FORMER NESTLE FACTORY, HAYES

SUSTAINABILITY STATEMENTS (including Overheating Reports)

MAY 2017

BARRATT LONDON

SEGRO

BBS

watkins payne
designed engineered focused

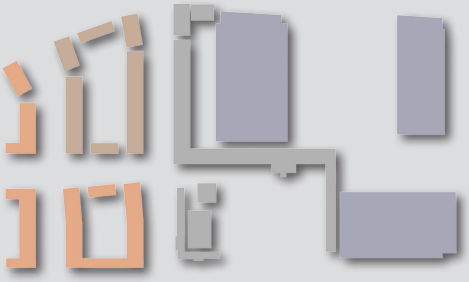
INTRODUCTION

This covering report has been prepared for the joint Applicants, SEGRO plc and Barratt London Ltd, by BBS Environmental, a construction consultancy specialising in sustainability, energy conservation and the application of renewable energy technologies. It has been prepared to accompany a detailed planning application for the redevelopment of the former Nestlé factory site in Hayes in the London Borough of Hillingdon.

The proposals for the whole site comprise the part-demolition of existing factory buildings and associated structures, and redevelopment comprising 120,487 sqm (GEA) of residential floorspace to provide 1,381 dwellings (Use Class C3), office, retail, community and leisure uses (Use Classes A1/A3/A4/B1/B8/D1/D2), 22,663 sqm (GEA) of commercial floorspace (Use Classes B1c/B2/B8 and Data Centre (sui generis)), amenity and playspace, allotments, landscaping, access, service yards, associated car parking and other engineering works.

The joint applicants are leading developers in their respective field of operations, which are very different, and each employ Design Teams which are composed of architects and consultants who specialise in their particular types of development. So, while there will be a single planning application based on a single masterplan, there have been two contributing teams, and the Sustainability Statement for the site necessarily comprises two parts. This brief covering report brings together the two sets of proposals that show how the individual teams have addressed national, regional and local policies that require new developments to be sustainable, and shows that the proposals effectively address matters relating to the management of resources and pollution, and are well adapted to the anticipated effects of future changes to the climate.

Reference should be made to the individual sections within the following report for further details of the proposals for the two parts of the development.



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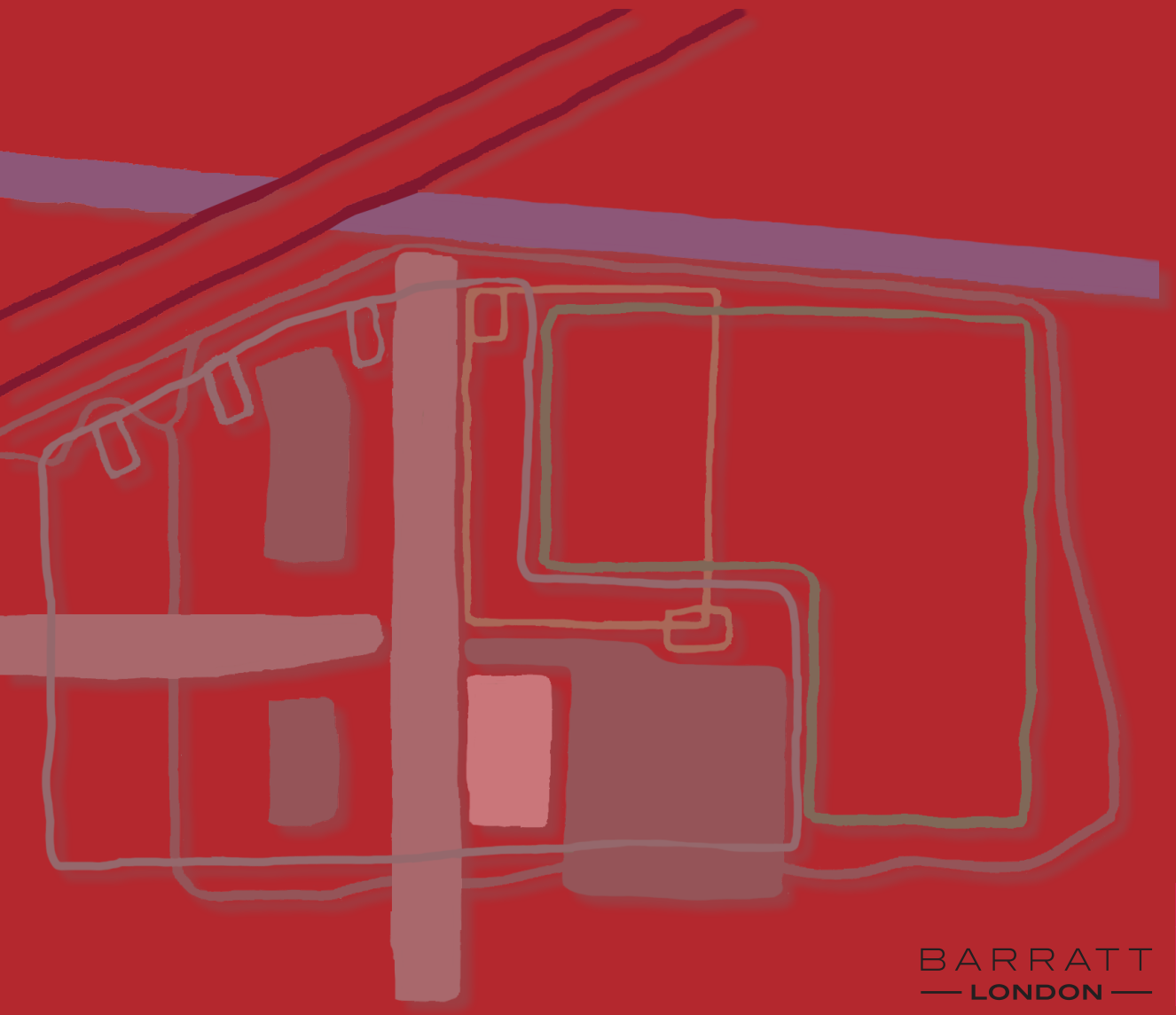
FORMER NESTLE FACTORY, HAYES

SUSTAINABILITY STATEMENT

(Residential Scheme) including Overheating Risk Analysis

MAY 2017



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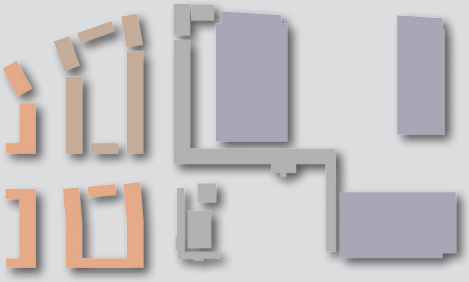

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Former Nestlé Factory

Nestles Avenue, Hayes UB3 4RF

Sustainability Statement

(Residential Scheme)

Prepared by

BBS Environmental

For

Barratt London

Date

May 2017

SUS54738 Issue 2

Contents

About Bespoke Builder Services Ltd

Bespoke Builder Services Ltd is a construction consultancy specialising in sustainability, energy conservation and the application of renewable energy technologies. As a consultancy, we do not sell products, so we are able to take an objective view of a development to assist developers in incorporating the most cost effective and practical solutions.

Our range of services includes specialist pre-planning reports, energy consumption calculations for Building Regulations purposes, and broader environmental and sustainability studies and reports and, BREEAM Assessments. Our team of consultants includes registered SAP and SBEM Assessors, registered BREEAM Assessors, Planning Specialists, Renewable Energy Specialists, Chartered Engineers and Chartered Surveyors.

A sister consultancy is a Corporate Approved Inspector, approved to provide Building Control services in both the residential and commercial sectors, and where necessary we are able to draw on this additional expertise to ensure that all advice given in respect of energy conservation and sustainability will also meet all other constraints imposed by the Building Regulations.

Established in 2001 by two directors with many years' experience in the construction industry, the practice has grown steadily, and to date has carried out hundreds of EcoHomes, BREEAM and CSH assessments, and many thousands of SAP assessments. In early 2016, and with the full support of the existing BBS directors and senior management, the business became part of the Stroma Group, although it continues to operate as a separate entity with the same directors, management and staff.

By applying this expertise to assist developers to understand and meet the obligations to ensure that developments are sustainable, and incorporate energy conservation and on-site renewable energy technologies, we are able to help ensure that these vitally important issues are addressed in a transparent way, where the needs and responsibilities of all the stakeholders are fully respected.

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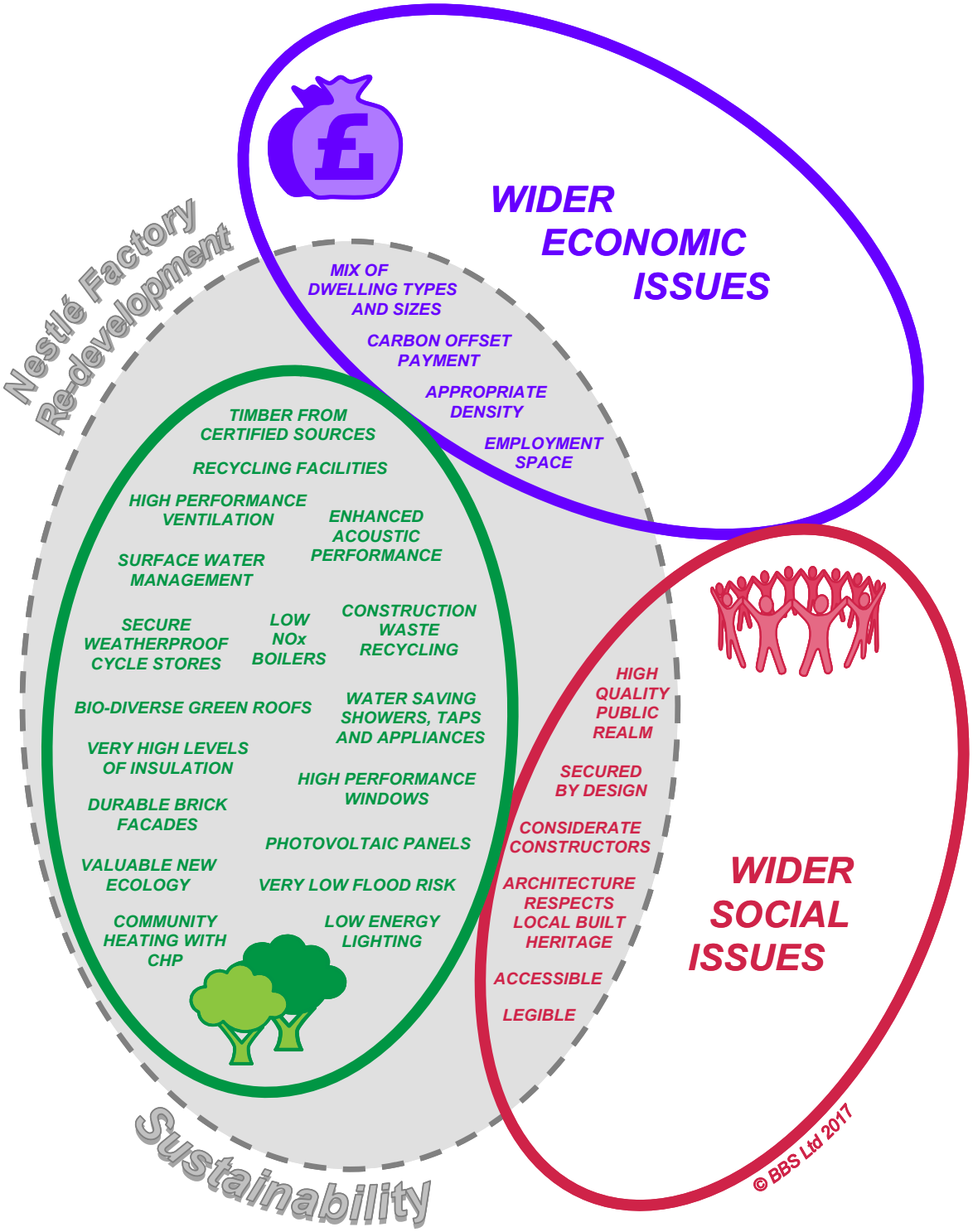
8th May 2017

Assessment type: Full Planning Application



A diagrammatic representation showing the extent and limits to which the design, specification and implementation of a development can contribute to wider sustainability objectives.

1. Executive Summary

Introduction

This Sustainability Statement has been prepared for the Applicant, Barratt London Ltd, by BBS Environmental, a construction consultancy specialising in sustainability, energy conservation and the application of renewable energy technologies. It has been prepared to accompany a detailed planning application for the redevelopment of the former Nestlé factory site in Hayes in the London Borough of Hillingdon. This Sustainability Statement deals only with the residential buildings within the scheme together with the supporting Use Classes A1, A3, A4, B1, B8, D1 and D2. A separate Sustainable Design and Construction Statement has been prepared for the industrial re-development that forms part of the development proposal.

The proposals for the site comprise the part-demolition of existing factory buildings and associated structures, and redevelopment comprising 120,487 sqm (GEA) of residential floorspace to provide 1,381 dwellings (Use Class C3), office, retail, community and leisure uses (Use Classes A1/A3/A4/B1/B8/D1/D2), 22,663 sqm (GEA) of commercial floorspace (Use Classes B1c/B2/B8 and Data Centre (sui generis)), amenity and playspace, allotments, landscaping, access, service yards, associated car parking and other engineering works.

The development proposals satisfy the key environmental targets set out in the London Borough of Hillingdon *Local Plan Part 1: Strategic Policies (November 2012)*, and specifically, *Policy BE1: Built Environment* and *Policy EM1: Climate Change Adaptation and Mitigation.*

Table 1: Former Nestle Factory Sustainability Targets

Overall emissions reduction	**35% reduction in emissions (2013 baseline)**
Connect to a heating network	**Creation of a site-wide communal heating network**
On-site low carbon technologies	**378 kWp of PV panels and 600kWth CHP system**
Surface water run-off reduction	**Run-off attenuated to < 3 x the greenfield level**
Potable water use	**Domestic water use to be <105 L/p/d**

In addition to meeting the key targets listed above the proposals incorporate many other measures and features that will result in a development that conserves natural resources, limits pollution and environmental damage and is adapted to cope with the potential impacts of a changing climate, both during construction, and when in operation.

The development will be subject to Part L1A/L2A: 2013 of the Building Regulations. The Energy Statement is being submitted as a separate document.

Location, land use and urban design

The Planning Statement and the Design and Access Statement address these issues and specifically London Plan 2016(1) polices 7.1; 7.4 and 7.6. The planning application is for 1,381 dwellings, together with 22,663 m^2 of non-residential floorspace. The site was occupied by Nestlé until December 2014 and used as a coffee factory, with decommissioning taking place into 2015.

The entire factory site is within the *Botwell: Nestlé, Hayes Conservation Area*, and contains four buildings and structures identified as non-designated heritage assets, namely the main factory building, the gates and railings, the former canteen and the lodge. The *saved UDP (2003)* identifies the Nestlé site as a protected industrial site, and the emerging Local Plan Part 2 includes allocations for mixed use, subject to 20% of the site being used for employment generating uses and 10% being retained for open space and a sports pitch. The site has been used for industrial purposes for over a century, although it is bordered to the south by suburban housing. The proposed layout of the site has been developed to allow retention of the historic factory façades, and the factory canteen building, and to allow the remnant of woodland to be incorporated into the landscaping scheme. It also means that the original sense of place, and the concept of a “factory in a garden” has been successfully maintained.

The layout will create a highly pedestrian-permeable site and provide a new access to the canal towpath that borders the site to the north. The design also utilises the opportunity provided by the creation of two large podium blocks to conceal much of the servicing, and car and cycle parking provision, in undercroft locations, thereby maximising the area of landscaped open space within the scheme and improving the overall appearance. The problem of in-active frontages, that this approach often creates, has been addressed in a very ingenious way by locating “walk-up” duplex apartments around the perimeter of these blocks which generally have access both from the ground level, and the podium level.

Note 1: *The Spatial Development Strategy for London, consolidated with alterations since 2011*, GLA (March 2016)

Great care has been taken in the planning of the buildings to ensure that the development is fully accessible and adaptable. 90% of the dwellings have step-free access to the entrance level, and to private amenity spaces, and the required living space and facilities to satisfy Part M4(ii) – the successor to Lifetime Homes. In addition, 10% of the dwellings comply with the more demanding Part M4(iii) – the successor to a variety of local and regional wheelchair housing standards.

All of the communal facilities across the development have been designed to be accessible in accordance with *BS8300: 2009 Design of buildings and their approaches to meet the needs of disabled people: Code of practice.*

Energy and carbon dioxide emissions

The dwellings will be designed to exceed the requirements of Part L1A: 2013 by provision of enhanced insulation and energy efficient plant and equipment alone. All of the residential buildings and the non-residential space will be heated by a community heating system with condensing gas boilers and a gas Combined Heat and Power (CHP) system. The community heating network will be capable of being connected to a district heating scheme should one be developed in the locality in the future. In addition, substantial photovoltaic panel arrays are proposed for the roofs of the apartment buildings with a combined rating of 378 kWp, and these will contribute a further significant reduction in carbon dioxide emissions. The combination of the energy efficiency measures, the CHP unit and the photovoltaic panels will result in overall emissions for the development that are 35% below the 2013 regulatory baseline.

Adaptation to climate change

The development includes a range of features which will enable it to adapt to the potential effects of climate change including windows with deep reveals, and sized to provide good daylight, while avoiding excessive solar gain, balcony overhangs which provide significant summer shade, and where necessary, solar control glazing. These measures mean that no risk of overheating of the residential units was identified following a detailed assessment.

Bio-diverse green roofs are proposed to all buildings with the exception of Block I, the restored former canteen building, which will retain a lightweight barrel-vaulted roof. The roofs, with the exception of areas of roof terrace, are not required for, or suitable for, residential amenity use, so have been designed to maximise biodiversity. The roofs will also contribute to reducing rainwater run-off as part of a range of measures that will enable the development to cope with increased rainfall intensity, and reduce the overall run-off rate from the site to less than three times the greenfield levels in accordance with the London Plan 2016.

Avoiding pollution and environmental nuisance

An Air Quality Impact Assessment has been prepared for the development. The assessment concludes that the proposed development will have a negligible impact on local air quality taking account of all factors including the emissions from the community heating boilers and CHP unit, and the revised traffic profiles that will occur with the alternative use.

A Noise Impact Assessment has been carried out and the development will incorporate appropriate design measures to ensure that both the internal noise levels and the impact of the development on external noise-sensitive receptors, including those created within the new development, are acceptable. This will be subject to a technical assessment.

The Applicant will prepare and implement a Construction Environmental Management Plan in line with the Mayor's best practice guidance to minimise the local environmental impact during the construction phase. This will be supported by registering the development with the Considerate Constructors Scheme and subjecting the site to the regime of rigorous external audits that this entails.

Avoiding waste and minimising landfill

Prior to the commencement of the construction phase the Applicant will prepare a Site Waste Management Plan in accordance with best practice. They have an excellent track record of minimising and recycling construction waste, and evidence from previous projects demonstrates that typically over 90% of construction waste is recycled.

A strategy for managing operational waste has been developed and is being submitted in support of the application. Separate bin stores with space for refuse bins and bins for recycling of dry materials, together with space for bulk waste, will be provided in accordance with LBH guidance.

Nature conservation and biodiversity

The larger part of the site, which has a total area of approximately 7 Ha, has been developed for industrial use and is occupied by buildings and hard standings. An area of open space in the western part of the site was used for a tennis court and bowling green and has surrounding areas of amenity grassland and a number of mainly non-native, semi-mature trees. None of these areas has any significant biodiversity value. Notwithstanding this, the development of the scheme has taken account of the existing trees within the site and those along the perimeter will be retained as far as possible.

A second area of open space to the south of the site, amounting to approximately 0.9 Ha is a remnant of former woodland – part of the "garden" within which the original factory was built. This has a substantial number of mature native trees and therefore significant bio-diversity value, and so will be retained and incorporated into landscape masterplan for the site.

Across the rest of the site the landscaping scheme has been designed to achieve the maximum possible ecological benefit, and incorporates bio-diverse green roofs, grassland, and shrub, tree, woodland and ground flora planting.

Water conservation

A range of water conservation measures will be implemented to reduce the calculated residential water consumption to below 105 litres per day for each resident, and each dwelling will have an individual water meter.

The landlord's areas and the individual tenanted commercial units will be similarly metered, and all non-residential sanitary facilities will use low-water fittings in accordance with BREEAM guidance.

Flood risk and surface water management

The whole of the site is in a Zone 1 flood risk zone. The risk of groundwater or sewer flooding is also considered to be low.

The larger part of the site is currently occupied by impermeable buildings and hardstandings, and 33% of the site is soft landscaping. The proposed development will increase the area of soft landscaping slightly to 34% of the total site area. In addition, substantial areas of permeable paving and podium soft landscaping have been incorporated into the scheme. Deep-substrate green roofs are provided to all the apartment buildings.

The proposed surface water drainage system incorporates a number of SuDS measures as noted above, that follow the London drainage hierarchy although the use of infiltration is not generally feasible due to the underlying clay geology. All run-off from the site is routed via a series of attenuation systems prior to eventual discharge at controlled rates to either the canal to the north of the site, or the Thames Water surface water sewer in Nestles Avenue.

