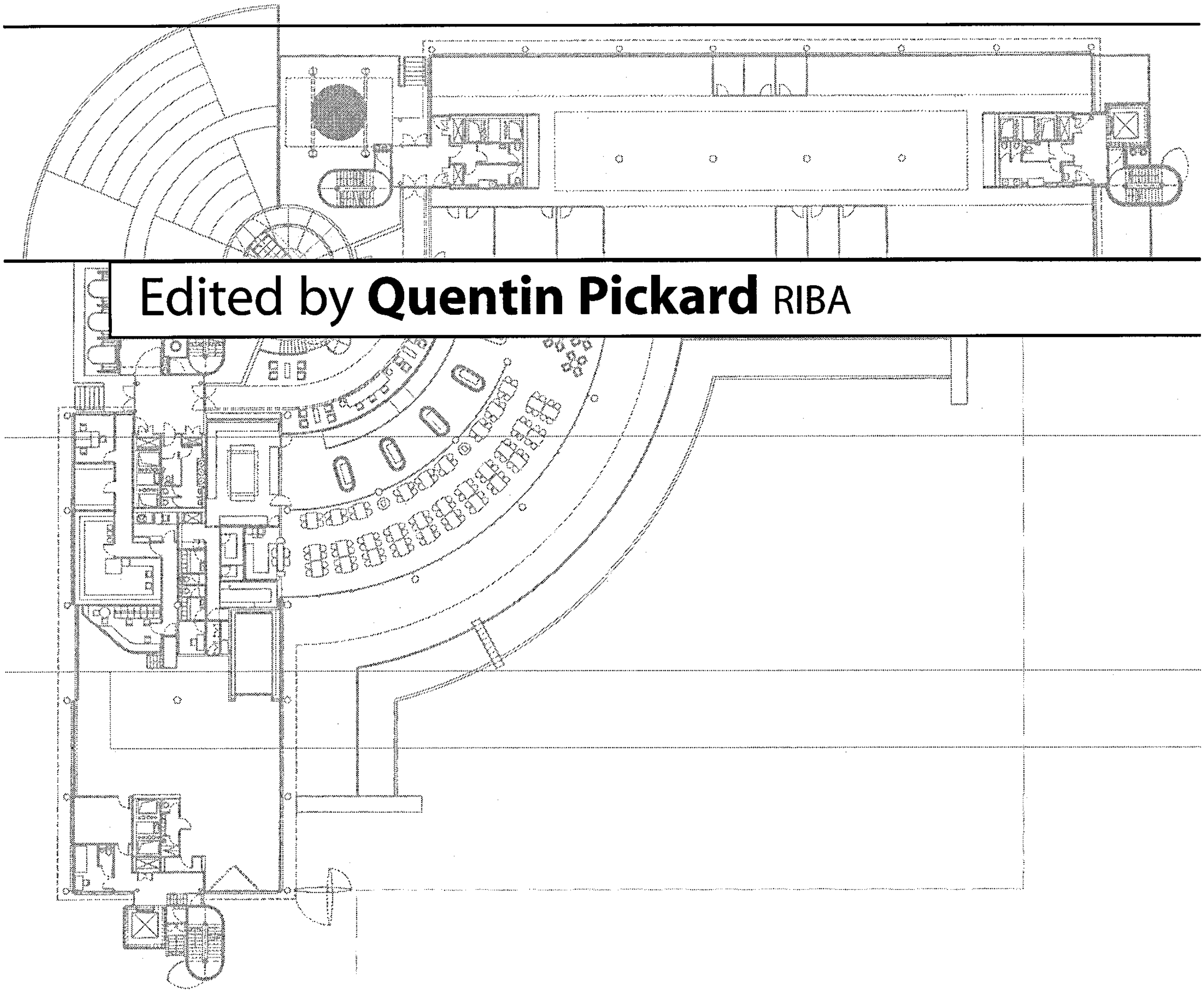
The **Architects'** Handbook



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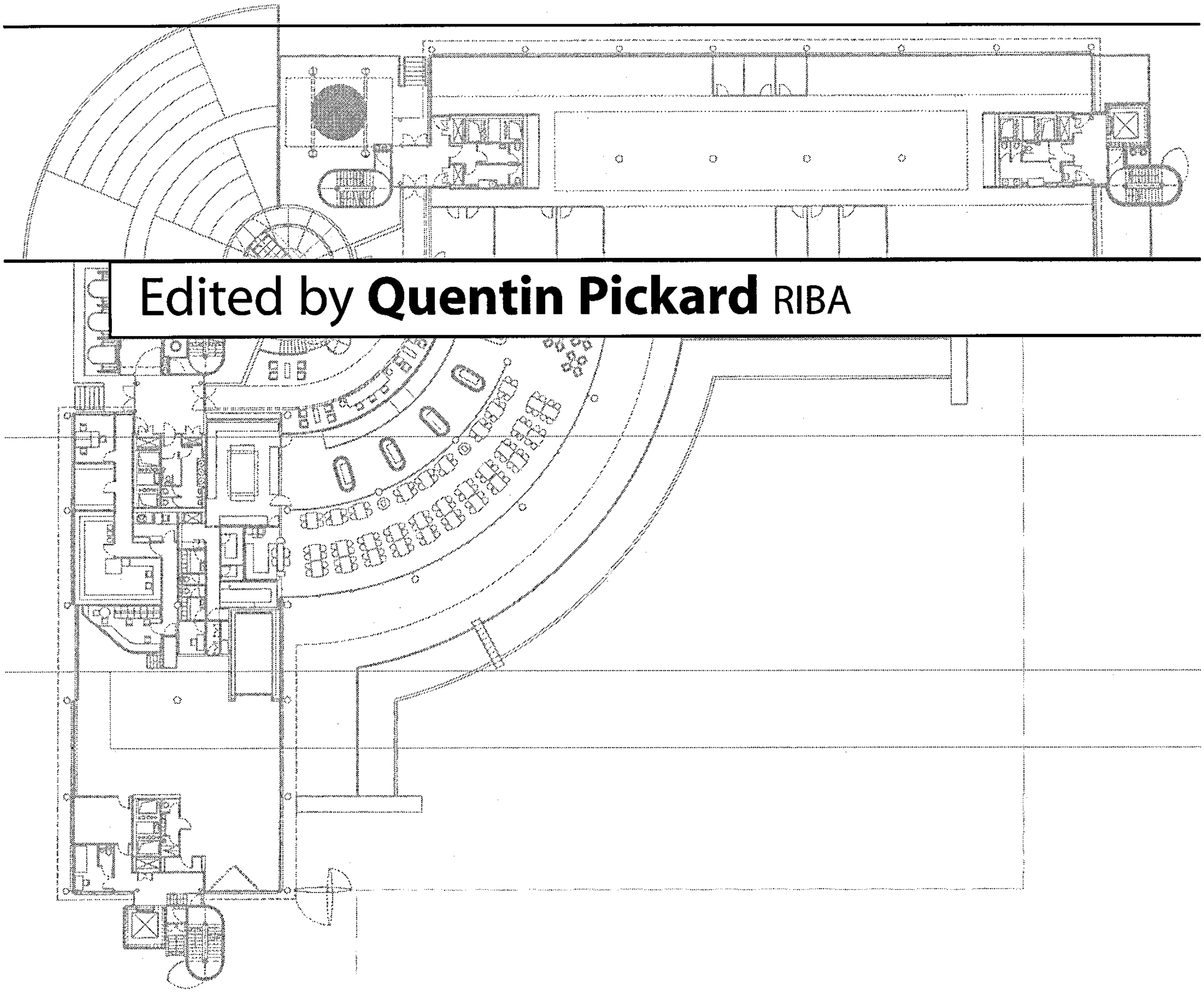

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PREFACE

The Architects' Handbook provides visual and technical information for most building types likely to be encountered by architects, designers and building surveyors. For each section, we have tried to ensure a representative sample of recent buildings to reflect the diversity of approach so essential in a well-designed environment. Numerous plans, many sections and elevations, and some three-dimensional views have been included, to give the essential character of a particular building. The distinctive contribution of this book is that it concentrates more on the overall character of buildings, and not on excessive detail or too much technical information. Although we have deliberately avoided comment on the design qualities of buildings, the fact that a building is included indicates that we consider it makes a positive design contribution.

