



Government
Property
Agency

Architectural Technical Annex

Version 1.0
March 2022
Official

Contents

Architectural.....	3
Acoustics.....	24
Structures.....	28

Architectural

BUILDING FORM	▼
	SHELL & CORE
	CAT A
	CAT B & C
Space Configuration	●
Occupancy Standards	●
Core Elements	●
Entrance and Reception	●
External Spaces	●
Vehicular Access, Cyclists and Parking	●
Loading Bays and Building Management	●
Grids	●
Circulation	●
ENVELOPE	>
FINISHES & FIT-OUT	>

BUILDING FORM

The design parameters set out within building form will aid how the building will function, allowing the space to be planned in the most efficient way.

Space Configuration

SHELL & CORE

Space and building type

Every workspace will be within 12m of glazing, providing natural light and aspect (in most circumstances). Deeper spaces beyond this without an atrium, should be used for ancillary and support functions and not as primary people spaces.

Building depths recommendations: Window to window or atrium, ranges; 12.0-15.0m, 15-21m. Window to core; 6-12m.

Consideration should be given for inclusion of atria in deep floorplate buildings to bring natural daylight into deep zones. For campus type buildings, internal streets providing efficient connectivity should be considered.

Buildings must be capable of sub-letting floor by floor and across floorplates for large floorplate configurations.

Ceiling/clear height

For floor depths of up to 18m the recommended dimensions of ceilings/clear heights, from finished floor to the underside of ceilings is 2.75m. For deeper plan spaces, or deeper than 18m from the glazed perimeter, a height of 3.0m should be provided.

Occupancy Standards

SHELL & CORE

Occupancy standards take into account modern office construction techniques, standard absence factors and smarter more flexible working. These values should be used for building services design.

	New Build	Refurb.
Acquisition Density	6m ² / occupant	8m ² / occupant
Planned Occupancy Density	9m ² / planned occupant	12m ² / planned occupant
Building Services & Infrastructure	8m ² / occupant	12m ² / occupant
Fire Safety	6m ² / occupant	8m ² / occupant

Designing space

Planned Occupancy Density is how we ensure a great place to work. This allows us to design buildings that are cost effective yet still provide a high-quality working environment. Whilst acquisition and occupation density varies from new build and refurbishment, there will always be a constant look and feel however big or small a building is, ensuring a consistent, standard across all hubs. This includes all the elements of our workspaces: focus, informal, do not disturb, interact, book and use and our amenity spaces.

We anticipate an average of 50% of planned occupants will be in occupation at any one time. This means the space should be designed accordingly: 9m² per occupant of the Net Internal Area (NIA) of the whole of a new building (proportionally more for a refurbishment) to achieve the quality and blend of workplace types needed and taking into account the nature of the building.

Building Information Modelling (BIM)

Refer to BIM standards covered within the B2IM EIR.

Architectural

BUILDING FORM		
	SHELL & CORE	CAT A B & C
Space Configuration	●	
Occupancy Standards	●	
Core Elements	●	
Entrance and Reception	●	
External Spaces	●	
Vehicular Access, Cyclists and Parking	●	
Loading Bays and Building Management	●	
Grids	●	
Circulation	●	
ENVELOPE		>
FINISHES & FIT-OUT		>

Core Elements

SHELL & CORE

Main/principal and secondary core

A key driver in the efficiency and flexibility of a building is the design of the core.

The main core contains the operational components of the building that provide vertical circulation;

- » Passenger, goods and fire-fighting lifts.
- » Escape stairs and access stairs.

Also, it will contain;

- » WCs.
- » Main distribution for mechanical, electrical, plumbing and data services.
- » Cleaners' sink and stores.
- » Disabled refuges.
- » Dry riser.

Secondary cores may have some or all of the components found in a primary core.

Location of cores

The location of cores will be designed to:

- » Maximise floor plate efficiency.
- » Reduce extensive travel from reception to lifts.
- » Allow efficient floor plate subdivision into smaller, lettable units.

Design of cores

The core should be designed and reviewed to;

- » Maximise NIA.
- » Have few irregularities within the core, such as riser doors or access points.
- » Space planning efficiency.
- » Amenity planning.
- » Internal cellularisation planning.
- » Provide access to WCs and risers from the core. Necessary riser access on the floor plate should be located in relation to the planning grid to allow efficient planning of tenant cellurisation.

Escape and access stairs

Escape and access stairs should be designed to;

- » Current British Standards BS 9999 series.
- » Be easily accessible and finished to encourage everyday use.

Lifts and lift lobbies

Refer to [Vertical Transportation section](#).

Lifts and their lobbies occupy a significant portion of the core and require the following elements as part of their design;

- » Lifts ensure efficient people movement and sufficient for all building occupants/ the building in its entirety.
- » Critical to achieving a productive workplace.
- » Lobbies are important during emergencies, providing evacuation facilities for disabled people and secure access for fire-fighting personnel.
- » Security and fire strategy are integral to lift lobby design.
- » Floor by floor security is required and doors should open into the lobby.

Lifts and lobbies should be designed to the current and relevant British/ISO/EN standards and reviewed with local authorities fire and rescue to ensure maximum effectiveness is achieved.

Vertical Transportation

	SHELL & CORE	CAT A	CAT B & C
Lifts and Escalators	●		
Goods Lift	●		
Firefighting Lift	●		
Fire Evacuation	●		

Lifts and Escalators

SUSTAINABILITY

These need to be optimised for sustainability inc. energy efficiency with elements such as regenerative braking, minimising energy from standby, LED lighting and turning off lights and ventilation when stationary.

SHELL & CORE

The provision of vertical transportation systems in multi-storey office buildings is critical to their operation. These include: passenger lifts; firefighting lifts; evacuation lifts; goods lifts and escalators to be reviewed on a case-by-case basis.

Passenger lifts will meet the current BCO guide specification and performance requirements. These will include but not be limited to;

Lift calling management system to be included and linked to appropriate call out response team agreed between developer and GPA FM teams.

Provide an up-peak handling capacity of at least 12% of the design population in a five-minute period with 85% up, 10% down and 5% inter-floor traffic demand.

There should be the ability to interrogate the system remotely to obtain performance data, etc.

Provide an up-peak average waiting time across all floors served of no more than

25s. Average waiting times of up to 30s may be acceptable in cases where the average time to destination is 80s or fewer.

- » Provide an up-peak average time to destination across all floors served of no more than 90s. Average time to destination of up to 110s may be acceptable where the morning up-peak average waiting time is fewer than 25s.
- » Provide a 2-way handling capacity of at least 13% of the design population in a five-minute period with 45% up, 45% down and 10% inter-floor traffic demand. Where buildings offer cafe facilities in-house, assume this to be the case, a greater inter-floor allowance of 20% should be made with the commensurate reduction in up and down traffic.
- » Provide a two-way average waiting time across all floors served of no more than 40s.
- » For all traffic conditions the average car loading in any five minutes including scenic lifts should not be more than 80%, allowing 0.21m² of floor space per person.
- » Where not all lifts in a group serve all floors, care should be taken to check that lift performance remains acceptable to and from the specific floors with restricted lift service.

Goods Lift

SHELL & CORE

A minimum of 1 No. electric traction goods lift (between 2000 and 2500 kg) will be provided serving all floors including roof plant room and basement.

Refer to **Fire Engineering Annex - Fire Fighting Lifts.**

Architectural

BUILDING FORM		
	SHELL & CORE	
	CAT A	
	CAT B & C	
Space Configuration	●	
Occupancy Standards	●	
Core Elements	●	
Entrance and Reception	●	
External Spaces	●	
Vehicular Access, Cyclists and Parking	●	
Loading Bays and Building Management	●	
Grids	●	
Circulation	●	
ENVELOPE		>
FINISHES & FIT-OUT		>

Core Elements continued

SHELL & CORE

Washrooms

The requirement for WC provision is based on the occupancy of the space and is defined by the overall NIA and the anticipated density of occupation.

The relevant and current UK standard BS 6465-1:2006+A1:2009 calls for occupancy to be calculated on the normal peak use. Where WC cores are provided based on an occupation density of one person per 8m² or less, then services and structures etc. should be designed to allow the WC accommodation to be extended at a later date.