The total discharge rate for all outfalls will be limited to three times the "greenfield" rate from the site, in accordance with the London Plan 2016.

2. Introduction

Background

This Sustainability Statement has been prepared for the joint Applicants, SEGRO plc and Barratt London Ltd, by BBS Environmental, a construction consultancy specialising in sustainability, energy conservation and the application of renewable energy technologies. It has been prepared to accompany a detailed planning application for the redevelopment of the former Nestlé factory site in Hayes in the London Borough of Hillingdon. This part of the Sustainability Statement deals only with the residential buildings within the scheme together with the supporting Use Classes A1, A2, A3, A5, D1 and D2. A separate Sustainable Design and Construction Statement has been prepared for the commercial re-development that forms part of the development proposal.

This document outlines the measures that have been taken to contribute to the sustainability of the proposals, including matters relating to the use and layout of the site, the design of the blocks, and the construction and operational phases of the development. It draws extensively on the more detailed technical reports commissioned from specialist consultants and submitted in support of the application. Additional information contained in this report has been assembled from extensive discussions with the Applicant and the Design Team.

Development proposals

Planning permission is sought for the part-demolition of the existing redundant factory buildings, and the erection of two large podium-style apartment buildings and four smaller apartment buildings. The east, south and part of the western facades of the locally-listed main factory building will be retained and re-built or re-used to create a further apartment building along the perimeter of the residential part of the site, and the original locally-listed factory canteen building cluster will be restored to create space for the management offices, a nursey, a cafe and a leisure suite.

The proposed development will contain a total of 1,381 dwellings, and the total floor area of the non-residential buildings is approximately 2,400 m^2. Across the development, in suitable basement, undercroft and ground floor locations, space has been allocated for car and cycle parking, the Energy Centre, and for other services such as tank rooms, and heating and electrical substations.

The site is located on Nestles Avenue and it is bounded to the north and northwest by the Great Western Main Line railway and the Grand Union Canal. To the east, across North Hyde Gardens, there is a major electricity sub-station, to the south west there is extensive suburban housing, and to the west there is a small post-war industrial estate. The emerging London Borough of Hillingdon local plan has identified the site for residential-led mixed use re-development.

A significant feature of the development proposal is the retention of the southern, eastern and parts of the western façades, and entrance tower of the iconic Truscon / Wallis Gilbert & Partners factory building, the repair and rebuilding of the original west front of the Sandow factory building that dates from 1911, and the restoration of the factory canteen cluster. In all cases the retained elements will be sympathetically restored and preserved while being converted to mainly new residential use, and in so doing, the performance will be upgraded as far as possible to the latest standards, although there may be some necessary compromises in terms of the thermal performance of the fabric compared to equivalent new buildings.

The existing use of the site for manufacturing purposes has brought significant employment to Hayes for many decades. The closure of the Nestlé factory in 2014 was the result of a strategic decision by the owners to rationalise its coffee production in the UK. The production was transferred to an expanded site at Tutbury, Derbyshire. The loss of this employment is not related to the outcome of this current planning application, and the specialist nature of the buildings means they could not easily be adapted to other Class B1 use. Notwithstanding this fact, the Applicant in conjunction with local consultees, is keen to retain some employment use on this part of site, and the ground floor of Block H, and the whole of the historic factory canteen cluster will be used to provide a management suite and supporting community facilities, with a resulting small number of employment opportunities. The eastern part of the development, covered by a separate report, will provide significant industrial re-provision and employment opportunities.

The proposal for the larger residential part of the site is to produce a development of the highest quality that will reflect the local built environment both in its more suburban nature to the south, and its industrial aesthetic along the line of the railway and canal to the north. In so doing it will contribute positively to the character of the neighbourhood; retain and restore important historic elements; use the latest technologies and construction practices to create a development that has the lowest possible environmental impact; and provide much needed high quality homes for local people.

Sustainability statement outline

This Sustainability Statement includes the following parts:

- A summary of the local and regional planning policies relating to sustainability and applicable to the development (Section 3);
- An examination of how the design of the proposed development responds to these policies and guidelines (Section 4).

This document makes frequent reference to other technical reports that are being submitted separately in support of the application. Reference should be made to these documents for further detailed information.

3. Planning policy context

3.1 Introduction

The development proposals have been considered in the context of national, regional and local planning policy. The National Planning Policy Framework (NPPF), published on 27th March 2012, sets out the current national policy on land use planning. Paragraphs 6 to 17 of the NPPF set out how the government expects the planning system to contribute to the achievement of sustainable development, and the subsequent paragraphs, 18 to 219, taken as a whole, constitute the government's view of what sustainable development in England means in practice for the planning system.

At the heart of the NPPF is a presumption in favour of sustainable development. This presumption must guide decision-taking, and means that development proposals that accord with the applicable development plan must be approved without delay. Where a development plan is absent, silent, or relevant policies are out of date, approval should also be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the NPPF taken as a whole, or where specific policies in the NPPF indicate that development should be restricted. It follows therefore that where an adopted development plan or emerging policies are in place, both at a regional and local level, the NPPF requires that the supplication is determined in the light of these policies. The key policy and planning guidance documents that are relevant to the proposals in this application are detailed below.

3.2 Regional planning policies (Greater London Authority policies)

The current overarching spatial planning document for London is the London Plan: Spatial Development Strategy for London (consolidated with alterations) (GLA) (March 2015).

In addition the GLA London Plan Supplementary Planning Guidance document: Sustainable Design and Construction SPG (GLA) (April 2014) is also material to the application (see also below).

3.3 Local planning policies (London Borough of Hillingdon policies)

The local spatial planning document for the London Borough of Hillingdon is the *Local Plan Part 1: Strategic Policies (November 2012)* and the emerging *Local Plan Part 2: Development Management Policies (Revised Proposed Submission Version, October 2015)*. The detailed development

management policies are contained in the Local Plan Part 2, which expands the strategic policies with additional guidance, and although not yet adopted the content is material to deciding the application.

The key policies that relates to the sustainability of new development in the *Local Plan Part 1,* are *Policy BE1: Built Environment* and *Policy EM1: Climate Change Adaptation and Mitigation.* The detailed guidance on implementation is contained in the *Local Plan Part 2,* mainly in *Section 5. Historic and Built Environment* and *Section 6. Environmental Protection and Enhancement.* These emerging policies are all aligned to the *London Plan 2016,* and broadly follow the form and content of the *GLA Sustainable Design and Construction SPG (GLA) (April 2014)* although this latter document does introduce some more demanding requirements, particularly with regard to energy efficiency and air quality.

Therefore, this Sustainability Statement has been structured to reflect the structure and requirements of the *Sustainable Design and Construction SPG (GLA) (April 2014).* However, where there are distinctive local policy requirements, these are noted. In addition, a variety of other regional and national guidance published by the GLA and others has been taken into account.

3.4 Changes to national planning policy

A specific paragraph of the LBH *Local Plan Part 1, Policy BE1: Built Environment* deals with *Code for Sustainable Homes (CSH)* compliance and states that the Council will encourage all new residential developments to meet Code Level 4. This policy has been superseded by an amendment to *National Planning Policy* issued in the form of a *Written Ministerial Statement (WMS)* on 25th March 2015. The WMS announced the withdrawal of the CSH and a general prohibition on local planning authorities requiring CSH compliance with immediate effect. This change has been reflected in the emerging *Local Plan Part 2: Development Management Policies (Revised Proposed Submission Version, October 2015)* from which all references to the CSH have been deleted.

The WMS also announced the introduction of new *National Technical Standards* (NTS) including new standards on energy and emissions, water conservation, access and internal space, and a new *Part Q* of the Building Regulations on *Security.* These standards can be applied by local planning authorities that have in place an existing policy requirement for CSH Level 4 compliance. The new standards for energy and water are described as being equivalent to compliance with the mandatory requirements of CSH Level 4, section Ene1 which requires (for dwellings subject to Part L1A: 2013) a 19% reduction in emissions, and section Wat1 which requires that internal water use does not exceed 105 L/p/d.

Given that LBH does have an existing adopted policy that encourages CSH Level 4 compliance it is anticipated that a requirement for compliance with the new National Technical Standards on energy and emissions, and water conservation will be applied, and accordingly the development proposals as set out in this and the other supporting documents fully satisfy these standards.

Finally, the WMS announced a general prohibition on local planning authorities imposing requirements that relate to *the construction, internal layout or performance* of new dwellings apart from the new National Technical Standards. Therefore, notwithstanding any existing policies or guidance on Sustainable Design and Construction, for the purpose of this application and except as otherwise described in this Statement, the Developer is not submitting for approval details of matters that relate the construction, internal layout or performance of the individual dwellings within the scheme, nor should the local planning authority attempt to impose these by means of Planning Conditions.

4. Design response

4.1 Introduction

This Sustainability Statement addresses issues that relate to local and regional planning policy and each section identifies relevant policies and an explanation of how the proposed development responds to these policies. The information presented is based on documentation prepared by and discussions held with the Design Team.

4.2 Resource management

4.2.1 Introduction

London is a growing city with a limited supply of land for economic, residential, recreational and natural land uses. This section outlines how the proposals make the most of the opportunities provided by the site, based on its specific circumstances, and how they have been designed to improve the local and wider environment and minimise their demand on wider resources including land, energy, water and materials.

4.2.2 Land

MAYOR'S PRIORITIES

Optimising the use of land (London Plan policy references: 3.4, 4.3, 7.6)

Developers should optimise the scale and density of their development, considering the local context, to make efficient use of London's limited land.

Design response

The development site is vacant, and the redundant, mainly low quality buildings, have no prospect of substantive re-use for employment or other purposes. The London Borough of Hillingdon *saved UDP* identifies the Nestlé site as a protected industrial site, and the emerging Local Plan Part 2 includes allocations for mixed use, subject to 20% of the site being used for employment generating uses and 10% being retained for open space and a sports pitch.

The proposed density is within the appropriate density range in the London Plan 2016 guidance for a suburban site, given the PTAL and the nature of the proposed buildings. The Planning Statement and the Design and Access Statement address these issues and specifically London Plan polices 7.1; 7.4 and 7.6. During the development of the scheme the Architects have consulted extensively with GLA the LBH, residents' groups and other local stakeholders, and have held public consultation meetings. The feedback received has been taken into account in the final form of the proposals.

The proposals contain the following key provisions of land uses:

- 1,381 residential units
- 2,400 m^2 (approx) of non-residential space
- 712 car parking spaces (including 20 non-residential spaces)
- 139 active electric vehicle charging points (EVCPs) and 139 passive EVCPs
- 2,186 cycle spaces (including 78 visitor spaces)

The underlying objectives of the proposal are to retain the distinctive landmark provided by the façade of the historic factory building and to provide a supporting development of the highest quality that will contribute positively to the character of the neighbourhood; to use the latest technologies and construction practices to create a development that has the lowest possible environmental impact; to include some re-use for employment purposes, although not from a single use or user; and to provide much-needed dwellings for local people.

4.2.3 Site layout and building design

MAYOR'S PRIORITIES

Site layout and design (2.18, 5.2 – 5.13, 5.16, 5.18, 5.21, 6.1, 6.7 – 6.13, 7.1, 7.6, 7.14 – 7.22)

The design of the site and building layout, footprint, scale and height of buildings as well as the location of land uses should consider:

Existing features

- *the possible retention and reuse of existing buildings and structures; and*
- *the retention of existing green infrastructure, including trees and potential for its improvement and extension;*
- *access routes to public transport and other facilities that minimise the use of private transport;*

New design of development

- *the existing landform;*
- *the potential to take advantage of natural systems such as wind, sun and shading;*
- *the principles set out London Plan policies 7.1 and 7.6;*
- *the potential for adaption and reuse in the future;*
- *potential for incorporating green infrastructure;*
- *potential for incorporating open space, recreation space, child play space;*
- *energy demands and the ability to take advantage of natural systems and low and zero carbon energy sources;*
- *site wide infrastructure;*
- *access to low carbon transport modes;*
- *potential to address any local air quality, noise disturbance, flooding and land contamination issues; and*
- *the potential effect on the microclimate.*

Design response

While the majority of the existing factory buildings are of poor quality and no architectural merit, the distinctive façade and entrance tower of the main Truscon factory building is such that retention and conversion to apartments was an obvious, and initially preferred option. However detailed surveys revealed that this would be technically difficult, and the performance and layout of the resulting building would be far from ideal as the dimensions of the structural grid make it very difficult to design apartments that meet the current space standards. So, in consultation with the various stakeholders, and given that there is broad agreement that the main historic and aesthetic value lies in the façades and the tower, it is proposed to retain only these limited parts of the building.

A new concrete frame building will be constructed behind the façade to support it, and thermal insulation will be installed between the existing façade and the new internal walls of the apartments being created behind the façade. The floor structure can be thermally isolated in two ways: the first would be to cut through the floor structure close to the façade, and tie the façade back to a new supporting concrete frame using thermally broken lateral restraints; the second is to apply very substantial thicknesses of insulation directly to the top and bottom of the existing slab. While the best technical solution can only be determined following intrusive structural investigation and detailed thermal modelling, it is anticipated that the performance of this façade can be broadly similar to that of the new-build elements.

The alternative, which would be to apply a thick layer of external insulation and a decorative render finish to the *outside* of the façade was not considered as this would result in a major change to the appearance of the building, and this is understood to not be acceptable.

The other historic buildings on the site are the Sandow building, which is the original cocoa factory building dating from 1911, and the canteen hall and its surrounding cluster of service units. The Sandow building has suffered from so much alteration and accretion that there is nothing of substance left of the original building, however it will be re-built to form block F2. The canteen hall will be restored, retaining as much of the original structure as possible, and the cluster of service buildings will be re-built or restored as necessary – with all of these buildings being brought up-to-date as far as possible in terms of structural, thermal, fire and weatherproofing performance.

The site falls into two distinctive areas. The larger part of the site is occupied by the extensive factory buildings and hardstandings that were developed and expanded around the original Sandow building to meet the growing needs of the manufacturing plant. The open areas of the site generally include mainly amenity grassland, ornamental shrubs and non-native trees that are of poor quality and little amenity value. However, there is an open green space to the south which once formed part of a larger area of woodland, and which contains a significant number of mature and semi-mature native trees. This will be retained and enhanced by the development. Other highlights of the design include:

- Retaining, restoring and re-building key elements of the industrial architecture;
- Designing the façades to achieve a balance between daylight, heat loss and overheating;
- Designing 90% of the dwellings to be accessible and adaptable, to Part M4(ii)
- Designing 10% of the dwellings for wheelchair users, to Part M4(iii)
- Using concrete frame construction which allows future re-use of the frame;
- Specifying fabric thermal performance to a level that exceeds current standards;
- Incorporating the remaining parcel of woodland into the landscaping scheme;
- Constructing a site wide CHP-based communal heating network;
- Installing a series of substantial PV panel arrays on most flat roofs;
- Implementing a sustainable drainage system with significant on-site water storage; and
- Providing bio-diverse green roofs to all the new apartment blocks.

All of the above are covered in much greater detail in the specialist reports that accompany the application. Please refer specifically to the Design and Access Statement; the Energy Statement, the Flood Risk Assessment, the Landscape Strategy and the Ecological and Tree Survey Report.

4.2.4 Energy and carbon dioxide emissions

MAYOR'S PRIORITIES

Energy and carbon dioxide emissions (5.2, 5.3)

The overall carbon dioxide emissions from a development should be minimised through the implementation of the energy hierarchy set out in ***London Plan policy 5.2.***

Developments should be designed to meet the following Regulated carbon dioxide standards, in line with ***London Plan policy 5.2.***

Residential buildings	
Year	*Improvements beyond 2020 Building regulations*
2013 - 2016	*40 percent*
2016 - 2031	*Zero carbon*
Non-domestic buildings	
Year	*Improvements beyond 2020 Building regulations*
2013 - 2016	*40 percent*
2016 - 2019	*As per the Building regulation requirements*
2019 - 2031	*Zero carbon*

Energy demand assessment (5.2)

Development applications are to be accompanied by an energy demand assessment.

Use less energy (5.2, 5.3, 5.9)

The design of developments should prioritise passive measures.

Developers should aim to achieve Part L 2013 Building Regulations requirements through design and energy efficiency alone, as far as is practical.

Efficient energy supply (5.5, 5.6)

Developers should assess the potential for their development to:

- *connect to an existing district heating or cooling network;*
- *expand an existing district heating or cooling network, and connect to it; or*
- *establish a site wide network, and enable the connection of existing buildings in the vicinity of the development.*

Design response

One of the fundamental objectives of any development that embraces sustainable design principles is to reduce operational carbon dioxide emissions. This is of course to reduce the rate at which the level of atmospheric carbon dioxide is increasing as well as to conserve finite fossil fuel reserves.

An Energy Statement has been prepared for the residential part of the development and this is being submitted as a separate document as the strategy is different to that proposed for the industrial element. This statement adheres to the principles set out in the London Plan 2016 and has been prepared in accordance with the *GLA Guidance on preparing energy assessment (March 2016).*

The starting point in developing the energy strategy for the proposed buildings was to determine and then design-in specifications that would minimise the intrinsic energy demand of the development. The National Calculation Method (NCM) for dwellings, SAP2012, was used for the apartments, for other buildings SBEM2013 was used. An extensive and fully representative range of building types were modelled and assessed.

The specifications proposed will ensure that the buildings exceed the requirements of Part L1A/L2A: 2013 of the Building Regulations prior to the application of low and zero carbon technologies, and that the average improvement in predicted carbon dioxide emissions for the development at this point compared to the compliance level is 2.82%.

Further details are provided in the Energy Statement, but key efficiency measures proposed for the residential part of the development are as follows:

- Significantly reduced U-values (compared to the compliance reference values) for external walls, roof, floors and windows for all buildings including the rebuilt main building;

- Careful detailing of non-repeating thermal bridges to reduce the linear thermal transmittance figures as far as possible and minimise surface condensation risk;
- Careful detailing to create a robust airtight building envelope for each dwelling with an air leakage rate of <4m^3/hour/m^2, verified by an appropriate scheme of testing to ensure compliance;
- Optimised window sizes and recessed windows designed to benefit from desirable winter solar gains, but avoid problems with summer overheating;
- Low energy lighting throughout the development using “A” rated low energy lamps;
- Automatic controls using PIR or daylight sensors for all common area and external lighting, including ancillary areas such as bin and cycle stores;
- High performance hot water cylinders with declared loss factors of less than 0.01 kWh/L/day;
- High efficiency EST “best practice compliant” mechanical balanced ventilation systems with heat recovery and summer bypass;
- Low water showers and taps to reduce as far as possible the consumption of domestic hot water.

As a further energy saving measure – albeit one that does not affect the *regulated energy use* as defined by the Building Regulations – all relevant white goods, namely fridges, freezers, washing machines, washer-dryers and dishwashers will have “best in class” EU energy ratings (typically “A” or A+”) as specified to gain credits in the CSH2010 Technical Guide.

The non-residential spaces, as is generally the case for uses of the type proposed, have significant regulated energy demands for hot water and lighting and limited demands for heating. The efficiency measures proposed include the very high levels of insulation and the low air leakage rate proposed for the buildings generally together with a range of efficiency measures relating to lighting and other services. The tenant’s fit-out specification is likely to include the following:

- Automatic lighting controls
- Space lighting lamp efficacy of at least 80 lumens/watt
- Glazing g-value of 0.4 or less where appropriate

In addition to adopting the extensive range of efficiency measures listed above, the Design Team reviewed the options for heating systems in the context of the constraints of the scheme itself, including the architecture of the buildings, the location of the site, the latest planning guidance and substantial practical experience of low and zero carbon heating systems.

The possibility of connecting to an existing district heating system was considered but a review of existing schemes using the London Heat Map revealed that there are none within a reasonable distance of the site. The site is approximately 580 m south east of the nearest point of a proposed "Hillingdon-Hayes" District heating Network, but no practical progress on such a network appears to have been made. There is therefore no short term potential to connect to an existing wider network.

The options were evaluated as set out in the Energy Statement and the final proposals are as follows:

- A community heating system will provide heat to the all the apartment buildings, using a heat-led gas CHP system as the lead heat source, and condensing low NOx gas boilers to satisfy peak heat demands;
- The CHP system will be specified to deliver at least 60% of the annual heat demand, and to satisfy the CHPQA (Quality Assurance for Combined Heat and Power) criteria;
- The commercial space will also use the low carbon heat from the community heating plant and this, in addition to the efficiency measures, is predicted to result in compliance with the requirements of Part L2A: 2013 of the Building Regulations without the provision of additional dedicated renewable energy systems; and
- This approach is wholly consistent with The London Plan 2016 *Policy 5.6 Decentralised Energy Networks*, and the equivalent LBH policies.

The location of the Energy Centre, on the western flank of Block D1, has been selected because it has good servicing access from the Milk Street entrance and the adjoining Milk Yard parking area, and Block D1, at ten storeys, will allow the boiler and CHP unit flues to be taken up the outside of the building and discharge above the roof level, at a height that is well above the lower surrounding buildings. It also allows a straight forward route for a future connection to a district heating network to be reserved through soft landscaping to Nestles Avenue. Finally, if in the future, there should be a further mixed used re-development of the industrial estate to the west of the site, the heating network could easily be extended to the west to serve this.

