

MAYOR OF LONDON

MODULE C - DRAFT FOR CONSULTATION

GOOD QUALITY HOUSING

FOR ALL LONDONERS

LONDON PLAN GUIDANCE

OCTOBER 2020

GOOD GROWTH BY DESIGN



HOUSING DESIGN

QUALITY AND STANDARDS

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1 INTRODUCTION

1.1 Purpose

The purpose of this London Plan Guidance is to help interpret and implement the Intend to Publish London Plan (London Plan) policies on housing design, optimising site capacity on all scales of site and enabling housing supply through smaller housing developments, with the wider purpose of supporting Good Growth. The document sets out a design-led approach to intensification, using residential types to quickly identify the indicative capacity of a site or area, with careful consideration of housing design standards that protect quality of life for residents.

The document provides guidance on assessing the capacity of land and buildings to accommodate housing by optimising site capacity at all stages of the planning process (plan-making, site allocation, area-based strategies, pre-application discussions and application determination). The National Planning Policy Framework (NPPF, 2019) encourages the use of ways of proactively granting permission for new housing. This document provides guidance to boroughs and neighbourhood forums for bringing forward high-quality homes by way of development orders and Permission in Principle (PiP).

The Government and the Mayor recognise that small housing development should play a greater role in the provision of additional homes. This guidance provides advice on how opportunities to deliver new homes on small housing developments should be identified, shaped and permitted to meet London's housing needs and deliver contextually appropriate, better quality design (London Plan Policy H2: Small Sites).

Housing is the most common land use in London, yet there is not enough. Its inclusion as part of mixed-use developments in town centres, high streets, and industrial areas, can enliven places and make them more attractive and safer, as well as providing much needed additional homes. This guidance provides advice on how housing can be successfully integrated with a range of uses and building types to provide successful places and high-quality additional homes. The guidance focuses on general needs housing across tenures, including Build to Rent. However, it does not provide advice on specialist forms of housing such as housing for students or older people. Relevant London Plan policies and other guidance are referenced throughout the document.

1.2 Structure

This London Plan Guidance is constructed as a series of modules.

Foreword: Good Quality Homes For All Londoners

The foreword communicates the Mayor's vision for high-quality housing, particularly housing delivering improved quality of life through design-led processes of site optimisation. This narrative situates the purpose and content of the Housing Design London Plan Guidance within the wider context of the Greater London Authority's mission to ensure Good Growth and provide good quality housing for all Londoners.

Module A: Optimising Site Capacity - A Design-led Approach

Module A advocates a design-led methodology for optimising site capacity at the plan-making stage. It is aimed at borough policy officers when calculating capacity on strategic and non-strategic site allocations. It sets out an approach to assessing sites' suitability for development and offers a tool for assessing site capacity.

The module provides a range of residential types to test site capacity. The most common existing and emerging housing types are categorised based on their typical characteristics, access and circulation arrangements and their ability to meet Module C's housing design quality standards. Each type is described in terms of its inherent qualities, characteristics, flexibility to accommodate different tenure and type mixes and suitability for integration with mixed uses. Module A provides guidance on the residential type suitable for a site, in order to determine potential capacity.

Module B: Small Housing Developments - Assessing Quality and Preparing Design Codes

Providing guidance on both assessing the quality of small sites schemes and preparing design codes, Module B will help boroughs to optimise development opportunities on sites below 0.25 of a hectare and deliver on their small sites housing targets set out in London Plan Policy H2 (Small sites). To do this, the module explores the typical conditions found across London which might be suitable for small site development and offers examples of how a borough could write design codes linked to the Housing Design – Quality and Standards identified in Module C, offering template design codes. Case studies of successful small sites development are included in Module D and can be referenced when writing codes as best practice examples.

Module C: Housing Design - Quality and Standards

Module C updates the *London Housing Design Guide (2010)*. It is aimed at borough development management officers and developers and their design teams seeking planning permission. The guidance is categorised under the broad themes of Shaping Good Places, Designing for a Diverse City, From Street to Front Door, Dwelling Space Standards, Home as a Place of Retreat, Living

Sustainably and Future Proofing. In addition to providing technical standards where applicable, Module C provides qualitative guidance, with reference to best practice examples (in Module D: Housing Design- Case Studies and Appendices), to demonstrate where good design has been critical to a positive resident experience.

Module D: Housing Design - Case Studies and Appendices

Module D is a library of best practice case studies, additional information on the planning process and a glossary of terms used within the London Plan Guidance.

1.3 Who is it for?

The document comprises four modules that seek to provide helpful guidance and increased certainty for all Londoners that good growth is possible and will happen. This guidance is aimed at landowners, prospective developers, architects and wider design teams, planners and decision-makers across the public, private and community sectors. The different modules will be of different levels of interest to different parties. The guidance also hopes to provide local communities with confidence that the Mayor is determined to work with development partners to deliver growth that safeguards amenity and helps ensure that all Londoners have a good quality of life. Module C is principally aimed at borough development management and design officers tasked with assessing the design quality of planning applications.

1.4 How to use this module

This module presents a set of housing design standards for use when designing or assessing new housing. Quality of life for residents is at the heart of this guidance and runs as a 'golden thread' throughout. The guidance is based around eight key themes covering the scale of the neighbourhood through to the scale of the home. Qualitative descriptions and technical standards are provided in order to set a benchmark for the highest quality housing developments.

Module C highlights key standards with references to relevant London Plan policies and further guidance. The module also highlights which of the case studies perform particularly well in relation to the standards, with references to the case study library in Module D for further detail.

The housing types illustrated in the capacity toolkit in Module A have been selected due to their ability to deliver an environment that promotes a good quality of life and to effectively meet the standards set out in this module (particularly at the higher density range). Therefore, the quality of life factors that inform these standards, and the standards themselves, underpin the

methodology to identify indicative capacity set out in Module A. In addition, the housing design standards are a tool for small sites design code preparation, as set out in Module B. This ensures that the human experience is inherently captured and considered at the earliest stages of the planning process.

As well as underpinning the capacity methodology and small sites design code preparation, the standards serve as a stand-alone guide for delivering great housing and great city-making at all scales. In reality, all of these standards are interrelated and should not be considered in isolation. Instead, they should all be considered in the round with a view to producing a holistic design that will deliver a comfortable, healthy and high-quality environment, as well as meeting compliance requirements. It should be noted that some of these factors could pull in opposite directions. It is therefore recommended that a single party, typically the architect, takes ownership of reviewing all of these factors early in the planning stage.

2 DESIGN STANDARDS

2.1 Summary

C1 Shaping Good Places

Response to character and context
Sense of community
Topography
Land use mix
Open space

C2 Designing for a Diverse City

Diversity of residential type and tenure
Accessible housing and inclusion
Sense of community

C3 From Street to Front Door

Access and servicing
Safety and security
Cycle parking
Car parking

C4 Dwelling Space Standards

Private internal space
Private outside space
Spatial quality

C5 Home as a Place of Retreat

Privacy
Aspect and outlook
Daylight, sunlight and overshadowing
Indoor air quality and noise
Thermal comfort

C6 Living Sustainably

Environmental sustainability
Biodiversity and urban greening
Flood mitigation and Sustainable drainage systems
Air pollutant emissions

C7 Future Proofing

Flexibility and adaptability
Safeguarding development potential
Quality, maintenance and management

C1

SHAPING GOOD PLACES

C1.1 Response to character and context

C1.1.1 Development proposals should demonstrate:

How the design responds to its physical context. This includes the character of the area and the local pattern of buildings, public space, landscape and topography.

How the scheme relates to the identified character of the place and to the local vision and strategy. Or, how bolder change is justified in relation to a coherent set of ideas for the place as expressed in the local vision and strategy.

C1.1.2 Development proposals should demonstrate:

How the scheme complements and links into the local network of public spaces, including how it integrates with existing streets, paths and ecological links.

That public spaces and pedestrian routes are designed to be overlooked and safe, and how blank elevations onto the public realm at ground floor have been avoided.

For larger developments, how any new public spaces, including streets and paths, are designed on the basis of an understanding of the planned role and character of these spaces within the local movement network, and how new spaces relate to the local vision and strategy for the area.

Relevant London Plan policies: GG1, D1, D3

C1.2 Topography

C1.2.1 Development proposals should take advantage of any level changes to optimise the full potential of the site. They should also achieve efficient internal and external access arrangements and optimise urban greening and sustainable drainage (see C6.2 and C6.3) whilst ensuring an accessible and inclusive scheme in terms of inclusive design (see C2.2).

Relevant London Plan policies: D1

C1.3 Land use mix

- C1.3.1** Development proposals should demonstrate how the mix of uses meets strategic and local borough needs.
- C1.3.2** Residential proposals should be designed to avoid compromising the day-to-day functioning and long-term viability of adjacent non-residential uses, in accordance with the Agent of Change principle (London Plan Policy D13).
- C1.3.3** Development proposals that combine different uses should be designed to protect the quality of home life through careful consideration of noise mitigation, refuse collection, services, parking arrangements and access routes to homes and amenity spaces.

Relevant London Plan policies: GG5, SD5, SD6, D13, E1, E2, E3, E4, E7, E8

C1.4 Open space

- C1.4.1** Development proposals should demonstrate that they comply with the borough's open space strategies and policies. They should ensure that an analysis of surrounding open space is undertaken and that opportunities to address a deficiency in provision by providing new public open spaces, or creating links between networks of open space, are taken forward in the design process.
- C1.4.2** For developments where 10 or more children and young people are expected to live, development proposals should make appropriate play and informal recreation provision in accordance with London Plan Policy S4. The GLA Population Yield Calculator should be used to calculate the expected number of children and young people likely to live in the development. Children's play space should be designed to be stimulating and incorporate greenery, be overlooked to enable passive surveillance, be accessible to all tenures and be safely accessed from the street by children and young people independently.
- C1.4.3** Where communal open space is provided, development proposals should demonstrate that the space meets the qualitative design aspects identified in London Plan Policy D6 (Table 3.2) (see guidance in Section 3).

Relevant London Plan policies: GG3, GG6, D5, D6, S4, G1, G4, G5, G6, G7, G8, SI 1, SI 13

C2

DESIGN FOR A DIVERSE CITY

C2.1 Diversity of residential type and tenure

- C2.1.1** Development proposals should demonstrate how the mix of dwelling sizes and the mix of tenures meet strategic and local borough targets, and how they are appropriate for their location in London.
- C2.1.2** Development proposals should demonstrate that housing of different types and tenures in a scheme have been fully integrated, and that the quality of architecture and materials is consistent across all tenures.

Relevant London Plan policies: GG1, GG4, D2, D5, D7, H2, H5, H6, H7, H10, H12

C2.2 Accessible housing and inclusion

- C2.2.1** Development proposals should demonstrate how they have been designed to meet the needs of a diverse population, including disabled people, older people and families with young children, in terms of wider site arrangements, adopting an inclusive design approach, and the provision of accessible housing, in the form of both accessible and adaptable housing and wheelchair user dwellings.
- C2.2.2** Development proposals should demonstrate how they have been designed to accommodate the travel needs of disabled residents, including through designing inclusive street environments and access to public transport networks, and the provision of disabled persons car parking.

Relevant London Plan policies: CG1, D5, D7, S4, S6, T6.1, T5

C2.3 Sense of community

- C2.3.1** Development proposals should include an appropriate range of housing types and tenures to provide opportunities for people to remain within their community as their lives evolve.
- C2.3.2** Development proposals should demonstrate that meaningful engagement has taken place with existing communities from the early

design stage in order to help define specific community needs and aid with any integration of new communities.

Relevant London Plan policies: GG1, GG3, D5

C3

FROM STREET TO FRONT DOOR

C3.1 Access and servicing

- C3.1.1** Development proposals should ensure that all main entrances to houses, ground floor flats and communal entrance lobbies are visible from the public realm and clearly identified.
- C3.1.2** Development proposals should ensure that the number of dwellings accessed from a single core does exceed eight per floor. Deviation (by exception) from this requirement will need to be justified and mitigated by maximising corridor widths (beyond 1500mm) and introducing natural ventilation/daylight to corridors.
- C3.1.3** Development proposals should ensure that communal refuse, recycling and food waste containers, communal bin enclosures and refuse stores are easily accessible to and usable by all residents including children and disabled people, and located on a hard, level surface. The location should satisfy local requirements for waste collection and, if within buildings, should be positioned to limit the nuisance caused by noise and smells, and provided with means for cleaning.

Relevant London Plan policies: D1, D5, D6, D8, S17, T7

C3.2 Safety and security

- C3.2.1** Development proposals should demonstrate that they are safe and secure, and that they design out opportunities for crime and anti-social behaviour.
- C3.2.2** Development proposals should demonstrate that they achieve the highest standards of fire safety, identify unobstructed outside space for fire appliances which is also appropriate for use as an evacuation assembly point, and provide suitable and convenient means of escape and an associated evacuation strategy for all building users.

Relevant London Plan policies: D1, D5, D6, D11, D12

C3.3 Cycle parking

C3.3.1 Residential development should provide dedicated long-stay parking space for cycles in accordance with the London Plan and guidance in the London Cycling Design Standards:

One long-stay space per studio or one bedroom (one-person) dwelling

One and a half long-stay spaces per one bedroom (two-person) dwelling

Two long-stay spaces per two or more bedroom dwelling.

In addition, for developments of between 5 and 40 dwellings at least two short-stay cycle parking spaces should also be provided, with at least one additional space per 40 dwellings thereafter.

C3.3.2 In line with the London Cycling Design Standards, cycle parking should be conveniently located, secure and accessible. Communal cycle stores should have an appropriate mix of stand types and adequate spacing and facilities for larger cycles. In some instances, it may be appropriate for cycle parking to be provided within individual homes, but it should be fully accessible and provided in addition to minimum space requirements and not in habitable rooms or on balconies.

Relevant London Plan policies: D5, T5

C3.4 Car parking

C3.4.1 Residential development should conform to London Plan maximum residential parking standards as set out in Table 10.3 of Policy T6.1 (below)

Location	Maximum parking provision
Central Activities Zone Inner London Opportunity Areas Metropolitan and major town centres All areas of PTAL 5 - 6 Inner London PTAL 4	Car free
Inner London PTAL 3	Up to 0.25 spaces per unit
Inner London PTAL 2 Outer London PTAL 4 Outer London Opportunity Areas	Up to 0.5 spaces per unit
Inner London PTAL 0-1 Outer London PTAL 3	Up to 0.75 spaces per unit
Outer London PTAL 2	Up to 1 space per unit
Outer London PTAL 0-1	Up to 1.5 spaces per unit ¹

C3.4.2 Careful consideration should be given to the location and organisation of car parking within an overall design so that car parking does not create barriers to walking, cycling and public transport use or negatively affect the use and appearance of open spaces. More information is provided in TfL's Parking Design and Management Plan guidance.

