BRITISH
COUNCIL
for
OFFICES

BCO GUIDE 2000

Best practice in the specification for offices

Contents

President's introduction

Since its launch in 1994 the BCO Guide has become the accepted industry standard through providing clear and concise guidance for the specification of offices. Specification 2000 has not only updated the guide but also expanded the areas where advice is offered and I feel certain it will prove to be of value to a wider readership. I am delighted to be able to recommend it to you.

The objectives of the BCO are:

- to understand the changing nature of work and the way that business locates, uses and manages workspace
- to understand the investment and development issues that affect the provision of workspace
- to understand the urban system within which workplace locations feature as prime generators
- to understand workplace design and construction issues

These objectives have influenced the manner in which the guide has been produced and the eventual content of the individual sections.

The BCO Guide to Best Practice in the specification for offices is currently recognised in the market place as representing good practice in the procurement of commercial office workspace. It is not a prescriptive specification, but rather a document of its time that seeks to recognise the key elements in a complex supply chain.

The many members who have worked so diligently to produce the Guide are listed at the end of this document.

I would like to thank them all for their invaluable contribution in, again, establishing a recognised and authoritative yardstick for our industry that will be of benefit to all those involved in the procurement, and the occupation, of commercial office space.

Chris Strickland
President of the British Council for Offices
October 2000

Editorial

The Year 2000 Guide to Best Practice

The Guide to Best Practice was first published in 1994 as a reaction to the constantly rising levels of specification in the design and procurement of offices experienced in the preceding decade, and which was recognised as being excessive and wasteful of resources.

The Guide quickly became a document used by clients and their professional teams in deciding the level of specification to be adopted, and to that extent it has achieved its objective.

The second edition, produced in 1997, reflected some of the changes that had taken place in the preceding three years; in particular the growing awareness of environmental issues and their influence on the design of the workplace.

This third edition of the Guide covers a broader spectrum of criteria than in the previous editions. It recognises that, as an organisation, the BCO has a greater pool of expertise to draw on in order to decide what represents current best practice.

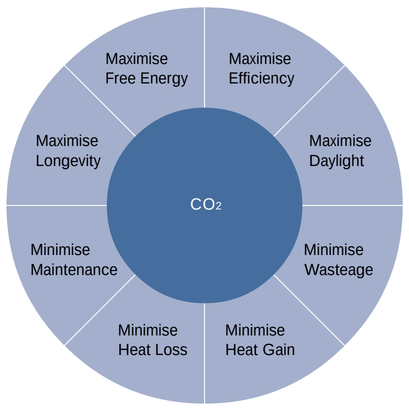
Offices, whether located in business parks or in urban areas, share many common key characteristics. Where there are differences, however, these have been clearly identified.

There are four issues that we have highlighted which have influenced our collective approach:

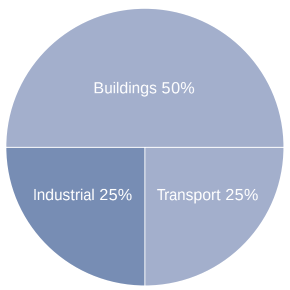
(1) Sustainability and sustainable development

The BCO has been at the forefront in ensuring that the membership, and a wider audience, is made aware of the implications of the 1997 Kyoto Protocol. Under this Protocol, developed countries committed to achieve reductions in their emissions of greenhouse gasses by an average of 5.2% in the period 2008 to 2012. The UK Government has a manifesto commitment to reduce CO_2 emissions to 20% below 1990 levels by 2010.

Measures to reduce CO_2 emissions



Energy Use



Given that buildings are directly responsible for approximately 50% of CO_2 emissions, and indirectly for another 25% through transport and materials manufacturing, the construction industry has a large part to play.

The implications of sustainability are examined in this Guide and key reference sources are identified.

The BRE and Forum for the Future have reviewed each section and the Guide now includes many valuable pointers to current best practices in sustainable design and procurement.

(2) Recognising the role of the occupier, the end user

In 1998, the BCO adopted the theme 'Connecting property to business' and, in preparing this document, a deliberate effort has been made to approach the procurement of commercial workspace with the end user in mind.

Representatives of major space occupiers contributed to the Guide. Their aspirations have been reflected in the text.

Inadequate client briefing to the procurement team on the desired outcome of the project can, all too easily, lead to an unsatisfactory and acrimonious contractual relationship, and the Guide to Best Practice now establishes an obligation on all the parties to establish a clear brief at the outset.

The intention of this document is to help the client make informed decisions in establishing a brief, and to evaluate advice given by their many advisers.

(3) New ideas and new methods

In 1998, the Egan Report 'Rethinking Construction' sought to create a new mind set for the whole industry on what might be achievable in terms of unit cost, construction time and construction quality.

http://www.construction.detr.gov.uk/cis/rethink/index.htm

The Guide recognises that substantial benefits in procurement time and cost can be achieved by:

- Establishing accepted industry performance criteria for the building fabric and for the engineering services
- Encouraging the use of standard components, standard design solutions for repetitive detail and repeating proven technical solutions
- Working with clients and occupiers to agree whole life cost/value parameters
- Educating clients that higher design quality does not necessarily mean greater complexity or cost
- Educating investment funds that their funding criteria can lead to over-specification and to user dissatisfaction.

(4) Productivity

It is a statement of the obvious that contented staff made a difference to bottom line business performance. But with staff costs representing as much as 75-80% of operational costs, it is not surprising that business is increasingly focusing on the importance of maximising staff productivity.

There are a number of key motivators:

- The recognition of the impact that the quality of the internal environment can have on staff comfort, satisfaction and productivity
- The wish to provide flexible spaces and settings to support effective team work
- The wish to intensify the use of space without adversely affecting staff performance

The realisation of productive working environments has always been an implicit goal of the BCO Guide to Best Practice in the Specification of Offices. With this revision comes the opportunity to address these issues explicitly and give guidance to those responsible for specifying offices on some of the measures that can be taken to enhance office productivity.

We have therefore chosen to make productivity a theme which runs through the document. Where appropriate, under each section you will find a discussion of issues relating to productivity and pointers to achieving good practice.

'Creating the Productive Workplace' SPON, 2000

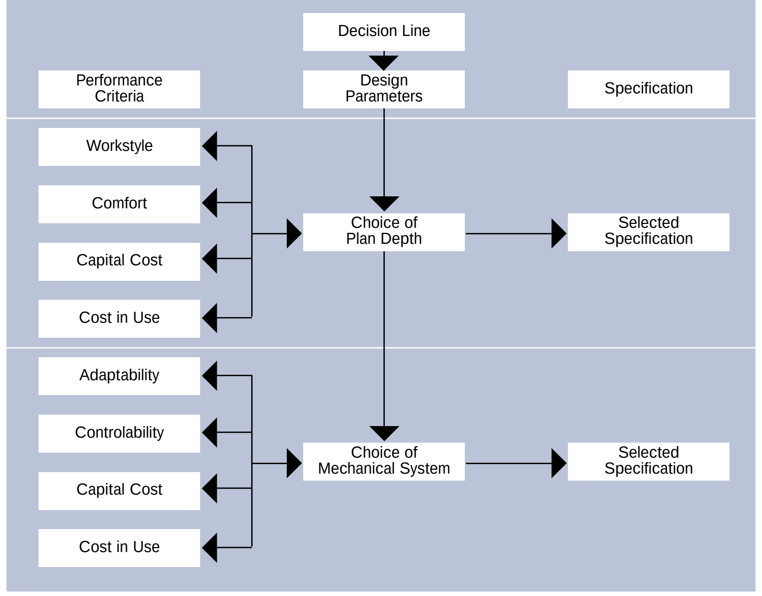
How to use this Guide

This printed document is an edited version of the full report. The complete research carried out by the Editorial Committee and related material can be accessed on www.constructionplus.co.uk

Sections will be regularly updated and additional information made available on the www copy.

The Guide can be used as a conventional reference tool, but it is also arranged to enable a structured approach to the creation of a tailored design specification appropriate to a particular development need.

Selecting a specification



Sections 1.0 and 2.0 are concerned with strategic decisions about whether or not to build and about the content and location of a development. Section 3.0 deals with design specification and in many cases presents optional choices, giving appropriate cross-reference to background and related information, particularly concerning performance.

Often the performance outcomes of a particular choice of design parameter are multiple, and for this reason the Guide separates the section dealing with performance criteria (Section 4.0). When considering, for instance, the appropriate plan depth or mechanical system, a variety of performance factors should be taken into consideration.

Current typical design standards

Current typical design standards are available for ease of reference in the appendix, section 6.7, comparative table.

Icons have been used to facilitate ease of reference in addition to the detailed index, section 6.10.

Relevant reference section in the text

www site for an electronic source paper

Paper document

Tim Battle
Rybka Battle

Graham Francis
Sheppard Robson

1.0 Key decisions before deciding to build

The brief sets the performance criteria which will determine the choice of the design parameters. The purpose of the brief is to establish a framework of desired outcomes.

1.1 The brief

The brief is an essential process by which clients communicate their requirements and their aspirations. The success of a project relies heavily on the quality of briefing. Briefs should not be static, but challenged and developed throughout the life of a project. However, a clear set of strategic objectives should be established at the outset which are not challenged.

A failure on the part of the design team to be aware of the operational issues during the design process can lead to buildings being costly to maintain and operate, sometimes to the detriment and well-being of the occupants. Access to facilities management expertise or an awareness of facilities issues will minimise these impacts.

Project success will be reliant on good teamwork; the client should therefore select a team that will work well together, with roles and responsibilities clearly defined. The client's role should be to give clear instructions based on good quality information and options provided by the design team. Changes made early will be less costly than those made later in the project. The client's ongoing involvement should be matched with sufficient resources to evaluate options and make decisions on a timely basis.

'Briefing the Team' produced by the Construction Industry Board in 1997, provides a detailed guide.

BREEAM provides a means of specifying an environmental performance in a simple and flexible manner.

⇨ 6.1 The Design Team, 6.5 BREEAM

www.ciboard.org.uk/Procrmnt/briefing.htm

1.2 Is a new building necessary?

In considering options, the more efficient use of existing buildings should always be evaluated. Internal reorganisation, or the application of new working practices, often using new technologies intensively, can produce very substantial efficiencies which may obviate the need for a new building. Re-location may lead to staff losses. The decision to develop or refurbish should be driven by the opportunity cost, and the anticipated return, from each alternative.

2.0 Key variables if you decide to build

This section covers the strategic decisions which will affect the choice of office product.

2.1 Basis of Funding (end user/speculative developer)

Users will need to decide whether to acquire land and develop a building for their own use, or to lease a building constructed by a property developer. The route selected will affect the ability of the end user to influence the design and specification. Occupiers and developers have much to gain from pre-letting arrangements in reducing overall project costs and delivery times, as well as end user satisfaction.

Property developers may adhere to a standard specification, which has historically become the BCO Specification. Institutional funding for an owner occupier building will only be given on condition that the building can be returned to the commercial market place. Use of the BCO standard specification facilitates, for both freehold and leasehold properties, changes in occupation.

A building, either new or refurbished, would normally be completed at Practical Completion to what is known as a Category A fit-out. Further fitting-out work required by the incoming occupier of the workspace to meet their particular requirements is known as Category B.

⇨ 6.4 Cat A & B

2.2 Site location (in-town/out-of-town)

In selecting a site for development or occupation, a number of factors need to be considered:

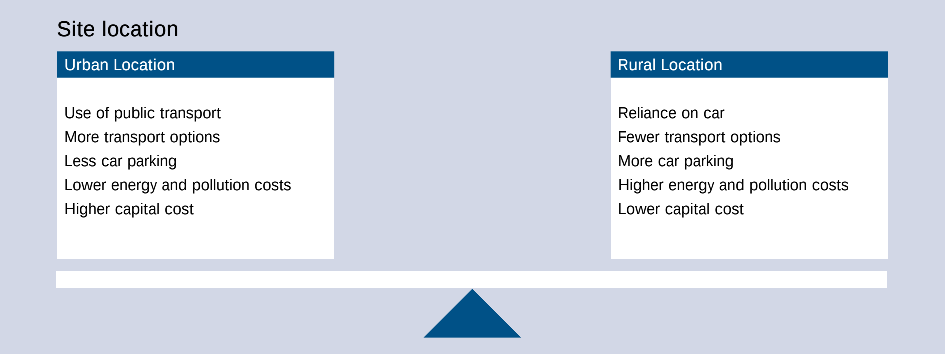
- Current national and local planning policy is strongly driven by a desire to: reduce private car use; encourage other means of private (eg. shared journeys) and public transport; encourage development on previously used sites (particularly at transport nodes/corridors); and, to encourage mixed use and sustainable development
- The availability of public transport
- Road congestion
- Work patterns

Site location is a key factor considered by BREEAM

2.3 Town planning

The Town and Country Planning Act 1990 is the principal legislation for development control. Where proposals affect listed buildings or conservation areas, the Planning (Listed Buildings and Conservation Areas) Act 1990 comes into play. Government guidance, which is intended to amplify this legislation, is provided in a series of Planning Policy Guidance Notes, or 'PPGs'. More detailed planning policies are drafted by each local authority within this national framework; these are set out in a Unitary Development Plan.