To summarise therefore, the combination of the use of very high thermal performance building fabric for every building, including the rebuilt factory buildings and the non-residential spaces, a wide range of efficiency measures in both the residential units and the non-residential spaces, and a low carbon community heating system with heat-led gas-fired CHP units, will achieve emissions for the whole of this part of the scheme that are over 25% lower than the total emissions permitted by the 2013 Building Regulations. This total saving is composed of a 2.82% saving from efficiency measures and 22.50% from the low carbon CHP-based communal heating.

4.2.5 Renewable energy

MAYOR'S PRIORITIES

Renewable energy (5.4, 5.7)

Major developments should incorporate renewable energy technologies to minimise overall carbon dioxide emissions, where feasible.

Carbon dioxide off-setting (5.2, 5.4)

Where developments do not achieve the Mayor's carbon dioxide reduction targets set out in London Plan policy 5.2, the developer should make a contribution to the local borough's carbon dioxide off-setting fund.

Monitoring energy use (5.2, 5.3)

Developers are encouraged to incorporate monitoring equipment, and systems where appropriate to enable occupiers to monitor and reduce their energy use.

Design response

There is often limited scope for renewable energy systems on high density urban and suburban residential developments where CHP-based communal heating is employed. However, in this case there is significant available flat roof space that can be used for photovoltaic (PV) panel arrays.

A review of the roof plans demonstrated that the majority of roofs would be suitable for PV arrays, and that only limited areas were proposed for amenity space, or would be affected by shading from other buildings. Extensive arrays will therefore be installed on all the buildings with the exception of blocks F1, F2, F4, H, and the non-residential units.

The proposed arrays will have a total nominal rating of 378 kWp, and together contribute carbon dioxide emissions savings of 149 Tonnes per year, and increase the overall savings to 35.31% referenced to the 2013 Building Regulations. The scheme is therefore fully compliant with Policy 5.2 of the London Plan 2016. Full details are contained in the Energy Statement, submitted as separate document.

4.2.6 Water efficiency

MAYOR'S PRIORITIES

Water efficiency (5.3, 5.4, 5.13, 5.15)

Developers should maximise the opportunities for water saving measures and appliances in all developments, including the reuse and using alternative sources of water.

Developers should design residential schemes to meet a water consumption rate of 105 litres or less per person per day.

New non-residential developments, including refurbishments, should aim to achieve the maximum number of water credits in a BREEAM assessment or the 'best practice' level of the AECB (Association of Environment Conscious Building) water standards.

All developments should be designed to incorporate rainwater harvesting.

All residential units, including individual flats / apartments and commercial units, and where practical, individual leases in large commercial properties should be metered.

Design response

A range of water conservation measures will be implemented to reduce the calculated water consumption to below 105 litres per day for each resident as calculated using the methodology defined in Part G: 2010 of the Building Regulations.

The following sanitaryware and fitting specifications are typically used by the Applicant:

- 4.5/3 Litres dual flush WCs
- Bath capacity 155 Litres to overflow
- Showers regulated to 9 Litres/minute
- Basin taps regulated to 4 Litres/minute
- Kitchen sink taps regulated to 6 Litres/minute

Note: Bath taps do not have to be regulated as bath water consumption is based on bath capacity to overflow not tap flow rate.

In addition, low water appliances are typically specified with consumption figures not exceeding 8.17 Litres/kg of wash load for washing machines and 1.3 Litres/place setting for dishwashers. Each dwelling will have an individual water meter.

Landlord's area and the individual tenanted commercial units will be similarly metered, and all non-residential sanitary facilities will use low-water fittings in accordance with BREEAM guidance.

Rainwater harvesting is not proposed for irrigation purposes as the buildings have deep-substrate green roofs. This means that the summer run-off is very limited for normal rainfall events, so the amount of water collected during the summer when water could be used for irrigation purposes would not be sufficient to justify providing such systems.

Rainwater harvesting was considered for WC flushing in, for example the supporting non-residential areas such as the café and nursery. However, it is not proposed because the useful rainwater collection period would be limited to typically the winter months only for the reasons set out above, and even with treatment the water can be discoloured, and this is considered to be unacceptable for use in public or other areas where hygiene is a priority.

4.2.7 Materials and waste

MAYOR'S PRIORITIES

Design phase (5.3, 5.20, 7.6, 7.14)

The design of development should prioritise materials that:

- *have a low embodied energy, including those that can be re-used intact or recycled;*
- *at least three of the key elements of the building envelope (external walls, windows roof, upper floor slabs, internal walls, floor finishes / coverings) are to achieve a rating of A+ to D in the BRE's The Green Guide to specification;*
- *can be sustainably sourced;*
- *at least 50% of timber and timber products should be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source;*
- *are durable to cater for their level of use and exposure; and*
- *will not release toxins into the internal and external environment, including those that deplete stratospheric ozone*

Construction phase (5.3, 5.20)

Developers should maximise the use of existing resources and materials and minimise waste generated during the demolition and construction process through the implementation of the waste hierarchy.

Occupation phase (5.3, 5.17)

Developers should provide sufficient internal space for the storage of recyclable and compostable materials and waste in their schemes.

The design of development should meet borough requirements for the size and location of recycling, composting and refuse storage and its removal.

As noted in Section 3, the Written Ministerial Statement (WMS) issued on 25th March 2015, that constitutes a revision to National Planning Policy, announced a general prohibition on local planning authorities imposing requirements that relate to the construction, internal layout or performance of new dwellings. Accordingly this Statement contains no details of the proposed construction materials. Details pertinent to the appearance of the development are contained in the Design and Access Statement.

Design response

Prior to the commencement of the construction phase the Applicant will prepare a Site Waste Management Plan (SWMP). The SWMP will include policies that relate to the monitoring, reduction, and recycling of construction waste. Typical materials groups that are recycled include inert materials, plasterboard, ceramics, metals, concrete and timber. The policy follows guidance issued by BRE such as the SMARTWASTE^{TM} system and relevant guidance from CIRIA, published as: *Special Publication 133: Waste minimisation in construction, a site guide; CIRIA (1997).* As far as possible, inert material will be re-used on site for landscaping purposes. The Applicant has an excellent track record of minimising and recycling construction waste, and evidence from previous projects demonstrates that typically over 85% of construction waste is recycled.

The Design Team has consulted with LBH and the design includes separate dedicated bin stores and bulk waste stores for the apartments on the ground floor and in the car parking areas. The bin capacities satisfy the LBH requirements, providing at least 100 Litres per dwelling for 1-bed units, and an additional

70 litres of capacity per dwelling for each additional bedroom. In the first instance, the bins provided will be split 50:50 between residual waste and comingled dry recycling. Use will be monitored, and the split revised as necessary. LBH do not provide a food waste collection service from apartment-style developments, and are not proposing to do so in the near future, so these facilities are not included. All the bin stores have been designed to be accessible in accordance with *BS8300: 2009 Design of buildings and their approaches to meet the needs of disabled people: Code of practice.* Full details are provided in the Design and Access Statement being submitted in support of the application.

In addition, separate storage for dry recyclables and food waste will be provided in the kitchen of every dwelling, and detailed information will be provided on the LBH recycling service to encourage residents to participate in the recycling collection scheme.

4.2.8 Nature conservation and biodiversity

MAYOR'S PRIORITIES

Nature conservation and biodiversity (5.3, 7.19)

There is no net loss in the quality and quantity of biodiversity.

Developers make a contribution to biodiversity on their development site.

Design response

The larger part of the site, which has a total area of approximately 7 Ha, has been developed for industrial use and is occupied by buildings and hard standings. The buildings have been surveyed and found to contain no areas that are likely to be used by bats. An area of open space in the western part of the site was used for a tennis court and bowling green and has surrounding areas of amenity grassland and a number of mainly non-native, semi-mature trees. None of these areas has any significant biodiversity value. However, the second open space in the southern part of the site is a remnant of a larger area of woodland and this has significant value, mainly due to the range of mature native trees present. It extends to an area of approximately 0.9 Ha.

This area, which represents an amenity of significant value, forms a key component of the landscape masterplan for the site, and it will be retained and protected. Across the rest of the site the landscaping scheme has been designed to achieve the maximum possible ecological benefit, and incorporates bio-diverse green roofs, grassland, and shrub, tree, woodland and ground flora planting.

Full details of the existing site ecology are provided in the Ecological and Tree Survey and Report, and the details of the substantial range of new landscaping works, are provided in the Landscape Strategy. These proposals will result in the protection of the existing site ecology, and a significant enhancement to the quality and quantity of the biodiversity on the site.

4.3 Climate change adaptation

4.3.1 Introduction

This section outlines how the proposals incorporate measures that will enable the new dwellings to adapt to predicted future changes in the climate, and to help ensure that London remains an inviting environment in which to invest, work and live.

4.3.2 Tackling increased temperature and drought

MAYOR'S PRIORITIES

Overheating (5.3, 5.9)

Developers should include measures, in the design of their schemes, in line with the cooling hierarchy set out in London Plan policy 5.9 to prevent overheating over the scheme's lifetime.

Heat and drought resistant planting (5.3, 5.15)

The design of developments should prioritise landscape planting that is drought resistant and has a low water demand for supplementary watering.

Resilient foundations (5.3, 5.76)

Developers should consider any long-term potential for extreme weather events to affect a building's foundations and to ensure they are robust.

Design response

The development in general, and the dwellings in particular, include a range of measures that reflect the cooling hierarchy set out in London Plan Policy 5.9.

With respect to summer overheating:

- Window sizes have been optimised, and none of the apartments have an overheating risk greater than “slight” when assessed in accordance with SAP 2012 Appendix P.
- Windows to some ground floor apartments together with those on façades closest to the railway line will have solar control glazing as necessary;
- Windows are generally recessed up to 200mm to provide shading, and significant shading is provided by balconies;
- Low energy lighting and low-loss hot water cylinders will be installed in all dwellings to reduce undesirable internal gains;
- All apartment blocks will have green roofs to create a positive impact on biodiversity and reduce the contribution from the buildings to the urban heat island effect;
- A significant area of the roof of most of the blocks will be occupied by PV panel arrays, but it is envisaged that with suitable mounting arrangements this can be mounted above the green roof surface and create additional habitat diversity due to shading;
- The vegetated surface of the roofs will absorb less radiant heat from the sun and will provide some limited additional cooling as heat is removed in conjunction with the transpiration of moisture from the plants; and
- A substantial proportion of the car parking is located in basements or undercrofts allowing the total area of unvegetated surfaces across the development (buildings with conventional roofs, roads, paths, car parks and other hardstandings) to be reduced by 45% compared to the current site, thus further reducing the contribution to the urban heat island effect.

Further detailed information including façade glazing ratios and a full set of Appendix P results for each dwelling type is provided in the Energy Statement, submitted as separate document.

There is a need to carefully balance the use of low water planting with the need to ensure that the planting has local biodiversity and amenity value. To this end, while the main ground-level and podium planting may require some supplementary watering in dry weather, the deep-substrate green roofs will be seeded with species that will not require routine supplementary watering.

All apartment buildings will have deep-piled foundations which will eliminate any potential for the foundations to be affected by extreme weather events.

4.3.3 Increasing green cover

MAYOR'S PRIORITIES

Urban greening (2.18, 5.3, 5.10, 5.11)

Developers should integrate green infrastructure into development schemes, including by creating links with wider green infrastructure network.

Trees (5.3, 5.10, 7.21)

Developments should contribute to the Mayor's target to increase tree cover across London by 5% by 2025.

Any loss of a trees resulting from development should be replaced with an appropriate tree or group of trees for the location, with the aim of providing the same canopy cover as that provided by the original tree(s).

Design response

The larger part of the site, which has a total area of approximately 7 Ha, has been developed for industrial use and is occupied by buildings and hard standings, and 33% of the site area is currently occupied by soft landscaping. The majority of this existing green space is located at the south of the site in two distinct areas. To the southwest, part of the site was used for a tennis court and bowling green and it has surrounding areas of amenity grassland and a number of mainly non-native, semi-mature trees. To the southeast, the second open space is a remnant of a larger area of woodland that has a range of mature native trees, and hence significant biodiversity value.

The woodland area forms a key component of the landscape masterplan for the site, and it will be retained and protected. The trees and other amenity planting on the rest of the site has limited value and includes mainly non-native trees planted relatively recently to provide screening to the buildings, and along boundaries, together with areas of semi-improved grassland and ornamental shrub. Notwithstanding this, the development of the scheme has taken due account of other existing trees within the site and these will be retained as far as possible.

The proposed development will increase the area of soft landscaping slightly to 34% of the total site area. However, the deep-substrate green roofs and podium gardens occupy an additional 26% of the

site area, and so make a further substantial contribution to site greening, increasing the overall fraction of green cover to 60%. The new landscaping has been designed to achieve the maximum possible ecological benefit, and incorporates grassland, shrub, woodland and ground flora planting, and many new trees, and the resulting tree cover will exceed that of the existing site.

Full details of the existing site ecology are provided in the Ecological and Tree Survey and Report, and the details of the substantial range of new landscaping works, are provided in the Landscape Strategy. These proposals will result in the protection of the existing site ecology, a significant enhancement to quality and quantity of the biodiversity on the site.

4.3.4 Flooding

MAYOR'S PRIORITIES

Surface water flooding and sustainable drainage (5.3, 5.12, 5.13, 5.14)

Developers should maximise all opportunities to achieve greenfield runoff rates in their developments.

When designing their schemes, developers should follow the drainage hierarchy set out in London Plan policy 5.13.

Developers should design Sustainable Drainage Systems (SuDS) into their schemes that incorporate attenuation for surface water runoff as well as habitat, water quality and amenity benefits.

Flood resilience and resistance of buildings in flood risk areas (5.3, 5.12, 5.13)

Development in areas at risk from any form of flooding should include flood resistance and resilience measures in line with industry best practice.

Flood risk management (5.3, 5.12)

Developments are designed to be flexible and capable of being adapted to and mitigating the potential increase in flood risk as a result of climate change.

Design response

The assessment of flood risk carried out for the purpose of this planning application has confirmed that the whole of the site is in a Zone 1 flood risk zone. The risk of groundwater or sewer flooding is also considered to be low. Full details are provided in the Flood Risk Assessment and Drainage Strategy that is being submitted in support of the application.

The larger part of the site is currently occupied by impermeable buildings and hardstandings, and 33% of the site is soft landscaping. The proposed development will increase the area of soft landscaping slightly to 34% of the total site area. In addition, the two podium blocks have large areas of deep-planted soft landscaping, and permeable paving is provided to the car parking areas. These areas amount to a further 13% of the site. Finally, deep-substrate green roofs, amounting to 20% of the site area, are provided to all the apartment buildings.

The proposed surface water drainage system incorporates a number of SuDS measures as noted above, that follow the London drainage hierarchy although the use of infiltration is not generally feasible due to the underlying clay geology. All run-off from roofs and paved areas is directed via an attenuation system. Run-off from the podium blocks is routed via a water storage layer located beneath the podium soft landscaping. The main car parking areas have tanked subbase which collects the incident rainfall and also acts a storage for the roof run-off from nearby buildings. Finally, underground geocell storage tanks are located under areas of non-permeable hardstanding. The outflow from the storage is routed via controlled discharge outfalls to the canal to the north and the surface-water sewer in Nestles Avenue to the south. Consent has been obtained for a total discharge rate for all outfalls to the canal of 85.9 L/s which is based on the existing peak discharge rate. The total discharge rate for all outfalls to the sewer network will be limited to 270.6 L/s which is three times the “greenfield” rate from the site.

4.4 Pollution management

4.4.1 Introduction

The density of activity across London can lead to various forms of disturbance to nearby occupiers and can result in legally recognised levels of pollution. These forms of pollution include air, water, noise and light. The pollution can occur temporarily during the construction of the new development and can also occur as a result of its operation once complete. This section outlines how the proposals seek to minimise the risk and impact of all forms of pollution.

4.4.2 Land contamination

MAYOR'S PRIORITIES

Land contamination (3.2, 5.3, 5.21)

Developers should set out how existing land contamination will be addressed prior to the commencement of their development

Design response

Prior to the commencement of site works, and as they progress, appropriate intrusive investigations will be carried out to determine whether there is any contamination on the site, although elevated levels of contaminants are not expected. If any are found, appropriate decontamination and mitigation measures will be implemented. Further details are included in the in Chapter 8 of the Environmental Statement.

4.4.3 Air pollution

MAYOR'S PRIORITIES

Air quality (3.2, 5.3, 7.14)

Developers are to design their schemes so that they are at least 'air quality neutral'.

Developments should be designed to minimise the generation of air pollution.

Developments should be designed to minimise and mitigate against increased exposure to poor air quality.

Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7.

Developers and contractors should follow the guidance set out in the emerging The Control of Dust and Emissions during Construction and Demolition SPG when constructing their development.

Design response

The development proposals have been shown to be better than "Air Quality Neutral". Full details are provided in the Air Quality Impact Assessment (AQIA), submitted in support of the application.

The development will be heated by means of a connection to a new CHP-based community heating system that is located in an Energy Centre adjoining the western flank of Block D1. The two CHP units will be fitted with catalytic converters and the specification for emissions of NOx will be 50 mg/Nm^3. The gas boilers will be types with pre-mix burners that achieve NOx emissions that are less than 40 mg/kWh. The location of the Energy Centre will allow the boiler and CHP unit flues to be taken up the outside of the Block D1, a ten-storey building, and discharge above the roof level, at a height that is well above the lower surrounding buildings.

The impact of the installation of the proposed communal heating plant together with the effect of any increased emissions from road vehicles as a result of the development has been assessed in the AQIA that has been prepared for the development. The results from the assessment indicate that the proposed development will have a negligible impact on local air quality taking account of all factors. Full details of the results are provided in the AQIA which is being submitted in support of the application.

The Applicant, who will act as the main contractor, and who will therefore be directly responsible for site operations, recognises that the public impression of site activities has a direct impact on the corporate image of a construction business, and that this has far reaching consequences. Accordingly the Applicant has well established policies and procedures dealing with the good management of site operations. They will prepare and implement a Construction Environmental Management Plan in line with the Mayor's best practice guidance to minimise the local environmental impact during the construction phase. The plan will include specific policies and procedures to prevent dust nuisance and surface and ground water contamination, as well a range of other measures to ensure that site activities do not inconvenience neighbouring properties. Implementation of these policies will be supported by registering the development with the Considerate Constructors Scheme (CCS) which requires sites to address issues under five themes: appearance; community; environment; safety; and workforce. The site will be subject to regular external CCS audits and the results forwarded to senior management for action as necessary. The Applicant regularly achieves very high audit scores, and in a recent report for the Aldgate Place site in central London, dated 27th April 2016, the summary states: *"Overall this was an excellent site with a focussed team. This was a nice visit with a warm welcome and I look forward to my return visit in a few months' time".* There is every reason to expect that this site will be operated in the same exemplary way.

4.4.4 Noise

MAYOR'S PRIORITIES

Noise (3.2, 5.3, 7.6, 7.15)

Noise should be reduced at source, and then designed out of a scheme to reduce the need for mitigation measures.

Design response

The part of the development proposal covered by this report is primarily for residential use, with small areas of supporting non-residential and commercial use where appropriate across the site. The ambient noise climate across the site is dominated by road traffic from local roads close to the site, main roads within the vicinity, and the M4, which is 700 m to the south. The size of the site means that in addition, local noise sources such as the railway to the north, the sub-station to the east and the industrial units to the west, affect the noise levels in specific parts of the site. A Noise Impact Assessment (NIA) has been carried out to determine the likely impact of this noise on the new dwellings and appropriate technical measures will be implemented to ensure that it is acceptable.

Fixed noises sources within the new development will be limited to the following plant:

- CHP unit and other plant within the Energy Centre;
- Ventilation plant for the café kitchen;
- Ventilation fans for the undercroft and basement car parks.

The cumulative noise emanating from this and other plant in the new development will comply with the LBH planning standards, as set out in in the *Noise* SPD (2006), and in particular, appropriate technical measures will be implemented to ensure that any noise generated is at least 5 dB(A) below the background level as measured from any point 1 m from the façade of the nearest sensitive receptor.

The construction phase noise will be managed in accordance with best practice, and particularly the requirements of the Considerate Constructors Scheme code of considerate practice which includes a specific section that requires that the Developer addresses this proactively by selecting the quietest plant, ensuring that it is sited away from neighbouring properties if possible, that it is only used when necessary, that neighbours are advised of when it will be used, and that they are provided with contact details for the site manager so that contact can easily be made if they have concerns.

The internal dwelling-to-dwelling acoustic performance will be designed to exceed the requirements of Part E: 2003 of the Building Regulations by typically 3dB for both airborne and impact noise.

4.4.5 Light pollution

MAYOR'S PRIORITIES

Light pollution (5.2, 5.3, 6.7)

Developments and lighting schemes should be designed to minimise light pollution.

Design response

External lighting will minimised as far as possible consistent with satisfying requirements for safety and security. Light pollution will be minimised by designing the external lighting in accordance with the Institute of Lighting Professionals guidance including *Guidance notes for the reduction of obtrusive light, GN01 (2011).*

4.4.6 Water pollution

MAYOR'S PRIORITIES

Surface water run-off (5.3, 5.13, 5.14)

In their aim to achieve a greenfield runoff rate developers should incorporate sustainable urban drainage systems (SuDS) into their schemes which also provide benefits for water quality.