One aspect that became increasingly evident as the book progressed was just how flexible a building designation needs to be: 'business parks', for instance, do not want to be included in 'industrial buildings'; an 'arts centre' should be considered with theatres, and certainly not with 'art galleries'; and is an arts centre really just a superior type of community centre? Many buildings designed to produce physical components, which we used to call 'industrial buildings', are now more akin to offices than industry. There are many similarities between an out-of-town hypermarket shed and a warehouse, yet one is commonly called a 'shop' and the other an 'industrial building'.

The question of how much reference should be made to technical standards and other legislation is never easy to answer. Wherever possible, therefore, such references have been kept to a minimum, and grouped at the end of the book. It should also be remembered that accessibility facilities have been discussed in several sections, and generally it has been assumed that, for instance, a disabled WC must be provided in every building to which the public has access, and it seemed superfluous to mention this in every instance.

The one thing of which we can be certain is that technical requirements will continue to be amended, and no doubt expanded. Architects and other designers have to keep abreast of seemingly constant changes and will appreciate that it is essential to check that all technical information is up to date.

One sad but inevitable development is the increasing rarity of drawings of good visual appeal. The growth of computer-aided design is resulting in the near-disappearance of visually satisfying drawings. CAD drawings are often unsuitable for book reproduction – there is little distinction in line thickness, much irrelevant detail is included (grid lines, minor dimensions etc.), while other important information often seems impossible to obtain (for instance, scales and north points). To try to ensure that the art of good draughting is not entirely forgotten, a section on drawing practice has therefore been included – a subject that otherwise might not seem to be particularly appropriate for this book.

This work has drawn upon many sources, and considerable efforts have been made to ensure that all copyright material has been properly credited. If by mischance anything has been overlooked, it will be noted in the next edition. Many specialists have been consulted about technical details, and their contributions are gratefully acknowledged; they are listed in the following pages.

Inevitably in a work as extensive as this, some errors are bound to occur, and readers' comments and suggestions (which should be sent to the publishers) will all be noted.

I am very grateful to all the architects, other individuals and organisations who have supplied information, many having gone to considerable lengths to provide the correct drawings or technical details.

Sincere thanks are due to all the contributors for their hard work, and also to Antonia Powell, who undertook a great deal of research. I would also like to thank my publisher, Julia Burden, who offered constant encouragement and suggestions, and Paul Stringer and Mark Straker, who have managed to turn a mass of text and drawings into an excellent final layout. Thanks also to Geoff Lee for his many first-rate drawings.

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Raymond S. and Cunliffe R. (1997) *Corporate reception areas: a design guide*, Eclipse, London

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AIRPORTS

Brian Edwards

INTRODUCTION

Airports are one of the few uniquely 20th-century building types and the terminals their defining piece of architecture. Early airports date from the 1930s but the bulk have their origins in the post-war period. The tailor-made modern terminal began its life in the 1950s, with notable prototypes such as the TWA Terminal at Kennedy Airport, New York (1956) by Eero Saarinen, Turnhouse Airport Edinburgh (1956) by Robert Matthew and O'Hare, Chicago (1955) by C. F. Murphy. These effectively established the typology of the terminal as a split-level container handling arriving and departing passengers on different levels.

Today the airport has matured into a second generation and largely hybrid building type. Modern terminals are no longer simple structures for the processing on to the plane of a few hundred passengers per day. They are multi-level megastructures (four main levels at Kansai in Japan by the Renzo Piano Building Workshop and five levels in the plans for Heathrow's Terminal 5 by the Richard Rogers Partnership) of check-in, lounge, leisure and retail floors serving thousands of passengers an hour. The world's busiest airports now handle in excess of 60 million passengers a year, have considerable economic and environmental impacts and provide one of the toughest challenges for today's architects and space planners.

London Heathrow is a good example. In 1997 over 56 million passengers passed through its four terminal buildings, many using the airport as a hub to other UK or European destinations. Heathrow has enormous economic influence upon the western quadrant of London, employing 62 000 people (more than the City of Oxford) at the airport or in service industries in the hinterland. Of these, half are employed on security in one form or another, about a quarter in serving passenger needs directly and a further quarter in retail. As airports expand (growth rate world-wide is about 6% per annum and 8–9% in the Asian region) they take on the characteristics of cities. Leisure and retail sales at Heathrow now exceed the revenue generated by the airline companies using the airport, leading to the situation where the modern terminal has become rather like a shopping mall with a runway to one side.

The modern terminal is, therefore, a complex structure functionally, socially and aesthetically. As more activities are added to enhance the passengers' experience and to generate additional sources of revenue, the task for the airport designer becomes ever more difficult. The key to good design is flexibility and legibility – the first in order to meet ever changing marketing and operational needs in the terminal, the second to allow passengers to steer their way through the often labyrinthine airport environment.

As the envelope of the terminal becomes larger, there is a growing need for designers to consider user needs as well as those of the client. In contrast to 20 years ago, the majority of the world's airports are now privately owned. They are highly profitable undertakings and airport authorities have become expert at diversifying sources of revenue. In the process, passenger satisfaction levels have declined, especially at airports such as Kennedy, Heathrow and Charles de Gaulle, which developed mainly in the 1960s. Many recently built terminals have been constructed in response to the poor conditions experienced in overcrowded facilities (e.g. Stansted and Chek Lap Kok as relief for Heathrow and Hong Kong's Kai Tak). These new terminals mark a change in approach in which the psychological and physical needs of the passenger are given greater priority. Today's terminals tend to be lofty, spacious, well-lit containers where tranquillity and efficient movement sit side by side.

Characteristics of modern terminals

The 21st-century terminal differs from first generation airport buildings in three major ways:

- Greatly diversified range of facilities, especially in the retail, conference and leisure fields
- More attention paid to the quality of the passenger experience, particularly with regard to legibility, orientation and the creation of tranquil spaces
- Design which accepts the inevitability of internal change and external growth

These three factors have become defining elements of second generation terminals. They reflect changing priorities within the airport industry, especially the need for individual airport authorities to meet global standards of excellence in order to survive competitive pressures. Airport authorities now compete internationally for their share of the air-transportation market and increasingly recognise that the standard of terminal design is a measure consumers use in their choice of airports.

How airport authorities generate income

Airside

Runways and apron areas

- Take-off and landing fees
- Air traffic control charges
- Aircraft parking charges
- Apron services
- Passenger charges
- Freight charges
- Fuel sales

Land side

Terminal building

- Baggage handling
- Rent income from airline companies
- Rent income from franchisers
- Direct retail sales
- Advertising

Peripheral airport areas

- Car parking
- Land development
- Hotels
- Warehousing

Outside airport

Business parks

Non-retail, non-airline facilities in terminal building

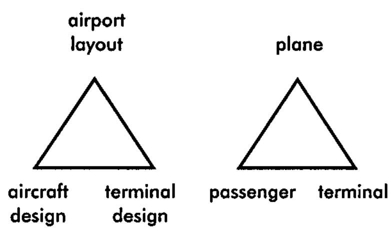
- Banks/foreign exchange offices
- Tourist information
- Car rental
- Hairdressing/beauty salon
- Medical services
- Conference/business facilities
- Church/mosque
- Cinema
- Swimming pool/fitness centre

