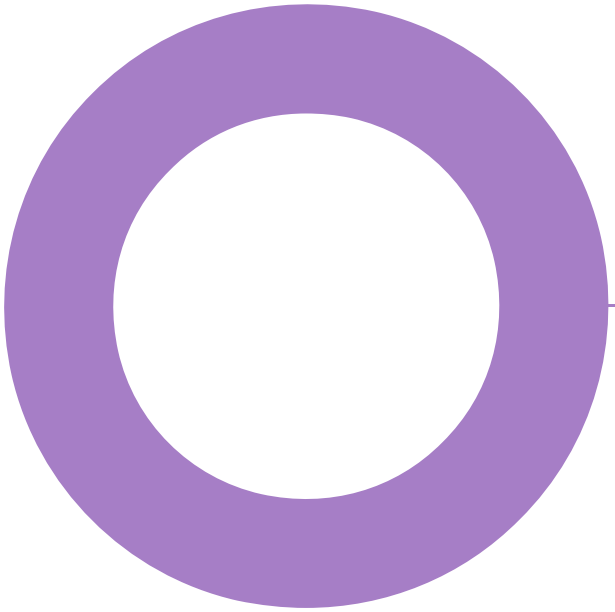
HOARE LEA

Tolworth.
London.
The Guinness Partnership.

SUSTAINABILITY
ENERGY STRATEGY NOTE

REVISION 00 – 15 MAY 2020



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	15/05/2020	First Issue	JH	RE	RE

Project number: 07/10187
Document reference: 200515 Tolworth - Energy Strategy Note

Contents.

Introduction

This note has been produced in support of the Deed of Variation to the Section 106, namely Schedule 13 'Energy Centre' and Plan 9 which illustrates the Energy Centres consented location(s). It explains the principles of the changes to the existing energy strategy and the benefits this will bring.

Exiting Energy Strategy

The existing energy strategy includes a central Energy Centre with gas boilers and CHP providing heat and power to the entire Tolworth site. This is based upon the requirements of the GLA policy at the time the original application was made.

The agreed strategy included temporary boilers within Phase 1 to provide heat to this phase prior to the completion of the Energy Centre in Phase 2. The temporary plant within Phase 1 would then be decommissioned and this phase connected to the Energy Centre.

The strategy also included a high performing façade and PV electrical generation on the roof. This resulted in a Be Lean CO_2 reduction of 4% and an overall reduction of 35%.

Proposed Strategy

The proposed energy strategy follows the same principles of the existing strategy. Temporary boilers providing heat to Phase 1 will be provided. These and the ancillary equipment to support them will be contained within a temporary boiler plant room adjacent to Phase 1 instead of within the building footprint.

Phase 2 will contain the site wide energy centre, as before, and this will connect into Phase 1 once this is built, allowing the temporary plant to be removed. The thermal performance of Phase 1 has also improved, as demonstrated in the Part L1A and L2A reports appended to this note, with CO_2 reductions of 10% and 2% respectively.

A detailed application for Phase 2 will be made in the future. This will include a detailed Energy Strategy applying the new GLA policy of decarbonisation. The new Energy Centre will include heat pumps to provide a large proportion of the heat to the site and utilise low temperature heat network principles. Combined with the new fuel carbon factors this will greatly increase the CO_2 reduction of the development, including Phase 1, once this is connected. There will also be an improvement to the local air quality compared to the approved scheme.

Confirmation of the CO_2 reductions and overall performance will be confirmed in the Phase 2 Energy Strategy.

Conclusion

As can be demonstrated the principles of the original energy strategy will be followed. The changes to the thermal performance within Phase 1 and the proposed updated energy strategy for Phase 2 will result in large CO_2 reductions and increased air quality. It will also mean the entire site is compliant with the latest GLA policy.

Appendix 1 – Site Wide Infrastructure Drawing with Temporary Plant

A0

This drawing shall not be scaled.
Work from the dimensions shown in the drawing or given in relevant specifications

X:_PROJECTS_Projects 10100 - 10199\10187 - Tolworth\11 Issued and Received\118 Received\040 - 06-04-20 - PRP Drawing Issue\3_0000 Site Setting Drawings\DWG\TW-PRP-ZZZ-00-DR-A-3_0001_P00 - Site Wide Plan - Ground Floor - HL
X:_PROJECTS_Projects 10100 - 10199\10187 - Tolworth\07 BIM and CAD\7B CAD\7B-1 Templates\0710187 - HL18_sheetA0L
X:_PROJECTS_Projects 10100 - 10199\10187 - Tolworth\11 Issued and Received\118 Received\049 - 24-04-20 - Landscape Plan\Landscape Masterplan - HL

EXACT LOCATION AND DETAILS TO BE CONFIRMED

EXTERNAL BELOW GROUND VALVE BOX TO ALLOW FOR CONNECTION OF THE TEMPORARY BOILER PLANT AND FUTURE LTHW FROM THE PHASE 2 ENERGY CENTRE - APPROXIMATE SIZE 800X800MM.

PHASE 2 PHASE 1

INCOMING HV CABLES FOR PHASE 1 TRANSFORMER
INCOMING BT DUCTS
INCOMING LIFE SAFETY CABLES FROM GENERATOR
LIFE SAFETY DUCT MAIN DISTRIBUTION

THE FOLLOWING SERVICES ENTER/ EXIT BUILDING VIA THE EXTERNAL RISER:
DISTRICT HEATING LTHW F&R
MCWS TO TEMPORARY BOILER PLANT
SPRINKLER PIPEWORK TO PHASE 2
IRRIGATION WATER SUPPLY
SERVICE ENTRY POINT AND RISER POSITION

IRRIGATION SUPPLY TO SERVE SITE.

INCOMING DATA DUCT – TO BE CONFIRMED

TEMPORARY GENERATOR FOR PHASE 1

TEMPORARY BOILER PLANT FOR PHASE 1

TEMPORARY GAS METER FOR PHASE 1 TEMPORARY BOILER PLANT LOCATED WITHIN AN EXTERNAL METER HOUSING (ONCE THE MAIN ENERGY CENTRE FOR PHASE 2 IS COMPLETE, THE METER WILL NEED TO BE REMOVED & THE GAS PIPEWORK CUT BACK TO THE MAIN CONNECTION POINT)

LTHW F&R FROM PHASE 2 ENERGY CENTRE

SPRINKLER PIPEWORK TO PHASE 2

TO PHASE TWO CONNECTION POINT

CAPPED SERVICES TO SERVE PHASE 2

PART OF THE PHASE 1 WORKS

Temporary Boiler Plant location serving Phase 1

BULK WATER SUPPLY TO SERVE PHASE 1 DOMESTIC WATER TANK AND COMMERCIAL SPRINKLER TANK

MCWS TO SERVE COMMERCIAL UNIT

THAMES WATER MAIN

MCWS TO SERVE COMMERCIAL UNIT

IRRIGATION SUPPLY TO COURTYARD AREA.