Relevant London Plan policies: T6, T6.1, T6.2, T6.3, T6.4, T6.5

C4 DWELLING SPACE STANDARDS

C4.1.1 Private internal space

C4.1.1 All housing developments should meet the minimum floor space standards set out in Table 3.1 of the London Plan below:

Number of bedrooms (b)	Number of bed spaces (persons (p))	Minimum gross internal floor areas and storage (sqm)			
		1 storey dwellings	2 storey dwellings	3 storey dwellings	Built in storage
1b	1p	39 (37)*			1
	2p	50	2b	2b	1.5
2b	3p	61	1b	1b	2
	4p	70	1b	1b	
3b	4p	74	1b	1b	2.5
	5p	86	1b	1b	
	6p	95	1b	1b	
4b	5p	90	1b	1b	3
	6p	99	1b	1b	
	7p	108	1b	1b	
	8p	117	1b	1b	
5b	6p	103	1b	1b	3.5
	7p	112	1b	1b	
	8p	121	1b	1b	
6b	7p	116	123	129	4
	8p	125	132	138	

*Where a studio / one-bedroom one-person one-bedspace (i.e. one single bedroom) dwelling has a shower room instead of a bathroom, the floor area may be reduced from 39 sqm to 37 sqm, as shown bracketed.

- C4.1.2** A one bedspace, single bedroom must have a floor area of at least 7.5 sqm and be at least 2.15m wide.
A two bedspace, double (or twin) bedroom must have a floor area of at least 11.5 sqm.
- C4.1.3** Wheelchair user dwellings should meet the design requirements set out in Approved Document M volume 1, M4(3) (see C2 Designing for a Diverse City).
- C4.1.4** Dwelling plans should demonstrate that dwelling types provide flexibility by allowing for an alternative seating arrangement in living rooms and by accommodating double or twin beds in at least one double bedroom.

Relevant London Plan policies: D5, D6, D7

C4.2 Private outside space

- C4.2.1** A minimum of 5 sqm of private outside space should be provided for one-to-two person dwellings and an extra 1 sqm should be provided for each additional occupant.
- C4.2.2** The minimum depth and width of all balconies and other private external spaces is 1500mm.

Relevant London Plan policies: D6, D7

C4.3 Spatial quality

- C4.3.1** Development proposals should create well-considered layout arrangements within dwellings that improve the lived experience through generosity of floor-to-ceiling heights, and spatial arrangements that optimise quality of outlook and aspect.
- C4.3.2** The minimum floor-to-ceiling height in habitable rooms is 2.5m between finished floor level and finished ceiling level.

Relevant London Plan policies: D6

C5

HOME AS A PLACE OF RETREAT

C5.1 Privacy

- C5.1.1** Design proposals should demonstrate how habitable rooms within each dwelling are provided with an adequate level of visual and acoustic privacy in relation to neighbouring property, the street and other public spaces.
- C5.1.2** The layout of adjacent dwellings and the location of lifts and circulation spaces should seek to limit the transmission of noise to sound-sensitive rooms within dwellings.

Relevant London Plan policies: D1, D6

C5.2 Aspect and outlook

- C5.2.1** All new dwellings should be dual aspect, unless there are exceptional circumstances that justify the inclusion of any single-aspect homes. Single-aspect dwellings that are north facing, contain three or more bedrooms, or are exposed to noise levels with significant adverse effects on health and quality of life, should not be permitted.
- C5.2.2** Where single-aspect dwellings are proposed (by exception), the design team should demonstrate how good levels of ventilation, daylight, privacy and thermal comfort will be provided to each habitable room and the kitchen.

Relevant London Plan policies: D6, D8, SI 2, SI4

C5.3 Daylight, sunlight and overshadowing

- C5.3.1** New dwellings should achieve a minimum average daylight factor (ADF) target value of 1 per cent for a bedroom and 1.5 per cent for a living room.
- C5.3.2** Proposed development should maximise quality and availability of sunlight and natural light in outdoor spaces, particularly in winter. Outdoor spaces should benefit from at least two hours of daylight on 21st March into 50 per cent of space in line with BRE guidance.

- C5.3.3** All homes must provide for direct sunlight to enter at least one habitable room for part of the day. Living areas and kitchen dining spaces should preferably receive direct sunlight.

Relevant London Plan policies: D1, D6, SI2, SI 4, S12, S14

C5.4 Air quality and noise

- C5.4.1** Development proposals should be located and designed to reduce the accumulation of indoor air pollutants and exposure of residents to air pollution
- C5.4.2** Development proposals should be located - or attenuation measures should be introduced - to reduce the exposure of residents to noise pollution.

Relevant London Plan policies: SI1, SI4

C5.5 Thermal comfort

- C5.5.1** Careful building design (including thermal mass, layout, aspect, shading, window size, glazing specification and ventilation), and landscaping and green infrastructure should be used to ensure good internal thermal comfort and avoid the need for active cooling.

Relevant London Plan policies: D3, SI2, SI4

C6 LIVING SUSTAINABLY

C6.1 Environmental sustainability

- C6.1.1** Development proposals should be designed in accordance with the Mayor's energy hierarchy to achieve the Mayor's Net Zero Carbon Homes policy. This means being Lean (energy efficient), Clean (exploit local energy sources and connect to heat networks), Green (maximise on-site renewables) and Seen (monitor, verify and report on energy performance).

- C6.1.2** Referable development proposals should calculate and reduce whole life-cycle carbon emissions, which includes the embodied carbon in construction, by using fewer materials and low-carbon materials. Other development proposals are encouraged to do this too.
- C6.1.3** Development proposals should be designed so that water fittings and appliances consume no more than 105 litres per person per day (plus up to five litres for external water consumption). Opportunities for water reuse (to reduce potable water consumption should be identified).

Relevant London Plan policies: SI2, SI3, SI4, SI5, SI7, SI13

C6.2 Urban greening and biodiversity

- C6.2.1** Major developments should meet relevant borough Urban Greening Factor target scores, or where none exist, the interim scores set out in the London Plan.
- C6.2.2** Development proposals should contribute to a net gain in biodiversity.
- C6.2.3** Small site developments should demonstrate no net loss of green cover.

Relevant London Plan policies: GG3, GG6, D3, D6, S4, G1, G4, G5, G6, G7, G8, SI4, SI13

C6.3 Flood mitigation and sustainable drainage systems

- C6.3.1** Where development in areas at risk from flooding is permitted, homes should make space for water and aim for development to be set back from the banks of watercourses and be designed to incorporate flood resistance and resilience measures.
- C6.3.2** New development should incorporate sustainable drainage systems (SuDS) in line with the drainage hierarchy.

Relevant London Plan policies: G1, G5, SI 12, SI 13, C9

C6.4 Air pollutant emissions

- C6.4.1** The development of large-scale redevelopment areas (i.e. Opportunity Areas) should consider how local air quality can be improved as part of an air quality positive approach. All other development should be at least Air Quality Neutral. Air Quality Assessments should be submitted with all major developments.

Relevant London Plan policies: SI1, SI3

C7 FUTURE PROOFING

C7.1 Adaptability and circularity

- C7.1.1** Buildings should be retained and refurbished where practicable. New buildings should be designed in ways that ensure they are adaptable - including to climate change - and capable of conversion to different uses.
- C7.1.2** Buildings should be designed to support the circular economy, including for disassembly, allowing for the reuse of materials and products, reducing waste and pollution.

Relevant London Plan policies: D1, D2, D3, G5, SI 13, SI4, SI5, SI 7, SI 12

C7.2 Safeguarding development potential

- C7.2.1** The development of a site should not prejudice the development of adjoining land or buildings, including subsequent phases of development.

Relevant London Plan policies: D1, D3, T3

C7.3 Quality, maintenance and management

- C7.3.1** Development proposals should be designed to take full account of future maintenance practicalities and likely costs.

Relevant London Plan policies: D1, D6, D6, D8

3

DESIGN STANDARDS GUIDANCE

C1 Shaping Good Places

London's new housing should help shape great places in the city. By creating places that people can identify with, these places will contribute towards enriching the fabric of the city.

Housing design is not about creating iconic buildings that are at odds with their context. Instead, new houses and apartment buildings should provide a lasting backdrop to our daily lives and be a pleasure for people to walk past every day through their character, the quality of materials used.

Housing makes up the majority of the city's built environment. With our new housing developments, we have an opportunity to create a beautiful and enduring legacy of homes that truly belong in London.

C1.1 Response to character and context

Key standards

C1.1.1 Development proposals should demonstrate:

How the design responds to its physical context. This includes the character of the area and the local pattern of building, public space, landscape and topography.

How the scheme relates to the identified character of the place and to the local vision and strategy. Or, how bolder change is justified in relation to a coherent set of ideas for the place as expressed in the local vision and strategy or agreed locally.

C1.12 Development proposals should demonstrate:

How the scheme complements the local network of public spaces, including how it integrates with existing streets, paths and ecological links.

That public spaces and pedestrian routes are designed to be overlooked and safe, and how blank elevations onto the public realm at ground floor have been avoided.

For larger developments, how any new public spaces, including streets and paths, are designed on the basis of an understanding of the

planned role and character of these spaces within the local movement network, and how new spaces relate to the local vision and strategy for the area.

Character context

The best developments are those designed with a clear understanding of their urban context, so that they value the characteristics of a place and its community. The urban context includes the quality of the environment, and careful consideration of issues such as flood risk, air quality and urban greening should inform the design process.

How our housing looks matters. Each building plays a part in the city and its architecture should contribute to its character. The most successful residential areas in London generally have a strong architectural character.

New developments sometimes struggle to make coherent places. Because of this, the Mayor encourages a design approach that carefully responds to the whole context of a development. This means building on an understanding of the place, the observation of existing assets, and the local authority's vision or spatial strategy for the area. Through the designer's choice of scale, material, massing and building type, development should acknowledge the existing character and urban grain of a place and build on the positive elements, while also considering the implications for energy efficiency and thermal comfort.

Where a spatial strategy is already in place, this should be respected, and architects should demonstrate how new development contributes to the vision and strategy for the area. Where no such guidance is in place, those who propose bolder change should undertake an inclusive process that allows for a coherent vision for the future of the area to be developed and realised

Well-connected and legible

Woven through the city is an intricate network of public spaces made up of streets, squares, paths, lanes, mews, gardens and parks. This is the framework of London, allowing people to get where they want to go and to enjoy spending time outdoors in the city.

The parts of the city that work well generally have a safe network of connected spaces and routes for pedestrians, cyclists and vehicles that are easy to understand and navigate. Each new development should connect into and extend the surrounding network and show an understanding of the existing hierarchy of these routes. Policies such as Healthy Streets (refer to London Plan Policy T2 and the Mayor's Transport Strategy) seek to rebalance existing hierarchies away from traffic-dominated streets towards spaces that are pedestrian and cyclist friendly.

Each new development should also connect existing green and biodiversity corridors to extend London's network of green infrastructure.

It is important to ensure that outdoor spaces are inviting and accessible, and that they engender a sense of ownership among the people who use them. There should also always be clear distinctions between spaces that are for public and private use.

The arrangement of uses and the architectural expression of a development significantly affect the character of streets and public spaces, and whether or not they become well-loved and well-used.

Placing entrances and windows on street frontages and around public spaces increases neighbourliness and security by passive surveillance. To those inside looking out, it also gives an important sense of belonging to the wider world. In contrast, when public spaces are flanked by extensive windowless elevations, exposed undercroft parking, refuse or poorly designed cycle stores, this is at best a missed opportunity, and at worst a catalyst for anti-social behaviour.

Relevant case studies

D3.2 Sheendale: an infill development that reflects the scale and character of surrounding development whilst providing a distinctly contemporary set of new homes.

D3.4 Caudale: a terrace of homes and a distinct bookend apartment block that together respond to the rhythm and façade composition of surrounding street buildings.

C1.2 Topography

Key standards

C1.2.1 Development proposals should take advantage of any level changes to optimise the full potential of the site. They should also achieve efficient internal and external access arrangements and optimise urban greening and sustainable drainage (see C6.2 and C6.3) whilst ensuring full compliance with inclusive design standards (see C2.2).

Getting the best out of the terrain

The topography of a site can present both opportunities and constraints to development. Ensuring inclusive access on steeply sloping sites can be challenging, and so careful consideration of movement networks, building entrances and approaches should be an early priority.

Sloping sites can also offer opportunities to increase exposure of homes to daylight and sunlight, manage solar gain and overheating, and improve

opportunities to use photovoltaic panels. The vertical staggering of homes on a sloping site can also provide long-range views out, and help address privacy issues between neighbours.

Level changes on sites can be exploited, with careful spatial design, to create homes with more generous floor-to-ceiling heights or multiple levels, while still ensuring that accessible housing is provided and the highest standards of access and inclusion are met throughout the site (London Plan Policies D5 and D7). Greater floor-to-ceiling heights can help optimise daylight, and/or create interesting spatial relationships between rooms.

Relevant case studies

D3.5 Two Family Houses: this infill scheme cleverly uses a stepped section to manage a change in levels whilst also providing level access.

C1.3 Land use mix

Key standards

- C1.3.1** Development proposals should demonstrate how the mix of uses meets strategic and local borough needs.
- C1.3.2** Residential proposals should be designed to avoid compromising the day-to-day functioning and long-term viability of adjacent non-residential uses, in accordance with the Agent of Change principle (London Plan Policy D13).
- C1.3.3** Development proposals that combine different uses should be designed to protect the quality of home life through careful consideration of noise mitigation, refuse collection, services, parking and access to homes and amenity spaces.

Encouraging mixed uses

All new development should contribute to creating stronger inclusive neighbourhoods and places with a good range of services and amenities. Residents should be able to get to public transport, shop for food, relax in a park or have access to food and beverage facilities within comfortable walking distance of their home. Inclusive neighbourhoods should be created in which people can live and work in a safe, healthy, supportive and inclusive environment. An inclusive neighbourhood approach will ensure that people are able to easily access services, facilities and amenities that are relevant to them and enable them to safely and easily move around by active travel modes through high quality, people-focused spaces, while enjoying barrier-free access to surrounding areas and the wider city. Inclusive design and the inclusive

neighbourhoods approach creates spaces and places that can facilitate social integration, enabling people to lead more interconnected lives.

The London Plan encourages residential mixed-use schemes across London, particularly in Opportunity Areas and town centres. Mixed-use schemes have many advantages, including strengthening local employment opportunities, increasing the vitality and safety of an area, reducing the need to travel, improving viability and enabling the inclusion of social infrastructure.

Proposals for larger residential developments should assess the need for community and ancillary services such as shops, local health and education facilities. The proximity and capacity of existing facilities will determine whether or not non-residential uses within development proposals are suitable.

Public and commercial uses at street level are therefore encouraged in appropriate locations where these uses are needed and would not negatively impact upon residential amenity. It is important that such ground floor units are designed and managed to ensure that they are fit for purpose. In this way, they have a good chance of being occupied and can deliver the intended benefits. Use of the GLA's 'Good Practice Checklist' in its Vacant Ground Floors in New Mixed-Use Development note should help ensure this.

Combining different uses can bring further design challenges. Noise mitigation, exposure to air pollution, deliveries, refuse collection, services, parking and access to homes and amenity space need to be carefully considered in the design in order to protect the quality of home life. Care should also be taken in the design of new residential development to avoid compromising the day-to-day functioning and long-term viability of adjacent non-residential uses.

The management of buildings with multiple landlords should inform the design from the earliest stages and long-term management responsibilities should be defined in a joint management plan prior to practical completion of the development.

Development that includes a mix of residential and non-residential uses should be designed to achieve a supportive complementary relationship between each use. The design of these uses should also consider how each use could protect the quality of residential amenity and the day-to-day function of non-residential uses as well as achieving an appropriate form of development that meets the requirements of the London Plan.