Types of people in terminal building

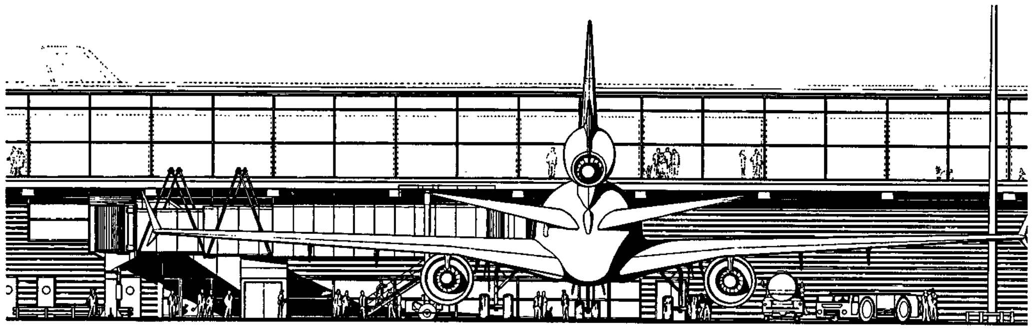
- Passengers
- Airport employees
- Security staff
- Meeters and greeters
- Leisure visitors
- Business/conference visitors

Criteria for terminal design

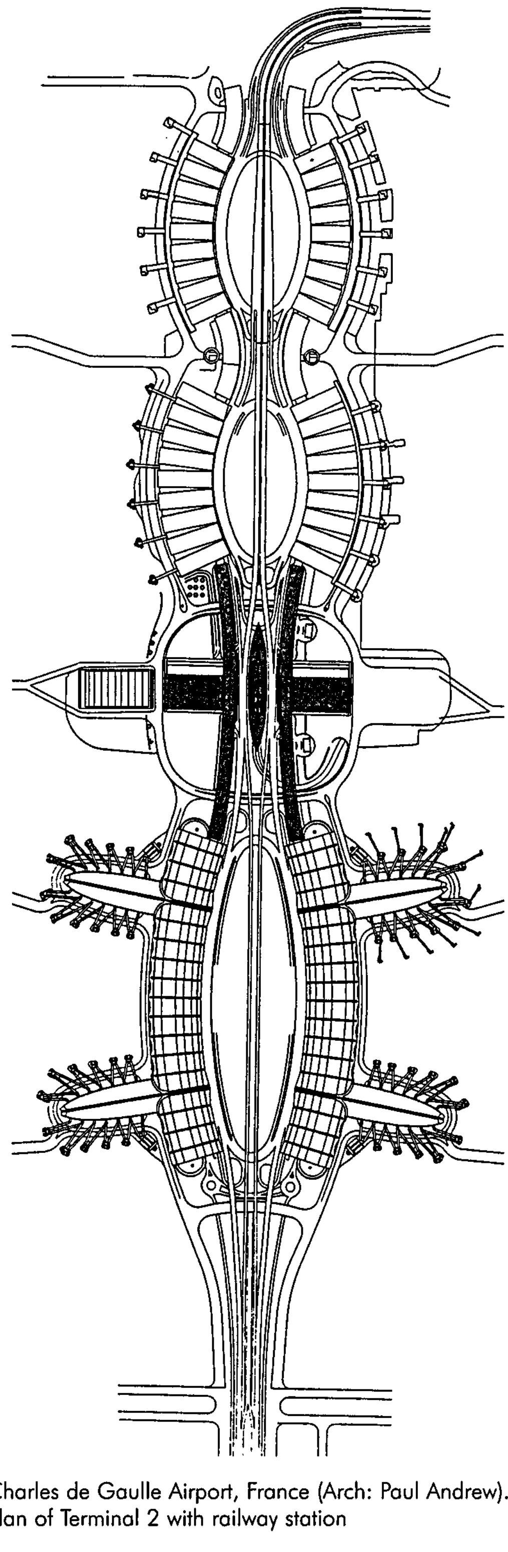
- Flexibility and extendability
- Avoidance of passenger cross-flows
- Shortest walking distances
- Minimum level changes
- Easy orientation
- Effective security by design



1 Two key interactions upon terminal



2 Stansted Airport, Essex (Arch: Foster & Partners). Elevation of apron area



3 Charles de Gaulle Airport, France (Arch: Paul Andrew). Plan of Terminal 2 with railway station

THE AIRPORT

A typical international airport consists of six major physical elements and up to a dozen secondary ones. The major elements are:

- Runway, taxiing areas etc.
- Air traffic control centre
- Passenger terminal
- Car parks and road system
- Freight depot and warehouse areas
- Hangars and aircraft service areas

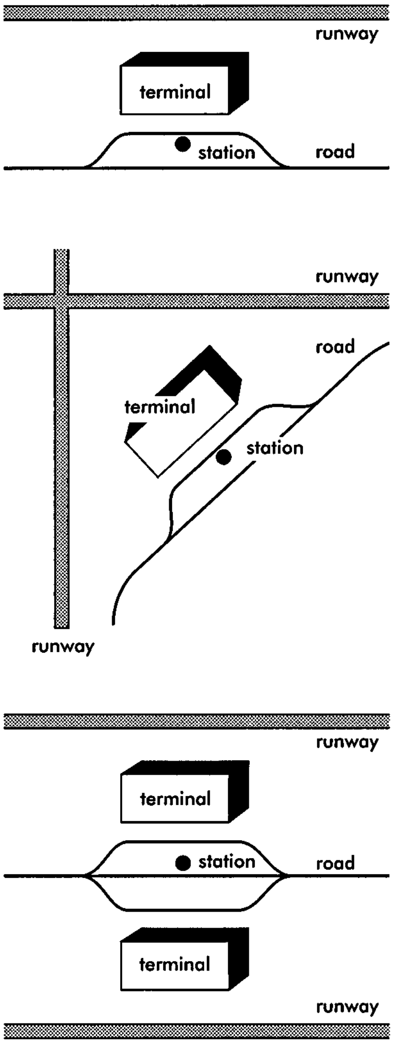
In addition, there are many secondary elements which can form substantial parts of the airport estate, such as:

- Railway station
- Hotel
- Conference facilities
- Leisure/recreation areas
- Green space and planted areas

Mature airports (such as Chicago's O'Hare or Amsterdam's Schipol) consist of a well-integrated amalgam of major and minor elements sometimes built as a dense collection of closely connected structures. Others have the range of facilities in more widely spaced structures, as at Heathrow where they are joined by an underground railway system and at Gatwick where an above-ground shuttle links the two terminals.

Integration and ease of connection is the key to a successful airport from the passenger point of view. This is particularity true of the means of reaching the airport – whether by car, bus or train. The circulating road system of a typical airport, or the underground railway, tends to disorientate the passenger and is frequently overcrowded. Routes need to be clearly articulated, with buildings and landscaping providing the means by which a sense of direction is established. The progression from car seat to plane seat is necessarily complex (for reasons of security and control) but the experience should not be excessively complicated or at any point unpleasant. Good airport layout and building design should seek to remove ambiguity, to reduce travel length, to maintain a sense of progression towards the destination; and should wherever possible uplift the spirit. Psychological needs are as important as physical ones.

Two clear but divergent perceptions exist – that of the airport authority which wishes to maximise profit, and that of the passenger who wants stress-free travel. Good design consists of reconciling these viewpoints.



