

Carbon Management Response 22/03/2024

Sproughton, Courtney Avenue, Hornsey, London, N6 4LR

2. Energy Strategy

Actions:

- Please submit the GLA's Carbon Emission Reporting Spreadsheet.

Energy Use Intensity / Space Heating Demand

Applications are required to report on the total Energy Use Intensity and Space Heating Demand, in line with the GLA Energy Assessment Guidance (June 2022). The Energy Strategy should follow the reporting template set out in Table 5 of the guidance, including what methodology has been used. EUI is a measure of the total energy consumed annually, but should exclude on-site renewable energy generation and energy use from electric vehicle charging.

Building type	EUI (kWh/m ² /year)	Space Heating Demand (kWh/m ² /year)	Methodology used
Not reported			

Actions:

- What is the calculated Energy Use Intensity (excluding renewable energy)? How does this perform against GLA benchmarks, i.e. at 35 kWh/m²/year? Please submit the information in line with the GLA's reporting template.
- What is the calculated space heating demand? How does this perform against the GLA benchmark of 15 kWh/m²/year? Please submit the information in line with the GLA's reporting template.

Applicant's Response:

- The GLA carbon reporting spreadsheet will be completed and submitted
- The GLA Energy Guidance stipulates that the Energy Use Intensity and space heating demand be calculated for developments using either the 'be seen' methodology or any other form of predictive operational energy modelling methodology. As the council rightly derives on Page 3 and 4 of the Carbon Management Response document, the 'Be Seen' policy element does not apply to the size of the reporting unit.

If the alternative predictive energy modelling methodology is chosen, it is typically CIBSE TM54 for non-domestic developments and PassivHaus Planning Package (PHPP) for domestic developments. However, our view is that given the scale of the dwelling, PHPP would not provide accurate operational energy results given the default occupancy rate would assume much higher occupancy than the dwelling is being planned for. This in turn would over-inflate the unregulated energy, and in turn defeat the purpose of the assessment.

We would request the planning officer to consider that this exercise would come at an additional consulting cost to the client who is a private owner, without providing very meaningful outputs. The design team and client are very inclined towards making this development zero carbon, which is evident from the various measures that have been considered for implementation on the project. We request that subsequent predictive energy modelling be required as a planning condition of this application.

Energy- Lean

Actions:

- The FEES improvement is only 1%, and the Be Lean reduction does not quite meet the 10% minimum. How can this be reduced further?

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- Please identify on a plan where the MVHR units will be located within the dwellings. The units should be less than 2m away from external walls. This detail can also be conditioned.
- How is lighting energy demand improved? Should consider daylight control and occupancy sensors for hallway areas.
- What is the proportion of glazed area? Consider following the LETI Climate Emergency Design Guide principles in façade design.

Applicant's Response:

- The dwelling meets the Fabric Compliance requirement with DFEE being lower than TFEE. Since there is no % requirement, the scheme is considered compliant with this requirement. The 10% requirement for GLA is related to the Be Lean performance, and not to the FEES compliance. Regarding the Be Lean performance, the development is already targeting high performance evidenced by the low U-values for the fabric elements and low air permeability.

U-values

Element	Minimum 2021 Building Regulations U-value W/m ² K	Proposed U-value W/m ² K
Flat roof	0.16	0.11
Pitched roof	0.16	0.11
Wall	0.26	0.12
Ground floor	0.18	0.11
Exposed floors	0.18	0.11
Windows	1.60 (g-value 0.63)	1.20 (g-value 0.5)
Rooflights	2.20 (g-value 0.63)	1.40 (g-value 0.5)
Doors	1.60	1.40

Air permeability

A reduced air permeability has been targeted as per the table below:

Air permeability (m ³ /hm ² @50 Pa)	Minimum 2021 Building Regulations	Proposed
Dwelling	8	1.5

- Any further reductions would not only lead to loss in internal useable area and add embodied carbon to the development, but also increase costs significantly for the client who is a private owner. The design team is also targeting low psi values for junctions to minimise heat loss further. The strategy for the scheme is to reduce energy demand, but also prioritise with technological solutions such as the heat pump system, solar PVs and battery back up etc to work towards the decarbonisation goal set for the site.
As mentioned in the report, is worth noting that the SAP database presents several limitations, such as underestimating the unregulated energy demand, lacking ventilation units in the SAP database

that are capable of serving more than seven wet rooms, limitation on the available capacity for the heat pump (the database's largest Ground Source Heat Pump (GSHP) is 22kW, which is significantly lower than the probable requirement of 130kW), and the maximum solar PV battery capacity being 15kW (which is a tenth of the likely need). These constraints result in the inability to accurately capture the carbon reduction potential that the design has to offer. Despite these limitations, the proposal under consideration is anticipated to outperform SAP results. Since the development is targeting a much higher specification for the design, to over-specify the fabric is likely to provide less value for the capital and carbon cost that it would lead to.