Washroom location

Washrooms should be located no more than 100m away from users, with a maximum travel distance of 40m for wheelchair users and to BS 8300 2018 guidance.

Gender neutral WCs

All sanitary provisions should be located off core areas to minimise business disruption on floorplates.

Gender neutral sanitary provisions should be provided throughout to promote inclusivity and sharing culture. Sanitary layout designs should allow reconversion back to traditional layouts with limited cost and infrastructure change where applicable.

Disabled WC provision

To current BCO guide specification, Building Regulations/Technical Handbooks & BS 8300-1:2018; BS 8300-2:2018.

Cubicle size

To British Standard and Building Regulations guide specification.

Shower provision

To current BCO guide specification and BREEAM requirements. WCs will be provided within shower accommodation, including facilities for Mobility Impaired Persons (MIP).

Cleaners' cupboards

To current BCO guide specification.

Architectural

BUILDING FORM		
	SHELL & CORE	CAT A B & C CAT
Space Configuration	●	
Occupancy Standards	●	
Core Elements	●	
Entrance and Reception	●	
External Spaces	●	
Vehicular Access, Cyclists and Parking	●	
Loading Bays and Building Management	●	
Grids	●	
Circulation	●	
ENVELOPE		>
FINISHES & FIT-OUT		>

Entrance and Reception

SHELL & CORE

The location of the main entrance is determined primarily by local conditions: street address; proximity to thoroughfares; other building entrances and flows through the general environment. Government buildings should be welcoming, light, bright places to encourage a more open, accessible, transparent ‘place’ whilst balancing security needs. The degree of openness and permeability will depend on the departments who occupy the building, however, the building should not inhibit future relaxation or enhancement of security measures.

The entrance area may include the following;

- » Concierge/reception
- » Security and security control
- » BS 8300 2018 compliant WC facility
- » Gender neutral WCs
- » Wayfinding
- » Departmental signage
- » Waiting/seating area(s)
- » Informal meeting space
- » Interconnection to vertical transportation
- » Amenity spaces
- » WiFi and connectivity
- » Local expression such as artwork and artefacts

Main entrance doors are to be sliding type (not rotating) to avoid separate entrances for MIP staff and visitors. Refer to Inclusive Design Standards.

Provide lobbies to the main building entrance to minimise heat loss to outside. Where practical allow a min. of 4 metres between the inner and outer doors (if the doors are too close, then both doors will be open at the same time).

External Spaces

SHELL & CORE

External spaces can affect the buildings that define them – particularly for government buildings preferred urban environments where green spaces are rare. The design of these spaces should consider shelter, shading, pollution dispersal and spacing to ensure that sunlight can reach the space itself and the surrounding buildings in accordance with the current BCO guide specification.

External spaces and terraces within the secure boundary should be configured to allow working in external environments, and include secure WiFi provision aligned to BREEAM, or other suitable guidance, to ensure coverage.

Vehicular Access, Cyclists and Parking

SHELL & CORE

Car parking provision at Government buildings will be minimal or none (dependant on location and the green travel plan), emphasis should be placed on cycle access and parking and related amenities.

Electric car use should be supported by bays, again minimal, with charging points.

Space for proper servicing of the building should be carefully considered as should taxi drop-off to current BCO guide specification.

In accordance with BS 8300-1:2018 (Clause 7.4.2), seek to provide accessible parking spaces, where parking exists.

Architectural

BUILDING FORM		
	SHELL & CORE	CAT A B & C
Space Configuration	●	
Occupancy Standards	●	
Core Elements	●	
Entrance and Reception	●	
External Spaces	●	
Vehicular Access, Cyclists and Parking	●	
Loading Bays and Building Management	●	
Grids	●	
Circulation	●	
ENVELOPE		>
FINISHES & FIT-OUT		>

Loading Bays and Building Management

SHELL & CORE

The loading bay area should be sized to suit the likely use of the building, this includes the number of users based on expected effective occupancy densities.

The local authority requirements for waste collection and recycling should be considered as part of the whole building operations and waste strategy to current BCO guide specification.

Provide a facilities management office which will contain the BMS head end; security control room which will contain the security monitoring equipment and the mail room.

Security requirements and procedures to be defined in accordance with **Physical Security Design Standards, Threat and Risk Assessment** and **Strategic Security Plan**.

Grids

SHELL & CORE

Planning grids

The planning grid is a means of co-ordinating components of the structure, fabric, services and finishes. This includes the column grid; mullion spacing; ceiling layout and ultimately partition grid. The planning grid supports flexibility and adaptability of the space in use over time.

A planning grid of 1.5 x 1.5m is preferred for new buildings.

Structural grids

These should follow through on the discipline of the planning grid, the structural grid should be a multiple of 1.5m. To maximize flexibility, it should be a multiple of 1.5m.

This should be provided in line with current BCO guide specification

Circulation

SHELL & CORE

Circulation to be full in compliance with Building Regulations and BS 8300 series.

Primary circulation

Primary circulation is the network of clear routes within the net internal area (NIA) connecting all points of entry and exit and providing access to all parts of the workplace area. A nominal width between 1.2-1.5m should be provided in all areas. For longer circulation routes on larger floor plates larger dimensions should be considered. **To be in accordance with our Inclusive Design Standards which supports this document.**

Secondary circulation

Secondary circulation is the space providing access for short distances within and around workspaces. This should be provided in line with current BCO guide specification.

Architectural

BUILDING FORM	>
ENVELOPE	<
	SHELL & CORE
	CAT A
	CAT B & C
Overview	●
FINISHES & FIT-OUT	>

ENVELOPE

Overview

SHELL & CORE

The building envelope acts as the interface between the internal controlled environment of an office and the variable climate outside. The façade and roof combine with the structure of the building and give the building its visual appearance.

As such, façade designs for new buildings and performance specifications must be developed in tandem with factors such as the visual perception, the building services strategy, security threats, acoustic requirements, the structural design and the cost.

The building envelope should minimise the buildings energy consumption.

The other key elements the building provider and/or developer needs to consider are as follows;

- » Façade types
- » Structural loads and interfaces
- » Water and airtightness
- » Thermal insulation¹
- » Solar control and light transmission
- » Acoustic attenuation
- » Fire separation
- » Fire strategy
- » Natural and smoke ventilation
- » Movements and tolerances
- » Materials and finishes
- » Design life
- » Cleaning and maintenance
- » Sustainability
- » Security
- » Wayleaves
- » Utility service impacts
- » Cost
- » Resilience infrastructure

Refurbishment projects will need to be considered on a site by site basis with the emphasis on;

- » Windows
- » Curtain walling
- » Walls
- » Roofs
- » Public realm
- » Canopies
- » Entrance accessibility
- » Façade maintenance
- » Security

For new or extensively refurbished buildings, a 'fabric-first' approach shall be taken to reduce the heat losses and gains through the building fabric. These should be consistent with an overall carbon reduction target of 50% below current Building Regulations. Fabric elements which have U values that align with the current Approved Document Part L will not be consistent with this approach. Any glazing to spaces which require mechanical cooling should have a g-value <0.3.

¹ New buildings or replacement facades are to have a maximum air permeability of 3m³/h/m²@50Pa

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

FINISHES AND FIT-OUT

Definitions

SHELL & CORE | CAT A | CAT B & C

Shell & Core

Shell & Core works cover the essential base structure and services of a building and generally cover communal areas such as main receptions, lobbies, lifts, stairwells and WCs.

Types of fit-out

Category A (CAT A)

Category A works extend central services out onto floor plates and provide a basis for CAT B works. New builds are generally provided to CAT A finish to improve marketability of a building.

Category B (CAT B)

Category B works provides bespoke CAT A provisions to align with occupier brand, business functions and performance.

Category C (CAT C)

Category C works provides loose items such as furniture, fixtures and fittings.

Main Reception

SHELL & CORE

Main reception finishes

Generally, as current BCO guide specification.

Floor finishes

- » Large format tile: 900 x 900mm, 1200 x 600mm, 1200 x 1200mm.
- » Flooring: natural stone or ceramic tiling.
- » Skirtings: ceramic tile or natural stone.
- » Ceramic tiling will conform to BS EN 14411:2016, EN ISO 10545-series.
- » Natural stone tiling will conform to BS EN 12057:2015 and BRE Information paper BRE IP 10/00, Flooring paving and setts.
- » Barrier matting to current & relevant BS8300 & BS 7953 standards.