Mixed-use development in well-connected areas should be car-free (with the exception of disabled persons parking). Any car parking provision must not exceed the maximum levels permitted in the London Plan and should provide electric vehicle charging for residents. Any operational parking provision should be determined on a case-by-case basis.

Residential and social infrastructure

There are a number of good examples across London where housing has helped to facilitate the re-provision of libraries and leisure facilities in town centres, or sits above facilities such as new schools or health centres. This is a good way to optimise the development of a site and incorporate social infrastructure to help service new residents. Mixed-use buildings that include schools or other social infrastructure on lower floors should be designed to allow for the social infrastructure element to expand in the future. Some social infrastructure uses, such as schools and medical facilities, may be used by those most vulnerable to air pollution, and this should be considered when selecting their location within the development site.

Residential and cultural space

London Plan Policies HC5 and HC6 seek to support and nurture London's culture, creative industries and nightlife (e.g. cafés, bars, restaurants, museums, galleries, cinemas, theatres, music venues). These policies support a mix of uses, including housing, which derive mutual benefits from and do not compromise creative industries and cultural facilities. Particular care should be taken when considering the co-location of housing and night-time economy uses in terms of safeguarding amenity and not compromising the ongoing operation of existing or proposed non-residential uses.

Residential and business/industrial use

Housing and business use (Class B1) can be compatibly co-located and there are many good examples that include offices and light industrial space in a mixed-use building or side-by-side.

London Plan Policies E4 and E7 make clear that for designated employment land, intensification of industrial uses and co-location of housing should not result in a net loss of industrial floorspace capacity (defined against the existing industrial floorspace on a site, or a 65 per cent plot ratio, whichever is greater). The Mayor's Industrial Intensification and Co-Location Study: Design and Delivery Testing (We Made That et al, October 2018) provides guidance on the acceptability of industrial intensification and co-location with housing and tests the viability and deliverability of various scenarios. This gives helpful guidance on optimising the capacity of sites to provide both industrial intensification and additional housing. Such an approach provides opportunities to positively change the character of industrial areas that adjoin residential neighbourhoods and make a more efficient transition from industry to adjoining residential neighbourhoods.

In some cases, industrial and light industrial uses can entail pollutant emissions, including emissions such as volatile organic compounds that are harmful to health but not always common to combustion sources. Careful consideration should be given to the relationship between emissions points and residential, amenity and public outdoor space to ensure that that exposure is minimised.

Furthermore, the layout, orientation and internal arrangement should be designed from the outset to minimise the effects of noise or nuisance-generating activities. Physical interventions such as screening, sound proofing and other acoustic design measures should be considered as an additional means of mitigation, depending on the findings of environmental analysis.

Relevant case studies

D2.2 Hidden House: a new home built in a mixed-use complex.

D4.1 Foundry Mews: a compact infill development with residential accommodation above workspaces.

D5.3 Kirkfell: a block of stacked maisonettes and a community centre, community garden and new public square.

D5.6 Silchester Estate: a mixed-use scheme with housing and retail located on strategic street corners.

D7.1 Keybridge House: a high-rise dense scheme with housing and primary school.

D7.3 Porters Edge: a new housing development with retail, café and fitness space.

D7.4 Tiger Way: two residential apartment buildings on a plinth accommodating a new school.

C1.4 Open space

Key standards

- C1.4.1** Development proposals should demonstrate that they comply with the borough's open space strategies and policies. They should ensure that an analysis of surrounding open space is undertaken and that opportunities to address a deficiency in provision by providing new public open spaces, or creating links between networks of open space, are taken forward in the design process.
- C1.4.2** For developments where 10 or more children and young people are expected to live, development proposals should make appropriate play and informal recreation provision in accordance with London Plan Policy S4. The GLA Population Yield Calculator should be used to calculate the expected number of children and young people likely to live in the development. Children's play space should be designed to be stimulating and incorporate greenery, be overlooked to enable passive surveillance, be accessible to all tenures and be safely accessed from the street by children and young people independently.
- C1.4.3** Where communal open space is provided, development proposals should demonstrate that the space meets the qualitative design aspects identified in London Plan Policy D6 (Table 3.2).

Safe, accessible and well-designed

The provision of good quality communal space, play spaces and urban greening is essential to ensuring the success of optimised density. Such spaces are expected to work harder as the density of the proposed scheme increases. Good provision will help achieve a city accessible for all Londoners, including children and young people by increasing opportunities for young people to safely and easily move independently around the public realm.

Open spaces are essential for health and wellbeing as well as delivering environmental benefits. Making sure that new development safeguards, and where possible enhances biodiversity, tree cover and food growing opportunities, is also integral to optimising density. Developments should seek to maximise the provision of these features in accordance with relevant London Plan policies and guidance.

All open space, whether for private, communal or public use, should be designed to be safe, accessible and inclusive, avoiding features which could enhance the fear of crime. It should encourage an appropriate sense of ownership and be managed to ensure that it remains useful and inviting to all users from the outset to minimise ongoing management and maintenance costs (without compromising design quality and amenity). It should incorporate appropriate boundary treatments between private gardens and communal spaces. Open space should be designed to be child-friendly and encourage independent outdoor play and socialising of children and young people.

It is vital that development proposals consider the adequacy of open space provision and that the provision of open space provides other benefits of urban greening such as surface water management, air quality improvement and biodiversity conservation or enhancement.

Outside communal space

The most important factors to consider are provision of good levels of sunlight penetration, security, shelter from wind and other environmental factors, and access to good levels of passive surveillance.

London Plan Policy D6 (see extract from Table 3.2 below) sets out the Mayor's expectations with regard to the design quality of outside space:

Outside space

iv	Communal outside amenity spaces should: provide sufficient space to meet the requirements of the number of residents be designed to be easily accessed from all related dwellings be located to be appreciated from the inside be positioned to allow overlooking be designed to support an appropriate balance of informal social activity and play opportunities for various age groups meet the changing and diverse needs of different occupiers
v	Private amenity space for each dwelling should be usable and have a balance of openness and protection, appropriate for its outlook and orientation

As sites are optimised for development, it is critical that open space is designed with a clear purpose to ensure that land is effectively used and spaces are naturally activated rather than just overlooked. This can be achieved by designating specific uses to spaces such as play space or leisure use and by flanking its edges with active frontages such as building entrances to residential units, residential cores, internal communal areas, cycle stores etc.

Communal space should be provided where there is better air quality in order to reduce exposure to poor air quality. For larger developments and area plans, careful consideration should be given to the relationship between heavily-trafficked roads or other emission sources – such as energy centres and industry – and communal open spaces.

Outside play space

To create successful residential neighbourhoods that meet the needs of children and young people, development must be supported by suitable outside play space appropriate for the age group living in the area. Large sites should explore opportunities to incorporate facilities that serve a wider area and help integrate development with the surrounding neighbourhood.

Play space should be carefully integrated into a scheme and creative approaches developed for play equipment which is accessible and inclusive for a range of users- including people with a range of impairments. The public realm can be developed with activity trails and informal play and landscape for

interaction, which helps extend the opportunity for activity beyond allocated play spaces. There should not be separate play spaces for children living in different tenure housing and, other than in exceptional circumstances, children should be able to independently access spaces at all times.

Children are especially vulnerable to the health effects of poor air quality. Play spaces, especially for younger children, should therefore be located to minimise exposure to pollution.

Outside publicly accessible space

Developers should undertake a review of existing open spaces in the area and take account of borough open space strategies and standards where they exist. Planned, as well as existing, publicly accessible open space should be taken into account when considering the optimum density of a site or area. Ensuring sufficient, high-quality outdoor space that supports residents' health and wellbeing is key to optimising sites for development. Any new publicly accessible space therefore should be well planned to promote leisure and recreation. This can be achieved by ensuring it is well landscaped, has areas of play or trim trails, outdoor gym equipment and spaces to relax. Spaces should be located so that they benefit from direct sunlight for some of the day and have an attractive micro-climate.

Relevant case studies

D5.5 Redwood Park: a large new development with public space designed for the benefit of a new school.

D5.6 Silchester Estate: an estate regeneration scheme designed around a large communal garden.

D5.7 Trafalgar Place: a development with a pedestrian priority street at its heart and a generous new playground and park.

D7.3 Porters Edge: a development with a number of rooftop outdoor spaces which help maximise the amount of shared amenity.

C2 Designing for a Diverse City

This guide aims to ensure that new development accommodates the diversity of the city's population. It also encourages new development to consider not just the initial occupiers of a home, but possible future tenants and owners. One of the key challenges is to ensure that dwellings for smaller households will cater for people as they find partners, have children and grow older.

C2.1 Diversity of residential type and tenure

Key standards

- C2.1.1** Development proposals should demonstrate how the mix of dwelling sizes and the mix of tenures meet strategic and local borough targets, and how they are appropriate for their location in London.
- C2.1.2** Development proposals should demonstrate that housing of different types, tenures and access standards within a scheme have been fully integrated, and that the quality of architecture and materials is consistent across all tenures.

Variety of residential type

The London Plan seeks to ensure that residential developments provide an appropriate mix of housing types, sizes and tenures that can meet the full range of housing needs in neighbourhoods. It requires individual boroughs to specify, control and monitor the proportion and number of dwellings of each type provided in new developments.

Density decisions on new schemes should take account of the different housing needs of the households who will live in the completed scheme. While larger family housing is typically provided at relatively low densities, it is possible to successfully accommodate family homes within higher density schemes where these units are carefully located and designed. For example, ground-level family maisonettes, duplex apartments or terraced houses can be provided within schemes of much higher densities, with front doors at street level and private gardens. Play space can be accessed either through communal areas or public open space, with good overlooking from family units providing natural surveillance.

Where family units are provided on the upper floors, it is important to ensure appropriate private open space is provided with adequate outlook, orientation, and privacy. Social infrastructure, including childcare and primary schools, should be accessible and within a safe and convenient walking distance.

In addition, consideration should be given to the extent to which the provision of smaller accessible and adaptable units in higher-density, mixed-use development can encourage downsizing, helping to free-up under-occupied, larger properties for families in the existing housing stock.

Integration

Schemes should be designed to maximise the integration of different tenures and different access standards, whilst maximising choice for potential residents. In particular:

- Affordable homes should have the same external appearance as private market homes.
- In some higher-density schemes, separate provision of entrance and circulation spaces for different tenures may enable affordable housing provision which might otherwise be made unviable given high service charges and management arrangements
- Where separate entrances for different tenures are included, the size and legibility of all residential entrances should be designed such that equal weight is given to the quality and accessibility of residential entrance lobbies and their visual presence from the public realm
- Residents of all homes in a residential tower should have access to all communal amenity and play space that serves the building
- There should be equitable access to on-site cycle parking and any car parking spaces for different tenures based on the proportion of affordable homes within the scheme
- Developments such as gated communities that might compromise objectives to secure a more socially inclusive city should be resisted.
- Requirements for M4(3) wheelchair user dwellings apply to all tenures.
- M4(3) dwellings should be distributed throughout developments to provide a range of aspects, floor level locations, views and unit sizes, which respond to local need or are reflective of the overall housing choice within the development.

Relevant case studies

D3.4 Caudale: this small scheme delivers large family housing alongside apartments to meet different household structures and needs.

D5.2 Ely Court: an estate regeneration scheme with a wide mix of dwelling types to meet returning residents and local need.

C2.2 Accessible housing and inclusion

Key standards

- C2.2.1** Development proposals should demonstrate how they have been designed to meet the needs of a diverse population, including disabled people, older people and families with young children, in terms of wider site arrangements, adopting an inclusive design approach, and the provision of accessible housing, in the form of both accessible and adaptable housing and wheelchair user dwellings.
- C2.2.2** Development proposals should demonstrate how they have been designed to accommodate the travel needs of disabled residents, including through designing inclusive street environments and access to public transport networks, and the provision of disabled persons car parking.

Housing for diverse communities

This section considers broader inclusive design issues over and above diversity of residential type and tenure.

London is made up of numerous and diverse communities. Planning for Good Growth involves planning with these communities in mind, in order to make new connections and erode inequalities. The overall spatial qualities of development and communal areas must create places that everyone (including children and young people, older people, disabled people, people with young children and people with other protected characteristics), can use confidently, independently, and with choice and dignity.

To provide suitable housing and genuine choice for London's diverse population, inclusive design needs to be considered at the earliest possible stage during the preparation of local plans and guidance, as well as in a scheme's development (from initial concept through to completion and in the on-going management and maintenance of the development).

Wheelchair user dwellings should be dispersed across the development, providing choice in terms of location, aspect, floor level, views and unit sizes, and should as far as possible not look any different from adjacent homes. Wheelchair user dwellings should generally be provided for all tenures of housing to maximise choice for wheelchair users. However, wheelchair users disproportionately require affordable housing and so at least 10 per cent of affordable homes should comprise wheelchair user dwellings with a mix of dwelling types to cater for a broad range of household sizes, ages of residents and varying family needs.

Relevant case study

D3.4 Caudale: lateral apartments are designed with generous internal layouts to allow ease of movement and are wheelchair accessible with level access balconies.

C2.3 Sense of community

Key standards

- C2.3.1** Development proposals should include an appropriate range of housing types and tenures to provide opportunities for people, to remain within their community as their circumstances change.
- C2.3.2** Development proposals should demonstrate that meaningful engagement has taken place with existing communities from the early design stage to help define specific community needs and aid with any integration of new communities.

Promoting a sense of community

A sense of community and belonging is important to many people living in cities. Research suggests that a critical mass of long-term residents often contributes to a sense of community within a development. Therefore, development proposals should provide an appropriate range of housing types and tenures so that, cumulatively, they provide opportunities for people to remain within a community over a longer period of their lives.

Homes should be designed to be as flexible and easily adaptable as possible, so that changes in circumstances and lifestyle can be accommodated without residents having to move to a new home. In situations where existing residents want to upsize or downsize, if developments offer a broad range of dwelling types then they are more likely to be able to remain within the same community.

Developers and their architects should consider how they could help foster a stronger sense of community, increase social integration and address social isolation through good design. Studies show that a contributing factor to improved well-being of residents is the ability for an individual to have and manage opportunities to meet others. Streets, squares, shared gardens, lobbies and corridors should all be designed with this in mind and offer opportunities for informal conversation and interaction. This is achieved through ensuring a clear hierarchy of spaces between the public and private realms. This includes street facing entrances, generously-sized lobby spaces, areas to pause in corridor spaces, naturally lit cores, views out from corridors, seating areas and threshold spaces to units.

Developers and their design teams should ensure that buildings and spaces are designed to reinforce or enhance the identity, legibility, permeability and inclusivity of neighbourhoods, and that they are resilient and adaptable to changing community requirements.

Provision of communal spaces, where possible, that are of value to the existing or future community such as well-located open green spaces or community rooms that enable a variety of activities, can help to foster active participation in social life.

Meaningful consultation is crucial to understanding the needs of residents and the successful integration of new residents into existing communities. Proposals should demonstrate how local resident groups and other stakeholder groups have been engaged to influence design development.