- Since the project involves a single dwelling, being developed by a private owner, it was not considered monetarily feasible to engage the services of a M&E consultant at this stage. We would request that any requirement associated with the MVHR unit be conditioned at this stage and this will be addressed when the services of an M&E consultant are secured at an advanced stage of the project. What is clear is that there is sufficient space available in this proposal to successfully implement the MVHR units effectively throughout this property, whilst ensuring sufficient flexibility for future proofing.
- Lighting sensors can be installed for some spaces such as circulation, ancillary areas. However, there is no provision for this in SAP, so the savings from such measures cannot be reflected in the calculations for Part L compliance. It must be noted that occupancy and daylight sensors are not common in residential uses. The team can look at providing sensors for external lighting, however this is not covered in the SAP assessment either.
- Glazing areas have been optimised for the development:
 East= 15% of wall area
 South= 15.4% of wall area
 West= 17% of wall area
 North= 11% of wall area

These areas align with the LETI guidance. Moreover, all elements of the design should be considered holistically while assessing fenestration performance, such as windows being openable and shaded using external shading.

Energy Green

Actions:

- How will the solar energy be used on site (before surplus is exported onto the grid)?
- Will any battery storage accompany the solar PV system? the introduction mentions a 15 kW capacity, but what is actually being proposed? This would help reduce demand-side emissions and energy and could work well in tandem with the GSHP.
- Please explain the assumption behind needing a larger system, what is this based on? How will this be mitigated in terms of on-site requirements, location and the associated embodied and operational emissions?
- Please identify on the plans where the ground source heat pump equipment will be located.
- What type of heat emitters are proposed?
- How large is the thermal store?
- What is the Seasonal Coefficient of Performance (SCOP), the Seasonal Performance Factor (SPF) and Seasonal Energy Efficiency ratio (SEER) of the GSHP?

Applicant's Response:

- solar energy generated on-site will primarily be utilized to power the immediate energy needs of the property before any surplus is exported onto the grid. This includes powering lighting, heating, cooling, appliances, and any other electrical equipment including the heat pump and auxiliary renewable energy systems that are required for operations. The aim is to maximize self-consumption of solar energy to reduce reliance on grid electricity and minimize emissions associated with energy consumption.
- Regarding the battery storage system, it will indeed accompany the solar PV system; it is crucial for storing excess solar energy generated during periods of high sunlight for use during times when solar generation is low or non-existent (e.g., at night or during cloudy days). This not only optimizes self-consumption but also enhances energy resilience and reliability.

- The assumption behind the need for a larger system is based on several factors such as the energy demand of the property when fully in use, the variability of solar irradiance throughout the day and year, as well as considerations for future expansion or increased energy needs. This could be mitigated by conducting a thorough energy audit to accurately assess the facility's energy requirements, optimizing energy efficiency measures, and utilizing advanced forecasting and monitoring technologies to manage energy demand and supply effectively.
- In terms of on-site requirements and location, careful planning and design has already ensured that both embodied and operational emissions associated with the solar PV system has been reduced through minimizing the use of materials of the building fabric with high embodied carbon in the construction of the system, optimizing the layout and orientation of solar panels for maximum efficiency, and considering lifecycle emissions associated with maintenance and decommissioning of the system. Additionally, we have made sure that we are integrating renewable energy sources like solar PV with other low-carbon technologies such as the UTES Interseasonal system and the ground source heat pump (GSHP), which will further enhance the overall sustainability and efficiency of the system.
- The ground source heat pump will be located on the south side of the property adjacent to the house. The reason for this is the proximity to the utility spaces in the basement allows for simpler access and connectivity. In addition, the landscaping strategy has been specifically designed to restore and celebrate especially the deep rooted Oak trees on the property. This is the side of the garden which requires the least amount of planting depth and is free from deep roots that could be damaged. The heat emitters will be a wet underfloor heating system throughout the entirety of the property. The thermal store model has not yet been specified as this proposal will require a specialised solution. However, in the -2 level there are two rooms specified to equip the systems. Both the thermal store and the battery store room measures to 6.4 x 4.2m, and the plant room is situated adjacent to the thermal store room, which could be connected should additional equipment be required. However, a maximum standard size thermal store for this scale of building will be around 1850 x 600. The provision afforded the thermal store has been generously allocated to ensure that maintenance, and system space requirements are easily met.
- Since the project involves a single dwelling, being developed by a private owner, it was not considered monetarily feasible to engage the services of a M&E consultant at this stage. We would request that any requirement associated with the heat pump unit be conditioned at this stage and this will be addressed when the services of an M&E consultant are secured at an advanced stage of the project.

