Materials strategy

The use of timber and low density, lightweight materials has been a priority in the design so far. This prioritisation must be balanced with the considerable legislative restriction in the use of timber and other combustible materials in UK residential construction.

Early-stage materials strategies should be careful not to rely on overly-ambitious specification, with 'premium' low carbon products dominating decisions that could easily be substituted later in the detailed design work. Instead, the focus should be on alternative lower carbon materials, maximising reuse, and significantly improving material efficiency. Additionally, providing options for prefabricated elements offers a way to reduce wastage and resource use.

This has been the approach taken at Richmond College. The diagram highlights the critical elements to embodied carbon and the intended material choice across the buildings. Materials and products shown in the current strategy are subject to later design changes and are dependent upon further survey information such as geotechnical investigations.

Embodied carbon assessment

An initial review of embodied carbon has been carried out following the RICS 2017 guidance on *Whole life carbon assessment* and using industry benchmark data. The assessment was completed using the One Click LCA tool.

Data is presented on a per square meter basis, established using the Gross Internal Floor Area (GIFA).

This initial analysis has focused on the embodied carbon from the **product** (A1-A3) life stage. Transport and construction carbon impacts have been excluded from current estimates to focus on material efficiency. These later life stages are included within the whole life carbon assessment presented later in the report.

The results show that the terrace homes are likely to be low in embodied carbon compared to industry benchmarks and targets. An overall figure of 225 $kgCO_{2e}/m^2$ has been calculated.

Carbon sequestration

The benefits of storing carbon in materials has not be accounted for in the embodied carbon assessment, despite timber elements being prioritised in the design. The benefits of potential biogenic carbon storage are included in the whole life carbon analysis.

GLAZING

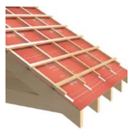
- Timber triple/double glazed windows with aluminium cladding
- Triple/double glazed bi-fold patio doors

Nordan AluClad

25 $kg/CO_{2e}/m^2$

TOP

- Timber rafters and tile battens
- Targeted elements of structural steel

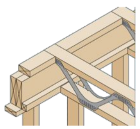


Sandtoft Roof Solutions

15 $kg/CO_{2e}/m^2$

MID

- Metal web joist timber upper floors
- Lightweight chipboard finish

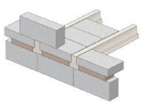


Posi-Joist system

12 $kg/CO_{2e}/m^2$

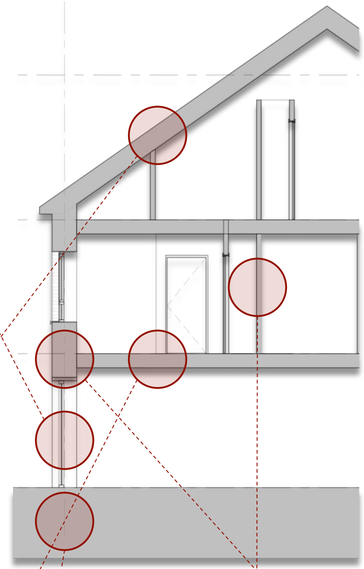
BASE

- Compact trench fill foundations with reinforced concrete
- Precast concrete beam and block floor with screed finish



Forterra floor system

45 $kg/CO_{2e}/m^2$



EXTERIOR

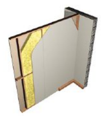
- Lightweight precast concrete blockwork structural wall
- Stone wool insulation with brick finish

Stone wool insulation

36 $kg/CO_{2e}/m^2$

INTERIOR

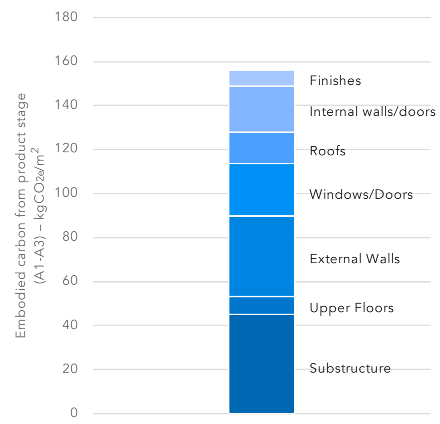
- Timber partition walls with plasterboard finish
- Precast concrete blockwork party wall with full fill insulation



British Gypsum

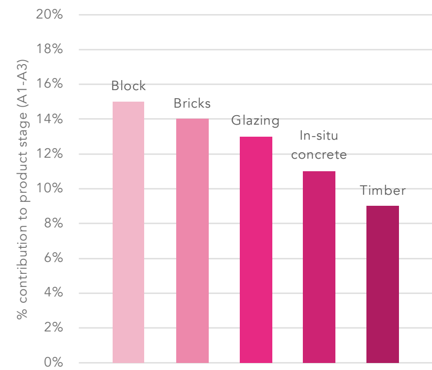
23 $kg/CO_{2e}/m^2$

Estimated embodied carbon emissions - life stages A1-A3



600 $kg/CO_{2e}/m^2$	300 $kg/CO_{2e}/m^2$	<250 $kg/CO_{2e}/m^2$
RIBA & LETI 2020 Target	*RIBA & LETI 2030 Target*	*A1-A3 emissions for Terraces*

Impact of material types - life stages A1-A3



Etude

Embodied carbon | Apartments

Materials strategy

The apartment buildings at Richmond College are based around a reinforced concrete frame with reinforced concrete foundations and floors slabs.

As with the terraces, the strategy has not sought to rely on low carbon materials at this stage, instead looking at efficiencies in the the overall weight of the building resulting in slimmer concrete frame. This has resulted in an efficient concrete structure with an external wall designed to meet the high energy efficiency standards expected for the site.

Materials and products shown in the current strategy are subject to later design changes and are dependent upon further survey information such as geotechnical investigations.

Embodied carbon assessment

An initial review of embodied carbon has been carried out following the RICS 2017 guidance on *Whole life carbon assessment* and using industry benchmark data. The assessment was completed using the One Click LCA tool.

Data is presented on a per square meter basis, established using the Gross Internal Floor Area (GIFA).

This initial analysis has focused on the embodied carbon from the **product** (A1-A3) life stage. Transport and construction carbon impacts have been excluded from current estimates to focus on material efficiency. These later life stages are included within the whole life carbon assessment presented later in the report.

The results show that the terrace homes are likely to be low in embodied carbon compared to industry benchmarks and targets. An overall figure of 250 $kgCO_{2e}/m^2$ has been calculated.

Cement replacement

Detailed work has been carried out by the structural engineer to understand an appropriate level of cement replacement for the apartments.

Cement replacement can play a significant role in reducing the embodied carbon impacts of concrete structures. However, cement replacement materials are quickly becoming over specified when considered against their domestic production levels. It is therefore more important that an industry appropriate level is assumed in calculations at this stage in design.

GLAZING

- Timber triple/double glazed windows with aluminium cladding
- Triple/double glazed balcony doors

Nordan AluClad

17 kg/CO2e/m²

TOP

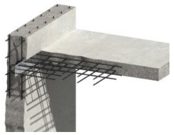
- Screed with XPS insulation layer
- Aggregate ballast or green/brown roof finish

Ravago XPS X

6 kg/CO2e/m²

MID

- In-situ reinforced concrete superstructure frame with poured slabs and steel rebar

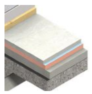


Ancon reinforcement

133 kg/CO2e/m²

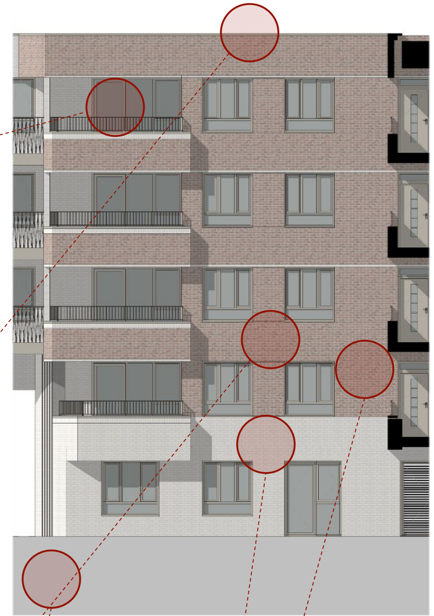
BASE

- Piled foundation with pile caps
- In-situ reinforced concrete insulated ground floor slab – 40% cement replacement