Inclusive design creates spaces and places that can facilitate social integration, enabling people to lead more interconnected lives. Development proposals should help to create inclusive neighbourhoods that cumulatively form a network where people can live and work in a safe, healthy, supportive and inclusive environment. An inclusive neighbourhood approach will ensure that people are able to easily access services, facilities and amenities that are relevant to them and enable them to safely and easily move around by active travel modes through high quality, people-focused spaces, while enjoying barrier-free access to surrounding areas and the wider city.

C3 From Street to Front Door

The thresholds, front doors, common areas and circulation of a building can transform the perceived value of a home, help people feel proud of where they live, and encourage social interaction. A central aim of this guide is to promote common areas that are well designed, welcoming and accessible to all, and accompanied by management arrangements that are robust and viable in the long term.

The design of interior and exterior communal areas should create welcoming spaces with distinct spatial qualities that support their functional environments. They should be easy to maintain, encourage interaction and ensure the safety and security of residents.

A driving concern for the design of groups of dwellings is to ensure that shared areas outside and within buildings become places residents feel are intended for and can be used by them. Some recent developments have created spaces that are perceived as alienating and lack a sense of ownership, for example apartment buildings with long, enclosed, double-loaded corridors. These spaces risk creating institutional environments and do little to foster a permanent sense of home. Layouts should be pursued that achieve a people-centred environment, for example through provision of generously-sized lobbies, areas to pause in corridors, external deck spaces, and naturally-lit and ventilated stair and lift cores.

C3.1 Access and servicing

Key standards

- C3.1.1** Development proposals should ensure that all main entrances to houses, ground floor flats and communal entrance lobbies are visible from the public realm and clearly identified.
- C3.1.2** Development proposals should ensure that the number of dwellings accessed from a single core does not exceed eight per floor. Deviation (by exception) from this requirement will need to be justified and mitigated by maximising corridor widths (beyond 1500mm) and introducing natural ventilation/daylight to corridors.
- C3.1.3** Development proposals should ensure that communal refuse, recycling and food waste containers, communal bin enclosures and refuse stores are easily accessible to and usable by all residents including children and disabled people, and located on a hard, level surface. The location must satisfy local requirements for waste collection and, if within buildings, should be positioned to limit the nuisance caused by noise and smells and provided with means for cleaning.

Entrance and threshold

The design of the threshold between the public realm of the street and the private realm of the home affects people's sense of security and ownership. Entrances should feel welcoming, offer shelter and be celebrated. It is especially important that individual homes in blocks of flats are given front doors that are clearly recognisable as such, and that the main entrances are of high quality. They should be situated on principal access routes or attractive, landscaped spaces. Design must avoid discriminating between tenures and where separate tenure entrances are justified they must be designed to give equal status.

For safety, entrances should be well-lit and overlooked by the dwelling or by neighbouring properties. Entrances to communal cores or individual dwellings should be visible from the public realm, clearly identified and easy to find, with a direct line of approach from the street. The approach to all entrances, should be level or gently sloping. All main entrances should be illuminated and have level access over the threshold.

Access and circulation

Vehicular and pedestrian access and circulation should be designed to be as safe and efficient as possible (see also London Plan fire safety guidance). Arrangements should take account of and integrate with the existing and proposed movement network in surrounding streets to improve permeability and legibility.

Within residential blocks, the number of dwellings served by a single core needs careful consideration as it affects both security and people's sense of community and ownership. Both the number of people and the number of dwellings sharing each access core will affect how intensively the space will be used. Twenty-five dwellings per core is generally considered to be the maximum. However, a core with 25 one-bedroom flats (which will be occupied by up to 50 adults) will be of less concern than a core with 15, three-bedroom flats (with a maximum occupancy of 75 people, including almost 50 children).

The mix of dwelling sizes and the number of dwellings in each core should therefore be carefully controlled. Tenure also affects the intensity of use because affordable rented dwellings are the most likely to be fully occupied.

In terms of the number of homes per floor, groups of two to eight dwellings are usually desirable. In these smaller groups, residents tend to enjoy a greater sense of privacy, security and ownership, and may be more likely to take an active interest in the upkeep of shared spaces. External circulation spaces shared by a limited number of people can also become places where residents can connect and socialise with neighbours.

Refuse and recycling

The London Plan requires suitable and easily accessible storage facilities for recycling, including food waste recycling, and general waste in all new developments.

Waste and recycling is a rapidly changing field and there are significant variations in local authority policy and recycling service provision. Therefore, architects must consult early with local waste management officers about waste and recycling in relation to: internal (in-home) storage capacity, location of external facilities, provision of adequate capacity for waste and recycling, provision of good quality communications/signage, collection methods and collection frequency. Flexibility should be built in to anticipate the ever-increasing levels of recycling needed to reach London Plan and London Environment Strategy recycling targets, including 65 per cent municipal waste recycling by 2030.

The management of waste and recycling in flatted developments poses particular challenges. Provision needs to be factored into the design of individual dwellings and buildings at an early stage to ensure adequate, accessible and convenient waste and recycling storage and collection facilities as well as the maintenance of these services for the life of the building.

Most boroughs already collect food waste (cooked food and table scraps) and organic waste for composting (grass clippings and raw fruit and vegetable peelings). Composting organic waste on site is another important and often overlooked method of reducing waste that brings positive benefits to residents.

A central composting point is encouraged in all new developments, with an appropriate management plan which sets out who will manage this. Any composting area should be separate from the refuse and recycling storage area.

Storage facilities for waste and recycling containers should be provided in accordance with local authority requirements and London Waste and Recycling Board guidance, including guidance and templates for flatted properties¹.

The London Waste and Recycling Board has developed waste planning and strategy templates including service standards for flats (Flats Recycling Package)². that should be applied for all new flatted developments (summarised below). Applying these templates and standards will maximise recycling in flats, and address barriers that can cause low recycling rates.

Both these documents can be found at https://www.london.gov.uk/sites/default/files/waste_management_in_high_density_development_spd_final.pdf and <https://resourcelondon.org/>.

1. Templates and guidance can be found here: <https://www.lwarb.gov.uk/what-we-do/resource-london/successes-to-date/efficiencies-programme-outputs/>

2. Further information about this can be found here: <https://resourcelondon.org/resources/research-and-innovation/making-recycling-work-for-people-in-flats/>

Minimum Flats service standards description	Outcomes
<ol style="list-style-type: none"> 1. Clean and well-maintained bins and bin areas 2. Appropriate recycling aperture to fit carrier bag of recycling 3. Provision of reverse lidded bins to prevent signage damage and contamination 4. Good quality, clear signage on and above bins 5. Collection of a full range of dry recyclables (six key materials) 6. Sufficient collections to prevent overflows and minimum standard of recycling capacity (60ltr/hh/wk) 7. Recycling bins in prominent places 8. Yearly recycling leaflet 9. Recycling information in key locations (i.e. noticeboards) 10. Bulky waste information 	<ol style="list-style-type: none"> 1. Residents think recycling feels easier 2. Residents are more motivated to recycle and have a positive experience when they recycle 3. Residents have a better knowledge of what can and cannot be recycled

Servicing

The day-to-day servicing of the proposed development should be considered at the outset, including for the ongoing management of any central composting and reuse points. This should include full consideration of the delivery of post and parcels and waste and recycling management (see D6.1 Environmental sustainability). Where possible, facilities that minimise additional freight trips from missed deliveries should be provided. These could include large letter/parcel boxes or communal facilities and services (such as concierges that accept deliveries).

Relevant case studies

D3.2 Sheendale: a terrace of homes with carefully integrated refuse stores as part of the boundary treatment.

D4.2 Dujardin Mews: refuse stores are designed to form defensible space to the street and mediate between the buildings and the garden fence.

D5.1 Bourne Estate: an urban infill housing scheme where entrances are emphasised by means of generous arches.

D5.4 Darbshire Place: an apartment block where the refuse store is arranged for direct street access and separated from residents' entrance on a quiet courtyard side.

D5.6 Silchester Estate: an estate regeneration scheme where buildings activate the street including a new mews alongside railway arches.

C3.2 Safety and security

Key standards

C3.2.1 Development proposals should demonstrate that they are safe and secure, and that they design out opportunities for crime and anti-social behaviour.

C3.2.2 Development proposals should demonstrate that they achieve the highest standards of fire safety, identify unobstructed outside space for fire appliances which is also appropriate for use as an evacuation assembly point, and provide suitable and convenient means of escape and an associated evacuation strategy for all building users.

Planning for density

As neighbourhoods increase in density, issues of safety and security are a greater concern for residents and can become a major factor in people's quality of life. Safety and security should be foremost in the minds of architects when planning layout and orientation of development. Areas of priority include:

- Separate footpaths and cycle paths should generally be located next to trafficked streets
- Streets, footpaths, cycle paths, communal and public open spaces should be overlooked from nearby housing, thus providing natural surveillance and the perception of 'eyes on the street'
- Non-residential uses that incorporate entrances and/or shopfronts should front on to streets where housing at ground floor is not appropriate for noise, air quality or other reasons
- Gated forms of development are unacceptable, and alternative means of security should be achieved through using good design principles

Fire safety

Ensuring suitable access and equipment for firefighting, means of escape and evacuation, and assembly points should be integral to considering the layout and orientation of development, and as such will impact on the capacity of sites and areas.

Emergency means of escape should be designed to incorporate safe and dignified emergency evacuation for all building users. In all developments where lifts are installed, as a minimum, at least one lift per core (or more subject to capacity assessments) should be suitably sized fire evacuation lift to evacuate people who require level access from the building in the event of a fire. *Please see the London Plan fire safety guidance for more information*

Relevant case studies

D4.2 Dujardin Mews: a compact shallow terrace means the majority of rooms overlook the street thereby maximising passive surveillance.

D5.1 Bourne Estate: an infill development designed with clear routes through the estate and well-overlooked public realm and circulation areas.

C3.3 Cycle parking

Key standards

- C3.3.1** Residential development should provide dedicated long-stay parking space for cycles in accordance with the London Plan and guidance in the London Cycling Design Standards:
- One long-stay space per studio or one bedroom (one-person) dwelling
 - One and a half long-stay spaces per one bedroom (two-person) dwelling
 - Two long-stay spaces per two or more bedroom dwelling.
- In addition, for developments of between 5 and 40 dwellings at least two short-stay cycle parking spaces should also be provided, with at least one additional space per 40 dwellings thereafter.
- C3.3.2** In line with the London Cycling Design Standards, cycle parking should be conveniently located, secure and accessible to all. Communal cycle stores should have an appropriate mix of stand types and adequate spacing and facilities for larger cycles to be accessible for all. In some instances, it may be appropriate for cycle parking to be provided within individual homes, but it should be fully accessible and provided in addition to minimum space requirements and not in habitable rooms or on balconies.

Designing to encourage cycling

Cycle parking should take full account of London Plan Policy T5 and the London Cycling Design Standards (LCDS) and be integrated into proposals in ways that enable residents and visitors of a development to access it by bicycle. As such, cycle parking should generally be prioritised over car parking space in terms of

delivering overall quantity requirements and in terms of convenience of location for residents.

Cycle parking should be fit-for-purpose. In communal cycle stores, this includes having an efficient but adequate spacing between stands, with an appropriate mix of stand types as some are not accessible to everyone e.g. two-tier stands. Enlarged spaces with tubular stands should be provided for larger cycles, such as adapted cycles for disabled people, and stores should have step-free access.

Cycle parking should also be designed to be secure and well-located. This can include placing parking where people feel safe e.g. visible, well-overlooked and well-lit areas. Internal long-stay cycle parking areas should have access for residents only, and stands should be covered and allow both the frame and at least one wheel to be secured. Cycle parking should be close to the entrance and access should avoid obstacles such as stairs, multiple doors, narrow doorways and tight corners. For large developments, it can be beneficial to sub-divide communal bicycle storerooms to reduce access distances and improve security.

In some cases, such as single-dwelling building typologies, it may be appropriate to provide cycle parking within the dwelling. In these cases, the space must be provided in addition to the minimum GIA, storage and circulation space requirements. Parking should be located at entrance level, within, or adjacent to the circulation area. Cycle storage identified in habitable rooms, or on balconies, will not be considered acceptable.

Developments should also provide cycle parking provision for visitors in line with the London Plan requirements - secure hoops or stands are usually the most convenient for short stay use. External cycle parking should allow for both wheels to be lockable to the stand. Cycle stands should be in convenient, well-overlooked locations, avoiding obstructing main pedestrian desire lines.

Relevant case studies

D4.2 Dujardin Mews: terrace houses and apartments with cycle storage designed as part of the entrance arrangement.

D4.3 Signal Townhouses: a terrace of houses with large built in cycle stores designed to form party fences between properties.

C3.4 Car parking

Key standards

C3.4.1 All developments should conform to London Plan maximum residential parking standards as set out in T6.1 Table 10.3.

Location	Maximum parking provision
Central Activities Zone Inner London Opportunity Areas Metropolitan and Major town centres All areas of PTAL 5 - 6 Inner London PTAL 4	Car free
Inner London PTAL 3	Up to 0.25 spaces per unit
Inner London PTAL 2 Outer London PTAL 4 Outer London Opportunity Areas	Up to 0.5 spaces per unit
Inner London PTAL 0-1 Outer London PTAL 3	Up to 0.75 spaces per unit
Outer London PTAL 2	Up to 1 space per unit
Outer London PTAL 0-1	Up to 1.5 spaces per unit ¹
Central Activities Zone Inner London Opportunity Areas Metropolitan and Major town centres All areas of PTAL 5 - 6 Inner London PTAL 4	Car free

C3.4.2 Careful consideration should be given to the location and organisation of car parking within an overall development design so that car parking does not create barriers to walking, cycling and public transport use or negatively affect the use and appearance of open spaces. More information is provided in TfL's Parking Design and Management Plan guidance.

Designing to minimise the impact of car parking

Car parking provision should be designed to minimise the dominance of vehicles and the barriers to walking and cycling this creates. In particular, cars should not dominate the urban realm, create dangerous streets or increase severance. Instead, the first things people should see when arriving at a new development should be clear footpaths, cycle facilities and routes to public

transport connections. Car parking should be carefully integrated with the design of landscape and buildings to help form an attractive, accessible and inclusive public realm, with the needs of people on foot and cycle prioritised. Further guidance on car parking design is provided in TfL's Parking Design and Management Plan guidance.

Given the considerable land requirements of car parking, great attention should be paid to the location and organisation of any on-site car parking in the initial design stage of a project. This should reflect the relationship between housing density, building type and parking ratio so that amenity space can be preserved and so that the public realm, including streets, is not dominated by parked cars.

Higher levels of parking can prevent the optimal density of a site from being achieved and reduce housing delivery. Total provision should therefore be considered within the constraints of what can be designed to perform well within the site boundaries (with provision no greater than the London Plan maximums). Low levels of on-site car parking provision can be successfully implemented without creating parking stress through the use of Controlled Parking Zones (potentially funded through Section 106 contributions) combined with either an overall cap on permits issued or restricting access to permits for residents of new development.

Choosing how to accommodate parking – such as on-street, or in a parking court, podium or underground car park – is a key decision that can have a major impact on the appearance and amenity of a development. Different solutions have different advantages and disadvantages and may not be appropriate in all contexts, and in some instances a combination may help reduce any one location becoming too vehicle dominated. The location of parking and its access can also impact on the levels and location of pollution on and around the site, which should be reduced where possible (such as through the location of ventilation shafts for basement parking).