Early contact with the relevant local authority to discuss the town planning issues will prove beneficial. The length of time taken to determine formal applications can be reduced substantially



2.0

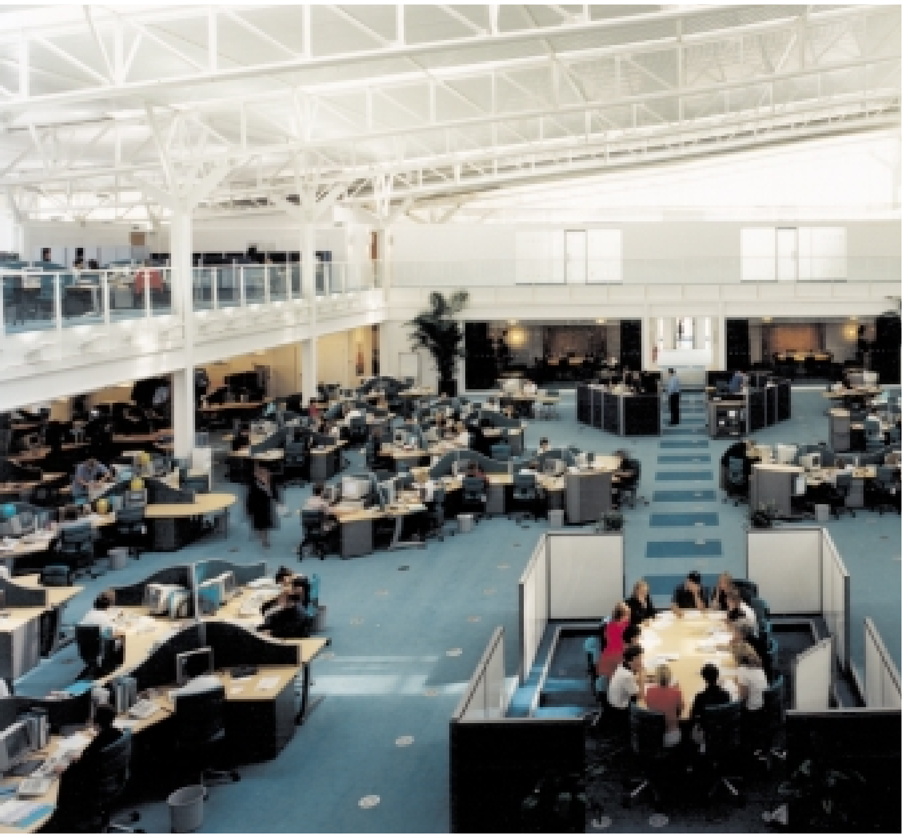
by adopting a flexible approach to negotiations prior to submitting proposals for planning permission.

2.4 Planning for sustainability

The main principles of sustainable development are:

- economic growth
- social progress
- environmental protection
- prudent use of natural resources and mixed-use developments

They are being incorporated into planning policy at all levels in the UK. Under Local Agenda 21, local government is obliged to address sustainability issues. BREEAM can be used as a negotiating tool also.



2.5 Building size

The development or tenancy brief will specify total space requirements, based on expected occupancy, applying relevant space standards and having regard to workstyle.

⇨ 1.1 The brief, 4.2 Workstyle, 4.3 Occupancy Standards

For speculative developments, the total quantum of space may be determined simply by optimising the development potential of the site, but aspects of amenity, accessibility and planning control will need to be considered on arriving at an appropriate site density.

⇨ 4.5 Amenity, 4.6 Accessibility

There may also be market-driven requirements for buildings and/or lettings of a particular size. It may be necessary to provide the total quantum of space in the form of a number of smaller buildings rather than a single large one; however, this approach will tend to reduce site density and increase capital cost.

⇨ 3.1 Site density, 4.7 Capital cost

Where subdivision of larger floor plates to form separate tenancies is relied upon to satisfy user requirements, then the position and number of cores and escape staircases is critical, and can affect adaptability and floor plate efficiency.

⇨ 3.10 Core elements, 4.10 Adaptability

In general, larger floor plates are more efficient and more cost-effective. For a given floor plate configuration, cost efficiency and floor plate efficiency will diminish as building height is increased or decreased above or below four storeys.

⇨ 3.5 Floor plate efficiency

3.0 Key design parameters

This section describes common design parameters and gives background information together with cross-references to aspects of performance to enable the reader to determine an appropriate specification standard under each subject heading.
No two office developments have identical requirements. The developers and users of buildings have their own particular needs and aspirations, and these are rightly reflected in the specifications that are evolved for their buildings. In some cases, typical standards will be applicable, but in others, selection from a range of possible options will be necessary in order to achieve a specific performance result.

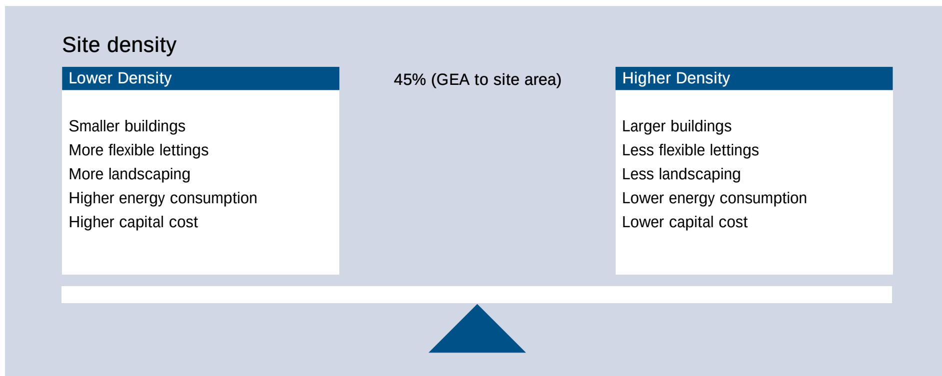
3.1 Site density

45% (gross external area to site area) for business parks
The key variables affecting site density are car parking ratio, design of road network, quantity of landscaping, and building shape. Optimising the right balance between these variables is critical to the success of a development and will have an effect on value and on perceived amenity.

The emerging model for business parks involves more intense site coverage than the quoted standard, and follows a trend towards tighter urban planning, reduced car parking and greater integration of diverse uses such as retail and leisure.

⇨ 3.2 Parking, 3.3 Landscaping, 4.5 Amenity

Development density is affected by building size. Groupings of small buildings result in lower optimum densities than the provision of larger buildings of similar total area, because more space is required for road access to small buildings, and because smaller floor plates are less space-efficient. Increasing the number of storeys of buildings of a given area reduces footprint; however, plate efficiency also reduces and capital cost will increase.



3.2 Parking

1 space per 25m² (of GEA) for business car parks
Local authority policies and Government legislation are together actively restricting the levels of car parking that can be provided on both city centre and out-of-town sites because of the impact of parking provision on congestion, pollution and the use of energy. Access by private car is still considered desirable, but there is an associated cost to the environment. Cycle and motorcycle spaces are now required, and standards are applied for the provision of disabled spaces.

⇨ 3.1 Site density, 4.6 Accessibility

Parking layouts of 25m² per space are optimum and can be achieved by ensuring that aisles serve parking bays on both sides.

Parking levels in urban areas will be dependent on negotiation with the planning authority.

3.3 Landscaping

25% (of site area) for business parks
Out-of-town locations are increasingly assessed in terms of landscape impact. Structured tree and shrub planting, together with hard surface landscaping, as part of a masterplan strategy is essential for major business park schemes, and is a primary contributor to a sense of amenity.

⇨ 3.1 Site density, 4.5 Amenity

Landscape features can contribute to security by both implying and/or determining which areas have controlled access. Tree planting adjacent to glazed elevations absorbs solar energy as well as creating shade and acts as a wind barrier, and can thereby contribute to energy efficiency.

⇨ 3.15 Services systems, 4.9 Cost in use

3.4 Building orientation

The orientation of building facades in relation to the sun path can have a significant impact on running cost. In general, east- and west-facing elevations are difficult to shade; south-facing elevations can be provided with effective sun breaks; while north-facing elevations are unconstrained in respect of glazing.

'Solar Shading of Buildings' – BR364, Construction Research Communications, 1999

In practice, however, the relative location and orientation of buildings is often determined either by the surrounding urban context, or by the attributes and constraints of a masterplan, in the case of business park locations.

⇨ 3.14 Envelope, 4.9 Cost in use

The prominence given to entrances and the degree of identity and separation they provide to building occupiers is also a very important aspect of building orientation.

⇨ 4.5 Amenity

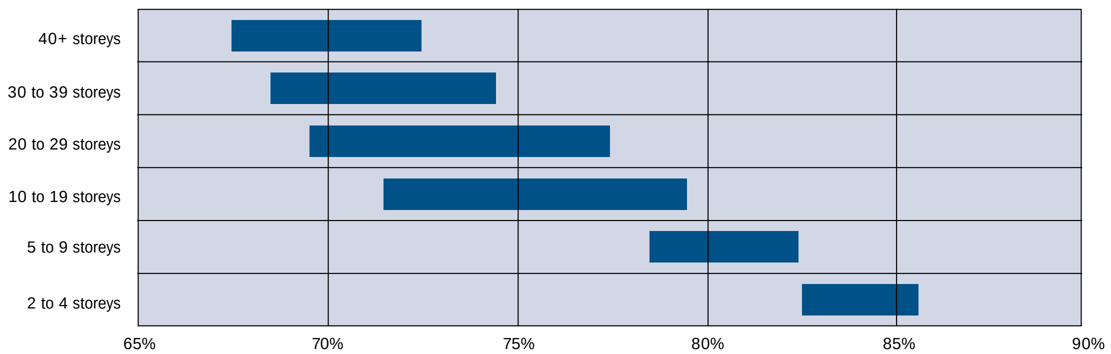
3.5 Floor plate efficiency

80-85% (NIA:GIA)
Measures of plate efficiency per floor include:

- ratio of net internal area to gross internal area (NIA:GIA)
- ratio of net internal area to gross external area (NIA:GEA)
- cost per m² of net internal area

Cost per m² of net internal area is a reliable measure of the cost-efficiency of providing usable space, which does not rely on interpretations of the basis for calculation of gross floor area (such as whether plant areas and escape staircases are included or not).

Typical multi-storey office buildings efficiency ranges
(net gross floor area ratios)



Another useful measure of plate efficiency is the ratio of floor area to external wall surface area, which reflects the amount (and therefore the cost) of envelope required for a given plan shape. If the floor to wall ratio exceeds 0.4, a value engineering exercise should be considered to test the validity of the design criteria and value for money.

⇨ 3.14 Envelope, 4.7 Capital cost

Plate efficiency can be optimised by:

- Reducing to a minimum the size and number of elements serving the usable space, such as core areas (stairs, toilets, lifts), duct risers and enclosed circulation routes
- Providing the minimum number of escape staircases for a given plate size and conversely by increasing the floor plate in size, where possible, so that maximum travel distances to escape staircases are achieved
- Creating square and atrium-based plan shapes and cubic rather than linear building shapes
- Reducing the thickness of the envelope to the minimum practical dimension (when a measure of NIA:GEA is used)

⇨ 3.10 Core elements, 3.11 Use of atria, 6.6 Statutory regulations

Maximum efficiency figures for the whole building of approximately 80-85% (NIA:GIA) may be achieved, depending on building shape (see diagram p.23). In general, smaller plates are less efficient because the core elements become disproportionately large as plate size is decreased. Floor plates of less than 750m² are relatively inefficient.

Large floor plates of 2,000m² or more can be very efficient and flexible both for single-tenanted and multi-tenanted buildings. Optimum plate size is closely related to workstyle.

⇨ 4.2 Workstyle, 4.7 Capital cost

3.6 Building plan depth

13.5m-21m
Practice varies across the world, and is affected by workstyle. American working culture is appropriate to deep-plan space; continental Europeans favour narrow space.

⇨ 4.2 Workstyle, 4.7 Capital cost

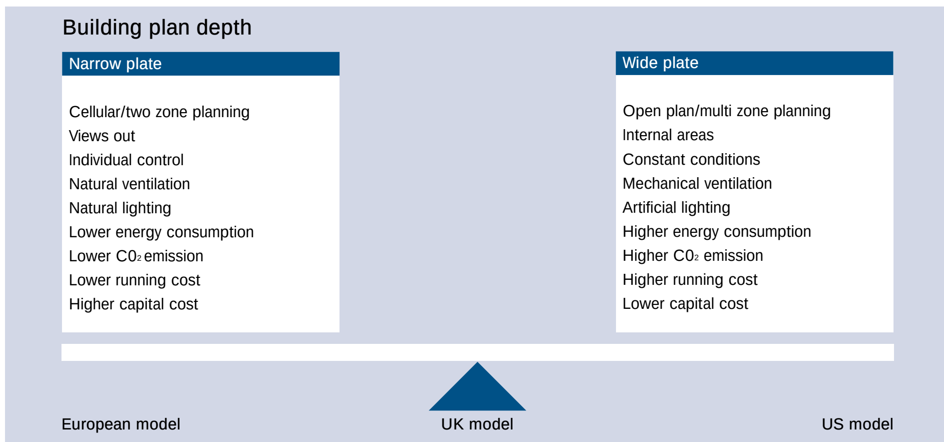
Depths of 15-18 metres are very common, and are suitable for use with a variety of mechanical systems, including conventional air conditioning, mixed-mode. Depths of less than 15 metres are preferred for effective natural ventilation, but very narrow plates (of 13.5 metres or less) are less able to efficiently accommodate mixed cellular and open-plan working space.

Greater plan depth increases the ratio of floor area to wall area, which reduces capital cost. The maximum plan depth regarded as within the range of good practice in the UK is 21m.

