WHOLE LIFE CYCLE CARBON ASSESSMENT (WLCA)

PROJECT:
81-103 King's Road, London

PROJECT NUMBER:
P2723

DOCUMENT REF:
P2723-WLCA-01

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CONTENTS

1.0 NON-TECHNICAL SUMMARY

Non-technical FAQs are summarised below:

Question	Answer
What is this analysis?	An embodied carbon assessment for the refurbishment of 81-103 Kings Road.
What is it for?	To compare the embodied carbon emissions of refurbishment to a demolition & new build of the same site, 81-103 Kings Road.
What demolition and new build?	The submitted planning application *PP/23/00968* proposes to fully bulldoze the building at 83-103 Kings Road, retaining the basement, and build a new mixed-use development which increases footprint, floor area and height over the existing building. It will also increase carbon emissions over the building's life cycle.
What is embodied carbon?	Embodied carbon are the emissions omitted from every aspect of a building over its life cycle: including manufacture and production of building materials to make the building, construction activities to build it, operational emissions from gas, electrical and water consumption, replacement and maintenance of the building and everything in it throughout its life and the emissions to demolish it and filter waste at end of life.
Which produces less carbon emissions then?	A refurbishment will produce much less, a reduction of -18,452 tonnes (-37%) of CO_2 over 60 years.
Why would a refurbishment have less embodied carbon?	A refurbishment will not require carbon intensive demolition or manufacture and delivery of many tonnes of new materials, including carbon intensive site construction works that will take several years. The existing building is also not very old and with a HVAC & lighting replacement and some additional solar panels at roof level, operational energy will be comparable. Carbon from demolition at building end of life will also be comparable but of course the refurbishment will be a smaller building with less to disassemble and less rubbish to throw away.
Does a refurbishment operate efficiently?	Yes. It is very feasible for a refurbished 81-103 Kings Street to achieve an EPC band A rating, similar to how a new-build would perform.

Table 01: Non-technical queries and answers

2.0 TECHNICAL EXECUTIVE SUMMARY

QuinnRoss Energy has carried out a Whole Life Cycle Carbon Assessment (WLCA) for a theoretical refurbishment of the commercial building at *81-103 King's Road, London* to compare embodied carbon emissions to a proposed demolition and new-build construction.

This document will outline the differences between a refurbishment and new-build assessment of the same site and highlight the benefits of refurbishment in terms of carbon emissions.

A planning application *PP/23/00968* has been submitted which is a full demolition of the 83-103 Kings Road building, retaining the basement, and a new-build mixed use development which increases footprint, floor area and height of the existing building. Accompanying the application is an embodied carbon assessment, document *KGR-RAM-ZZ-ZZ-RP-SS-00007* and the applicable GLA spreadsheet, produced by *Ramboll*. The report highlights the predicted embodied carbon of the proposed new build.

This report will perform the same embodied carbon assessment however for a theoretical refurbishment of the building, assuming a full internal, HVAC & lighting replacement and an additional roof mounted PV array.

The analysis has been undertaken using the *One Click LCA* software tool using the GLA module. This gives a variety of benchmarks based upon comparisons to other projects reviewed in the software. One Click LCA is the only tool currently approved by the BRE for undertaking life cycle carbon assessments.

Embodied carbon comparison:

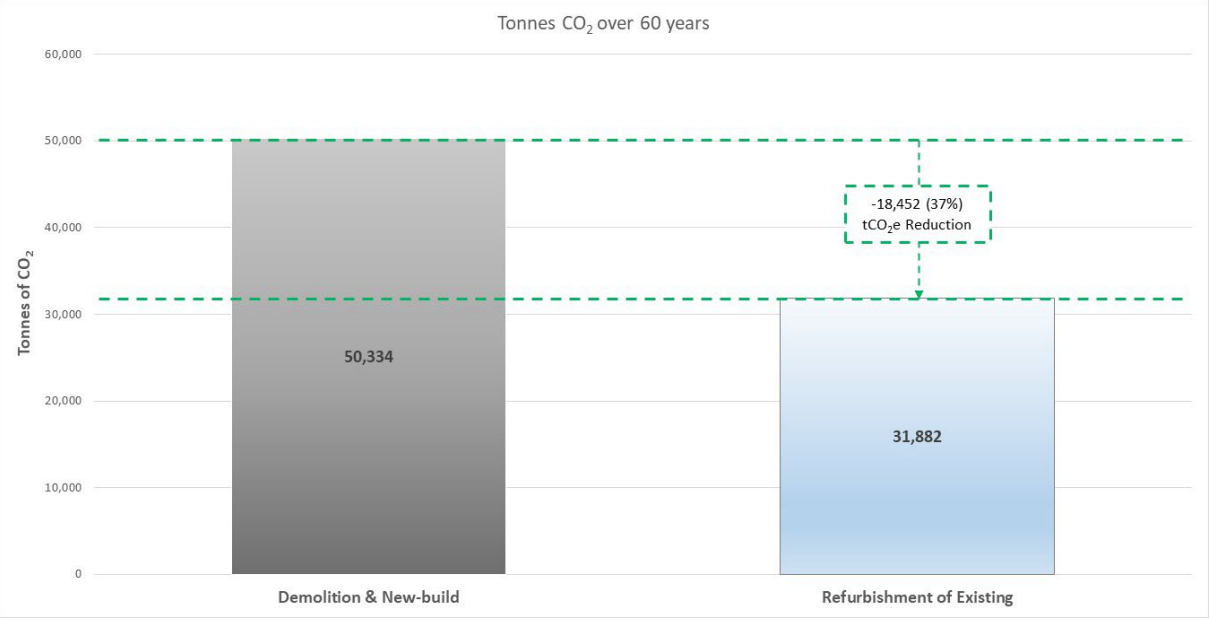


Figure 01: Potential improvement options

Results summary: The results show that the demolition & new-build proposal will, according to their submitted GLA spreadsheet, accumulate 50,334 tonnes of CO_2 in the building's life cycle. A refurbishment of the existing building, no extensions, will amass 31,882 tonnes of CO_2 in the building's life cycle, a reduction of -18,452 tonnes (-37%) of CO_2 of a 60-year life cycle.

Why is refurbishment so much less? A refurbishment will not require carbon intensive demolition or manufacture and delivery of many tonnes of new materials, including carbon intensive site construction works that will take several years. Although the refurbishment will likely not operate (day to day energy use) as efficiently as a new building, the existing building is not very old and with a HVAC & lighting replacement and some additional solar panels at roof level, operational energy will be comparable. Carbon from demolition at building end of life will be comparable but of course the refurbishment will be a smaller building with less to disassemble and send to waste facilities.