Wall finishes

- » Feature panelling to class 0 flame spread standards.
- » Panelling will conform to BS 476 series and BS 6150:2019.
- » For Glass: Refer to [Standards and Requirements section.](#)

Ceiling finishes

- » Profiled painted plasterboard and/or Glass Reinforced Gypsum (GRG) feature ceiling with appropriate access and maintenance panels and environmental rating to allow access to building services.
- » Suspended ceilings will conform to the requirements of BS EN 13964:2014.

Reception desk

Reception desks will be sized appropriately for the number of people required to staff the desk including equipment to be located on the desk. They will comprise:

- » Desktop linoleum working plane
- » Space for printers, access card printers, web-cameras and signing-in books.
- » Space for controls comprising but not limited to: turnstile controls, blind controls, lighting controls, panic alarms.
- » Space for single monitor to allow CCTV images to be viewed
- » Sufficient power and data points
- » The ability to install a safety screen / sneeze guard as necessary

The reception desk to be fully compliant with the Equality Act 2010 and BS 8300 2018.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Stairs

SHELL & CORE

To current BCO guide specification, with;

Finishes

- » Non-slip floor finish, to be reviewed on a case-by-case basis.
- » Step nosing contrasts
- » PPC balustrade with stainless steel handrails.
- » Carpet or textile flooring will conform to the requirements of BS EN 1307:2014+A3:2018.

Wellness criteria: stair accessibility

The following requirements must be met for at least one common staircase:

- » Stairs are accessible to building occupants during all regular business hours.
- » Wayfinding signage and point-of-decision prompts are present to encourage stair use (at least one sign per lift bank).

Wellness criteria: stair promotion

In buildings of 2 to 4 floors, at least one common staircase must meet the following requirements:

- » Located within 7.5m (25ft) of the entrance to the building or the edge of its lobby.
- » Clearly visible from the main entrance and/or located before any lifts.

Standards and requirements

Stairs will be provided to comply with relevant Building Regulations, Technical Handbooks and BS 8300-1:2018; BS 8300-2:2018 Annex E.

Lighting to stairwells should be wall mounted to avoid lamp changing and / or servicing from ladders or platforms.

Polyester Powder Coated (PPC) will be to the requirements of BS EN 12206-1:2004, BS EN 13438:2013

Stainless steel will be to the requirements of BS EN 10296-1-2:2003; BS EN 10296-2:2005; BS EN 10297-1:2003 and BS EN 10297-2:2005.

Lift Cars and Lobbies

SHELL & CORE

Generally, to current BCO guide specification, with;

Finishes

- » Lobby and lift car floor: Ceramic tile/ natural stone, to match reception type and module size.
- » Ceiling: Painted plasterboard with metal tile to accessible zones for access to building services.

- » Fixtures: Internal hooks for protective sheeting/padding when used to carry goods.
- » Audio floor caller and braille buttons.

Lift architraves and door

- » Brushed finish stainless steel.
- » Ceramic tiling will conform to BS EN 14411:2016 and EN ISO 10545 series.
- » Natural stone tiling will conform to BS EN 12057:2015 and BRE Information paper BRE IP 10/00, Flooring paving and setts.
- » Lacquer panelling will conform to BS 476 series, BS 6150:2019.
- » Stainless steel will conform to BS EN 1008 series.
- » Suspended ceilings will conform to the requirements of BS EN 13964:2014.
- » For Glass: Refer to [Standards and requirements](#).

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

WC and Showers

SHELL & CORE | CAT A

WCs and showers will be provided in a variety of configurations and types to fulfill the needs of a modern workforce working smartly.

Generally, to current BCO guide specification, with addition of self-contained washrooms and supershowers. Washrooms are to have inclusivity design led entrances and be future proofed to convert back to standard sanitary design.

Floor finishes

Ceramic tiling with tiled skirting.

Wall finishes

Ceramic tiling to all wet areas with painted moisture resistant plasterboards in non-wet areas. Provide contrasting colour at dado height.

Ceiling finishes

Painted moisture resistant plasterboard with metal access panel (suitable for high humidity environment) building services access points.

Fixtures and finishes

Shower facilities should or may include the following:

- » WC cubicles – proprietary cubicles with SGL veneer doors, laminate dividers and duct panelling. Cubicles to include all ironmongery and WC roll holders in stainless steel finish.
- » White porcelain WCs with flushing arrangement to AECB water standard and flow rates.
- » White porcelain washbasin.
- » DocM packs with white porcelain ware, stainless-steel grab rails and emergency call alarm.
- » Brassware – infrared mixer taps, mains powered sensors, chrome finish and legionella testing facility.
- » Brassware – vanity top mounted soap dispenser, chrome finish.
- » Hand-dryers with full height splashback.
- » Shaver sockets to shower areas.
- » Hairdryers to shower areas.
- » Mirror to full width of vanity top with paper towel dispensers behind.

- » Waste bins below vanity top. Holes to be provided in top.
- » Coat hooks.
- » Air fresheners.
- » Space provided for sanitary bins.

Shower provisions and configurations to be reviewed on a building-by-building basis.

Non-inclusivity changes to standard showers to provide cubicles with glass etched doors and door hooks and trams to aid drainage, non-slip approach. Showers to be adjacent to changing areas.

Supershowers to be accessible to all and self-contained to provide full height room with space to change in private. Shower cubicle to be DocM compliant with tray and glass screen provided. Changing area to provide stool and wall hooks.

WCs and showers to comply with relevant Building Regulations/Technical Handbooks and BS 646-1-6.

Architectural

BUILDING FORM >

ENVELOPE >

FINISHES & FIT-OUT <

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Internal Doors and Ironmongery

SHELL & CORE | CAT A | CAT B & C

Interior Doors will be provided as follows:

Meeting rooms and offices

Full height, acoustic doorsets. (FSC/ PEFC sustainability sourced/trackable timber) – to meet acoustic levels of room environment. Doors to have drop down and perimeter acoustic seals to meet acoustic performance criteria and appropriate ironmongery to BS EN 1906 inc. kickplates/ doorstops/closers with HW lipping etc.

WC and circulation

HW Veneered. Fire rated as applicable for all doors.

Store rooms and back of house

Painted or Laminate finish. Fire rated as applicable to comply with relevant Building Regulations/Technical Handbooks.

Riser access

Painted or Laminate finish. Fire rated to relevant Building regulations/Technical Handbooks.

Lift lobbies

Glass. Fire rated as applicable.

Security

To meet appropriate security rating where required by occupying government departments.

Standards and requirements

- » Timber doors will conform to the requirements of BS EN 14351-2:2018 and BS EN 942:2007 and BS 8300:2018.
- » For fire rated doors, certified evidence will be provided in the form of a product conformity certificate, directly relevant fire test report or engineering assessment, that each door/door assembly/ doorset supplied will comply with the specified requirements for fire or smoke resistance if tested to BS 476-22:1987; BS EN 1634-1:2014+A1:2018; BS EN 1634-3:2004. Such certification must cover door and frame materials, glass and glazing materials and their installation, essential and ancillary ironmongery, hinges and seals.
- » Components, assemblies or sets will be marked to the relevant product standard and/or third party certification rating.
- » Laminates will conform to BS EN 438 series
- » Internal door frames will be fabricated to allow for wireways for security devices as necessary.
- » Door frame structures to be adequately designed and sized to manufacturer's recommendations.

Ironmongery

- » Ironmongery will be satin stainless steel finish and comply to relevant Building Regulations/Technical Handbooks & BS 8300-1:2018; BS 8300-2:2018
- » Ironmongery will be selected to match the shell and core specification
- » Ironmongery will conform to the requirements of BS EN 1527:2013.

Decoration

SHELL & CORE | CAT A | CAT B & C

Generally:

- » Core walls and drylining generally will be painted in durable matt, water based white emulsion.
- » Internal timber door frames and skirtings will be finished in durable white eggshell and provide adequate contrasts to aid current BS 8300 guidance.
- » Corner protection to be provided to vulnerable areas where trolleys may be used i.e. near goods delivery areas, mail room and service lobbies etc.