Encourage those working on demolition and construction sites to prevent pollution by incorporating prevention measures and following best practice.

Wastewater treatment (5.3, 5.14)

Residential developments discharging domestic sewage should connect to the public foul sewer or combined sewer network where it is reasonable to do so

Design response

The larger part of the site is currently occupied by impermeable buildings and hardstandings, and just 33% of the site is soft landscaping. The proposed development will increase the area of soft landscaping slightly to 34% of the total site area. In addition, the two podium blocks have large areas of deep-planted soft landscaping, and permeable paving is provided to the car parking areas. These areas amount to a further 13% of the site. Finally, deep-substrate green roofs, amounting to 20% of the site area, are provided to all the apartment buildings.

The proposed surface water drainage system incorporates a number of SuDS measures as noted above, that follow the London drainage hierarchy although the use of infiltration is not generally feasible due to the underlying clay geology. All run-off from roofs and paved areas is directed via an attenuation system – and three types are utilised. Run-off from the podium blocks is routed via a water storage layer located beneath the podium soft landscaping. The main car parking areas have tanked subbase which collects the incident rainfall and also acts a storage for the roof run-off from nearby buildings. Finally, underground geocell storage tanks are located under two areas of non-permeable hardstanding. There are a total of six separate storage zones, and each has a flow-controlled outfall – three go north to the canal, and three go south to the Thames Water surface water sewer in Nestles Avenue. Consent has been obtained for a total discharge rate for all outfalls to the canal of 85.9 L/s which is based on the equivalent existing total peak discharge rate from the site to the canal. The total discharge rate for all outfalls to the sewer network will be limited to three times the “greenfield” rate from the site, and the maximum rate will therefore be 270.6 L/s during a 1 in 100 year + 40% storm event. This approach has been agreed in principle with Thames Water.

The provision of the deep-substrate green roofs will serve to retain, bind and treat contaminants that contact the surface either as dust, or suspended or dissolved in rainwater. A London Ecology Unit publication *Building Green – a guide to using plants on roof, walls and pavements (1993, revised GLA 2004)* states that 95% of heavy metals are removed from run-off by green roofs and nitrogen levels can also be reduced. Other studies demonstrated the removal of 75% of solids.

The Applicant, who will act as the main contractor, and who will therefore be directly responsible for site operations, recognises that the public impression of site activities has a direct impact on the corporate image of a construction business, and that this has far reaching consequences. Accordingly the Applicant has well established policies and procedures dealing with the good management of site operations. They will prepare and implement a Construction Environmental Management Plan in line with the Mayor’s best practice guidance to minimise the local environmental impact during the construction phase. The plan will include specific policies and procedures to prevent surface and ground

water contamination, as well a range of other measures to ensure that site activities do not inconvenience neighbouring properties.

The development will be connected to the local foul sewer network. The drainage system will be compliant with Part H: 2002 of the Building Regulations, and follow the Environment Agency's Pollution Prevention Guidelines PPG3, with provision, if appropriate, of oil separators on the drainage from high risk areas such as the car parks.

Full details of the proposed surface and foul water systems are provided in the Flood Risk Assessment and Drainage Strategy that is being submitted in support of the application.

5. Conclusions

The details of the proposed development as set out in the proceeding sections, and in the technical reports on which this document is based, show that this part of the development proposal meets the applicable planning policies that relate to resource management, climate change adaptation and pollution management. It will therefore result in a scheme that is compliant with the broad range of policies that seek to promote sustainable development in Hillingdon, and across London generally.

In developing these proposals, the Design Team has taken careful account of the nature of the site and its outer-London suburban location, albeit on a site that has been occupied by industrial buildings for more than a century. The proposal responds to the site history in many ways: retaining key historic building elements; adopting a layout that respects the remaining site ecology; and boldly celebrating the industrial aesthetic in the key group of new buildings that contains the Energy Centre with its distinctive external flues and highly visible photovoltaic panel arrays.

As well as building on the past, the proposals look forward, utilising the latest energy conservation and renewable energy technologies. The site-wide heating network will use heat from a CHP-based communal heating system, and the combustion plant has been specified to have the lowest possible emissions of atmospheric pollutants, ensuring that there will be a negligible impact on local air quality. Water use will be minimised in accordance with the latest national policy. The risk from future severe rainfall events has been carefully addressed, and the scheme incorporates an extensive system of surface water attenuation features that will ensure that the total rate of discharge of surface water can be reduced significantly compared to the current level. Finally, the proposals for ecological enhancement and landscaping retain and protect the remnant of woodland and incorporate new grassland, shrub, woodland and ground flora planting, and many new trees, and, with the new green roof, will result in an 60% increase in total green cover.

The development proposals therefore fully meet the requirements of The London Plan 2016 for *Sustainable Development*, and the equivalent local strategic policies in the London Borough of Hillingdon Local Plan Part 1, *Policy BE1: Built Environment* and *Policy EM1: Climate Change Adaptation and Mitigation,* as supported by a range of emerging implementation policies in the Local Plan Part 2.

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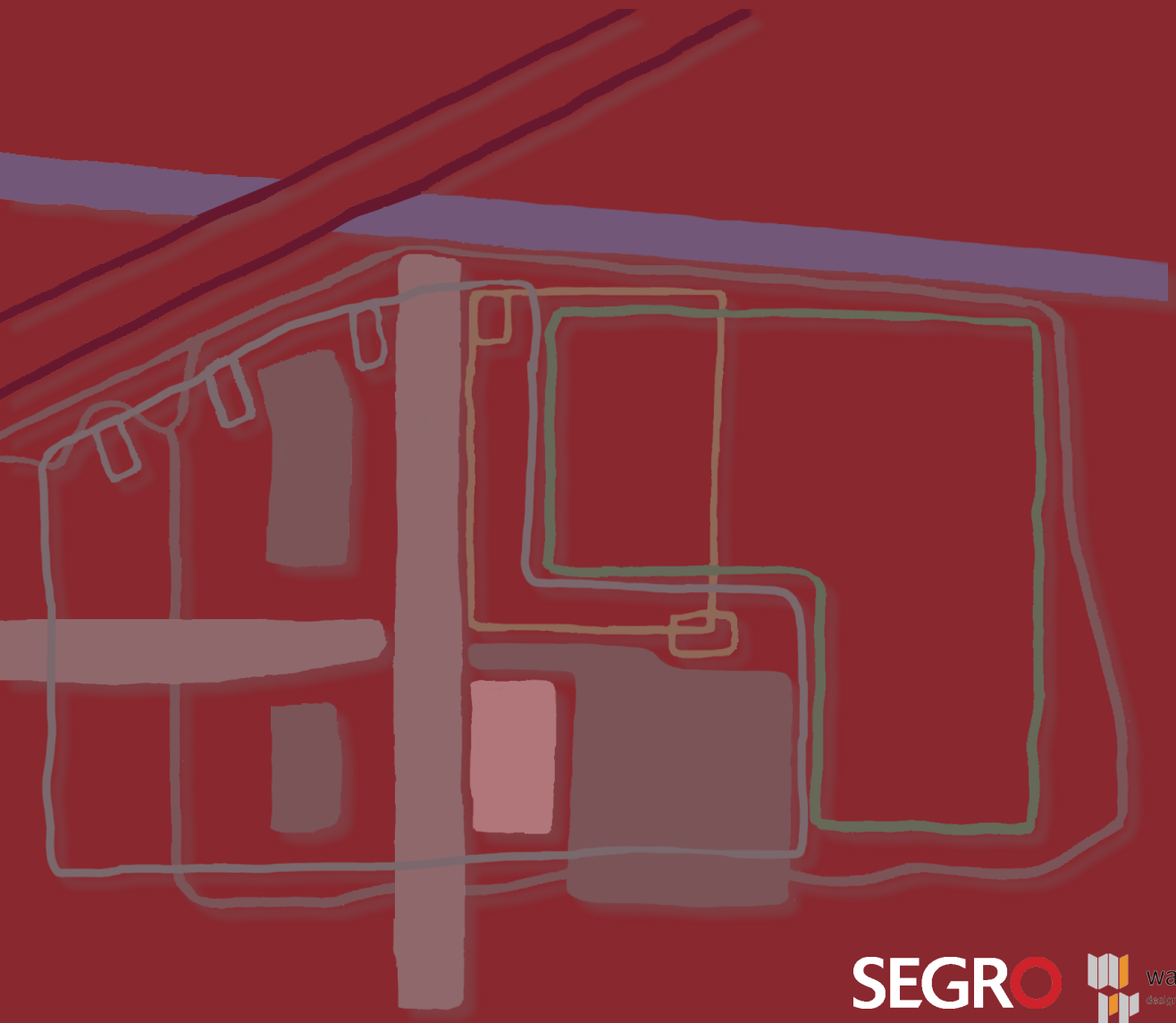
FORMER NESTLE FACTORY, HAYES

SUSTAINABILITY STATEMENT

(Industrial Scheme) including Overheating Risk Analysis

MAY 2017



SEGRO

watkins payne

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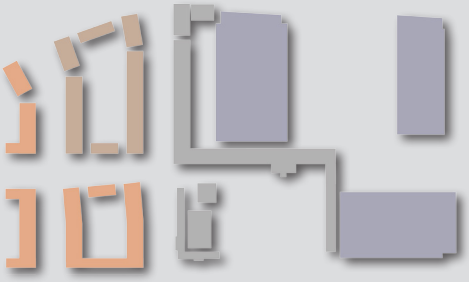

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SEGRO Plc

The Former Nestlé Factory
Nestles Avenue
Hayes
UB3 4RF

Sustainability Statement (Industrial Scheme)

Planning Submission

Issue 5

Client Name	SEGRO PLC
Client Address	258 Bath Road Slough SL1 4DX
Property:	The Former Nestlé Factory Nestles Avenue Hayes UB3 4RF
Project Reference:	3660
Issue:	Planning Submission, Issue 5
Date:	May 2017
Prepared by:	SH/JD
Checked by:	MDC
Validated by:	MDC

1.00 EXECUTIVE SUMMARY

The purpose of this document is to provide an overview of the Sustainable Design and Construction strategy to accompany the planning application. This report supports the commercial part of the development which is shown on the Architect's site layout contained in the appendix.

This report should be read in conjunction with the sustainability statement prepared by BBS for the residential part of the proposed redevelopment. Combined, the two reports set out the proposed sustainability strategy for the redevelopment of the factory site in its entirety

2.00 ENERGY

2.01 Policy Requirements

A summary of the applicable GLA policy requirements are as follows:

- London Plan 2011, updated March 2016 requirement for 35% Regulated CO_2 reduction over Part L 2013.
- In accordance with the London Plan, CO_2 reductions are to be achieved in accordance with the Energy Hierarchy: Be Lean (energy efficiency); Be Clean (communal heating and CHP); Be Green (renewable energy technologies).

A summary of the applicable London Borough of Hillingdon Policy requirements are set out below.

The LBH Local Plan: Part 1 applicable policies are as follows:

- Policy EM1: Climate Change Adaption and Mitigation.

The LBH Local Plan: Part 2 applicable policies are as follows:

- Policy DMEI2: Reducing Carbon Emissions
- Policy DEMI3: Decentralised Energy

2.02 Outline Strategy

A detailed energy assessment, based on the Energy Hierarchy has been undertaken and an Energy Strategy Report produced based on the GLA guidance on preparing energy assessments SPG. Measures considered in the energy assessment are outlined below.

2.02.01 Energy Efficiency

The industrial buildings will incorporate a variety of energy efficiency measures within both the fabric envelope and the building services installation. Examples of the energy efficiency measures that will be incorporated are as follows:

- Enhancements to the building fabric envelope thermal performance by introducing thermal insulation to achieve lower capacity heating systems thereby reducing energy consumption
- Providing high performance glazing in conjunction with solar shading in order to reduce solar heat gains thereby lowering the size of cooling plant and hence reducing energy consumption and carbon dioxide emissions for the operational building

- Selection of high efficiency plant together with using high efficiency motors serving pumps, compressors and fans
- Heat recovery within the mechanical ventilation plant
- Increasing the size of air distribution ductwork in order to reduce the system resistance thereby allowing smaller fan motors to be used reducing energy consumption
- Increasing the thermal insulation performance on distribution ductwork to reduce standing heat losses/gains
- Providing occupancy detection and automatic daylight dimming within the office area lighting control system
- Using low energy high efficiency lamp sources, LED lighting to all areas is proposed.
- Maximising the use of day lighting within the building
- Improved building air leakage beyond the Building Regulations Part L2A minimum requirements

The thermal modelling indicates that by incorporating the energy efficiency measures a predicted regulated energy carbon emission reduction of 34.38 %, when compared with the Building Regulations 2013 baseline can be achieved for the whole industrial development. Therefore, the industrial development exceeds the regulated energy carbon emission reduction target of the Building Regulations 2013 by energy efficiency measures alone.

2.02.03 Decentralised Heating, Cooling and Power

For combined heat and power to be viable there needs to be a consistent base electrical and heat demand within the building. For the industrial units the domestic hot water requirement is low along with the relatively low heating demand for the core areas as the offices are heated via the air source heat pumps (variable refrigerant flow systems), as a result it is not considered that CHP will be viable.

The use of a district energy network to the industrial element of the scheme has been considered and concluded as not viable. The low base load heating and domestic hot water demand from the units makes the scheme not practical.

The connection of the industrial units to the residential district energy network has been considered. Again due to the low base load heating and domestic hot water demand from the units makes the scheme not practical and when the DEN pumping energy is considered the connection to the residential DEN does not reduce the overall carbon emissions from the industrial development.

2.02.04 Renewable Energy Sources

The alternative renewable energy sources assessment, included in the Energy Strategy, has concluded the following:

- Wind turbines were not considered viable due to their visual impact and that in urban areas non-laminar wind flow occurs as a result of turbulence due primarily to adjacent buildings. There is growing evidence of urban wind turbines failing to perform in line with manufacturer's estimated outputs and as a result wind turbines are likely to produce only modest power outputs with corresponding low carbon dioxide emission reduction within urban sites.
- Biomass boilers could potentially provide heating to the buildings however they are not considered to be suitable for this development due to fuel delivery implications and air quality issues.

- Ground water cooling will necessitate boreholes through to the chalk aquifer. This imposes a significant capital cost with inherent technical risks on the achievable flow rate, Environment Agency licences and overall commissionability.
- Ground source heating and cooling will necessitate boreholes through to the chalk aquifer or pipework in separate boreholes. This imposes a significant capital cost with inherent technical risks on the achievable performance, Environment Agency licences (when using the aquifer) and overall commissionability.
- There is available roof area with an appropriate orientation for photovoltaic cells to provide a contribution to each buildings electrical consumption. However as the carbon emission reduction targets are met via the combination of the energy efficiency measures and the use of air source heat pumps the use of photovoltaic cells is not proposed.
- There is available roof area with an appropriate orientation for solar thermal water heating panels to provide a contribution to each buildings domestic hot water consumption. However as the buildings have a low domestic hot water demand and that the carbon emission reduction targets are met via the combination of the energy efficiency measures and the use of air source heat pumps, the use of solar thermal panels is not proposed.
- Air source heat pumps in their variable refrigerant flow (VRF) format are appropriate for use to provide the comfort cooling and heating to the office accommodation in each industrial unit and hence their use is proposed.

The thermal modelling indicates that by incorporating air source heat pumps to provide the heating and cooling to the office accommodation in each unit that a regulated energy carbon emission reduction of 37.9 %, when compared with the Building Regulations 2013 baseline can be achieved for the whole industrial development. Therefore, the industrial development exceeds the regulated energy carbon emission reduction target of the London Borough of Hillingdon and the London Plan.

3.00 OVERHEATING

3.01 Policy Requirements

London Plan 2011, Updated March 2016 Policy 5.9 is applicable.

3.02 Outline Strategy

An overheating risk analysis has been undertaken on the office accommodation for all four units. As stated in the GLA guidance notes an overheating analysis of the warehouse areas has not been undertaken as the opportunities to reduce the cooling demand in these areas by passive means is limited.

A separate Overheating Risk Analysis Report for the industrial element of the scheme has been provided with the planning submission. Full details of the analysis can be found in this report. For ease of reference the conclusions of the separate Overheating Risk Analysis Report are repeated below.

The office accommodation to each of the four industrial units have been analysed for the overheating risk in free running mode and mechanically comfort cooled mode in accordance with the requirements of TM52 and against the three GLA recommended TM49 design summer years.

For the free running criteria:

- All four units have a risk of overheating due to failing each of the three TM52 criterion.

The modelling already includes the appropriate passive measures to help mitigate the overheating risk. The measures included are summarised below:

- Openable windows albeit with a restricted opening to the office accommodation.
- High performance glazing that has a 'U' value of 1.50 W/m^{2}K and a 'g' value of 0.30.
- LED lighting to reduce internal casual heat gains.
- Solar shading is provided by an overhang at the upper level of the office accommodation to each of the units.

The provision of openable windows will be maintained in each of the units to allow the future tenants the choice of operating the building in free running mode as the prevailing whether conditions allow.

To alleviate the predicted overheating the office accommodation in each of the industrial units will be provided with comfort cooling. The office accommodation in each of the units passes the TM52 mechanical cooled building overheating criteria.

Therefore, the proposed comfort cooling systems to the office accommodation are appropriate for inclusion in each of the four industrial units.

This report accounts for all relevant design features and includes for the anticipated building usage. Should the final design and/or use of the building differ from the described, or should the actual weather differ from the accredited weather files, then 'out of range' temperature may occur beyond that predicted.

4.00 SUSTAINABILITY

4.01 Policy Requirements and Strategy

A summary of the applicable GLA and London Borough of Hillingdon policy requirements are as follows:

- High standards of sustainable design and construction to improve the environmental performance of the new development
- Retention and enhancement of biodiversity, particularly alongside the Grange Union Canal
- Provision of good quality and useable outdoor amenity space including public access to the improved canalside environment
- Compliance with the flood risk assessment and management requirements, as well as the use of sustainable urban drainage systems (SUDS)
- Improved and safeguarded ground and surface water quality along the Grand Union Canal
- Minimal use of mains water through the incorporation of water saving measures and equipment
- Effective waste management at all stages of development
- Noise impacts to be adequately controlled and mitigated

- Demonstration of 'air quality neutrality' including the provision of a Management Plan for ensuring air quality impacts can be kept to a minimum.
- Provision of policy compliant car charging points.

4.02 Outline Strategy

In addition to the strategy points noted above the following specific elements will be incorporated in to the industrial scheme

Water Conservation

The various appliances within the buildings will be selected to reduce water consumption by adopting elements such as low flow taps, low flow showers, urinal flow controls, dual flush low volume WC cisterns and water metering.

Cyclist Facilities

Cycle storage facilities will be provided.

Ecology/Bio-Diversity

The landscape areas will be included in the scheme to enhance the ecological value of the development where appropriate.

Flood Risk / SUDs

The site is located in Flood Zone 1 and is at low probability of flooding, both on and off-site, from site-generated runoff. This will be addressed via a surface water drainage strategy. SUDs techniques will be incorporated into the scheme to provide a London Plan compliant runoff rate.

Pollution

The approach will be to utilise zero or low global warming potential materials wherever possible within the building construction.

Materials

The use of recycled materials will be assessed as part of the overall selection process for the building. The intention is to use to WRAP (Waste and Resources Action Programme) assessment tool wherever possible to assist in the selection of materials. Also reference will be made to the BRE Green Guide to Specification where appropriate.

Construction Process

The Contractor selected to build the scheme will be a member of the Considerate Constructors Scheme and hence will need to adopt processes such as waste recycling, minimising power usage, minimising water usage, recycling materials, etc.

Waste Management

The Contractor selected to build the scheme will operate a BREEAM compliant site waste management plan.

Noise

The building and its associated services installations will comply with the Hillingdon Council planning requirements.

Light Pollution

The external lighting will be designed using appropriately selected luminaires to meet current best practice to reduce light pollution.

BREEAM

A BREEAM 2014 pre-assessment for the scheme has been undertaken by Jamie Daniel of Watkins Payne Partnership, a registered BREEAM Assessor and an accredited sustainability professional. The BREEAM pre-assessment has taken the form of iterative reports being reviewed by the team and discussed with Jamie to achieve the best practical sustainable solutions for the buildings. The BREEAM pre-assessment report identifies that a **Very Good** rating will be achieved by the development.

