



Energy Statement

Port Control Centre, Gravesend

Port of London Authority

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1.0 EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

On behalf of the Port of London Authority (PLA), HDR has undertaken an energy strategy and overheating assessment for the Port Control Centre Development, located within Gravesham Borough, in Gravesend, Kent. It details the approach taken to energy and overheating in line with the current Building Regulations Part L Vol2 2021 for existing non-domestic buildings, Gravesham’s Local Plan (2014), and the industry standard overheating methodology CIBSE TM52.

The approach taken for the energy assessment responds to Gravesham Local Plan by demonstrating energy efficiency measures, the consideration of low carbon and renewable energy generation, in line with Part L Volume 2 2021.

The design team has looked for opportunities to reduce the energy consumption of the building through optimised building fabric, passive design, and energy efficient building services.

This energy and overheating assessment demonstrates for the proposed development:

- Part L 2021 Vol 2 **compliance** (sections 3-6 & 10-12) for non-domestic existing buildings
- Part L 2021 Solar gains check (section 4)
- TM52 overheating analysis **pass** (using London Gatwick DSY1-3 and 2020-2080 weather files)

Building Regulations Part L 2021

Under Building Regulations Part L Volume 2 2021, the proposed development is classified as an existing building as the extension is less than 25% of the floor area of the existing building. Consequential improvements are not applicable as the development is under 1,000m². Compliance is demonstrated within this report.

Passive Design and Energy Efficiency

The following building **fabric and passive design measures** are proposed to limit heat gains and losses within the building and improve energy efficiency:

- The existing façade and structure shall be retained and renovated with a high-performance insulated cladding
- All windows shall be replaced with glazing with a low thermal transfer parameter (U-value)
- Optimised glazing g-value to limit unwanted excess summer solar gain but maintain a level of useful winter solar gains
- New extension shall utilise high-performance insulated fabric
- Low air permeability

The following **energy efficiency** measures within the building services design are proposed for the development:

- High-efficacy LED lamps/luminaires with efficient lighting controls help to further maximise the use of natural daylight and reduce artificial lighting loads and energy use

- Provision of efficient air source heat pumps for heating and cooling
- Heat recovery on mechanical ventilation and air handling plant
- Photovoltaic panels

Excessive Solar Gains and Overheating

The risk of **excessive solar gains and overheating** has been considered for the development and assessed in line with Part L 2021 and CIBSE TM52 methodology. All occupied spaces were assessed against a selection of future weather files using the TM49 methodology.

The following passive design and energy efficiency measures also mitigate the risk in line with the cooling hierarchy:

- Optimised glazing g-value to limit unwanted excess summer solar gain
- Externally cladding the existing façade provides a level of external shading from deep window recesses
- Low internal gains through efficient lighting
- Hybrid ventilation system to reduce cooling load

All occupied spaces pass the Part L 2021 solar gain check and CIBSE TM52 criteria. This indicates that there is a reduced risk of overheating in these spaces.

Table 1 Summary of TM52 Overheating Analysis for the Port Control Centre Development

Zone	Part L 2021 Limiting Solar Gains Check	TM52 Compliance Status
Hydrographics and flexible workspace	Pass	Pass
Pilot ready	Pass	Pass
Meeting rooms	Pass	Pass
Mess rooms	Pass	Pass
General workspace	Pass	Pass

The results and conclusion of this report are valid for the information and details used at the time of assessment and report writing. Due to the holistic nature of the overheating assessment any changes in the design criteria stated in this report will have a direct impact on the risk of summertime overheating and may subsequently change the results reported.

For further information on sustainability please refer to separate Sustainability Statement produced by Bennetts Associates.

2.0 INTRODUCTION



INTRODUCTION

This Energy Statement is submitted on behalf of the Port of London Authority to accompany the planning application for the redevelopment of the Port Control Centre which is located within Gravesend Borough in Gravesend, Kent.

This Energy Statement has been prepared by HDR and details the energy and overheating strategy for the Proposed Development.

2.1 Site Description

The site is located on Royal Pier Road, as shown on , (Easting: 566327 Northing: 174257) and is approximately 300m north east of Gravesend Station, immediately south of the river Thames. The site is predominantly occupied by buildings forming the Port of London Authority's estate of office buildings and associated ground level and under croft car parking.

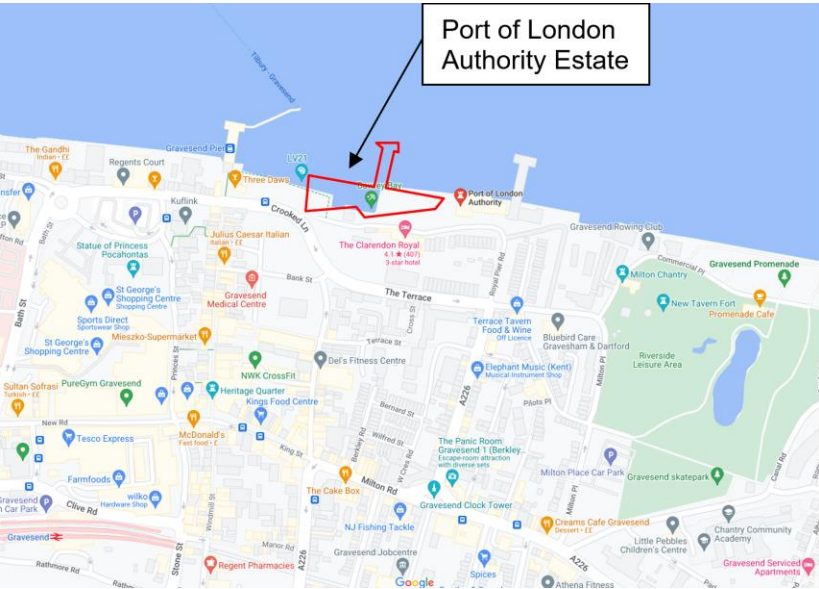


Figure 1 Site Location Plan

The existing building comprises a ground plus three storey building over a single level basement. The building houses Vessel Traffic Services and radar equipment for the Port of London Authority and ancillary office areas. The basement is occupied by plant serving the building.

The Port Control Centre Building is bounded by The Link building to the west, the listed Royal Terrace Pier to the east, the river front to the north and Royal Pier Road to the south.



Figure 2 Port Control Centre Building for Proposed Refurbishment

2.2 Development Proposals

The proposed development comprises the following:

- Single storey vertical extension to the existing building
- Refurbishment/ replacement of the façade
- Changes to the floor layout with a new lift and stair core and associated new openings to the floor structure
- Plant and building services refurbishment and replacement
- External works to provide a new piazza external entrance area to enhance links between London River House, the Link Building and Port Control Centre