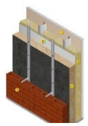
Kingspan ground floor insulation

48 kg/CO2e/m²



EXTERIOR

- Light steel framing system insulated infill
- Brickwork facade



Example build up

39 kg/CO2e/m²

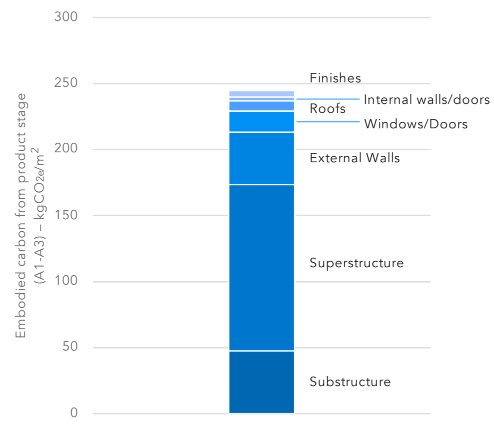
INTERIOR

- Timber partition walls with plasterboard finish

British Gypsum

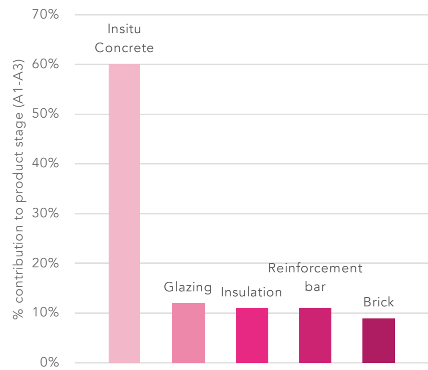
2 kg/CO2e/m²

Estimated embodied carbon emissions - life stages A1-A3



600 kg/CO2e/m²	300 kg/CO2e/m²	250 kg/CO2e/m²
RIBA & LETI 2020 Target	*RIBA & LETI 2030 Target*	*A1-A3 emissions for Apartments*

Impact of material types - life stages A1-A3



Etude

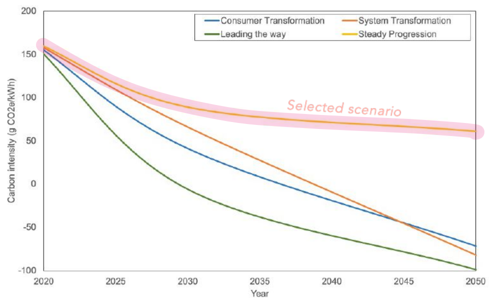
Analysis across the development's lifetime

Using the analysis of operational energy and embodied carbon we can build a picture of how the development will emit carbon throughout its lifetime.

The chart on this page shows the building life stages and events for both building types at Richmond College, giving indicative figures for greenhouse gas emissions at each point.

Results

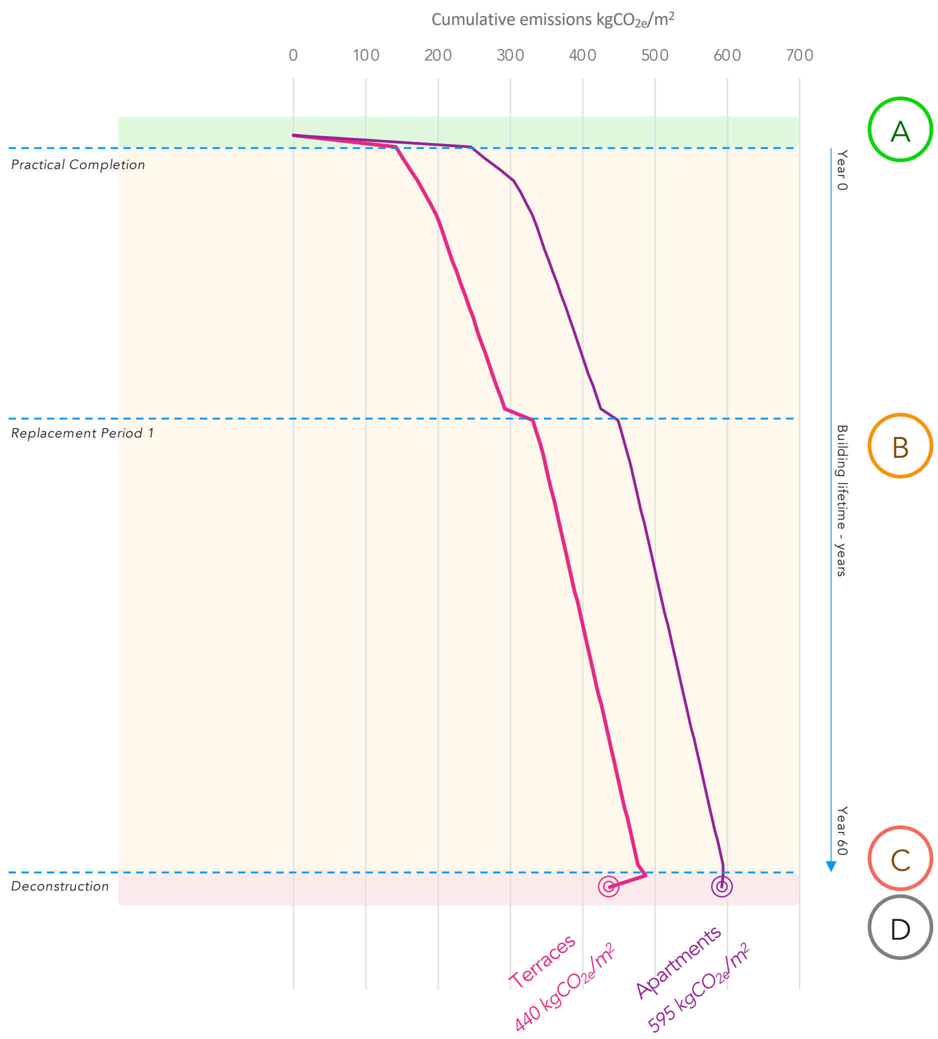
A full analysis of whole life carbon has been carried out in accordance with the latest draft GLA guidance on the issue. The GLA WLC spreadsheet required as part of applications, will be sent over via email following the submission.



National Grid - Future Energy Scenarios 2020

	Life stage	Life stage description	What is considered on this development
A	**A1-A5** *Upfront carbon*	The emissions from products and materials, their transport and construction impacts.	• The embodied carbon calculated in previous pages is added to assumptions for transportation and construction emissions. • Assumed values follow the RICS PS methodology.
B	**B1** *Ongoing emissions and sequestration*	Parts of the development will be responsible for directly emitting GHG emissions on continual basis - other parts will sequester carbon, either directly or through their procurement for the development. This is spread over the lifetime of the development.	• Biogenic – mostly from timber products. Sequesters carbon annually from replacement planting • Refrigerant from heat pumps – leakage and replacement of refrigerant contributes to GHG emissions
	B3-B5 *Maintenance, replacement and repair of elements*	The building's expected to be 60 years (minimum), however, several of the elements will require major overhaul or replacement ahead of this. The emissions associated with this routine event are allocated to this life stage event.	• A glazing replacement period has been allowed for despite the glazing product specified having a lifetime of 60 years.
	B6-B7 *Operational energy and water consumption*	The energy consumption for the buildings is used in conjunction with national projections for energy generation carbon intensity. This is combined with the impacts of water consumption.	• Operational energy for all buildings has been reduced as highlighted in previous sections. A rate of 60 kWh/m^2/year has been set for this calculation as a conservative estimate. • National projections for the carbon intensity of the grid from the National Grid (shown above). • Water consumption is expected to be at most 120 litres per person per day.
C	**C1-C4** *Deconstruction and demolition*	At the end of the building's 60 year operational life the assumption is that all parts of the building are deconstructed or demolished.	• Forecasting the carbon impacts of this life stage is problematic. Assumptions based on those in the RICS PS have been included for.
D	**D** *Reuse, recycling, or recovery potential*	Following the deconstruction of the buildings an estimate is made on how much of the material can be repurposed and at what further carbon cost.	• Forecasting the carbon impacts of this life stage is problematic. Assumptions based on those in the RICS PS have been included for.

Whole lifecycle emissions for Apartments and Terraces



Etude

Circular economy

Contributing to change

Moving toward circularity in construction requires developers to take small individual steps in many directions to allow the industry to make this larger leap.

The Applicant has already sought to find new ways to embed circularity into development on previous sites and intends to bring the learning from this to Richmond College.

Site approach

The scheme includes the demolition of existing College buildings, removal of hard-surfacing, site clearance and groundworks together with the redevelopment of the site to provide 212 residential units across a collection of buildings up to 5 storeys in height, together with associated parking, cycle parking, open space and landscaping.

Circular economy has been reviewed in two directions:

What's already there:

- Undertaking an in-depth, pre-demolition audit with circularity being a focus; and
- Maximising material and resource recovery from materials on site and being creative about opportunities.

What will be added

- Design out waste though a considered approach to construction;
- Sourcing low-impact materials, high in recycled content and low embodied components;
- A no excuses policy for household recycling; and
- Develop clear maintenance strategy and programme for maintenance and elemental replacement.

Clarion Housing and the circular economy

Clarion Housing have identified the positive link between sustainable development and circular economy principles.

As the UK's largest housing association, they recognise that those with a long-term interest in the homes they are building, e.g. registered housing providers, should be at the forefront of circular design and construction of homes. By fulfilling this role registered housing providers will both be helping their resident and reaping the long-term financial savings.

