and building integrated systems. The electricity requirements of the site will be supplied

using a combination of local centralised plant, building integrated renewables and supply from the national grid for the purpose of backup and top up as necessary.

3.3.1 Electricity Supply

The majority of the electricity requirements of the site shall be generated using a carbon neutral combined heat and power plant (CHP) using technology such as biomass gasification. The characteristics of the CHP plant shall be as per those provided in the table in section 3.1.3 below.

If desired building integrated renewable electricity generators such as wind turbines and photovoltaic panels located on the various development buildings can be used to supply electricity to the development.

Any electricity required in excess of that generated using onsite generators shall be imported via the grid connection.

3.3.2 Heating Supply

The Gallions Park heating supply shall be provided wholly from the site-wide district heating network. The district heating network shall be provided with heat from a combination of carbon neutral CHP, gas boiler and thermal storage plant located in one or more energy centres.

3.3.3 Electricity and Heating Plant Specifications

The general specifications of the electricity and heating plant can be found in the table below:

Item	Requirements
Carbon Neutral CHP	<ul style="list-style-type: none"> • Generation voltage 400/230 volts @50Hz • Minimum electrical efficiency 32% (gross calorific value basis) • Heat recovery hot water provided at up to 130°C • Minimum thermal efficiency (usable heat output) to be 38% • NOx emissions – to be agreed with Planners
Gas Boilers	<ul style="list-style-type: none"> • Minimum seasonal efficiency 80% (gross calorific value basis) • NOx emissions – to be agreed with Planners
Thermal Storage	<ul style="list-style-type: none"> • The quantity of thermal storage shall be sized to suit the plant design selected • Thermal losses from the thermal store over an eight hour cycle shall be a maximum of 3%
Circulation Pumps	<ul style="list-style-type: none"> • Variable speed
Heat Dumping Plant	<ul style="list-style-type: none"> • Heat dumping equipment may be used to increase the electricity generation if required providing it is dumping heat only from renewable energy sources.
Biofuel Storage	<ul style="list-style-type: none"> • There shall be sufficient biofuel storage available to be discussed further – 100hrs at plant maximum continuous rating • Energy centre to incorporate sufficient access for biofuel delivery vehicles

	<ul style="list-style-type: none"> • Vehicle movement restrictions to be agreed with the Local Authority to limit noise to local residencies and the like.
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3.4 Distribution Systems

3.4.1 Electrical Distribution System

The electrical distribution system shall carry electricity from the energy centre and other energy sources to the units. It shall be able to import and export electricity to and from the National Grid.

Design Requirements

Provide an electrical distribution system from the energy centre and other energy sources that make up the Primary Infrastructure to the Plot Developments. Include all necessary distribution equipment such as sub-stations, transformers and underground cables. Provide a connection to the grid that enables electricity to be imported and exported.

It shall be an active distribution system, in other words it must accept two-way flows across the whole system, able to receive the embedded electrical generation in each building, with multiple infrastructure power generation plants and the Grid.

Electrical Interfaces

Interfaces with the Primary Infrastructure must be provided as follows.

- Connection to the biomass CHP plant
- Connection to any wind turbines or PV installed
- Import and export interface for the central connection to the grid.
- Connection to each residential and commercial consumer.

Gallions Park is expected to generate a certain amount of excess renewable electricity at certain times of day and at certain times of year. Any excess electricity produced by the Gallions Park renewable energy sources shall be exported.

The distribution system must interface with each consumer with a connection to each of the consumers on a plot, ending at individual electricity meters.

The ESCo shall provide end users with a reliable electricity supply and the plot developers shall take electricity from the distribution system.

3.4.2 Heat Distribution System

Heat will be distributed around the site to each building on each of the plots. The heat is provided as a by-product of electricity generation by the biomass CHP plant with top up and back up heat generation using gas boilers. The heat will be distributed as hot water in an indirect district heating system. Heat will be distributed to each building using the primary heating pipes. Heat will be taken to a heating substation in each building. The substation will contain heat exchanger(s) and all necessary auxiliary and ancilliary equipment needed to supply secondary hot water to the building's secondary heating network. Space will be allocated in the substation for pumps, pressurisation systems and all necessary auxiliary and ancilliary equipment as needed to supply the secondary heating systems. Heat will be distributed around each building as required using secondary heating pipes. The primary heating pipes will supply heat to the secondary pipes through heat exchangers. Each

secondary system will therefore be hydraulically separated from the primary system. Secondary heating systems will be installed by the building developer and operated by their designated management company.

Consumers will require supply and return water temperatures of 90°C and 60°C respectively. To maintain these temperatures the district heating supply design temperatures shall be maintained at a minimum of 95°C. The secondary systems may be operated at variable or constant flow and return water temperatures may fluctuate as a result.

Design Requirements

- The provision of a district heating system connecting the CHP plant and boiler plant in the energy centre to each of the heating substations within the individual buildings. This will allow use of waste heat produced from the CHP plant.
- To provide sufficient capacity for each of the consumer's requirements at all times of the day and night throughout the year.

The energy centre(s) shall be located in close proximity to buildings that need heat so that the hot water distribution is distances are reduced and so minimising the amount of heat lost from the pipe network.

The district heating pipework shall be designed as follows:

- Steel pipe, pre-insulated with thermal insulation
- Insulating sheath over joints, thermally welded, filled with expanding foam
- Pipes to include a leak monitoring system
- Flow temperature from CHP plant 95 °C
- Provide 2-pipe flow and return system from and to the CHP and boiler plant
- Maximum pressure loss per unit length 100 Pa/m at peak flow
- Low pressure loss fittings (fittings, valves, branches etc.), heat exchange components) should form less than 50% of the pump design pressure head.
- Maximum heat loss from the whole pipework system of 2% of peak heat flow capacity
- Variable speed pumps to match delivered heat to the fluctuating demand
- Intelligent water metering system to identify where abnormal demands are occurring and raise alarms to prompt investigations into potential water leaks

Heating Interfaces

The Energy Centre generates waste heat as by-product of electricity generation and through the use of dedicated heating plant. The Heat Distribution system must connect with the heat output from the Energy Centre. The hot water input to district heating shall be metered so that due payment can be made to the Energy Centre operator for the heat supplied.

Heat supply is then billed at each consumer supply point.

Heat meters shall be provided by the ESCo to the developer of each building for connection at the supply point to the consumer. Heat meters shall be capable of remote reading accessed from the powerhouse or other agreed location for the purpose of billing. They shall also provide a visible means of recording energy use and cost at a convenient and frequently accessed point within the consumer's demise (e.g. a kitchen wall).

The distribution system shall be designed to allow additional heat sources and consumers to be connected in future phases.

4 Ensuring Carbon Neutrality

The ESCo shall be responsible for ensuring the carbon neutrality of the site. This shall be calculated using the carbon dioxide emission factors published by the DTI / ODPM annually. The ESCo shall calculate the site emissions using the factors relating to the period covering the emissions.

To enable the calculation of the carbon dioxide emissions, the generation of heat and electricity from each generation unit shall be metered. Where natural gas or a liquid fuel is used this shall be metered also. Where biomass is used as a fuel it shall be metered in an appropriate fashion.

An individual annual Net Neutral Carbon Account will be made available to Consumers showing the combination of electrical and heat sources use, and their carbon impact (negative in the case of renewable sources and fuels and positive in the case of fossil fuels) aggregated to zero, with any positive offset identified for mitigation in the succeeding year.

An overall annual Net Neutral Carbon Balance will be made available for inspection for the whole development.