⇨ 3.12 Building section, 4.4 Comfort, 4.9 Cost in use

The relationship between plan depth and building section should also be considered. Natural light and ventilation are available to occupiers of perimeter space which, depending on the size and location of windows, is a zone approximately 5-7.5mwide or 2 to 2.5 times the floor-to-ceiling height of the room. Comfort in the space which is not within this perimeter zone has to be maintained using artificial light and ventilation, with resulting effects on energy consumption.

⇨ 4.4 Comfort diagram



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3.7 Column grid

7.5m-9.0m
The column grid dimension should be a multiple of the planning grid dimension. The column grid should be as large as possible taking into account the characteristics of the proposed structural system and having regard to capital cost and floor-to-floor constraints. In general, spans of 7.5m to 9m are economic and greater spans will only be appropriate if workstyle dictates their use.

⇨ 3.8 Planning grid, 3.13 Structural systems, 4.2 Workstyle, 4.7 Capital cost,

The location of perimeter columns should neither restrict subdivision nor create unusable space.

3.8 Planning grid

1.5m
The planning grid is derived primarily from workstyle and reflects the smallest unit of subdivision of space made available by a particular building system. A mullion grid of 3.0m is not uncommon because cellular offices are rarely narrower; however a 1.5m grid will inevitably provide more layout flexibility. A grid of 1.35m is an option used more frequently in Europe. This grid co-ordinates with ground floor or basement parking and brick dimensions, and also permits slightly smaller unit offices (2.7m wide) which are regarded as more efficient in terms of space usage. The less generous standard based on a 1.2m grid will also co-ordinate with parking.

⇨ 3.7 Column Grid, 3.14 Envelope, 3.16 Finishes, 4.2 Workstyle

The planning grid is typically expressed on the elevation to facilitate partitioning of perimeter offices, and it also operates as the co-ordinating grid in plan for the principal components of the structure, services, fabric and finishes, including column grid, envelope, ceiling tile grid and partition grid.

3.9 Circulation

Space budgeting is normally based on an allocation for working footprint area (derived from standards for occupancy) together with allowances for ancillary space, and for primary and secondary circulation.

⇨ 4.3 Occupancy

Primary circulation space is the minimum area required to access and escape from open plan work areas and cellular offices. Secondary circulation space is that which is provided between and around personal workspaces.

Current North American, British and Japanese office developments typically minimise circulation space to achieve maximum efficiency. Many Northern European examples, on the other hand, demonstrate the importance attached to the function of secondary circulation areas as interactive and stimulating communal workspaces which promote a sense of amenity and enhance working effectiveness and productivity. The imaginative use of atria is a common feature of this approach.

⇨ 3.11 Use of atria, 4.2 Workstyle, 4.5 Amenity

Structural grid/planning grid

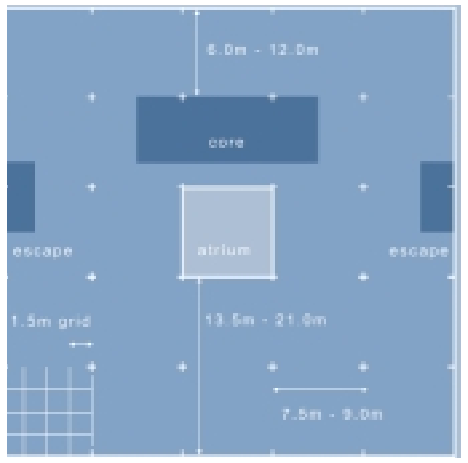
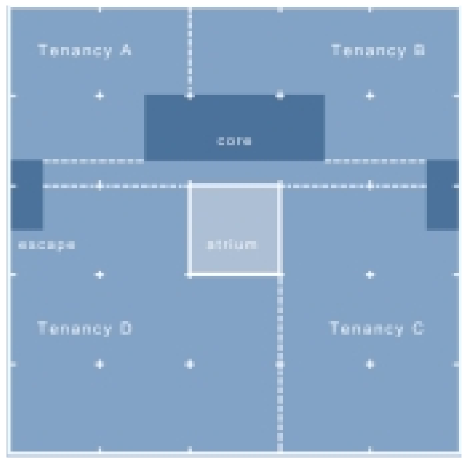


Plate subdivision/circulation diagram



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3.10 Core elements and staircases

Escape staircases should:
- be designed to minimum occupancy standards and anticipate the maximum occupancy requirement during the life of the building
- be located to optimise capital cost, and serve the largest possible floor plate area
- be located to promote adaptability and permit flexibility of letting and workstyle
- where practical be located to encourage their use for short journeys between floors

⇨ 3.9 Circulation, 4.3 Occupancy, 4.7 Capital cost, 4.10 Adaptability, 6.6 Statutory regulations,
See diagram page 10

Lavatories should:
- be designed to a standard of one person per 14m² net area based on 120% of the population (60:60 male/female ratio) when male and female toilets are provided, but where urinals are used in male toilets, the appropriate male/female ratio is 50/60.
- be designed to a standard of one person per 14m² net area based on 100% of the population when unisex toilets are provided

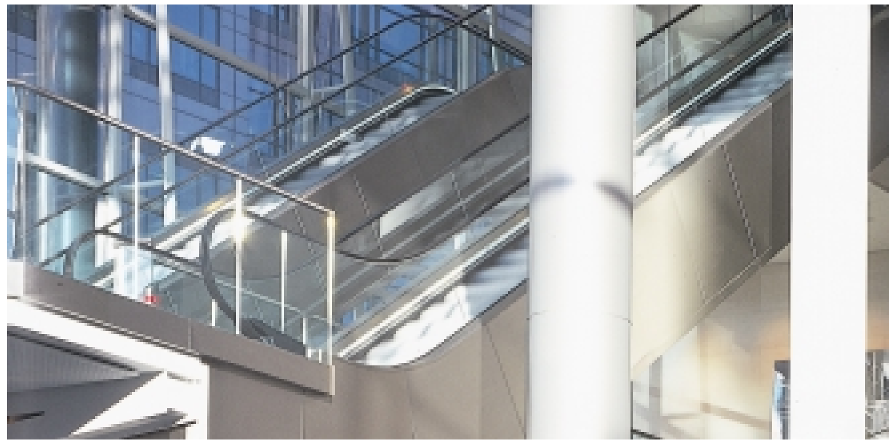
Consider whether it is appropriate to install or leave space for spare drainage, water risers and ventilation to provide additional lavatories to meet increased population, or where sub-letting requires, the provision of additional services.

⇨ 4.3 Occupancy, 4.10 Adaptability

Passenger lifts should:
- be designed to a standard of one person per 14m² net area
- target an average interval of lift departure at the main entrance of 30 seconds with cars assumed to be loaded at 80% of capacity (for scenic lifts reduce car loading to 60%)
- provide a minimum percentage passenger handling capacity in a five-minute interval of 15%
- be selected from manufacturers' standard range (use of standard and pre-engineered components reduces initial costs, maintenance costs and increases reliability)
- be located to provide a choice between lift and main stairs for both occupants and visitors

⇨ 4.3 Occupancy

"Transportation Systems in Buildings" – Chartered Institution of Building Services Engineers Guide D, 1993



Goods lifts should:
- be provided in buildings over 10,000m², but also consider the need for goods lifts in buildings over 5,000m² and an associated goods receiving area separate from the passenger entrance

Kitchens in buildings over 5,000m²:
- if it would be difficult to adapt the building later, give due consideration to increased fresh air requirements and position of kitchen exhaust relative to air intakes and adjacent properties

3.11 Use of atria

The use of atria in conjunction with office floor plates of optimum width can reduce capital cost because envelope cost is less, and can reduce running cost because exposure to external climate is reduced. Employing building shapes based on atria also improves plate efficiency.

⇨ 3.5 Floor plate efficiency, 4.7 Capital cost, 4.9 Cost in use

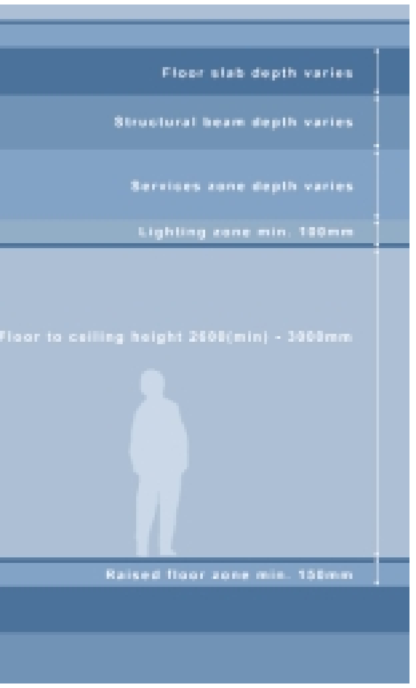
Apart from the purely technical advantages of atria, they can be used to support a workstyle which is more open and interactive, and when used in conjunction with shared resources, such as meeting areas, catering and retail facilities, can significantly contribute to the effectiveness of the office environment and to amenity.

⇨ 4.2 Workstyle, 4.5 Amenity

In the life of larger buildings, it may be an advantage to be able to create large areas of deep plan space by infilling atria.

⇨ 4.10 Adaptability

"Daylight in Atrium Buildings" – BRE Information Paper, IP3/98, Construction Research Communications, 1998



Cross section dimensions diagram

3.12 Building section

The overall dimensions for services and structural zones will depend on the frame solution and extent of services to be included. For column grids of up to 9m centres, it is usual to keep the horizontal services in a separate zone from the structure. For larger span spaces, a different strategy is needed to avoid large storey heights. The space between long-span beams is the main area of services distribution.

⇨ 3.13 Structural systems, 3.15 Services systems, 4.7 Capital cost

Structure and building services should be integrated to achieve a compact zone, but not so tightly arranged that buildability, access and flexibility are compromised. Significant savings in overall storey height can be obtained by co-ordinated overlaps in zones.

Ceiling/lighting zone: 100mm overall
This figure assumes suspended ceiling and integral fluorescent fittings using T5 lamp technology. Where underfloor air conditioning or natural ventilation is proposed, alternative zones, possibly incorporating exposed soffits, can be considered.

Floor-to-ceiling height: 2600-3000mm
The choice of floor-to-ceiling height within these dimensions will be influenced by building plan depth, the form of environmental control system selected and daylighting.

⇨ 3.6 Building plan depth, 3.15 Services system diagrams pp 16-17, 4.4 Comfort

Raised floor zone: 150mm overall
If an underfloor air conditioning or ventilation system is adopted, this dimension will increase by 300mm to 450mm.

Specialised operations
If there is a reasonable expectation that the building may incorporate dealing operations or a www internet exchange during its life, the slab-to-slab height should be increased on relevant floors to accommodate the requirement for greater raised floor and ceiling void depths. Modern cabling has reduced the need for very deep floor voids in dealer areas. Consider 200-300mm overall. Major changes in power supplies and cooling capacity should be considered if a www/co-locate operation is likely or anticipated.

⇨ 4.10 Adaptability

3.13 Structural systems

The choice of structural system can be complex. It will be influenced by many factors including site location and site constraints, building form, planning and structural grids, loading requirements and sustainability issues.

3.13.1 Loadings

Standard allowances for live load:
General area
- 2.5 kN/m^2 over approx 95% of each potentially sub-lettable floor area

High loading area
- 7.5 kN/m^2 over approx 5% of each potentially sub-lettable floor area and not in primary circulation routes

Standard allowances for dead load:
Demountable partitions
- 1.0 kN/m^2

Raised floors, ceiling and building services equipment
- 0.85 kN/m^2

Historically, UK office buildings have been designed and marketed with floor loadings significantly higher than the current British Standard loading threshold of 2.5 kN/m^2. Research has shown this to be an over-provision.

Stanhope Position Paper "An Assessment of the Imposed Loading for Current Commercial Office Buildings in Great Britain", August 1992

3.13.2 Frame and materials

A steel or reinforced concrete structure is equally acceptable. A comparative table is given below.

A clear strategy for flexibility and future adaptability of the structure should be developed. The efficient and sustainable use of structural materials should be a vital consideration.

⇨ 4.7 Capital Cost, 4.8 Embodied Energy Cost, 4.10 Adaptability

3.13.3 Deflections, tolerances and vibration

The overall depth of the structural floor zone should make adequate allowance for dead load deflection of the structure.

The building elements attached to the structure should be detailed to accommodate both dead load and live load deflections of the structure.

They should also be detailed to accommodate manufacturing, fabrication and construction tolerances in the structure.

The design of longer span and shallower floor systems should be checked to ensure that any vibration from footfall (and other sources) is within acceptable limits.

3.14 Envelope

The building envelope provides an interface between the controlled internal environment and the uncontrolled and variable external climate. The design of the envelope, therefore, determines how the climate is moderated while maximising the benefits, such as fresher air and daylight.

3.14.1 Component life

- replaceable elements should last less than 60 years and replacement has to be considered at design stage – double-glazed units (20 to 25 years), sealants (20 to 25 years)
- maintainable elements should last a minimum of 60 years with periodic treatment, eg. opening window ironmongery, weathering gaskets on opening windows
- long-life elements will last 60 years without any maintenance, eg. bracketing attaching cladding to primary structural frame, cladding framing members

⇨ 4.10 Adaptability

BS 7534: 1992 Amendment – 1998

3.14.2 Envelope/frame interfaces

At the earliest opportunity, the designers of the structural frame and the designers of the building envelope need to consult on the effects that building frame movement and tolerances will have on the jointing between building envelope elements, and on the connections between the building envelope and the structural frame. Almost without exception, it is better to provide extra stiffness to structural framing members around building perimeters to limit movement in the building envelope elements rather than design frames to minimum code requirements and then have expensive retrofit stiffening done on site.