4 Diagrammatic layouts of relationship between terminal, runway and road

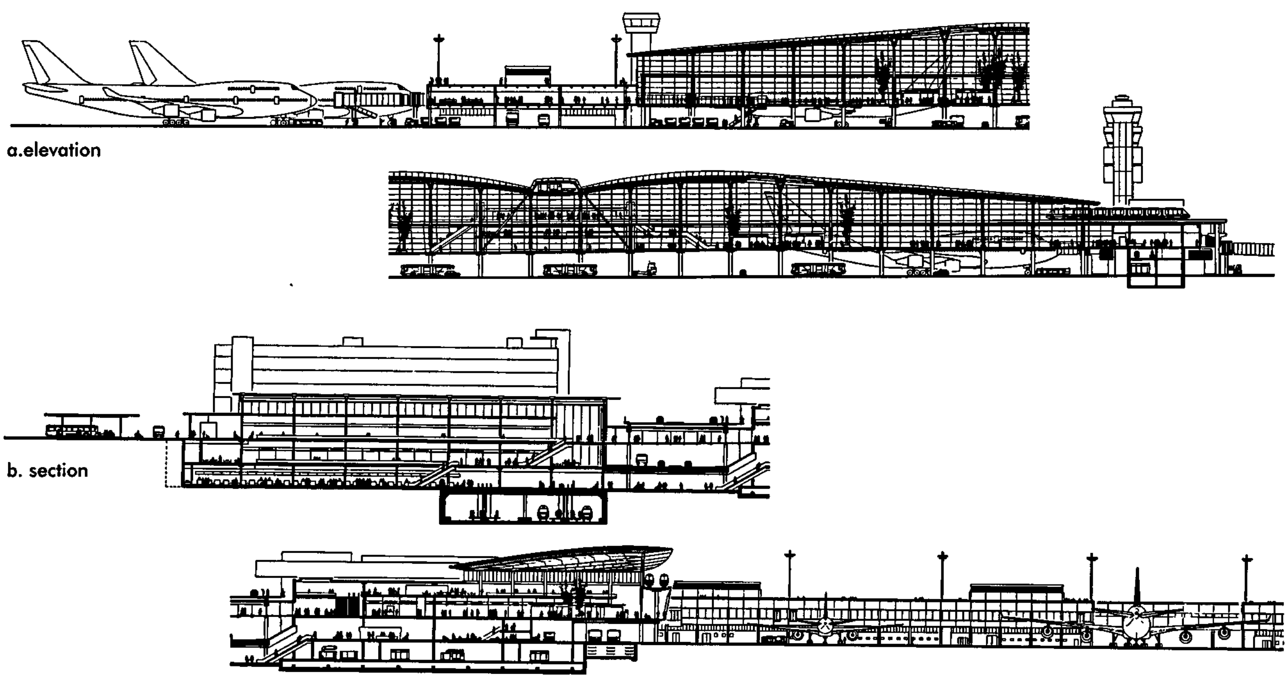
In the layout of the airport the determining factor is normally the orientation and length of the runways (see **4**). These are shaped mostly by the direction of the prevailing wind, the size of aircraft to be handled, and external factors such as the position of towns, mountain ranges and power lines. Normally the airport masterplan is prepared by civil engineers working with land-use planners and environmental consultants. Increasingly, environmental impact analysis determines the key elements of the airport plan, especially the resolution of noise, ecological and visual impacts.

As an understanding of the complexities of airport development has grown there has occurred a better balance between infrastructure planning and land utilisation. Most airports today have integrated transport systems which cater for passenger as well as staff needs. This not only serves the airport well but allows for the development of land for non-air transport purposes. Many airports today have extensive warehouse areas at their edge and business parks in the towns nearby. Airport masterplanning and regional development plans need to be well integrated if the full potential of the airport as an investment magnet is to be realised.

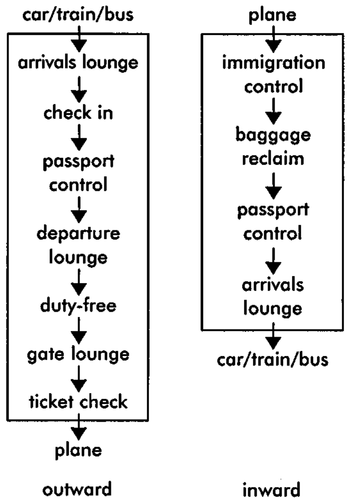
Normally architects are appointed after the airport masterplan has been prepared. The task then is one of designing the buildings whose footprint has already been established. However, good urban design is essential if infrastructure planning and building design are to be effectively bridged.

In any airport the terminal building is the key structure physically and aesthetically. Although air traffic control towers may provide welcome points of vertical punctuation, it is the terminal which waymarks the airport and establishes a sense of architectural quality (see **5**). Like a small city, the terminal is the airport's town hall – the place where everybody is encouraged to enter. To fulfil this role the terminal should be the dominant building, with other structures such as hotels and car parks having a secondary role. The visual ensemble of the airport environment needs to be legible, thereby avoiding the necessity for signs. The hierarchy of airport structures for the passenger (terminal, station, car park) is quite different to that perceived by the airport authority (runway, boarding gate, terminal).

Good design allows the terminal building and other structures to be identified immediately for what they are. The role of architectural form is to give meaning to the various buildings. The question of airport character is communicated by reference to aeronautical metaphors or to high technology (e.g. Stuttgart Airport – see **7** and **9**), though there is a trend towards giving airport buildings more of a regional architectural flavour in the belief that terminals are gateways to countries.



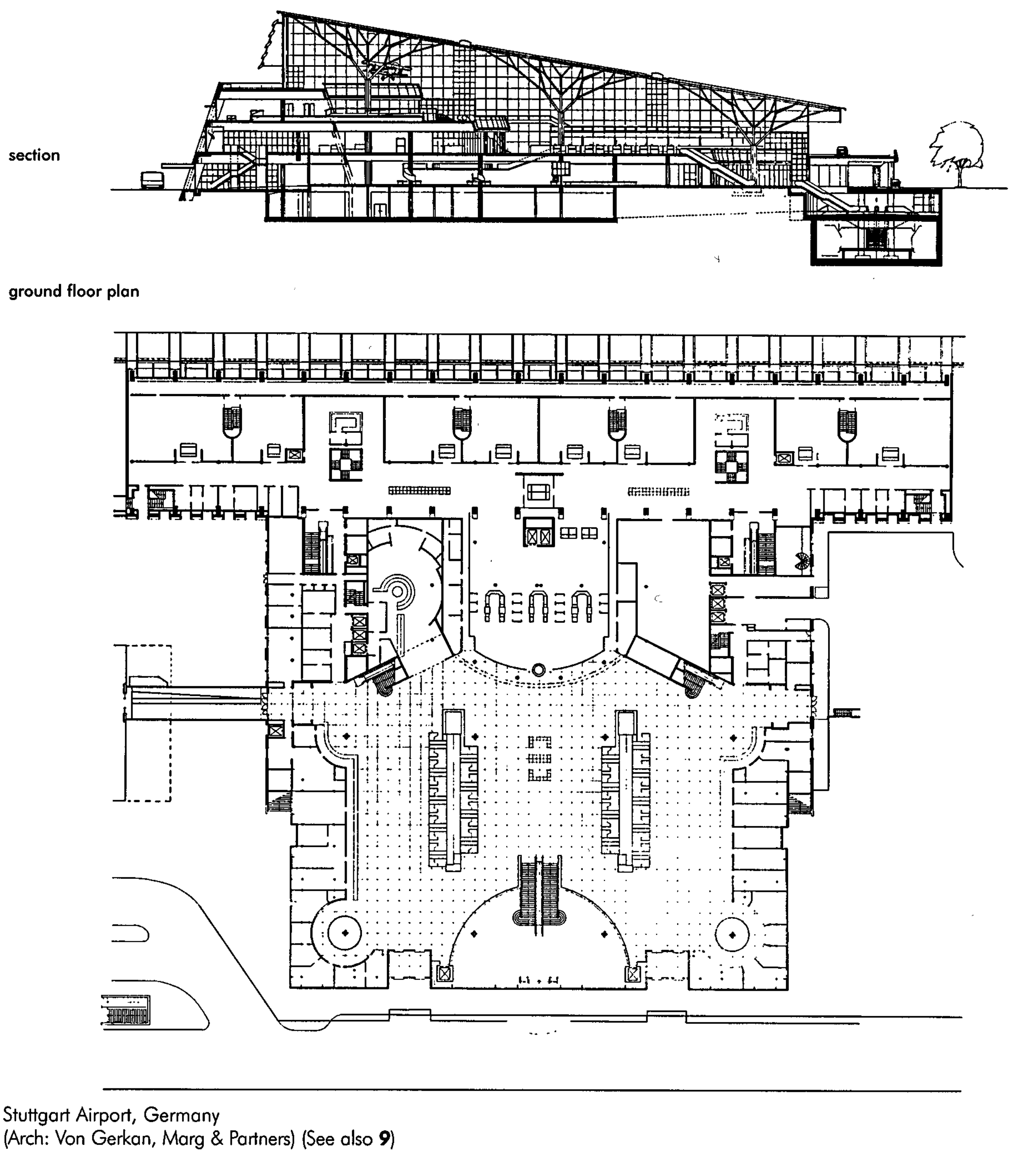
5 Zurich Airport, Switzerland (Arch: Nicholas Grimshaw & Partners)