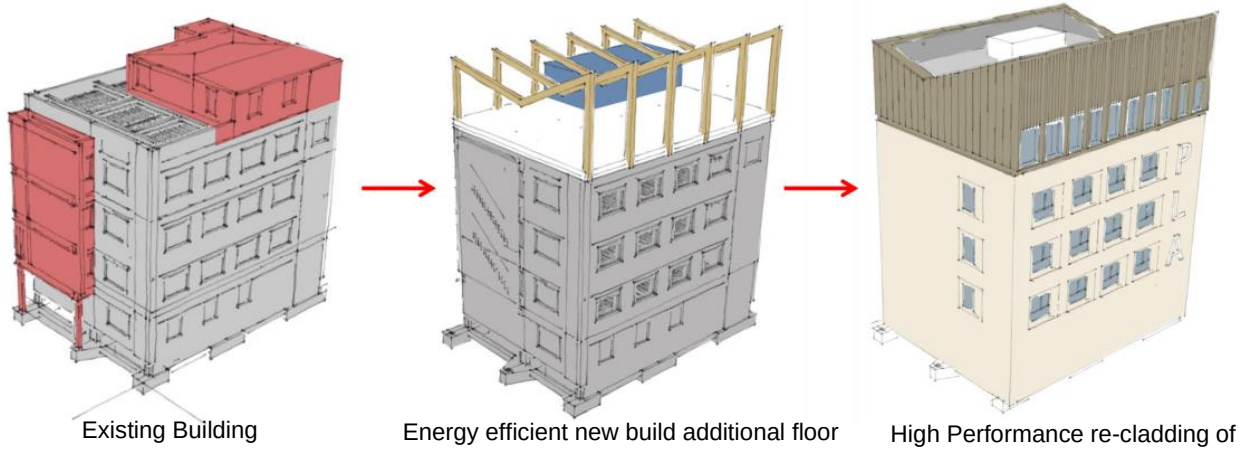


Figure 3 Development proposals

3.0 BUILDING REGULATIONS AND PLANNING POLICY



BUILDING REGULATIONS AND PLANNING POLICY

The development has been designed to meet sustainability and energy targets which are driven through:

1. Climate Change Act 2008 (2050 Target Amendment)
2. Energy Act 2011
3. National Planning Policy Framework (NPPF July 2021), England
4. UK Building Regulations Part L Vol 2 2021 – Conservation of fuel and power in new buildings other than dwellings
5. Gravesham Local Plan Core Strategy 2014

3.1 Climate Change Act 2008 (2050 Target Amendment)

The Climate Change Act sets legally binding greenhouse gas emission reductions targets of 100% by 2050 (with an interim target of 26% by 2020) against a 1990 baseline, which are to be achieved through action taken in the UK and abroad. It contains provisions to enable the Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address the risk of climate change.

In May 2019, the Climate Change Committee recommended a new emissions target for the UK: net-zero greenhouse gases by 2050 to respond to the Paris Agreement commitments. The recommendation has been adopted by the government and the targets have been amended accordingly in June 2019.

3.2 Energy Act 2011

The Act includes provisions for the establishment of the Green Deal, which was a new financing framework to fund improvements to the energy efficiency of domestic and non-domestic properties. The scheme would be paid back through a charge on the energy bill so that there would be no upfront cost for consumers. The scheme was cancelled on July 2015.

The Act provides powers to ensure that from April 2018, it will be unlawful to rent out a residential or business property that does not reach a minimum energy efficiency standard (the current limit for this is for an EPC rating 'E').

3.3 National Planning Policy Framework (NPPF), England

In July 2021, the Ministry of Housing, Communities and Local Government revised the issue of National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how development should happen in the country.

The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs. At a similarly high level, members of the United Nations – including the United Kingdom – have agreed to pursue the 17 Global

Goals for Sustainable Development in the period to 2030. These address social progress, economic well-being and environmental protection.

Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

The new revision of NPPF (July 2021) contains a revised structure and chapters, which provide a clear overview of the planning framework and the relevance of different policies. The chapters reflect the new priorities of the Government and have a strong focus on housing delivery and affordability.

Chapter 14: "Meeting the challenge of climate change, flooding and coastal change" is NPPF's relevant section to this energy statement. That chapter provides a framework for local authorities to address the following issues as regards planning applications: (Only relevant clauses)

The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

New development should be planned for in ways that:

- a) Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- b) Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
- c) Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

In determining planning applications, local planning authorities should expect new development to:

- a) Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- b) Take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

When determining planning applications for renewable and low carbon development, local planning authorities should:

- a) Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- b) Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

The Local Planning Policies are based on this framework and adapted to account for regionally specific requirements. The concept design of the Proposed Development takes into account the NPPF guidelines and comply with all the above-listed ethos.

3.4 Building Regulations Part L Vol2 2021 Summary

The development will comply with current Building Regulations Part L 2021 Volume 2 (Conservation of fuel and power in buildings other than dwellings).

Guidance for existing buildings is given in this approved document in the following:

- Section 3 – Consideration of high-efficiency alternative systems
- Section 4 – Limiting heat gains losses
- Section 5 – Minimum building services efficiencies and controls general guidance
- Section 6 – System specific guidance
- Section 10 – New elements in existing buildings, including replacing a thermal element and constructing an extension
- Section 11 – Existing elements in existing buildings, including renovating or retaining a thermal element
- Section 12 – Consequential improvements

3.5 Gravesham Local Plan Core Strategy 2014

3.5.1 Policy CS18 (Climate Change) - Carbon Reduction

5.14.20 The Core Strategy seeks to reduce greenhouse gas emissions through the appropriate location and design of future development in the Borough. The NPPF requires local planning authorities to support energy efficiency improvements to existing buildings and to take into account the Government's zero carbon buildings policy and national standards when setting local requirements for building sustainability. The aim is to move towards zero carbon development and to reduce the overall carbon footprint of the Borough.

5.14.21 To help increase the use and supply of renewable and low carbon energy, the NPPF states that local planning authorities should:

- Have a positive strategy to promote energy from renewable and low carbon sources
- Design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily
- Consider identifying suitable areas for renewable and low carbon energy sources; and
- Identify opportunities where development can draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

5.14.24 The Government is moving towards introducing zero carbon standards from 2016 for all new homes and from 2019 for all new non-domestic buildings through changes to Part L of the Building Regulations. Zero carbon will be achieved through a combination of: fabric energy efficiency which will require that new homes are sufficiently well insulated and adequately air tight; carbon compliance (the overall on-site contribution to zero carbon) which includes on-site low and zero carbon heat and power, e.g. solar panel electricity systems; and allowable solutions which are methods to deal with the remaining regulated emissions to meet zero carbon standards, e.g. investment in off-site renewable electricity or combined heat and power (CHP systems). Beyond setting minimum standards for fabric efficiency and carbon compliance, the emerging system is likely to follow the Zero Carbon Hierarchy model set out in Figure 20 and be designed to allow for flexible solutions that encourage technical innovation and cost reduction.

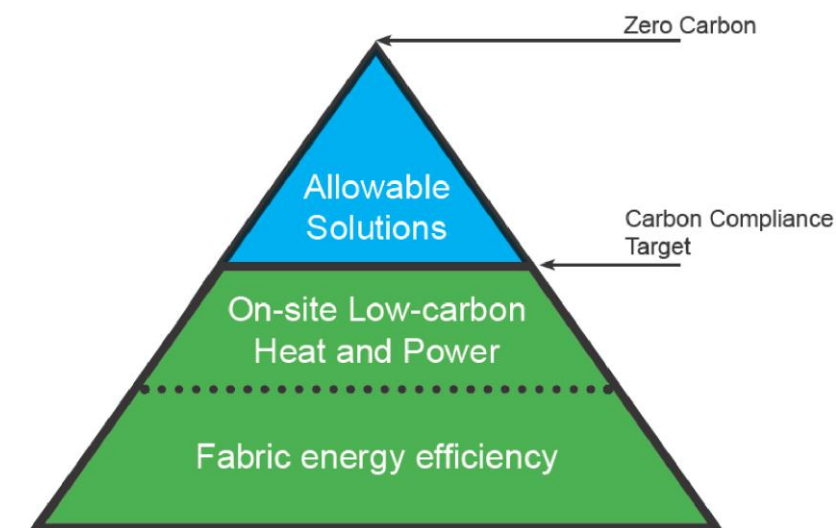


Figure 20: Zero Carbon Hierarchy

Figure 4: Figure take from Gravesham Local Plan Core Strategy 2014

5.14.28 The Council also supports proposals for stand-alone decentralised, renewable or low carbon energy development. It is recognised that such development may employ a range of different technologies where the impact of proposals will depend on location and will need to be evaluated on a case by case basis. Small scale proposals for renewable or low carbon energy production (particularly at a domestic scale) may not always require planning permission. Proposals for larger scale development such as wind turbines or solar farms may also arise in the rural area of the Borough. These developments can have an impact on landscape character, particularly in the nationally important Kent Downs Area of Outstanding Natural Beauty. As a result, proposals will need to take into account other policies in this plan, in particular those relating to protecting the Green Belt from inappropriate development, Green Infrastructure, Development

and Design Principles, and Transport. Opportunities may exist to combine carbon reduction with green infrastructure objectives through the use of locally produced biomass fuels which may also improve the sustainability and biodiversity of the Borough’s woodlands.