3.14.3 Support system

Generally, better overall envelope performance is achieved if the envelope passes outside the structural frame. When it does, a nominal gap of at least 50mm should be allowed for between the inside face of the envelope and the outside edge of the structural frame. It is preferable, from health and safety considerations, for bracketing connecting the envelope to the frame to be connected to the top surfaces of floor slabs. At least 150mm clear nominal above the target level of the floor slab should be allowed for these brackets.

3.14.4 Watertightness

Performance requirements are defined in the Centre for Window and Cladding Technology (CWCT) Standard for Curtain Walling. Testing to verify compliance is described in the CWCT Test Methods for Curtain Walling.

Steel or reinforced concrete?

Steel	Reinforced concrete
Relatively lightweight	Relatively heavy
Greater depths minimum depth solutions inefficient	Shallower depths for modest spans, flat slabs give minimum depth
Good for longer spans but depth requirements imply combined structure and services zone	For longer spans, post-tensioned slabs give minimum depths
More efficient on rectangular grids than on square grids	Can be efficient on rectangular and square grids
Inherently good for holes and fixings (into soffit)	Holes and fixings can be accommodated but strategy must be considered early. Holes should avoid prestressing tendons
	Concrete soffits give option of chilled beam cooling

The following requirements are appropriate for offices:

Performance under test

- no leakage onto the internal face of the curtain wall under a static test pressure differential of 600 Pascals held for 5 minutes when tested in accordance with CWCT test methods section 5
- no leakage onto the internal face of the curtain wall under a dynamic test pressure differential of 600 Pascals held for 15 minutes when tested in accordance with CWCT test methods section 6
- no leakage onto the internal face of the curtain wall under a hose test carried out in accordance with CWCT test methods section 7, when tested on a test specimen off-site and on the actual wall on-site

3.14.5 Airtightness

Performance requirements for curtain walls are defined in the Centre for Windows and Cladding Technology (CWCT) Standard for Curtain Walling. Testing to verify compliance of curtain walls is described in the CWCT Test Methods for Curtain Walling.

Performance requirements and test procedures for the whole completed building envelope are described in BSRIA Technical Memorandum TN8/95 Air Leakage of Office Buildings.

The following requirements are appropriate for offices:

Performance under test

- the permissible air leakage rate through the curtain wall should not be more than 1.5cu.m^3/hour/m^2 of wall for fixed areas, and not more than 2.0cu.m^3/hour/linear metre of joint for opening areas under a static test pressure differential of 600 Pascals held for 5 minutes when tested in accordance with CWCT test methods section 4
- the permissible air leakage rates for fixed areas and opening areas for static test pressure differentials of between 50 and 600 Pascals should not be more than the values given in figure 1 of the CWCT Standard for Curtain Walling
- the permissible air leakage rate for the whole completed envelope should not be more than 5.0m^3/hr/m^2 at 50 Pascals test pressure differential, and with any air leakage paths evenly distributed about the envelope

"Air leakage Testing of Buildings" – Chartered Institution of Building Services Engineers, TM23, 2000

"Minimising Air Infiltration in Office Buildings" – Construction Research Communications, BRE Report BR265, 1994

3.14.6 Thermal insulation

Average U-values for building envelopes used for buildings other than dwellings are quoted in Table 5 of the Building Regulations L1, conservation of fuel and power, approved document and are as follows:

Roofs	0.25 W/m2k
Solid sections of exposed walls	0.45 W/m2k
Windows/personnel doors and roof lights	3.3 W/m2k
Vehicle access and similar large doors	0.7 W/m2k

These values are used to carry out initial assessments of the energy efficiency of a particular building. Adjustments can then be made to these values to obtain the required aesthetic without compromising the overall requirements of the Regulations.

3.15 Services systems

3.15.1 Electrical systems

Small power consumption

When diversified over an area of 1,000m^2 or more, power consumption for equipment in offices rarely exceeds 15W/m^2. Risers/busbars should be sized for 25W/m^2 overall as a minimum.

Provide a sufficient number of spare ways, typically 15-25%, at each riser distribution board and at the central mains panel.

"Stanhope BCO Occupancy and Small Power Position Paper", June 2000

Standby generation

The base building design may provide for standby generator plant for essential services to maintain the use of the building during power failure (when not operating in fire mode). Provision should be made for occupiers' standby plant, including space, for fuel storage and exhaust flue.

Information technology

Consideration should be given to diverse routes for links to external telecommunications infrastructure. Each intake position should make provision for several service providers. Whenever possible the intake rooms should be at the building perimeter and have incoming ducts directly from outside.

Specialist broadband suppliers may provide vertical cabling for tenants as well as managing and aggregating their high speed wide bandwidth traffic.

3.15.2 Mechanical systems

Cooling requirements are dictated by solar gains, occupancy, lighting and office equipment power. Solar gains, which depend on facade orientations, should preferably not exceed 60-90W/m^2 of perimeter office floor area. Occupancy should be based typically on one person per 12m^2, but diversified, where possible, to one per 14m^2 at the central plant. Lighting should be designed to ensure no more than 12W/m^2 heat gain to the central cooling plant.

Cooling loads due to power consumption for office equipment in general office areas rarely exceed 15W/m^2 when diversified and measured over an area of 1,000m^2 or more, but with an ability to upgrade to 25W/m^2. Local work station loads are typically 20-25W/m^2. Where possible provide space for additional cooling plant.

"Stanhope BCO Occupancy and Small Power Position Paper", June 2000

Zoning

Zoning of air conditioning should segregate the perimeter and internal zones and be selected to take account of likely partitioning, occupancy and use of the space.

At the perimeter, provide one control device to not more than 6m of perimeter space assuming a perimeter office depth of 4.5m. Zoning of mechanical equipment should be consistent with the planning grid to take into account future partitioning.

Internal zones do not attract solar gains and have more stable conditions. This allows larger zones of 50-80m^2 to be accommodated.

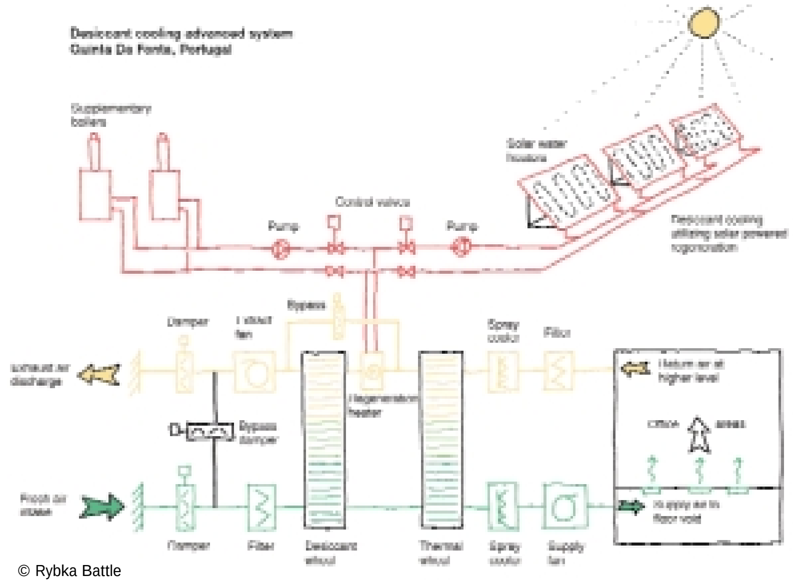
4.3 Occupancy

3.15.3 Choice of mechanical system

There are many mechanical-air cooling systems available, each of which has particular performance characteristics and is therefore suitable for differing locations or building forms and for specific applications.

The selection of system type should take into account the particular circumstances of the building, and the following factors:

- Adaptability 4.10
- Capital cost 4.7
- Controllability 4.4.7
- Energy and maintenance costs 4.9



© Rybka Battle

- Workstyle 4.2
- Noise 4.4.6
- Space requirements 4.3
- Comfort 4.4
- Special user requirements 5.9

An appropriate system may be, amongst others, any of the following:

- Chilled ceiling/beams
- Displacement ventilation
- Fan coils
- Variable air volume
- Variable refrigerant volume

4.9 Cost in use

See service system diagrams pp16-17

Regardless of which system is selected, installations should be designed to take maximum advantage of natural or renewable energy. This should include "free cooling", where advantage is taken of uncooled ambient air in mid-season conditions, when economic.

Occupants should be able to run their systems in a simple but effective manner, regardless of other occupants.

4.4 Comfort

Where refrigerants are to be used, they should have an ozone depletion potential of zero.

Refrigeration and air-conditioning gases – March 1993, DETR

3.15.4 Controls/BMS

Controls should be designed to operate the mechanical system in line with each anticipated occupancy. The system should be capable of operation on a part-floor basis where large floor plates are proposed. Controls should enable occupants to make limited adjustments locally to the heating/air-conditioning systems.

⇨ 4.4.7 Comfort control, 4.10 Adaptability

A Building Management System (BMS) should be considered a standard requirement to co-ordinate the control of building engineering systems and to monitor their performance. The system architecture should be based on intelligent plant controllers networked to a PC supervisory terminal. Provision should be made to allow integration of future tenant billing of heating, cooling and power.

3.15.5 Water

If required, provide water storage at a rate of 10-20 litres per person per day to keep turnover high to minimise the risk of Legionnaires Disease.

To minimise water usage, consider the use of PIR control with sequenced flushing of all urinal flushes, having spray taps for wash hand basins, the use of low flush WCs and of grey water systems.

Rainwater

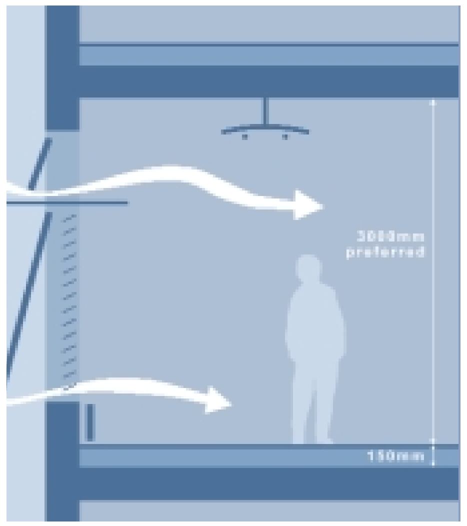
Evaluate siphonic systems which can reduce the number of roof outlets and enable horizontal pipework to be used.

3.15.6 Commissioning

Efficient and effective operation of building services systems is reliant on successful commissioning of the installations and their subsequent maintenance; provision for commissioning must be considered during the design of the services.

Consideration should be given to employing an independent commissioning engineer.

Adequate time must be programmed during the construction process to allow all commissioning activities to be completed. Systems should be monitored under operating conditions. Full records of the installed systems, together with clear and complete maintenance recommendations, must be provided.

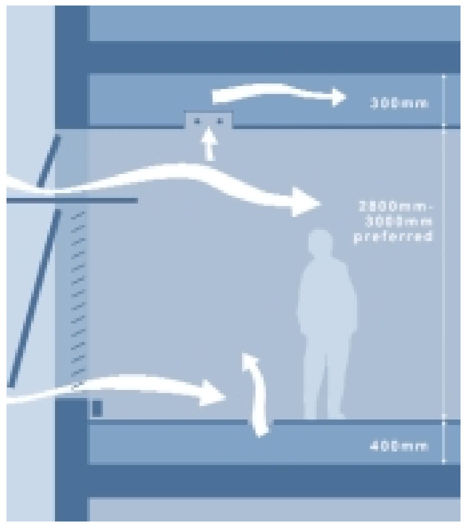


Natural ventilation

Capital cost	Low
Running cost	Low
Small power capacity	Low
Simplicity of construction	Simple
Flexibility/adaptability	Moderate

High-level windows allow passive cooling at night.
Shading and blinds reduce solar gain.
Building structures can be exposed for mass cooling.
Perimeter heating offsets heat losses.
Maximum temperature 25°C for 95% of year.

Typical annual CO_2 emissions: 30-80 kg/m^2



Mixed mode

Capital cost	Medium
Running cost	Medium
Small power capacity	Medium
Simplicity of construction	Moderate
Flexibility/adaptability	Moderate

High-level windows allow passive cooling at night.
Shading and blinds reduce solar gain.
Building structures can be exposed for mass cooling.
Maximum temperature 25°C for 95% of year.

Typical annual CO_2 emissions: 40-80 kg/m^2

Procedures for preventative measures against the sludge-generating effects in pipework of the aerobic bacteria, Pseudomonas, should be incorporated into the commissioning documentation.

BSRIA Pre-commissioning and cleaning of water systems Guide AG 8-91 with report of BSRIA Seminar, 12th February 1999

3.16 Finishes

Too often, elaborate and individual designs, using expensive and unique materials, have been evolved in areas of the building where they are not warranted, with the result that occupiers have been faced with high costs of maintenance and replacement during the life of a building. The use of standardised products and proprietary systems increases reliability and the availability of replacement parts.

This does not seek to limit the quality of design and it is accepted that richer materials may be used in the public areas of the building, in particular the entrance hall.