6 Functional flows through terminal

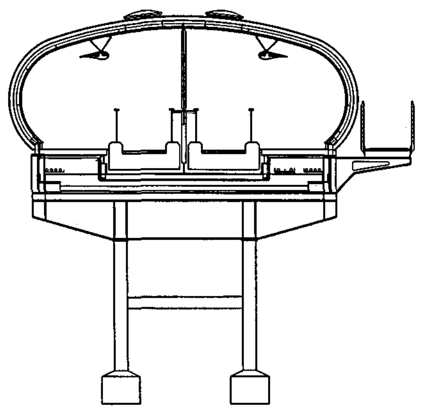
THE TERMINAL

Legibility and passenger-orientation are important because airports are normally devoid of obvious points of external reference and many travellers are in a hurry (see **6**). Once inside the terminal the problem of identifying routes to check-in, ticket purchase or arrivals lounge can be as great as in the external airport environment. Architectural landmarking is an important adjunct to effective signage. Light, structural form and volumetric orchestration are factors to employ (see **7** and **9**). If the primary architectural language is not strong, the terminal will not survive either retailing pressure or management changes to the use and distribution of space. After the example of terminals at Stansted or Denver, the aesthetic qualities of architectural structure have tended to be the primary elements in establishing airport character. The design of columns and beams, often interplayed with the clever manipulation of roof lighting, provides a memorable experience to aid navigation through complex terminals. It is a philosophy which accepts various degrees of change of structure, enclosure, building services, interior space and finish. With each on a different time-scale, one can be altered without sacrificing the quality of the remainder.



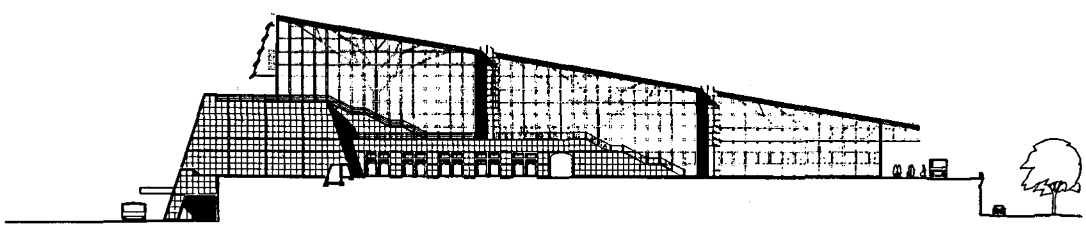
7 Stuttgart Airport, Germany
(Arch: Von Gerkan, Marg & Partners) (See also **9**)

Increasingly terminals are designed with varying layers of permanence attached to the parts. Time-scales from 3 to 50 years apply with the parts detailed so that they can be replaced, renewed or fundamentally altered without jeopardising the operation of the whole. Permanent elements, such as the structural framework, are designed with long life and lasting visual impact. It is these parts, and the social spaces (i.e. departure lounge) which survive the longest and have to be designed to the highest standard. Their enduring qualities depend to a large extent upon the depth of design thought put in at the outset, and the anticipation of change or ease of replaceability of key parts. A well-designed terminal is one which has high and lasting visual impact, yet adjusts readily to interior change, and caters for physical renewal over a 50 or 60 year lifespan.

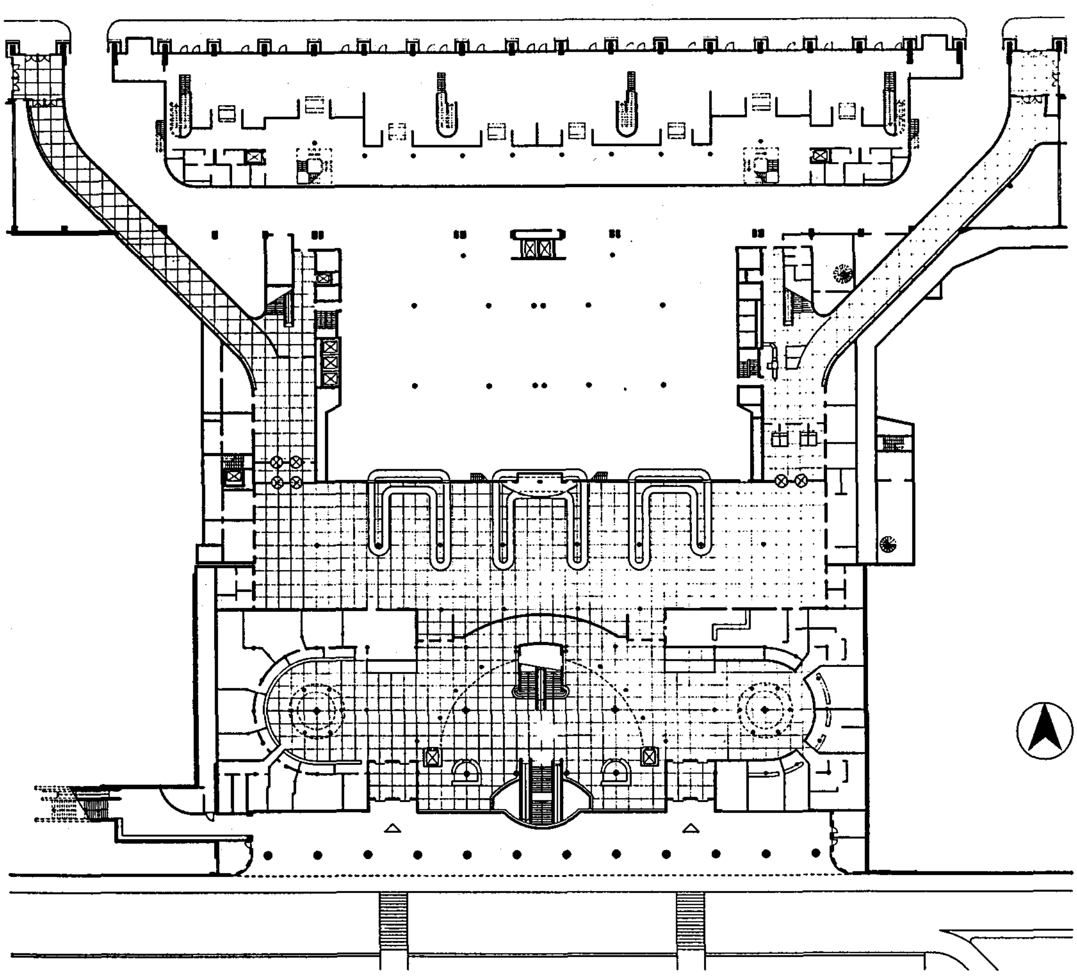


8 Heathrow Airport, London
Transfer satellite at pier 4A: section
(Arch: Nicholas Grimshaw & Partners)
(See also ***11***)

section



upper floor plan



9 Stuttgart Airport, Germany
(Arch: Von Gerkan, Marg & Partners)
(See also ***7***)

Terminal facilities

The modern terminal is a complex building with many types of accommodation contained within its envelope and has necessarily to provide for high levels of control. Conceptually, there are public (e.g. departure lounge) and private (e.g. offices) areas, as well as secure and unsecure areas. In addition, there are the barriers to movement needed for ticket and non-ticket holding people, as well as immigration controls. The airport in general and terminal in particular is one of the most intensively managed areas from a security point of view. There are barriers to movement, physical and psychological controls, security cameras and spot checks of passengers and airline staff. Architecture is, therefore, a question of both creating space and helping to control it.