Feature painting

Feature painting to entire walls will be of a durable finish and selected from standard colour ranges to match department branding colours.

Internal decoration will conform to the requirements of BS 6150:2019.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Signage

SHELL & CORE | CAT A | CAT B & C

Statutory signage

Statutory signage will be provided to BS EN ISO 7010:2020. In front of house these will be stove enamelled or stainless steel finish.

Escape signage

Escape signage will be provided to comply with BS 5499-4; BS 5499-10:2014 and BS EN ISO 7010:2020 and be selected to match the format of the shell and core signage.

Departmental logo

The locations and presentation of departmental logos to be reviewed with occupants at design stages.

Wayfinding signage

Wayfinding signage will be two colour, laser cut acrylic wayfinding signage. Signage will be consistent throughout the building.

Feature manifestation and graphics

Feature manifestation will be BS 8300 for collision of glazed partitions. Feature to include organisational logo and local influence graphics. Design to be approved.

Feature graphics to drylined partitions.

Features to include, organisational logo and local influence graphics, design will be reviewed with occupants at design stages.

Standards and requirements

- » Signage will comply with the requirements of BS 559:2009.
- » Geometric shapes, colours and layout will be in accordance with current BS standard.
- » Design standard for mobility impaired persons (MIP) will be in accordance with BS 8300-1:2018; BS 8300-2:2018.

Outdoor Smoking Signage

CAT B & C

No smoking signage will be provided to statutory requirements and local authority recommendations. The signage should indicate:

- » A smoking and e-cigarette ban within 7.5m (or the maximum extent allowable by local codes) of all entrances, operable windows and building air intakes.
- » A smoking ban on all decks, patios, balconies, rooftops and other regularly occupied exterior building spaces.

- » The hazards of smoking, in all areas beyond 7.5m of the building entrances (if smoking is permitted in this areas). These signs are to be placed along all walkways with a distance of not more than 30m (100ft) between signs.

No smoking signage will be two colour, laser cut acrylic signage.

Cycle Racks

SHELL & CORE

Cycle racks to be provided to BCO specification. Quantities to be confirmed by local planning authority, racks should be located close by to showering and changing facilities, lockers and drying areas.

Where cycle racks are sited in an external environment, they will be under cover, with appropriate lighting. Location to be reviewed by and approved security assessment.

Racks will be galvanized to the requirements of BS EN ISO 1461:2009 or Polyester Powder Coated (PPC) to the requirements of BS EN 12206-1:2004, BS EN 13438:2013.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Suspended Ceilings

CAT A | CAT B & C

Ceiling types

CAT A ceilings provided by landlords will comply with GPA criteria in acoustics, performance, longevity and maintenance.

- » Suspended ceilings will conform to the requirements of BS EN 13964:2014.
- » Decoration will conform to the requirements of BS 6150:2019.

Feature open ceiling

Suspended acoustic baffle, open ceiling and moisture resistant ceilings (WC/shower – high humidity spaces) with sprayed soffit and services above.

Plasterboard ceiling

Painted MF plasterboard ceiling. Taped and jointed with paint finish.

Perforated acoustic plasterboard ceiling

Painted MF perforate plasterboard ceiling. Taped and jointed with paint finish.

Allowance to be made for jointing compound filling of perforations around ceiling mounted services and perimeters.

Breakout and collaboration areas

Painted MF plasterboard ceiling with feature lighting.

Refreshment Hub

Hygienic plain suspended ceiling tile system full accessible, reviewed on a case-by-case basis.

Meeting rooms

Subject to acoustic requirements of the room the CAT A ceiling may be modified during CAT B works.

Raised Access Flooring

CAT A | CAT B & C

Generally

- » Raised access floors will conform to the requirements of MOB PF2 PS/SPU or BS EN 12825:2001.
- » Concrete slabs will be dust sealed prior to pedestal installation.
- » Sandbag tests will be carried out to MOB PF2 PS/SPU to determine method of fixing pedestals.

Raised flooring types

SER/MER rooms

Heavy Grade, with integral antistatic vinyl finish.

Substrate to tiled floors

Interlocking Calcium sulphate raised floor substrate for tiled flooring.

Standards and requirements

- » CAT A raised access floors to be capable of being modified to accommodate CAT B fit out.
- » Provision and location of power and data access & cabling to be determined at CAT B fit out.
- » Hollow floors will conform to BS EN 13213:2001.
- » Raised access floor: Medium Grade. General office use.
- » For displacement plenum floors, stringers and gaskets will be included to meet floor air performance criteria. Floor diffuser outlets, with lockable air outlet.
- » Raised access floors to equipment rooms. Heavy grade with factory bonded anti-static flooring finish.

Additional requirements

- » Systems will be capable of accommodating bridging over floor void equipment as part of CAT B fit-out.
- » All to be earthed in accordance with electrical requirements.
- » Minimum floor zone of 150mm – including the thickness of the tile.
- » Appropriate fire stopping to be included under an approved fire strategy with local authority and fire and rescue.
- » Developer/landlord to provide an allowance on pedestals and flooring. Contribution to be confirmed.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Floor Finishes

CAT A | CAT B & C

Generally

- » Carpet tile: to office floorplates. Carpet to be heavy duty contract grade.
- » Carpet or textile flooring will conform to the requirements of BS EN 1307:2014+A3:2018; BS 8300 2018.

Types

Feature carpet tile

- » 500 x 500mm carpet tile. 80% of carpet area to be of a field colour CAT A specification and the remaining 20% contrasting colours as feature areas as part of the CAT B fit out.
- » Carpet to be heavy duty contract grade.

Rubber sheet flooring

Sheet rubber smooth texture with welded seams. Laid on plywood substrate.

Entrance spaces ceramic tiling /natural stone

- » Ceramic tile/Natural stone to match shell and core specification.
- » Sizes from: 900 x 900mm, 1200 x 600mm, 1200 x 1200mm.
- » All laid on interlocking raised floor substrate/screed.

Cafe spaces ceramic tiling

- » Large format, non-slip ceramic tiling. Sizes from: 600 x 600mm, 900 x 900mm, 600 x 300mm.
- » All laid on interlocking raised floor substrate/screed.

Refreshment Hub flooring

Non-slip PVC or vinyl with welded seams and self-coved skirting 100mm upstand to edges.

WCs and showers

- » Large format, non-slip ceramic tiling. Sizes from: 600 x 600mm, 600 x 300mm, 300 x 300mm.
- » All laid on interlocking raised floor substrate/screed.

Standards and requirements

- » Sheet vinyl flooring will conform to the requirements of BS EN ISO 10874:2012.
- » Carpet underlay will conform to BS EN 14499:2015.
- » Ceramic tiling will conform to BS EN 14411:2016, BS EN ISO 10545-2:2018 Natural stone tiling will conform to BS EN 12057:2015.
- » Plywood will conform to BS EN 314-2:1993 class 3 and BS EN 635-1:1995.

Skirtings

Types

Timber skirting

Painted MDF 100mm recessed skirting.

Skirtings to tiled floors

- » Ceramic tile/natural stone, 100mm high.
- » Joints in skirtings to align with floor grout joints.

Standards and requirements

- » MDF products will conform to BS EN 622 series.
- » Ceramic tiling will conform to BS EN 14411:2016; BS EN ISO 10545-2:2018.
- » Flooring screeds will comply to the requirements of BS 8204 series.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Partitions

SHELL & CORE | CAT A | CAT B & C

Types

Where possible glazed partitions should be used in order to allow penetration of daylight from perimeter office space into deep plan areas.

Plasterboard to meeting rooms

- » Plasterboard partitions. Slab to slab. Acoustic rating to meet acoustic section criteria.
- » Paint finish and recessed skirting.
- » Partitions to have deflection heads to accommodate building structural movement.
- » Partitions will be skim finished to receive decoration.
- » Partitions to include plywood strengthening to walls earmarked for AV and/or IT additions.

Plasterboard to semi enclosed spaces

- » Plasterboard partitions. Floor to ceiling. Acoustic rating to meet acoustic section criteria.
- » Paint finish and recessed skirting.
- » Partitions will be skim finished to receive decoration.
- » Provision of sound insulation above ceiling to stop sound transfer.