Review of new-build application submittals: All submittals for the new-build application were reviewed and an overview of all inconsistencies are summarised below:

Document	Query
Ramboll Embodied Carbon Assessment: Ref KGR-RAM-ZZ-ZZ-RP-SS-00007	**CO_2 figures:** The carbon emissions stated in the embodied carbon analysis don't appear to match the figures stated in the submitted GLA spreadsheet.
	Unclear input data: The embodied carbon report does not appear to state the inputs used for the analysis, such as material used.
	High re-use and recycling rate: The embodied carbon GLA template states a very high re-use and recycle rate with no evidence as back-up.
	GLA min benchmarks are not achieved: The submitted GLA spreadsheet show that modules B-C and A-C do not meet the minimum GLA benchmark requirements, though they are marginal.
Ramboll Energy Strategy: Ref KGR-RAM-ZZ-ZZ-RP-ZZ-00004	**Does not meet London Plan 2021 Energy Hierarchy targets:** Energy strategy shows scheme does not meet the minimum London Plan 2021 requirements as only shows a 13% reduction in regulated CO_2 emissions. The target is at least 35%.
Ramboll Detailed Circular Economy Statement: Ref KGR-RAM-ZZ-ZZ-RP-ZZ-00007	**Unsubstantiated scoring system for design options:** Report contains a scoring system that outlines different design options. The scoring system for this assessment is a) not explained in any way, and b) appears illogical. Refurbishment for example scores 0 for "buildings that make people feel their best".
	Overly negative on the option of minor refurbishment: Report states building fabric and operational energy consumption is poor for a refurbishment. Performance won't be quite as good as a new building, the building is not that old, and operational energy can be almost as good with a HVAC and lighting replacement.
	Agreement refurbishment is the lower embodied carbon option: The report confirms that the analysis is in agreement that refurbishment is the lower embodied carbon option.
	Unfeasibly high re-use %: Report claims 33% re-use for the substructure, 66% re-use for internal finishes and 36% re-use for MEP services which is very high.
	Unfeasibly long service life: Document claims the service life of the proposed will be 120 years which is unfeasibly long for a steel frame building. BRE expect a 60 year period for life cycle analysis.
Circular Economy Completed GLA Template	**Retained basement:** Other submittals claim the basement level can be retained and re-used, however the GLA template claims a survey needs

	to be performed before any retention of the basement can be confirmed. The next page contradicts this again by promising 400m^2 of the basement will be retained.
Pre-demolition Audit: ENV-SF-025-Pre-Demolition Audit Report	**Misleading re-use targets stated:** Reuse targets have misleading colour coded feasibility. Figures show 60-100% can be reused however is colour coded in red meaning the chances of re-use are "very low".

Table 05: Review of submittals

Please note, the above items are not necessarily considered to be wrong or incorrect, it is either the source information is unclear, or they are simply not addressed in the planning application or no obvious evidence is present.

3.0 INTRODUCTION

3.01 London Plan 2021

The London Plan 2021 has the following requirements for embodied carbon:

> *"Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions".*

3.01 London Plan Guidance: Whole Life-Cycle Carbon Assessments March 2022

To assist consultants with producing WLCA assessments the GLA produced guidance in March 2022 showing how compliance with policy SI2 can be achieved. Generally, the guidance requires WLCA's to implement the WLC principles outlined in Table 2.1.

3.03 Whole Life Cycle Assessment (WLCA)

The impact of the construction industry on non-renewable resources, global warming, and greenhouses gases emissions is well documented. Managing the environmental impacts that arise from the construction and operation of building is of key importance in mitigating the damage caused directly and indirectly on the biosphere. LCA is the leading industry standard in clearly identifying optimum strategies for reducing environmental impacts. This report presents the results for the LCA assessment undertaken at the end of RIBA Stage 3 for the project.

OneClick LCA software has been used to model the infrastructure's environmental and cost impacts.

This study has been conducted in accordance with the following standards:

- European Standard EN 15978: Sustainability of Construction Works – Assessment of Environmental Performance of Buildings – Calculation Method.
- International Standards 14040:2006 (en).

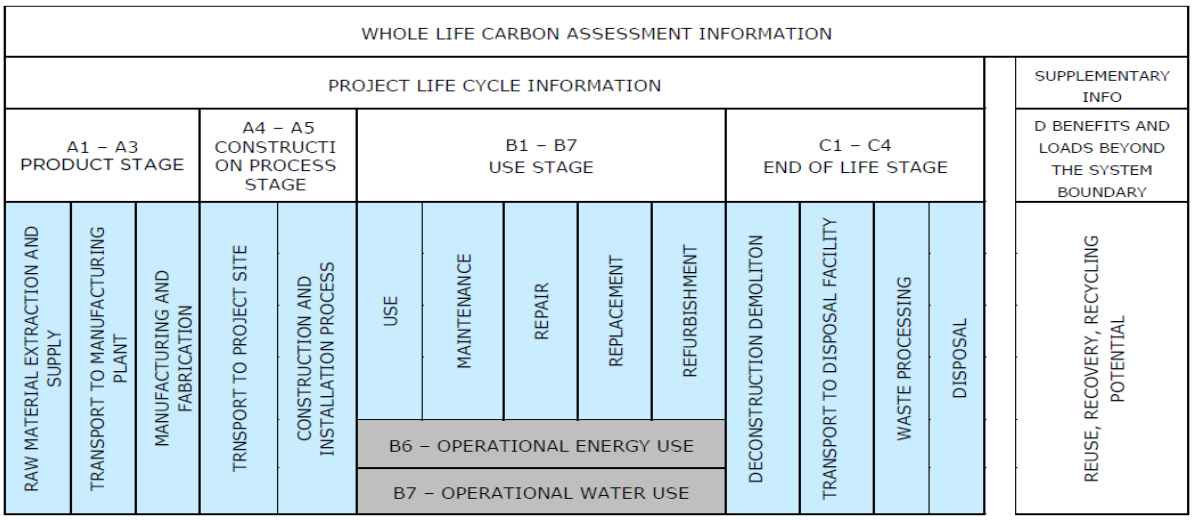


Figure 02: Life cycle stages and scope of assessment in line with BS EN 15978: 2011

3.04 Assessor Details

The study has been conducted by *Chris Armstrong*, of *QuinnRoss Energy*, who has undertaken numerous Life Cycle Carbon assessment studies in the qualifying two-year period prior to this assessment and is an independent consultant for the project. He also has nearly 20 years' experience in energy & sustainability for the built environment projects working for clients such as *Barrat Homes Ltd*, *Berkeley Homes Ltd, Star Real* Estate and *Vision Construction Ltd*. He is also an approved *CIBSE* energy assessor (for commercial EPC calculations), an approved *Elmhurst Energy* On-Construction Energy Assessor (for residential EPC calculations), a *LEED* assessor, a *BREEAM* assessor and a *NABERS* assessor.

3.05 Aims of the LCA Study

The aim of the study is to profile and improve the environmental performance of the development as an embodied approach, rather than just running costs, as per the diagram below:

Figure 03: Life cycle stages

3.06 Report Assumptions

The function of the building must reflect the core purpose of the asset such that it can be compared accurately to different designs to get most viable design options.

The existing building is mostly constructed in late 1980's with some additional extensions added in the mid 1990's.

The estimated design life is 60 years which has been adopted for the LCA study period. This takes into consideration the structural service life limit (30 years) as well as redevelopment pressure on the asset such as surrounding density, asset ownership structures and the architectural design quality.