To promote a switch to the use of electric cars and other ultra low-emission vehicles, electric charge points must be included in line with the parking policies of the London Plan: 20 per cent active provision and 80 per cent passive provision. The parking management plan and/or leasing arrangements should indicate how passive provision would be made active in response to demand.

Relevant case studies

Please see TfL's Parking Design and Management Plan Guidance for relevant case studies of car parking design within residential developments.

C4 Dwelling Space Standards

No amount of sensitive design can compensate for houses and flats that are too small. The minimum space standards at the heart of this guidance will improve residents' quality of life and ensure that our homes are able to accommodate changing personal needs and growing families.

Extra space will enable homes to be more than places to eat and sleep, encouraging sociable rooms within homes and giving individual family members private space when they need it.

This section sets out essential minimum standards for the gross internal floor area (GIA) and private outdoor space of general needs housing and provides guidance on the size and layout of rooms and storage areas. These standards aim to make more generous housing that can allow people to live a full life in the city.

C4.1 Private internal space

Key standards

- C4.1.1** All housing developments should meet the minimum floor space standards set out in Table 3.1 of the London Plan below
- C4.1.2** A one bedspace, single bedroom must have a floor area of at least 7.5 sqm and be at least 2.15m wide.
A two bedspace, double (or twin) bedroom must have a floor area of at least 11.5 sqm.
- C4.1.3** Wheelchair user dwellings should meet the design requirements set out in Approved Document M volume 1, M4(3) (see C2 Designing for a Diverse City).
- C4.1.4** Dwelling plans should demonstrate that dwelling types provide flexibility by allowing for an alternative seating arrangement in living rooms and by accommodating double or twin beds in at least one double bedroom.

Floor space standards

In our homes people need sociable rooms in which they can gather with friends and family, and private spaces in which they can enjoy being alone. Play, work and study are as much a part of daily life as cooking, eating and sleeping, while storage and circulation areas support and provide essential buffers between these varied activities.

The area-based space standards for flats and multi-storey dwellings are set out below and apply to self-contained new dwellings of all tenures including build to rent. This covers new build, conversions and change of use.

Number of bedrooms (b)	Number of bed spaces (persons (p))	Minimum gross internal floor areas and storage (sqm)			
		1 storey dwellings	2 storey dwellings	3 storey dwellings	Built in storage
1b	1p	39 (37)*			1
	2p	50	2b	2b	1.5
2b	3p	61	1b	1b	2
	4p	70	1b	1b	
3b	4p	74	1b	1b	2.5
	5p	86	1b	1b	
	6p	95	1b	1b	
4b	5p	90	1b	1b	3
	6p	99	1b	1b	
	7p	108	1b	1b	
	8p	117	1b	1b	
5b	6p	103	1b	1b	3.5
	7p	112	1b	1b	
	8p	121	1b	1b	
6b	7p	116	123	129	4
	8p	125	132	138	

*Where a studio / one-bedroom one-person one-bedspace (i.e. one single bedroom) dwelling has a shower room instead of a bathroom, the floor area may be reduced from 39 sqm to 37 sqm, as shown bracketed.

The GIA of a dwelling is defined as the total floor space measured between the internal faces of perimeter walls that enclose a dwelling. This includes partitions, structural elements, cupboards, ducts, flights of stairs and voids above stairs. GIA should be measured and denoted in square metres

(sqm). Built-in storage areas are included within the overall GIA and include an allowance of 0.5 sqm for fixed services or equipment such as a hot water cylinder, boiler or heat exchanger.

It is important to remember that these minimum space standards should not be taken as maximum areas. In order to achieve certain design configurations or work within site constraints, architects and developers may need to make early allowance to exceed the minimum GIA – and this is encouraged. However, the Mayor will, and boroughs should, resist dwellings with floor areas significantly above the minimum standards (unless they are M4(3) wheelchair user dwellings) due to the imperative to make efficient use of land to meet housing need in London.

Additional rooms, including utility rooms, studies and en-suite bathrooms, are encouraged. But these will require additional floor area above the minimum GIA to avoid compromising the space and functionality of other parts of the home.

Further space requirements for wheelchair user dwellings are set out in Approved Document M volume 1 M4(3).

Other internal space standards

- Dwellings with two or more bedspaces must have at least one double (or twin) bedroom that is at least 2.75m wide. Every other additional double (or twin) bedroom must be at least 2.55m wide
- A one bedspace, single bedroom must have a floor area of at least 7.5 sqm and be at least 2.15m wide.
- A two bedspace, double (or twin) bedroom must have a floor area of at least 11.5 sqm
- Any area with a headroom of less than 1.5m is not counted within the GIA unless used solely for storage (if the area under the stairs is to be used for storage, assume a general floor area of 1 sqm within the GIA)
- Any other area that is used solely for storage and has a headroom of 0.9-1.5m (such as under eaves) can only be counted as up to 50 per cent of its floor area, and any area lower than 0.9m is not counted at all
- A built-in wardrobe counts towards the GIA and bedroom floor area requirements, but should not reduce the effective width of the room below the minimum widths set out above. Any built-in area in excess of 0.72 sqm in a double bedroom and 0.36 sqm in a single bedroom counts towards the built-in storage requirement
- The minimum floor-to-ceiling height must be 2.5m for at least 75 per cent of the GIA of each dwelling (see D4.3 Spatial quality below). Where site constraints compromise the quality of daylight into the home, more generous floor-to-ceiling heights with increased window sizes should be considered to improve daylight levels
- Sufficient space should be designed to accommodate recycling and waste storage to meet the local waste collection strategy.

Designing rooms and internal spaces

How a dwelling is planned will influence how successful it is for its residents, as much as the size allowed for individual rooms or the overall dwelling. Approved Document M volume 1 of the Building Regulations includes a furniture schedule

(Appendix D) identifying furniture typically required for different household structures and occupancy numbers. This guidance recommends that developers prepare dwelling plans that illustrate the furniture in the schedule, in order to demonstrate that dwelling layouts are effective and achieve good spatial design.

Living rooms

Designers should create layouts that cater for different preferences and lifestyles. An open-plan layout of living, dining and kitchen spaces is often considered to be the market preference, but there are times when it is preferable to achieve a degree of separation, at least between the living space and the work area of the kitchen.

Homes for larger families should cater for activities involving any number of members of the family, with or without guests. Dwellings with three or more bedrooms should have two social spaces, for example a living room and a kitchen-dining room, both with external windows.

Where housing is being designed to suit specific cultural requirements, designers might (depending on said cultural requirements) find a preference for the kitchen to be separated from the living and dining spaces. Different methods of cooking may require larger kitchens with additional ventilation or features.

Narrow living rooms are not usually useful, enjoyable or flexible. To allow sufficient space for circulation around furniture, and allow people to sit or play as a group, it is recommended that the width of the principal sitting space is at least 3.2m for dwellings with four or more occupants, and at least 2.8m in dwellings for those with fewer than four occupants.

Bedrooms

Bedrooms should be planned to allow flexibility of use. People often use bedrooms for work and study, or to relax away from the social spaces of the home. Children and young people need space in bedrooms for homework, play and hobbies, storing their belongings, entertaining friends, and spending time alone. The minimum floor areas required for bedrooms, of 7.5 sqm for a single bedroom and 11.5 sqm for a double bedroom, allow for bed, wardrobe and additional furniture such as a console or desk, and thus plans should demonstrate this possibility.

Storage

The lack of storage is a major problem in new homes. Everyday household items including cleaning equipment need to be readily accessible. Other belongings only in seasonal or occasional use (such as suitcases or decorating equipment, for example) and items such as baby equipment may need to be stored away for some time. Without adequate storage space, people's belongings will take space away from the rooms of the home and limit their enjoyment of them.

The requirements are for dedicated built-in storage cupboards of 1 sqm for one-person dwellings and 0.5 sqm for each additional occupant. Built-in storage areas are included within the overall GIAs and include an allowance of 0.5 sqm for fixed services or equipment such as a hot water cylinder, boiler or heat exchanger.

Developers are encouraged to provide additional secure storage cupboards for individual dwellings at ground or basement level in flatted developments, and external storage for outdoor equipment in dwellings with gardens.

A dedicated utility room with space and services for a boiler, washing machine (and preferably heating and ventilation for drying clothes) will always be desirable in any size of home. In family dwellings designed for five or more people, providing such a utility room is recommended.

Accessible housing standards

Many households in London require accessible or adapted housing to lead dignified and independent lives. In addition, Londoners are living longer and with the incidence of disability increasing with age, older people should have the choice of remaining in their own homes rather than moving due to inaccessible accommodation. To address these and future needs, London Plan Policy D7 Accessible housing should apply to all dwellings which are created via works to which Part M volume 1 of the Building Regulations applies.

Policy D7 Accessible housing states:

To provide suitable housing and genuine choice for London's diverse population, including disabled people, older people and families with young children, residential development must ensure that:

1. at least 10 per cent of dwellings (which are created via works to which Part M volume 1 of the Building Regulations applies) meet Building Regulation requirement M4(3) 'wheelchair user dwellings'
2. all other dwellings (which are created via works to which Part M volume 1 of the Building Regulations applies) meet Building Regulation requirement M4(2) 'accessible and adaptable dwellings'.

Where any part of an approach route – including the vertical circulation in the common parts of a block of flats – is shared between dwellings of different categories (i.e. M4(2) and M4(3)), the design provisions of the highest numbered category of dwelling served should be applied, to ensure that people can visit their neighbours with ease and are not limited by the design of communal areas.

To ensure that all potential residents have choice within a development, the requirement for M4(3) wheelchair user dwellings applies to all tenures. Wheelchair user dwellings should be distributed throughout a development to provide a range of aspects, floor level locations, views and unit sizes. London Plan Policy D5 requires fire evacuation lifts to be provided to support this approach.

Standard M4(3) wheelchair user dwellings distinguishes between 'wheelchair accessible' (a home readily usable by a wheelchair user at the point of completion) and 'wheelchair adaptable' (a home that can be easily adapted to meet the needs of a wheelchair user). Planning Practice Guidance states that Local Plan policies for wheelchair accessible homes should only be applied to those dwellings where the local authority is responsible for allocating or nominating a person to live in that dwelling, otherwise M4(3) dwellings should be wheelchair adaptable.

This guidance does not repeat the Approved Document. Working with these standards, designers should be specifically mindful of the need to design circulation efficiently, and plan dwelling layouts to achieve a sensible balance between space allowed for circulation, such as corridors, and space allocated for habitable rooms.

M4(2) and M4(3) dwellings should be secured via planning condition to allow the Building Control body to check compliance of a development against the optional Building Regulations standards. Planning conditions should specify:

- Number of dwellings per size typology (i.e. x no. of y bed units) which must comply with Part M4(2)
- Number of dwellings per size typology (i.e. x no. of y bed units) which must comply with Part M4(3)(2)(a) wheelchair adaptable standards
- Number of dwellings per size typology (i.e. x no. of y bed units) which must comply with Part M4(3)(2)(b) wheelchair accessible standards

Flexibility

People do not always want, nor are they always able, to move home as their circumstances change. Every home should be flexible enough to accommodate a range of possible changes in circumstances. This flexibility is the basis of the longevity of the best parts of our city.

Flexibility is the potential for rooms in a home to be used in a variety of ways without altering the building fabric. In practice, this means making individual rooms large enough to accommodate different types and arrangements of furniture, carefully considering the location of doors, windows and built-in furniture, and building in the potential for spaces to be linked or separated without moving walls or changing the position of openings.

At planning application stage, architects are encouraged to indicate in Design and Access Statements how dwelling types facilitate flexible use. Showing that alternative arrangements of furniture can be accommodated in living spaces, or that double bedrooms can accommodate double or twin beds, can achieve this.

Homes in which living, dining and kitchen functions are combined in a single space can make it difficult for family members to pursue different activities at the same time without disturbing each other. Even very large rooms will not be flexible when there is an insufficient area of external wall with windows to allow for sub-division.

Relevant case study

D7.2 Lock Keepers: an apartment block with a non-residential ground floor designed to allow a flexibility of use.

C4.2 Private outside space

Key standards

- C4.2.1** A minimum of 5 sqm of private outside space should be provided for one-to-two person dwellings and an extra 1 sqm should be provided for each additional occupant.
- C4.2.2** The minimum depth and width of all balconies and other private external spaces is 1500mm.

Privacy and amenity

Private outside space is desirable in all circumstances. This guide requires that all dwellings should be provided with adequate private outside space in the form of a garden, terrace, balcony or glazed winter garden. This applies to all forms of tenure from market sale to affordable rent and includes Build to Rent properties, and intermediate forms of ownership.

Private outside space standards have been established in the same way as internal space standards, by considering the space required for furniture, access and activities and the number of occupants. A minimum of 5 sqm of private outdoor space is required for all two-person dwellings and an extra 1 sqm should be provided for each additional occupant. The required minimum width and minimum depth for all balconies and other private external spaces is 1.5m. The minimum depth and width apply to all the minimum area i.e. only the area that has at least a 1.5m depth and width will be calculated in the minimum balcony area (sqm), thus triangular and irregular shaped balconies will likely need to be larger than the minimum area to achieve this standard. These minimum areas and dimensions provide sufficient space for either a meal around a small table, clothes drying, or for a family to sit outside with visitors. Plans should demonstrate this capability.

Enclosing balconies as glazed, ventilated winter gardens is an option in some circumstances, including where dwellings will be exposed to high levels of noise and/or strong wind, particularly at high level. Winter gardens should be thermally separated from the interior, and the floor should be 'drainable' to avoid standing water.

In very exceptional circumstances, where site conditions make it impossible to provide private outside space for all dwellings, a proportion of dwellings in a development may instead be provided with additional internal living space

equivalent to the private open space requirement, added to the minimum GIA and the minimum combined living area of the dwelling. Justification will need to be made as to why external private outside space cannot be provided.

Private amenity space for each dwelling should be usable, and have a balance of openness and protection appropriate for its outlook and orientation. Private outside space should not be located where it will be exposed to high levels of noise or air pollution.

Balconies should be designed to provide some shelter and privacy from neighbouring properties. This can be achieved using screens or by setting the balcony back within the façade, while being mindful of achieving acceptable levels of daylight and sunlight penetration to the dwelling. Balconies should have solid floors draining to a downpipe. Where balconies overlook noise sources, solid parapets and absorbent soffit materials should be considered for their acoustic benefits. As with communal and public open spaces, exposure to air pollution should be minimised when deciding where to locate gardens and balconies.

For small developments on existing private garden or other outdoor amenity space to be acceptable, both the original and proposed homes must meet the minimum standards in London Plan Policy D6.

Relevant case studies

D2.2 Hidden House: a clever, compact home with an outdoor sunken courtyard. This provides amenity and brings light into the plan.

D3.3 Caudale: a scheme comprising houses and apartments with large recessed balconies and roof terraces.

D3.5 Barretts Grove: a street infill development with deep balconies designed to optimise use and light.

D5.3 Kirkfell: a block of stacked maisonettes with full width balconies at each level giving access to each room.

D6.2 Brentford Lock West Phase 2: a complex of apartment buildings with full width loggia and corner balconies.

C4.3 Spatial quality

Key standards

C4.3.1 Development proposals should create well-considered layout arrangements within dwellings that improve the lived experience through generosity of floor-to-ceiling heights, and spatial arrangements that optimise quality of outlook and aspect.