MCWS TO SERVE FUTURE KIOSK. FINAL POSITION TO BE AGREED.

LV CABEL FOR FUTURE KIOSK. FINAL POSITION TO BE AGREED.

LV CABLES FOR FUTURE BUILDING, THESE WILL ROUTE FROM RELOCATED EXISTING SUBSTATION TO A FUTURE PHASE 2 BUILDING EXACT ROUTE TO BE CONFIRMED AT FUTURE DATE

HIGH VOLTAGE CABLE TO THE SITE
LOW PRESSURE GAS MAINS TO THE SITE CONNECTS TO GAS SHIPPERS MAIN.

SUBSTATION TO BE RELOCATED INTO PHASE 2

PHASE 1 GAS INSTALLATION WORKS ARE TO COMPRISE OF THE FOLLOWING:

1) INSTALLATION OF THE PERMANENT GAS PIPEWORK TO THE PHASE 2 ENERGY CENTER.
2) PROVIDE A TEMPORARY GAS SUPPLY FROM THIS PERMANENT PIPEWORK TO SERVE THE PHASE 1 TEMPORARY BOILER PLANT.

WHEN THE PHASE 2 ENERGY CENTRE IS COMPLETE AND IS OPERATIONAL, THE TEMPORARY GAS SUPPLY WILL NEED TO BE REMOVED BACK TO THE JOINT WITH THE PHASE 2 GAS CONNECTION.

CAPPED GAS SUPPLY TO SERVE FUTURE ENERGY CENTRE

APPROXIMATE POSITION OF PHASE 2 MECHANICAL PLANT ENTRY POINT

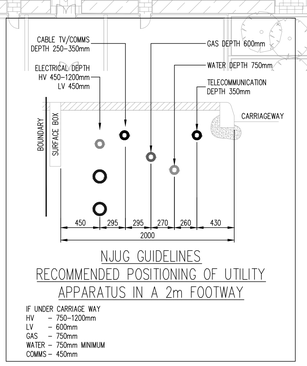
Bowling Centre

Drayton Court

Dean Court

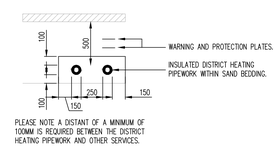
LEGEND:

- HV — HIGH VOLTAGE CABLE
- LV — LOW VOLTAGE CABLE
- LIFE — LIFE SAFETY FROM GENERATOR
- BT — BT CABLE COMMS CABLE
- DATA — SECONDARY COMMS SUPPLIER CABLE
- SLV — MAIN DISTRIBUTION LIFE SAFETY CABLE
- MCWS — MAINS COLD WATER SUPPLY
- GAS — GAS SUPPLY
- LTHW — LOW TEMPERATURE HOT WATER FLOW & RETURN
- T-GAS — TEMP GAS
- FM — SPRINKLER PIPEWORK



NJUG GUIDELINES
RECOMMENDED POSITIONING OF UTILITY APPARATUS IN A 2m FOOTWAY

IF UNDER CARRIAGE WAY
HV – 750–1200mm
LV – 600mm
GAS – 750mm
WATER – 750mm MINIMUM
COMMS – 450mm



PLEASE NOTE A DISTANT OF A MINIMUM OF 100MM IS REQUIRED BETWEEN THE DISTRICT HEATING PIPEWORK AND OTHER SERVICES.

TYPICAL ARRANGEMENT FOR BURIED DISTRICT HEATING PIPEWORK

REVISIONS:

Index	Description	Designed	Reviewed	Authorised	Date

CDM Regulations:

In addition to any information included in this drawing or the model from which it is derived, refer also to the project CDM Risk Register for information on residual risks'

General Notes:

- The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
- The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
- Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.

Project Notes:

1. PROVIDE POEWR SUPPLIES TO RAISING BOLLARDS. AT TENDER STAGE, ALLOW FOR 6 NUMBER 200WATT SUPPLIES TO BE LOCATED CLOSE TO THE FUTURE KIOSK.
2. EXTERNAL LIGHTING NOT SHOWN. FINAL DESIGN TO BE DEVELOPED BY CONTRACTOR. EXTERNAL LIGHTING TO THE DEVELOPMENT AREA TO BE TO THE LANDSCAPE ARCHITECTS' REQUIREMENTS, AND TO THE PUBLIC ROAD AREAS TO THE HIGHWAY AUTHORITY REQUIREMENTS. AT TENDER STAGE ALLOW FOR POWER SUPPLIES TO ALL FUTURE EXTERNAL LIGHTING REQUIREMENTS, AND FOR THE PROVISION OF THE EXTERNAL LIGHTING FITTINGS, COLUMNS, CONTROLS, ETC.

ARCHITECT: PRP	PROJECT TITLE: TOLWORTH
CLIENT: THE GUINNESS PARTNERSHIP	DRAWING TITLE: COMBINED SERVICES INCOMING SERVICES

HOARE LEA

TENDER ISSUE

PERSON RESPONSIBLE FOR:

Design:	Review:	Authorising Issue:
CTa/ JCM	JH	JH
Project No:	Date:	Scale @ A0:
0710187	APRIL 2020	1:200

DRAWING NUMBER: TW-HLP-ZZZ-00-DR-U-08500 — Revision: T1

X:_PROJECTS_Projects 10100 - 10199\10187 - Tolworth\07 BIM And CAD\7B CAD\7B-5 Coordination\003 Stage 3\003 GAs\TW1-HLP-ZZZ-00-DR-U-08500.dwg,Charles Tapper,04/05/2020 15:40:20

Appendix 2 – Phase 1 Part L1A and L2A Reports

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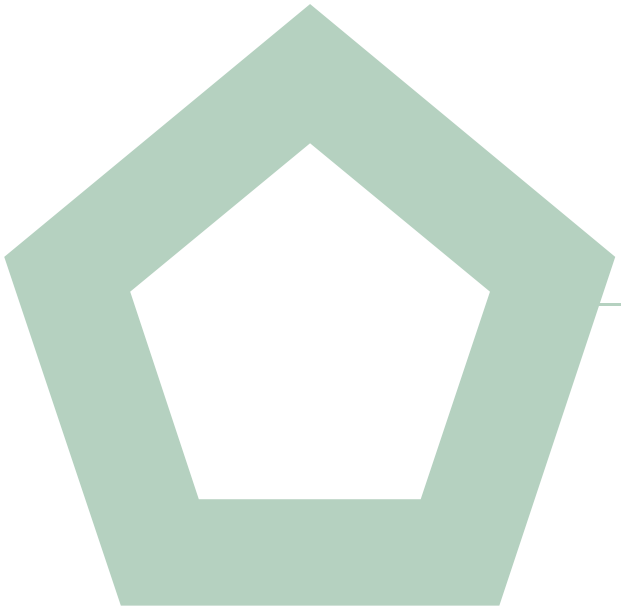
SUSTAINABILITY
STAGE 3 ADL1A MODELLING REPORT

REVISION 0 – 29 APRIL 2020



STAGE 3

Audit Sheet.