The object of the assessment is the structure itself. The assessment includes all the upstream and downstream processes needed to provide the primary function of the structure from construction, maintenance, operation and finally demolition and disposal. The inventory includes the extraction of raw materials or energy and the release of substances back to the environment or to the point where the inventory items exit the system boundary either during or at the end of the project life cycle.

3.07 Method Statement

The basic requirements for a Life Cycle Carbon Assessment are built based on standards such as ISO 14040 and ISO 14044. In the construction sector the relevant scope is defined by the LCA standard EN15978, RICS methodology and relevant issues are highlighted below.

The EN15978 cut-off criteria were used to ensure that all relevant potential environmental impacts were appropriately represented:

- Mass – if a flow is less than 1% of the mass at either a product-level or individual-process level, then it has been excluded, provided its environmental relevance is not of concern.

- Energy – if a flow is less than 1% of the energy at either a product-level or individual-process level, then it has been excluded, provided its environmental relevance is not a concern.

- Neglected Mass – The total of neglected input flows per module as defined in CEN/TC 350 EN Standards, e.g., per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5% of energy usage and mass.

- Environmental relevance – if a flow meets the above criteria for exclusion but is considered to potentially have a significant environmental impact, it has been included. All material flows which leave the system (emissions) and whose environmental impact is higher than 1% of an impact category, have been included.

The RICS professional statement indicated component lifespans which has been used for replacement cycles in this assessment.

The Operational Guidance for Life Cycle Assessment Studies (Wittstock et al. 2012) states:

> *"The apparent paradox is that one must know the result of the LCA (so one can show that the omission of a certain process is insignificant for the overall results) to be able to know which processes, elementary flows etc. can be left out. The approach taken in this study is to continue modelling smaller inputs until confidence is gained that the criteria is safely met".*

Allocation rules follow those of EN15804 as given below:

- Allocation will respect the main purpose of the studied processes. If the main purpose of combined processes cannot be defined (e.g., combined mining and extraction of nickel and precious metals), economic allocation may be used to divide resources and emissions between the products.

- The principle of modularity is maintained. Where processes influence the product's environmental performance during its life cycle, they will be assigned to the module where they occur.

- The sum of the allocated inputs and outputs of a unit process are equal to the inputs and outputs of the unit process before allocation. This means no double counting of inputs or outputs is permissible.

4.0 OPERATIONAL ENERGY MODELLING

All operational energy calculations were taken from detailed TM54 calculations. The Dynamic Simulation Modelling (DSM) method was used in the software *Integrated Environmental Suite (IES)* software *Virtual Environment (VE) Version 2022.3.0.0.* Unlike the calculations used to produce BRUKL documents for the energy strategy, which use pre-set National Calculation Method (MCM) inputs, TM54 modelling uses specific inputs, gains, and internal temperatures in line with how the building is predicted to operate.

5.0 NEW-BUILD COMPARED TO REFURBISHMENT

5.01 Demolition & New-Build Planning Application

A planning application PP/23/00968 has been submitted which is a full demolition of the 83-103 Kings Road building, retaining the basement, and a new-build mixed use development which increases footprint, floor area and height of the replacement of the existing building. Accompanying the application is an embodied carbon assessment, document KGR-RAM-ZZ-ZZ-RP-SS-00007 and the applicable GLA spreadsheet, produced by Ramboll. The report highlights the predicted embodied carbon of the proposed new build.

This report will perform the same embodied carbon assessment however for a theoretical refurbishment of the building, assuming a full internal, HVAC & lighting replacement and an additional roof mounted PV array.

5.02 Refurbishment Details

The design details and analysis parameters are set out below for reference as they stand at the time of writing:

Design Details	
Design purpose	Refurbishment
Number of floors	4 storeys incl. basement
Primary function	Retail / Commercial
Structural service life limited	60 years (as defined by the BRE)
Predicted design life	60 years (as defined by the BRE)
Functional Characteristics	
Occupants	Commercial
Total Floor Area	
Site footprint	4,826 m^2
Building footprint	3,297 m^2
Floor area	9,790 m^2

Table 01: Design details

6.0 CALCULATION INPUT DATA

As the building is at planning stage the full inventory of materials, energy consumption, construction site activities and demolition are based on design estimates, building regulations calculations (SAP 10 and Part L 2021) and benchmarking from other similar projects that have completed. Information available on these are shown below:

6.01 Building Materials

The following elements forming the building were identified by the design team and can confirm accounts for at least 95%, and likely closer to 100%, of capital cost allocated to each building element

based on the existing floor area of 9.790 m^2. These were imported into the One Click LCA software system:

Building Element	Material Description	Quantity	
Foundations & Substructure		Area	kg
N/A	-	-	-
Vertical structures and facade			
Internal partitions	Timber frame internal wall	450 m^2	
Horizontal structures: beams, floors, and roofs			
Raised floor (office & retail areas)	Steel floor panels	6,027 m^2	
Ceramic floor tiles (core areas)	Ceramic tiles	1,006 m^2	
Other Structures			
Emulsion paint	Interior use paint	2,800 m^2	
Internal door	Timber door	166 m^2	
External Areas			
N/A	-	-	-
Building Technology			
Building systems and installations	LED lighting unit	705 no.	
	Electrical cable	32460 m	
	AHU	2 no.	
	Heat pump condenser	12 no.	
	Fan coil unit	205 no.	
	Ventilation duct work	1114 m	
	Solar panel	625 no.	
	Electric water heater	4 no.	

Table 02: Building Materials

6.02 Construction & Operational Energy Consumption

The following energy using end uses were identified and imported into the One Click LCA software system:

Energy Use, Annual	Description	Quantity
Operational Electricity Consumption		
Electricity	SAP 10 carbon factors	650 MWh/annum
Operational Gas Consumption		
N/A	-	-
Operational Water Consumption		
Tap water, clean	Thames water	46.8 m^3 / annum

Operational Exported Energy		
Exported energy from solar panels	SAP 10 carbon factors	163 MWh / annum
Construction Electrical Consumption		
Electricity	SAP 10 carbon factors	1,050 kWh (total)
Construction Water Consumption		
Water consumption	Main water	2.44 m^3 (total)

Table 03: Construction & operational energy consumption

6.03 Construction Waste

The following site construction waste is predicted and imported into the One Click LCA software system:

Waste type	Quantity in tonnes
Carboard	0.72
Wood	7.4
Ceramic	1.24
Inert	10.5
Meta	3.26
Gypsum	6.32
Plastic	2.28

Table 04: Predicted construction waste

7.0 EMBODIED CARBON RESULTS FOR REFURBISHMENT

Based on the inputs outlined in this report the following result were achieved:

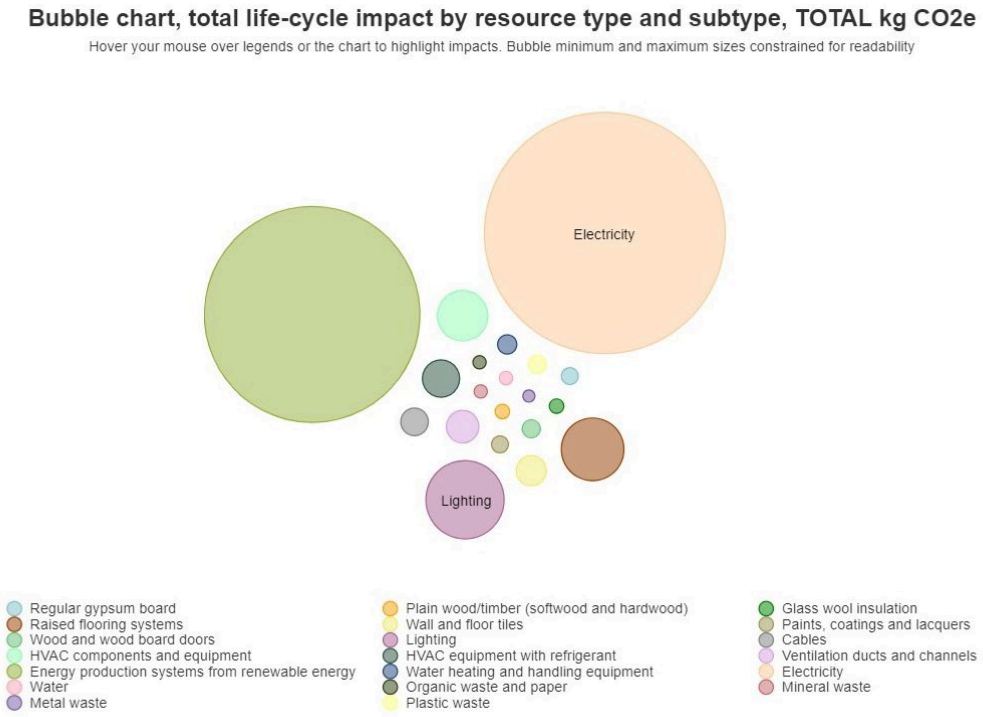


Figure 04: Life-cycle stage results

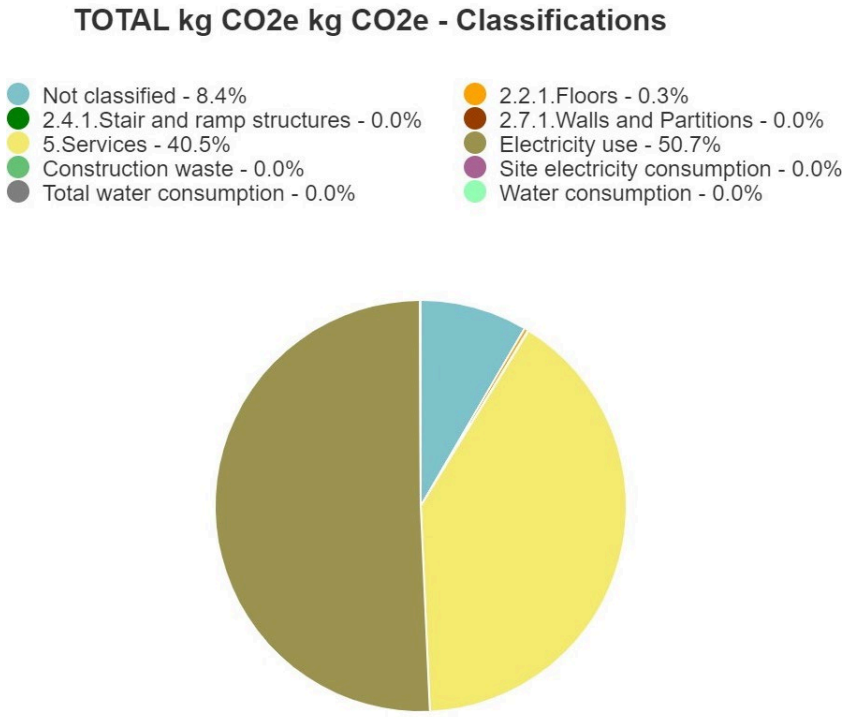


Figure 05: Classifications results

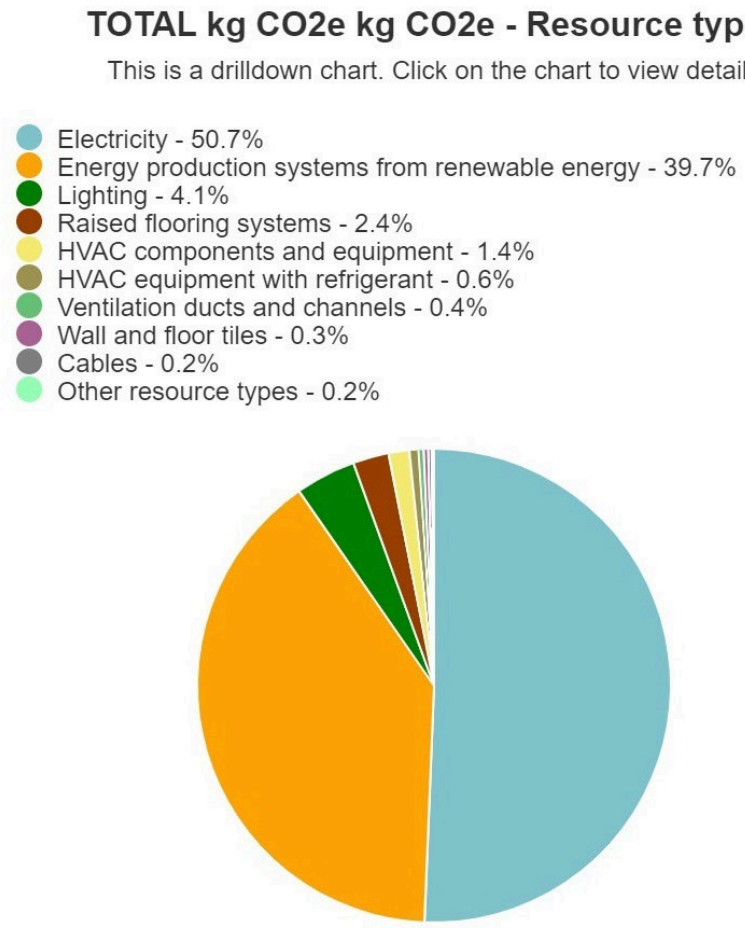


Figure 06: Resource type results

The LCA results according to EN 15978 are shown below:

	A1-A3 Product Stage	A4 Transportation to site	A5 Site operations	B1 Use Phase	B3 Repair	B4 Replacement	B6 Operational Energy use	B7 Operational Water use	C1-C4 End of life	D External impacts (not included in totals)	TOTAL kg CO2e
1 Substructure											
2.1-2.4 Superstructure	25 505	69	2 567		0	27 554			92	−226	55 786
2.5-2.6 Superstructure											
2.7-2.8 Superstructure	3 918	33	503		0				258	−1 192	4 712
3 Finishes											
4 Fittings, furnishings & equipments											
5 Services (MEP)	2 428 344	294	210		0	4 835 777			1 161	−160 930	7 265 786
6 Prefabricated buildings and building units											
7 Work to existing building											
8 External works											
Other materials - TOTAL	482 726	743	8 793		0	1 016 181			4 274	−610 992	1 512 717
Site, energy and water			5 987				9 080 010	55			9 086 052
TOTAL kg CO2e kg CO_2e	2 940 492	1 139	18 060		0	5 879 513	9 080 010	55	5 785	−773 339	17 925 053