C4.3.2 The minimum floor-to-ceiling height in habitable rooms is 2.5m between finished floor level and finished ceiling level.

Floor-to-ceiling heights

Developers and architects should consider the relationship between indoor and outside spaces and the volume (as well as the area) of the homes they are designing. They should consider how the three-dimensional arrangement of homes, and the quality of space and interaction with outside spaces, can affect the quality of life of residents.

The height of rooms in a dwelling dramatically affects the perception of space in a home. A small increase in ceiling height can make the difference between a home feeling cramped or spacious. When matched with generous window sizes, higher ceilings also improve natural light levels and ventilation, and the depth to which light penetrates a room.

In ground floor dwellings where daylight may be limited, higher ceilings can provide better light levels and a better urban scale to the base of larger buildings. They can also give the potential for homes to be used more flexibly and can make ground floor dwellings more suitable for conversion to non-residential uses.

Generous ceiling heights ensure good provision of daylight penetration, ventilation and cooling, and a sense of space. To allow for some essential equipment in the ceilings of kitchens and bathrooms, up to 25 per cent of the gross internal area of the dwelling can be lower than 2.5m. However, any reduction in ceiling height below 2.5m should be the minimum necessary for this equipment and should not cause an obstruction.

Higher ceiling heights are encouraged, particularly for ground floor dwellings, and a ceiling height of 2.6m in habitable rooms is desirable. Additional height can help improve daylight and sunlight penetration into the home where there are site constraints, or building adjacencies, that compromise light levels.

Natural light and internal views

In addition to windows providing aspect outwards, dwellings should consider the sequence of rooms within the home and the visual connections between them. Where possible, dwellings should have a clear view from the front door through to the outside.

In multi-storey dwellings, visual connections between storeys and opportunities for double height spaces are encouraged. Roof lights in strategic places, such as over staircases, can bring daylight deep into the plan, changing the perception of a space and providing views of the sky or trees.

All of the above should be designed with the impact on energy efficiency and thermal comfort in mind.

Relevant case studies

D2.3 Adolphus Road: an infill house that achieves good spatial qualities on a compact site with cleverly designed windows, which help connect floors.

D3.5 Two Family Houses: a pair of townhouses with a well designed split-level arrangement that delivers spatial generosity.

D5.3 Kirkfell: a block of stacked maisonettes with a stepped section giving spacious 3.2m high living rooms at first floor.

D6.1 Finsbury Park Villas: generously-designed apartments in villa block configuration.

C5 Home as a Place of Retreat

Surrounded by the noise and activity of daily life in London, it can be difficult to make homes that offer people a place to withdraw and retreat from the city. Even in the suburbs, traffic noise and adjacent uses can be hostile to the quiet repose we want within our homes. The Mayor is determined to encourage the kind of housing that provides comfortable and enjoyable places of retreat and privacy.

To address this, the guidance in this section proposes standards around privacy, aspect, daylighting/sunlighting and overshadowing, indoor air quality, noise and thermal comfort. All of these factors need to be considered individually, but also as part of developing a holistic design. Often during the planning and design stages of a scheme, each factor is considered in relation to compliance with minimum standards in isolation from the other factors (and by several different designers and consultants). This can lead to decisions being made in relation to one factor that will adversely affect another or cause the other to not comply. A lack of overview means this discrepancy is often carried through into the planning application process and construction stage.

C5.1 Privacy

Key standards

- C5.1.1** Design proposals should demonstrate how habitable rooms within each dwelling are provided with an adequate level of visual and acoustic privacy in relation to neighbouring property, the street and other public spaces.
- C5.1.2** The layout of adjacent dwellings and the location of lifts and circulation spaces should seek to limit the transmission of noise to sound-sensitive rooms within dwellings.

Visual privacy and overlooking

Homes in the city should provide the opportunity to look out on and enjoy surrounding public and shared open spaces. At the same time, the home should be a comfortable, private setting for family and individual pursuits, social interaction and relaxation. A balance needs to be struck between how we design to enable a sense of community (D2.3) and offer people sufficient privacy. Dwellings that overlook the street can give a sense of security and allow neighbourly interaction, though defensible space can be integrated to provide a degree of control over the relationship between private and public space.

In the past, planning guidance for privacy has been concerned with achieving visual separation between dwellings by setting minimum distances between back-to-back homes (typically 18-21m). However, this is a crude measure, and adhering rigidly to these distances can limit the variety of urban spaces and housing types in the city, and unnecessarily lowers density. Good Quality Homes For All Londoners – Foreword adopts daylight factors to determine offset distances between buildings rather than a standard distance. As building heights increase, greater distance should be created between buildings to ensure adequate daylight into the dwellings.

Instead of boroughs prescribing a standard offset distance between dwellings, it is recommended that architects demonstrate how the design as a whole uses a variety of measures to provide adequate visual and acoustic privacy for every home. Architects should carefully consider the position and aspect of habitable rooms, gardens and balconies in relation to neighbouring buildings.

Visual privacy and overlooking of spaces can be managed by good design to avoid windows that directly face each other where privacy distances are tight. This may include careful use of non-standard windows (where design, daylight/sunlight, energy efficiency and thermal comfort considerations allow) such as offset, angled or oriel windows. Or, the design may provide a set-back or buffer where habitable rooms directly face a public thoroughfare or access deck. Requiring fixed, opaque glass should be a last resort, as it limits people's ability to control their own degree of privacy through interior design solutions.

Overlooking of private open spaces (particularly the part of the space nearest to the home that it serves) also needs to be carefully managed to safeguard the privacy of its users. The careful siting and design of windows and the deployment of screens and planting can help to ensure that adequate levels of privacy are provided. Screens may provide an added thermal comfort benefit, while measures to mitigate overheating risk, such as shutters and brise-soleils may provide an added privacy benefit. However, this should be balanced to ensure adjacent spaces are well considered. Private gardens with high fences that back onto a communal garden may deliver privacy for the occupant but could undermine passive surveillance and even the sense of community of the shared space.

Acoustic privacy

Noise from adjoining properties, from the street, and from common areas of the building, can be a common cause of stress, sleep disturbance and friction between neighbours. Research suggests that people's perception of privacy in the home is affected by noise as much as by visual privacy, an issue particularly pertinent in higher density developments.

Good technical detailing, and well-specified separating walls and floors built to good workmanship, will go a long way to ensuring acoustic privacy. In addition, consideration should be given to the location of balconies and private external spaces in relation to the habitable rooms of neighbouring properties.

The following are general considerations for good practice:

- Limiting noise from external sources, including road, rail and air traffic and noise-generating public and business uses, by orientating sound-sensitive rooms to face quieter external spaces
- Designing larger developments to create quieter external spaces between dwellings
- Planning building and dwelling layouts to limit the transmission of airborne and impact sound from common areas, lifts and refuse chutes
- Planning dwelling layouts to limit noise transmission between adjacent dwellings by arranging bedrooms of adjacent dwellings next to, and above, one another, rather than living rooms above bedrooms
- Taking measures to limit reverberation within internal common circulation areas.
- Limiting sound transfer within the individual dwelling by ensuring that walls between bedrooms and the living room and WCs provide adequate resistance to the passage of sound.

Relevant case studies

D3.1 Otts Yard: two homes with private gardens and a shared courtyard achieve privacy through careful arrangements of windows and plan.

D4.4 Moray Mews: a terrace of homes which uses clever plans and window arrangements to manage light and privacy.

D6.1 Finsbury Park Villas: these villa blocks are designed in close proximity to each other but with well-planned windows and balconies to avoid overlooking.

C5.2 Aspect and outlook

Key standards

- C5.2.1** All new dwellings should be dual aspect, unless there are exceptional circumstances that justify the inclusion of any single-aspect homes. Single-aspect dwellings that are north facing, contain three or more bedrooms, or are exposed to noise levels with significant adverse effects on health and quality of life, should not be permitted.
- C5.2.2** Where single-aspect dwellings are proposed (by exception), the design team should demonstrate how good levels of ventilation, daylight, privacy and thermal comfort will be provided to each habitable room and the kitchen.

Dual and single aspect

Buildings should be designed to maximise the number of dual-aspect dwellings. A dual-aspect dwelling is defined as one with openable windows on two external walls. These may be either on opposite sides of a dwelling or on adjacent sides of a dwelling where the external walls of a dwelling wrap around the corner of a building. This gives the ability to stand in the dwelling and get outlook up to, or exceeding 90 degrees (the provision of a bay window does not constitute dual aspect). One aspect may face towards an external access deck or courtyard, although the layout of such a dwelling needs to be carefully considered in these cases to manage privacy.

Providing dual-aspect dwellings greatly enhances the likelihood that the internal environment of a dwelling will perform well and have a positive effect on the well-being of the occupants. Having dual aspect usually leads to better daylight levels due to daylight coming from two sides, and can also improve cross ventilation, which will help minimise overheating. It also allows occupants to move from one side of the dwelling to the other if there is excessive noise or solar gain on one façade, through the provision of bedrooms and living spaces on the quieter side of the dwelling. The provision of dual-aspect dwellings should be maximised in a development proposal, and outline planning applications should specify the expected percentage of dual-aspect dwellings.

Single-aspect dwellings are more difficult to ventilate naturally and more likely to overheat. This is an increasing concern in London due to anticipated temperature increases related to climate change, coupled with the urban heat island effect that is experienced in high-density areas of the city.

High-quality, single-aspect, one- and two-bedroom homes may be acceptable (by exception) where limited numbers of rooms are required. The design of Single-aspect flats will need to demonstrate that all habitable rooms, and the kitchen, are provided with adequate natural ventilation, privacy, daylight and

thermal comfort. Such flats would require a generous frontage, a shallow plan and a favourable orientation and/or outlook including views, with care taken to mitigate the potential for overheating without the need for mechanical cooling.

Single-aspect dwellings may also be appropriate when being used to wrap podium level car parks or large retail units with active frontages. However, they must be avoided where they face onto areas of unacceptable noise or pollution, or are north-facing.

Justification will need to be made for the inclusion of any single-aspect dwellings. For single-aspect dwellings with more than two bedrooms, it is difficult to achieve adequate natural ventilation and daylight to all rooms in an efficient plan layout that avoids long internal corridors. Single-aspect dwellings containing three or more bedrooms should therefore be avoided. Module A: Optimising Site Capacity - A Design-led Approach only uses dwelling types that deliver dual-aspect for all dwellings.

Site layout, orientation and the design of individual dwellings and common spaces should be orientated to help meet the challenges of a changing climate, by ensuring homes are suitable for warmer summers and wetter winters. The design should also optimise opportunities for visual interest through a range of immediate and longer-range views, with the views from individual dwellings considered at an early design stage.

Whilst it is a long-established principle that planning should not seek to safeguard particular views from private property, the general openness and appearance of the immediate surroundings, when seen from principal rooms in people's homes, is a material planning consideration. Outlook from neighbouring properties should be considered, and the design of proposed schemes should ensure the creation of positive spaces and a sense of visual connection between homes and their immediate surroundings.

Relevant case studies

D2.3 Adolphus Road: this infill house uses a screened, courtyard garden to ensure it still achieves dual aspect on a compact site.

D5.5 Redwood Park: apartments designed around gallery access help increase dual aspect in a dense urban development.

D6.1 Finsbury Park Villas: villa blocks are designed to maximise the number of corner dwellings with dual aspect.

D6.2 Brentford Lock West Phase 2: an urban block formed of villas and terraces, which maximise dual aspect opportunities.

D7.2 Lock Keepers: a development designed to maximise dual aspect through small footprint blocks.

C5.3 Daylight, sunlight and overshadowing

Key standards

- C5.3.1** New dwellings should achieve a minimum average daylight factor (ADF) target value of 1 per cent for a bedroom and 1.5 per cent for a living room.
- C5.3.2** Proposed development should maximise quality and availability of sunlight and natural light in outdoor spaces, particularly in winter. Outdoor spaces should benefit from at least two hours of daylight on 21st March into 50 per cent of space in line with BRE guidance.
- C5.3.3** All homes must provide for direct sunlight to enter at least one habitable room for part of the day. Living areas and kitchen dining spaces should preferably receive direct sunlight.

Balancing natural light

Providing good levels of natural light makes for a more pleasant internal environment, improving wellbeing as well as reducing the energy required for artificial lighting. This document prioritises good daylight to the home in determining suitable development capacity. Module A: Optimising Site Capacity - A Design-led Approach adopts daylight factors to determine offset distances between buildings. It acknowledges that the taller we build, the more need there is for appropriate compensation in the form of greater distance between buildings, in order to ensure adequate daylight into the dwellings.

The relationship to neighbouring buildings, as well as the size of windows and floor-to-ceiling heights, will all play their part in determining the adequacy of light levels within the home. Often, larger windows are provided to improve daylight levels. However, this can lead to increased heat loss since windows are less thermally efficient than walls. Large windows can also increase solar gain, which is beneficial in the winter but can cause overheating in the summer. These conflicting considerations should be carefully balanced.

Natural light can be restricted in densely developed areas. However, an appropriate degree of flexibility needs to be applied when using BRE guidelines to assess the daylight and sunlight impacts within proposed new homes, as well as the impact that proposed development would have on surrounding homes and open spaces.

Applying BRE guidelines in relation to neighbouring homes

Decision-makers should recognise that fully optimising housing potential on sites may necessitate standards which depart from those presently experienced, but which still achieve satisfactory levels of residential amenity and avoid unacceptable harm.

Guidelines should be applied sensitively to higher density development, where BRE advice suggests considering the use of alternative targets. This should take into account local circumstances, the need to optimise housing capacity, and the scope for the character and form of an area to change over time.

The BRE guidelines apply nationwide, and the default numerical targets provided are purely advisory. These are based on a uniform, 25 degree development angle (vertical obstruction angle) typical of a low-rise suburban location. This corresponds to the Vertical Sky Component (VSC) target of 27 per cent cited in the guidelines. Typical development angles in a city or central urban location are considerably higher. In Central London, development angles of 40 degree or 50 degree are common and can, if well planned, deliver successful schemes. A uniform development angle of 40 degree corresponds to a VSC target of 18 per cent, and 50 degree gives a VSC target of 13 per cent. Such daylight levels have been accepted in many desirable central areas for well over a century. Module A: Optimising Site Capacity - A Design-led Approach therefore adopts a 50 degree development angle to determine offset distances.

Even with access to good levels of daylight on the outside of a building, it is possible to have low levels of daylight within a building due to design features such as small windows, recessed windows, poor placement of balconies or deep rooms. Therefore, consideration of the retained target VSC should be the principal consideration. Where this is not met in accordance with BRE guidance, it should not be less than 0.8 times its former value (which protects areas that already have low daylight levels).

Less weight should be given to the room-based measures of daylight such as 'no-sky line' or average daylight factor as these are dependent on the design of the neighbouring property. Except in exceptional circumstances, design features of neighbouring properties (referred to above) should not hamper the development potential of a site.

Applying BRE guidelines in relation to proposed homes

It may be possible to mitigate lower external daylight VSC levels by using design features such as larger windows, roof lights and light coloured internal and external surfaces to ensure reasonable internal daylight levels. Therefore, room-based measures of daylight and sunlight are most appropriate for judging the acceptability of a proposed development, as these encourage good daylight design. Appropriate 3D modelling should be used to demonstrate acceptable levels.