¾ Height plasterboard space dividers

- » Plasterboard partitions. Acoustic rating – N/A.
- » Construction to allow for internal steel stability structure bolted to structural slab
- » Paint finish and recessed skirting.
- » Partitions will be skim finished to receive decoration.

Double glazed partition to general meeting rooms

- » Double glazed partition system with PPC and/or anodized metal framing. Glass to glass joints to be dry gasket type. Glazed partitions to extend from floor to ceiling with drylined construction above and below to provide slab to slab acoustic separation.
- » Acoustic rating to meet acoustic section criteria.
- » Glazed partitions to have printed vinyl manifestation, to comply with relevant Building Regulations and/or Technical Handbooks.
- » Opacity and area of manifestations should be minimised to allow natural daylight to enter.

Single glazed partition to general meeting rooms

- » Single glazed partition system with PPC and/or anodized metal framing.
- » Glass to glass joints will be a dry gasket type.

- » Glazed partitions will extend from floor to ceiling with drylined construction above and below to provide slab to slab acoustic separation.
- » Acoustic rating to meet acoustic section criteria.
- » Glazed partitions to have printed vinyl manifestation, to comply with relevant Building Regulations and/or Technical Handbooks.
- » Opacity and area of manifestations should be minimised to allow natural daylight to enter.

Movable partitions/room dividers to meeting rooms

- » Movable stackable room dividers to meeting rooms will be top hung from ceiling track flush to the ceiling.
- » Ceiling tracks will be suspended from additional secondary steelwork as part of the CAT B Works as necessary.
- » Panels will be fixed via a 2-point suspension system and stack in a formed recess as part of the drylining works.
- » Panels will be finished both sides in acoustic fabric top and bottom with a magnetic writeable 1200mm high central band. Acoustic rating to meet acoustic section criteria.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Partitions continued

SHELL & CORE | CAT A | CAT B & C

Standards and requirements

- » Plasterboard partitions will conform to the requirements of BS 5234-1:1992; BS 5234-2:1992. Partitions will be medium strength grade to BS 5234-1:1992; BS 5234-2:1992. Consideration should be given to the use of cellulose gypsum board to increase thermal mass and robust building (BREEAM credits).
- » Workmanship to glazing will conform to the requirements of BS 6262-1:2017; BS 8000-0:2014.
- » Glass generally will conform to BS 952 series and relevant parts of:
 - » BS EN 572 series for basic soda lime silicate glass.
 - » BS EN 1096 series for coated glass.
 - » BS EN 1748-1 for borosilicate glass.
 - » BS EN 1748-2 for ceramic glass.
 - » BS EN 1863 series for heat strengthened soda lime silicate glass.
 - » BS EN 12150 & BS EN 12600 series for thermally toughened soda lime silicate safety glass.
 - » BS EN 12337 series for chemically strengthened soda lime silicate glass.

- » BS EN 13024 series for thermally toughened borosilicate safety glass.
- » BS EN ISO 12543 series for laminated glass and laminated safety glass.
- » MDF products will conform to BS EN 622 series.

Internal Blinds

CAT A | CAT B & C

Internal blinds to façades and atria

Glare control, manual roller blinds should be provided to external façades and building atria. Blinds will be located in perimeter plasterboard upstand/recess to ceiling. Blinds will include safety chains and provided with a manufacturer's guarantee to industry standards. Blinds should maximise glare control without blocking out daylight to minimise artificial lighting.

Types

Glare control to façade – CAT A

Normally provided at CAT A fit out:

- » Chain operated, manual roller blinds on integral, in a neutral colour. Blinds to cover extent of glazing and be sized to façade mullions.
- » Blinds to meet glare standards dependant on building location.

Privacy blinds – CAT B

Normally provided at CAT B fit out:

- » Manual control privacy blinds to meeting rooms, only where requested by departments. To be reviewed case-by-case.
- » Manual roller blinds or integral, in a neutral colour. Blinds to cover extent of glazing and be sized to glazing panel sizes.

Dim out blinds – CAT B

- » Dim out blinds, automated control – to areas where required and requested.
- » Neutral colour with electric operation. Blinds to cover extent of glazing and be sized to glazing panel sizes. Controls to be sited on panel with room controls.

Curtains to reflection rooms – CAT B+C

Full height fabric curtain on ceiling mounted metal track, where required.

Standards and requirements

- » Internal blinds will conform to the requirements of BS EN 13120:2009+A1:2014.
- » Curtains will conform to BS 5867-1:2004; BS 5867-2:2008.
- » Manual blinds will be fitted with safety chains.

Architectural

BUILDING FORM >

ENVELOPE >

FINISHES & FIT-OUT <

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Acoustic Security			
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Acoustic Wall Treatment

CAT B & C

Acoustic panelling

- » Acoustic wall panelling will be provided to meeting rooms, open meeting rooms and conference rooms.
- » Acoustic panelling will be applied to one full wall to control reverberation within the space. Panelling will be of a proprietary system sized to the room and be constructed with a concealed framing system with acoustic absorptive foam core and fabric wrapped to all visible faces. The fabric will be chosen from a standard range and will compliment the brand.

Acoustic tiles

- » Acoustic wall tiles will be applied to community spaces and quiet spaces.
- » Acoustic panelling will be formed from individual proprietary fabric wrapped tiles, chosen from a standard range and compliment the brand.

Acoustic - Security

Refer to **Security Annex** regarding speech intelligibility in cubicles / pods.

Magnetic Writeable Boards

CAT B & C

- » Magnetic writeable panels to meeting rooms and breakout spaces will be formed from proprietary magnetic writeable laminate bonded to a MDF base with PPC metal frame to perimeter. Boards will extend along the length of one wall of meeting spaces and be 1200mm high.
- » 'Write on me' vinyl graphics will be applied.
- » Boards will be cleanable with water based products to manufacture's recommendations.
- » Laminates will conform to BS EN 438 series.
- » MDF products will conform to BS EN 622 series.

Joinery

CAT B & C

Panelling

Hardwood (HW) veneer panelling
HW veneer panelling, will form internal linings to the front of conference suites, and include: HW acoustic door assemblies; HW veneer gravity hung boards with concealed lippings on all sides and solid HW skirtings. Veneers generally will be crown cut book matched, with doorsets in panelling systems will be finished in same veneer stock as adjacent panelling. Panelling will be finished in lacquer to meet surface spread of flame requirements to comply with relevant Building Regulations and/or Technical Handbooks.

Lacquer panelling

Lacquer panelling, will form internal linings to reception areas, comprising high build up lacquer panels sprayed on visible faces. Installations will include matching skirtings. Panelling to be finished to meet surface spread of flame requirements to comply with relevant Building Regulations and/or Technical Handbooks.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Joinery continued

CAT B & C

Refreshment Hub

Refreshment hub provision will vary dependant upon size and location within the building and may comprise:

- » Base and wall units with laminated doors, drawers and cabinets with stainless steel handles, heavy duty hinges and drawer runners.
- » 30mm thick solid surface worktops, with underslung 1½ bowl stainless steel sink. Machined drainer grooves and hole for mixer tap – to meet appropriate capacity and flows per workstation.

Print hubs

Print hubs may include:

- » Base and wall units with laminated doors, drawers and cabinets with stainless steel handles and heavy duty hinges and drawer runners.
- » Desktop linoleum work surface.
- » Cut-outs and receptacles for recycled paper.
- » Vinyl applied graphic icons.
- » Wall mounted bulletin boards.
- » Receptacles for mail drop.

Wall fixed shelving

HW veneered cantilevered wall shelving, with dividers to accommodate books, display artefacts.

4No shelves 300mm deep x 2500mm long.

Refreshment hub bench table

High bench table formed from factory bonded laminate finished plywood 50mm thick. Table formed from solid sides and top in a goal post arrangement with stiffeners below.

Space dividers

1200mm high space dividers formed from a top rail and vertical uprights formed from painted timber. Dividers to include all necessary fixings for stability. Avoid use wherever possible.

Banquette seating booths

Banquette seating booths comprising two 2-seater banquette seats facing across a fixed rectangular table. Seating to be fully upholstered with high backs. Stain resistant fabrics to be used. Dividers between booths to be formed in painted or laminated joinery with a joinery dropped ceiling element to create booth enclosure. Power for screen, laptop and charging facilities to be provided.