Maximising residual value

The existing site has a wealth of materials that could be reused and repurposed as part of the development of Richmond College. Some possible identified uses for materials are:

- **Bricks** – Can be reused in construction and through the application of landscape features and elements.
- **Concrete** – Concrete can be reused as aggregate in sub-base and concrete manufacture.
- **Glass** – can be used as aggregate in concrete production, but when processed to certain standards to limit the alkali-silica-reaction. High value glazing like this also has high reclamation potential.
- **Tarmac** – road arisings can be used in sub-surface reconstruction
- **Aggregates** – construction waste can be used as aggregates for the development of the proposed development.

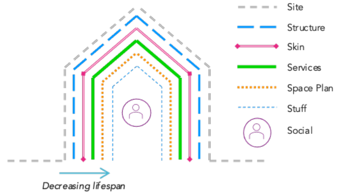
Google maps image of existing Richmond College building and hard standing

The Applicant is committed to carry out a detailed pre-demolition audit with a focus on material retention and recycling. The methodology used for this audit will be adapted to recognise recent work by ReLondon and the BRE.

Where material cannot be reused on site, its wider reuse in the local area will be a priority. Feeding in and supporting the development of local material banks in this way is a key component of developing circularity in construction.

Adaptability and flexibility

Building in layers is the core concept of creating adaptable and flexible buildings. This principle considers the intended lifespan of each building "Layer" – site, structure, skin, services, space plan, stuff.



Adapted building in layers diagram from Loughborough University

The key to increasing the longevity of a building is to ensure that each layer is designed to be as independent as possible. By isolating these different layers, identifying what can be refurbished, upgraded or replaced, it is possible to develop a strategy for extending the lifecycle of the overall building and development.

The Applicant is a long-term asset owner of multiple new buildings, and therefore has a vested interested in ensuring the retained value of materials and elements within the buildings is maximised and ease of maintenance improved.

This approach offers significant benefits to homeowners and tenants as it enables maintenance to be undertaken with minimal disruption, allows future upgrade of building services to ensure buildings are as efficient as possible and supports adaptation of the internal layout to meet changing homeowner needs.

Summary of targets for development

- A detailed and thorough pre-demolition audit in-line with latest best practice guidance from ReLondon
- Continued investigation through detailed design stages of:
    - Lime mortar use in brickwork
    - Deconstruction of reinforced concrete superstructure
    - Recycled material in landscaping
- Fully recyclable and long life windows and doors
- Provision of dedicated space for storing demolition material for reuse elsewhere, if required.

Diversion of waste for demolition

95% Volume m^3 or 95% Tonnes

Amount of construction waste generated per $100m^2$ of GIA

7.5 Volume m^3 or 6.5 Tonnes

Target operational recycling waste rates

50%

Water consumption

Reducing internal water use

Part G of the Building Regulations requires a maximum water consumption of 125 litres/person/day. The design at Richmond College will look to meet and surpass this requirement with a target of 105 litres/person/day.

Internal potable water consumption will be minimised through the use of water-efficient taps, showerheads and water-saving appliances. Careful consideration of sanitaryware and low flow fittings will enable these savings at no extra cost.

A breakdown of anticipated flow rates from such fittings and devices is shown below; flow rates are in line with AECB recommendations to the right of the page.

< 105
litres/person/day

- **Showers:** <8 litres/min
- **Hand wash taps**: <4 litres/min
- **Kitchen taps:** <6 litres/min
- **WC:** dual flush 4-6 litres
- **Washing Machine:** 6.5 litres/kg of dry load
- **Dishwasher:** 1 litre/place setting
- **Bath Capacity:** 160 litres to overflow

Appliance	Good Practice Requirement
Showers	6 to 8 l/min measured at installation. Mixer to have separate control of flow and temperature although this can be achieved with a single lever with 2 degrees of freedom (lift to increase flow, rotate to alter temperature). All mixers to have clear indication of hot and cold, and with hot tap or lever position to the left where relevant.
Basin and bidet taps (domestic)	4 to 6 l/min measured at installation (per pillar tap or per mixer outlet). All mixers to have clear indication of hot and cold with hot tap or lever position to the left.
Basin taps (washroom)	≤ 1.7 l/min measured at installation. Dead leg <0.5 litres.
Kitchen sink taps	6 to 8 l/min measured at installation. All mixers to have clear indication of hot and cold with hot tap or lever position to the left.
White Goods	Best energy class available, see energy standard for details.
WCs	≤ 6 l full flush when flushed with the water supply connected[4]. All domestic installations to be dual flush. All valve-flush (as opposed to siphon mechanism) WCs to be fitted with an easily accessible, quarter turn isolating valve with a hand-operated lever. Where a valve-flush WC is installed, the Home User Guide must include information on testing for leaks and subsequent repair. No requirement for dual flush for non-domestic installations.
Urinals	Where urinals are to be installed the designer shall justify the choice of technology, see text. For low user numbers, flush per use generally results in lower water use than automatic flushing. Where automatic flushing is installed it shall be controlled to provide two flushes an hour of no more than 4.5 litres/bowl, see text. Waterless urinals are preferred but evidence shall be provided to demonstrate that the running cost and environmental impact is less than for flushed urinals since some models have a high consumable cost.
Baths	≤ 180 litres measured to the centre line of overflow without allowing for the displacement of a person. Note that some product catalogues subtract the volume of an average bather. A shower must also be available. If this is over the bath then it must be suitable for stand-up showering with a suitable screen or curtain.

Flow rates recommended by the AECB, (©AECB)

Etude

Flood risk & drainage

Flood risk

Sweco produced a Flood Risk Assessment and Drainage Strategy for the site in April 2021. Their report assessed the risk of flooding for the proposed site and surrounding neighbourhood. The report also includes a surface water drainage strategy and surface water management strategy.

The Flood Risk Assessment concluded that the site is located within Flood Zone 1 and is at a low risk of flooding from tidal/fluvial sources. EA mapping also shows that most of the site is at a 'very low' risk of surface water flooding, with some small localised areas in the north at a low risk of surface water flooding. The risk of flooding from river and tidal sources, water bodies and infrastructure is deemed negligible. The assessment indicates that there is some minor potential risk of flooding to the site from surface water and groundwater flooding.

The proposed development will lead to a 28% decrease in impermeable surfacing on-site. The proposed surface water drainage system will direct on-site surface water through permeable paving for the access roads and parking areas to the underground attenuation via a ground pipe system.

Finished floor levels should be raised above surrounding ground levels with falls away from the building and entrances to ensure that low ground levels adjacent to the building have a suitable overland flood flow route and do not rely entirely on piped drainage systems.

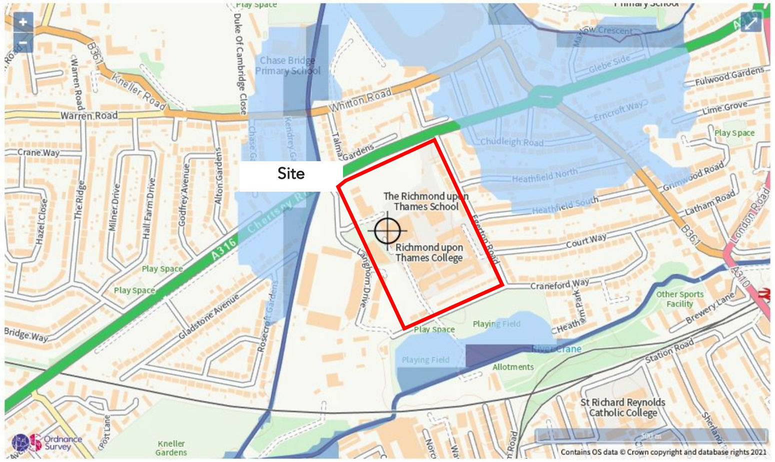
Sustainable urban drainage

The required storage volume has been sized to store 1 in 100 annual probability storm events including a 40% increase in rainfall intensity in order to allow for climate change.

Based on C753, brown roofs are proposed to reduce peak flow rates to the site drainage system for small to medium sized events. Geocellular systems will serve as temporary storage of surface water run-off, while the attenuation crates will provide approximately 730 m^3 of total attenuation volume to hold flows anticipated for the worst-case rainfall event.

The maximum rate at which surface water is discharged from the site will be restricted to to 5 l/s.

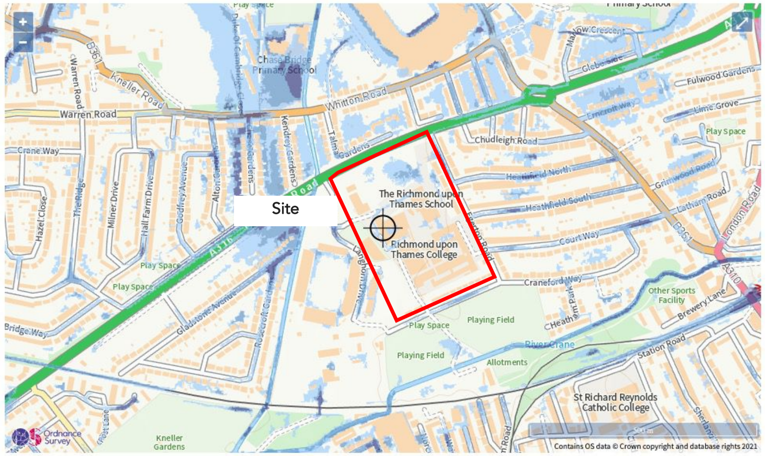
There will be separate foul water networks for the east and west of the development due to the constraints of site levels and meeting an existing outfall.



Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

Environment Agency – Fluvial/Tidal Flood Risk Map. The Richmond College site is marked with red outline and falls within Flood zone 1. (source: RPS)



Extent of flooding from surface water

High Medium Low Very low Location you selected

Updated Flood Risk Map for Surface Water. The Richmond College site is marked with red outline and falls within a 'Very Low' Flood risk from surface water (source: RPS)

Etude

Transport

A Transport Assessment was produced by RGP to provide a summary of the highway and transport planning input for the proposed redevelopment of the Richmond College. The final TA will outline proposals in line with the 10 indicators of TFL's Healthy Streets for London guidance.

Walking

There are numerous amenities within 8 to 15-minute walking distance from the site including off-licence, supermarket, dentist, ATM, gym, recreational grounds, café, bicycle store, GP practice and post office.

Accessibility to public transport

The site's Public Transport Accessibility Level (PTAL) rating is 3 which represents an 'Moderate' level of accessibility to public transport for the site.

The site is 770 metres (10-minutes walk) from Twickenham Rail Station (Southwestern Railway). There are also four bus services (110, 481, 681 & 281) that stop on the bus stop on Whitton Road which is within an 8-minute walk from the site.

Cycle provision

Cycle parking layouts have been sized for the blocks to comply with the London Plan standards (1.5 space per 1 bed / 2 spaces per 2 bed+, etc.).

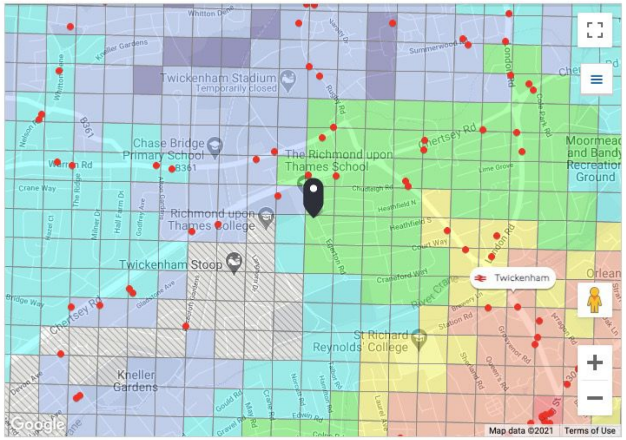
The cycle stores on site will provide space for 387 cycles in total. The proposals include a range of different parking methods to suit all abilities, including a mixture of cycle stackers, 'Sheffield' type cycle stands and 'oversized' spaces for cargo bikes and tricycles, recumbent bikes, bicycles with trailers and tandem bikes for instance.

Cars

There will be 110 car parking spaces provided for the proposed 212 dwellings. This will include 103 standard and 7 disabled parking bays.

In line with London Plan 20% of the parking spaces within the care park will be equipped with 'active' charging points for electric cars (22 spaces) with the remaining 80% (86 spaces) connected to a 'passive' charging provision for potential future use. All car parking spaces will therefore be provided with ducting and wiring to allow for future electric vehicle charging points to be installed.

Cycle storage



You can click anywhere on the map to change the selected location.

PTAL output for Base Year
3

TW2 7SL
Egerton Rd, Twickenham TW2 7SL, UK
Easting: **515424**, Northing: **173879**

Transport for London's PTAL rating for the Richmond College site 'Moderate' rating

Transport for London's Healthy Streets for London 10 Indicators

Etude

Waste

Primary bin stores are located on the ground floor for both the blocks and the terrace houses.

Residents of the blocks will be encouraged to sort and transport their own waste down to communal store at ground floor level.

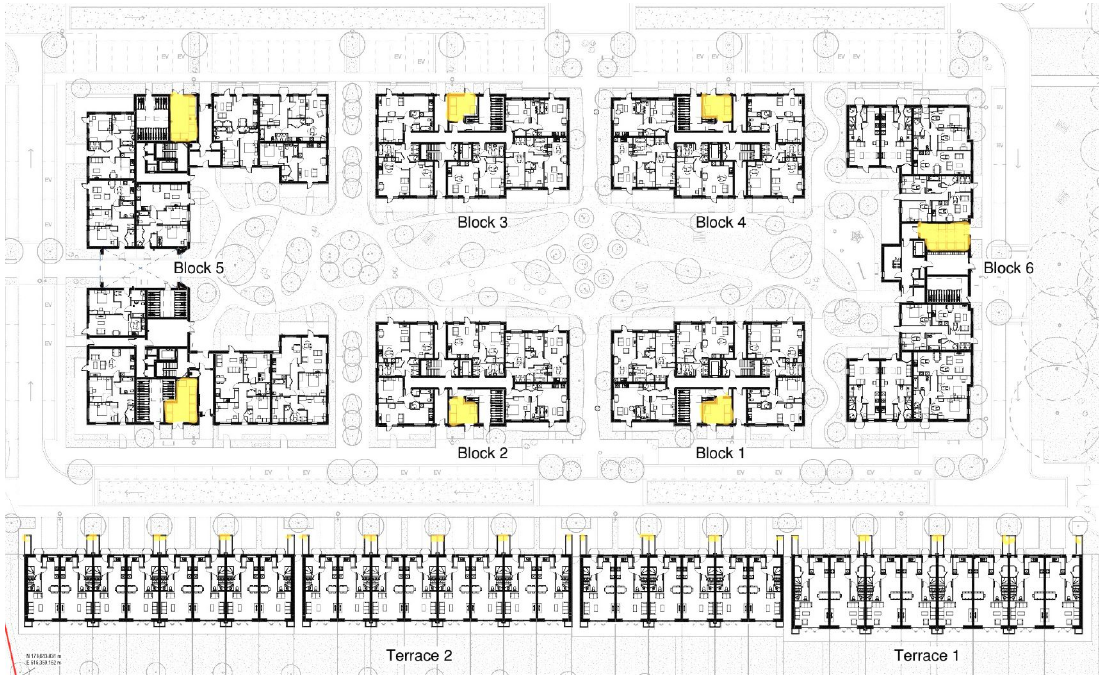
Waste storage

Communal bins have been sized in line with the British Standard BS 5906:2005 "Waste management in buildings. Code of practice". This allows for the following provision:

*general waste arising is presumed to be 75% of the total residential waste arising. It is understood that recent annual domestic recycling rates in Haringey have been around 30%.

**to encourage additional recycling, and in line with BS5906:2005 recommendations, recyclable waste storage is based on 50% of the total residential waste arising.

The bin storage and collection points for all the apartment blocks are located within suitable distances of the carriageway edge. In some cases, a separate refuse collection point would be provided closer to the highway, with bins moved by the residents prior to the collection day. The collection distances provided for operatives are a 25m minimum distance for the houses (household refuse bins) and a 12m distance for the apartments (larger communal bins).



Ground floor plan highlighting provision for operational waste

Block 3	Weekly arising	Storage requirement	Storage capacity
General waste*	2610 L	3 x 1,100-litre bins	3,300 L
Recyclable waste**	1740 L	2 x 1,100-litre bins	2,200 L

Block 5	Weekly arising	Storage requirement	Storage capacity
General waste*	7973 L	8 x 1,100-litre bins	8,800 L
Recyclable waste**	5315 L	5 x 1,100-litre bins	5,500 L

Block 6	Weekly arising	Storage requirement	Storage capacity
General waste*	2550 L	3 x 1,100-litre bins	3,300 L
Recyclable waste**	1700 L	2 x 1,100-litre bins	2,200 L

Etude

Ecology & Biodiversity

Preliminary ecological assessment

Delta Simons were commissioned by the Client to undertake a Preliminary Ecological Appraisal (PEA) and Bat Roost Potential (BRP) Survey of Richmond College.

The PEA comprised a desk study, *Phase 1 Habitat Survey, protected species assessment and the BRP*, which identified areas of potential to support species of conservation concern or other species which could present a constraint to the development of the site. The key conclusions from this assessment are summarised below. Guidance on enhancement of biodiversity as part of the proposals was also provided.