BRE guidelines confirm that the acceptable minimum average daylight factor target value depends on the room use. That is 1 per cent for a bedroom, 1.5 per cent for a living room and 2 per cent for a family kitchen. In cases where one room serves more than one purpose, the minimum ADF should be that for the room type with the higher value. Notwithstanding this, the independent daylight and sunlight review states that in practice, the principal use of rooms designed

as a 'living room/kitchen/dining room' is as a living room. Accordingly, it would be reasonable to apply a target of 1.5 per cent to such rooms.

The need for balconies to be a minimum depth so as to function as usable amenity space, (see C4 Dwelling Space Standards), can have significant bearing on the daylight and sunlight levels reaching nearby windows and rooms. Inevitably, any window or room under a balcony will receive much lower daylight and sunlight levels, although the adjacent balcony space will typically have excellent levels of daylight and sunlight amenity. Given this, the Mayor encourages boroughs to allow the daylight levels on the balcony to contribute to the ADF of the adjacent living space.

Overshadowing

The BRE guidelines recommend that at least half of private amenity and public open space should receive at least two hours of sunlight on March 21. Development should be designed to maximise sunlight in these spaces, particularly during the winter, and at least meet the BRE guidelines. The design of outside communal space should be planned so that seating areas or play space are located in the areas that are most likely to receive sunlight.

Relevant case studies

D2.2 Hidden House: an infill house which uses sunken courtyards and roof lights to optimise daylight into the home.

D4.4 Moray Mews: a terrace of houses with shallow plans to maximise daylight into each room.

D5.2 Ely Court: an estate regeneration scheme with a variety of block types, each designed to boost daylight within rooms and circulation areas.

D5.4 Darbshire Place: an apartment block with corner balconies designed to increase daylight and aspect for the dwellings.

D6.3 Camden Road: a compact urban development with tight courtyards, which nonetheless delivers good daylight by keeping block depths shallow and dwellings dual aspect.

D7.1 Keybridge House: a dense, high-rise scheme, which delivers good daylight by managing height and orientation.

C5.4 Indoor air quality and noise

Key standards

C5.4.1 Development proposals should be located and designed to reduce the accumulation of indoor air pollutants and exposure of residents to air pollution.

C5.4.2 Development proposals should be located - or attenuation measures should be introduced - to reduce the exposure of residents to noise pollution.

Avoiding poor indoor air quality

Poor indoor air quality can arise from materials and processes inside the home. A number of steps can be taken at the design stage to reduce indoor air pollution, including:

- Ensuring adequate ventilation to extract or disperse internally generated emissions. Particular focus should be given to preventing build-up of damp (which leads to mould and spores), extracting cooking emissions, and ensuring sufficient ventilation to prevent carbon monoxide build-up
- Using low volatile emission materials and finishes. Or, where volatile materials are used in construction, allowing sufficient time before occupation for them to disperse
- Taking measures to prevent ingress of natural pollutants such as radon, or other land and subsurface contaminants, where appropriate
- Ventilation strategies to ensure that the best quality external air is available for passive and purge ventilation.

Ventilation strategies need to be considered carefully in areas of high external pollution to get the best available external air quality, while taking into account the ventilation hierarchy in the London Plan. Wherever possible, passive ventilation strategies should be used.

Well-designed housing that is not positioned near a source of pollution should rarely, if ever, need to employ 'hard' mitigation measures such as sealed windows and forced draft ventilation systems solely to improve indoor air quality. Where mechanical ventilation is used for other reasons, well-positioned air inlets can further reduce the exposure of residents to pollution. Where ventilation systems are provided, fixed-glazing is not considered appropriate.

The GLA will publish additional guidance on indoor air quality

Internal noise conditions

Quality of life at home can be hugely compromised by the impact of unwanted noise. This can include traffic noise, plant noise, noise from the activities on the new development, or noise generating use-types like theatres, pubs, concert halls and sports pitches.

London Plan Policy D14 (Noise) requires developments to provide good quality internal environments. This will involve ensuring internal noise levels are adequate and minimise the risk of adverse noise impacts on health. This is most likely to be an issue on sites close to noise sources such as a busy road, train line or airport. If done at the outset, site layout, orientation, screening or other measures may be able to mitigate against noise pollution. The planning officer should consult with the borough's noise pollution officer. Where noise could be an issue, the developer/applicant should be advised to engage with an acoustician at an early stage.

The Department for Environment, Food and Rural Affairs (DEFRA) has provided a strategic noise map, covering road and rail noise but excluding noise from aircraft, industrial or other sources. This can be consulted to assess noise impact.

Draft guidance from the Association of Noise Consultants suggests that if ambient noise levels are close to or above 62dB in the daytime and 55dB at night, there is a reasonable likelihood that openable windows cannot be relied upon as the principle means of cooling. This is because windows are likely to need to be open for a significant amount of time in order to mitigate overheating.

As far as possible, the location of buildings, layout of rooms and specification of glazing should ensure good internal noise conditions that are appropriate for the intended use of rooms, with bedrooms being the most sensitive.

It is important for the wellbeing of occupants that living rooms and bedrooms aren't too noisy. There are standards for internal sound levels but these do not currently make full allowance for the scenario when windows are open for long periods to mitigate overheating. So, in a noisy location, an apparently compliant acoustic strategy and a compliant overheating strategy can be designed, but in reality, the wellbeing of the occupants will suffer if windows need to be opened for prolonged periods in warm weather. Therefore, designers need to design an overheating strategy that takes into account external noise. This should include passive measures, such as external shading, in line with the cooling hierarchy (London Plan Policy SI 4 - Managing heat risk) and may involve mechanical ventilation systems. These systems should be highly efficient and would need to be accounted for in carbon and energy use calculations. Active cooling should be avoided due to the additional energy use.

Relevant case studies

D6.3 Camden Road: a courtyard development where great care has been taken to deal with the impact of a busy road through clever planning and mitigation measures.

C5.5 Thermal comfort

Key standards

C5.5.1 Careful building design (including thermal mass, layout, aspect, shading, window size, glazing specification and ventilation), and landscaping and green infrastructure should be used to ensure good internal thermal comfort and avoid the need for active cooling.

Overheating

Climate change means London is already experiencing higher than historic average temperatures, and more severe hot weather events, both will worsen

over time. This trend, combined with a growing population, the new growth of town centres and suburban areas, and the urban heat island effect, means that London must manage heat risk in new developments. This can be done using the cooling hierarchy set out in the London Plan.

During the design stage, an assessment should be carried out to assist with the façade design and ensure that the likelihood of overheating has been adequately mitigated. Available resources include the GLA's Energy Assessment Guidance and the Good Home Alliance's Overheating in New Homes Tool and Guidance (<https://goodhomes.org.uk/overheating-in-new-homes>).

Issues that affect overheating include window size, openable area of windows, building orientation, thermal mass, and the amount of window shading and solar transmittance of the glazing. If the overheating strategy relies on solar control glass, this will need to be accounted for in the energy calculation because it will be likely to reduce solar gain in winter and push up the heating demand. If the strategy relies on large openable windows, this needs to be aligned with the acoustics and air quality considerations.

Higher density developments, including tall buildings, need to be designed to avoid a number of environmental design challenges when optimising capacity. These include:

- Southern and western aspect homes in tall buildings are sometimes prone to overheating, whilst north-facing units have increased heating demands and may have limited access to good daylight and sunlight
- Large windows and floor-to-ceiling glazing can further contribute to overheating, especially in summer if windows are directly exposed to sunlight.

Thermal envelope performance and energy use

Improving the performance of the thermal envelope means less energy is required for heating. This can be achieved by improving air-tightness, reducing thermal bridging and delivering better U-values. However, reductions in air-leakage and heat loss can lead to heat gains being contained, with build-up in warmer weather leading to overheating. Proper insulation of building services, especially in circulation areas and corridors, can help to reduce year-round overheating. If considered in isolation, the aim of cutting heat loss could lead to a reduction in window size. It is therefore important to consider the factors of daylight/sunlight, thermal comfort, overheating risk, acoustics and air quality in the round.

Relevant case study

D4.3 Signal Townhouses: a terrace of homes integrated into the district heating system with features to manage thermal comfort.

C6 Living Sustainably

The Mayor is committed to making London the world's greenest global city. By 2050, London is aiming to be zero carbon and to have the best air quality of any major world city. It also aims to be resilient to severe weather and longer-term climate change impacts including flooding, heat risk and drought. The London Plan supports these aims by seeking to ensure that all new housing is built to the Mayor's net zero carbon standard and is water efficient, mitigates flooding, incorporates urban greening, is resilient to extreme weather, and safeguards biodiversity.

An understanding of climate and ecology is necessary, not just to contribute to the Mayor's drive to reduce London's carbon emissions, but also to make.

C6.1 Environmental sustainability

Key standards

- C6.1.1** Development proposals should be designed in accordance with the Mayor's energy hierarchy to achieve the Mayor's Net Zero Carbon Homes policy. This means being Lean (energy efficient), Clean (exploit local energy sources and connect to heat networks), Green (maximise on-site renewables) and Seen (monitor, verify and report on energy performance).
- C6.1.2** Referable development proposals should calculate and reduce whole life-cycle carbon emissions, which includes the embodied carbon in construction by using less material and low carbon materials. Other development proposals are encouraged to do this.
- C6.1.3** Development proposals should be designed so that water fittings and appliances consume no more than 105 litres per person per day (plus up to five litres for external water consumption). Opportunities for water reuse to reduce potable water consumption should be identified.

Low carbon construction

Buildings and infrastructure account for around 35 per cent of resources globally and nearly 40 per cent of energy use and carbon emissions. Approximately, half of the carbon emissions are from operational emissions - the energy used in buildings. These can be reduced through the Lean, Clean and Green approach set out in the Mayor's energy hierarchy. The other 50 per cent of a building's carbon emissions come from its embodied carbon; a figure which will increase as operational emissions are continually reduced through the Mayor's carbon reduction target. This carbon results from the energy and industrial process used in the manufacture and delivery of the materials,

products and components required to construct a building, the materials used during refurbishment and how those materials are eventually disposed of. Embodied carbon can be reduced by being more efficient with materials. This includes designing- out waste, reusing materials, and using materials with a lower embodied carbon for the structure and building fabric.

If the UK is to achieve its ambitious target of bringing all greenhouse gas emissions to net zero by 2050, closer attention needs to be paid to a building's whole life-cycle carbon including the embodied carbon in construction. Each designer's priority should be to use fewer material in construction and to use alternative, lower carbon materials in construction.

The GLA will publish guidance on how to calculate and reduce whole life-cycle carbon.

Zero carbon homes

London's homes have an important role to play in achieving the Mayor's target for a zero carbon city by 2050. Since October 2016, major residential development in London has been required to comply with the Mayor's net zero carbon standard. This involves achieving at least a 35 per cent improvement beyond Building Regulations; ten per cent of which should come from energy efficiency measures in line with the Mayor's energy efficiency target. Where on-site emissions cannot be reduced any further, the carbon shortfall is offset through a cash-in-lieu contribution to a local authority's carbon offset fund.

The Mayor's carbon target should be met by following the energy hierarchy (be lean, be clean, be green and be seen) as set out in the GLA's Energy Assessment Guidance.

Developments in Heat Network Priority Areas should follow the heating hierarchy to select the most appropriate low emission solution, taking into account air quality as well as carbon.

Development proposals should take account of the space needed to incorporate renewable energy technologies on-site such as solar PV on roofs, and sufficient space in energy centres/on roofs for heat pump technologies.

Development proposals should be future-proofed to achieve zero carbon emissions on-site by 2050.

Urban heat islands and microclimates

Greening measures can help to reduce the overall urban heat island effect. This can be addressed via green roofs, green walls, trees, sustainable drainage systems and water features. These elements can help reduce heat within buildings, as well as cool the surrounding area. Measures done at street level or head height will have the most impact on thermal comfort, whereas roof level

interventions have more impact on the broader heat island. Green walls and trees can also provide buffers to help with wind and pollution. The use of high albedo surfaces and reduction of waste heat sources can also play a role.

The GLA will publish guidance on mitigating the urban heat island effect.

Water use

Demand for water is rising as London's population grows. The hotter, drier summers predicted as a result of climate change are likely to increase demand further and reduce availability. Less predictable rainfall patterns will also make it more difficult to retain the water that does fall.

The London Plan requires new developments to be designed so that water fittings and appliances consume no more than 105 litres per person per day (plus up to five litres for external water consumption). Specifying low-flow fittings, fixtures and white goods can ensure this is achieved, such as using standards found in the optional requirement found in Approved Document Part G of the Building Regulations.

The GLA will publish guidance on water use and efficiency.

Water reuse

Opportunities for water reuse to reduce potable water consumption should be identified. These can include rainwater harvesting, grey water reuse and larger-scale wastewater recycling. Most housing developments would be expected to be able to incorporate some element of water reuse, though systems that require pumping should try to reduce energy consumption.

Rainwater harvesting aligns with the top of the drainage hierarchy, and can perform the dual function of attenuating surface water while also providing non-potable water for use. In order to properly incorporate rainwater harvesting, this needs to be considered early on in the design process. The placement of downpipes to connect to harvesting systems, the roof loading required to support blue roof systems, and the integration of harvesting with SuDS systems all require early design consideration and coordination across design specialists.

Opportunities for integrated water management should be identified as part of the masterplanning process, and these should inform the building design. Measures may include identifying places to locate large-scale SuDS, establishing a dual pipe network for a non-potable water source, and locating areas where water reuse will be required.

The GLA will publish guidance on water reuse and integrated water management.

Relevant case studies

D3.6 Barretts Grove: a six-storey development made of cross-laminated timber and other sustainable materials.

D5.8 Chobham Manor: a new development that delivers exemplary environmental standards designed to reduce energy in use and maximise solar gain.

C6.2 Urban greening and biodiversity

Key standards

- C6.2.1** Major developments should meet relevant borough Urban Greening Factor target scores, or where none exist, the interim scores set out in the London Plan.
- C6.2.2** Development proposals should contribute to a net gain in biodiversity.
- C6.2.3** Small site minor developments should demonstrate no net loss of green cover.

Supplementing and protecting natural assets

Greener neighbourhoods are known to provide a wide range of benefits including better health and resilience to climate change. We also have a legal and moral responsibility to conserve the city's heritage of biodiversity and natural landscapes. Therefore, the design of housing developments should consider the need to protect any existing natural assets and contribute to extending and connecting the city's green infrastructure.

London Plan Policy G5 (Urban Greening) requires boroughs to develop an Urban Greening Factor (UGF) target score to identify the appropriate amount of urban greening required in new developments. All major developments should demonstrate how the score is being achieved. Where a specific borough target score is not in place, development proposals should meet the suggested target scores set out in Policy G5 (Urban Greening). Meeting the UGF aims to ensure that development contributes to addressing the adverse impacts of increased urbanisation and density of development by providing nature-based solutions. These contribute to reducing surface water flooding and the urban heat island effect, as well as increasing habitat for wildlife and providing opportunities for food growing.

Further guidance on applying the UGF will be published.

Development proposals should also contribute to a net gain in biodiversity. This can often be achieved by application of the UGF. The GLA's guidance on applying the UGF will set out how biodiversity net gain can be included.