Rev.	Date	Description	Prepared	Verified
0	29/04/2020	Stage 3 Issue	DM	LH

Document reference: 200429 Tolworth Stage 3 ADL1A Modelling Report Rev 0.docx.

Contents.

1. Introduction.

Hoare Lea has been appointed to provide an analysis of Building Regulation ADL1A compliance for the Tolworth development in Kingston-upon-Thames. The building is required to comply with the current 2013 edition of the Building Regulations. The Elmhurst Design SAP v4.11r11 has been used to assess compliance with Part L.

The development is required to meet the requirements of the various Criteria within Part L1A of the Building Regulations;

Criterion 1: Achieving the TER – the building shall not exceed the target CO_2 emission rate.

Criterion 2: Limits on design flexibility – the fabric elements and the fixed building services shall all meet the minimum energy efficiency standards.

Criterion 3: Limiting the effects of heat gains in summer.

2. Model Construction Data.

The following sections of the report detail the drawings used to construct the thermal model and the construction thermal performance specifications that form the basis of the proposed design.

2.1 Drawings Used

A list of drawings provided by PRP, which have been used to perform the calculations, are listed in Table 1 below.

Table 1 - Drawings used

Drawing number	Title	Date
TW-PRP-ZZZ-00-DR-A-4_1000_P01 - Site Plan - Level GF	Ground Level Floor	21/04/20
TW-PRP-ZZZ-01-DR-A-4_1001_P01 - Site Plan - Level 1	Floor 1	21/04/20
TW-PRP-ZZZ-02-DR-A-4_1002_P01 - Site Plan - Level 2	Floor 2	21/04/20
TW-PRP-ZZZ-03-DR-A-4_1003_P01 - Site Plan - Level 3	Floor 3	21/04/20
TW-PRP-ZZZ-04-DR-A-4_1004_P01 - Site Plan - Level 4	Floor 4	21/04/20
TW-PRP-ZZZ-05-DR-A-4_1005_P01 - Site Plan - Level 5	Floor 5	21/04/20
TW-PRP-ZZZ-06-DR-A-4_1006_P01 - Site Plan - Level 6	Floor 6	21/04/20
TW-PRP-ZZZ-07-DR-A-4_1007_P01 - Site Plan - Level 7	Floor 7	21/04/20
TW-PRP-ZZZ-08-DR-A-4_1008_P01 - Site Plan - Level 8	Floor 8	21/04/20
TW-PRP-ZZZ-09-DR-A-4_1009_P01 - Site Plan - Level 9	Floor 9	21/04/20

Drawing number	Title	Date
TW-PRP-ZZZ-LR-DR-A-4_1010_P01 - Site Plan - Level Roof	Roof Level	21/04/20
TW-PRP-D01Z-ZZ-DR-A-4_2101_P02 - Block D01 - North Elevation	Block D01, North Elevation	21/04/20
TW-PRP-D02Z-ZZ-DR-A-4_2201_P02 - Block D02 - North Elevation	Block D02, North Elevation	21/04/20
TW-PRP-D03Z-ZZ-DR-A-4_2301_P02 - Block D03 - North Elevation	Block D03, North Elevation	21/04/20
TW-PRP-D01Z-ZZ-DR-A-4_2102_P02 - Block D01 - East Elevation	Block D01, East Elevation	21/04/20
TW-PRP-D02Z-ZZ-DR-A-4_2202_P02 - Block D02 - East Elevation	Block D02, East Elevation	21/04/20
TW-PRP-D03Z-ZZ-DR-A-4_2302_P02 - Block D03 - East Elevation	Block D03, East Elevation	21/04/20
TW-PRP-D01Z-ZZ-DR-A-4_2103_P02 - Block D01 - South Elevation	Block D01, South Elevation	21/04/20
TW-PRP-D02Z-ZZ-DR-A-4_2203_P02 - Block D02 - South Elevation	Block D02, South Elevation	21/04/20
TW-PRP-D03Z-ZZ-DR-A-4_2303_P02 - Block D03 - South Elevation	Block D03, South Elevation	21/04/20
TW-PRP-D01Z-ZZ-DR-A-4_2100_P02 - Block D01 - West Elevation	Block D01, West Elevation	21/04/20
TW-PRP-D02Z-ZZ-DR-A-4_2200_P02 - Block D02 - West Elevation	Block D02, West Elevation	21/04/20
TW-PRP-D03Z-ZZ-DR-A-4_2300_P02 - Block D03 - West Elevation	Block D03, West Elevation	21/04/20

2.2 Opaque Constructions Used

Table 2 below details the U-values/construction types used within the model for the opaque constructions of the development.

Table 2 - Opaque constructions and U-values used for the modelling of Tolworth

Location	Exposed floor (W/m^2K)	Exposed roof (W/m^2K)	External wall (W/m^2K)	Walls between dwellings and heated spaces	Walls between dwellings and unheated spaces (W/m^2K)	Opaque doors (W/m^2K)
Tolworth	0.13	0.10	0.20	Solid or Fully filled cavity with sealed edges	0.18	1.00

2.3 Glazing Specification

Table 3 below details the glazing parameters used within the model for all glazing constructions.

Table 3 - Glazing constructions

Location	U-value (W/m²K)	G-value (-)	Fraction glazed (%)
Curtain Walling Windows	1.40	0.48	80

2.4 Air Permeability

The air permeability shown below in Table 4 was used throughout the model.

Table 4 - Air permeability

Location	Air permeability (m³/m²/h@50Pa)
Tolworth	3.00*

*note – to use the measured air permeability rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.

2.5 Thermal Bridging

The length of junctions has been measured as per the floor plan drawings in order to complete the thermal bridging calculations. The range of PSI values used across the Tolworth development can be seen in Table 5.