Summary

A Phase 1 Habitat Survey showed the 1.94 ha site comprised of the college with associated buildings and hard and soft landscaping. The habitats present on site are generally considered widespread and common and are of limited ecological value. Specifically:

- The buildings on site had low to moderate potential to support roosting bats. The site generally had suitable foraging opportunities and the connectivity to the surrounding residential properties provide further opportunities. Therefore, a precautionary approach to its' demolition is required.
- The trees, scrub, and introduced scrub within the site had the potential to support nesting birds. According to the Arboricultural impact assessment, a total of 13 trees and 9 tree groups are currently located on site. Six trees were assessed to have low BRP with extensive ivy coverage and rot holes, which are subject to felling and management works, or alternatively will be assessed by a licenced bat ecologist for potential roost features.
- Cotoneaster and pink snowberry are present on site. Several cotoneaster species are listed on Schedule 9 of the WCA as invasive species, while pink snowberry is not listed it does have prolific growth and can impede the biodiversity of the area. Therefore, these species should be subject to a suitable management plan.
- Due to the presence of suitable habitat on the site, recommendations to protect hedgehogs during construction and occupation have been made.
- The site is surrounded by residential properties and their gardens as well as an area of amenity space for a block of flats west of the site. Therefore, to ensure no adverse impacts, good practice guidelines should be adhered to during construction to ensure protection from contamination, dust etc. during the build.

Biodiversity enhancement

As the site is currently of limited ecological value, the redevelopment of Richmond College could provide genuine biodiversity gain for the area. Delta Simons suggested the following could be done to enhance the biodiversity of the site post-development:

- Rain gardens and ecological corridor planting including native species
- Installation of bat and bird boxes
- Protection of existing trees along the eastern boundary

Wildlife friendly planting

Provision of native species or vegetation of known value to wildlife should be sourced from local nurseries for the landscaping schemes io enhance foraging opportunities for local birds and bats, by increasing the invertebrate diversity on-site.

Installation of bat and bird boxes

Bat and bird boxes are recommended within the final development design to enhance the site for breeding and mitigate for loss of suitable habitat for these species. The boxes should be installed on-site or integrated into the new buildings. Delta Simons should be consulted to inform the type and locations of the new bird and bat boxes for the site once final developments are known.

Wildlife friendly lighting

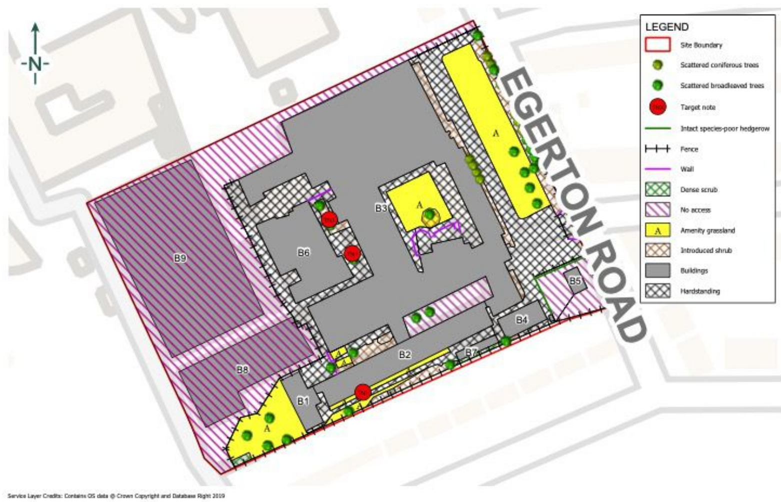
It is advised to maintain dark corridors to minimize the attraction and disturbance to the insect and bat populations. Therefore, any new lighting should not have UV elements; ideally have lux levels between 0 and 2; have a warm white spectrum and feature peak wavelengths higher than 550nm.

Landscape design

The hard and soft landscaping strategy for Richmond College has been provided by Levitt Bernstein. The retaining existing matured trees on site and enhancing the landscape.

- Planting will be chosen to provide ecological value including those that produce flowers, seeds, fruits and berries. The extensive new planting scheme should aim to enhance the ecological value and support the biodiversity on-site. Several new trees and shrubs are proposed to be incorporated in the scheme.
- In consultation with the ecologist, bat and bird boxes will be installed within the final redevelopment design to enhance the site for breeding and mitigate any loss of suitable habitat for these species.

Provisional landscape arrangement plan, March 2021



Phase 1 Habitat Survey Map – Delta Simons Preliminary Ecological Assessment, Mar 2021

Etude

13.0

Appendices

- Key energy modelling assumptions
- SAP worksheets

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Appendix A | Summary of key energy modelling assumptions | NZC Block of flats

Assumption	PHPP	SAP	Notes
General			
Weather file (height above OD)	GB0002a-Silsoe (11m)	Address input	
Calculated occupancy	Standard residential occupancy – 27.4 persons	-	
Winter design temperature	20°C	-	
Software version	9.6a	1.0.4.25	
Building Fabric			
Air permeability	0.6 $m^3/m^2/h$ @ 50Pa (0.6 h^{-1} @ 50Pa)	0.6 $m^3/m^2/h$ @ 50Pa (0.6 h^{-1} @ 50Pa)	
Average external wall U-value	0.13 $W/m^2.K$	0.15 $W/m^2.K$ Area-weighted. Including effect of brick shelves, etc.	PHPP: does not include the effect of thermal bridging from structure and masonry support system, which is added
Average ground floor U-value	0.10 $W/m^2.K$	0.08 $W/m^2.K$	PHPP: excludes effect of ground SAP: includes effect of ground.
Ground conditions	A default assumption for heat loss through the ground assumes a conductivity suitable for sand/gravel/moist clay.		
Average roof U-value	0.10 $W/m^2.K$	0.10 $W/m^2.K$	
Terrace U-value	0.15 $W/m^2.K$	0.15 $W/m^2.K$	Assumed - Not given in energy statement.
Window U-value	Frame U-value 0.85 $W/m^2.K$ Glass U-value 0.55 $W/m^2.K$	Whole window 0.8 $W/m^2.K$	Assumes glazing to frame ratio based on 90mm thick frames.
Window g-value	0.5	0.5	
External doors U-value	0.9 $W/m^2.K$	0.9 $W/m^2.K$	Average U-value of door and frame, not including installation thermal bridge.
Blinds or movable shading	None assumed	None assumed	
Fixed shading	Estimated based on overhang and reveal shading of windows, and horizon shading from adjacent buildings		
Staircase	As it is part of the thermal envelope the staircase has been considered a 'warm' space for the purpose of SAP calculations. This is to be validated with Building Control.		

Thermal bridges for SAP	Junction type	Linear Thermal Transmittance (Ψ-Value)
	E1: Steel intel with perforated steel base plate	0.10 W/mK
	E2: Lintels	0.10 W/mK
	E3: Sill	0.05 W/mK
	E4: Jamb	0.05 W/mK
	E5: Ground floor / external wall junction	0.16 W/mK
	E7: Party floor between dwellings	0.05 W/mK
	E23: Balcony	0.23 W/mK
	E23: Deck	0.14 W/mK
	E15: (Main) flat roof with parapet	0.089 W/mK
	E15: (Green) flat roof with parapet	0.099 W/mK
	E16: Corner (normal)	0.07 W/mK
	E17: Corner (inverted)	-0.07 W/mK
	E18: Party wall between dwellings	0.10 W/mK
	E20: Exposed floor (normal)	0.057 W/mK
	P1: Ground floor	0.16 W/mK
	P3: Intermediate floor between dwellings / party wall junction	0.00 W/mK
	P4: Roof / party wall junction	0.24 W/mK
	E21: Eaves (insulation at ceiling level – inverted)	0.10 W/mK
	E24: Eaves (insulation at ceiling level – inverted)	0.12 W/mK
	E12: Gables (insulation at ceiling level)	0.24 W/mK
	E10: Eaves (insulation at ceiling level)	0.12 W/mK

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Assumption	PHPP	SAP	Notes
Ventilation Systems			
System	Balanced Mechanical Ventilation with Heat Recovery (MVHR). Zehnder Comfoair Q450 or similar		Unit should be Passivhaus certified.
Efficiency	SFP = 0.48 W/l.s Heat recovery efficiency = 90%	SFP = 0.48 W/l.s Heat recovery efficiency = 90%	PHPP uses Passivhaus tested values, SAP uses Appendix Q database value. Heat recovery efficiency for MVHR unit not including duct losses.
External duct connections	External ducts are less than 4m to outside.	-	External duct connections are pre-insulated to 25 mm.
Ventilation rates	0.4 ACH sufficient to provide fresh air requirement	-	
Summer ventilation	Provided by opening windows to achieve at least 1ach per flat.		
Electricity			
Lighting	LED fixed lighting throughout. Efficacy 80 lumens/Watt.	100% fixed low energy lighting.	
Lighting controls:	Manual switching.		
Equipment usage	Washing machine, dishwasher and fridge / integrated fridge-freezer per flat. All appliances have an ErP rating of A++/A+++	Regulated electricity use only.	PHPP: Allowance for consumer electronics and small appliances. Allowance for lift consumption in standby and operational mode / based on energy efficient lift data
Clothes drying	All clothes drying is via an external or internal clothes line. No tumble drier.	-	
Cooking	Electric oven. Electric induction hob.	-	
Domestic Hot Water			
Consumption	Calculated assumption 25 l/person/day	-	
Water heating	Various options modelled	Various options modelled	
Shower waste water heat recovery	All showers, 50% heat recovery efficiency		
Space Heating			
Heating system	Various options modelled		
Solar Photovoltaics			
Panel specification	360W monocrystalline silicon		
Inverter	Microinverter or DC optimiser		
Orientation	East/West (off 25 degrees)		
Tilt	15°	Horizontal	

Assumptions are for energy calculations only. They are based on the design information provided to date. Where detailed information is not known, a safe assumption has been made. Etude should be made aware of any discrepancy between the assumptions and the design information. Estimates of heating energy demand at this stage are based on assumed use, and performance of products, materials, systems and construction quality in the building. There is a substantial margin for error. The assumptions that effect the estimated heating energy are summarised for each building. It is very important that these specification items are maintained through technical design and construction. Small changes in specification could have a disproportionate effect on the performance of the building.