The management of security underpins the plan and section of a typical airport terminal. Different levels of the building are used for different passenger flows (arrivals, transit and departures) with controlled cross-over between them. Different levels also allow baggage to be handled and processed effectively. The growth of the multi-level terminal in the 1970s was in response to growing concern over international terrorism, drug trafficking and illegal immigration.

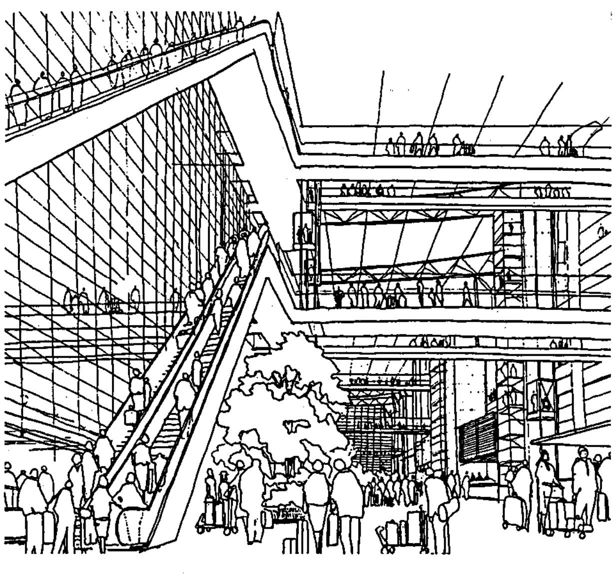
The complexity in section of a modern large terminal (e.g. Kansai in Japan) places particular responsibility on the design of stairs, escalators and lifts. Changing level is a necessity in current airport design and poses special difficulties for travellers with disabilities. For all, however, the means of moving from one floor to the next needs to be as enjoyable and as possible. Consequently, the escalator and lift have become major visual elements in the interior of a typical terminal. They not only move people effectively but provide points of reference in a waymarking sense for passengers.

Terminals are complex in plan for many of the same reasons. Although passenger space may account for 60% of the terminal volume, the remaining 40% has to provide space for airline staff, airport staff, and governmental and security staff. Four main stakeholder groups have an interest in the terminal, each needing gathering space, secure rooms and connecting routes (see ***11***)

- the passengers (lounges, shops etc.)
- airline companies (ticket offices)
- airport authority (administrative areas)
- government (health and immigration control)

Added to this, the essentially public space for the passenger is often surrounded by shops, bars, restaurants and amusement arcades. Reconciling all the different needs is only possible if space planning recognises the inevitability of change and makes adequate provision for it.

Change occurs in the layout of airports terminals in a recognisable and often planned fashion. Different parts of the building are subject to varying levels of usage. Major circulation areas (such as gate corridors) may, therefore, require upgrading more quickly than quieter areas even though the same finishes and furniture have been employed. BAA makes provision for change by entering into long-term 'framework agreements' with manufacturers to ensure that matching components are available well into the future.



10 Kansai Airport, Japan (Arch: Renzo Piano Building Workshop) Sketch of interior of passenger terminal

Principal function of terminal building

- Facilitates change of transport mode from plane to car, train, bus etc
- Processes passengers (ticket check-in, customs clearance etc)
- Provides services (shopping, conference etc)
- Groups and batches passengers for air transportation

Criteria for effective baggage handling

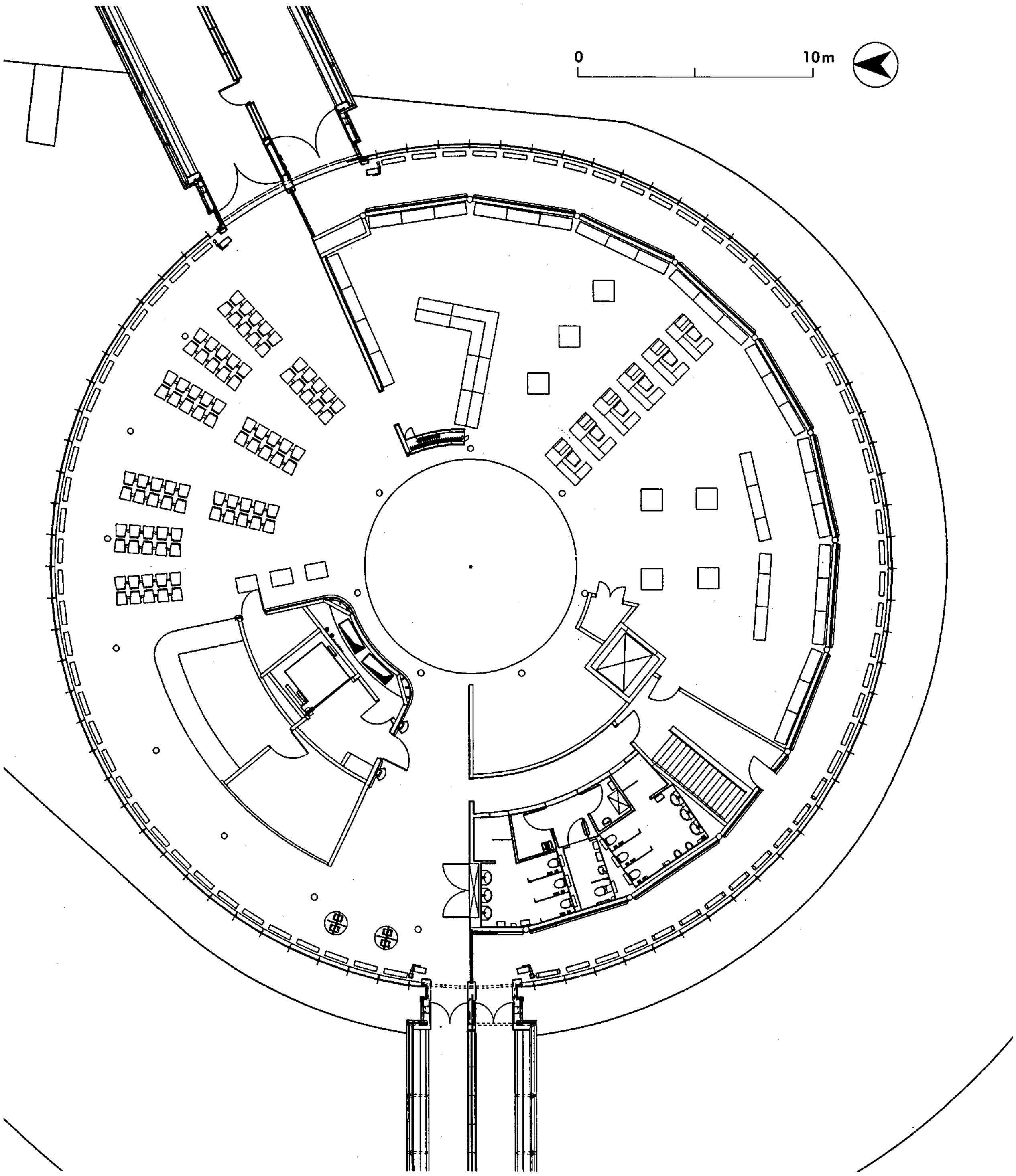
- Avoid baggage flows crossing passenger flows
- Place baggage sorting alongside apron area
- Avoid turns and level changes
- Keep conveyor slopes below 15°
- Minimise number of handling operations
- Provide for safety and security at each handling stage

Passenger processing in terminal building

Airline function	• Ticket check-in • Baggage handling (part) • Gate check-in
Airport function	• Baggage handling (part) • Security (part)
Government function	• Immigration control • Passport control • Customs control • Health control • Security (part)

Timescale of facilities adaptation

Staircase, escalators, major routes	30–50 years
Passenger lounges	20–30 years
Airport offices	15 years
Airline offices	5–10 years
Shops, bars, restaurants	3–5 years
Carpets, seats, finishes	1–5 years