Office space

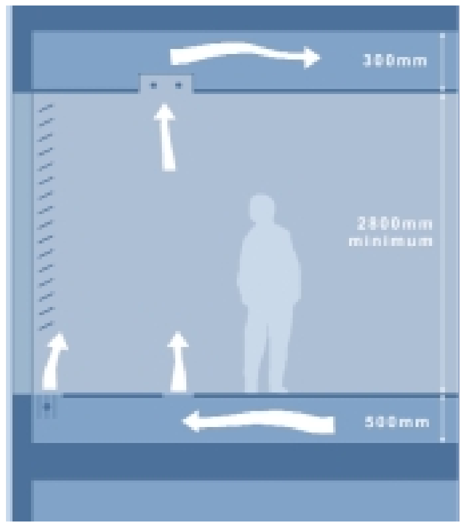
The use of emulsion paint on plasterboard walls is acceptable. For suspended ceilings, use either mineral fibre or metal ceilings that are easily demountable and allow the incorporation and interchangeability of recessed light fittings.

Lavatories

Ceramic tiles to floors and walls with laminate cubicles and vanity units provide a perfectly satisfactory and functional level of finish.

Core/staircase area

Staircases in modern buildings are generally used for escape purposes rather than inter-floor communication. A functional and utilitarian standard of finish, such as painted plaster wall finishes, painted concrete floors and painted metal handrails, is therefore appropriate. Where inter-floor communication is anticipated, then a higher standard of finish could be appropriate.

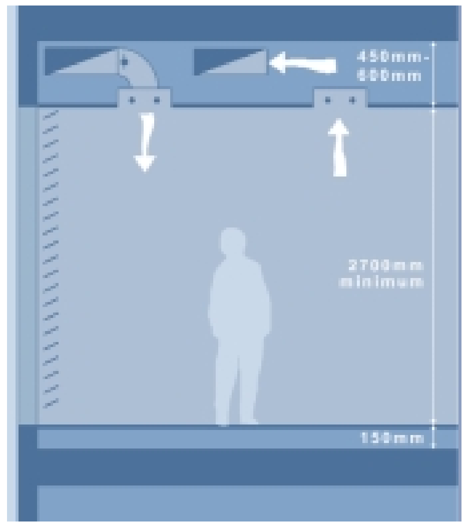


Energy-efficient air conditioning

Capital cost	High
Running cost	Medium
Small power capacity	High
Simplicity of construction	Complex
Flexibility/adaptability	High

Displacement mechanical ventilation under floor plenum.
Integral blinds reduce solar gain.
Maximum temperature 24°C for 95% of year or lower.

Typical annual CO_2 emissions: 60-90 kg/m^2



Conventional air conditioning

Capital cost	High
Running cost	High
Small power capacity	High
Simplicity of construction	Complex
Flexibility/adaptability	High

Fan coil units in ceiling void.
Blinds reduce solar gain.
Maximum temperature 24°C or lower.

Typical annual CO_2 emissions: 80-140 kg/m^2

3.0

Lift car interiors
The lift car interior is generally seen as an integral part of the design of the entrance hall and, as such, the quality of finishes should be compatible. However, unique designs for the functional aspects of the lift car, such as call buttons, etc., should be avoided. The use of manufacturers' standard car finishes is more economic and allows for easier maintenance.

3.16.1 Shell and core

There are advantages to both owner and occupier in completing the building to shell-and-core standard. These are:

- Shorter construction period for owner and earlier possession by occupier for fitting out
- Savings in costs to occupier as developers' standard items do not need to be removed or protected during fitting out
- Flexibility for the occupier to vary finishes specification without cost of removing and discarding materials already installed by owner
- Reducing waste caused by stripping out base building works to accommodate tenant fitting-out requirement

⇨ 6.4 Categories A & B

The building shell-and-core should be offered to the occupier completed to the following specification:

Fully finished areas:
- Entrance hall, staircases, common parts, toilets, lifts and core

Shell finish areas:
- Office space excluding suspended ceiling, lighting, raised floor, wiring, air conditioning ductwork and terminal boxes, decoration
- Base services plant and equipment terminated at breakout to floors

When completing a building to shell-and-core, a portion of the space may be fitted out to the developers standard into which a marketing suite can be incorporated.

3.16.2 Fully-fitted

This option applies where an occupier has been identified prior to completion of the building.

The landlord undertakes to complete the building to a standard ready for occupation by the occupier and to a specification agreed between the parties.

The cost of bringing the building up to notional developer's standard will be borne by the landlord but the extent to which the landlord will contribute to the additional cost of fitting out beyond that point will be subject to negotiation.

4.0 Key performance criteria

Users and owners of buildings are interested in the way in which their workplace performs; whether the buildings and spaces support their working patterns and corporate aspirations, and whether they provide a safe, comfortable and productive environment.

The location and accessibility of a development, its function and appearance, and its whole-life costs (including both capital and running costs) are all aspects of performance, but not as important as the performance of the workforce. All of these features should be understood and measured.

Wind-driven generators at Sainsbury's, Greenwich Peninsula

4.1 Sustainability and building performance

Buildings alone are directly responsible for approximately 50% of all energy consumption, and much more if the effects of road traffic generation are taken into account. Buildings are also responsible for half of the UK's CO_2 emissions, double that caused by industry or transport.

Many of the choices made by the developers and designers of buildings have a direct and inevitable impact on sustainable performance. These include choices associated with, the reuse of existing buildings; site location; building orientation; building shape; heating and cooling methods; and the selection of materials.

Standards for sustainable design will increasingly be set by legislation. They will also be used by progressive businesses as criteria for the selection of suitable premises. Improved environmental performance and sustainability in a building can result in significant benefits in running costs, staff satisfaction and productivity. The BREEAM 98 environmental assessment method is the current industry standard for measuring environmental performance; it establishes levels of performance that represent industry best practice.

⇨ 6.5 BREEAM, Productivity (Editorial)

www.products.bre.co.uk/breeam

4.2 Workstyle

Trends in workstyle are evolving and vary considerably between business processes and cultures. The traditional practice of allocating space by grade or status is being replaced by a new pattern in which space standards are related to specific activities with specific footprint and environmental requirements. Group-based, interactive working is becoming more prevalent than isolated, cellularised working. As work becomes more project-oriented and less process-driven, the interaction between people becomes more fluid and more dynamic. Developments in IT have made possible a variety of mobile, time-flexible working practices, and these have an impact on the variable use of space. At peak occupancy many spaces (in addition to cellular offices and open workstations) are occupied dynamically as short stay work settings.

Organisations can be characterised by the degree to which these new workstyles have been embraced or are appropriate, and solutions can be tailored to their specific corporate requirements. However, when buildings are developed speculatively, and when design life is an overriding concern, the most versatile solutions anticipating the widest application of innovative working practice should be sought. In general, change of space planning from open to closed and vice versa has to be anticipated, as does the flexible insertion of distributed support facilities such as meeting rooms, project spaces, rest and catering spaces and local centres for copier/printer/post and office supplies distribution. This degree of flexibility can be facilitated by creating wider floor plates and by making provision (in section and in plan) for future changes to building services.

The importance to working effectiveness of interaction leads to the need to accommodate a variety of spaces and facilities for spontaneous, as well as planned meetings. One outcome is a reinterpretation of the use and value of secondary circulation space, and use of atria.

⇨ 3.6 Plan depth, 3.9 Circulation, 3.11 Use of atria, 4.3 Occupancy, 4.10 Adaptability

"The New Office" – Francis Duffy, ISBN 85029 8912

4.3 Occupancy standards

In recent years the norm has been 10m^2 per person of net floor area. Research has shown that very few buildings are occupied to a density that is this high. However, it is essential to ensure that the maximum number of people occupying a building is not artificially limited, particularly since new workstyles can involve variable levels of occupancy.

⇨ 3.9 Circulation, 3.10 Core elements, 4.2 Workstyle, 6.6 Statutory regulations

Good UK practice for conventional occupancy is currently between 12m^2 and 17m^2 per person of net internal area. Space standards for specific individual task-based activities range from a 4m^2 to 6m^2 footprint for trading desks or call-centre workstations, and up to 15m^2 or more for enclosed offices.

⇨ 3.15 Services systems

"Stanhope BCO Occupancy and Small Power Position Paper", June 2000

4.4 Comfort

Occupants' perception of comfort influences workplace productivity. Building services (active measures) and the fabric of the building (passive measures) should be designed together to help ensure a healthy working environment.

"Sick Building Syndrome: A Review of the Evidence on Causes and Solutions" – The Health and Safety Executive, 1992

Creating the protective workplace, SPON 2000

4.4.1 Visual Comfort

Daylight and sunlight play an essential part in the physiological well-being of occupants and have an effect on productivity in the workplace. Evolving glass technology can provide improved solar characteristics while allowing good daylight penetration. Provision should be made for user-controlled blinds to prevent glare and resulting eye strain.

Optimum standards for the office workplace are:

Minimum daylight factor	>0.5%
Average daylight factor	>2%-5%

(Daylight factor: lux inside/ lux outside x 100%)

Note should be taken of Health & Safety (Display Screen Equipment) Regulations 1992

⇨ 3.6 Plan depth, 3.11 Use of atria, 3.12 Building section, 3.14 Envelope, 3.15 Services systems

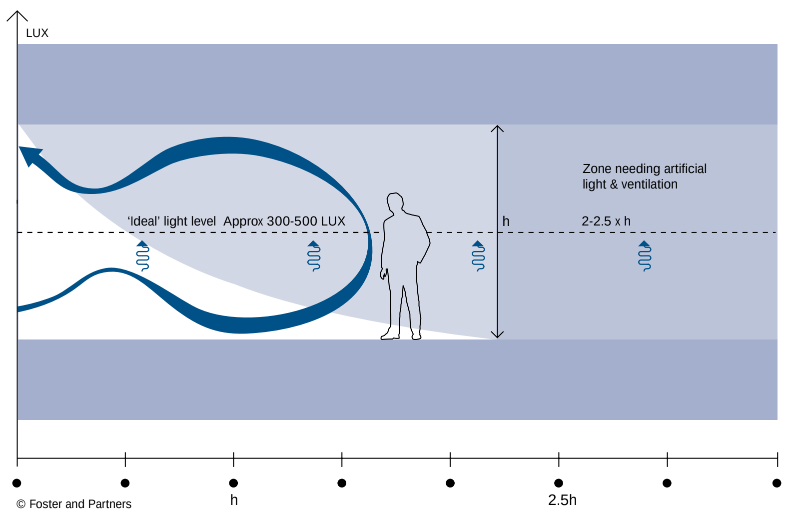
"Desktop Guide to Daylighting for Architects" – Good Practice Guide 245, Department of the Environment, Transport and the Regions, 1998

"Daylighting and Window Design" – Chartered Institution of Building Services Engineers, LG10, 1999

The provision of daylighting will effect decisions with regard to overall plan depth, floor-to-ceiling heights, shading solutions and glass type.

⇨ 3.6 Plan depth, 3.15 Services systems

Daylight penetration/distribution and natural ventilation depth



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4.4.2 Temperature

Recommended standards for offices are:

24ºC for summer design
22ºC for winter design

The range of temperatures achieved in the space will depend on the selected control band which can vary for different system types but will typically be ± 2°C. Internal temperatures will rise when summer design conditions are exceeded. Design air temperatures need to be reviewed with other comfort criteria such as radiant effects and air movement. Radiant cooling systems, such as chilled ceilings, achieve equal comfort at higher design temperatures.

Predicted thermal comfort in naturally ventilated buildings can be assessed based on the percentage of occupied hours for which particular internal temperatures are expected to be exceeded. An appropriate design target might be to limit the time when air temperatures exceed 25°C for 5% of occupied hours.

General Information Report 30 – "A Performance Specification for the Energy Efficient Office of the Future".

If wider bands of tolerance can be set for temperature ranges within general office space, then there is an opportunity to consider ventilation systems with reduced cooling capacity or without mechanical cooling. BREEAM requires adequate thermal modelling to ascertain that these criteria are achieved.

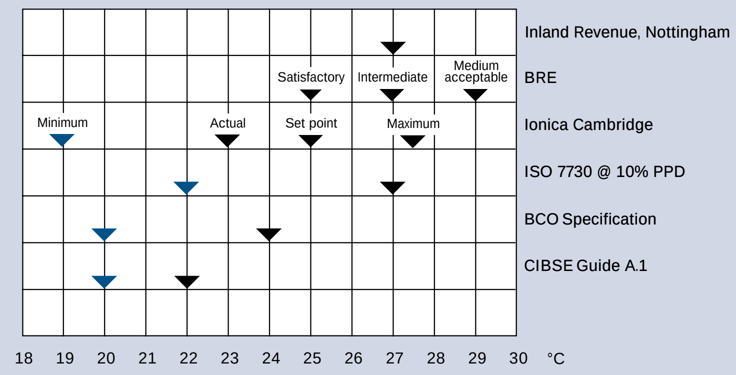
4.4.3 Lighting

Design for a maintained illuminance level of 300-500 lux (open plan) with a uniformity ratio of 0.8 over the designated task area, with 12W/m^2 maximum power consumption.

Lighting is a significant cause of energy use in office buildings, and the use of photoelectric or presence switching devices should be considered. The lighting control system should allow reconfiguration to Part L of the Building Regulations without the need to modify the wiring.

In VDT environments, where bright uncontrolled light sources can cause glare and eye strain, compliance with CIBSE Lighting Guide 3 must be sought. Unless specific occupant activities are known, base the lighting design on luminaires incorporating reflectors with Category 2 performance suitable for regular use with VDT's. Use high frequency control gear on fluorescent luminaries as it has lower energy consumption

How hot is too hot/design criteria



and can permit dimming. The high frequency eliminates stroboscopic effects, so reducing the feeling of nausea and headaches sometimes associated with fluorescent lighting. Installed efficiency should be at least 75lm/W.