Appendix B | Summary of key energy modelling assumptions | NZC House

Assumption	PHPP	SAP	Notes
General			
Weather file (height above OD)	GB0002a-Silsoe (11m)	Address input	
Calculated occupancy	Standard residential occupancy – 2.2 persons	-	
Winter design temperature	20°C	-	
Software version	9.6a	1.0.4.25	
Building Fabric			
Air permeability	0.67 $m^3/m^2/h$ @ 50Pa (0.6 h^{-1} @ 50Pa)	0.67 $m^3/m^2/h$ @ 50Pa (0.6 h^{-1} @ 50Pa)	
Average external wall U-value	0.10 $W/m^2.K$ 0.13 $W/m^2.K$ for bay wall and 2F wall to terrace.	0.10 $W/m^2.K$ Area-weighted..	PHPP: does not include the effect of thermal bridging from structure and masonry support system, which is added
Average ground floor U-value	0.10 $W/m^2.K$	0.10 $W/m^2.K$	PHPP: excludes effect of ground SAP: includes effect of ground.
Ground conditions	A default assumption for heat loss through the ground assumes a conductivity suitable for sand/gravel/moist clay.		
Average roof U-value	0.10 $W/m^2.K$ 0.12 $W/m^2.K$ for secondary roof at lower level, 0.15Wm^2K for terrace and bay roofs.	0.10 $W/m^2.K$	
Terrace U-value	None assumed	None assumed	
Window U-value	Frame U-value 0.90 $W/m^2.K$ Glass U-value 0.60 $W/m^2.K$	Whole window 0.8 $W/m^2.K$	Assumes glazing to frame ratio based on 90mm thick frames.
Window g-value	0.5	0.5	
External doors U-value	0.9 $W/m^2.K$	0.9 $W/m^2.K$	Average U-value of door and frame, not including installation thermal bridge.
Blinds or movable shading	None assumed	None assumed	
Fixed shading	Estimated based on overhang and reveal shading of windows, and horizon shading from adjacent buildings		

Thermal bridges for SAP	Junction type	Linear Thermal Transmittance (Ψ-Value)
	E1: Steel intel with perforated steel base plate	0.10 W/mK
	E2: Lintels	0.10 W/mK
	E3: Sill	0.05 W/mK
	E4: Jamb	0.05 W/mK
	E5: Ground floor / external wall junction	0.16 W/mK
	E7: Party floor between dwellings	0.05 W/mK
	E23: Balcony	0.23 W/mK
	E23: Deck	0.14 W/mK
	E15: (Main) flat roof with parapet	0.089 W/mK
	E15: (Green) flat roof with parapet	0.099 W/mK
	E16: Corner (normal)	0.07 W/mK
	E17: Corner (inverted)	-0.07 W/mK
	E18: Party wall between dwellings	0.10 W/mK
	E20: Exposed floor (normal)	0.057 W/mK
	P1: Ground floor	0.16 W/mK
	P3: Intermediate floor between dwellings / party wall junction	0.00 W/mK
	P4: Roof / party wall junction	0.24 W/mK
	E21: Eaves (insulation at ceiling level – inverted)	0.10 W/mK
	E24: Eaves (insulation at ceiling level – inverted)	0.12 W/mK
	E12: Gables (insulation at ceiling level)	0.24 W/mK
	E10: Eaves (insulation at ceiling level)	0.12 W/mK

Assumption	PHPP	SAP	Notes
Ventilation Systems			
System	Balanced Mechanical Ventilation with Heat Recovery (MVHR). Zehnder Comfoair Q350 or similar		Unit should be Passivhaus certified.
Efficiency	SFP = 0.48 W/l.s Heat recovery efficiency = 90%	SFP = 0.48 W/l.s Heat recovery efficiency = 90%	PHPP uses Passivhaus tested values, SAP uses Appendix Q database value. Heat recovery efficiency for MVHR unit not including duct losses.
External duct connections	External ducts are less than 2m to outside.	-	External duct connections are pre-insulated to 25 mm.
Ventilation rates	0.4 ACH sufficient to provide fresh air requirement	-	
Summer ventilation	Provided by opening windows to achieve at least 1ach per flat.		
Electricity			
Lighting	LED fixed lighting throughout. Efficacy 80 lumens/Watt.	100% fixed low energy lighting.	
Lighting controls:	Manual switching.		
Equipment usage	Washing machine, dishwasher and fridge / integrated fridge-freezer per flat. All appliances have an ErP rating of A++/A+++	Regulated electricity use only.	PHPP: Allowance for consumer electronics and small appliances.
Clothes drying	All clothes drying is via an external or internal clothes line. No tumble drier.	-	
Cooking	Electric oven. Electric induction hob.	-	
Domestic Hot Water			
Consumption	Calculated assumption 25 l/person/day	-	
Water heating	Various options modelled	Various options modelled	
Shower waste water heat recovery	Not considered in baseline		Should be considered as an option
Space Heating			
Heating system	Good practice heat pump assumed		
Solar Photovoltaics			
Panel specification	360W monocrystalline silicon		
Inverter	Microinverter or DC optimiser		
Orientation	South (155°)		
Tilt	To roof pitch (35°)	Pitched	

Assumptions are for energy calculations only. They are based on the design information provided to date. Where detailed information is not known, a safe assumption has been made. Etude should be made aware of any discrepancy between the assumptions and the design information. Estimates of heating energy demand at this stage are based on assumed use, and performance of products, materials, systems and construction quality in the building. There is a substantial margin for error. The assumptions that effect the estimated heating energy are summarised for each building. It is very important that these specification items are maintained through technical design and construction. Small changes in specification could have a disproportionate effect on the performance of the building.

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Appendix C | Summary of key energy modelling assumptions | Non-NZC Apartment blocks

Assumption	SAP	Notes
General		
Weather file (height above OD)	Address input	
Calculated occupancy	-	
Winter design temperature	-	
Software version	1.0.4.25	
Building Fabric		
Air permeability	< 3 $m^3/m^2/h$ @ 50Pa	
Average external wall U-value	0.15 $W/m^2.K$	Area-weighted. Including effect of brick shelves, etc.
Average ground floor U-value	0.10 $W/m^2.K$	SAP: includes effect of ground.
Ground conditions	A default assumption for heat loss through the ground assumes a conductivity suitable for sand/gravel/moist clay.	
Average roof U-value	0.10 $W/m^2.K$	
Terrace U-value	0.14 $W/m^2.K$	Assumed - Not given in energy statement.
Window U-value	Whole window 1.30 $W/m^2.K$	Assumes glazing to frame ratio based on 90mm thick frames.
Window g-value	0.5	
External doors U-value	0.9 $W/m^2.K$	Average U-value of door and frame, not including installation thermal bridge.
Blinds or movable shading	None assumed	
Fixed shading	Estimated based on overhang and reveal shading of windows, and horizon shading from adjacent buildings	
Staircase	As it is part of the thermal envelope the staircase has been considered a 'warm' space for the purpose of SAP calculations. This is to be validated with Building Control.	

Thermal bridges for SAP	Junction type	Linear Thermal Transmittance (Ψ-Value)
	E1: Steel intel with perforated steel base plate	0.10 W/mK
	E2: Lintels	0.10 W/mK
	E3: Sill	0.05 W/mK
	E4: Jamb	0.05 W/mK
	E5: Ground floor / external wall junction	0.16 W/mK
	E7: Party floor between dwellings	0.05 W/mK
	E23: Balcony	0.23 W/mK
	E23: Deck	0.14 W/mK
	E15: (Main) flat roof with parapet	0.089 W/mK
	E15: (Green) flat roof with parapet	0.099 W/mK
	E16: Corner (normal)	0.07 W/mK
	E17: Corner (inverted)	-0.07 W/mK
	E18: Party wall between dwellings	0.10 W/mK
	E20: Exposed floor (normal)	0.057 W/mK
	P1: Ground floor	0.16 W/mK
	P3: Intermediate floor between dwellings / party wall junction	0.00 W/mK
	P4: Roof / party wall junction	0.24 W/mK
	E21: Eaves (insulation at ceiling level – inverted)	0.10 W/mK
	E24: Eaves (insulation at ceiling level – inverted)	0.12 W/mK
	E12: Gables (insulation at ceiling level)	0.24 W/mK
	E10: Eaves (insulation at ceiling level)	0.12 W/mK