11 Heathrow Airport, London
Transfer satellite at pier 4A: plan
(Arch: Nicholas Grimshaw & Partners)
(See also **9**)

movement	activities	space needs
departure passengers	check-in commercial areas customs clearance	departure concourse
	security shopping eating	departure lounge
	gate check-in	gate lounge
arrivals passengers	immigration security	arrivals area
	baggage claim	baggage hall
	customs clearance	customs hall
	meeting refreshment	arrivals lounge
transfer passengers	security customs clearance immigration refreshment	transfer lounge/ departure lounge

12 Activities and space needs in terminal building

Planning the terminal

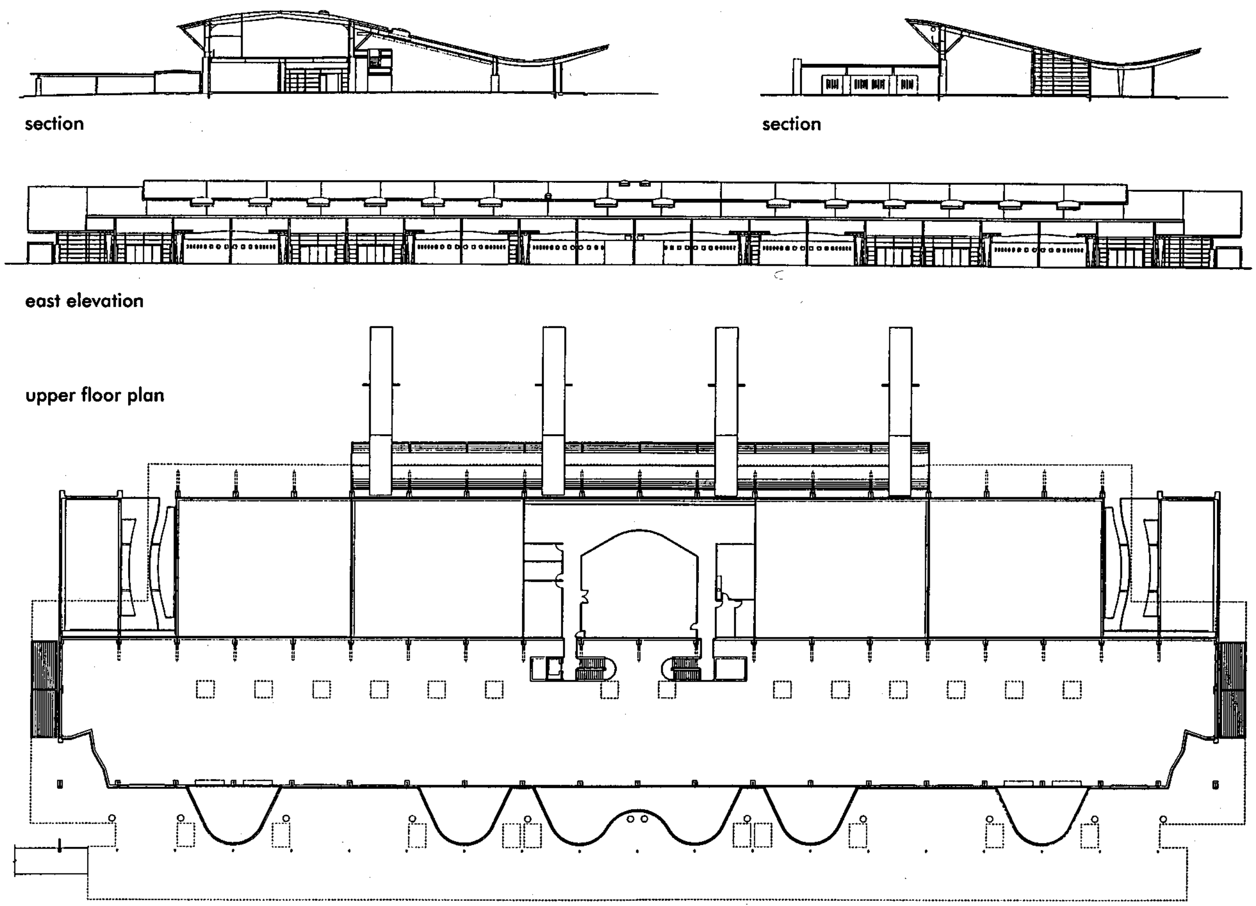
The planning of the terminal building should revolve around passenger needs. In a sense the passenger flow-path from check-in, through ticket and passport control to departure, then gate lounge to plane is a progression through space which needs to be expressed clearly in plan (see **12**). The points of interruption in the flow are where banks of offices of various sorts (airline, airport, customs) need to be located. Passenger needs rather than airport ones need to be given priority in the differentiation of space. Likewise in the opposite direction, the flow from plane to arrivals lounge via baggage reclaim needs to be expressed spatially. Again, the interplay of volume, light and structure needs to articulate key routes not obstruct them.

Balancing retailer needs with passenger needs can be difficult. As terminals become destinations in their own right (i.e. irrespective of further travel) many people present are there for the experience of the building and the chance to shop. Leisure shopping has influenced the terminal as elsewhere yet the passengers' progression through the building should not be overly obstructed by shops and burger bars no matter how profitable for the airline company or airport authority (see **14**).

14 Terminal building: space standards per passenger

check-in area	1.4 m^2
departure lounge	1.8 m^2
bars/shopping areas	2.1 m^2
arrivals lounge	1.5 m^2
baggage claim	1.6 m^2
customs/immigration	2.0 m^2
circulation areas	2.0 m^2

13 Rockhampton Airport, Australia (Arch: Bligh Voller)



Terminal layout

The relationship between the terminal and satellites used for boarding planes is an important one for designers. There are four common variations and various hybrids between them (see **15**):

- terminal with linear gate piers connecting the satellites
- terminal with detached satellites
- terminal and satellites closely integrated
- terminal with radiating finger piers with or without satellites

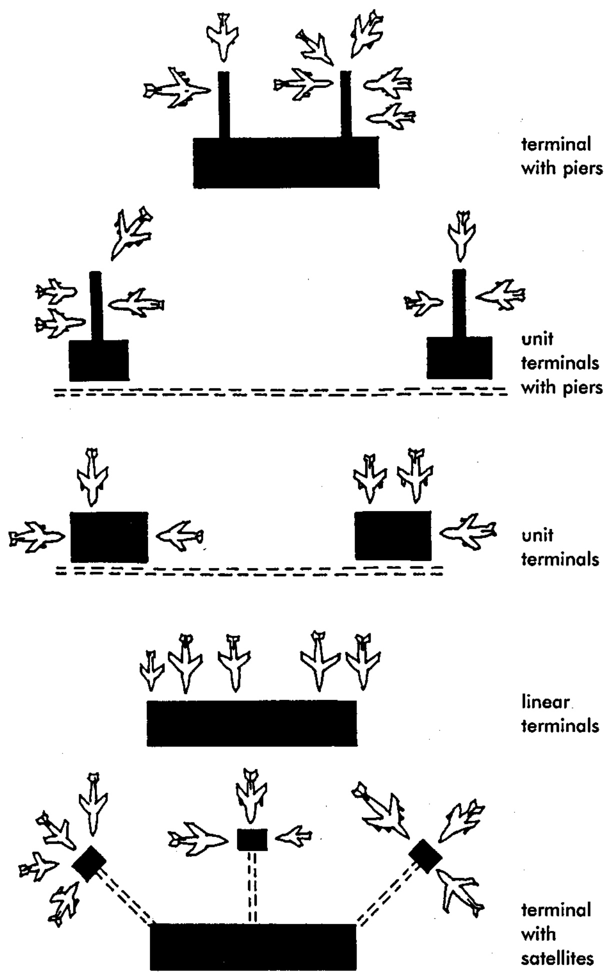
The different layouts reflect the management of the airport, particularly whether it is a hub or destination airport. With larger airports it is common for an airline company to 'adopt' a satellite, thereby giving the ticketing, retail, duty free and movement function a consistent stamp. At O'Hare, Chicago the practice extends to whole terminals being dedicated to the needs of particular airline companies, with the result that the airport consists of a number of terminals each managed and controlled by a different carrier. With smaller regional airports the pattern is usually one of a single terminal with linear piers placed on a parallel alignment to the main runway.