Table 5 – Thermal bridging psi values used in Tolworth

Junction Type	Design PSI-value range
E2 – Other lintels	0.300
E3 – Sills	0.040
E4 – Jamb	0.050
E20 - Exposed floor (normal)	0.320
E7 - Party floor between dwellings (in block of flats)	0.070
E24 – Eaves (insulation at ceiling level – inverted)	0.240
E14 – Flat roof with parapet	0.080
E16 – Corner (normal)	0.090
E17 – Corner (inverted)	-0.090
E18 – Party wall between dwellings	0.060
E25 – Staggered party wall between dwellings	0.120

Junction Type	Design PSI-value range
P7 – Exposed floor (normal)	0.160
P4 – Party wall – roof (insulation at ceiling level)	0.240

2.6 Thermal Mass Parameter

The Thermal Mass Parameter (TMP) value has been modelled at 175 which has been based upon a calculated TMP from a similar building. The TMP range can be seen below in Table 6.

Table 6 – Calculated TMP values for Tolworth

Location	Thermal Mass Parameter value used
Tolworth	175

3. Proposed Specification – Services Description.

The heat source for the space heating requirements for the development will be provided via gas boilers. The water heating will be provided by a Heat Interface Unit (HIU).

The parameters for the heating systems can be found in Table 7 below.

Table 7 - Systems

System	Heating Efficiency (%)	Percentage of Heat (%)
Gas Boilers	89	100

All of the dwellings will be provided with a Mechanical Ventilation with Heat Recovery (MVHR) unit with the parameters outlined in Table 8, as per SAP Appendix Q.

Table 8 - MVHR parameters

Number of wet rooms (excluding kitchen)	Efficiency (%)	Specific Fan Power (SFP) (W/l/s)
1	94	0.62
2	93	0.62
3	93	0.66

4. Criterion 1 – Achieving the TER and TFEE Rate.

The following section details the Criterion 1 results of the Part L1A 2013 analysis.

The Target CO_2 Emission Rate (TER) and Target Fabric Energy Efficiency (TFEE) rate are the minimum energy performance requirements for a new dwelling. The TER and TFEE rate for new dwellings have been calculated with the Elmhurst Design SAP software (version 4.11r11) using the Standard Assessment Procedure (SAP), 2012 edition.

For buildings that contain more than one dwelling (block of flats), the calculated average Dwelling CO_2 Emission Rate (DER) and the average Dwelling Fabric Energy Efficiency (DFEE) rate must be no worse than the average TER and average TFEE rate.

The average DER is the floor-area-weighted average of the individual DERs for all the dwellings in the building, and is calculated in the same way as the average TER. The average DFEE rate is the floor-area-weighted average of the individual DFEE rates for all the dwellings in the building and is calculated in the same way as the average TFEE rate.

All data has been inputted to the best of Hoare Lea's knowledge at the time of modelling. Area-weighted results are shown below in Table 9 and Table 10.

See Appendices C and D for more detailed results.

Table 9 - Criterion 1 - TER/DER results for Tolworth

Location	TER ($kgCO_2/m^2/Annum$)	DER ($kgCO_2/m^2/Annum$)	Improvement over TER	Criterion 1 (Pass/Fail)
Tolworth	20.05	17.96	-10.44%	Pass

Table 10 - Criterion 1 - TFEE/DFEE results for Tolworth

Location	TFEE ($kWh/m^2/Annum$)	DFEE ($kWh/m^2/Annum$)	Improvement over TFEE	Criterion 1 (Pass/Fail)
Tolworth	61.76	54.63	-11.56%	Pass

5. Criterion 2 – Limits of Design Flexibility.

In order to comply with Criterion 2, all U-values and air permeability must be below the limiting values shown in Table 11.

Table 11 - Criterion 2 limiting values

Parameter	Area weighted limiting value	Tolworth
Roof	0.20 (W/m^2K)	0.10 (W/m^2K)
External Wall	0.30 (W/m^2K)	0.20 (W/m^2K)
Floor	0.25 (W/m^2K)	0.13 (W/m^2K)
Glazing/Curtain Walling	2.00 (W/m^2K)	1.40 (W/m^2K)
Air permeability	10.00 ($m^3/m^2/h$)	3.00 ($m^3/m^2/h$)

6. Criterion 3 – Limiting the Effect of Heat Gains in Summer.

Solar gains are beneficial in winter to offset demand for heating but can contribute to overheating in the summer. The effect of solar gains in summer can be limited by the appropriate combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and high thermal mass.

The ventilation strategy for the development is detailed in Table 12.

Table 12 – Ventilation and blinds strategy for Tolworth

	Ventilation Strategy	Internal Blinds
Tolworth	Openable windows	Dark-coloured curtain or roller blind (SAP default)

With the above measures in place, all dwellings pass Criterion 3.

7. Conclusion.

A Part L1A 2013 analysis has been performed for the proposed Tolworth development.

The new building passes Criterion 1, 2 and 3 of Part L1A of the Building Regulations by bettering the target for maximum carbon emission levels and maximum target fabric energy efficiency.

Table 13 and 14 show the area-weighted DER and DFEE for Tolworth in comparison to the TER and TFEE.

Table 13 - Criterion 1 - TER/DER results

Location	TER ($kgCO_2/m^2/Annum$)	DER ($kgCO_2/m^2/Annum$)	Improvement over TER	Criterion 1 (Pass/Fail)
Tolworth	20.05	17.96	-10.44%	Pass

Table 14 - Criterion 1 - TFEE/DFEE results

Location	TFEE ($kWh/m^2/Annum$)	DFEE ($kWh/m^2/Annum$)	Improvement over TFEE	Criterion 1 (Pass/Fail)
Tolworth	61.76	54.63	-11.56%	Pass

The results above show that an area weighted carbon reduction of 10.44% has been achieved.

Summary results and model inputs are found in Appendix A and B with more detailed results in Appendices C, and D.

The final energy performance certification can only be issued when the building has been built and the commissioning figures show that the 'as built' building is consistent with the 'as designed'.

An ADL1A compliance calculation has to be carried out again upon completion of the installation and commissioning to demonstrate the finished building is fully compliant with ADL1A. Should the scheme not comply upon either of these calculations then further improvements must be made at the relevant stage.

It is important that the installation is monitored during construction to ensure that the Part L1A criteria can be achieved upon completion.

Appendix A – SAP Results Sheets showing Inputs and Results.

Appendix B – Summary of Inputs.

Appendix C – Block Compliance Reports

Appendix D - Part L1A 2013 Regulations Compliance Reports.