Overheating

Overheating Actions:

- Specify the shading strategy, including: technical specification and images of the proposed shading feature (e.g. overhangs, Brise Soleil, external shutters), elevations and sections showing where these measures are proposed. Internal blinds cannot be used to pass the weather files, but can form part of the delivered strategy to reduce overheating risk for occupants (as long as it does not compromise any ventilation requirements).
- Set out a retrofit plan for future and more extreme weather files, demonstrating how these measures can be installed, how they would reduce the overheating risk, what their lifecycle replacement will be, and who will be responsible for overheating risk.
- Demonstrate how the future mitigation measures will improve the overheating results.

Applicant's Response:

- Fixed shading, shutters and automated overhangs (fenster markisen) will reduce the solar heat gains in the habitable rooms, especially living rooms. Shading devices will be specified by Grants Super-Prime Shading Consultancy and Supply. They provide bespoke technical solutions for super-prime residential and high-end projects such as 5 star hotels, luxury restaurants and gardens rooms and glasshouses. The shading devices will be custom made for Sproughton. However, specific precedents from Grants would be the [Traditional French Pinoleum Blinds used in the Ballyfin Estate](#) and their dual integrated blind system. Specification link [here](#). The external Half Cassette Drop Arm Awnings will be supplied by Primrose Awnings.

- CIBSE TM59 modelling and analysis is done using certain guidelines, such as specific temperature for opening of windows, exclusion of internal blinds and fixed occupancy. However, in reality spaces and occupants are likely to behave differently. Occupants are more sensitive to internal comfort and are likely to open windows sooner than assumed for modelling purposes. Moreover, given the size of this dwelling, it is not likely that all rooms will be occupied all year round. Also, internal blinds are not permissible for compliance modelling, however, for all practical purposes internal curtains/ blinds will be installed and used especially in bedrooms for privacy.
An Inter-seasonal Underground Thermal Energy Storage "UTES" has been designed. This system acts as 'thermal batteries'; it absorbs heat gains during the day when the building is occupied and 'store' it for an extended period, thereby helping to stabilise daytime temperatures. At night this heat can be dissipated, which 'resets' the heating cycle. Ventilation will also be used at night to purge the stored heat within the structure.
Therefore, it is more likely that the development will perform better in reality as compared to what is demonstrated through the modelling exercise.
- The DSY weather file represents a single continuous year, rather than a composite year made up of 'average' monthly values specific to the location and is used for overheating analysis. DSY2 weather file focuses on a summer with a short but intense warm spell, while DSY3 simulates a summer with a longer duration of warmth but with less intensity compared to DSY2. If the DSY2 and DSY3 results are looked at in detail, it is only bedrooms which are failing the nighttime criteria. The development has already followed the cooling hierarchy as follows:
 1. Minimise internal heat generation through energy efficient design;
 2. Reduce the amount of heat entering a building in summer through shading, albedo, fenestration, insulation and green roofs and walls;
 3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
 4. Passive ventilation;
 5. Mechanical ventilation;
- Since the bedrooms fail at night (absence of solar gains) and mitigation of solar gains has already been done (through low g-value of glazing and external shading), the only way to further improve performance would be to increase ventilation. The scheme already has fully openable windows and no fixed glazing so this could only be done through increasing window sizes. However, this will negatively impact the energy performance of the building due to increased heat losses (evidence from glazing area ratios outlined earlier).

Apart from introducing cooling, there is very little room for retrofit measures in the future to mitigate the likely overheating in the future.

Urban Greening/ Biodiversity

Actions:

- Please submit the Urban Greening Factor.