5.14.30 The introduction of local standards for reducing the carbon footprint of new buildings in advance of changes to the Building Regulations is not recommended in the Eco-Assessment but the Sustainability Appraisal contradicts this advice. Whilst there remain uncertainties about the forthcoming regulatory framework to achieve zero carbon standards, the evidence currently available does not support a policy that would effectively only apply for a very short time. In view of this, the Council is not seeking to introduce local standards.

5.14.42 The Council will seek to reduce the overall carbon footprint of the borough. In particular the council will:

- In the context of national policy on the transition to zero carbon development via amendments to Part L of the Building Regulations, require proposals for development of the Key Sites throughout the Borough and other major development elsewhere in the Gravesend Town Centre Opportunity Area to consider the potential and include proposals for low carbon and renewable energy generation, including combined heat and power. Where choosing not to do so, applicants must submit evidence which demonstrates that compliance is not technically or financially feasible or that improved fabric energy efficiency or an allowable solution results in improved carbon saving benefits;
- Support stand-alone decentralised, renewable or low carbon energy development where it is compatible with national policies for protecting the Green Belt and where it accords with policies in this plan, in particular those relating to Development and Design Principles, Transport, Green Infrastructure, and Heritage and the Historic Environment; and
- Support other proposals which lead to a reduction in carbon footprint including the retrofitting of existing homes and businesses, including local initiatives based on carbon off-setting via allowable solution

4.0 ENERGY EFFICIENCY



ENERGY EFFICIENCY

4.1 Approach to Part L Volume 2 2021 Compliance

Energy efficiency shall be achieved for the proposed development through compliance with and improvements upon the current Building Regulations Part L 2021 Volume 2 (Conservation of fuel and power in buildings other than dwellings).

Under Building Regulations Part L Volume 2 2021, the proposed development is classified as an existing building. The table below shows key relevant Building Regulations excerpts that have led to this conclusion.

Building Regulations Part L Volume 2 2021	Comments
10.7 An extension should be regarded as a new building, and guidance in Sections 1 to 9 should be followed, if the proposed extension has a total useful floor area that is both of the following: a. Greater than 100m b. Greater than 25% of the total useful floor area of the existing building. If the proposed extension does not meet criteria (a) or (b) above, the guidance in paragraphs 10.8 to 10.11 should be met.	The total useful floor area of the extension is 160m². The total useful floor area of the existing building (including areas to be demolished) is 723m². The extension forms 22% of the total useful floor area of the existing building. Therefore, the extension does not need to be regarded as a new building.
10.9 When a building is extended, elements should satisfy all of the following. a. New thermal elements should meet the standards in Table 4.1 b. Replacement thermal elements should meet the standards in Table 4.1. c. New windows, roof windows, rooflights and doors (controlled fittings) should meet the standards in Table 4.1. d. Existing fabric elements that will become thermal elements should meet the limiting standards in Table 4.2 by following the guidance in paragraphs 11.2 to 11.4. In addition, the area of openings in the extension should not exceed that given in Table 10.1, if either of the following areas are greater than that of the existing building. a. Window and pedestrian doors as a percentage of exposed wall. b. Rooflights as a percentage of area of roof.	All thermal elements of the new build extension are proposed to follow the guidance in 10.9.
10.10 As an alternative approach to paragraph 10.9, the area-weighted U-value of all thermal elements in the extension should be shown to not exceed the area-weighted U-value of an extension of the same size and shape that complies with paragraph 10.9. This includes the opening area standards in Table 10.1.	Calculation not applicable as all U-value are proposed to comply with Part L limiting values.
10.11 As an alternative approach to paragraphs 10.9 or 10.10, an approved calculation tool may be used to demonstrate that the building primary energy rate and the building emission rate for the building and proposed extension do not exceed those for the building plus a notional extension.	Calculation of primary energy rate and building emissions rate not applicable as building is to comply with paragraphs 10.9-10.10.

11.2 Renovation of a thermal element means one of the following: a. Providing a new layer through cladding or rendering the external surface of the thermal element. b. Providing a new layer through dry lining the internal surface of a thermal element. c. Replacing an existing layer through stripping down the element to expose basic structural components (e.g. bricks, blocks, rafters, joists, frame) and then rebuilding. d. Replacing the waterproof membrane on a flat roof. e. Providing cavity wall insulation.	External insulation and rendering is proposed to existing façade, therefore the existing building falls under definition of renovation (rather than new element). Level 4 roof and external walls are considered as new elements.
11.3 If a thermal element is renovated and one of the following applies, then the whole of the thermal element should be improved to achieve at least the U-value in Table 4.2 column (b). a. More than 50% of the surface of the individual thermal element is renovated (see paragraph 11.4). b. The work constitutes a major renovation. A major renovation is when more than 25% of the surface area of the external building envelope is renovated.	It is proposed for the whole of the existing façade to be insulated/renovated with u-values better than Part L minimum requirements

Guidance for existing buildings is provided in Part L Vol2 2 2021 in the following sections:

- Section 3 – Consideration of high-efficiency alternative systems (refer to section 6.1.1 of this report)
- Section 4 – Limiting heat gains and losses (refer to section 4.2 of this report)
- Section 5 – Minimum building services efficiencies and controls general guidance (refer to section 4.3 of this report)
- Section 6 – System Specific Guidance (refer to section 4.4 of this report)
- Section 10 – New elements in existing buildings, including replacing a thermal element and constructing an extension (refer to section 4.5 of this report)
- Section 11 – Existing elements in existing buildings, including renovating or retaining a thermal element (refer to section 4.6 of this report)
- Section 12 – Consequential improvements (refer to section 4.7 of this report)

4.2 Part L 2021 Section 4: Limiting Heat Gains and Losses

4.2.1 U-values

U-values will be assessed using the approved methods and conventions set out in Building Regulations Part L Volume 2 2021.

4.2.2 Limiting standards for new or replacement elements

All existing windows are to be replaced and a new extension is proposed as part of the development work. New fabric elements shall exceed the Part L 2021 limiting standards.

The table below shows the targeted façade thermal performance of the proposed design for the development.

Table 2: Target Fabric and Glazing Specifications for NEW/REPLACEMENT ELEMENTS

New/ Replacement Elements		Target and proposed Fabric Targets		
		Maximum Building Regulation Part L 2 2021 Vol 2	Proposed Building	Percentage improvement over Building Regulations Part L 2021
External Wall (curtain wall solid panels)	U-value (W/m².k)	0.26	0.25	4%
Roof (flat)	U-value (W/m².k)	0.18	0.14	22%
Roof (pitched)	U-value (W/m².k)	0.16	0.14	13%
Windows (including frame and losses)	U-value (W/m².k)	1.60	1.40	13%
	g-value (L1-3)	-	0.23	-
	g-value (L4)	-	0.19	-
Air Permeability	(m³/h.m² @50Pa)	8	3.00	63%

Whilst these are the performance levels currently targeted, their achievability will be reviewed through each design stage to consider any design, procurement, and construction changes. Any future revisions to fabric performance will comply with the maximum Building Regulations values listed in the table above.