When determining the development capacity of a site, the need to safeguard existing valuable habitats, specimen trees and food growing opportunities should be taken into account.

Minor developments should achieve no net loss of overall green cover. Any loss of existing green cover should be mitigated, for example through turning areas of hard standing to green space, or through greening measures such as the installation of green roofs or walls, or landscaping that contributes to sustainable urban drainage.

Proposals should clearly set out the areas of existing and proposed green cover and any associated mitigation measures (see also Module B: Small Housing Developments - Assessing Quality and Preparing Design Codes).

Relevant case studies

D3.1 Otts Yard: this development increases the biodiversity of the small site through new landscaped gardens and green roofs.

D6.2 Brentford Lock West Phase 2: a perimeter block of villas designed around a generously landscaped communal garden.

C.6.3 Flood mitigation and sustainable drainage systems

Key standards

C6.3.1 Where development is in areas at risk from flooding is permitted, homes should make space for water and aim for development to be set back from the banks of watercourses and be designed to incorporate flood resistance and resilience measures.

C6.3.2 New development should incorporate sustainable drainage systems (SuDS) in line with the drainage hierarchy.

Flood risk

London is prone to flooding from six sources: tidal, fluvial, surface water, sewer, groundwater and reservoir flooding. Climate change is likely to increase the likelihood of flooding from all sources. Flood risk can be reduced by locating new developments in appropriate places, by making space for water and aiming for development to be set back from the banks of watercourses, through first flood resistant and then resilient design including safe evacuation and quick recovery, and by managing surface water run-off. Measures to address flood risk should be integral to development proposals and considered early in the design process.

The National Policy Planning Framework (NPPF) aims to encourage housing development in low flood risk areas, and to take measures to mitigate the

impact of flooding on houses built in medium or high-risk areas. Under the London Plan, flood risk should be assessed in accordance with the NPPF.

For developments adjacent to flood defences, planning for the protection of their integrity, as well as access for maintenance and upgrade of those defences must be incorporated into the site design. This includes the consideration of setbacks from the flood defences.

For sites at risk of tidal flooding, the Thames Estuary 2100 Plan and a related riverside strategy approach must be considered as part of the design.

The GLA will publish guidance on flood risk.

Surface water run-off

Managing surface water run-off from new developments is a mandatory planning requirement set by Government policy introduced in April 2015. It requires developments greater than 10 dwellings (and with a commercial area of >1000 sqm) to use sustainable drainage systems (SuDS) to manage surface water.

London Plan policy aims to achieve green field run-off rates and ensure that surface water run-off is managed as close to its source as possible by using a drainage hierarchy. This prioritises water reuse and green infrastructure techniques over grey features and discharging to sewers. Impermeable surfacing should not be used.

SuDS approaches can achieve multiple objectives beyond surface water management, including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

The GLA will publish guidance on sustainable drainage.

Relevant case studies

D4.1 Foundry Mews: a mixed-use scheme which lifts residential above workspace to mitigate the risk of flooding homes.

D6.2 Brentford Lock West Phase 2: a river front development that manages changes in level to mitigate the risk of flooding.

C6.4 Air pollutant emissions and exposure

Key standards

C6.4.1 The development of large-scale redevelopment areas (i.e. Opportunity Areas) should consider how local air quality can be improved as part of an air quality positive approach. All other development should be at least Air Quality Neutral. Air quality assessments should be submitted with all major developments.

Improving the health of Londoners

The Mayor is committed to reducing the impact of poor air quality on the health of Londoners. Housing design has a crucial role to play in reducing or preventing people's exposure to pollution, both indoor and out. Exposure to poor air quality affects the long-term health and wellbeing of residents and users of new developments.

There are large existing inequalities in exposure to air pollution, with the poorest and most vulnerable often exposed to the highest levels of pollution in the areas where they live. New housing can start to address this imbalance by ensuring that affordable housing is treated equally when considering exposure to air pollution.

Air quality is predominantly assessed against the quantity of key pollutants measured in the air that are known to have harmful effects on human health. These are NO₂, PM₁₀ and PM_{2.5}. Other pollutants, such as volatile organic compounds VOCs, may be an issue in some kinds of mixed-use developments, particularly where industrial and light industrial units are in proximity to homes and amenities.

The location, layout and orientation of proposed housing in relation to existing and proposed pollution sources and/or poor air quality needs to be considered from the outset.

Generally, if the development site is in close proximity to a source of pollution such as a main road or significant combustion source, additional care will need to be taken during the design phase to reduce exposure, including in outdoor spaces. Design measures such as locating occupied rooms and amenity areas away from the pollution source should be preferred to "hard" mitigation such as sealed windows and mechanical ventilation. It is recommended that the planning officer consults with the borough's air quality officer at an early stage. Similarly developers should engage air quality expertise early in the design process, while architecture and design considerations are still fluid.

Introducing the air quality positive approach

The development of large-scale redevelopment areas (i.e. Opportunity Areas) should consider how local air quality can be improved as part of an air quality positive approach.

Preliminary studies should be used to identify the most appropriate locations for developments and any opportunities to reduce or eliminate emissions sources or built forms that lead to the accumulation, rather than dispersion, of pollutants.

The key to an air quality positive approach is to think about what measures can be designed in to actively improve air quality, rather than just minimising the amount of harm done. This can include detailed consideration of how form

and layout of buildings aid the dispersion of pollutants as well as designing out pollutant sources, such as combustion plant and fossil fuelled vehicles.

The GLA will publish guidance on the air quality positive approach and will continue to update it as good case studies emerge.

As a minimum, all major developments must, and minor developments should, meet the Air Quality Neutral benchmarks for both building and transport emissions.

All major developments should carry out an Air Quality Assessment. It is recommended that a Preliminary Air Quality Assessment (pAQA) is undertaken at an early stage in the design process. The aim of the pAQA is to enable the optimisation of the site to minimise impacts on local air quality and public exposure to air pollution, for example by reducing emissions, avoiding designs and layouts that lead to the accumulation of pollution, and by promoting design that aids dispersion.

Smaller developments should consider the qualitative approaches to understanding air quality used during the Mayors Schools Air Quality Audits, which examined how an individual building can respond to the determinants of pollution and exposure in its immediate environment. This approach can also be used in combination with quantitative approaches to deliver appropriate solutions for larger developments.

The GLA will publish updated guidance on Air Quality Neutral and Air Quality Assessments.

Relevant case studies

D6.3 Camden Road: a courtyard development where great care has been taken to mitigate the impact of a busy road through clever planning and mitigation measures.

C7 Future Proofing

To be more sustainable, we need buildings to be of value for longer to reduce the need for resource-intensive reconstruction and redevelopment. Loose-fit, long-life buildings can endure beyond the original intended user by adapting to different purposes or to suit changing lifestyles and needs. By designing for the circular economy, we can ensure that as buildings are adapted, their redundant fabric, or even the entire building, can be recycled or up-cycled.

C7.1 Adaptability and circularity

Key standards

- C7.1.1** Buildings should be retained and refurbished where practicable. New buildings should be designed in ways that ensure they are adaptable - including to climate change - and capable of conversion to different uses.
- C7.1.2** Buildings should be designed to support the circular economy, including for disassembly, allowing for the reuse of materials and products, reducing waste and pollution.

Adaptable homes

Adaptable homes offer the potential for internal spaces to be modified with relative ease. Thoughtful design can facilitate adaptation by positioning structural supports to allow new openings in internal walls, or by creating easily demountable internal walls/partitions that are clear of services. This could allow dwellings to be connected for extended family structures or sub-divided for downsizers. Whilst such adaptability will help ensure a long life for the building, buildings should also be designed to anticipate future uses.

To deliver truly long-life buildings, they need to be capable of change. As neighbourhoods evolve, areas of residential may become more desirable for commercial use, or industrial areas may become residential (as has historically been the case). As such, if buildings can be reimagined for other uses, their life will be extended. Warehouses have often been converted to housing, the change of use facilitated by their simple, robust structure and construction. Likewise, housing should be designed in a way that the building can be re-purposed. This will mean being generous with floor-to-ceiling heights, having regular structural grids, simple structural solutions, and designing in structural capacity for future extension.

Whilst building reuse helps sustain building stock longer, the Mayor expects any conversions to residential use to nonetheless meet the housing design quality standards set out in this document, to ensure homes are fit for purpose and help support a high quality of life.

The circular economy and reducing waste

The Mayor supports a 'circular economy', where materials and assets are retained in use at their highest value for as long as possible, and are then re-used or recycled, leaving a minimum of residual waste. The Mayor's London Environment Strategy sets out a recycling target of 65 per cent for municipal waste by 2030.

As the largest user of materials and generator of waste in the economy, the built environment sector must take a lead in supporting the shift towards a circular economy. In London, the sector consumes 400 million tonnes of material each year and accounts for 54 per cent of waste. Extending the life of buildings, and recovering and reusing materials at the end of their life, can help reduce the demand for virgin materials and waste arising from the built environment.

Large-scale development in particular presents opportunities for innovative building design to help London transition to a circular economy and deliver on the Mayor's Good Growth agenda. This approach links waste, circular economy and design policies to bring forward high-quality buildings where materials innovation and waste reduction are considered right up front in the design stage. This approach applies three broad principles:

- Retaining and refurbishing existing buildings, where practicable, as a first consideration
- Designing buildings in ways that reduce material demand, and enable building materials, components and products to be easily disassembled and re-used
- Designing buildings for adaptation, reconstruction and deconstruction.

The GLA has published a Design for A Circular Economy Primer (https://www.london.gov.uk/sites/default/files/design_for_a_circular_economy_web.pdf) setting out circular economy approaches applied in practice. The GLA will prepare guidance to help developers to better understand, and demonstrate circular economy approaches in new developments, in order to effectively comply with London Plan policy.

Climate adaptation and resilience

The known climate change impacts for London are increased flood risk, heat risk and water scarcity. Long building life spans mean that it's important to plan now for the anticipated effects of climate change to enable people to stay in their homes in the face of increasing climate change impacts. Details of these issues are covered in other guidance however, the overarching principle is that homes should be designed to mitigate these risks, be resilient to their impacts, and be able to be adapted over time.

Homes with residual flood risk from any source should be built to incorporate property flood resistance and resilience measures. This will enable properties to

both keep flooding out, but also to bounce back quickly if there is a major flood incident. New development near rivers should be built in such a way that allows access for the upgrade and adjustment of flood defences in the future.

The need to mitigate heat risk within homes, as well as in the public realm, will only increase over time. Detailed consideration of the cooling strategy, in tandem with energy efficiency, daylighting and air quality strategies, is crucial.

Heat waves are already reaching London, and design approaches more common in continental Europe need to start being adopted here, such as shutters, brise soleils, and other shading elements. Incorporating these types of passive cooling options gives residents the flexibility to adjust their homes for comfort without relying on cooling that adds to energy demand.

Based on climate change and an increasing population, London is forecast to have a water resource gap of more than 100m litres per day by 2020, rising to more than 400m litres per day by 2040. New housing should be designed to be water efficient. Water reuse systems that can reduce the demand for clean drinking water can enable homes to be more flexible in the future in the face of water scarcity.

Relevant guidance has been highlighted in sections above and include guidance on flood risk, overheating and energy efficiency and water efficiency and reuse.

Relevant case studies

D1.1 Piper Rooftop: a rooftop extension designed from lightweight demountable wall panels and recyclable components.

D3.2 Sheendale: a terrace of homes with triple height spaces designed to take additional floors.

C7.2 Safeguarding development potential

Key standard

C7.2.1 The development of a site should not prejudice the development of adjoining land or buildings, including subsequent phases of development.

Future development

It is important that the development of a site does not prejudice the development of adjoining land (either vacant or built on), including subsequent phases of development. The Mayor will, and boroughs should, consider this issue at all stages of the planning process, including by:

- Ensuring proposed uses are compatible with other proposed and nearby uses

- Ensuring proposals provide adequate protection and/or mitigation for planned transport schemes and enable reasonable pedestrian, cycle and vehicular access
- Ensuring that layout, scale and massing does not result in undue overshadowing of adjoining land, and enables the proposed development to be managed and maintained from within its boundaries
- Locating and designing windows (particularly those lighting habitable rooms) carefully so that they do not rely on adjoining land for their outlook, daylight or sunlight
- Ensuring that air quality or flood impacts do not prejudice the ability to build on nearby sites

Relevant case study

D7.2 Lock Keepers: an apartment block designed alongside a masterplan to ensure any future neighbouring development won't be compromised.

C7.3 Quality, maintenance and management

Key standard

C7.3.1 Development proposals should be designed to take full account of future maintenance practicalities and likely costs.

Quality of development

Whilst customer satisfaction with new build homes in the UK has increased significantly in recent years, there are persistent concerns about the quality of buildings and their associated private and communal outside spaces. The following should be considered to help ensure high-quality built results:

- Greater detail of design intent within planning submissions
- Materials and details subject to planning conditions
- Planning authority-led compliance meetings with developers, contractors and design teams where variations are proposed to the planning consent
- Early stage collaboration between design specialists where issues overlap, such as energy efficiency, overheating and daylighting, or landscape architecture and drainage
- Greater level of detail of design intent included in tender packages
- Traditional procurement routes for smaller sites with the architect retained as contract administrator
- Novation of the original design team in design and build procurement routes to ensure a golden thread of design thinking runs through from concept to completion
- Retention of design teams in client-side monitoring roles when novation is not possible
- Collaboration with trusted consultants and contractors

- Regular meetings and communication between team members on site
- On-site benchmarking and prototyping
- Use of pre-fabrication and off-site manufacture
- Use of robust and hard-wearing materials.

Developers should commit to minimum standards for consumer care through the development of service level agreements to govern the relationship between builders and customers. This should include a clear and efficient complaints procedure.

Communal spaces and facilities will be the subject of more intense use as density increases. London Plan Density Research identifies the importance of day-to-day maintenance and management in the provision of successful high-density housing.

Management and maintenance

On-going maintenance requirements should be considered as an integral part of building and landscape design. Issues that need to be considered include:

- Window cleaning
- Replacement of plant/equipment
- Maintenance and watering of trees and plants
- Maintenance of SuDS
- Maintenance of solar PVs or other site-based energy sources
- On-going optimisation of building management systems
- Maintenance of shading features
- Maintenance of water reuse systems.

Where on-site management is provided, such as a concierge service and/or other staff, they should be easily identifiable and visible within the development. London Plan Policy D4 makes clear that management plans for proposed higher density developments must include details of day-to-day servicing and deliveries, as well as longer-term maintenance implications. It adds that these plans should provide details on the affordability of running costs and service charges (by different types of occupiers). Costed plans should set out how management arrangements will work in mixed-tenure schemes, and how residents' views will be taken into account in delivering affordable services.

The overall costs of services reflect earlier design decisions. It is good practice for building and landscape managers to be closely involved in the design process, so that the details of good design are built in from the start (see C2.1 Diversity of residential type and tenure).

Relevant case studies

D1.1 Piper Rooftop: designed with a stepped profile for ease of access to all sides.

D5.7 Trafalgar Place: A dense urban housing scheme with a concierge at the heart of the scheme, to oversee management and respond to residents' concerns.

CONTRIBUTORS AND THANKS

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