APPENDIX – SITE LAYOUT PLAN

GRAND UNION CANAL

GRAND UNION CANAL

Towing Path

29.9m

29.9m

29.9m

29.6m

Tank

El Sub Sta

El Sub Sta

Gantry

MP 10.75

Gantry

MoPs

Compass Building

Mast (Telecommunication)

CANALSQUARE

COFFEE PARK

CANAL STREET GARDEN

MILK STREET GARDEN

VIVEASH SQUARE

VIVEASH YARD

CANAL STREET

SANDOW YARD

MILK STREET

SANDOW SQUARE

SANDOW WALK

MILK YARD

WALLIS GARDENS

WALLIS WALK

CANAL STREET

NESTLES AVENUE

NESTLES AVENUE

NESTLES AVENUE

NORTH HYDE GARDENS

SUTTHER

B1 B2 B3 B4 B5 B6 B7 B8 B9

C1 C2 C3 C4 C5 C6

D1 D2 D3

E1 E2

F1 F2 F3 F4

G H I

88 NO PARKING SPACES

FF & SF OFFICES

UNIT 4

31 NO PARKING SPACES

FF OFFICES

UNIT 3

UNIT 2

FF OFFICES

21 NO PARKING SPACES

3 M HIGH SECURITY FENCE

UNIT 1

FF OFFICES

73 NO PARKING SPACES TOTAL

3 M HIGH SECURITY FENCE

3 M HIGH SECURITY FENCE

KEY:

Permeable paving

Squirrels Trading Estate

1 3 4 7

7 to 11

7

3

92 102 112 122 134

136 138 142 150

152 164 174 180 182

184 196 208 218

Surgery

69

25

26

1 8 2

El Sub Sta

12

1

ESS

BARRATT LONDON

SEGRO

DATE	REV	DESCRIPTION	CHK

CONSULTANTS DWG NO:

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FORMER NESTLE FACTORY, HAYES
ILLUSTRATIVE SITE LAYOUT PLAN

MS 100

SCALE 1:500@ A0

0 5 10 25

ISSUE D6

watkins payne
designed engineered focused

Planning Application
For Development
at
The Former Nestlé Factory
Nestles Avenue
Hayes
UB3 4RF

Overheating Risk Analysis
(Industrial Scheme)

Planning Submission

Issue 4

Client Name:	SEGRO PLC
Client Address:	258 Bath Road Slough SL1 4DX
Property:	The Former Nestlé Factory Nestles Avenue Hayes UB3 4RF
Project Reference:	3660
Issue:	Planning Submission, Issue 4
Date:	April 2017
Prepared by:	MW/SH
Checked by:	MDC
Validated by:	MDC

CONTENTS

1.00 INTRODUCTION

1.01 Purpose

This report has been prepared for SEGRO PLC for the proposed former Nestlé Factory, Hayes. This report supports the commercial part of the redevelopment which is shown on the architect's site layout contained in the Appendix. This document assesses the overheating risk to the office accommodation of the industrial units and demonstrates how it complies with London Plan Policy 5.9.

The office accommodation of the industrial units has been subjected to an overheating analysis as set out in the GLA document "Energy Planning Greater London Authority guidance on preparing energy assessments (March 2016)" to assess the risk of the building overheating. The weather data used for the assessment has been taken from the CIBSE TM49 suite of data as recommended by the GLA energy strategy guidance. The assessment of the overheating criteria is based on the recommendations of the CIBSE Technical Memorandum document TM52 and the 2015 edition of the CIBSE Guide A that was published after TM52.

The warehouse areas of the industrial units are not included in this assessment as the opportunities to reduce the cooling demand by passive means is limited. However as stated in the accompanying Energy Strategy report the warehouse area roof lights have been provided with good 'U' valves, 'g' valves and light transmittance.

1.02 Proposed Building

Full planning permission for the part-demolition of existing factory buildings associated structures, and redevelopment to provide 1,381 dwellings (Use Class C3), office, retail, community and leisure uses (Use Classes A1/A3/A4/B1/B8/D1/D2), 22,663 m^2 (GEA) of commercial floor space (Use Classes B1c/B2/B8 and Data Centre (sui-generis)), amenity and play space, allotments, landscaping, access, service yards, associated car parking and other engineering works.

The four industrial units are to be built as shell warehouses with the associated office space being provided with comfort cooling and heating and fitted out to a Category A standard.

By their speculative nature the final use of the industrial units cannot be defined at this early stage. In terms of energy usage, it is assumed for estimating energy usage that the shell warehouse areas will be heated although this will ultimately be dependent on the future tenants' bespoke needs.

The fitting out of the industrial area for a specific process, for all the units, would require bespoke systems to suit the tenants' individual needs arising at the time of letting, which would all require assessment under ADL2B.

The servicing strategy for the industrial units will be as follows:

- Warehouse Heating — No heating, see the note below.
- Office Area Heating and Cooling — Air source heat pumps serving refrigerant based variable refrigerant flow (VRF) comfort cooling and heating systems.

- Office Area Ventilation — A combination of natural ventilation via openable windows and mechanical supply and extract ventilation via a heat recovery ventilation system.
- Core Area Heating — Radiators fed by gas fired boiler LTHW system.
- Domestic Hot Water — Indirect fired via LTHW boiler system.

For thermal assessment purposes the shell warehouse areas are assumed to be heated by direct/indirect gas fired heaters. A gas service will be provided to each space but left capped off for extension by the tenant as considered necessary to serve either convector unit heaters or radiant tubular heaters. These systems are preferred by tenants as they offer the most flexibility in terms of control and efficiency in performance compared to water based systems.

The aim of this overheating risk analysis is to prove that the above is an appropriate servicing strategy.

2.00 OVERHEATING RISK ANALYSIS PRINCIPLES

2.01 General

The "Testing for the presence or likelihood of overheating" criteria as set out in TM52 and the subsequent 2015 edition the CIBSE Guide A the overheating analysis shall be undertaken in two separate stages:

Stage	Operating Mode	Overheating Analysis Assessment Method
1	Free running i.e. no mechanical comfort cooling provided	Indoor operative temperature
2	Mechanical comfort cooling	Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD)

It should be noted that the base information for naturally ventilated buildings utilised in TM52 is taken from BS EN 15251 which is based purely on office buildings and is assumed to apply to a wider variety of buildings. However as noted in the 2015 edition of CIBSE Guide A "This assumption should be treated with caution and consideration should be given to any specific circumstances in any particular building".

2.02 Software Utilised

The modelling software used to carry out this analysis is a product of Environmental Design Solutions Ltd (EDSL) called TAS, version 9.4. This is a dynamic simulation software which is constructed in accordance with CIBSE AM11. TAS can provide a full dynamic thermal analysis for simple or complex building HVAC systems. Using this software, it will be illustrated how the buildings perform against the overheating / thermal comfort parameters, as set out in CIBSE TM52 and the subsequent 2015 edition of the CIBSE Guide A for mechanically cooled buildings.

2.03 Overheating Risk Criteria

2.03.01 Free Running Building

The TM52 overheating compliance criteria for a free running building to be regarded as not overheating is that two of the three criteria, set out below need to be met.

The pass / fail limits for the three criteria are summarised below:

Criterion 1	Hours of Exceedance (H_e)	The first criterion sets a limit of 3% for the number of occupied hours that the operative temperature (T_{op}) can exceed T_{max} during a typical non-heating season. T_{max} being exceeded is indicated by $\Delta T > 1K$
Criterion 2	Daily Weighted Exceedance (W_e)	The second criterion deals with the severity of overheating within any one day, which is given in terms of temperature rise and duration and sets a daily limit for acceptability. This is indicated by the weighted exceedance being less than or equal to 6

Criterion 3	Upper Limit Temperature (T_{upp})	The third criterion sets an absolute maximum acceptable temperature for a room. This is indicated by ΔT not exceeding 4 K.

Where the following, in the above table are defined as:

Operative temperature (T_{op})	The resultant hourly room air temperature calculated by the dynamic simulation software
Maximum acceptable temperature (T_{max})	T_{max} is calculated for each day from the running mean of the outdoor temperature. In accordance with Category II in BS EN 15251 T_{max} has been set at a maximum acceptable temperature of 3K above the comfort temperature.
Non-heating season	1st May to 30th September
Delta T (ΔT)	This is a simple equation where $\Delta T = T_{op} - T_{max}$

2.03.02 Mechanically Comfort Cooled Building

The TM52 overheating compliance criteria for a mechanically cooled building are as set out below in the extract from TM52.

A mechanically cooled building should aim to provide an indoor environment where the PMV index is near to or equal to zero. According to Table 2, it will be considered as overheating if the value of the PMV index is above 0.5 (PPD ≥ 10%).

However, this criterion has been further refined in the 2015 edition of the CIBSE Guide A. The applicable extract from the 2015 CIBSE Guide A is as follows:

A mechanically cooled building should aim to provide an indoor environment where the PMV index is near to or equal to zero. It will be considered as overheating if the value of the PMV index is above 0.5 (equivalent to a PPD of 10%).

The predicted indoor temperature or values of PMV should not exceed the tabulated values for more than 3% of occupied hours.

For heated and mechanically cooled buildings, the PMV (Predicted Mean Vote) is an index that predicts the mean votes of a large group of persons on the seven-point thermal sensation scale (below) based on the heating balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment.

PPD (predicted percentage dissatisfied) is an index that establishes a quantitative prediction of the percentage of thermally dissatisfied people who feel too cool or too warm. For the purposes of ISO 7730, thermally dissatisfied people are those who will feel hot, warm, cooler or cold.

Seven Point Thermal Sensation Scale	
3	Hot
2	Warm
1	Slightly warm
0	Neutral
-1	Slightly cool
-2	Cool

-3	Cold

Based on the ISO 7730 if you fall between 1 and -1 of the thermal sensation scale the occupants of the building are thermally satisfied.

As the PPD (predicted percentage dissatisfied) is an index that establishes a quantitative prediction of the percentage of thermally dissatisfied people who feel too cool or too warm based on the Seven Point Thermal Sensation Scale the PPD results include dissatisfied people who are “slightly cool”, “cool” or “cold”. From an overheating perspective, the occupants whose perception is that they are too cool needs to be discounted when applying the above compliance criteria.

2.04 Design Summer Year (DSY)

The GLA require three CIBSE TM49 DSY to be simulated. The three years are:

- *1976: a year with a prolonged period of sustained warmth.*
- *1989: a moderately warm summer (current design year for London).*
- *2003: a year with a very intense single warm spell.*

Also, to take account of the urban heat island effect appropriate for the development each the DSY data is available for three different locations as set out below:

- *The Greater London Authority Central Activity Zone (CAZ) and other high density urban areas (e.g. Canary Wharf): London Weather Centre data.*
- *Lower density urban and suburban areas: London Heathrow airport data.*
- *Rural and peri-urban areas around the edge of London: Gatwick Airport data.*

The location applicable to The Nestlé Development is London Heathrow Airport.

3.00 Overheating Risk Analysis

3.01 General

In accordance with the applicant's development standards the office accommodation to each industrial unit is proposed to be mechanically comfort cooled as set out section 1.03 of this report. Therefore, the risk of overheating during occupied hours in these areas is minimised due to the provision of the comfort cooling.

However, in line with the applicant's preferred specification the office accommodation has the ability to operate in a 'mixed mode' manner as the office areas are provided with individual on/off control of the comfort cooling system and openable windows. The opening aperture of the centre pivot window is restricted to a maximum of distance of 150 mm and hence putting a restriction on the amount of natural ventilation available. Hence the office accommodation to each unit can be assumed to have the ability to operate in a 'free running' mode as set out in TM52 albeit with a restricted window opening.

As the office accommodation to each unit has openable windows and comfort cooling this overheating risk analysis has been undertaken in two parts. Firstly, the initial risk analysis has been run without comfort cooling and secondly a comfort cooled analysis has been simulated. It is expected that the office accommodation should be capable of operating for significant periods without the need for comfort cooling.

As with all mechanically comfort cooled buildings a slight risk of overheating still does exist if the prevailing ambient conditions are in excess of the design criteria external temperatures.

The applicable accommodation use/designation National Calculation Method (NCM) internal heat gains have been used in this Overheating Risk Analysis.

3.02 Free Running Analysis

The free running analysis has been dynamically simulated and the subsequent associated results calculated for office accommodation in each of the four industrial units for each of the tree TM49 DSY's in accordance with the recommendations of TM52. The results for each of the sample rooms for each DSY are summarised in the following sub sections of this report.

Using the dynamic software, the resultant room air temperature has been calculated for each occupied hour in each room / zone for each of the three TM49 design summer years. The software does not calculate the operative temperature however TM52 accepts that simulated room air temperatures from dynamic modelling software are acceptable for use in place of the operative temperature.

In addition, the running mean of the outdoor temperature (T_{rm}) has been calculated from the DSY weather data for the non-heating season, 1st May to 30th September and hence the limiting maximum acceptable temperature (T_{max}) for the assessed rooms has been calculated.

The occupied hours applied to the different areas of the building area as follows:

- Office Accommodation 0800 hours to 1800 hours

3.02.01 Free Running Analysis

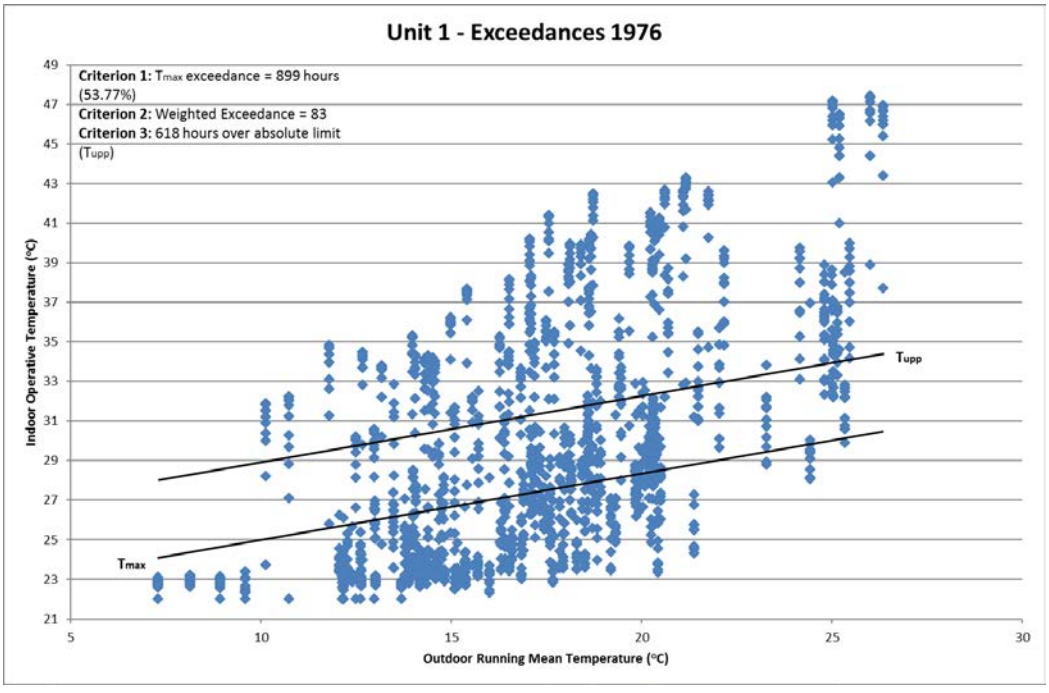
To be regarded as not at risk from overheating two of the three TM52 free running criteria must be met.

3.02.02 Free Running Analysis - TM49 DSY: 1976 LHR

A summary of the dynamic simulation results is as follows:

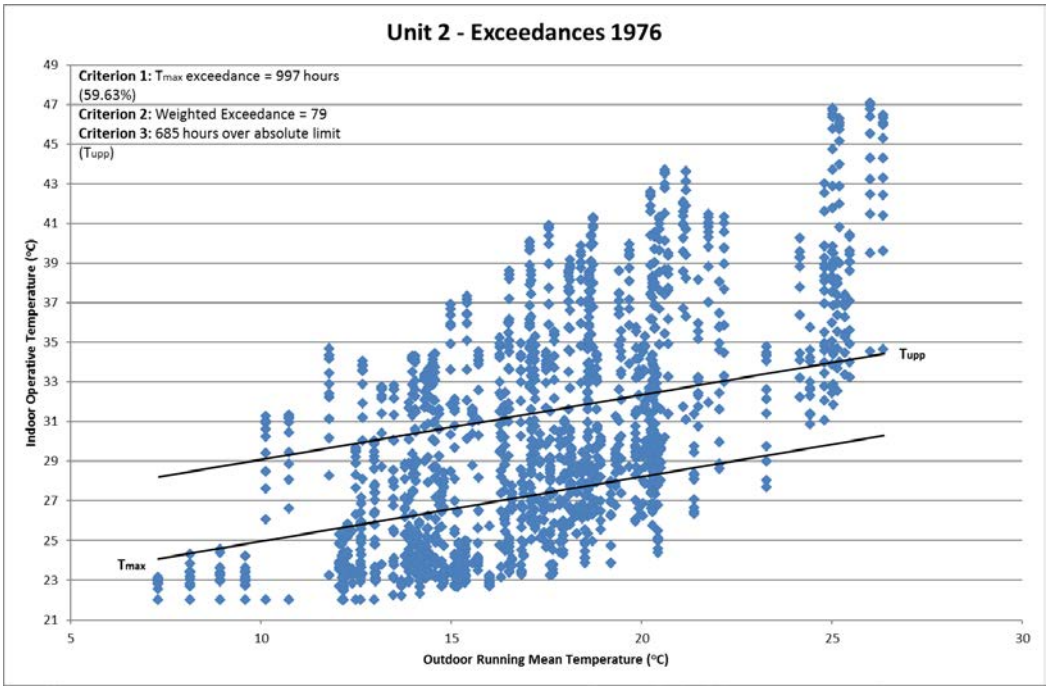
TM49 DSY: 1976 LHR			
Unit 1			
	Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 53.77% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for $\Delta T > 1K$ is day 180 The calculated W_e is 83 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 618 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



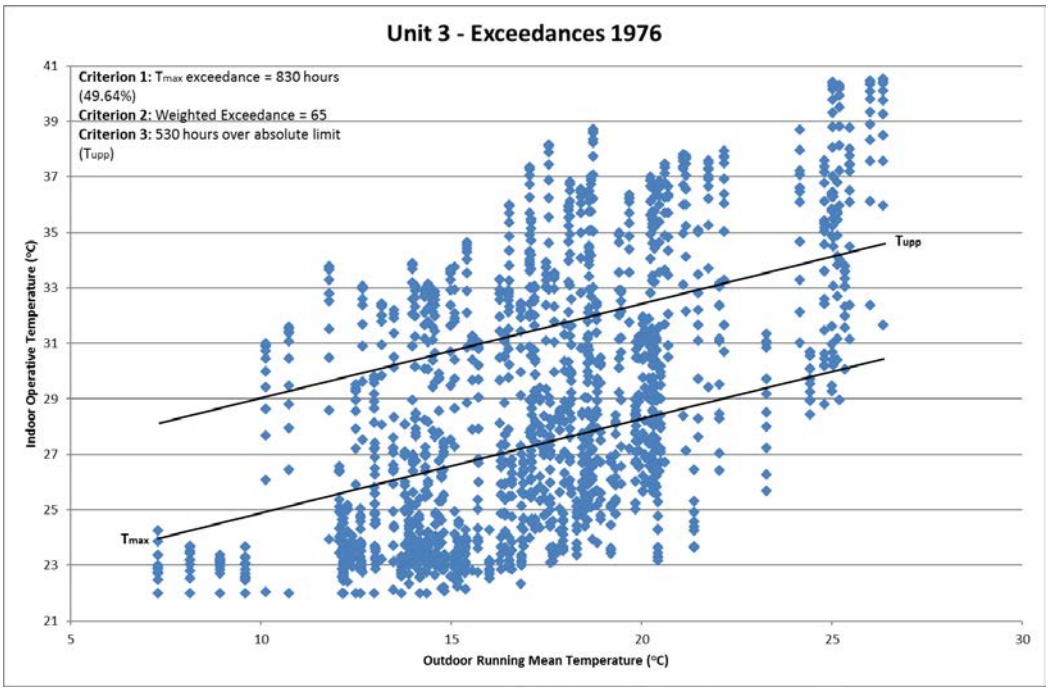
TM49 DSY: 1976 LHR			
Unit 2			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 59.63% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 180 The calculated W_e is 79 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 685 occupied hours during the assessed summer period.	Fail
	Summary	None the 3 criterion has passed The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring	**Fail**

These results are shown graphically below:



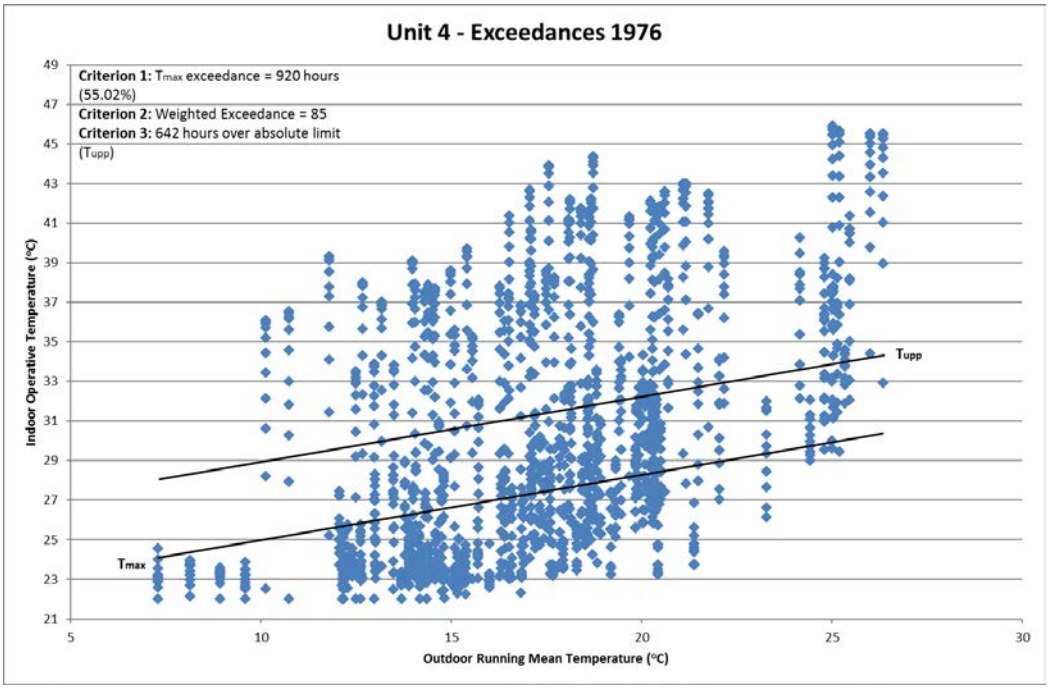
TM49 DSY: 1976 LHR			
Unit 3			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 49.64% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 180 The calculated W_e is 65 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 530 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criterion has passed The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring	**Fail**

These results are shown graphically below:



TM49 DSY: 1976 LHR			
Unit 4			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 55.02% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 180 The calculated W_e is 85 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 642 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



Based on the recommendations of TM52 all four units are shown to have a risk of overheating when operating in free running mode for the 1976 DSY.