4.2.3 Limiting standards for renovated and retained elements

The existing façade and exposed floors are to be retained and renovated as part of the development works. All other elements are to be replaced. Renovated elements shall exceed the Part L 2021 limiting standards. The table below shows the targeted façade thermal performance of the proposed design for the development.

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Table 3: Target Fabric for EXISTING ELEMENTS

Existing Elements		Target and proposed Fabric Targets		
		Maximum Building Regulation Part L 2 2021 Vol 2	Proposed Building	Percentage improvement over Building Regulations Part L 2021
External Wall (Overclad wall)	U-value (W/m².k)	0.25	0.17	32%
Floor	U-value (W/m².k)	0.25	0.13	48%
Roof	U-value (W/m².k)	To be replaced, refer to Table 2		
Windows	U-value (W/m².k)			

Whilst these are the performance levels currently targeted, their achievability will be reviewed through each design stage to consider any design, procurement, and construction changes. Any future revisions to fabric performance will comply with the maximum Building Regulations values listed in the table above.

4.2.4 Continuity of insulation

Continuity of insulation and thermal bridging shall be considered in line with Building Regulations Part L Volume 2 2021 requirements.

4.2.5 Airtightness in existing buildings

In line with Part L requirements, care will be taken to reduce unwanted heat loss through air infiltration. The proposed development works is currently targeting an air permeability of 3 m³/h.m²@50Pa. This is an improvement of 63% upon the minimum standard of 8 m³/h.m²@50Pa, applicable for new buildings. There is no requirement to pressure test for existing buildings however in place of a pressure test a default result 15 m³/h.m²@50Pa would need to be used in EPC modelling and could impact the EPC rating achieved.

4.2.6 Limiting the effects of solar gains in summer

A limiting solar gains check was run using IES VE 2022 Part L 2021 ApacheSim engine. All relevant occupied spaces passed the solar gain check.

4.2.7 Limiting heat losses and gains from building services

Direct hot water, heating/cooling pipework and ductwork shall be insulated to the minimum standards outlined in Part L 2021 Vol 2.

4.3 Part L 2021 Section 5: Minimum Building Services Efficiencies and Controls

4.3.1 New building services

New building services shall be installed throughout the proposed development. All new fixed building services will comply with Part L 2021 requirements. Please see information on Part L 2021 Vol. 2 'Section 6' below (section 4.4 of this report) for details on efficiencies.

4.3.2 Replacement building services in existing buildings

Replacement building services shall be at least as efficient as minimum Part L 2021 requirements. Please see information on building regulations Part L 2021 Vol. 2 Section 6 below (section 4.4 of this report) for details on efficiencies.

The proposed building will be 100% electric which is a change of fuel type from the existing building (part gas, part electric). The majority of the proposed developments heating demand will be met using high efficiency air source heat pumps. The proposed system will not produce more CO₂ emissions per kWh of heat or have a higher primary energy demand than the appliance being replaced as shown by the calculations below:

CO₂ emissions:

- Existing Gas Boiler: 0.210 kgCO₂ / 0.85 assumed efficiency = 0.24 kgCO₂/kWh
- Proposed electric ASHP: 0.136 kgCO₂ / SCOP 3.82 = 0.04 kgCO₂/kWh

Primary energy:

- Existing Gas Boiler: 1.13 kWh/kWh / 0.85 assumed efficiency = 1.33 kWh_{PE}/kWh
- Proposed electric ASHP: 1.50 kWh/kWh / SCOP 3.82 = 0.39 kWh_{PE}/kWh

4.3.3 Sizing new and replacement space heating systems

The specification of space heating systems shall be based on an appropriate heat loss calculation for the building in line with Part L 2021 requirements.

4.3.4 Controls and zoning for new and replacement space heating systems

Controls and zoning for the heating systems shall be in line with Part L 2021 requirements.

4.3.5 Energy submeters

Energy submetering shall be installed in line with Part L 2021 requirements.

4.4 Part L 2021 Section 6: System Specific Guidance

4.4.1 Electric space heating systems

Direct electric panel heaters are proposed for the WCs, shower rooms and stairs. Electric resistance heating is assumed to be 100% efficient, therefore no minimum efficiency is set for these types of systems. The systems will be controlled in line with Part L 2021 requirements.

4.4.2 Dedicated domestic hot water heaters

Point of use and instantaneous electric water heaters are proposed for the development due to the low hot water demand. Direct electric DHW systems are assumed to be 100% efficient, therefore no minimum efficiency is set for these types of systems. The systems will be sized, insulated, and controlled in line with Part L 2021 requirements.

4.4.3 Comfort Cooling

It is anticipated that variable refrigerant flow (VRF) heat pumps will be used to supply the majority of the development's cooling demand. The VRF system will turn off automatically when windows are opened to reduce energy usage (see Section 4.4.5 below for detail).

Heat pumps with a cooling SEER of 5.65 and 5.82 have been proposed for the development. These efficiencies improve upon the minimum Part L 2021 requirements, which are shown in Appendix A.

The systems will be controlled in line with Part L 2021 requirements.

4.4.4 Heat Pumps

It is anticipated that variable refrigerant flow (VRF) heat pumps will be used to supply the majority of the development's heating demand.

Heat pumps with a heating SCOP of 3.82 and 3.90 have been proposed for the development. These efficiencies are an improvement upon minimum Part L 2021 requirements, which are shown in Appendix A.

The systems will be controlled in line with Part L 2021 requirements.

4.4.5 Mechanical Ventilation

The workspaces will be ventilated via a new supply and extract air handling unit with heat recovery. A hybrid ventilation unit has been proposed for the development with traffic light controls. The traffic light controls are more like indicators which convey whether to allow natural ventilation to start, switching off the mechanical system via a sensor and thereby reducing energy usage. The proposed ventilation systems will be designed to meet Part L requirements and will exceed the recommended minimum standards for specific fan power listed in Appendix A.

4.4.6 Lighting

New high efficacy lighting has been proposed throughout the development. General lighting will be designed to have an average luminaire efficacy of 95 luminaire lumens per circuit watt. No display lighting is proposed as part of the current design. All lighting will be metered and controlled in line with Part L 2021 requirements.

4.4.7 Building automation and control systems

A building management system has been proposed for the development in line with Part L 2021 requirements.

4.4.8 On-site electricity generation and storage

A photovoltaic array (PV) has been proposed to the South facing roof of the proposed building. It is expected that the PV electrical output will always be used within the building electrical system and there is no requirement to feed back into the electrical grid. However, this shall be confirmed at further stage in the project. It is expected no battery storage shall be required.

4.5 Part L 2021 Section 10: New elements in existing buildings, including extensions

4.5.1 New and replacement thermal elements

All existing windows are to be replaced and a new extension is proposed as part of the development work. New fabric elements shall exceed the Part L 2021 limiting standards.

Refer to Table 2 in section 4.2.2 for the proposed targeted façade thermal performance for the development.

4.5.2 New and replacement windows

Window areas shall be less than the 40% maximum area of openings allowable in Part L 2021 as shown in Appendix A. This requirement met for both the extension and existing building.

4.5.3 Extension of buildings other than dwellings

The proposed extension of the building does not need to be regarded as a new building as the total useful floor area is less than 25% of the total useful floor area of the existing building. The extension shall comply with the relevant section of Part L 2021 applicable to extensions and existing buildings.

4.6 Part L 2021 Section 11: Work to fabric in existing buildings

4.6.1 Renovating thermal elements

It is proposed for the existing façade to be retained and renovated with the fabric performance to exceed Part L 2021 limiting standards.