Coat cupboards

Coat cupboards will comprise:

- » Full height units with laminated doors and applied graphics.
- » Hanging rails with hangers.

Architectural

BUILDING FORM	>		
ENVELOPE	>		
FINISHES & FIT-OUT	<		
	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Joinery continued

CAT B & C

Standards and requirements

Joinery will conform to the requirements of:

- » BS EN 942:2007; BS 1186-2:1988; BS 1186-3:1990.
- » BS EN 942:2007.
- » BS EN 1313-1:2010; BS EN 1313-2:1999.
- » Visible hardwood in finished joinery will be J2 class to BS EN 942:2007.
- » Laminates will conform to BS EN 438 series.
- » MDF products will conform to BS EN 622 series.
- » Solid surface materials will conform to BS EN ISO 19712-1:2013; BS EN ISO 19712-2:2013; BS EN ISO 19712-3:2013.
- » Refer to [Sustainability](#) section for further requirements on materials.

Additional requirements

Refreshment hub

Refreshment hub provisions may also include:

- » Tiled splash backs.
- » LED concealed lighting to base of wall units.
- » Cafe mixer tap, chrome finish.
- » Wheelchair accessible facilities.
- » Boiling and cold water tap with drainer and beneath counter equipment.
- » Built in dishwasher.
- » Built in fridges.
- » All white good A+++ rated. Frost Free.
- » FM own white goods, not departments.
- » Microwaves.
- » Built in waste receptacles for general waste, recycling.
- » Provide hand towel dispenser, crockery and cutlery.

Print and copy points

Print and copy points may also include:

- » Extract provision.
- » Data points for potential printing machine use.
- » Document shredder.

Feature Lighting

CAT B & C

The design process will identify areas which merit feature lighting. These areas will be reviewed and approved on a case-by-case basis.

Feature light fitting to quiet rooms

Suspended circular pendant fitting with opal diffuser. LED lamp source.

Feature light fitting to project rooms

Suspended linear luminaire to be positioned over rectangular tables. LED lamp source.

Feature light fitting to cafe areas

Suspended circular pendant fitting. LED lamp source.

Feature light fitting to breakout area

Suspended circular pendant fitting. LED lamp source.

Lighting to conform to relevant standards noted for office environments. Refer to [MEP – Lighting Installation](#) for reference.

Architectural

BUILDING FORM >

ENVELOPE >

FINISHES & FIT-OUT <

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Additional Spaces

CAT B & C

Furniture/facilities store

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#).
- » **Wall finishes:** Painted wall finish to clause [General decoration](#)
- » **Ceilings:** None
- » **Fixtures:** None
- » **Furniture and loose items:** None

Mail room

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#).
- » **Wall finishes:** Painted wall finish to clause [General decoration](#)
- » **Ceilings:** CAT A suspended ceiling.
- » **Fixtures:** WiFi; blinds.
- » **Furniture and loose items:** Heavy duty racking, desking/surface area, task chair and lockable storage units.

Operational staff welfare and FM room

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#).
- » **Wall finishes:** Painted wall finish to clause [General decoration](#).

- » **Ceilings:** CAT A suspended ceiling.
- » **Fixtures:** WiFi connectivity to support BMS; phone; blinds.
- » **Furniture and loose items:** Workstation, task chairs, soft seating, coffee table, lockable storage cabinets, low level storage unit and fridge.

FM storage

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#)
- » **Wall finishes:** Painted wall finish to clause [General decoration](#).
- » **Ceilings:** CAT A suspended ceiling.
- » **Fixtures:** None.
- » **Furniture and loose items:** Storage Cabinets with hinge doors, drawer units and heavy duty racking.

Central cleaners' store

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#).
- » **Wall finishes:** Painted wall finish to clause [General decoration](#).
- » **Ceilings:** CAT A suspended ceiling.
- » **Fixtures:** Cleaners' sink.
- » **Furniture and loose items:** Heavy duty racking.

Store rooms

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#).
- » **Wall finishes:** Painted wall finish to clause [General decoration](#).
- » **Ceilings:** None.
- » **Fixtures:** None.
- » **Furniture and loose items:** Heavy duty racking.

Drying room

- » **Floor finishes:** Sheet rubber finish to clause [Rubber sheet flooring](#).
- » **Wall finishes:** Painted wall finish to clause [General decoration](#).
- » **Ceilings:** CAT A suspended ceiling.
- » **Fixtures:** Towel rails.
- » **Furniture and loose items:** One locker provided per six cycle racks. Refer to **Government Hubs Healthy Building Guide**.

Architectural

BUILDING FORM	>
ENVELOPE	>
FINISHES & FIT-OUT	<

	SHELL & CORE	CAT A	CAT B & C
Definitions	●	●	●
Main Reception	●		
Stairs	●		
Lift Cars and Lobbies	●		
WCs & Showers	●	●	
Internal Doors & Ironmongery	●	●	●
Decoration	●	●	●
Signage	●	●	●
Outdoor Smoking Signage			●
Cycle Racks	●		
Suspended Ceilings		●	●
Raised Access Flooring		●	●
Floor Finishes & Skirting		●	●
Partitions	●	●	●
Internal Blinds		●	●
Acoustic Wall Treatment			●
Magnetic Writeable Boards			●
Joinery			●
Feature Lighting			●
Additional Spaces			●
Furniture			●

Furniture

CAT C

The [Crown Commercial Service \(CCS\) furniture agreement RM6119](#) is the default procurement route to market, with furniture requirements aligning to those identified as particular to this design guide within the CCS specification.

Specifications for Furniture, Fixtures and Equipment (FFE) are set out in the Government Hubs FFE Specification.

Standards and requirements

Furniture will comply to the requirements of the Inclusive Design Standards and the following standards:

- » **BS EN 1021-1:2014:** Furniture. Assessment of the ignitability of upholstered furniture. Ignition source: smouldering cigarette.
- » **BS EN 1335-1:2000:** Office furniture. Office work chair. Dimensions. Determination of dimensions.
- » **BS EN 1335-2:2018:** Office furniture. Office work chair. Safety requirements.
- » **BS EN 16139:2013:** Strength, durability and safety. Requirements for non-domestic seating.

- » **BS EN 12529:1999:** Castors and wheels. Castors for furniture. Castors for swivel chairs. Requirements.
- » **BS EN 14465:2003:** Textiles. Upholstery fabrics. Specifications and methods of test.
- » **BS EN 16139:2013:** Furniture. Strength, durability and safety. Requirements for non-domestic seating.
- » **BS 5459-2:2000+A2:2008:** Specification for performance requirements and tests for office furniture.
- » **BS 5852:2006:** Fire Tests for Furniture – Part 2: Methods of Test for the Ignitability of Upholstered Composites for Seating by Flaming Sources – Remains Current.
- » **BS EN ISO 9241-5:1999:** Ergonomic requirements for office work with visual display terminals (VDTs). Workstation layout and postural requirements.
- » **BS EN 16139:2013:** Office furniture – Visitors chairs.
- » **BS EN 527-1:2011:** Office furniture. Work tables and desks – Dimensions.
- » **BS EN 527-2:2016+A1:2019:** Office furniture. Work tables and desks. Mechanical safety.
- » **BS EN 527-3:2003:** Office furniture. Work tables and desks. Methods of test for the determination of the stability and the mechanical strength of the structure.
- » **BS EN 14074:2004:** Office furniture. Tables and desks and storage furniture. Test methods for the determination of strength and durability of moving parts.
- » **BS EN 15338:2007+A1:2010:** Hardware for furniture. Strength and durability of extension elements and their components.
- » **BS EN 15372:2016:** Furniture. Strength, durability and safety. Requirements for non-domestic tables.

Acoustics

THE ACOUSTIC ENVIRONMENT

	SHELL & CORE	CAT A	CAT B & C
Finishes	●		
Internal Sound Insulation	●	●	●
Partitioning Performance			●
External Noise Intrusion	●	●	●
Building Services Noise to Internal Areas	●	●	●
Building Services Noise to External Areas	●		
Emergency and Standby Plant	●		
Vibration	●		

THE ACOUSTIC ENVIRONMENT

External noise surveys to be undertaken in line with current BS/BCO guidance. Surveys to provide a baseline measure to aid internal acoustic analysis for noise sensitivity and background noise measures. Full octave band measurements should be recorded.