Figure 07: Total embodied carbon

Based on the modelling the most contributing materials (GWP) are as follows:

No.	Resource	Cradle to gate impacts (A1-A3)	Of cradle to gate (A1-A3)
1.	Photovoltaic monocrystalline silicon solar tiles, surface 6,67 m²	2 371 tonnes CO_2e	80.6 %
2.	LED overhead lighting system, 8.527 kg/unit	185 tonnes CO_2e	6.3 %
3.	Raised floor panels, cementitious core encased in steel, 600 × 600 × 35 mm, 12.71 kg/m2	143 tonnes CO_2e	4.8 %
4.	Fan coil unit, 50 kg/unit, P=1 kW	76 tonnes CO_2e	2.6 %
5.	Galvanized steel ventilation ducts, rectangular, 400x400 mm, 14.8 kg/m, wall thickness: 0.88 mm	63 tonnes CO_2e	2.2 %
6.	Air/air heat pump for commercial buildings, 99.1 kg/unit, P=10.8 kW	37 tonnes CO_2e	1.2 %
7.	Ceramic tiles, glazed, for floor application, 10 mm, 27.263 kg/m2, 2200 kg/m3	25 tonnes CO_2e	0.8 %
8.	Communication cable, LAN Category 6A F/UTP 2x4 pairs L 500 m LSZH, 0.144 kg/m	21 tonnes CO_2e	0.7 %
9.	Air handling unit (AHU), large, 15000 m3/hr, 1710.14 kg/unit	9 tonnes CO_2e	0.3 %
10.	Gypsum plaster board, regular, generic, 6.5-25 mm (0.25-0.98 in), 10.725 kg/m2 (2.20 lbs/ft2) (for 12.5 mm/0.49 in), 858 kg/m3 (53.6 lbs/ft3)	2,9 tonnes CO_2e	0.1 %
11.	External wood door,	3,1 tonnes CO_2e	0.1 %
12.	Electric water heater (water cylinder), per one liter of heated water,	4,1 tonnes CO_2e	0.1 %
13.	Planed timber, conifer,	0,23 tonnes CO_2e	0.0 %
14.	Glass wool insulation panels, unfaced, generic, L = 0.031 W/mK, R = 3.23 m2K/W (18 ft2°Fh/BTU), 25 kg/m3 (1.56 lbs/ft3), (applicable for densities: 0-25 kg/m3 (0-1.56 lbs/ft3)), Lambda=0.031 W/(m.K)	0,81 tonnes CO_2e	0.0 %
15.	Emulsion for interior use with recycled paint content, 0.168 kg/m2, 1.4 kg/l	0,51 tonnes CO_2e	0.0 %

Figure 08: Materials with most CO_2 impact (ascending order)

Please also note a refurbished building will achieve an EPC band A rating, a draft copy of which is in the appendices.

8.0 REFURBISHMENT VS DEMOLITION & NEW-BUILD

As mentioned above, a planning application *PP/23/00968* has been submitted for a full demolition of the 83-103 Kings Road building, retaining the basement, and a new-build mixed use development in its place. Accompanying the application is an embodied carbon assessment, document *KGR-RAM-ZZ-ZZ-RP-SS-00007* and the applicable GLA spreadsheet, produced by *Ramboll*.

A screen capture of GLA excel tool for the proposed demolition & new-build as taken from the planning portal of the application is shown below:

Estimated WLC emissions
N.B. This forms the WLC baseline for the development. The green cells will automatically populate from the tables below

	Module A1-A5 (excluding sequestered carbon)	Modules B-C (excl B6 & B7)	Modules A-C (excluding B6-B7; including sequestered carbon)	Module B1-B5	Module B6-B7	Module C1-C4	Module D
TOTAL kg CO_2e	10,473,310 kg CO2e	6,240,644 kg CO2e	16,282,205 kg CO2e	5,291,708 kg CO2e	15,282,581 kg CO2e	948,936 kg CO2e	-4,185,548 kg CO2e
TOTAL kg CO_2e/m^2 GIA	781.4153548	465.615	1214.818	394.8151906	1140.235843	70.8002686	-312.2844139
Please select most appropriate benchmark from drop-down menu	Retail						
WLC Benchmark	<850	<350	<1200				
Aspirational WLC Benchmark	<500	<300	<800				

Figure 09: GLA WLCA excel tool results for demolition & new-build

A screen capture of GLA excel tool for the refurbishment, the result of which are shown in section 7.0 above, is shown below:

Estimated WLC emissions
N.B. This forms the WLC baseline for the development. The green cells will automatically populate from the tables below

	Module A1-A5 (excluding sequestered carbon)	Modules B-C (excl B6 & B7)	Modules A-C (excluding B6-B7; including sequestered carbon)	Module B1-B5	Module B6-B7	Module C1-C4	Module D
TOTAL kg CO_2e	2,959,691 kg CO2e	5,885,298 kg CO2e	8,844,988 kg CO2e	5,879,512 kg CO2e	9,080,065 kg CO2e	5,785 kg CO2e	-773,340 kg CO2e
TOTAL kg CO_2e/m^2 GIA	240.0982031	477.431	717.530	476.9621343	736.5997437	0.469329115	-62.73545064
Please select most appropriate benchmark from drop-down menu	Retail						
WLC Benchmark	<850	<350	<1200				
Aspirational WLC Benchmark	<500	<300	<800				

Figure 10: GLA WLCA excel tool results for refurbishment

The above GLA excel results can be summarised as follows:

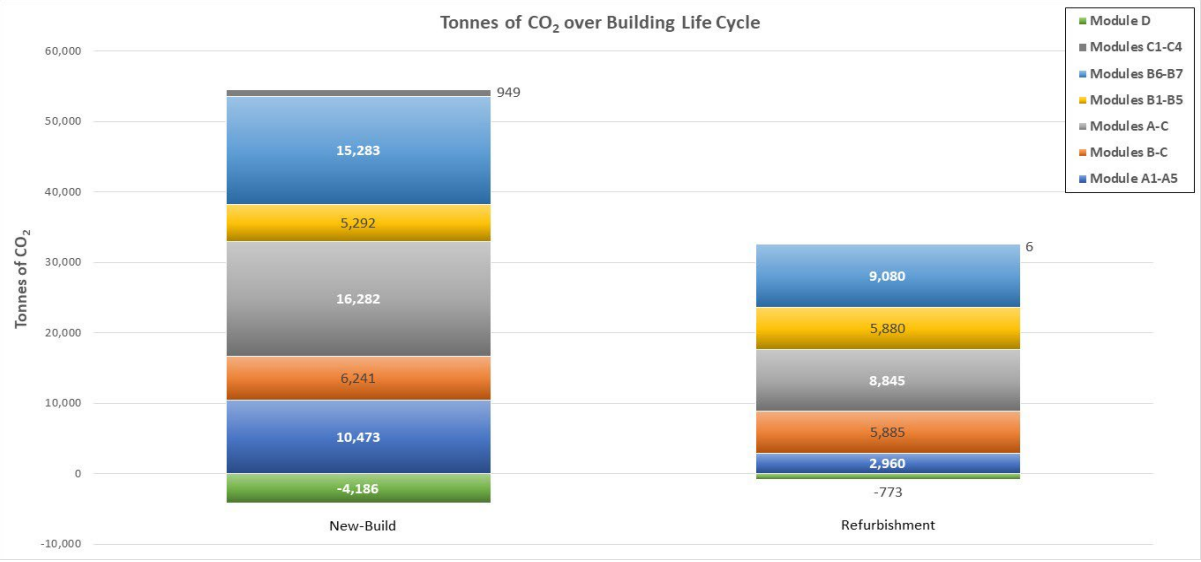


Figure 11: Comparison of life cycle carbon stages for new build & refurbishment

The embodied carbon results per life-cycle stage are summarised below:

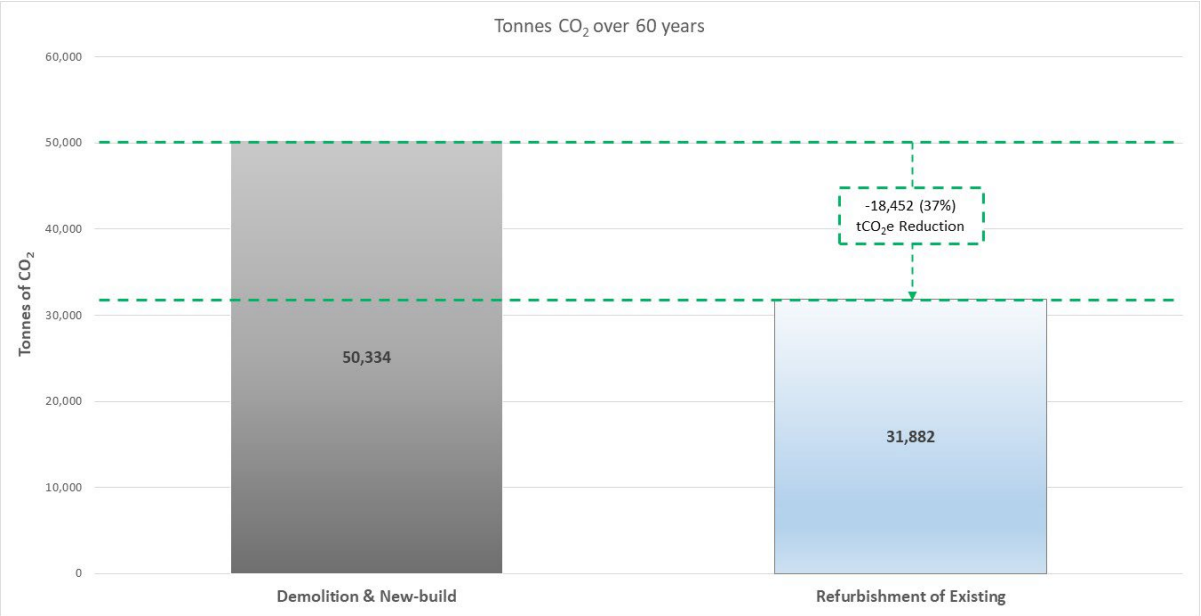


Figure 12: Comparison of total embodied carbon for new build & refurbishment

The results show that the demolition & new-build proposal will, according to their submitted GLA spreadsheet, accumulate 50,334 tonnes of CO_2 in the building's life cycle. A refurbishment of the existing building, no extensions, will amass 31,882 tonnes of CO_2 in the building's life cycle, a reduction of -18,452 tonnes (-37%) of CO_2 of a 60-year life cycle.

9.0 REVIEW OF NEW-BUILD APPLICATION SUBMITTALS

As part of the review of the new-build's planning application submittal, to establish the embodied carbon figures above, QuinnRoss Energy were also asked to give their professional opinion on the robustness of the submittals. The following are queries that have risen from said review:

Document	Query
Ramboll Embodied Carbon Assessment: Ref KGR-RAM-ZZ-ZZ-RP-SS-00007	**CO_2 figures do not appear aligned:** The carbon emissions stated in the embodied carbon analysis don't appear to match the figures stated in the submitted GLA spreadsheet. The report states the entire development will produce 16,100 tonnes of embodied CO_2 over its life cycle, which is very low for a development of this size, yet the GLA excel tool states 50,334 tonnes will be produced.
	Input data is not clear: The embodied carbon report does not appear to state the inputs used for the analysis, such as material used. The report outlines CO_2 emissions but does not give any indication of the inputs used to establish the figures. Hints of this are available in other documents, such as the GLA excel and bill of materials, but again it's unclear how it's all been married together.
	Re-use and recycling rate is very high: The Rambol embodied carbon report does not outline re-use and recycle rate of existing materials at all. The submitted GLA excel states nearly all waste materials are labelled as being re-used and/or recycled, with a particularly high quantity of re-use. Although theoretically feasible no other evidence has been provided as to how this is intended to be achieved, which is commonly asked for by GLA assessments.
	GLA minimum benchmarks are not achieved: The submitted GLA spreadsheet show that modules B-C and A-C do not meet the minimum GLA benchmark requirements, though they are marginal. Again, from experience, this is mandatory by the GLA and evidence as to how it's going to be achieved is required.
Ramboll Energy Strategy: Ref KGR-RAM-ZZ-ZZ-RP-ZZ-00004	**Does not meet London Plan 2021 Energy Hierarchy targets:** Energy strategy shows scheme does not meet London Plan 2021 policy SI2 requirements as the development will only achieve a 13% reduction in regulated CO_2 emissions. The target is zero carbon with at least a 35% improvement expected.
Ramboll Detailed Circular Economy Statement: Ref KGR-RAM-ZZ-ZZ-RP-ZZ-00006	**Unsubstantiated scoring system for different design options:** Page 25 contains a scoring system that outlines different design options and rates them based on different metrics, such as carbon emissions, costs, space efficiency etc. The scoring system for this assessment is a) not explained in any way with no evidence, and b) appears illogical as, for example, a refurbishment option scores 0 for "buildings that make people feel their best".
	Overly negative on the option of minor refurbishment: Page 15 gives an overly negative appraisal of a minor refurbishment option stating building fabric and operational energy consumption is poor. Neither is true as, although performance won't be quite as good as a new building,

	the existing fabric does not perform significantly different to modern buildings, as the building is not that old, and operational energy can be almost as good with a HVAC and lighting replacement, standard practice for an internal refurbishment.
	Agreement refurbishment is the lower embodied carbon option: Page 17 confirms that the analysis is in agreement that refurbishment is the lower embodied carbon option.
	Unfeasibly high re-use %: Table 9 claims targets for re-use, however a 33% re-use for the substructure, 66% re-use for internal finishes and 36% re-use for MEP services is very high. No evidence is provided outlining how these targets will be met which is a GLA requirement.
	Unfeasibly long service life: Page 6, 4th paragraph, claims the service life of the proposed will be 120 years. This is unfeasibly long for a steel frame building and the BRE stipulate that a 60 year service life is the maximum period for life cycle analysis.
Circular Economy Completed GLA Template	**Differing proposal for retained basement:** Other areas of the template and other documents claim the basement level can be retained and re-used to save on excavation, however the GLA template claims an invasive survey needs to be performed before any retention of the basement can be confirmed. This is a perfectly reasonable statement but not aligned throughout all documents which promise full retention. The next page of the template promises 400m^2 of the basement will be retained.
Pre-demolition Audit: ENV-SF-025-Pre-Demolition Audit Report	**Misleading re-use targets stated:** Section 4.0 outlines re-use targets for the existing buildings however are masked with a colour coded feasibility. For example, the table in section 4.3 shows 100% of lighting can be reused however is colour coded in red, meaning the chances of such a high % of re-use are “very low”.