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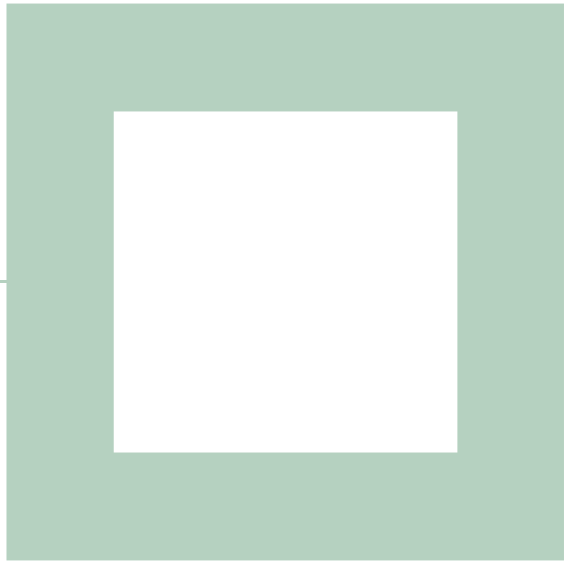

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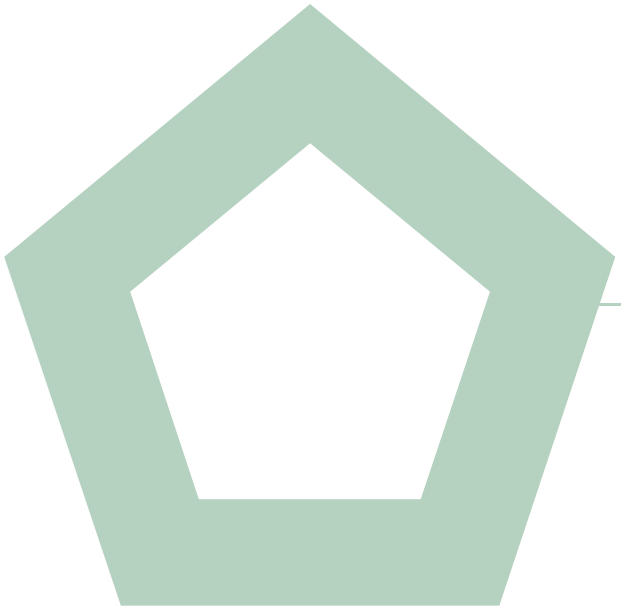
SUSTAINABILITY
STAGE 3 ADL2A MODELLING REPORT

REVISION 0 – 15 APRIL 2020



STAGE 3

Audit sheet.

Rev.	Date	Description	Prepared	Verified
0	15/04/2020	Stage 3 Issue	DP	LH

Document reference: 200415 - Tolworth ADL2A Modelling Report Rev 0.docx

Items for Resolution

Part L2A 2013 Compliance Calculation:	Date:	Completed by: (initials)
At RIBA Stage 3, the Part L2A modelling achieves 2.14% carbon reduction against Part L2013 of the Building Regulations.	15/04/2020	DP
Cooling NEER and SEER have been assumed as 3.50 and 3.90. Heating COP of 3.00 has been assumed.	15/04/2020	DP
Luminaire efficacy of 80 lm/w has been assumed	15/04/2020	DP
Electrical point of user water heater with storage capacity of 15 litres have been assumed.	15/04/2020	DP

Contents.

1. Introduction.

Hoare Lea has been appointed to provide an analysis of Building Regulation ADL2A compliance for the proposed Tolworth development. The building is required to comply with the current 2013 edition of Part L of the Building Regulations.

National Calculation Methodology (NCM) thermal modelling has been used to assess the carbon dioxide emissions of the proposed building and establish the requirements for ADL2A compliance.

2. Model Construction Data.

The following sections detail the drawings used to construct the thermal model and the construction specification that forms the basis of the proposed design. All calculations have been performed using the fully accredited, CIBSE AM11 compliant, IES [Virtual Environment] software suite, version 2017.4.0.0.

2.1 Drawings Used

A list of drawings which have been used to perform the calculations are shown below in Table 1.

Table 1 - Drawings Used

Drawing number	Rev	Issued by	Title	Date
TW-PRP-ZZZ-00-DR-A-4_1000	P01	PRP	Site Plan – Level GF	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1001	P01	PRP	Site Plan – Level 01	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1002	P01	PRP	Site Plan – Level 02	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1003	P01	PRP	Site Plan – Level 03	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1004	P01	PRP	Site Plan – Level 04	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1005	P01	PRP	Site Plan – Level 05	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1006	P01	PRP	Site Plan – Level 06	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1007	P01	PRP	Site Plan – Level 07	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1008	P01	PRP	Site Plan – Level 08	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1009	P01	PRP	Site Plan – Level 09	06/03/2020
TW-PRP-ZZZ-00-DR-A-4_1010	P01	PRP	Site Plan – Level Roof	06/03/2020

Drawing number	Rev	Issued by	Title	Date
TW-PRP-D01Z-ZZ-DR-A-4_2100	P01	PRP	Block D01 – West Elevation	06/03/2020
TW-PRP-D01Z-ZZ-DR-A-4_2101	P01	PRP	Block D01 – North Elevation	06/03/2020
TW-PRP-D01Z-ZZ-DR-A-4_2102	P01	PRP	Block D01 – East Elevation	06/03/2020
TW-PRP-D01Z-ZZ-DR-A-4_2103	P01	PRP	Block D01 – South Elevation	06/03/2020
TW-PRP-D02Z-ZZ-DR-A-4_2200	P01	PRP	Block D02 – West Elevation	06/03/2020
TW-PRP-D02Z-ZZ-DR-A-4_2201	P01	PRP	Block D02 – North Elevation	06/03/2020
TW-PRP-D02Z-ZZ-DR-A-4_2202	P01	PRP	Block D02 – East Elevation	06/03/2020
TW-PRP-D02Z-ZZ-DR-A-4_2203	P01	PRP	Block D02 – South Elevation	06/03/2020
TW-PRP-D03Z-ZZ-DR-A-4_2300	P01	PRP	Block D03 – West Elevation	06/03/2020
TW-PRP-D03Z-ZZ-DR-A-4_2301	P01	PRP	Block D03 – North Elevation	06/03/2020
TW-PRP-D03Z-ZZ-DR-A-4_2302	P01	PRP	Block D03 – East Elevation	06/03/2020
TW-PRP-D03Z-ZZ-DR-A-4_2303	P01	PRP	Block D03 – South Elevation	06/03/2020
TW-PRP-D01Z-ZZ-DR-A-5_0010	P00	PRP	Block D01 Height Rod	06/03/2020
TW-PRP-D01Z-ZZ-DR-A-5_0011	P00	PRP	Block D01 Height Rod through the Balcony	06/03/2020
TW-PRP-D02Z-ZZ-DR-A-5_0015	P00	PRP	Block D02 Height Rod	06/03/2020
TW-PRP-D02Z-ZZ-DR-A-5_0016	P00	PRP	Block D02 Height Rod through the Balcony	06/03/2020
TW-PRP-D03Z-ZZ-DR-A-5_0020	P00	PRP	Block D03 Height Rod	06/03/2020
TW-PRP-D03Z-ZZ-DR-A-5_0021	P00	PRP	Block D03 Height Rod through the Balcony	06/03/2020

2.2 Opaque Constructions Used

The following table details the U-values used within the model for opaque constructions (see Table 2).