Assumption	SAP	Notes
Ventilation Systems		
System	Balanced Mechanical Ventilation with Heat Recovery (MVHR). Zehnder Comfoair Q450 or similar	
Efficiency	SFP < 0.7 W/l.s Heat recovery efficiency = 85%	SAP uses Appendix Q database value. Heat recovery efficiency for MVHR unit not including duct losses.
External duct connections	-	External duct connections are pre-insulated to 25 mm.
Summer ventilation	Provided by opening windows to achieve at least 1ach per flat.	
Electricity		
Lighting	100% fixed low energy lighting.	
Lighting controls	Manual switching	
Equipment usage	Regulated electricity use only.	PHPP: Allowance for consumer electronics and small appliances. Allowance for lift consumption in standby and operational mode / based on energy efficient lift data
Clothes drying	-	
Cooking	-	
Domestic Hot Water		
Consumption	Calculated assumption 25 l/person/day	
Water heating	Various options modelled	
Shower waste water heat recovery	Not considered in baseline	Should be considered as an option
Space Heating		
Heating system	Various options modelled	
Solar Photovoltaics		
Panel specification	360W monocrystalline silicon	
Inverter	Microinverter or DC optimiser	
Orientation	East/West (off 25 degrees)	
Tilt	15° (Horizontal)	

Assumptions are for energy calculations only. They are based on the design information provided to date. Where detailed information is not known, a safe assumption has been made. Etude should be made aware of any discrepancy between the assumptions and the design information. Estimates of heating energy demand at this stage are based on assumed use, and performance of products, materials, systems and construction quality in the building. There is a substantial margin for error. The assumptions that effect the estimated heating energy are summarised for each building. It is very important that these specification items are maintained through technical design and construction. Small changes in specification could have a disproportionate effect on the performance of the building.

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Appendix D | Summary of key energy modelling assumptions | Non-NZC Houses

Assumption	SAP	Notes
General		
Weather file (height above OD)	Address input	
Calculated occupancy	-	
Winter design temperature	-	
Software version	1.0.4.25	
Building Fabric		
Air permeability	< 3 m^3/m^2/h @ 50Pa	
Average external wall U-value	0.15 W/m^2.K	Area-weighted. Including effect of brick shelves, etc.
Average ground floor U-value	0.15 W/m^2.K	SAP: includes effect of ground.
Ground conditions	A default assumption for heat loss through the ground assumes a conductivity suitable for sand/gravel/moist clay.	
Average roof U-value	0.15 W/m^2.K	
Terrace U-value	0.18 W/m^2.K	Assumed - Not given in energy statement.
Window U-value	Whole window 1.30 W/m^2.K	Assumes glazing to frame ratio based on 90mm thick frames.
Window g-value	0.5	
External doors U-value	1.2 W/m^2.K	Average U-value of door and frame, not including installation thermal bridge.
Blinds or movable shading	None assumed	
Fixed shading	Estimated based on overhang and reveal shading of windows, and horizon shading from adjacent buildings	

Thermal bridges for SAP	Junction type	Linear Thermal Transmittance (Ψ-Value)
	E1: Steel intel with perforated steel base plate	0.10 W/mK
	E2: Lintels	0.10 W/mK
	E3: Sill	0.05 W/mK
	E4: Jamb	0.05 W/mK
	E5: Ground floor / external wall junction	0.16 W/mK
	E7: Party floor between dwellings	0.05 W/mK
	E23: Balcony	0.23 W/mK
	E23: Deck	0.14 W/mK
	E15: (Main) flat roof with parapet	0.089 W/mK
	E15: (Green) flat roof with parapet	0.099 W/mK
	E16: Corner (normal)	0.07 W/mK
	E17: Corner (inverted)	-0.07 W/mK
	E18: Party wall between dwellings	0.10 W/mK
	E20: Exposed floor (normal)	0.057 W/mK
	P1: Ground floor	0.16 W/mK
	P3: Intermediate floor between dwellings / party wall junction	0.00 W/mK
	P4: Roof / party wall junction	0.24 W/mK
	E21: Eaves (insulation at ceiling level – inverted)	0.10 W/mK
	E24: Eaves (insulation at ceiling level – inverted)	0.12 W/mK
	E12: Gables (insulation at ceiling level)	0.24 W/mK
	E10: Eaves (insulation at ceiling level)	0.12 W/mK

Assumption	SAP	Notes
Ventilation Systems		
System	Balanced Mechanical Ventilation with Heat Recovery (MVHR). Zehnder Comfoair Q450 or similar	
Efficiency	SFP < 0.7 W/l.s Heat recovery efficiency = 85%	SAP uses Appendix Q database value. Heat recovery efficiency for MVHR unit not including duct losses.
External duct connections	-	External duct connections are pre-insulated to 25 mm.
Summer ventilation	Provided by opening windows to achieve at least 1ach per flat.	
Electricity		
Lighting	100% fixed low energy lighting.	
Lighting controls	Manual switching	
Equipment usage	Regulated electricity use only.	PHPP: Allowance for consumer electronics and small appliances.
Clothes drying	-	
Cooking	-	
Domestic Hot Water		
Consumption	Calculated assumption 25 l/person/day	
Water heating	Various options modelled	
Shower waste water heat recovery	Not considered in baseline	Should be considered as an option
Space Heating		
Heating system	Various options modelled	
Solar Photovoltaics		
Panel specification	360W monocrystalline silicon	
Inverter	Microinverter or DC optimiser	
Orientation	South (155°)	
Tilt	To roof pitch (35°)	

Assumptions are for energy calculations only. They are based on the design information provided to date. Where detailed information is not known, a safe assumption has been made. Etude should be made aware of any discrepancy between the assumptions and the design information. Estimates of heating energy demand at this stage are based on assumed use, and performance of products, materials, systems and construction quality in the building. There is a substantial margin for error. The assumptions that effect the estimated heating energy are summarised for each building. It is very important that these specification items are maintained through technical design and construction. Small changes in specification could have a disproportionate effect on the performance of the building.

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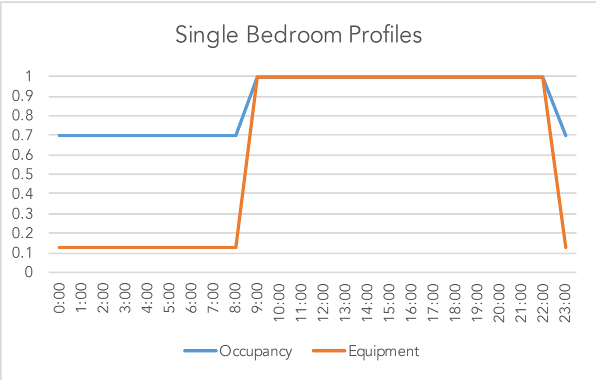
Occupancy and Equipment Profiles

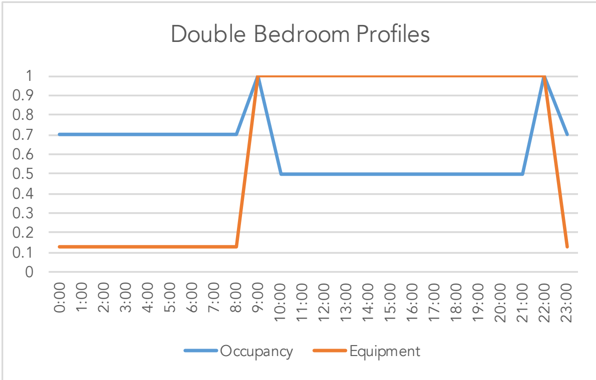
In order to assess the risk of overheating, a series of assumptions regarding how a room will be used throughout the day must be made. The images below show the profiles for both the occupancy (people) in the room, and the equipment use expected in each room in line with the CIBSE TM59 residential overheating guidance. Please note that these are fixed TM59 inputs and cannot be changed.

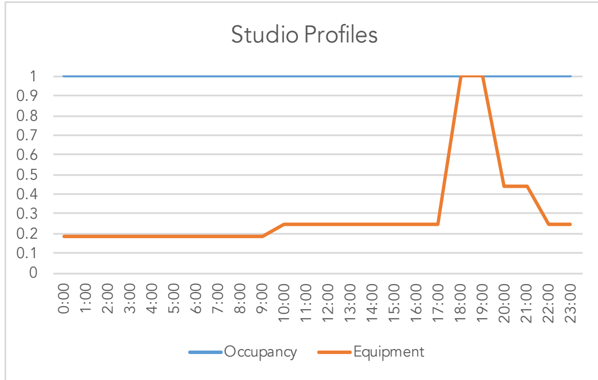
These profiles are then applied to the peak occupancy and equipment load for each room summarised in the adjacent table.