Table 05: Review of submittals

Please note, the above items are not necessarily considered to be wrong or incorrect, it is either the source information is unclear, or they are simply not addressed in the planning application or no obvious evidence is present.

10.0 CONCLUSIONS

The LCA analysis found the following conclusions:

- The proposed demolition & new-build development, planning application PP/23/00968, will produce 50,334 tonnes of CO_2 over a 60-year life cycle according to the submitted GLA excel tool.

- A refurbishment of 81-103 Kings Road is predicted to produce around 31,882 tonnes of CO2 over a 60-year life cycle, a 37% reduction in embodied life-cycle carbon over a demolition & new-build.

- The points above can be summarised below for each option, per life-cycle stage:

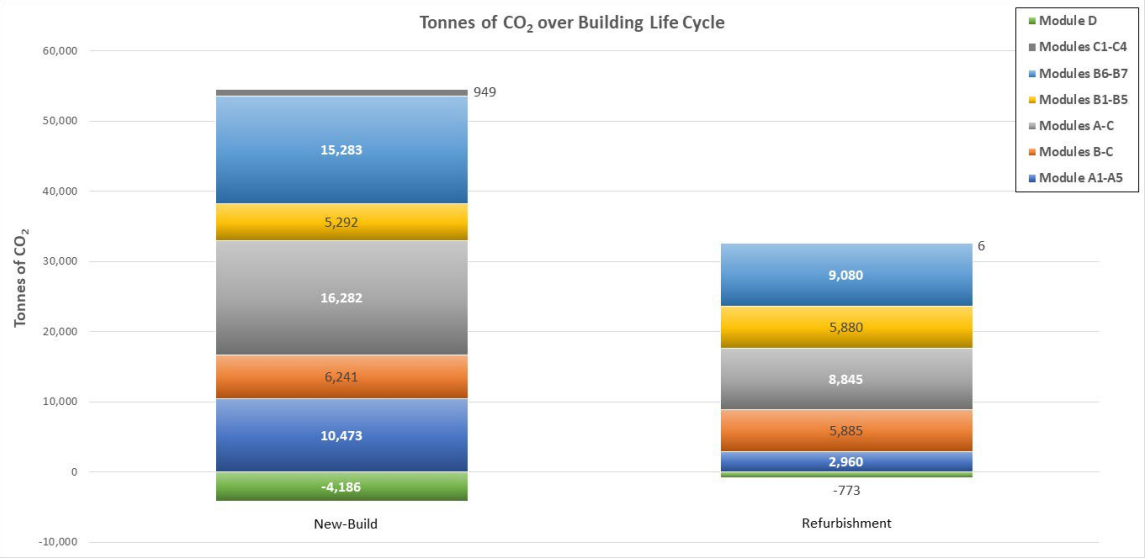


Figure 13: Comparison of life cycle carbon stages for new build & refurbishment

- As part of the review of the new-build's planning application submittal QuinnRoss Energy were also asked to give their professional opinion on the robustness of the submittals. The following are queries that have risen from said review:

    - Whole Life Cycle Carbon Analysis:
        - CO_2 figures do not appear aligned.
        - Input data is not clear.
        - Re-use and recycling rate is very high, with no evidence.
        - GLA minimum benchmarks are not achieved in part.
    - Energy strategy: Regulated CO_2 does not meet the London Plan 2021 targets.
    - Circular Economy Statement:
        - Unsubstantiated scoring system for design options.
        - Overly harsh negative view on refurbishment options.
        - Agrees that refurbishment has lower embodied carbon impact.
        - Unfeasibly high % of re-use with no evidence.
        - Unfeasibly high service life of 120 years, double BRE standard.
    - Circular economy GLA template: Mixed approach to retention of the basement level.
    - Pre-demolition audit: Misleading re-use targets are stated.

Please note, the above items are not necessarily considered to be wrong or incorrect, it is either the source information is unclear, or they are simply not addressed in the planning application or no obvious evidence is present.