Table 2 - Opaque Constructions

Name	U-Value (W/m²K)
External Walls	0.20
Ground Floor	0.13
Roof	0.10
Personnel Doors	2.20
Internal Walls (between Car Park and other spaces)	0.20

2.3 Glazing Constructions Used

Table 3 below details the glazing parameters used within the model for the Tolworth Development.

Table 3 - Glazing Construction

Name	U-Value (W/m²K)	G-Value (-)	Transmittance Factor	Fraction Glazed	Blinds
Windows	1.40	0.48	0.71	0.80	Yes
Glazed Doors	1.40	0.48	0.71	0.80	No

2.4 Internal Blinds

Table 4 below details the internal blinds parameters used within the model for the Tolworth Development.

Table 4 – Blinds Properties

Parameters	Value
Shading Co-efficient	0.40
Short-wave Radiant Fraction	0.30

2.5 Air Permeability

The air permeability shown below in Table 5 was used throughout the model.

Table 5 - Air Permeability

Name	Air Permeability (m³/m².h@50Pa)
Air Permeability	5

3. Proposed Specification – Services Description.

All conditioned spaces will be heated and cooled with fan coil units, connected to the air source heat pump (ASHP). All conditioned spaces will have air supply and extract ventilation through local mechanical ventilation heat recovery units (MVHR).

The modelling has included hot water to all spaces through an instantaneous electrical point of use water heater with the storage capacity of 15 litres. A full list of the parameters used within the model can be found in Appendix A.

4. Achieving the TER – Criterion 1.

The following section details the results of the Part L analysis and the energy breakdown of the Actual and Notional buildings. Data has been inputted to the best of Hoare Lea's knowledge at the time of modelling. The data contained in this report may be critical to the as-built building meeting final approval.

There are two methods to show compliance with Part L2A Criterion 1. These are the dynamic simulation route and the SBEM route. The SBEM route should only be used for simple buildings (Levels 3 and 4). The dynamic simulation route can be used for all levels but is compulsory for larger more complicated buildings (Level 5). The two routes do give different results for a given building but both are acceptable. The more detailed dynamic simulation route has been used for this building.

The Actual and Notional buildings use standardised profiles for inputs such as ventilation rates and occupancies for the purposes of Part L and may not reflect the final energy use. If this is required, a real building simulation should be performed with as-designed ventilation rates, occupancies, etc.

4.1 Energy Use and Carbon Emissions

The charts presented below examine the energy balance of the building. Figure 1 shows the energy comparison while Figure 2 shows the CO_2 comparison. If the 'actual' value is displayed to the right of the dotted line at 50%, this indicates the actual building is performing worse than the notional building.

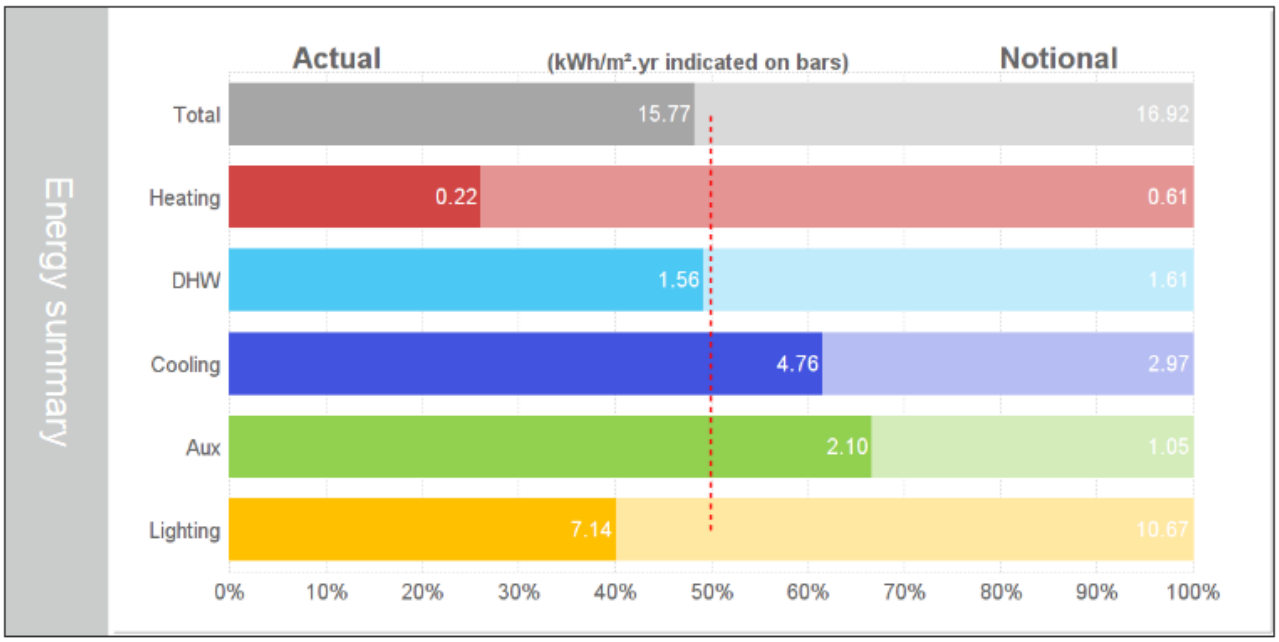


Figure 1 - Chart Showing Notional and Actual Building Energy Breakdown Comparison