4.6.2 Material change of use and change to energy status

The proposed development is not considered as a material change of use or change to the building’s energy status as it is currently a port control centre, and the proposed development will also be a port control centre.

4.7 Part L 2021 Section 12: Consequential Improvements

Consequential Improvements are not applicable as the proposed development is 800m² and therefore under 1000m².

5.0 COOLING HIERARCHY AND OVERHEATING



COOLING HIERARCHY AND OVERHEATING

5.1 Cooling Hierarchy

The proposed development has considered the cooling hierarchy and responds accordingly, as outlined below.

Table 4 Reporting template for cooling demand

Cooling Hierarchy and cooling demand

Minimising internal heat generation through energy efficient design:	Lighting will be designed to be highly efficient and reduce internal heat generation.
Reducing the amount of heat entering the building in summer	Optimising fabric efficiency will reduce the unwanted summer solar gains entering the building. Windows will target a low g-value also to reduce solar gains.
Use of thermal mass and high ceilings to manage the heat within the building:	The VTS operations space (new build extension) will benefit from maximised ceiling height which will allow heat to rise and the occupied space to remain cooler during the summer months.
Passive Ventilation	It is understood at this present time that windows shall be openable with the exception of the VTS Ops room which is likely to have no openable windows.
Mechanical Ventilation	Hybrid ventilation system has been proposed which turns off cooling and mechanical ventilation when windows are open (See section 4.4.5).

- Air temperature
- Air/Wind speed
- Radiant temperature
- Relative humidity
- Clothing level
- Gender and;
- Metabolic rate/Activity level

Guidance within CIBSE TM52 sets a maximum allowable operative temperature for mechanically conditioned buildings for different space usage types. The mechanically conditioned areas will therefore be assessed based on exceedance of the maximum operative temperatures. The table below is an excerpt from CIBSE TM52 guidance which sets the maximum operative temperature for different types of indoor spaces (Table 4 in section 6.2.2 ‘Testing for overheating in mechanically conditioned buildings using operative temperature’). For assessment purposes the proposed building has been considered as an office space.

Table 4 Maximum temperatures for different types of indoor space. Clothing is assumed to be 1.0 clo in winter and 0.5 clo in summer (after BS EN 15251 (BSI, 2007), Table A2)

Type and use of space	Assumed met	Winter (clo = 1.0) PMV< +0.5	Summer (clo = 0.5) PMV< +0.5
Residential (sedentary)	1.2	25.0	26.0
Residential (active)	1.5	25.0	
Offices	1.2	24.0	26.0
Public spaces (auditoria, cafe etc.)	~1.2	24.0	26.0
Classrooms	1.2	24.0	26.0
Kindergarten	1.4	22.5	25.5
Shops	1.6	22.0	25.0

Figure 5: Table 4 from CISE TM52 showing metabolic rate levels and operative temperatures for different space use types.

5.2 CIBSE TM52 Overheating Analysis

5.2.1 Assessment Criteria

With regards to excessive solar gains and overheating risk, the development has been assessed against the following criteria:

- Part L 2021 Limiting Solar Gains
- CIBSE TM52 – The limits of thermal comfort avoiding overheating in European Buildings
- CIBSE TM49 – Future weather files

Operative temperature is used to assess the thermal comfort under the TM52 methodology. Operative temperature is an average of the air temperature and the mean radiant temperature. It expresses the effect of the air temperature, controlled by the HVAC system, and the mean radiant temperature which is largely affected by the building façade design and performance. The target operative temperature necessary to achieve thermal comfort is affected by the following:

5.2.2 Modelling Approach

The solar gains and overheating assessments have been carried out using 3D dynamic thermal modelling. The simulation tool used for this analysis was Integrated Environmental Solutions (IES) Virtual Environment version 2022, a software tool providing thermal analysis in accordance the methodologies stated in CIBSE AM11.

The 3D dynamic thermal model was based on architectural drawings issued by Bennetts Associates on 16th September 2022. All occupied spaces have been assessed.

Immediate surrounding buildings have not been included as these are not considered to provide solar shading to the study building as can be seen in Figure 8.

For the purposes of this study, it has been assumed that the building is fully mechanically ventilated with closed windows as a worst-case scenario in terms of overheating.

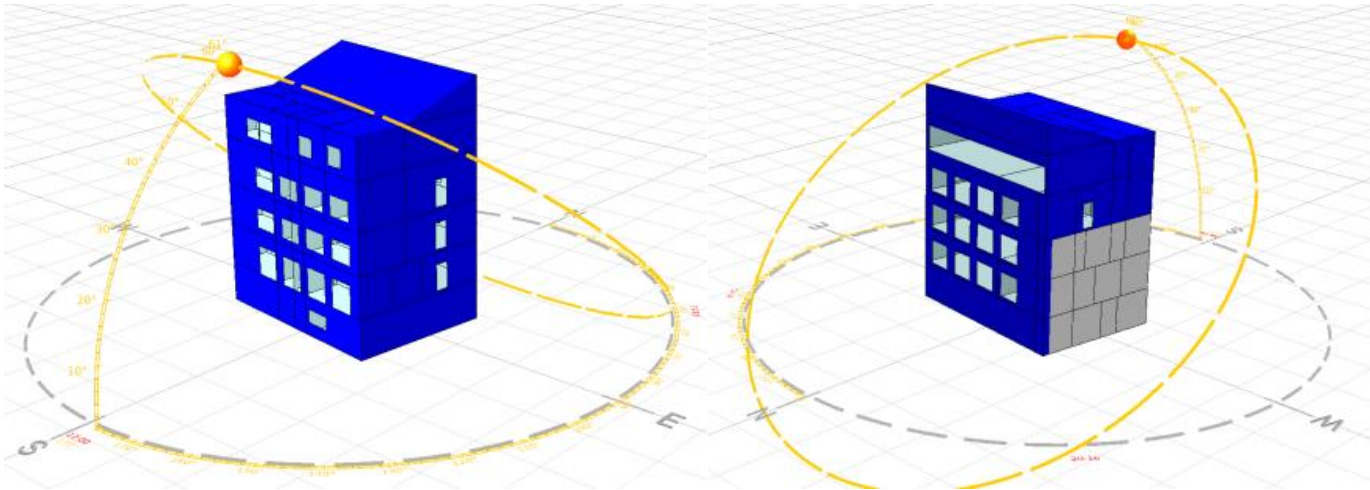


Figure 6: Thermal model created in IES

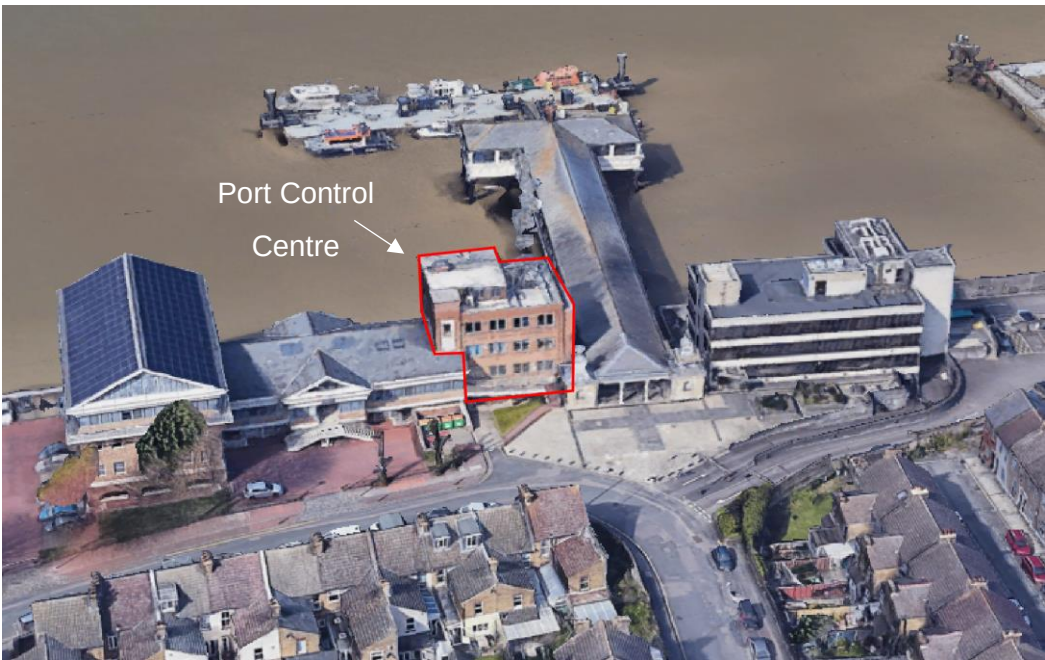


Figure 7 Google Earth image showing surrounding buildings.