Each unit has been shown to fail all 3 criteria and hence based on the recommendations of TM52 have a predicted risk of overheating during prolonged periods of high external ambient temperature when operating in free running mode for the 1976 DSY.

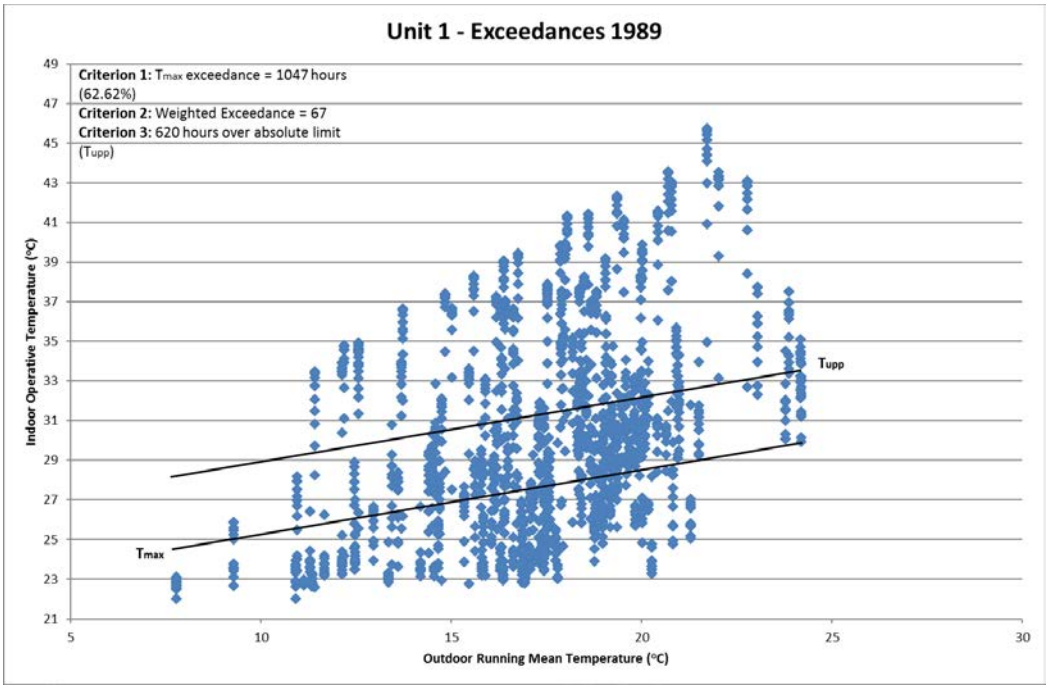
Therefore, additional measures need to be employed to reduce the predicted risk of overheating. See section 4.00 of this report for further details.

3.02.03 Free Running Analysis - TM49 DSY: 1989 LHR

A summary of the dynamic simulation results is as follows:

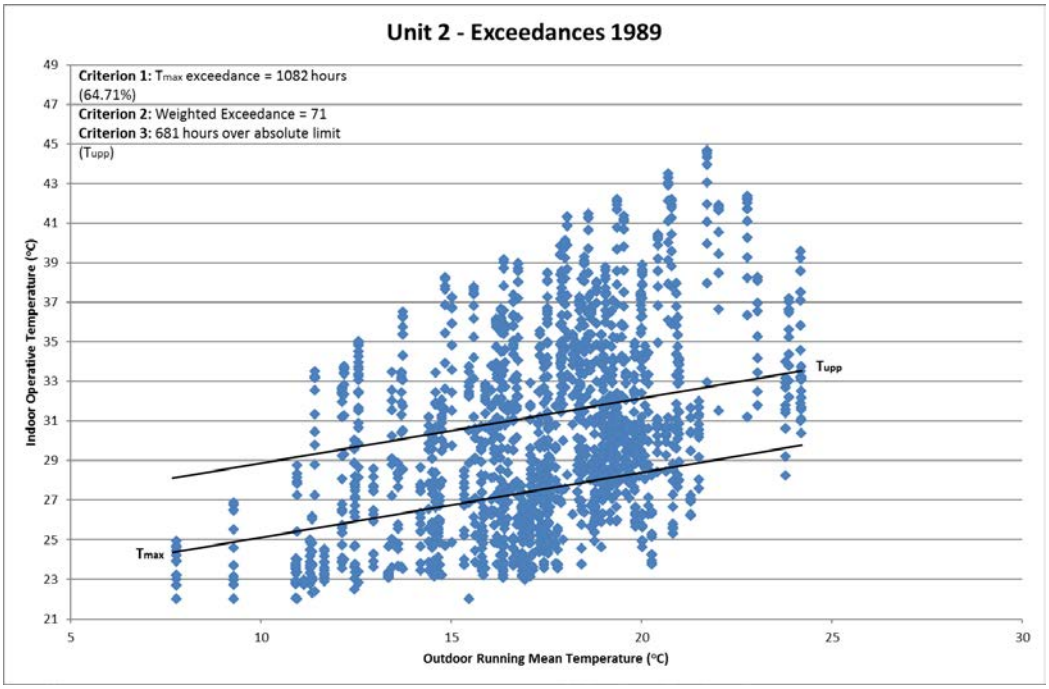
TM49 DSY: 1989 LHR			
Unit 1			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 62.62% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 204 The calculated W_e is 67 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 620 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



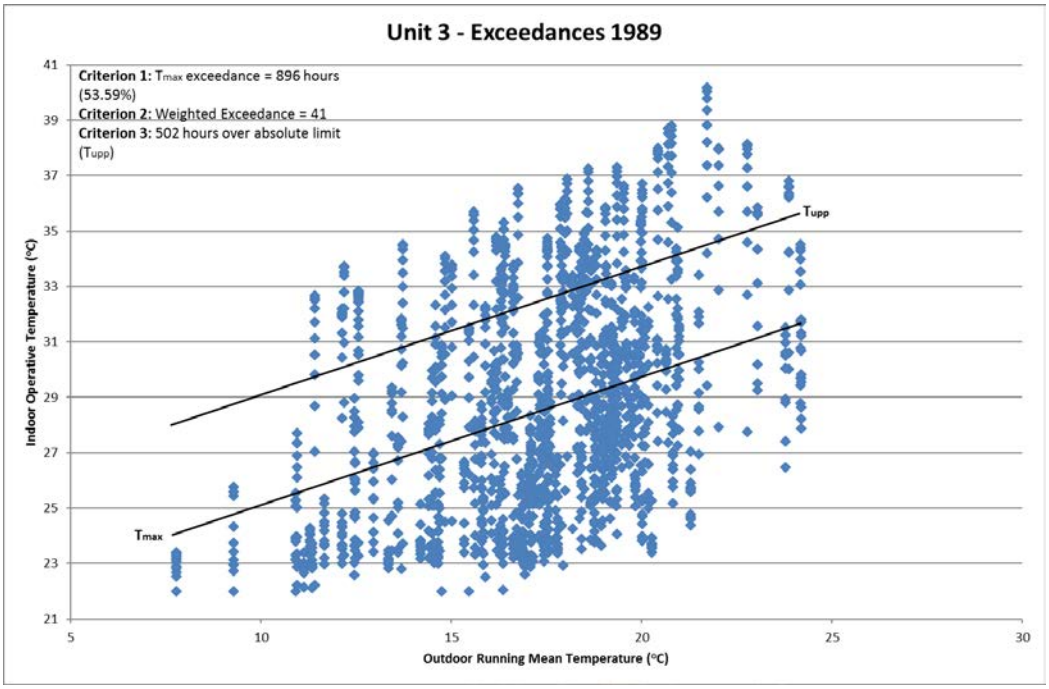
TM49 DSY: 1989 LHR			
Unit 2			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 64.71.7% The limiting value of percentage of occupied hours is 3% hence this criterion is failed	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 204 The calculated W_e is 71 The limiting value of W_e is 6 hence this criterion is failed	Fail
	Criterion 3	ΔT exceeds 4K for a total pf 681 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criterion has passed The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring	**Fail**

These results are shown graphically below:



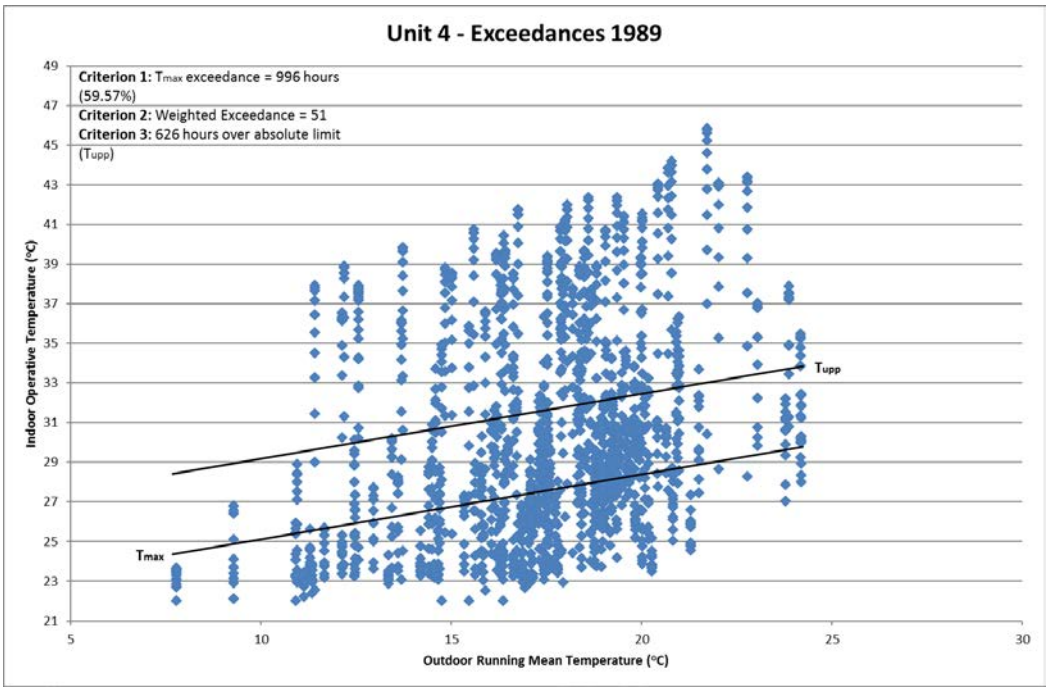
TM49 DSY: 1989 LHR			
Unit 3			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 53.59% The limiting value of percentage of occupied hours is 3% hence this criterion is failed	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 204 The calculated W_e is 41 The limiting value of W_e is 6 hence this criterion is failed	Fail
	Criterion 3	ΔT exceeds 4K for a total of 502 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criterion has passed The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring	**Fail**

These results are shown graphically below:



TM49 DSY: 1989 LHR			
Unit 4			
	Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 59.57% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for $\Delta T > 1K$ is day 204 The calculated W_e is 51 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 626 occupied hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



Based on the recommendations of TM52 all four units are shown to have a risk of overheating when operating in free running mode for the 1989 DSY.

Each unit has been shown to fail all 3 criteria and hence based on the recommendations of TM52 have a predicted risk of overheating during prolonged periods of high external ambient temperature when operating in free running mode for the 1989 DSY.

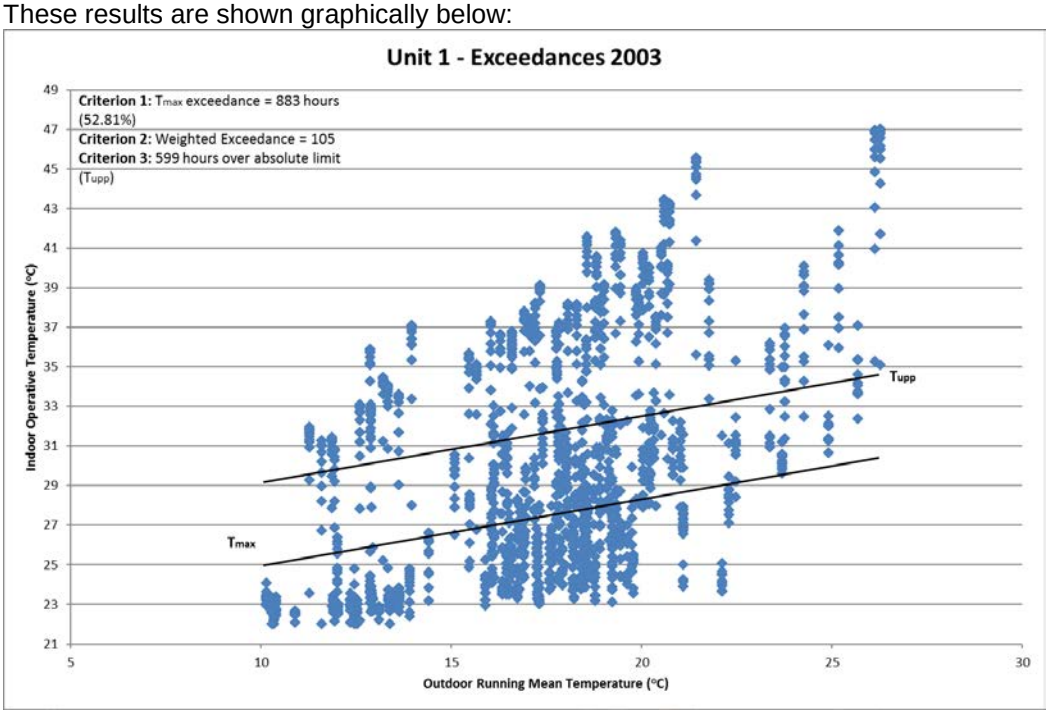
Therefore, additional measures need to be employed to reduce the predicted risk of overheating. See section 4.00 of this report for further details.

3.02.04 Free Running Analysis - TM49 DSY: 2003 LHR

A summary of the dynamic simulation results is as follows:

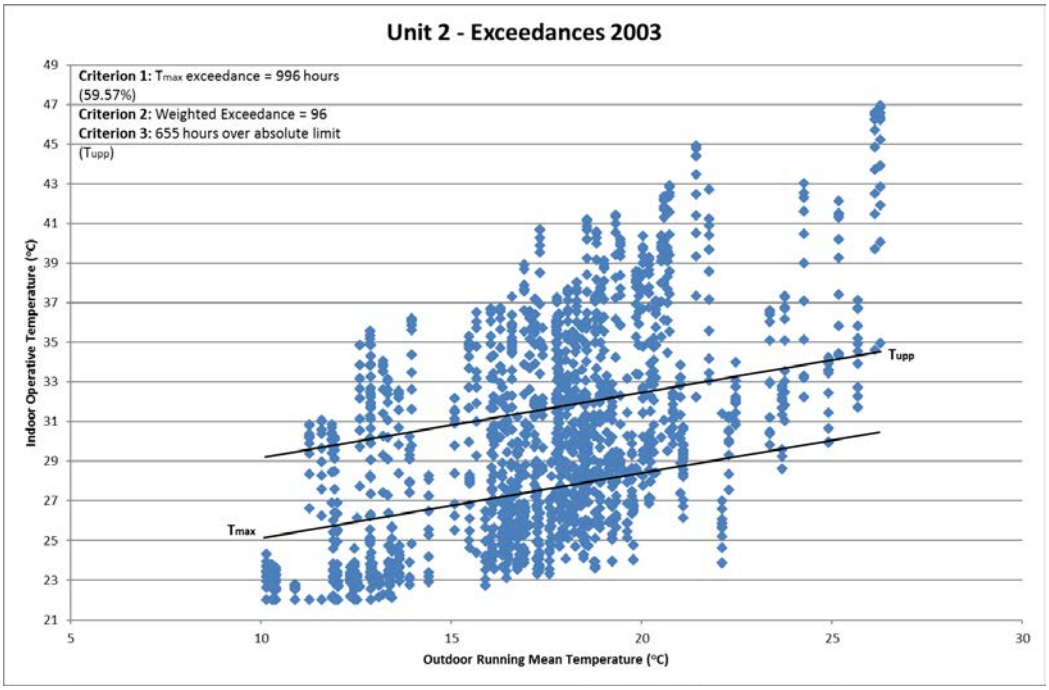
TM49 DSY: 2003 LHR			
Unit 1			
	Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 52.81% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for $\Delta T > 1K$ is day 222 The calculated W_e is105 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 599 hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



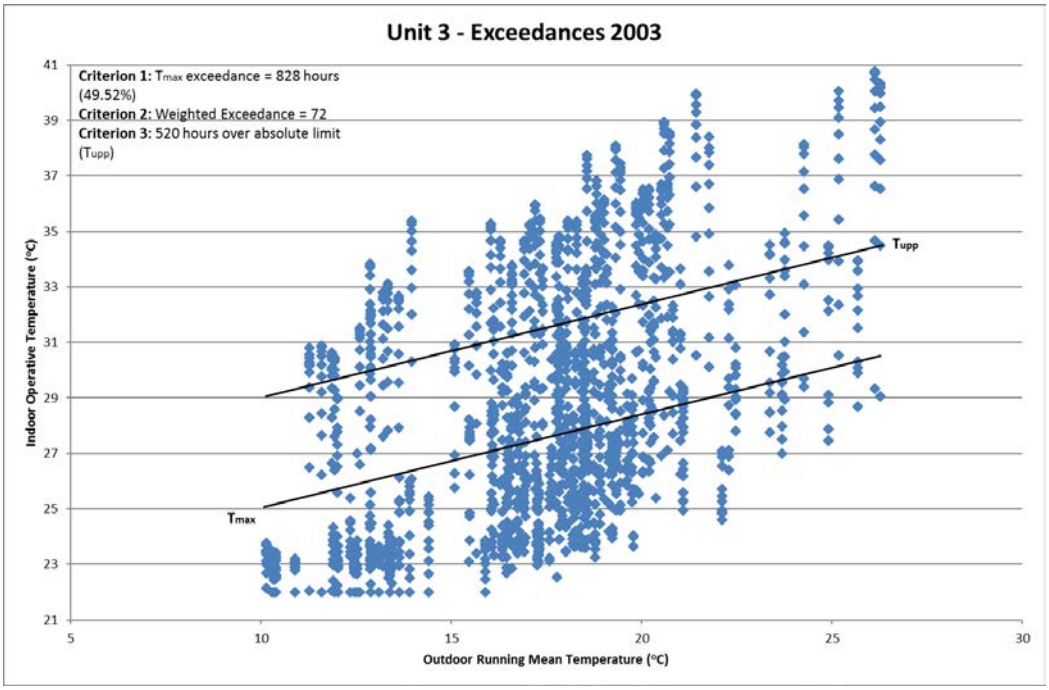
TM49 DSY: 2003 LHR			
Unit 2			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 59.57% The limiting value of percentage of occupied hours is 3% hence this criterion is failed	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 222 The calculated W_e is 96 The limiting value of W_e is 6 hence this criterion is failed	Fail
	Criterion 3	ΔT exceeds 4K for a total of 655 hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring	**Fail**

These results are shown graphically below:



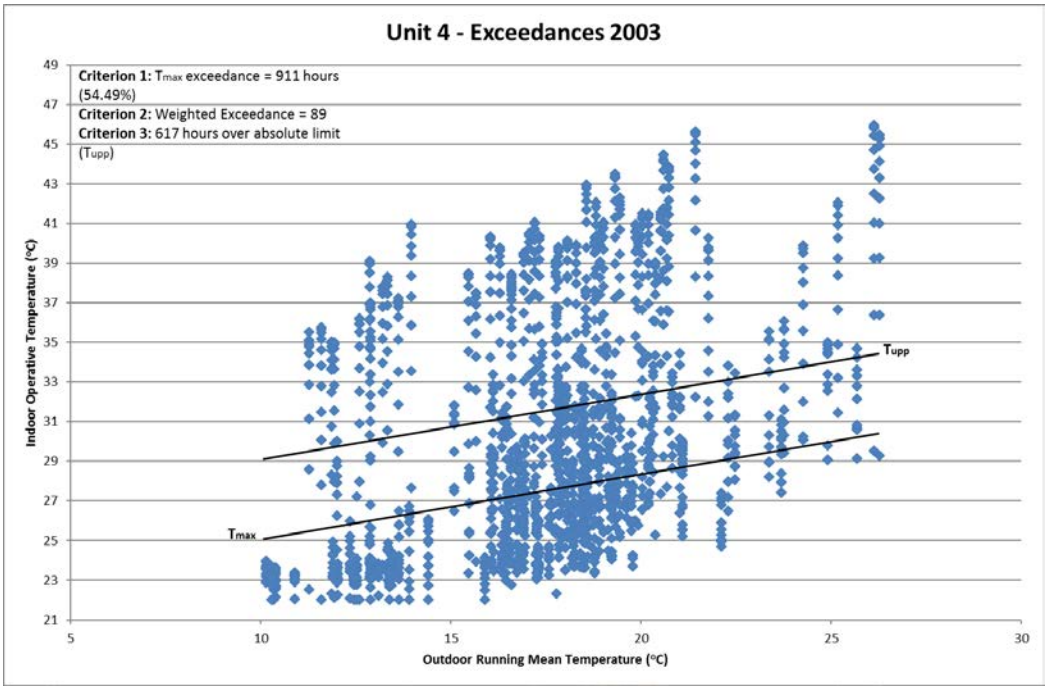
TM49 DSY: 2003 LHR			
Unit 3			
	Criterion 1	ΔT > 1K during some occupied hours The calculated resultant percentage of occupied hours where ΔT > 1K is 49.52% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for ΔT > 1K is day 222 The calculated W_e is 72 The limiting value of W_e is 6 hence this criterion is passed	Fail
	Criterion 3	ΔT exceeds 4K for a total of 520 hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



TM49 DSY: 2003 LHR			
Unit 4			
	Criterion 1	$\Delta T > 1K$ during some occupied hours The calculated resultant percentage of occupied hours where $\Delta T > 1K$ is 59.57% The limiting value of percentage of occupied hours is 3% hence this criterion is failed.	Fail
	Criterion 2	The worst case day for $\Delta T > 1K$ is day 222 The calculated W_e is 89 The limiting value of W_e is 6 hence this criterion is failed.	Fail
	Criterion 3	ΔT exceeds 4K for a total of 617 hours during the assessed summer period.	Fail
	Summary	None of the 3 criteria has passed. The limiting criteria is a pass in 2 out of the 3 criteria Hence overheating is at risk of occurring.	**Fail**

These results are shown graphically below:



Based on the recommendations of TM52 all four units are shown to have a risk of overheating when operating in free running mode for the 2003 DSY.