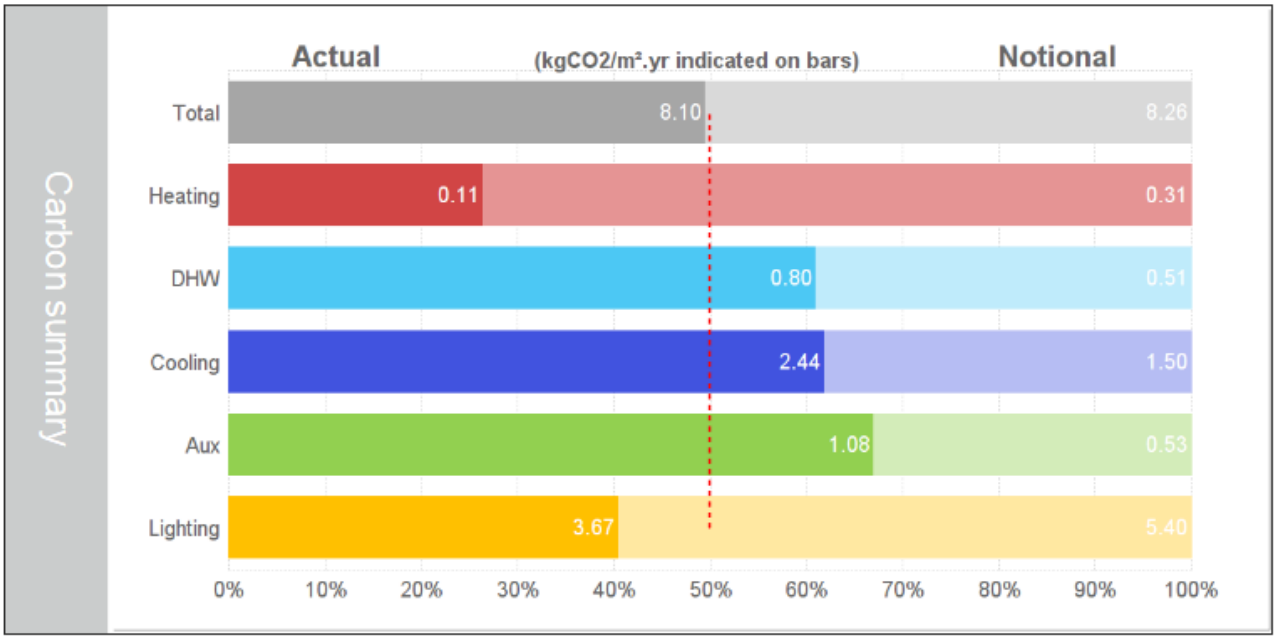


Figure 2 - Chart Showing Notional and Actual Building CO_2 Emissions Breakdown Comparison

The two charts above show that although the domestic hot water services, cooling and auxiliary systems aren't performing as well as the notional, the total emissions are still less than the notional due to the performance of the heating and lighting systems. Table 4 below lists these values in tabular form.

Table 4 - Breakdown of Carbon Dioxide Emissions between Actual and Notional Building

Carbon summary

$kgCO_2/m^2.yr$	Actual	Notional
Heating	0.11	0.31
DHW	0.80	0.51
Cooling	2.44	1.50
Aux	1.08	0.53
Lighting	3.67	5.40
Renewables	(0.00)	(0.00)
Total	**8.10**	**8.26**

Results represent total CO_2 output. BER rating includes applicable adjustment factors.

Figure 2 - Chart Showing Notional and Actual Building CO_2 Emission Breakdown Comparison

Figure 3 shows the percentage breakdown for both the actual and notional carbon emissions. Figure 4 shows the predicted annual CO_2 emissions for the actual building. From this it can be seen that the lighting and auxiliary are the dominant factors in energy and emissions.