The study uses TM49 design summer year (DSY1, DSY2 & DSY3) weather files for the 2020s, 2050s and 2080s. The DSY1 weather file is representative of a moderately warm summer year. DSY2 represents a short, intense warm spell and DSY3 represents a long, intense warm spell. CIBSE provides weather files for 14 locations in the UK. London is the closest location to the site and the Gatwick Airport weather file has been selected which represents rural and peri urban areas around the edge of London.

5.2.3 CIBSE TM52 Overheating Analysis – Modelling inputs

It is anticipated that variable refrigerant flow (VRF) heat pumps will be used to supply the majority of the developments cooling demand.

Table 5 below details the internal gains assumed for the spaces analyses under TM52.

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Table 5: Internal gains & design information for the assessed areas.

Space Type	Lighting W/m2	Small Power W/m2	Occupancy Density m2/person	Occupancy Load (sensible/ latent) W/Person	Schedule
Plant Space (Lower Ground)	-	-	-	-	-
Cleaner's Cup'd (Lower Ground)	-	-	-	-	-
Hydrographics & Flexible Working (Level 01 & 02)	6	25	8	90 / 50	7am-7pm
Pilot Ready Room (Level 01)	6	25	8	90 / 50	7am-7pm
Acc Shower (Level 01)	-	-	-	-	-
Lobby (Level 01)	6	2	8	90 / 50	7am-7pm
Mtg rooms [Board room (01), Meeting Room (02), Meeting Room (03)]	6	5	3	90 / 50	7am-7pm
Mess Rooms (Level 03 & 04)	6	25	8	90 / 50	24/7
WCs (Level 02)	22	-	-	-	-
WCs (Level 03 & 04)	22	-	-	-	-
General Workspace [Vessel Planning (03), VTS Ops [04], VTS Manager's Office (04)]	6	25	8	90 / 50	24/7

The design criteria is based upon HDR's MEP advice and cooling systems with unlimited cooling capacity. As the design progresses with detailed specification of equipment (post planning application), it is advised that updates to this overheating study are carried out considering the limited cooling capacity to ensure the potential risk of overheating is mitigated. Therefore, the specification of cooling equipment to be installed will need to demonstrate the set-points can be achieved as any variation, may alter the validity of the results reported.

5.3 Results

5.3.1 Part L 2021 Limiting Solar Gains

As part of Part L 2021 Vol 2 Section 4 – heat gains and heat losses, solar gains are also addressed in terms of excessive solar gains. A limiting solar gains check was run using IES VE 2022 Part L 2021 ApacheSim engine. All occupied spaces passed the solar gain check.

5.3.2 CIBSE TM52 Overheating Analysis

Using the London Gatwick DSY1, DSY2 & DS3 2020 and DSY3 2080 weather files, all occupied spaces pass the CIBSE TM52 overheating criterion as no hours are predicted to exceed the maximum allowable operative temperature of 26C.

Table 6: Overheating Analysis Results

Zone	Part L Limiting Solar Gains Check	TM52 Compliance Status
Hydrographics and flexible workspace	Pass	Pass
Pilot ready	Pass	Pass
Meeting rooms	Pass	Pass
Mess rooms	Pass	Pass
General workspace	Pass	Pass

6.0 RENEWABLE ENERGY



RENEWABLE ENERGY

A number of Low or Zero Carbon (LZC) technologies have been assessed for their viability to be included in the design. Where technologies are not considered appropriate to the site and energy demand of the development, these have not been further investigated.

The following localised green technologies have been considered as viable for the site:

- Electric heat pumps
- Photovoltaics

The following localised green technologies have been considered as non-viable for the site:

- Solar thermal
- Biofuel combined heat and power (CHP) local in the building
- Biomass (CHP) local in the building
- Fuel Cells
- Biofuel community heating scheme local in the building
- Wind turbines

6.1.1 Feasibility of Renewable Technologies

An initial assessment has been carried out to determine which technologies are technically feasible on the site. For technologies which are identified as feasible, the following factors have been considered to determine which technologies are appropriate in terms of economic and local planning feasibility:

- Energy generated from each LZC energy source per year
- Payback
- Land Use
- Local Planning Criteria
- Noise
- Life cycle cost/lifecycle impact of the potential specification in terms of carbon emissions
- Any available grants

6.1.2 Solar Panels

Solar panels have been deemed viable for this development. The sloped roof allows the solar panels to be oriented South facing at an optimal angle and pitch.

Table 7 below summarises the desktop study undertaken to determine the feasibility of solar photovoltaic panels at the site:

Table 7: Key Considerations of Solar Technology

Technology	Criteria	Requirement Met?
Photovoltaic panels		
Roof orientation	Are available roofs facing south-west to south-east (through south), or flat?	✓
Roof space	Is there enough un-shaded roof area?	✓
Electrical demand	Is there electrical demand on site?	✓

The proposals include for a 7.25kWp Photovoltaic (PV) array which equates to approximately 50m2 and 6.02MWh.

Figure 8 demonstrates the amount of roof available within the development confirming the location of the proposed photovoltaic modules with suitable orientation. It has been identified the adjacent building do not create shading that could impact the photovoltaic systems.