Applicant's Response: We can carry out this calculation for submission.

Circular Economy

Action:

- Please explain where structural building elements will actually be reused on site, rather than crushed for aggregate? What is the proportion where it will be possible to do so? The figure of 13.5% includes the downcycling of these existing materials, rather than reusing/repurposing or upcycling.

Applicant's Response:

- The existing house comprises four main structural elements: brick, concrete, timber, and steel reinforcement. Below, we provide a detailed explanation of the end-of-life scenarios for these

elements during the deconstruction process, outlining where they are reused. In cases where reuse is not feasible, we identify the most preferable end-of-life scenario.

- In summary, approximately 244 tonnes of brick are planned to be reused on-site. Given that the future build does not primarily consist of brick wall construction, these bricks will be reused throughout the basement walls and slab of the proposed build. This approach mitigates the need for additional concrete blocks in the future construction. Additionally, timber, another structural element of the existing house, can also be reused on-site. As the future build incorporates Cross-Laminated Timber (CLT) and the existing timber beams and columns differ from the proposed design, the recovered timber will find use (Repurposed) in partition walls, shading devices, and landscaping features on-site.

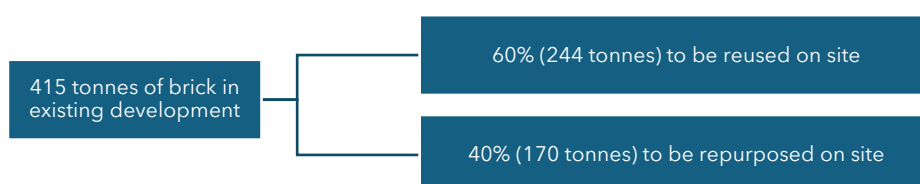
Bricks

Material quantity

Brick accounts for an estimated 415 tonnes and 244 m³ of waste arisings. This represents 59% of total waste arisings by weight, and 56% of total waste arisings by volume.

The main source of red brick in the existing development is the external walls (one brick thick solid wall), internal walls (half brick walls), foundation (strip footing) and floor finishes (rear entrance area).

Item	Weight (t)	Reuse potential	Repurpose potential
External walls	237.75	60%	40%
Internal walls	162.47	60%	40%
Foundation	8.56	0%	95%
Floor finish	5.89	60%	40%
Totals	~ 415 tonnes	~ 244 tonnes	~ 170 tonnes



Potential for reuse

It is possible to reuse a certain proportion of the bricks, depending on the strength of the cement mortar they are bonded with. At present a nominal value of 60% has been provided for walls and floor finishes since the practicability is unknown - further investigation is recommended, after which the target may be revised.

Repurposing, recycling, and diversion from landfill

It is recommended that bricks that are unable to be reused are segregated onsite and crushed to produce recycled aggregate (RA) which can be used as fill material. Finished recycled aggregates should not contain more than 1% (by weight) of clay, soil, metals, wood, plastic, rubber, and gypsum plaster, in line with the limits set within the aggregate's standards. The Environment Agency Quality Protocol for inert materials should be followed.

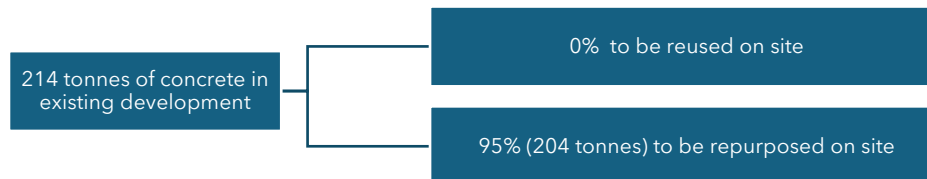
Structural concrete

Material quantity

Concrete accounts for an estimated 214 tonnes and 93 m³ of waste arisings. This represents 31% of total waste arisings by weight, and 21% of total waste arisings by volume.

The main source of concrete is the ground floor slab of both the original construction and extension.

Item	Weight (t)	Reuse potential	Repurpose potential
Ground floor - Original	109.55	0%	95%
Ground floor - Extension	104.85	0%	95%
Totals	~ 214 tonnes	0 tonnes	~ 204 tonnes



Potential for reuse

Concrete foundation cannot be reused as a sub-base for the proposed development as two basements are planned for the new build and the entire foundation needs to be demolished to excavate the basements.