Uplighting, or a combination of up and downlighting, can avoid dull ceilings but the power consumption may be greater.

4.4.4 Fresh air

General office areas should be provided with fresh air at a minimum rate of 8-12 litres per second per person, and this should take into account desired indoor air quality and the quality of outdoor air. Consider the type of system being proposed and its ventilation effectiveness.

⇨ 4.3 Occupancy

"Minimising Pollution at Air Intakes" – Chartered Institution of Building Services Engineers, TM21, 1999

The system should be designed as a non-smoking environment, but if smoking areas are required the system should be augmented locally to provide increased ventilation extraction rates and to discharge externally. Provision should be made for additional fresh air to meeting rooms.

4.4.5 Humidity

Humidity control should not be installed within the base office scheme unless a particularly high rate of fresh air per occupant is required, (2.0 litres per second per m^2), in which case it should be controlled to give a minimum of 35-40% RH (relative humidity). Humidification is rarely needed for general office use but space should be allowed for a steam-based system to be added at a later date.

4.4.6 Acoustics

The acoustic environment inside a building is dependent on noise from the following:

- External sources, such as traffic or aircraft noise
- Building services plant and equipment
- Occupiers' use of the space, including equipment
- The level of sound insulation of walls and floors

The design of any noise control measures in occupier areas should take account not only of the building structure, but also the finishes likely to be used by the building's occupants. Acoustic privacy between offices is a performance requirement.

Residual external noise, after attenuation by the building facade, should meet the following criteria within the relevant space:

• Open plan offices	45-50 LAeq
• Cellular offices	40-45 LAeq
• Conference rooms	30-40 LAeq

In the case of naturally ventilated buildings, it may be appropriate to accept higher values.

Building Services noise should be controlled to meet the following criteria:

• Entrance halls and lavatories	NR40
• Open plan offices	NR38
• Cellular offices	NR35
• Conference rooms	NR25-35

Reverberation time should be in the range of 0.4 seconds for small rooms of 50m³ to 0.7 seconds for a 500m³ room. BREEAM requires the lower end of these scales in all office areas as a reflection of best practice.

BS 823-1999

4.4.7 Control

Research shows a causal relationship between the ease of control of services systems and the perceived comfort of buildings by their occupiers. Buildings which rely on sophisticated systems capable of delivering precise and constant conditions, but which are poorly maintained and/or poorly managed, are perceived as uncomfortable. Buildings whose services are well-managed are perceived as relatively comfortable.

In general, buildings which offer greater control by individual occupants over their local circumstances are regarded as more comfortable. Naturally ventilated buildings, designed to a broader temperature band, tend to be perceived as relatively comfortable both because they are easier to manage, and because they afford more personal control.

⇨ 3.6 Plan depth, 3.15 Services systems

Probe Reports (Post-Occupancy Review of Buildings and their Engineering)

www.usable buildings.co.uk/Probe/ProbeIndex.html

4.5 Amenity

Workstyle, occupancy levels and comfort are performance measures concerned with the nature and quality of the workspace itself. The additional features and characteristics that contribute to the creation of an agreeable and pleasant general working environment are also important. These are referred to as 'amenity' and are those things that users feel add quality to their working lives when they are 'away from their desks'. From a user and an investment perspective, there is a clear relationship between amenity and value.

The character of the external environment can significantly contribute to a sense of amenity. The quality of landscaping, relationship of entrances, positioning of buildings creating framed views and vistas, and the relationships with surrounding and adjoining developments need to be determined with great care.

⇨ 2.2 Site location, 3.1 Site density, 3.3 Landscaping 4.6 Accessibility,

Proximity to local high street services providing restaurants and cafés, shopping, hairdressing, sports and other leisure facilities is desirable. When town centre facilities are remote, these services can be integrated into a development and can be particularly effective when provided as part of a workstyle concept operating as the focus of an interactive working community.

⇨ 3.11 Use of atria, 4.2 Workstyle

More difficult to measure, but nevertheless of great importance, are the image and the aesthetics of a new office development. Buildings impose compulsory viewing on their owners and users over many years. Insufficient attention, time, talent and financial investment applied to the design of the building envelope can yield results which fail to represent occupiers' aspirations.

⇨ 3.14 Envelope

4.6 Accessibility

The accessibility of a development by more than one means of transport, and the quality of interconnection between the available means of transport, are now very important selection criteria applied by developers and end users in assessing desirability. For endusers, location in relation to an established workforce will also be critical.

⇨ 2.2 Site location, 3.2 Parking, 6.5 BREEAM

Developments that rely exclusively on access by car not only limit choice, but also contribute to environmental and lifestyle costs (including pollution, energy consumption and wasted time). In general, there is an emphasis on reduction in car parking and support for proposals which contribute to a mixed-use urban environment encompassing employment, housing and social facilities, so that people can live and work in the same area without having to travel far. The term 'accessibility' can be used in the context of access for the disabled.

⇨ 6.6.3 Access and facilities for disabled people

4.7 Capital cost

Capital cost is defined as the expenditure incurred in the construction of new buildings and the extension or refurbishment of existing buildings. It includes the cost of construction works and associated professional fees, but excludes site purchase and letting costs.

Variables which affect capital cost include:

- location of site, including regional variations in materials and wage costs, remoteness and weather conditions
- nature of site, including ground conditions, contours, existing vegetation, archeological interest and accessibility
- building control requirements, town planning constraints
- availability of mains services and diversion works
- market conditions
- level of specification or quality of product

Capital cost is a performance issue in the sense that design choices, made after the above variables have been established for a specific project, will directly affect building cost. These choices include building size, floor plate design, structural and services systems and the design of envelope and finishes. Simple and effective design will make the building easier and faster to construct on site.

⇨ 3.5 Floor plate efficiency, 3.6 Plan depth, 3.7 Column grid, 3.12 Building section, 3.13 Structural systems, 3.14 Envelope, 3.15 Service systems, 3.16 Finishes

The optimisation of capital cost, once the level of specification or quality of product has been fixed, is assisted by the use of techniques such as Cost Planning, Value Management, Value Engineering, Risk Analysis/Control and Whole Life Costing. The latter is used to optimise the cost of construction together with maintenance and running costs – Cost in Use.

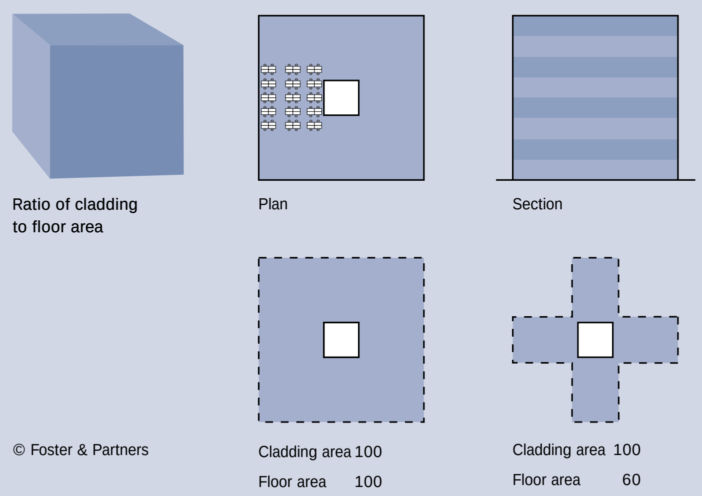
⇨ 4.9 Cost in use, 5.3.6 Value engineering

The efficiency and effectiveness of the procurement method used will also impact on capital cost. Integrated design and construction processes help to reduce waste, both in the finished product and during construction. Benchmarking and the rigorous measurement of results in the context of a rolling development programme can also be an effective technique for optimising expenditure.

⇨ 5.2 Construction strategy, 5.3.5 Benchmarking

Ideal building diagram from commercial points of view

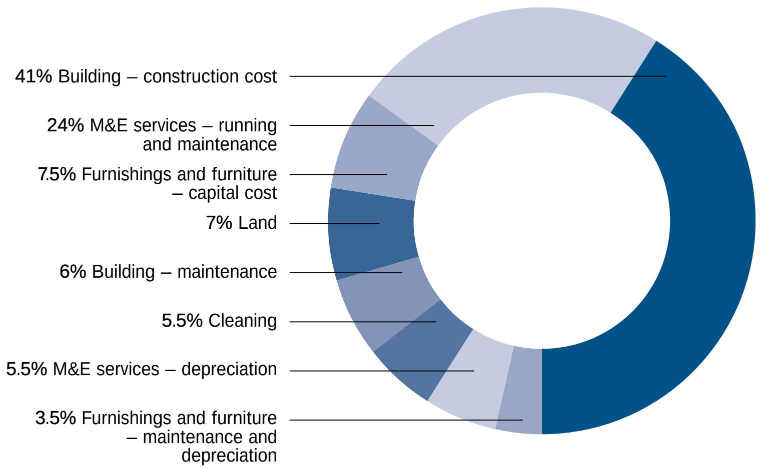
- Maximum lettable m² floor area per m² site
- Minimum building cost per m² lettable floor area
- Reduce amount of most expensive item per m² of lettable floor area = cladding in quantity
- The most efficient geometry would be the sphere or cube for wall to floor ratio



4.8 Embodied energy cost

Embodied energy is the energy needed for procuring raw materials, manufacture, transport, construction, maintenance and repair. The total amount of energy needed can be high, typically accounting for 20% of the building's energy use during a 50-year life cycle, the equivalent of 10 to 20 times the annual energy use. Reducing embodied energy can reduce the overall environmental burden of a building, and provide pointers to reducing capital cost.

Total investment in office building discounted to present value
Note: excludes occupants' staff costs



The reduction of embodied energy can be achieved through applying the four Rs: Rethink, Reduce, Recycle and Reuse.

⇨ 3.13 Structural Systems, 3.16 Finishes, 5.1 Procurement

In general:

- design for flexibility and adaptability (longer spans, higher ceilings, ease of maintenance
- design for durability considering the extended design life of permanent parts of the building (foundations, structure, service core, drainage)
- ensure that less durable materials, such as plastics and rubber, can easily be stripped out and replaced
- minimise transport of materials to site
- use materials already present on site, provided durability and mechanical properties are still acceptable (eg. aggregates, bricks, steel sections)
- advertise (with BRE's construction materials information exchange) any materials which are present on site but cannot be used, and search for local supplies of potential recycled materials
- specify waste minimisation and productivity enhancement measures to be implemented during construction
- utilise, where possible, forms of renewable energy
- minimise the use of high energy materials (eg. plastics)

⇨ 4.10 Adaptability

Energy Consumption Guide 19 – 'Energy Use in Offices', Department of the Environment, Transport and Regions, January 2000

'Building for Energy Efficiency – The Clients' Briefing Guide – CIC, 1997

'Environmentally Smart Buildings – A Quantity Surveyor's Guide to the Cost Effectiveness of Energy Efficient Offices' – Department of Environment, Transport and Regions, November 1999

'What will Energy Efficiency do for Your Business – A Business Manager's Guide to Environmentally Smart Buildings' – Department of Environment, Transport and Regions (due to be available April 2000)

'A Developers Guide to Environmentally Smart Buildings'. Department of the Environment, Transport and Regions, September 1999

'The Green Guide to Specification - an environmental profiling system for building materials and components' - BRE September 1998

www.bre.co.uk/envprofiles

www.bre.co.uk/envest

www.bre.co.uk/waste

4.9 Cost in use

Cost in use is also referred to as Total Occupancy Cost, and is the sum of costs associated with:

- property occupation (rent, property tax)
- adaptation (fit-out, furniture, equipment)
- building operation (insurance, maintenance, security, cleaning, waste disposal, water, sewage, energy)
- business support (telephones, reception services, post room)
- management (FM and estate management)
- IT/technology

While rent and local property tax will often account for half of the total cost in use, adaptation and building operation costs can also be very significant, typically accounting for a further 30%. Building design solutions may have a direct impact on cost in use, particularly on maintenance and running costs, and the performance of design choices should therefore be understood and tested. A building with low cost in use should have a lower rate of rental depreciation.

By far the greatest whole life costs associated with commercial office buildings are the salaries of the building occupants. Accordingly, careful selection of components and systems that have an influence on the productivity and comfort of the building occupants (such as finishes, heating, cooling, ventilation, control and the selection of furniture) is the most important issue.

The Total Occupancy Cost Code links costs in terms of both revenue and annualised capital costs.

OPD Total Occupancy Cost Code, IPD. 1999. www.opd.co.uk

⇨ 3.15 Services systems, 4.4 Comfort, 4.5 Amenity

"Whole Life Costing – A Client's Guide" – Construction Clients Forum, 1999

Investment property data-bank. www.ipindex.co.uk

Cost in use in the context of sustainability includes the costs to society of energy consumption, production of greenhouse gases and other pollutants, and transportation costs resulting from site location and accessibility.

⇨ 2.2 Site location, 3.6 Plan depth, 3.11 Use of atria, 3.14 Envelope, 3.15 Services systems

The Long Term Cost of Owning & Using Buildings, Royal Academy of Engineering www.raeng.org.uk

Typical and good practice standards for energy consumption and CO^2 emission are contrasted below.