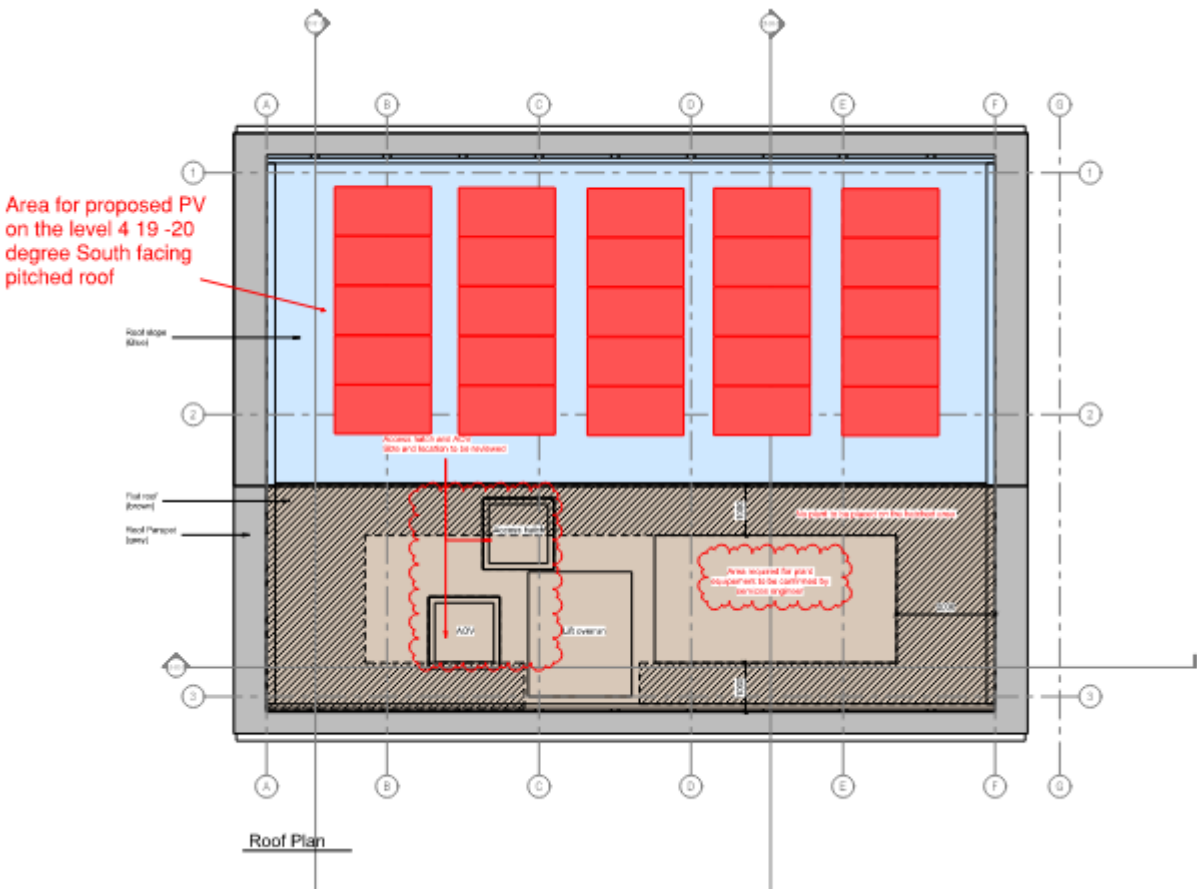


Figure 8: Photovoltaic System at Roof Level

Solar thermal technology has been deemed not viable for this project as it would conflict with the roof mounted PV arrays, as there is no additional space for solar thermal technologies. The proposed scheme has a low DHW demand therefore solar PV provides a more efficient solution in terms of CO₂ and primary energy reduction.

6.1.3 Heat Pumps

Table 8 below summarises the desktop study undertaken to determine the feasibility of heat pumps at the site:

Table 8 Key Considerations of Heat Pump Technology

Technology	Criteria	Requirement Met?
Heat distribution system	Is it possible to have a low-grade distribution system e.g. under floor heating?	X
Heat distribution system	Is it compatible with the proposed cooling system?	✓
Ground-source Heat Pump		
Ground conditions	Has a basic ground study concluded that the site is suitable for GSHP?	-
Horizontal piping	Is there a large area of open land where horizontal piping could be installed?	X
Vertical piping	Is the ground suitable for vertical piping? Can underground obstacles be avoided?	X
Plant room	Is there space allowed for a GSHP and associated auxiliary equipment?	X
Water-source Heat Pump (River or Lake)		
Resource	Is there an available water source close to the site?	✓
Access	Can the available water source be accessed?	X
Air Source Heat Pump		
Roof space	Is there available roof space for air-source heat pumps?	✓
Electrical Capacity	Is there sufficient electrical capacity for air-sourced heat pumps	✓

Air source heat pumps have been reviewed as the most appropriate solution for the development.

7.0 CONCLUSION



CONCLUSION

On behalf of the Port of London Authority (PLA), HDR has undertaken an energy strategy and overheating assessment for the Port Control Centre Development, located within Gravesham Borough, in Gravesend, Kent. It details the approach taken to energy and overheating in line with the current Building Regulations Part L Vol2 2021 for existing non-domestic buildings, Gravesham’s Local Plan (2014), and the industry standard overheating methodology CIBSE TM52.

The approach taken for the energy assessment responds to Gravesham Local Plan by demonstrating energy efficiency measures, the consideration of low carbon and renewable energy generation, in line with Part L Volume 2 2021.

The design team has looked for opportunities to reduce the energy consumption of the building through optimised building fabric, passive design, and energy efficient building services.

This energy and overheating assessment demonstrates for the proposed development:

- Part L 2021 Vol 2 **compliance** (sections 3-6 & 10-12) for non-domestic existing buildings
- Part L 2021 Solar gains check (section 4)
- TM52 overheating analysis **pass** (using London Gatwick DSY1-3 and 2020-2080 weather files)

Building Regulations Part L 2021

Under Building Regulations Part L Volume 2 2021, the proposed development is classified as an existing building as the extension is less than 25% of the floor area of the existing building. Consequential improvements are not applicable as the development is under 1,000m². Compliance is demonstrated within this report.

Passive Design and Energy Efficiency

The following building **fabric and passive design measures** are proposed to limit heat gains and losses within the building and improve energy efficiency:

- The existing façade and structure shall be retained and renovated with a high-performance insulated cladding
- All windows shall be replaced with glazing with a low thermal transfer parameter (U-value)
- Optimised glazing g-value to limit unwanted excess summer solar gain but maintain a level of useful winter solar gains
- New extension shall utilise high-performance insulated fabric
- Low air permeability

The following **energy efficiency** measures within the building services design are proposed for the development:

- High-efficacy LED lamps/luminaires with efficient lighting controls help to further maximise the use of natural daylight and reduce artificial lighting loads and energy use

- Provision of efficient air source heat pumps for heating and cooling
- Heat recovery on mechanical ventilation and air handling plant
- Photovoltaic panels

Excessive Solar Gains and Overheating

The risk of **excessive solar gains and overheating** has been considered for the development and assessed in line with Part L 2021 and CIBSE TM52 methodology. All occupied spaces were assessed against a selection of future weather files using the TM49 methodology.

The following passive design and energy efficiency measures also mitigate the risk in line with the cooling hierarchy:

- Optimised glazing g-value to limit unwanted excess summer solar gain
- Externally cladding the existing façade provides a level of external shading from deep window recesses
- Low internal gains through efficient lighting
- Hybrid ventilation system to reduce cooling load

All occupied spaces pass the Part L 2021 solar gain check and CIBSE TM52 criteria. This indicates that there is a reduced risk of overheating in these spaces.

Table 9 Summary of TM52 Overheating Analysis for the Port Control Centre Development

Zone	Part L 2021 Limiting Solar Gains Check	TM52 Compliance Status
Hydrographics and flexible workspace	Pass	Pass
Pilot ready	Pass	Pass
Meeting rooms	Pass	Pass
Mess rooms	Pass	Pass
General workspace	Pass	Pass

The results and conclusion of this report are valid for the information and details used at the time of assessment and report writing. Due to the holistic nature of the overheating assessment any changes in the design criteria stated in this report will have a direct impact on the risk of summertime overheating and may subsequently change the results reported.

For further information on sustainability please refer to separate Sustainability Statement produced by Bennetts Associates.

APPENDIX A.

The tables below are taken from Building Regulations Part L Volume 2 2021.

Table 6.6 Minimum seasonal energy efficiency ratio (SEER)⁽¹⁾ for comfort cooling

Type		Cooling unit SEER
Packaged air conditioners	Single-duct type	3.0
	Other types	3.0
Split and multi-split air conditioners >12kW		5.0
Split and multi-split air conditioners ≤12kW		5.0
Variable refrigerant flow/volume (VRF/VRV) systems ⁽²⁾		5.0
Water-to-water chillers <400kW		5.0
Water-to-water chillers 400–1500kW		6.0
Water-to-water chillers ≥1500kW		6.5
Vapour compression cycle chillers, air-cooled <400kW		4.0
Vapour compression cycle chillers, air-cooled ≥400kW		4.5
Absorption cycle chillers ⁽³⁾		EER 0.7
Gas-engine-driven variable refrigerant flow		1.6

NOTES:

- Seasonal space cooling energy efficiency as defined by the Ecodesign Commission Regulation No. 206/2012 Annex II, at average rating conditions where applicable.
- For VRV/ VRF systems, SEER is for the full system including indoor units.