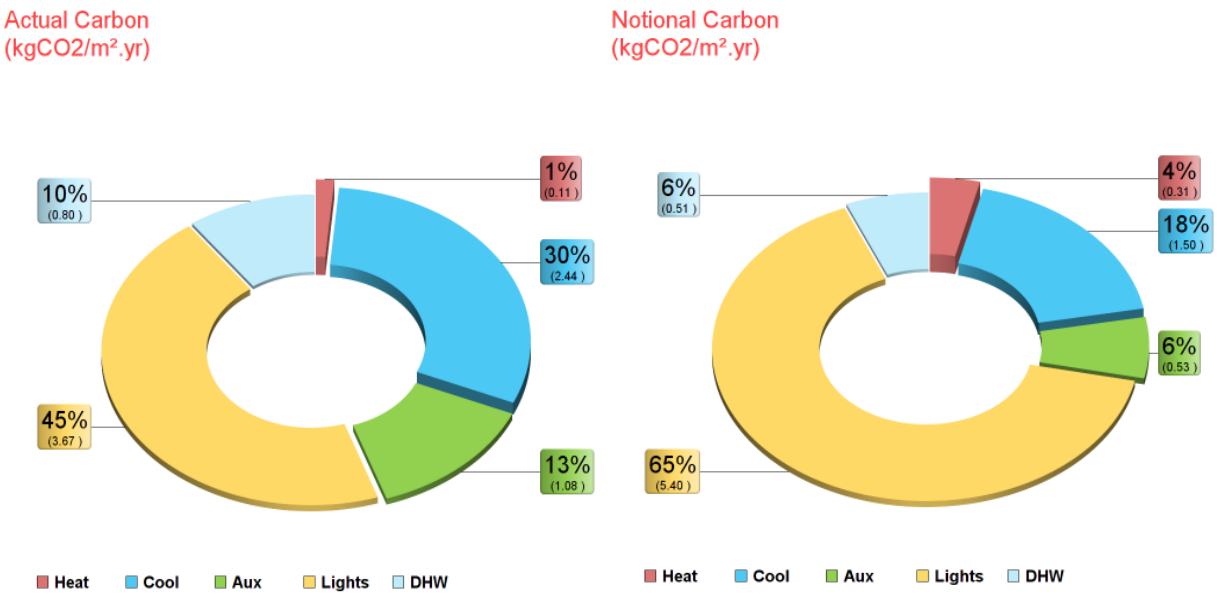


Figure 3- Actual and Notional Breakdown Percentages

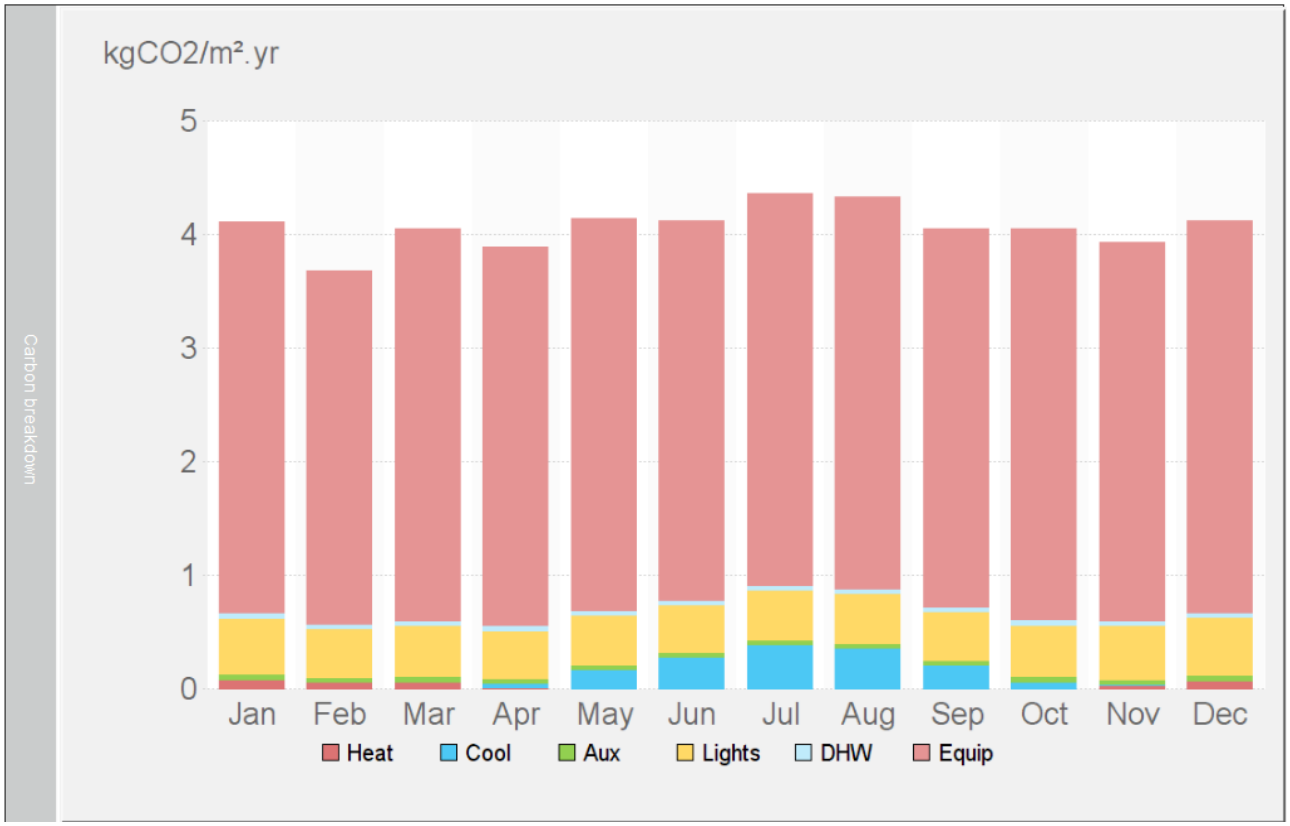


Figure 4 - Predicted Annual CO_2 Emission Profile for Actual Building

5. Limits on Design Flexibility – Criterion 2.

In order to comply with Criterion 2, all U-values and air permeability must be below the limiting values show in Table 6.

Table 6 - Criterion 2 Limiting Values

Parameter	Area weighted limiting value	Tolworth Development designed value (Area-weighted average U-value)
Roof	0.25 (W/m^{2}K)	0.10 (W/m^{2}K)
Wall	0.35 (W/m^{2}K)	0.20 (W/m^{2}K)
Floor	0.25 (W/m^{2}K)	0.13 (W/m^{2}K)
Windows and glazed doors	2.20 (W/m^{2}K)	1.40 (W/m^{2}K)
Doors	2.20 (W/m^{2}K)	2.20 (W/m^{2}K)
Air Permeability	10.00 (m^3/m^2.h)	5.00 (m^3/m^2.h)

6. Limiting the Effects of Heat Gains in Summer – Criterion 3.

A requirement in the 2013 edition of Part L2A is the solar gain limits placed upon each occupied zone within a building. These are calculated on a zone by zone basis giving each zone within the assessment its own target level of annual solar gain which must not be surpassed.

All rooms pass Criterion 3 with the use of solar control glazing and internal blinds. A full breakdown of results for each zone within the building can be found in the BRUKL document contained in Appendix B.

7. Conclusions.

A Part L2A 2013 analysis has been performed for the proposed Tolworth Development.

The new building passes Criterion 1 of Part L2A 2013 of the Building Regulations by bettering the target for maximum carbon emission levels. Results are shown in Table 7 below.

Table 7 - Results

	Target Emission Rate (TER) $kgCO_2/m^2.Annum$	Building Emission Rate (BER) $kgCO_2/m^2.Annum$	Criterion 1 Improvement Over TER %	Criterion 2	Criterion 3
Central House	8.30	8.10	2.41%	Pass	Pass

The carbon dioxide emission breakdowns for both the Actual and Notional buildings have been identified and discussed within section 4.1 of this report.

The simulation has shown that the BER is 2.41% lower than the TER.

As required by the regulations this ADL2A analysis is based on standardised NCM activities and building energy profiles and not the actual building operation. Therefore, while this calculation method is required to prove compliance with Part L2A 2013 of the Building Regulations, it should not be relied upon for sizing of equipment such as AHU, etc. This should always be performed using the load profiles of the building when under 'real life' occupancy and use conditions.

An ADL2A compliance calculation must be carried out again upon completion of the full design and completion of the installation and commissioning to demonstrate the finished building is fully compliant with ADL2A. Should the scheme not comply with the performance targets then further improvements must be made at the relevant stage.

If Hoare Lea are not to produce the 'as-built' certification or if there is there is a deviation from the 'as designed' building without discussion between the relevant parties, Hoare Lea cannot be held responsible for the building meeting final approval.

It is important that the installation is monitored during construction to ensure that the Part L2A 2013 Criteria can be achieved upon completion.

Appendix A – Modelling Inputs.

Appendix B – BRUKL Output.

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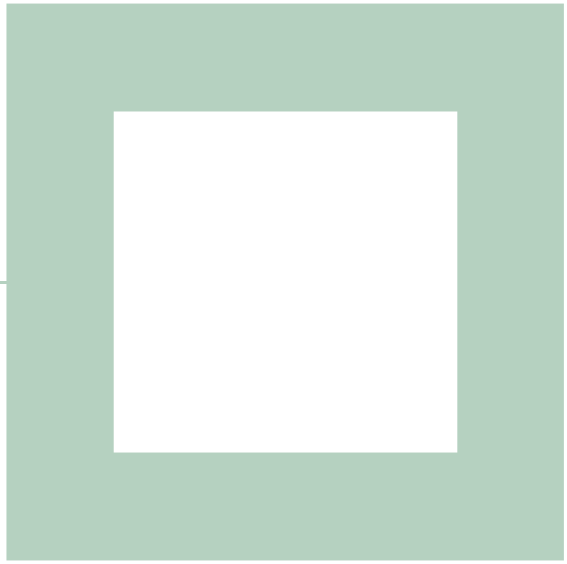

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