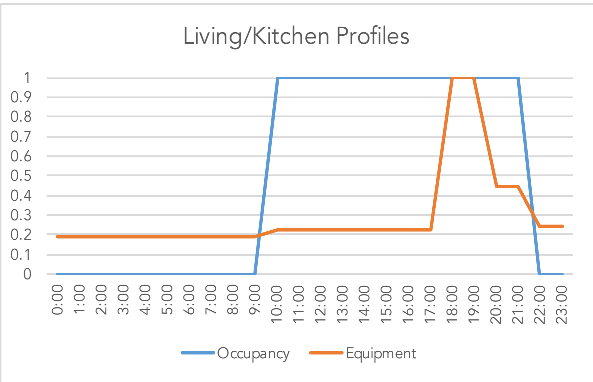
Modelled occupancy and equipment loads in each room (CIBSE TM59)

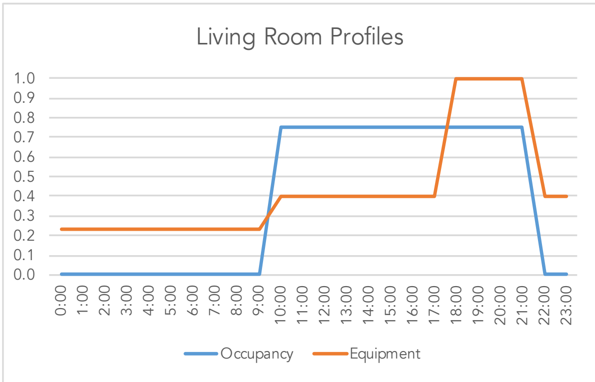
	Single Bedroom	Double Bedroom	Studio Apartment	1 Bed Living / Kitchen	1 Bed Living Room	1 Bed Kitchen	2 Bed Living / Kitchen	2 Bed Living Room	2 Bed Kitchen	3 Bed Living / Kitchen	3 Bed Living Room	3 Bed Kitchen
Occupancy	1 Person (130W)	2 People (260W)	2 People (260W)	1 Person (130W)	1 Person (130W)	1 Person (130W)	2 People (260W)	2 People (260W)	2 People (260W)	3 People (390W)	3 People (390W)	3 People (390W)
Equipment	80W	80W	450W	450W	150W	300W	450W	150W	300W	450W	150W	300W

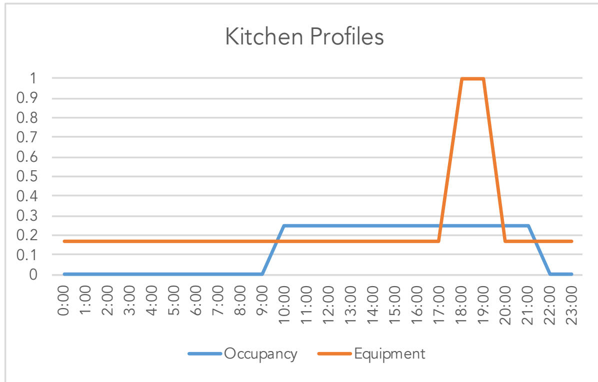












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Terrace 1 "Be Lean"

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 28 July 2021 at 15:15:56

Project Information:

Assessed By:	()	**Building Type:**	End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 151m²	
Site Reference :	RC-T1	**Plot Reference:**	Unit1
Address :			

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	16.1 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.80 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.29 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.61 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	OK
Hot water controls:	Cylinderstat	OK

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.6	
Maximum	1.5	OK
MVHR efficiency:	96%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (South England):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	7.2m²	
Windows facing: North West	4.8m²	
Windows facing: South East	2.88m²	
Windows facing: North West	5.88m²	
Windows facing: North West	0.98m²	
Windows facing: West	3.15m²	
Windows facing: North West	1.47m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind Closed 100% of daylight hours	

10 Key features

Air permeablility	3.0 m³/m²h
Roofs U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K
Community heating, heat from boilers – mains gas	
Community heating, heat from boilers – biomass	

Terrace 1 “Be Clean”

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 28 July 2021 at 15:23:32

Project Information:

Assessed By: () **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 151m²
Site Reference : RC-T1 **Plot Reference:** Unit1
Address :

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)		
Fuel factor: 1.55 (electricity (c))		
Target Carbon Dioxide Emission Rate (TER)	23.84 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.01 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.29 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.61 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	OK
Hot water controls:	Cylinderstat	OK

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.6	
Maximum	1.5	OK
MVHR efficiency:	96%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (South England):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	7.2m²	
Windows facing: North West	4.8m²	
Windows facing: South East	2.88m²	
Windows facing: North West	5.88m²	
Windows facing: North West	0.98m²	
Windows facing: West	3.15m²	
Windows facing: North West	1.47m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind	
	Closed 100% of daylight hours	

10 Key features

Air permeablility	3.0 m³/m²h
Roofs U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K
Community heating, heat from electric heat pump	
Community heating, heat from boilers – biomass	

Terrace 1 “Be Green”

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 28 July 2021 at 15:31:39

Project Information:

Assessed By:	()	**Building Type:**	End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE		Total Floor Area: 151m²	
Site Reference :	RC-T1	**Plot Reference:**	Unit1
Address :			

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)		
Fuel factor: 1.55 (electricity (c))		
Target Carbon Dioxide Emission Rate (TER)	23.84 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	-12.54 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.29 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.61 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	OK
Hot water controls:	Cylinderstat	OK

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.6	
Maximum	1.5	OK
MVHR efficiency:	96%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (South England):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	7.2m²	
Windows facing: North West	4.8m²	
Windows facing: South East	2.88m²	
Windows facing: North West	5.88m²	
Windows facing: North West	0.98m²	
Windows facing: West	3.15m²	
Windows facing: North West	1.47m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind	
	Closed 100% of daylight hours	

10 Key features

Air permeablility	3.0 m³/m²h
Roofs U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K
Community heating, heat from electric heat pump	
Community heating, heat from boilers – biomass	
Photovoltaic array	

Etude

Terrace 4 "Be Lean"

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 02 August 2021 at 20:12:56

Project Information:

Assessed By: () **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 115.9m²
Site Reference : RC-T2 **Plot Reference:** Unit1
Address :

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.74 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.12 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.1 kWh/m²	
		OK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.10 (max. 0.30)	0.10 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.81 (max. 2.00)	0.90 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	0.60 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.61 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	OK
Hot water controls:	Cylinderstat	OK

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Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.6	
Maximum	1.5	OK
MVHR efficiency:	96%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (South England):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	4.8m²	
Windows facing: South East	7.2m²	
Windows facing: North West	2.94m²	
Windows facing: South East	2.88m²	
Windows facing: North West	2.94m²	
Windows facing: North West	3.15m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind	
	Closed 100% of daylight hours	

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10 Key features

Air permeablility	0.6 m³/m²h
Windows U-value	0.8 W/m²K
Doors U-value	0.9 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K
Community heating, heat from boilers – mains gas	
Community heating, heat from boilers – biomass	

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Terrace 4 "Be Clean"

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 28 July 2021 at 15:36:52

Project Information:

Assessed By: () **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 115.9m²
Site Reference : RC-T2 **Plot Reference:** Unit1
Address :

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)
Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)	27.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.49 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.10 (max. 0.30)	0.10 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.81 (max. 2.00)	0.90 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	0.60 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.61 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	OK
Hot water controls:	Cylinderstat	OK

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Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.6	
Maximum	1.5	OK
MVHR efficiency:	96%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (South England):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	4.8m²	
Windows facing: South East	7.2m²	
Windows facing: North West	2.94m²	
Windows facing: South East	2.88m²	
Windows facing: North West	2.94m²	
Windows facing: North West	3.15m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind	
	Closed 100% of daylight hours	

10 Key features

Air permeablility	0.6 m³/m²h
Windows U-value	0.8 W/m²K
Doors U-value	0.9 W/m²K
Roofs U-value	0.1 W/m²K
External Walls U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K

Community heating, heat from electric heat pump
Community heating, heat from boilers – biomass

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Etude

Terrace 4 "Be Green"

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41
Printed on 28 July 2021 at 15:39:34

Project Information:

Assessed By: ()
Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE
Total Floor Area: 115.9m²
Site Reference : RC-T2
Plot Reference: Unit1
Address :

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity (c)		
Fuel factor: 1.55 (electricity (c))		
Target Carbon Dioxide Emission Rate (TER)	27.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	-9.22 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.81 (max. 2.00)	0.90 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	0.60 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - Heat pump	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.61 kWh/day	
	Permitted by DBSCG: 2.56 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and TRVs	OK
Hot water controls:	Cylinderstat	OK

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Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.6	
Maximum	1.5	OK
MVHR efficiency:	96%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (South England):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	4.8m²	
Windows facing: South East	7.2m²	
Windows facing: North West	2.94m²	
Windows facing: South East	2.88m²	
Windows facing: North West	2.94m²	
Windows facing: North West	3.15m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind	
	Closed 100% of daylight hours	

10 Key features

Air permeablility	0.6 m³/m²h
Windows U-value	0.8 W/m²K
Doors U-value	0.9 W/m²K
Roofs U-value	0.1 W/m²K
Floors U-value	0.1 W/m²K
Community heating, heat from electric heat pump	
Community heating, heat from boilers – biomass	
Photovoltaic array	

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