Table 6.8 Minimum COP for heat pumps in new and existing buildings

Heat pump type	Minimum COP (at rating conditions in BS EN 14511-2)
All types (except air-to-air with output ≤12kW, absorption and gas-engine) for space heating ⁽¹⁾	2.5
All types (except absorption and gas-engine) for domestic hot water heating	2.0
Absorption	0.5
Gas-engine	1.0

NOTE:

- For air-to-air heat pumps with an output ≤12kW, follow paragraph 6.44.

Table 10.1 Maximum area of openings in the extension

Building type	Windows and pedestrian doors as % of exposed wall	Rooflights as % of area of roof
Residential buildings where people temporarily or permanently reside	30	20
Places of assembly, offices and shops	40	20
Industrial and storage buildings	15	20

Table 6.9 Maximum specific fan power (SFP) in air distribution systems in new and existing buildings

System type	SFP (W/(l·s)) ⁽¹⁾⁽²⁾	
	New buildings	Existing buildings
Central balanced mechanical ventilation system with heating and cooling	2.0	2.6
Central balanced mechanical ventilation system with heating only	1.9	2.2
All other central balanced mechanical ventilation systems	1.5	2.0
Zonal supply system where fan is remote from zone, such as ceiling void or roof-mounted units	1.1	1.4
Zonal extract system where fan is remote from zone	0.5	0.5
Zonal supply and extract ventilation units, such as ceiling void or roof units serving single room or zone with heating and heat recovery	2.3	2.3
Local balanced supply and extract ventilation system, such as wall/roof units serving single area with heat recovery	2.0	2.0
Local supply or extract ventilation units, such as window/wall/roof units serving single area (e.g. toilet extract)	0.3	0.4
Other local ventilation supply or extract units	0.5	0.5
Fan assisted terminal variable air volume (VAV) unit	0.5	0.5
Fan coil unit (rating weighted average ⁽³⁾)	0.4	0.4
Kitchen extract, fan remote from zone with grease filter	1.0	1.0

NOTES:

- For balanced supply and extract systems, the maximum SFP includes an allowance for heat recovery and return filter.
- Where any of the following components are included in the installation, the maximum SFP may be increased.
 - High-efficiency particulate air (HEPA) filter: add 1.0W/(l·s).
 - Humidifier/dehumidifier: add 0.1W/(l·s).
 - Active chilled beams: add 0.3W/(l·s).
 - Transpired solar collector: add 0.3W/(l·s).

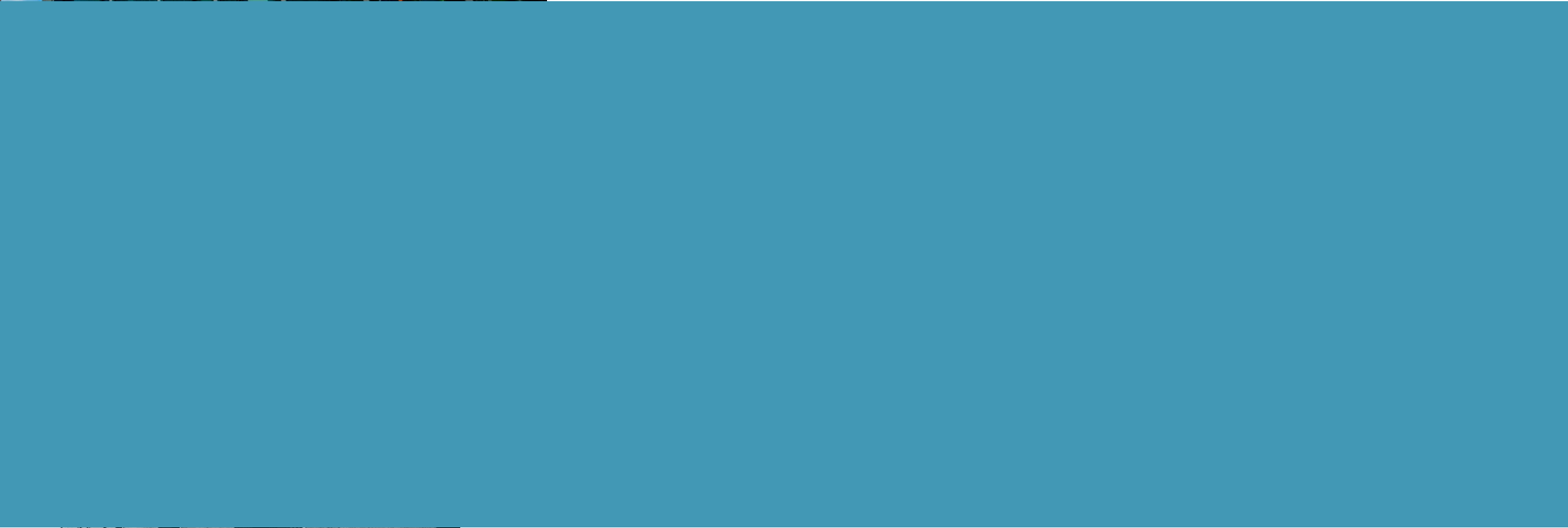
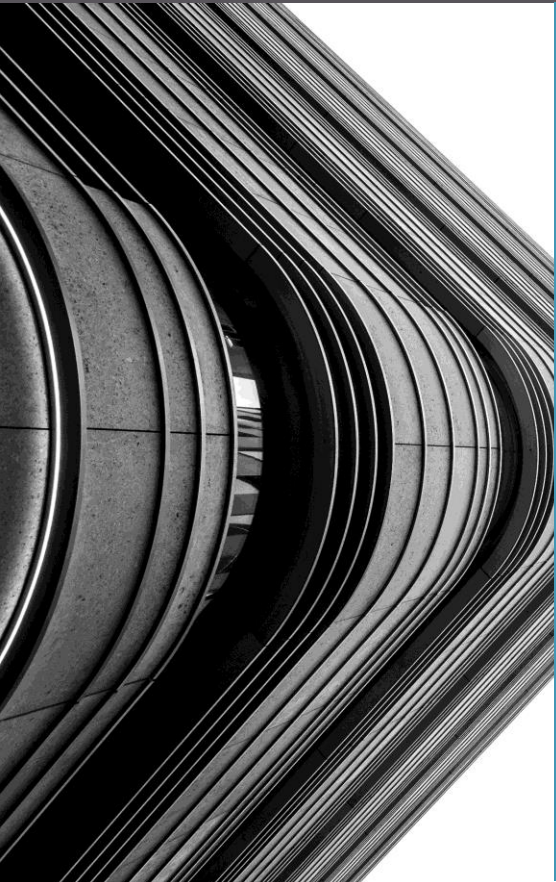
For example, a central balanced mechanical ventilation system with heating and cooling, HEPA filter and humidifier, installed in a new building.

$$\begin{aligned} \text{SFP} &= 2.0 + 1.0 + 0.1 \\ &= 3.1\text{W/(l·s)} \end{aligned}$$

- The rating weighted average is calculated using the following formula:

$$\frac{[(P_{\text{mains},1} \times \text{SFP}_1) + (P_{\text{mains},2} \times \text{SFP}_2) + (P_{\text{mains},3} \times \text{SFP}_3) + \dots]}{(P_{\text{mains},1} + P_{\text{mains},2} + P_{\text{mains},3} + \dots)}$$

where P_{mains} is useful power supplied from the mains in W.



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