Finishes

SHELL & CORE | CAT A | CAT B & C

Acoustically absorbent Class A ceilings (ref: BS EN ISO 11654:1997) to cover area equal to the floor area in open plan spaces with plasterboard margins. Room height to be no greater than 3m.

Where exposed soffits are used additional absorption will be required.

Carpeted floors having good sound-absorbent properties and are a desirable floor finish to control impact noise, such as footfall.

Reverberation time limit criteria are presented as an average of the 500Hz, 1kHz and 2kHz octave band centre frequencies.

Location	Reverberation Time Limit (seconds)
Task areas	1.0
Reception area	1.5
WCs	1.5
Other non-critical spaces	Not applicable

Internal Sound Insulation

SHELL & CORE | CAT A | CAT B & C

- » Sound level difference between floor to floor or demise to demise should be at least 45dB (S&C) or 48dB (if fitted to CAT A) and capable of being upgraded at CAT B to at least 53dB without affecting warranties.
- » Flanking transmission – 45 dB Dnf,w with potential to be upgraded.

To meet current and appropriate BCO/BS/ISO/EN standards for acoustic specifications.

Acoustics

THE ACOUSTIC ENVIRONMENT

	SHELL & CORE	CAT A	CAT B & C
Finishes	●		
Internal Sound Insulation	●	●	●
Partitioning Performance			●
External Noise Intrusion	●	●	●
Building Services Noise to Internal Areas	●	●	●
Building Services Noise to External Areas	●		
Emergency and Standby Plant	●		
Vibration	●		

Partitioning Performance

CAT B & C

Room	To room	Partition sound dB R	Approximate dB MSLD	Subjective privacy for normal speech levels
Telepresence	Meeting	58 Wall	51	Inaudible
Confidential/secure spaces	All other room types	58 Wall	51	Inaudible
Video conference	Video conference /meeting /cellular office	58 Wall	51	Inaudible
Meeting/cellular office	Meeting/cellular office	58 Wall	47	Upper limit of audible, mostly unintelligible private borderline inaudible
Meeting	Meeting	56 Movable wall	43	Audible, mostly unintelligible, private
Telepresence	Circulation	52 Wall 41 Door	41	Audible, mostly unintelligible, private
Video conference	Circulation/ open plan office/ breakout areas	48 Wall/office front 38 door	36	Audible, mostly unintelligible, private
Meeting/cellular office	Circulation/ open plan office/ breakout areas	48 Wall/office front 38 door	36	Audible, mostly unintelligible, private

To attain the required sound insulation, between adjacent cellular spaces and meeting rooms, partitions rated 52 to 58 dB Rw must be constructed from slab to structural soffit.

With the proposed double glazed partition system to office fronts, it is not expected to be practical to run the partition from slab to soffit, as the interface with the suspended ceiling and raised access floor would be problematic. As a result, acoustic void barriers need to be included in the ceiling and floor void above all glazed office fronts. It is recommended that these should be installed such that the ceiling line is broken at the head of the partition to minimise noise flanking via this route. The ceiling and floor void barrier should attain the following specification:

- » **Weighted sound reduction index of at least 48dB Rw:** This can be attained with two void barriers spaced by 100 mm, the first made from a foil faced rockfibre insulation with central heavy membrane to give 18kg/m² total sufficient mass. The second barrier can be a single vertical hung barrier circa 40mm thick to give a total of 10 kg/m² total.

Acoustics

THE ACOUSTIC ENVIRONMENT

	SHELL & CORE	CAT A	CAT B & C
Finishes	●		
Internal Sound Insulation	●	●	●
Partitioning Performance			●
External Noise Intrusion	●	●	●
Building Services Noise to Internal Areas	●	●	●
Building Services Noise to External Areas	●		
Emergency and Standby Plant	●		
Vibration	●		

Partitioning Performance

CAT B & C

Minimum Weighted Sound Reduction Index dB _{Rw}	Example Partition Construction
58	2 x 12.5mm high density plasterboard (e.g. Soundbloc) each side of 70 mm acoustic stud (e.g. British Gypsum 'AcouStuds'), 25 mm Isowool 1200 in cavity with a total nominal partition thickness of 122mm.
56 Movable wall	Movable wall sound insulation inclusive of panel head track and drop seals. Typically a side stacking, composite, acoustically specified, movable wall system with manually operated seals would be suitable such as the Accordial Premierwall or equivalent.
54	2 x 15mm high density plasterboard (e.g. Soundbloc) either side of a 70mm metal stud with 25mm Isowool 1200 in cavity.
52	2 x 15mm high density plasterboard (e.g. Soundbloc) either side of a 70mm metal stud with 25mm Isowool 1200 in cavity.
48 Glazed meeting /office front	Double glazed office front system with wide spaced frame to hold 1 x 2mm glass and 1 x 12.8mm laminated glass separated by at least a 62mm cavity such as the Optima Revolution 97 or 2 x 12.5mm of standard density wallboard either side of a 70mm metal stud with 25mm insulation in the cavity.
41 door	Solid core acoustic doorset inclusive of substantial frame and seals, typically 41mm thick solid timber door and rebated frame including mechanical drop down threshold seals such as the Huet Club 39 Medium Performance Timber Doorsets.
38 door	Solid core acoustic doorset inclusive of frames and seals. Likely to include full perimeter acoustic seals and mechanical threshold.

Examples of partitioning construction to meet partition acoustic ratings.

Note that these examples are to achieve acoustic performances only and security considerations may also need to be taken into account.

External Noise Intrusion

SHELL & CORE | CAT A | CAT B & C

Internal ambient noise levels are influenced by external noise ingress, predominantly from road traffic, and by noise from within the building, such as from building services.

The following levels will be achieved within the various spaces:

Space	Indoor Ambient Noise Level Design Range L _{Aeq T} (dB)
Boardroom	35
Meeting rooms	40
Open plan office	45
Circulation/entrance lobby	45
WCs	50

Acoustics

THE ACOUSTIC ENVIRONMENT

	SHELL & CORE	CAT A	CAT B & C
Finishes	●		
Internal Sound Insulation	●	●	●
Partitioning Performance			●
External Noise Intrusion	●	●	●
Building Services Noise to Internal Areas	●	●	●
Building Services Noise to External Areas	●		
Emergency and Standby Plant	●		
Vibration	●		

External Noise Intrusion continued

SHELL & CORE | CAT A | CAT B & C

In addition, LA_{max} (fast) noise ingress levels should not normally exceed 55 dBA in open plan and/or speculative offices or 50 dBA in cellular offices. In the case of naturally ventilated buildings, it may be appropriate and/or necessary to accept higher external noise intrusion levels than shown above (e.g. +5 dB relaxation in maximum ventilation mode provided occupants have the choice). Rain noise should be controlled so it does not exceed 60 dB LA_{eq} during heavy rainfall (as defined within BS EN ISO 140-18:2006).

External noise criteria

As per DS/EHO requirements, noise levels at the boundary of the site are not to be increased. Levels to be determined by an ambient noise survey and tested for compliance on completion. An allowance to be made for tenants plant.

Existing buildings will be required to demonstrate compliance with the above criteria.

To current and appropriate BCO guide specification and BS/ISO/EN Standards.

Building Services Noise to Internal Areas

SHELL & CORE | CAT A | CAT B & C

To current and appropriate BCO guide specification and BS /ISO /EN Standards.

Services should be designed to accommodate partitioning on an agreed planning grid.

Building services should be controlled to meet the following ratings:

Space	Building Services Noise Limits
Conference room	NR35
Meeting rooms	NR35
Cellular offices (huddle/study/informal meeting)	NR35
Open plan office	NR40
Circulation/entrance lobbie	NR40
WCs	NR45
Loading bays/underground car parks	NR55

Building Services Noise to External Areas

SHELL & CORE

To meet BS 4142:2014 guidance and any tenant or local authority requirements typically based on existing measured background noise levels.

Emergency and Standby Plant

SHELL & CORE

To meet BS 4142:2014 guidance and any tenant or local authority requirements.

Vibration

SHELL & CORE

Vibration transfer from building services plant to internal areas should not be more than 0.01 m/s² peak acceleration (based on W_b weighting as defined in Clause 3.3 of BS 6472-1: 2008).