Each unit has been shown to fail all 3 criteria and hence based on the recommendations of TM52 have a predicted risk of overheating during prolonged periods of high external ambient temperature when operating in free running mode for the 2003 DSY.

Therefore, additional measures need to be employed to reduce the predicted risk of overheating. See section 4.00 of this report for further details.

3.03 Mechanical Comfort Cooling Analysis

Using the dynamic software, the PMV and the PPD has been established for the office area for each unit for each of the three TM49 design summer years.

In accordance with TM52 the building would be regarded as at risk from overheating the if the PMV index is above 5% for more than 3% of the occupied hours.

3.03.01 Unit 1

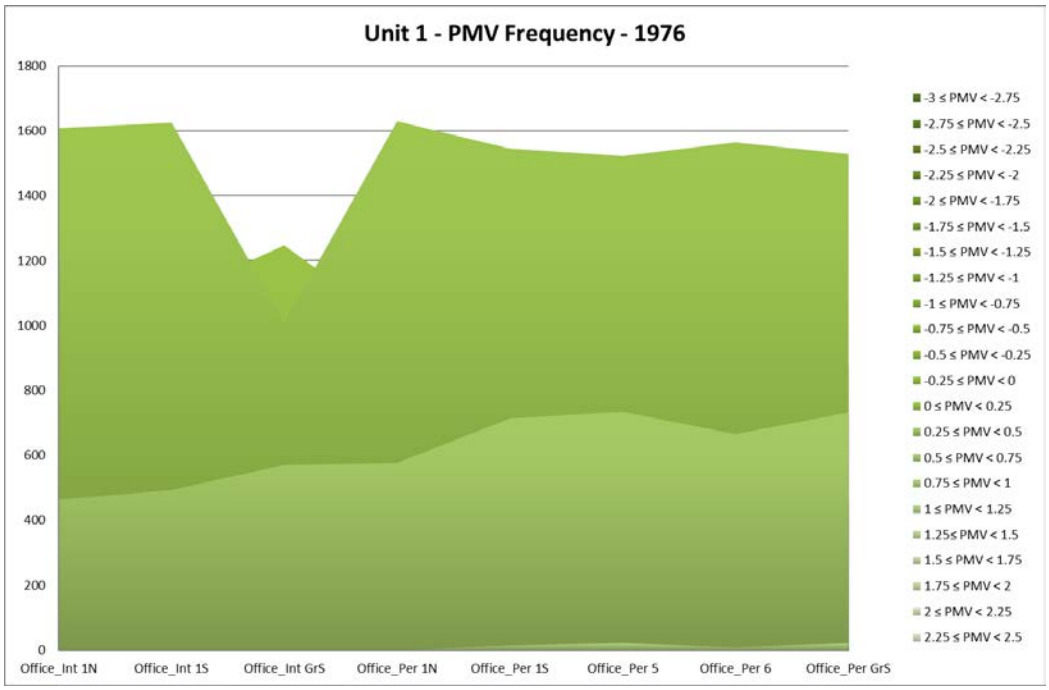
3.03.01.01 Mechanical Comfort Cooling Analysis – TM49 DSY: 1976 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1	496.5	1009.0	1503.8	618.4	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	13.6	27.6	41.2	16.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 edition risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.2% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ≤ *PPD < 10%*	***10%*** ≤ *PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*	*90% ≤ PPD ≤ 100%*
Average (hr)	3620.8	29.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as percentage of PPD that is greater than 10% is 0.8%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1976 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

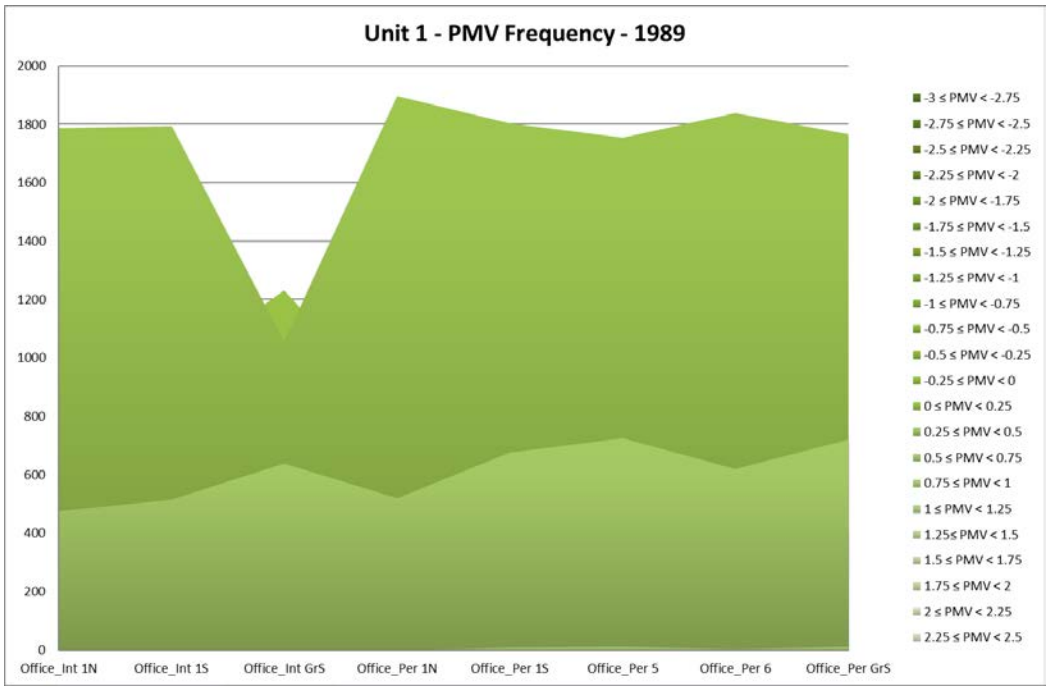
3.03.01.02 Mechanical Comfort Cooling Analysis – TM49 DSY: 1989 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	451.5	870.9	1711.5	611.4	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	23.9	46.9	16.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.1% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ***≤*** *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*	*90% ≤ PPD ≤ 100%*
Average (hr)	3643.6	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as percentage of PPD that is greater than 10% is 0.8%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1989 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

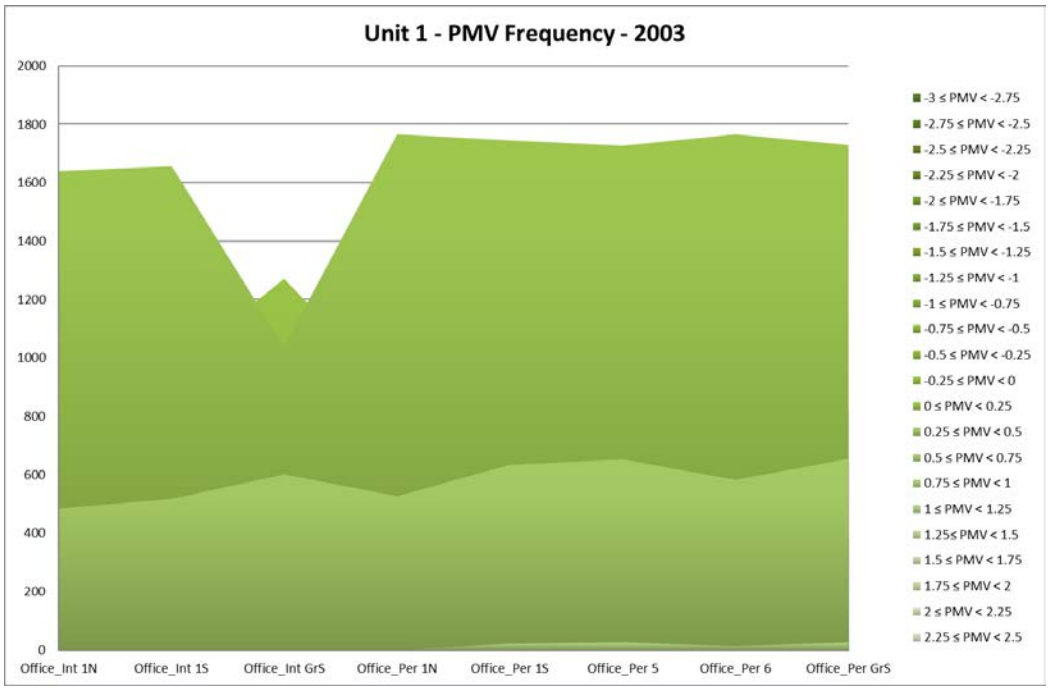
3.03.01.03 Mechanical Comfort Cooling Analysis – TM49 DSY: 2003 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	489.0	928.5	1633.3	581.5	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	13.4	25.4	44.7	15.9	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.3% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ***≤*** *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3628.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.6%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 2003 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

3.03.02 Unit 2

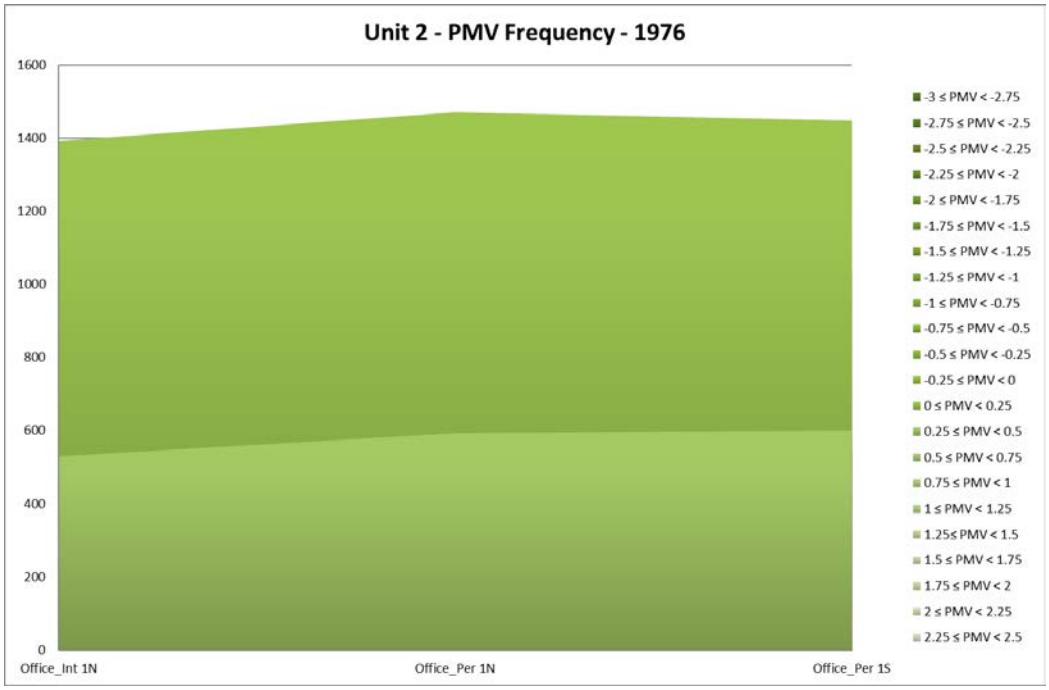
3.03.02.01 Mechanical Comfort Cooling Analysis – TM49 DSY: 1976 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	531.7	1098.0	1437.0	574.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	14.6	30.1	39.4	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ≤ *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3636.7	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.4%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1976 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

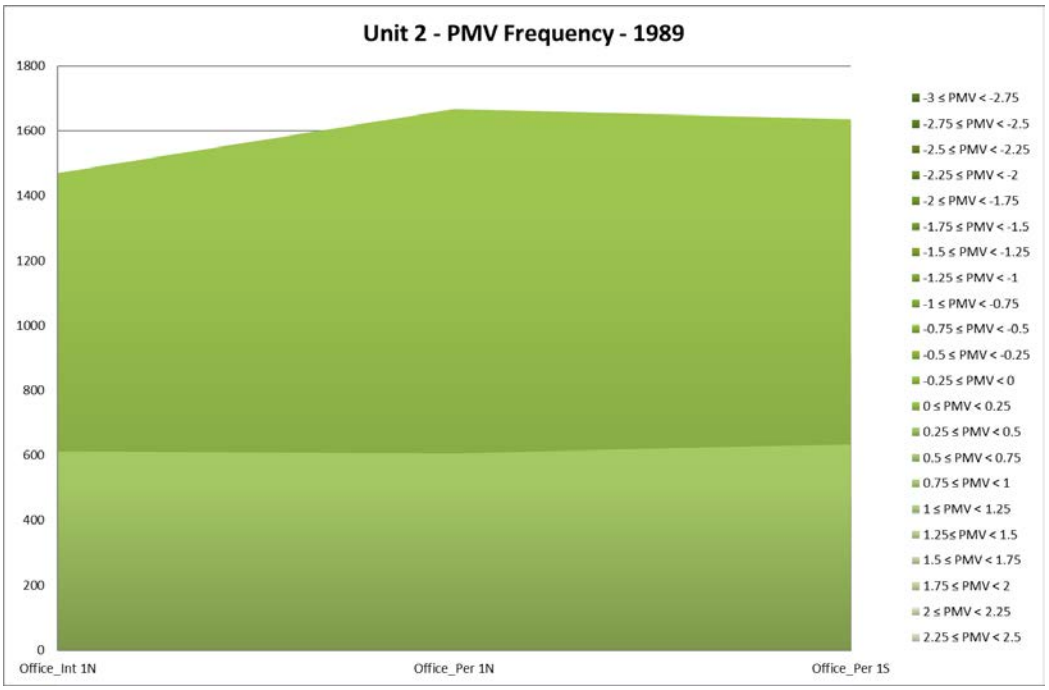
3.03.02.02 Mechanical Comfort Cooling Analysis – TM49 DSY: 1989 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	460.0	980.0	1591.3	617.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6	26.8	43.6	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0 0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ***≤*** *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3648.3	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1989 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

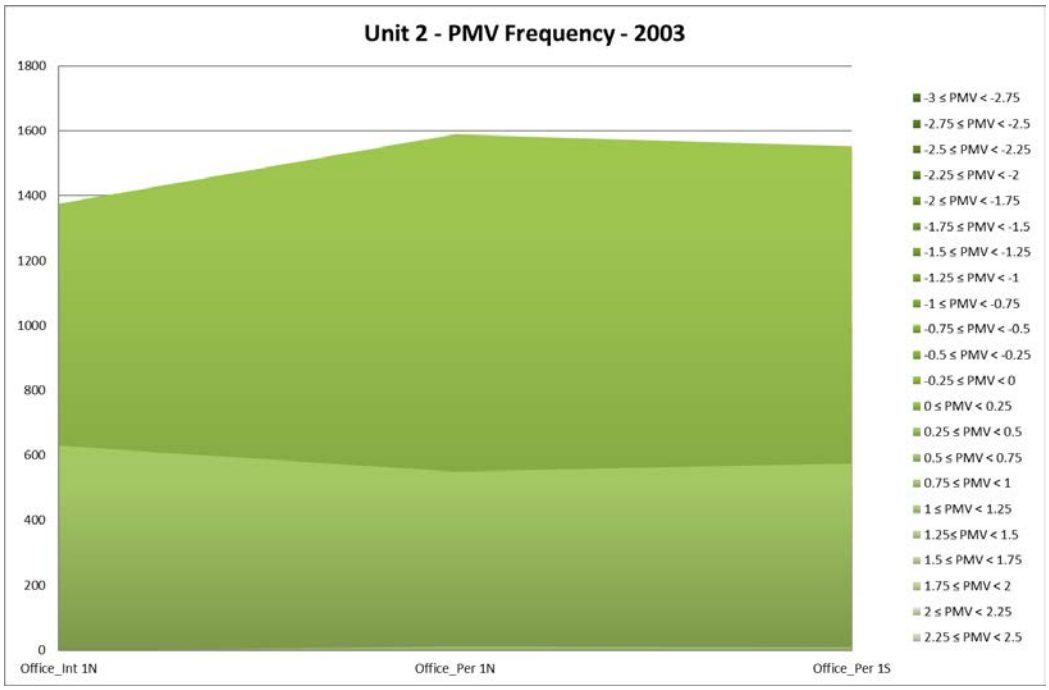
3.03.02.03 Mechanical Comfort Cooling Analysis – TM49 DSY: 2003 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	523.7	1029.0	1504.7	584.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	14.3	28.2	41.2	16.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.1% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ***≤*** *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3635.7	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.4%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 2003 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

3.03.03 Unit 3

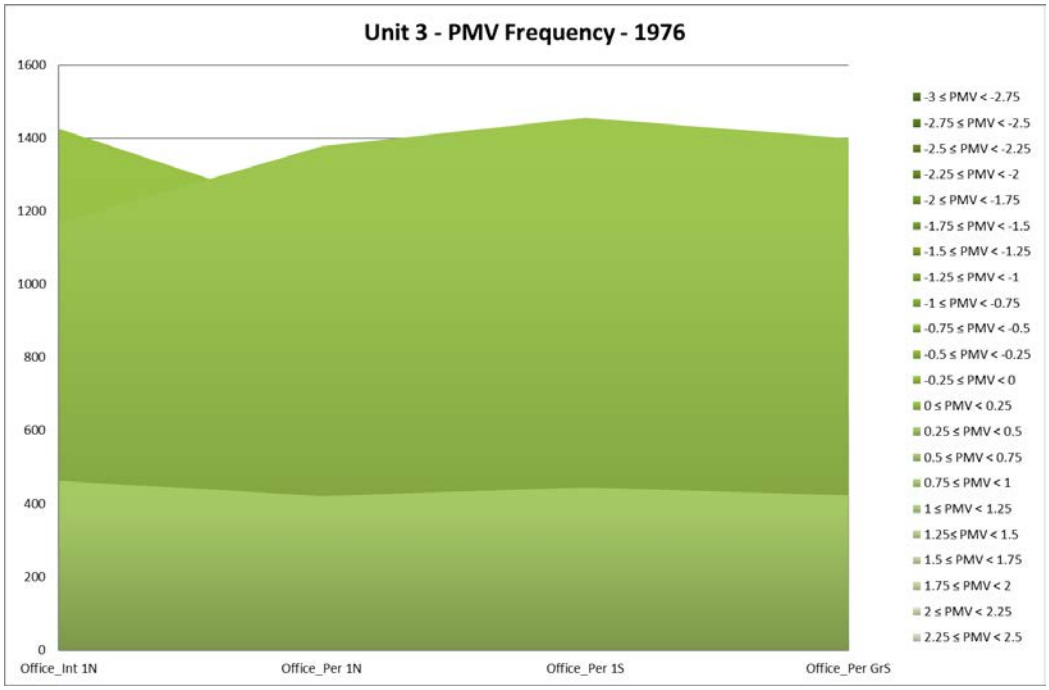
3.03.03.01 Mechanical Comfort Cooling Analysis – TM49 DSY: 1976 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.3	625.3	1213.5	1350.3	437.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	17.1	33.2	37.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ≤ *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3621.8	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.8%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1976 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