Repurposing, Recycling, and diversion from landfill

It is recommended that 95% of concrete from both the foundations be repurposed by segregation and crushing to produce recycled concrete aggregate (RCA) in accordance with the WRAP Quality Protocol for aggregates from inert waste.

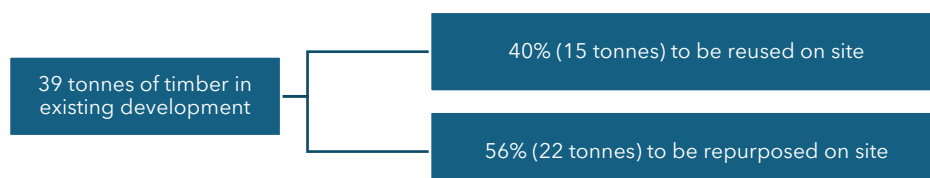
Timber

Material quantity

Timber accounts for an estimated 39 tonnes or 6% of total waste arisings by weight; this represents 19% of the total volume of waste arising.

The largest source is the upper floors construction and roof construction, which is assumed to be timber in the pitched roof of the main building (rafters, ridge board, purlins, wall plates, and battens) as well as in extensions. Other sources of timber include external and internal doors, staircases, and windows (including frames and sills).

Item	Weight (t)	Reuse potential	Repurpose potential
Upper floor structure	14.90	50%	45%
Roof structure	10.22	50%	45%
Staircases	6.75	10%	85%
Upper floorboards	2.97	50%	45%
Doors and windows	4.32	0%	95%
Totals	~ 39 tonnes	~ 15 tonnes	~ 22 tonnes



Potential for reuse

Although difficult to ascertain, some of the timber elements in the roof and floor structure may be reusable, however these were not visible during the site visit, so their quality, condition, and reversibility is not known. Therefore, 50% reusability potential is assumed at this stage for the structural elements and boards- further investigation is recommended, after which the target may be revised. Additionally, the solid timber balusters

and handrails are reusable for the proposed development. The doors and windows are not reusable because of current fire safety standards and thermal performance requirements of the proposed development.

The estimated percentage of reusable material is shown by item in the table above and images of items for potential reuse are shown on the next page. Overall, approximately 15 tonnes of the timber is estimated to be reusable on and off site for other projects.

Recycling and diversion from landfill

Most of the solid timber can be recycled, usually into chipboard. For the panel-based products, these will be suitable for energy recovery. It is recommended that a local wood recycling organization is contacted to see what timber items are suitable for reclamation and reuse. Where reclamation is not possible the timber should be segregated on site if space permits, or offsite and sent to a licensed waste management contractor for recycling.

Steel

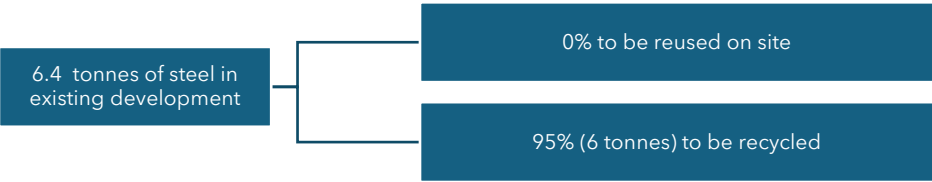
Metals account for an estimated 6.38 tonnes and 0.81 m3 of waste arisings. This represents 0.91% of total waste arisings by weight, and volume.

Material sources

The largest source is steel is present in the substructures (Ground floor slab of original house and extension).

Item	Weight (t)	Reuse potential	Recycle potential
Ground floor slab rebar	6.38	0%*	95%
Fencing and gates	To be retained	100%	0%
Totals	~ 6.4 tonnes	~ 0 tonnes	~ 6 tonnes

The rebar in ground floor slab cannot be reused as the slab needs to be demolished to accommodate two basement floors.



Potential for reuse

There is no potential to reuse rebar from the existing buildings on site as the limited quantity in foundation will be demolished to accommodate the basements.

Recycling and diversion from landfill

Any metal items including rebars that are unsuitable for reuse should be segregated on site and sent for recycling.

Based on the above reused quantities of 244 tonnes of brick and 15 tonnes of timber (total = 259 tonnes), the part of future build that is made using reused materials is 19%. The material weight can be found in cell F445 of the GLA circular economy template (Quantity = 1,341.669 tonnes)