Vibration transfer from intermittent sources, such as underground trains, to internal areas should not lead to re-radiated noise level in occupied cellular offices and meeting rooms of more than 45 dB LA_{max} (fast) or 50 dB LA_{max} (fast) for open plan offices.

Lift and escalator noise and vibration criteria, including within the lift car, lift lobbies and adjacent office areas – should be controlled to meet the requirements detailed within [Vertical Transportation](#).

Structures

	SHELL & CORE	CAT A	CAT B & C
Structural Systems	●		
Vibration	●		
Robustness & Security	●		

Structural Systems

SHELL & CORE

The structure is the integral asset of the building. The choice of structural system for a building will be influenced by many factors including site location and constraints, building form, planning and structural grids, loading requirements, budget, occupier flexibility and sustainability issues.

Loadings

Historically buildings have been designed for far higher loadings than regulations require and beyond what they experience in practice. This over specification has become the norm based on a perception in the market place that this provides a degree of flexibility. Generally, a loading capacity of 2.5 + 1.0 kN/m² however, reference must be made to the proposed use of the floorplate.

Loading allowances

The standard allowances for imposed load should be:

- » General area: A minimum of 2.5 kN/m² for floors above ground floor and;
- » 3.0 kN/m² at, or below, ground floor level (refer to BS EN 1991-1-1:2002 and the UK National Annex).

- » Higher load area: It is recommended that provision of a higher loaded area is made for storage and/or IT purposes: 7.5 kN/m² over around 5% of each potentially sub-lettable floor area and not in primary circulation routes. Final locations should be agreed with the design team.
- » Demountable partitions: 0.5-1.2 kN/m² depending on the self-weight of the partition used (refer to BS EN 1991-1-1:2002 and the UK National Annex).
- » Where the partition material is not known, a load of 1.0 kN/m² should be used.

The standard allowances for permanent load should be:

- » Raised floors, ceiling and building services equipment: 0.85kN/m² – consideration of actual materials proposed and the layout of building, services may increase or reduce this.

Imposed loading allowances for other areas typically used in office developments are:

- » Car parking: 2.5 kN/m².
- » Loading bays: 5.0 kN/m² to 10.0 kN/m² depending on vehicle capacity.
- » Plant room loading: 7.5 kN/m² (subject to specific loading requirements).
- » Retail: 4.0 kN/m².

(Refer to BS EN 1991-1-1:2002 and the UK National Annex.)

Some areas may require project specific considerations, these include;

- » Façade systems.
- » Heavy partitions.
- » Building maintenance units (bmus).
- » Heavy plant room items such as water tanks.
- » Transformers.
- » Heavy storage.
- » Fire engine access.
- » Landscaping.

The preparation of loading plans to illustrate the specification for the permanent and imposed loads for inclusion in the record drawing set. It is useful in understanding the assumptions made in the original design when considering a change of use of the building fit-out, temporary imposed loads or re-use of the foundations in the future.

Frame and materials

Office buildings will be formed generally from a combination of steel, concrete (reinforced and/or post-tensioned) and in some cases timber frames.

Structures

	SHELL & CORE	CAT A	CAT B & C
Structural Systems	●		
Vibration	●		
Robustness & Security	●		

Structural Systems continued SHELL & CORE

The building super-structure comprises generally an internal stability core and surrounding frame. The core usually stabilises the building using concrete and/or timber walls or steel braced frames as well as containing lifts, stairs and service risers. In some cases, the perimeter or internal vertical load bearing structure can also be used as frames to provide lateral stability in lieu of the core.

The lateral stability of the structure can have a major influence on the design and should take into account various construction techniques such as slip forming, where the walls must be shaped to allow it to free – stand prior to construction of the floors.

Previous site uses

Some sites, city centre ones in particular, can be affected by archaeological remains and previous usage. Avoiding or accommodating areas of special interest can impact the structural solution, especially the foundations. However, existing structures will often have removed any strata that might contain items of archaeological interest. A geotechnical desk study, undertaken in the early stages of the design process, should outline any potential archaeological or contamination issues on the site.

Flexibility and future adaptability

A clear strategy for flexibility and future adaptability of the structure should be developed. Depending on the structural framing and materials chosen some changes can be accommodated more easily than others. It is therefore important to test the viability of future changes early in the design process.

Future adaptability should be defined in the structural brief, for example:

- » New (service) openings
- » Internal accommodation stairs
- » Risers
- » Infilling
- » Staircases
- » Lifts
- » Extended service risers
- » Infill of any atria

These are to be agreed and clearly identified as part of the structural brief and structural design report.

Deflections and tolerances

The overall dimension of structural zones, and all non-structural elements and finishes connected or applied to the building frame, should be detailed to accommodate:

- » Permanent load deflections.
- » Setting out and constructional tolerances for the building structure.
- » Building frame deflections due to design criteria arising from the lateral forces applied to a building which is specific to its particular location

A clear set of interface requirements between the structure and those connecting elements which require specific movement or tolerance criteria should be identified.

These are likely to cover elements such as:

- » Lift equipment – pit provision, guide rails, static and dynamic loads
- » Escalators and travellers
- » Building maintenance units (BMUs) such as cleaning cradles or moving gantries
- » Envelope and cladding
- » Internal partitions

To reduce the deflection of any structural element of a frame, whether it is in steel or concrete, its stiffness or rigidity has to be enhanced. This will result in strengthening of the section and also an increase in the size or weight of the construction material, hence increasing its cost.

Structures

	SHELL & CORE	CAT A	CAT B & C
Structural Systems	●		
Vibration	●		
Robustness & Security	●		

Vibration

SHELL & CORE

Cause and effect

The building structure will be subjected to a number of actions that cause vibration. These can be internal such as footfall, mechanical plant and operation of equipment, or external, such as road traffic, under or over ground railways and air traffic.

The primary source of internal vibration tends to be footfall; acceptable criteria for this is subjective and will depend on the type and quality of office space being considered. External vibration sources need to be assessed using specialist advice; this will normally begin with a vibration survey.

Footfall-induced vibration tends to be significant in lightweight, medium and long span floors. Particular care should be given to the performance criteria of the building with sensitive uses, to be considered and evaluated to ensure that movement is fit for purpose.

Values

Recommended multiplying factors (response factors) provided by the SCI Guide P354 are:

Place	Multiplying factor for exposure
Office	8
Areas sensitive to vibration	4

The values proposed by the SCI have been accepted as best practice for a number of years giving a good balance between floor performance and structural economy. This has led some designers to move towards providing a greater floor performance, or lower the multiplying factor, for a typical office; this has dropped to six in many cases.

This action will most probably increase the cost of the floor structure and needs to be considered carefully with reference to the building's use. There are many existing buildings designed to eight or more which have performed satisfactorily and continue to do so without any adverse comments.

Reducing vibration

In order to mitigate other sources of internal vibration it is often necessary to install plant, particularly larger items such as AHUs on anti-vibration mounts. The requirement will depend on many factors such as the mass and stiffness of plant room floor, the running speed and size of the plant and the proximity to office space. All plant with oscillating elements should be isolated from the building structure.

Robustness and Security

SHELL & CORE

Building should be design as robust structures to avoid disproportionate collapse. These requirements are set out in the Building Regulations and Eurocodes to ensure that a minimum degree of robustness is provided in all buildings

The primary approach to avoid the disproportionate collapse of buildings is to provide effective horizontal and vertical tying of the structural frame elements to achieve a level of inherent robustness. Where tying provisions cannot be met the structure must be verified by alternative load paths or through the design of key elements.

Building Regulations also require that certain offices, depending upon the number of storeys, occupancy and floor area, will need to be assessed for abnormal hazards. They must be designed for those which may be reasonably foreseen during the life of the building – for example being hit by a vehicle.

Certain buildings may require a specialist security or threat assessment to be carried out which may have further implications for the structural design of the building, this may impact on abnormal and/or adverse loadings which may require additional key elements and detailed analysis for onerous conditions.

Contact Us

For queries regarding the Architectural Technical Annex please contact: designguide@gpa.gov.uk

For smarter working queries please contact the smarter working team on gpasmartworkingqueries@gpa.gov.uk