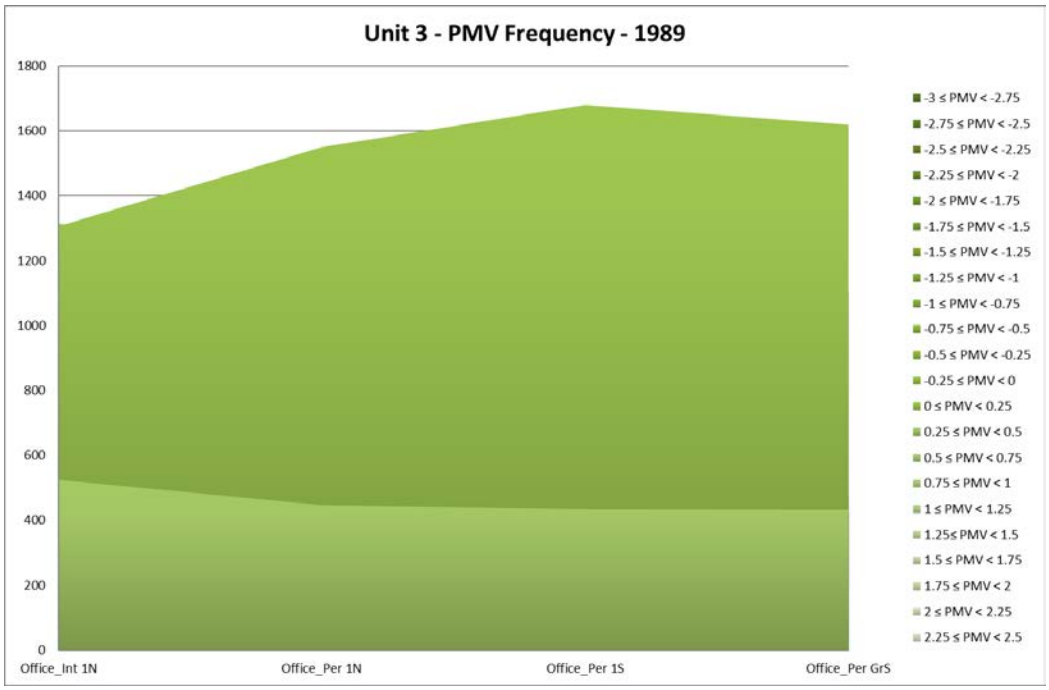
3.03.03.02 Mechanical Comfort Cooling Analysis – TM49 DSY: 1989 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	484.8	1163.3	1538.0	459.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	13.3	31.9	42.1	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.1% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ***≤*** *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3644.5	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.2%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1989 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

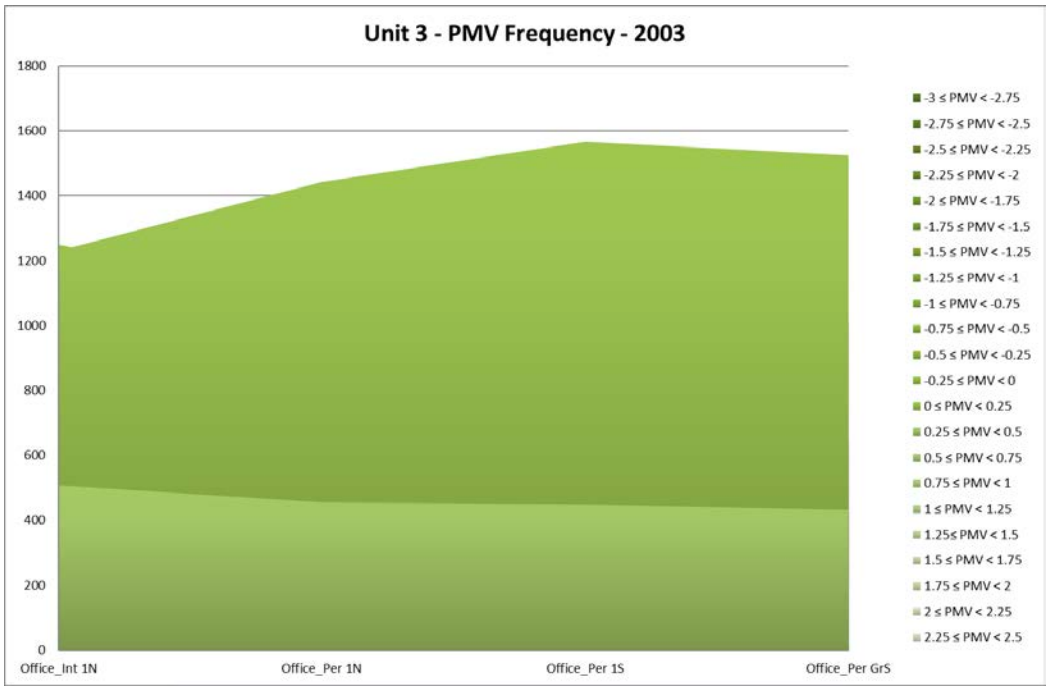
3.03.03.03 Mechanical Comfort Cooling Analysis – TM49 DSY: 2003 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	641.5	1091.0	1441.0	460.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	17.6	29.9	39.5	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

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The PPD analysis results are indicated below.

	0% ***≤*** *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3630.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	99.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.5%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 2003 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

3.03.04 Unit 4

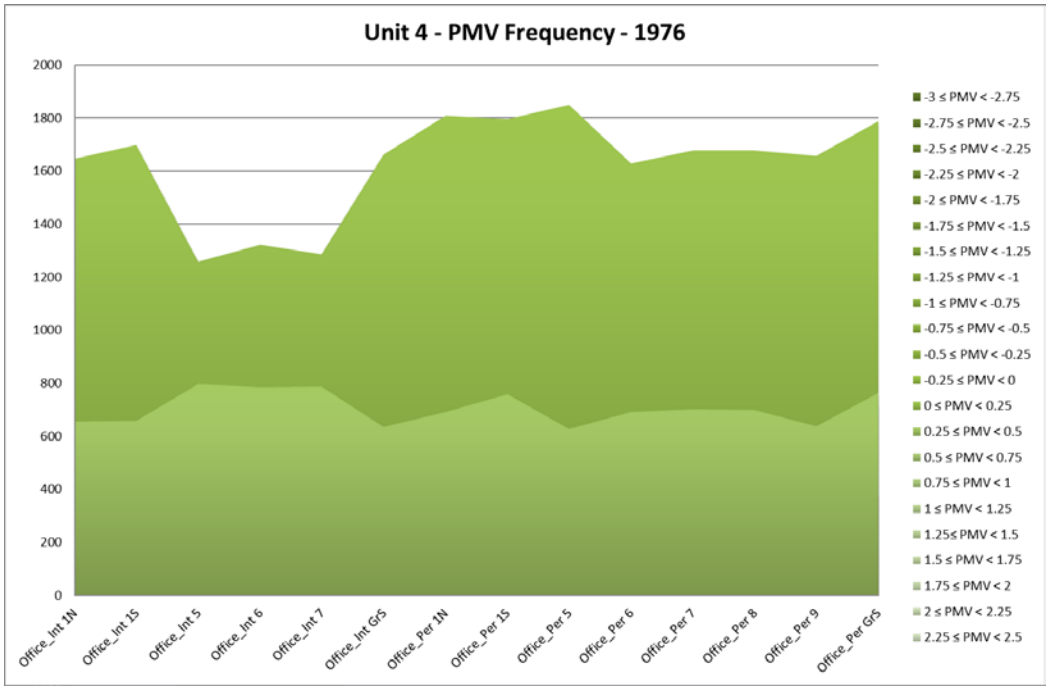
3.03.04.01 Mechanical Comfort Cooling Analysis – TM49 DSY: 1976 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	452.4	869.0	1515.2	812.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	23.8	41.5	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ≤ *PPD < 10%*	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3649.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1976 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

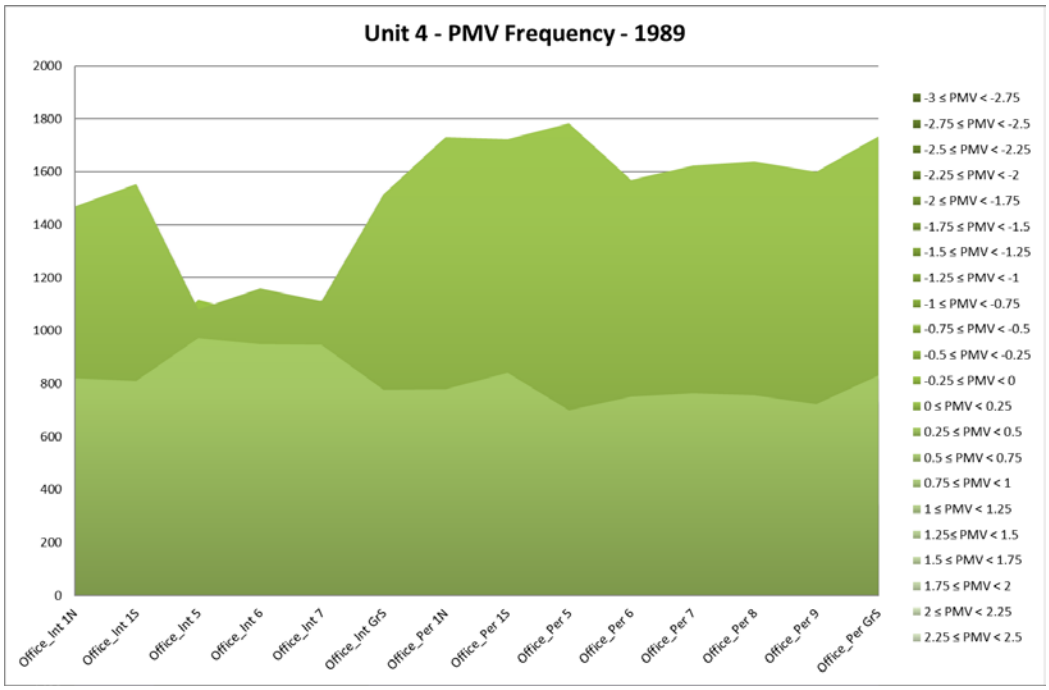
3.03.04.02 Mechanical Comfort Cooling Analysis – TM49 DSY: 1989 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	422.1	892.1	1520.3	815.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.6	24.4	41.7	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ≤ PPD < 10%	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3649.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 1989 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

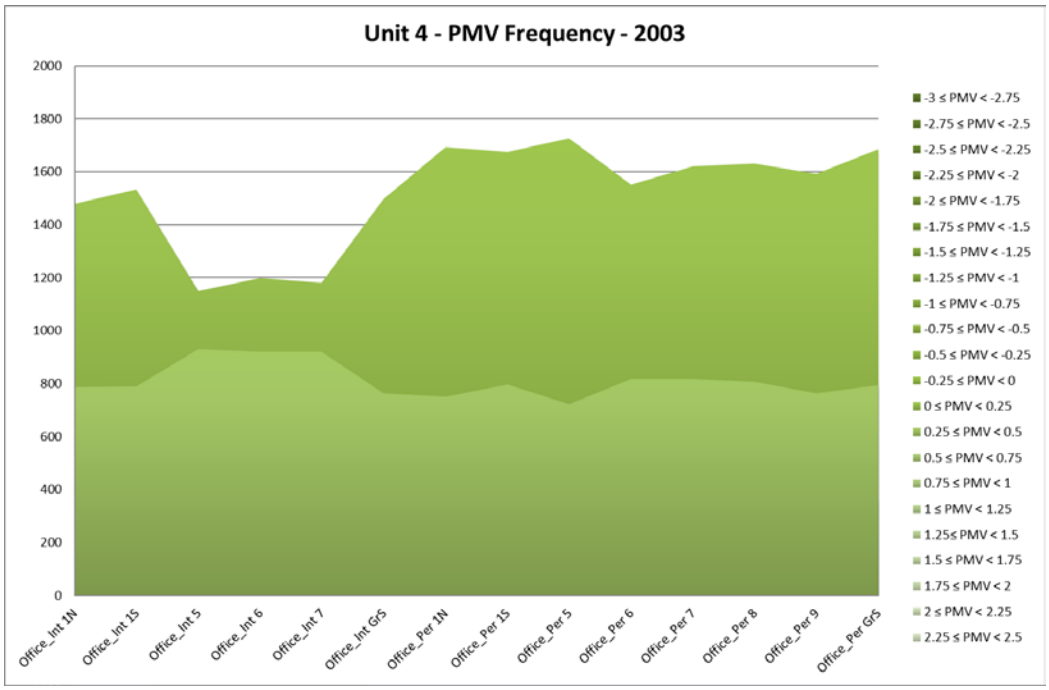
3.03.04.03 Mechanical Comfort Cooling Analysis – TM49 DSY: 2003 LHR

The table below shows the range of the thermal sensation scale and the average hours for the year which meets the criterion.

	-3 ≤ PMV < -2.75	-2.75 ≤ PMV < -2.5	-2.5 ≤ PMV < -2.25	-2.25 ≤ PMV < -2	-2 ≤ PMV < -1.75	-1.75 ≤ PMV < -1.5	-1.5 ≤ PMV < -1.25	-1.25 ≤ PMV < -1	-1 ≤ PMV < -0.75	-0.75 ≤ PMV < -0.5	-0.5 ≤ PMV < -0.25	-0.25 ≤ PMV < 0	0 ≤ PMV < 0.25	0.25 ≤ PMV < 0.5	0.5 ≤ PMV < 0.75	0.75 ≤ PMV < 1	1 ≤ PMV < 1.25	1.25≤ PMV < 1.5	1.5 ≤ PMV < 1.75	1.75 ≤ PMV < 2	2 ≤ PMV < 2.25	2.25 ≤ PMV < 2.5	2.5 ≤ PMV < 2.75	2.75 ≤ PMV ≤ 3
Average (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	452.4	869.0	1515.2	812.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	23.8	41.5	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Based on the results from a thermal comfort perspective the 100.0% of occupied hours fall between -1.0 ≤ PMV < 1.0 frequency. Therefore, based on the recommendations of ISO 7730 the occupants of the building are thermally satisfied.

This is graphically illustrated below.



The zones below the graph represent how the building has been split within the thermal model.

Applying the TM52 & CIBSE Guide A, 2015 issue risk of overheating criteria to the results indicates that the building is not at risk of overheating as the percentage of occupied hours that have a PMV of greater than 0.5 is 0.0% and is therefore below the prescribed tolerance of 3% of when a building would be regarded as overheating.

The PPD analysis results are indicated below.

	0% ≤ PPD < 10%	*10% ≤ PPD < 20%*	*20% ≤ PPD < 30%*	*30% ≤ PPD < 40%*	*40% ≤ PPD < 50%*	*50% ≤ PPD < 60%*	*60% ≤ PPD < 70%*	*70% ≤ PPD < 80%*	*80% ≤ PPD < 90%*
Average (hr)	3649.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage (%)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The results show that the office accommodation passes the TM52 criteria as the percentage of PPD that is greater than 10% is 0.0%.

Therefore, the mechanically comfort cooled building overheating risk analysis for the TM49 design summer year for 2003 at London Heathrow airport indicates that the office accommodation is not at risk of overheating.

4.00 OVERHEATING / THERMAL COMFORT STRATEGY

The TM52 free running overheating results for the office accommodation for each of the three TM49 design summer years are summarised below:

- All four units have a risk of overheating due to failing each of the three TM52 criterion for each of the three TM49 design summer years.

Therefore, additional measures need to be included to alleviate the small overheating risk.

The modelled scheme already incorporates the following passive measures to reduce the risk of overheating:

- Openable windows.
- High performance glazing that has a 'U' value of 1.50 W/m^{2}K and a 'g' value of 0.30.
- LED lighting to reduce internal casual heat gains.
- Solar shading is provided by an overhang at the upper level of the office accommodation to each of the units.

Therefore, additional passive measures are not applicable. Hence a mechanical ventilation or comfort cooling solution is required.

The additional mechanical ventilation of comfort cooling measures to be incorporated to the office accommodation needs to cater for the design weather data, the design internal heat gains plus the operational requirements / constraints of the future tenant. From an operational point of view each industrial unit needs to provide the following:

- Restrict the external noise intrusion in to the unit.
- Provide a comfortable internal environment for the occupants during the day and potentially night occupied periods.

Two main strategies have been considered:

1. The application of a night cooling strategy i.e. flooding the office accommodation with external ambient air during the night.
2. Adding mechanical comfort cooling.

A natural ventilation night time cooling strategy has been discounted for the following reasons:

- The location of the development, adjacent to the mainline railway to London Paddington and the A312 road, means that noise intrusion from open windows may result in unacceptable internal noise levels.
- The windows have a restricted opening size, already included in the assessment that cannot be increased.

A mechanical ventilation night time cooling strategy has been discounted for the following reasons:

- Night cooling strategies are generally applied to buildings during their unoccupied periods as the need to negate draughts in the occupied zones is unnecessary.
- The volume of supply air to the office accommodation would cause draughts in the occupied zones and therefore cause discomfort.
- The ductwork risers and distribution ductwork would be impractically large.

- The required large air change rates in the rooms are impractical to provide and are likely to cause excessive noise.

Hence a night time cooling strategy cannot be applied to the office accommodation.

Therefore, additional mechanical ventilation measures are not applicable. Hence a mechanical comfort cooling system is required.

The TM52 mechanical comfort cooling overheating risk analysis, the PMV and PPD results indicate that overheating in the comfort cooled office accommodation is not a risk.

Hence the proposed mechanical heat recovery ventilation system in conjunction with the mechanical comfort cooling system, as per the applicant's preferred development specification is appropriate.

5.00 CONCLUSION

The office accommodation to each of the four industrial units have been analysed for the overheating risk in free running mode and mechanically comfort cooled mode in accordance with the requirements of TM52 and against the three GLA recommended TM49 design summer years.

For the free running criteria:

- All four units have a risk of overheating due to failing each of the three TM52 criterion.

The modelling already includes the appropriate passive measures to help mitigate the overheating risk. The measures included are summarised below:

- Openable windows albeit with a restricted opening to the office accommodation.
- High performance glazing that has a 'U' value of 1.50 W/m^{2}K and a 'g' value of 0.30.
- LED lighting to reduce internal casual heat gains.
- Solar shading is provided by an overhang at the upper level of the office accommodation to each of the units.

The provision of openable windows will be maintained in each of the units to allow the future tenants the choice of operating the building in free running mode as the prevailing whether conditions allow.

To alleviate the predicted overheating the office accommodation in each of the industrial units will be provided with comfort cooling. The office accommodation in each of the units passes the TM52 mechanical cooled building overheating criteria.

Therefore, the proposed comfort cooling systems to the office accommodation are appropriate for inclusion in each of the four industrial units.

This report accounts for all relevant design features and includes for the anticipated building usage. Should the final design and/or use of the building differ from the described, or should the actual weather differ from the accredited weather files, then 'out of range' temperature may occur beyond that predicted.

APPENDIX

SITE LAYOUT DRAWING

GRAND UNION CANAL

GRAND UNION CANAL

Towing Path

29.9m

29.9m

29.9m

29.6m

Tank

El Sub Sta

El Sub Sta

Gantry

MP 10.75

Gantry

MoPs

Compass Building

Mast (Telecommunication)

CANALSQUARE

COFFEE PARK

CANAL STREET GARDEN

MILK STREET GARDEN

VIVEASH SQUARE

VIVEASH YARD

CANAL STREET

SANDOW YARD

MILK STREET

SANDOW SQUARE

SANDOW WALK

MILK YARD

WALLIS GARDENS

WALLIS WALK

CANAL STREET

NESTLES AVENUE

NESTLES AVENUE

NESTLES AVENUE

NORTH HYDE GARDENS

SUTTHER

B1 B2 B3 B4 B5 B6 B7 B8 B9

C1 C2 C3 C4 C5 C6

D1 D2 D3

E1 E2

F1 F2 F3 F4

G H I

88 NO PARKING SPACES

FF & SF OFFICES

UNIT 4

31 NO PARKING SPACES

FF OFFICES

UNIT 3

UNIT 2

FF OFFICES

21 NO PARKING SPACES

3 M HIGH SECURITY FENCE

UNIT 1

FF OFFICES

73 NO PARKING SPACES TOTAL

3 M HIGH SECURITY FENCE

3 M HIGH SECURITY FENCE

KEY:

Permeable paving

Squirrels Trading Estate

1 3 4 7

7 to 11

7

3

92 102 112 122 134

136 138 142 150

152 164 174 180 182

184 196 208 218

Surgery

69

25

26

1 8 2

El Sub Sta

12

1

ESS

BARRATT LONDON

SEGRO

DATE	REV	DESCRIPTION	CHK

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FORMER NESTLE FACTORY, HAYES
ILLUSTRATIVE SITE LAYOUT PLAN

MS 100

SCALE 1:500@ A0

0 5 10 25

ISSUE D6

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