Energy (kwh/m^2/yr)

Naturally Ventilated Office	Typical practice	Good practice
Gas	151	79
Electricity	54	33
Total	205	112
	(45% improvement)	

Airconditioned	Typical practice	Good practice
Gas	178	97
Electricity	226	128
Total	404	228
	(44% improvement)	

CO_2 emission (kg/m^2/yr)

Naturally Ventilated Office	Typical practice	Good practice
Total	58.7	33.0
	(44% improvement)	

Airconditioned	Typical practice	Good practice
Total	144.8	86.2
	(40% improvement)	

Comparison of whole life costs for alternative mechanical systems (at year 2000)

	Capital cost Installation £/m^2	Annual Maintenance Cost £/m^2	Annual Energy Cost £/m^2
2 pipe fan coil	155	8	16
Displacement ventilation	140	4	13

1. Both systems based on the use of electric heating 2. All figures assume a notional office building of 10,000m^2 gross (8,000m^2 net)
3. All figures are expressed in terms of gross internal area

4.10 Adaptability/design life

Current business culture and workstyle require office buildings to accommodate high levels of both transience (in terms of tenant turnover) and volatility (in terms of work setting change). A distinction is therefore made between the optimum life span of the physical elements of the office environment:

- site (indefinite)
- structure (75 years or more)
- skin or envelope (50-75 years)
- services (15 years)
- space planning elements (5 years)
- work settings (constantly changing)

In practice, services and space planning elements (in particular) may have to be adapted on a much more frequent basis, and IT (which drives much of the change in workstyle) is obsolescent within 3 years or less.

In general, long-life features (eg. structure, plate shape, access points, location) should allow as many servicing and layout options as possible to accommodate transience and volatility. This approach accords with the need to create generic solutions when buildings are developed speculatively. Consideration should also be given to the inclusion of features designed to deliver high levels of future flexibility. These include the provision of additional space capacity in vertical service risers, plant areas and building section. The additional construction cost of these features must be weighed against value attached to a looser fit and longer design life and against the probability of more compact, lower energy-use products in the future.

The performance in use of supplied building components in terms of durability and maintainability is extremely variable, and research should be undertaken to determine whether components under consideration will meet the specific requirements of designers and users.

⇨ 3.12 Building section, 3.14 Envelope, 3.15 Services systems, 4.8 Embodied energy cost

BPG Building Fabric Component Life Manual
ISBN 0-419-26000-5

4.11 Safety, security and risk

The key to good safety, security and risk management is early identification of the issues involved.

4.11.1 Risk management

The site

- Location of building in relation to site boundary and the provision of external wall or fence to provide the principle of 'defensible space'
- Single, monitored/manned point of access to site
- External CCTV coverage to entry road/building approach
- Car parking areas are to be well lit, covered by CCTV cameras and have access rigorously controlled
- Security patrols to external and internal areas
- All vulnerable external spaces to be well lit, including access doors, external doors and windows
- Access to car park/goods entrances to be monitored by central security room

⇨ 2.2 Site location, 4.5 Amenity

BCO Management Guidance Security
ISBN 0952 413 132

The building

- Single point of secure access to building.
- The number of recesses and re-entrant corners to be minimised or covered by CCTV cameras
- Conduit to be installed to allow tenant to install CCTV coverage to all common areas. Film to be recorded in security room and stored for required 30 days. Video cassettes to be regularly changed
- Robust construction of building, including provision of blast shelter
- Incorporate design features to minimise effects of bomb blast

4.11.2 Fire protection

L2 coverage should be provided in respect of detection and alarms. Voice alarms motivate people to leave a building more quickly, they are essential for phased evacuation but should be considered for all installations.

Building Regulations Part L

Current advice is that hose reels should not be installed, although this should be agreed with individual Building Control officers at the outset.

⇨ 5.9 Statutory regulations

Consideration should be given to the relationship between active and passive fire protection systems when formulating the design of a building. The combination of all aspects of life safety should be considered as a whole as opposed to element by element.

4.11.3 Support facilities

Standard practice in the diversification and availability of M&E systems may be part of tenant enhancement measures, and can include the following:

- Providing alternative and well separated sources of supply for utility services
- Assess the reliability and quality of the electrical supply
- Careful and selective oversizing of main plant and running them at a percentage of full load but be aware of the possible adverse impact on energy consumption
- Specifying high quality equipment
- Siting of normal and standby plant in different fire compartments, floors and aspects of the building
- Provide suitable maintenance facilities and design of plant for ease of maintenance and repair
- Provide a regular maintenance regime of planned tests and inspections
- Install control systems that can measure energy, maintenance cycles etc

⇨ 3.15 Services systems

4.11.4 Disaster recovery planning

The following should be considered:

- Production of detailed action plans by the business including business impact analysis, identification of critical components, names of key contacts with work/customers/suppliers, means of testing the plans to allow them to manage an interruption
- Formation of a core team, of a size appropriate to the business, to manage any business interruption. Functions that require consideration include: a central manager, accommodation, personnel, communications, IT and insurance
- Identifying and, if necessary, procuring recovery options: these may include doing nothing, working from home, switching operation, using off-site backed up facilities, using alternative accommodation
- Ongoing programme to maintain, and validate, recovery plans

5.0 Building completion

From an occupier standpoint the key point is not Practical Completion, but rather the point at which a building can be accepted as functioning effectively and when the end user has been adequately briefed in how to occupy, and maintain, the workspace.

5.1 Commissioning/handover

Commissioning/handover should be regarded as the successful transition from a construction project to an occupied, operational and defect-free building. This process can be broken down into distinct elements dependent upon timing of occupation.

Construction: pre-practical completion
Facilities Management Familiarisation/Pre-Planning Stage comprising:

- Development of proposed operational strategies
- Progressive consideration of all the information which will be in the Building Log Book
- Attendance at Construction Team inspections prior to Practical Completion Certification
- Preparation of standard Planned Maintenance Contract Tender documentation
- Set up of requisite facilities management procedures and documentation covering staffing, security, cleaning and operation/maintenance generally

⇨ 3.15 Services systems, 5.2 Building log book

Post practical completion to occupation

- Preparation of an occupational operation guide covering fitting-out procedures, cleaning, security, operation and maintenance
- Planned maintenance contracts put into operation
- Confirmation of occupier acceptance following Construction Team issue of Practical Completion Certification
- Identification of facilities management space and equipment needs as a result of agreed operational strategies
- Guidance for tenants for fitting-out works and re-commissioning procedures

12 months post practical completion

- Early rectification of identified building defects
- Ensuring building's operational energy and cost efficiency

The commissioning/handover process represents a total concept of quality control covering the inter-relationship of building components and operation to anticipate the future 'impact' upon building use.

Commissioning/handover of the building has the habit of bringing up the unexpected. It is essential to have the facilities management experience and expertise to cope with all situations that might arise.

⇨ 3.15.6 Commissioning

Freeman, Sheffield, designed by Carey Jones Architects, *photo Paul White Photography*

5.2 Building log book and training

5.2.1 Building log book

The aim of the building log book is to provide a proper record of the components, materials and systems that have been incorporated within the building structure and to give guidance to the user of the best way in which they should be maintained. It is also to provide a working document that can be updated when changes occur in the building.

The building log book should comprise a number of volumes, each covering a particular subject. The information within each volume should be presented in a structured and logical format.

Contents to include:

- Fabric and data
- Building services
- Specialist elements
- Manufacturers' literature
- Commissioning and testing data
- Record drawings
- Information produced during construction (CDM regulations)
- Measured drawings

www.hse.gov.uk

In addition, provisions are made for:

- Recording system for all occupier requests
- Building register recording all maintenance activities, breakdowns and defects
- Compliance procedures
- Environmental management, BREEAM
- Building warranties, including construction team's terms of engagement, statutory approvals and consents and building contracts
- Methodology for regular audit procedures
- Measured drawings to be included with log book

The building log book is to be made available in paper form and computer disk at the completion of the project.

5.2.2 Training

The components of a modern office building are complex and varied. The building owner must ensure that the building user/maintainer is given clear training and has the necessary understanding so that the building can be run efficiently and economically, and above all else, safely.

6.0 Appendix

The procurement of construction projects can follow a number of routes, each with advantages and disadvantages. A successful outcome or a potential failure, commences with the selection and briefing of the design team by the client.

6.1 The design team

There are two alternatives for the forms of appointment for the design team, either a standard form produced by the professional bodies (RIBA, ACE, RICS) or bespoke forms drafted by solicitors.

The selection will be influenced by the experience of the client, the complexity and size of the project and the choice of construction strategy.

Bespoke forms can lead to misinterpretation unless all parties involved understand the contractual obligations imposed upon them.

6.1.1 Warranties

Warranties will usually be required where a development will be financed, let or sold to a third party. The purpose of the warranty is to provide the tenant or purchaser with direct contractual rights to the design team member.

6.1.2 Professional Indemnity Insurance

Professional Indemnity Insurance (PI) cover should be provided by each member of the design team to a level that reflects their risk profile in the project.

6.2 Construction strategy

6.2.1 The options

There are four principal ways in which contracts for the construction of office buildings are arranged.

These fall under the generic headings of:

- Traditional Lump Sum
- Design and Build
- Construction Management
- Management contracting

6.2.2 Traditional Lump Sum

A design team, usually led by the architect, is appointed by the client to develop designs for the new office building. Competitive tenders are requested from, typically, four contractors who have been assessed to have the competence, resources and financial strength to construct the project.

Standard forms of building contract published by the Joint Contracts Tribunal are commonly used and three versions are available for projects of varying size. An alternative to requesting tenders on the basis of completed designs, which is becoming increasingly popular, is known as 'two stage tendering'. With this approach, the contractor is selected much earlier, either by negotiation or by inviting competitive proposals on certain aspects of the project (the cost of staff and preliminaries and perhaps some elements of the work, for example).

6.2.3 'Design and Build'

A design team, or perhaps a single consultant, is appointed by the client to work with him to agree and document his brief for the construction of the office building. Once this brief has been developed in conjunction with the design team, a set of employer's requirements is prepared and issued to, typically, three or four contractors who have previously been assessed to have the competence, resources and financial strength to design and construct the project. The contractor designs as well as constructs the new building.

The form of building contract is that published by the Joint Contracts Tribunal, namely the 'With Contractor's Design' version, 1998.

The design team, or single consultant, will confirm the acceptability of the 'Contractor's Proposals' for the design and construction of the project received from the tendering contractors. A contract is then placed solely with the contractor for the delivery of the building, an Employer's Agent being retained by the client to represent his interests. The design team may be novated to the contractor after the design scope and employer's requirements are produced. This procedure retains the quality of the design brief and the knowledge of the design team.

A variant know as 'Develop and Construct', describes the strategy when the client appoints designers to prepare the concept design before the contractor assumes responsibility for completing the detailed design and then constructing the works.

6.2.4 Construction Management

A design team, usually led by the architect, is appointed by the client to develop designs for the new office building. A construction manager is also appointed who will direct the preparation and completion of the designs into 'packages' which will then be tendered to individual specialist trade contractors, eg. foundations, steelwork, air conditioning, etc. The construction manager will then co-ordinate the execution of the work by the trade contractors. Unlike Traditional Lump Sum and Design and Build, there are no standard contracts for the appointment of a construction manager or the trade contractors. All of the trade contractors are appointed directly by the client, not the construction manager.

6.2.5 Management Contracting

If the individual trade contractors are contracted to the main contractor rather than the client, a Management Contract is created. This has many benefits of the Construction Management as it enables the client to contract with a single unity for the delivery of the building. The disadvantage is that the main contractor does not have an obligation to complete on time and to cost, but aims to complete the project within a target cost (the Prime Cost).

Procurement Route Selection, Occasional Paper No. 7 BCSC www.bcsc.org.uk

6.3 Procurement Best Practice

6.3.1 Background

In 1994, Sir Michael Latham's report 'Constructing the Team' was published which identified failings of the UK construction industry and proposed measures to develop effective, profitable and customer-focused approaches. Taking their lead from the work of Sir Michael, the CIB and the Construction Task Force developments include the Construction Best Practice Programme, the Movement for Innovation, the Reading Construction Forum, the Design + Build Foundation and the Construction Round Table.

www.cbpp.org.uk www.ciboard.org.uk
www.m4i.org.uk www.crtp.org.uk

6.3.2 Partnering

The essential principle of partnering is the ability to develop long-term relationships with the supply chain and to create a project environment within which the objectives of the customer and those of the various participants can be aligned as closely as possible.

Partnering can have significant benefits in terms of sustainability as it allows a greater opportunity for developing objectives.

Principal criteria in selecting forms of contract/procurement routes

Selection criteria	Traditional Lump Sum fixed price	Accelerated/2 Stage Traditional methods	Construction Management	Management Contracting	Design and Build	Develop and Construct
Price certainty before commitment to build	5	2	1	1	5	5
Lowest construction cost	4	3	2	2	5	5
Programme commitment from Contractor before entering Contract	5	4	1	1	5	5
Shortest overall programme (inception to completion)	2	4	5	5	4	3
Control over design and materials	5	5	5	5	2	4
Control over choice of Trade Contractors and Sub-contractors	3	4	5	5	1	1
Input (during design) from Contractor on programming and buildability	2	4	5	5	3	3
Control over programming/planning on site	2	2	5	5	1	1
Single point of responsibility for design and construction	1	1	1	1	5	5
Direct contractual relationship between employer and designers	5	5	5	5	1	3
Liquidated damages recoverable from Contractor if he completes late	5	5	1	1	5	5
Ability to introduce and accommodate changes	4	4	5	5	2	2
Suitability for complex design	4	3	5	5	2	3

5: Achieves criteria very well 3: Achieves criteria to accepted level 1: Does not achieve criteria

6.3.3 Selection on quality and price
It is imperative that all appointments of contractors and consultants properly reflect the quality of the service as well as its price. The CIB guide 'Selecting Consultants for the Team – Balancing Quality & Price' provides a basis for a project- or client-specific approach.