11.0 APPENDICES

11.01 Appendix A – Draft EPC for Refurbishment

Energy Performance Certificate

Non-Domestic Building

HM Government

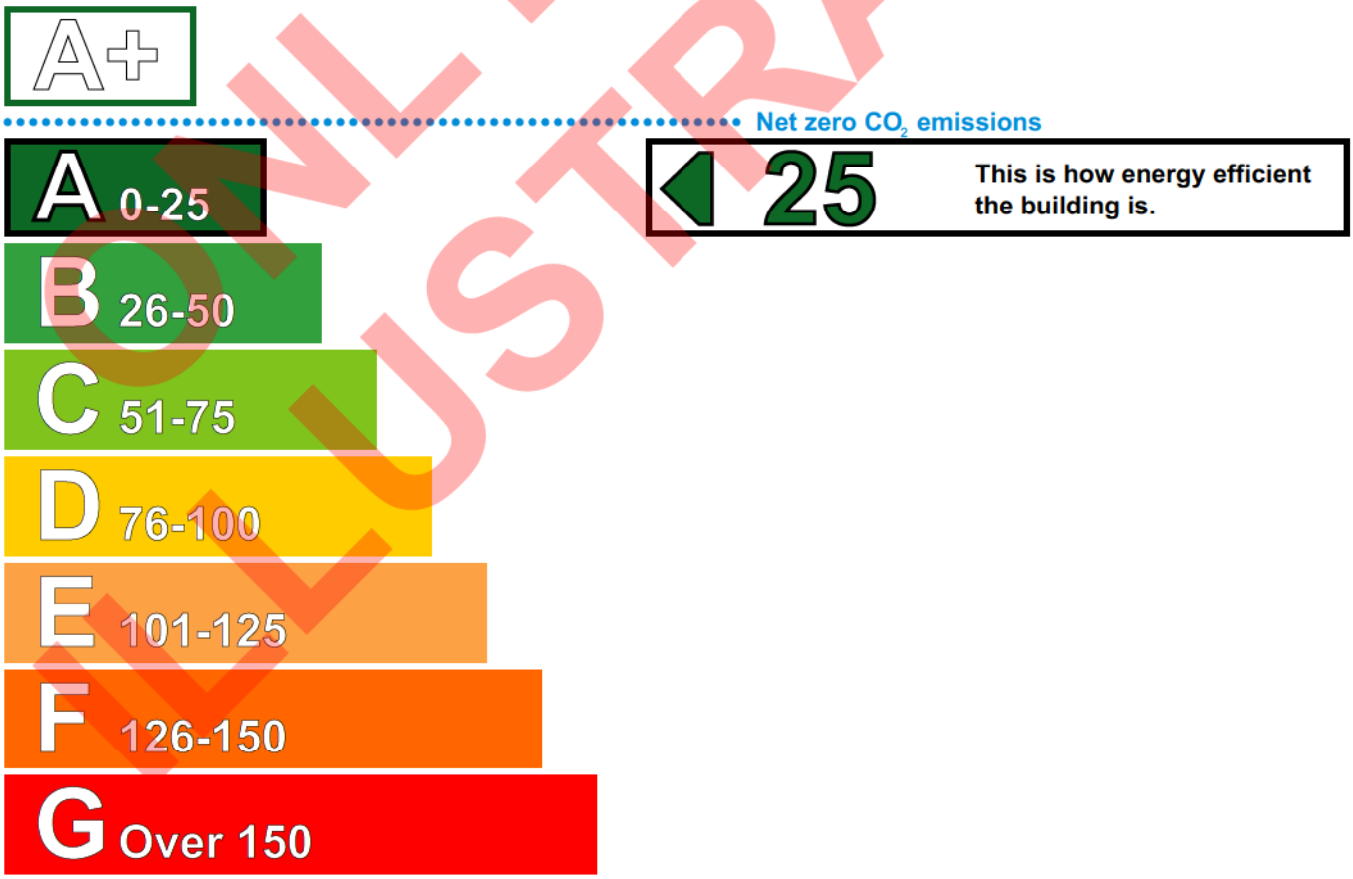
81-103 Kings Road
LONDON
SW3 4NX

Certificate Reference Number:
6319-1755-0575-4330-4563

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient



Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	7033.160
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	6.79
Primary energy use (kWh_{PE}/m^2 per year):	68.73

Benchmarks

Buildings similar to this one could have ratings as follows:

12 If newly built

50 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	Virtual Environment v7.0.22 using calculation engine ApacheSim v7.0.22
Property Reference:	UPRN-000000000000
Assessor Name:	Chris Armstrong
Assessor Number:	LCEA135681
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	Trading Name
Employer/Trading Address:	Trading Address
Issue Date:	05 Sep 2023
Valid Until:	04 Sep 2033 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 2151-5028-4370-5950-1451

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by CIBSE Certification Limited. You can obtain contact details of the Accreditation Scheme at www.cibsecertification.com.

A copy of this certificate has been lodged on a national register as a requirement under the Energy Performance of Buildings Regulations 2012 as amended. It will be made available via the online search function at www.ndepcregister.com. The certificate (including the building address) and other data about the building collected during the energy assessment but not shown on the certificate, for instance heating system data, will be made publicly available at www.opendatacommunities.org.

This certificate and other data about the building may be shared with other bodies (including government departments and enforcement agencies) for research, statistical and enforcement purposes. For further information about how data about the property are used, please visit www.ndepcregister.com. To opt out of having information about your building made publicly available, please visit www.ndepcregister.com/optout.

There is more information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government website at: www.gov.uk/government/collections/energy-performance-certificates. It explains the content and use of this document and advises on how to identify the authenticity of a certificate and how to make a complaint.

Opportunity to benefit from a Green Deal on this property

The Green Deal can help you cut your energy bills by making energy efficiency improvements at no upfront costs. Use the Green Deal to find trusted advisors who will come to your property, recommend measures that are right for you and help you access a range of accredited installers. Responsibility for repayments stays with the property - whoever pays the energy bills benefits so they are responsible for the payments.

To find out how you could use Green Deal finance to improve your property please call 0300 123 1234.

11.02 Appendix B – Glossary of terms

GWP - Global Warming Potential: Anthropogenic global warming is caused by an increase of greenhouse gasses (GHG) in the earth's atmosphere. These gasses reflect some of the heat radiated from the earth's surface that would normally escape into space back to the surface of the earth. Overtime this warms the earth. Common GHGs include CO_2, N2O, CH4 and volatile organic compounds (VOCs). Global Warming Potential (GWP) is expressed in equivalent GHGs released, usually in $kgCO_2e$.

ODP - Ozone Depletion Potential: Ozone is formed and depleted naturally in the earth's stratosphere (between 15-40 km above the earth's surface). Halocarbon compounds are persistent synthetic halogen containing organic molecules that can reach the stratosphere leading to more rapid depletion of the ozone. As the ozone in the stratosphere is reduced more of the ultraviolet rays in sunlight can reach the earth's surface where they can cause skin cancer and reduced crop yields. Ozone Depletion Potential (ODP) is expressed in equivalent ozone depleting gasses (normally kgCFC11e).

AP - Acidification Potential for Soil and Water: Acidification is a consequence of acids (and other compounds which can be transformed into acids) being emitted to the atmosphere and subsequently deposited in surface soils and water. Increased acidity can result in negative consequences for flora and fauna in addition to increased corrosion of manmade structures (buildings vehicles etc.). Acidification Potential (AP) is an indicator of such damage and is usually measured in $kgCO_2e$.

EP - Eutrophication Potential: Over enrichment of aquatic ecosystems with nutrients leading to increased production of plankton, algae and higher aquatic plants leading to a deterioration of the water quality and a reduction in the value and/or the utilisation of the aquatic ecosystem. Eutrophication is primarily caused by surplus nitrogen and phosphorus. Sources of nutrients include agriculture (fertilisers and manure), aquaculture, municipal wastewater, and nitrogen oxide emissions from fossil fuel combustion.

POCP - Photochemical Ozone Creation Potential: Photochemical Ozone Creation Potential (POCP), commonly known as smog, is toxic to humans in high concentration. Although ozone is protective in the stratosphere at low levels it is problematic from both a health and nuisance perspective. Plant growth is also affected through damaged leaf surfaces and reduced photosynthesis. POCP is formed when sunlight and heat react with Volatile Organic Compounds (VOCs).

ADPM - Abiotic Resource Depletion of energy: This is a measure of the extraction and consumption of primary resources from the earth. Such exploitation reduces resources available to future generations and as such must be managed. "

ARDE - Abiotic Resource Depletion of Energy is a measure of the extraction and consumption of non-renewable energy sources (primarily fossil fuels, but also inclusive of other energy sources such as uranium). Primary energy content of non-renewable energy sources including the embodied energy to extract, process and deliver the non-renewable fuels, or manufacture, transport and install the renewable generator. Hence there is usually, and non-renewable energy content associated with renewable fuels also.

Use of Renewable Primary Energy Resource: Use of renewable primary energy excluding renewable primary energy resources used as raw materials.

Use of Renewable Primary Energy Resource: Use of renewable primary energy resources used as raw materials.

Total use of Renewable Primary Energy Resources: Total use of renewable primary energy resources.

User of Non-Renewable Primary Energy Resource: Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.