1.1 The brief

6.3.4 Standardisation and pre-assembly
CIRIA 1997 offer the following definitions:

Standardisation
'The extensive use of components, methods or processes in which there is regularity, repetition and a background of successful practice. More generally, an agreed shared framework for project decisions, such as common interfaces or a dimensional grid.'

Pre-assembly
'The organisation and completion of a substantial proportion of final assembly work before installation in its final position. It includes many forms of sub-assembly. It can take place on site, but more usually off-site, and often involves standardisation from project to project.'

6.3.5 Benchmarking
'Key Performance Indicators', published in 1999 by the Construction Best Practice Programme, are a good first step towards introducing objective performance benchmarking standards. CALIBRE has been developed by the BRE to assess, and benchmark, site performance.

www.CALIBRE2000.com

6.3.6 Value Engineering and Value Management
VE and VM are methods to eliminate waste from the client brief, and the design and construction teams' responses to that brief, by the application of structured processes and workshops.

http://helios.bre.co.uk/valman

'Value Management in Construction – A Client's Guide', Ciria Special Publication 129

6.3.7 Site productivity
BSRIA have developed tools to improve productivity and efficiency on construction sites.

www.bsria.co.uk

6.3.8 Electronic Document Management Systems
There are a number of proprietary EDMS systems available that enable information to be exchanged electronically via telephone lines and a central 'hub'.

www.team-work.org.uk

6.4 Categories A&B

6.4.1 Category 'A' works (Background fitting out)
- These works generally follow completion of the base building structural works
- Category A is the definition used to describe the level of fitting out between the shell and core building option, and a point at which internal components must be designed to a specification for the particular end user, which is known as Category B, bespoke fitting out works.

Fitting out elements will include :

- Suspended ceilings
- Basic mechanical and electrical services (lighting, heating, ventilation and cooling systems etc.)
- Basic lighting, heating, ventilation and cooling control system
- Raised flooring system or other cable containment systems installed
- Finishes to cores
- Fully fitted out WC's
- Basic safety signage system installed.

6.4.2 Category 'B' works (Bespoke fitting out)
These works generally follow completion of Category 'A' works, but may sometimes be incorporated into the Category 'A' construction programme to reduce construction time and avoid duplication of materials and handling.

Fitting out elements will include :
- Suspended ceiling upgrade/modifications
- Installation of internal partitioning
- Floor finishes
- Acoustic upgrades
- Mechanical and electrical services upgrades (lighting, heating, ventilation and cooling systems etc.)
- Tailoring/upgrading lighting, heating, ventilation and cooling control systems
- Adaptation of raised flooring system or other cable distribution systems installed
- Reconfiguration of below-floor cabling and floor/ceiling outlets
- Upgrades to cores finishes
- Executive WC's
- Basic safety signage system installed
- Basic below floor cable tray/ways provided.

3.16 Shell & Core

6.0

6.5 BREEAM 98

BREEAM 98 for Offices is the latest version of the BRE's Environmental Assessment Method for Buildings.

The scheme was originally launched by BRE in collaboration with ECD and a number of major property developers and occupiers in 1990 and has been revised twice since then. The current scheme is neither prescriptive nor biased against any particular situation and so provides a fair comparison of the environmental impacts of one building with those of others.
BREEAM 98 establishes a set of issues for which performance criteria are defined.
These are as follows:

- Management
  policy and procedural issues including commissioning
- Health and well-being
  indoor and external factors
- Operational energy
  including CO_2 emissions and controllability
- Transport
  including CO_2 emissions for commuting
- Water
  consumption and leakage
- Materials
  environmental implications of materials selection
- Land use
  Greenfield and Brownfield sites
- Site ecology
  Ecological Value of the site
- Pollution
  air and water pollution

'Looking for a New Investment Angle – A Developer's Guide to Environmentally Smart Buildings' – Good Practice Guide 258, Department of Environment, Transport and Regions, September 1999

The relative importance of these different issues is taken into account through the application of consensus-based weightings. These are used to calculate the final BREEAM rating on a scale of Pass; Good; Very Good or Excellent. All represent a significant improvement on regulatory requirements. A second scale, the Environmental Performance Index or EPI, is also calculated. This provides a direct comparison of performance between buildings of all ages.

www.bre.co.uk/breeam

6.6 Statutory regulations
The UK Building Regulations are issued by the Secretary of State for the Environment under powers granted in the Building Act 1984. A designer is at liberty to demonstrate compliance with the requirements of the Regulations using parameters other than those contained in the Approved Documents.

Of principal importance are the Regulations governing escape, energy conservation and access for the disabled.

Occupancy standards given below are recommended not mandatory, however, if the recommended Building Regulations standard is not adopted, then the fire certificate for a completed office building will specify as a maximum the occupancy level for which the building has specifically been designed.

6.6.1 Means of escape
Regulation and Approved Document B1 deal with means of escape. Standards for office buildings include, but are not limited to, the following:

Limitations on travel distance:
- Maximum travel distance in one direction only: 18m
- Maximum travel distance in more than one direction: 45m

Limitations on direct distance:
- Maximum travel distance in one direction only: 12m
- Maximum travel distance in more than one direction: 30m

BREEAM rating for commercial offices by location

Building location	Medium sustainability target rating	High sustainability target rating
City Centre a/c	Good	Excellent
City Centre n/v	Very good	Excellent
Town Centre	Good	Excellent
Out of Town	Pass	Excellent

Occupancy factors for means of escape calculations:

- Open plan offices exceeding 60m^2: 6m^2 per person
- Other offices: 7m^2 per person

Minimum widths of escape routes:

- Maximum number of persons – 50:750mm
- Maximum number of persons – 110:850mm
- Maximum number of persons – 220:1050mm
- Maximum number of persons – greater than 220:5mm per person.

Stair widths:
Section 5 of Regulation B1 deals with numbers and widths of stairs and describes two methods of width calculation based upon total or phased evacuation. The numbers of stairs provided and their widths must be assessed by reference to various tables and to other British Standards.

These stairs may also be fire-fighting stairs if the building comes within the requirements laid out in Part B5: Access and facilities for the fire service.

6.6.2 Energy conservation

Regulation and Approved Document L deal with conservation of fuel and power. These documents are undergoing a full review and a radically revised version, targeting the reduction of CO^2 emissions, is due for release during 2000. Currently, however, the Approved Document permits three methods of calculating the heat loss through a building fabric. They are:

The elemental method:
Where the thermal performances of building elements are required to conform with stated 'U' Values.

The calculation method:
Where the heat loss through the whole envelope of a building is compared with, and shown to be better than, that for a notional building of the same size and shape calculated by the elemental method.

The energy use method:
Where the calculated annual energy use of a building is shown to be less than that for a similar building calculated by the elemental method.

Guidance for the design of energy-efficient space-heating controls, hot-water storage systems and lighting within offices is also given in Approved Document L.

⇨ 3.14 Envelope, 3.15 Services systems

6.6.3 Access and facilities for disabled people

Regulation and Approved Document M deal with access and facilities for disabled people.

For offices, the Approved Document covers access to and into a building, access within the building and sanitary conveniences within the building. Standards include, but are not limited to:

Ramped approach
Length of ramp:
10m for 1:15 to 1:20 slope
5m for 1:12 to 1:15 slope

Width of ramp:
1200mm surface width / 1000mm unobstructed width

Landing length:
1200mm minimum

Entrance doorways minimum clear opening:
800mm

Internal doorways minimum clear opening:
750mm

Lift cars
Minimum internal dimensions:
1100mm wide x 1400mm deep

Height of controls from FFL:
900mm minimum 1200mm maximum

Wheelchair WC compartment:
1500mm wide x 2000mm deep

6.6.4 Health and safety

Other relevant regulations governing health and safety in the UK include:

The Construction
(Design & Management) Regulations 1994

Management of Health & Safety at Work
Regulations 1992

Workplace
(Health Safety & Welfare) Regulations 1992

Provision and Use of Work Equipment
Regulations 1992

Health & Safety (Display Screen Equipment)
Regulations 1992

Manual Handling Operations
Regulations 1992

Personal Protective Equipment at Work
Regulations 1992

6.7 Comparative table

Current typical design standards

	UK (BCO)	Germany	USA	Ref
Occupancy: Net area/person	14m^2	15m^2		4.3
Occupancy: Net area/person escape	6m^2		100ft^2/10m^2	3.10
Occupancy: minimum workspace	5m^2	5m^2		4.3
Plan efficiency: NIA: GIA	85%		80%	3.5
Plan depth:	15m to 18m	13.5m to 15m	60ft/18.2m	3.6
Column grid:	7.5m or 9m or 8.1m	7.2m or 7.5m	32ft/9.8m	3.7
Planning grid:	1.5m or 1.35m	1.2m or 1.5m	4ft/1.2m	3.8
Floor to ceiling clear height	2.7m	3m	9ft/2.7m	3.12
Lifts: standards	80% loading 30 sec. interval	60% loading 30-40 sec. interval	5.5 sec. per floor interval	3.10
Raised floors	150mm 300/450mm (subfloor A/C)	150mm	2 inches 50mm	3.12
Structural loading live	General: 2.5kN/m^2 High: 7.5kN/m^2	General: 5.0kN/m^2	100psf	3.13
Structural loading dead	General: 2.0kN/m^2 High: 4.0kN/m^2		30psf	3.13
Small power loading	15W/m^2 – 25W/m^2	10-35W/m^2	1.57W/ft^2 17W/m^2	3.15
Lighting standard	300-500 lux open plan	400-500 lux	500 lux	4.4.3
Temperature standard	22ºC±2ºC	23ºC	75ºF/23ºC	4.4.2
Fresh air standard	8-12l/s/person		20ft^3/m/person	4.4.4
Air conditioning Systems	VAV/fan coil/displacement chilled ceiling	Opening windows simple systems	VAV/fan coil	3.15.3
Energy: A/C (kwh/m^2/yr)	Typical: 404 Good: 225			4.9
Energy: N/V (kwh/m^2/yr)	Typical: 205 Good: 112			
CO_2 emission: A/C (kg/m^2/yr)	Typical: 120-140 Good: 86			
CO_2 emission: N/V (kg/m^2/yr)	Typical: 40-50 Good: 33			
Noise criteria	Open plan offices: 45-50 LAeq Cellular offices: 40-45 LAeq Conference rooms: 30-40 LAeq			4.4.6

6.8 Materials guide

Certain materials should not be specified, or used, in the construction of a building to avoid hazards to the health and safety of the occupants, and to ensure long-term structural integrity.
The Guide to Good Practice in the selection of construction materials, produced by a steering group representing the BCO and the British Property Federation, the Guide to Good Practice covers the following categories of materials:

- Admixtures for use in concrete and mortar
- Aggregates for use in reinforced concrete
- Asbestos products
- Brick slips
- Calcium silicate bricks
- High alumina cement in structural elements
- Lead or materials containing lead
- Man-made with mineral fibres (MMMF)
- Urea formaldehyde (UH) foam
- Vermiculite products
- Wood preservatives
- Wood wool cement slabs

'Good Practice in the Selection of Construction Materials'. Tony Sheeham (Lead author). Ove Arup and Partners, R&D, 1997

6.9 Useful websites

Useful web sites and references

BRE
www.bre.co.uk

British Institute of Facilities Management
www.bifm.org.uk

BSRIA
www.bsria.co.uk

CIBSE
www.cibse.org

DETR
www.detr.gov.uk

HSE
www.hse.gov.uk

Reading Construction Forum
www.ref.org.uk

RIBA
www.riba.org

RICS
www.rics.org.uk

6.10 Tenants' Services Charges

Tenants should require their landlords to follow the British Property Federation Code of Practice for Service Charges in Commercial Properties. This requires landlords to produce annual budgets, to seek regular competitive tenders for services, not to make a profit out of service charges, to bear themselves the share of cost attributable to vacant units and to be open in providing information.

6.11 Floor area measurements

Gross External Area (GEA) is the area of a building measured externally at each floor level. It includes wall thicknesses and external projections, the area of internal walls and partitions, atria measured at base level only, and covered plant rooms. It excludes open balconies and open fire escapes.

Gross Internal Area (GIA) is the area of a building measured to the internal face of the perimeter wall at each floor level. It includes areas occupied by internal walls and partitions, columns, piers and other internal projections, internal balconies, stairwells, toilets, lift lobbies, fire corridors, atria measured at base level only, and covered plant rooms. It excludes the perimeter wall thickness and external projections, external balconies and external fire escapes.

Net Internal Area (NIA) is the usable area within a building measured to the internal face of the perimeter walls at each floor level. It includes kitchens and cleaners cupboards. (Atria and entrance halls should be measured separately.) It excludes toilets, stairwells, plant rooms, fire corridors, and internal structural walls, columns, internal projections and vertical ducts.

Code of Measuring Practice, Fourth Edition, RICS Books, ISBN 0 85406 610 1.

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Price £20

ISBN 0 9524131 2 4

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First published: May 1994 Second edition: 1997 This edition: October 2000