The relationship between ownership, management and shared facilities can be complex. It is common for several airlines to share space in the terminal but to have their own dedicated satellite or gate lounge. But as the life of management systems and that of airline companies is shorter than the life of the buildings, flexibility of use is required.

Just as there are many configurations of terminal and satellite, so too different means are adopted for moving passengers around. Travel distances of up to 300–400 m are acceptable for passengers to walk but over that distance assisted movement is required. Three main methods are employed:

- travellators
- light rail systems
- buses

The first is common for distances of 300–1000 m, the second for distances of 1–3 km, the third for complex multi-stop journeys such as from terminal to satellite via the airport apron. Light rail systems are expensive (at Stansted each AEG train cost around £1 m) and require linear routes and generous radii at turns. At Kansai a mini-train runs through the airside lounge stopping every 200 m or so. At Gatwick and Birmingham Airports there are monorail systems which link together the terminals. Moving people across or below the runways pose obvious safety and logistic problems. The design for Heathrow's Terminal 5 plans to use an underground railway to link the terminal to the four planned satellites. Radiating finger piers with satellites at their end have the advantage of reducing travel distance (and hence use less expensive travellators) whilst maximising the points of access to aircraft standing on airport aprons.



15 Diagrammatic layouts of types of terminal

regional	up to 1 million passengers per year	single deck road, single or 1½ level terminal, apron access to aircraft
national	1–5 million passengers per year	single deck road, double level terminal, elevated access to aircraft
international	over 5 million passengers per year	double deck road, two to four storey terminal, elevated access to aircraft

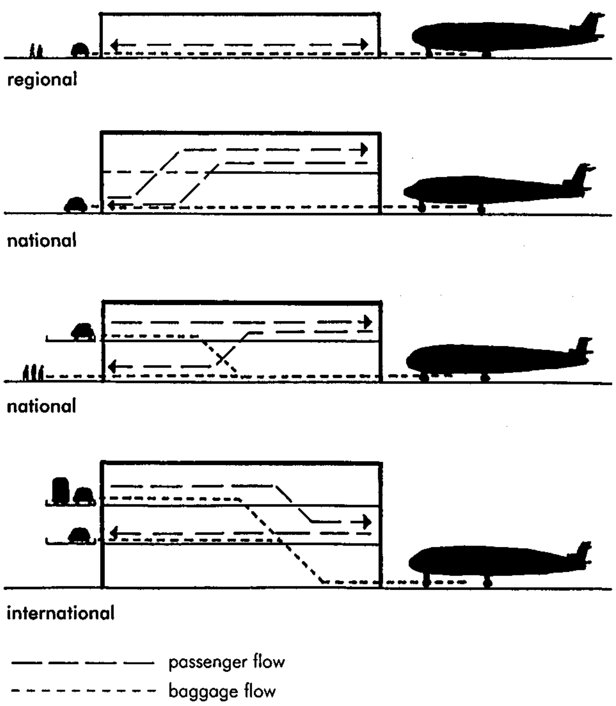
16 Main configuration of terminal according to size and capacity

17 Aircraft type and gate lounge size

DC-9, BAC111	60 m²
B737	100 m²
B707, B727, DC-8	140 m²
B757	190 m²
DC-10, B767	250 m²
B747	360 m²
B777, A3XX series	460 m²

journey type	distance (kms)	typical plane type	passenger capacity	passenger terminal type
intercontinental	over 3000	Boeing 747	450	multi-level terminal with satellites
continental	1500–3000	European Airbus A310	250	multi-level terminal
regional	under 1500	Boeing 737	150	1½ or single storey terminal
commuting	under 300	Saab 340	40	apron loading

18 Relationship between journey, plane and terminal type



19 Diagrammtic sectional layouts of terminal buildings

Design in section

There is inevitably a relationship between the layout in plan and the configuration in section. The degree of complexity of the section reflects the type, layout and capacity of the terminal (see **18**). Simple regional airports are usually single or 1½ storeys high whilst busy international ones may be four to six storeys high. Three main principles shape the design in section (see **19**):

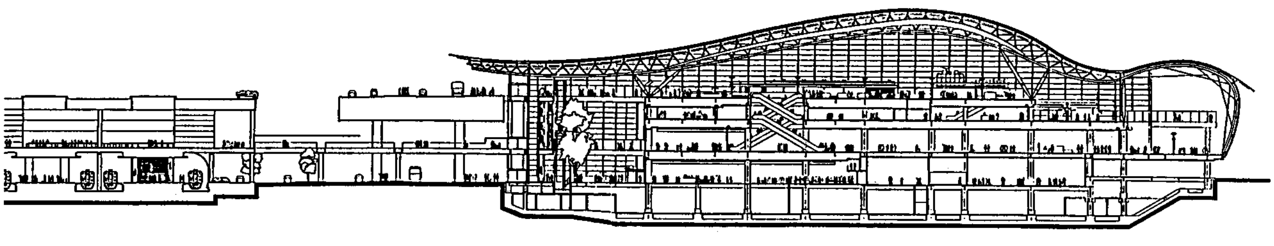
- different levels help provide for smooth passenger movement
- different levels help separate passengers from baggage and public from private areas
- breaks in section help introduce daylight into deep planned terminals and allow for smoke extraction by natural means

Since warm air rises and light falls, the sectional profile of many modern terminals is tempered by the laws of physics (see **20**). Wavy roofs and stepped profiles combine good environmental design with more interesting appearance than is the case with the Cartesian flat-roofed terminals. The use of more natural means of achieving ventilation, smoke extraction and daylight penetration has fashioned the design of some of the world's more interesting recent terminals. Both complex sections and rational plans are required to meet the dual demands of efficient people movement and more natural means of tempering the environment.

Jetty design

The means of reaching the aircraft from the terminal without subjecting passengers to the harshness of the airport environment requires the skilful design of jetties. These are usually telescopic or pneumatic in operation and many types are provided by specialist manufacturers. The rotational geometry of jetties achieves the correspondence between the arms of gate lounges and the various heights and position of aircraft doors.

As new aircraft are introduced great strain is put on the passenger handling facilities, especially in the gate lounge. Although aircraft have standard door cill heights, doors are often positioned at different points along the fuselage. The expected new generation of very large capacity aircraft (800–1000 seater by 2005) will make obsolete current arrangements for passenger handling, not so much in the terminal, but at the airside interface. The need for flexibility and upgradeability is obvious.



20 Kansai Airport, Japan (Arch: Renzo Piano Building Workshop)

Environmental factors

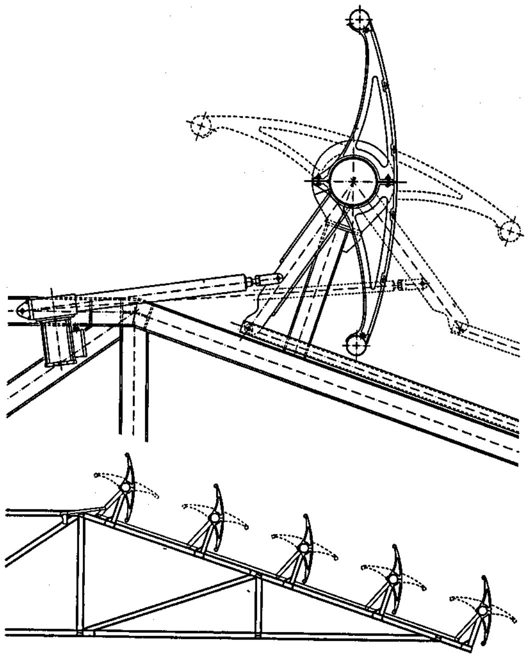
The airport environment is usually heavily polluted by fumes and noise. As a result most terminals are sealed air-conditioned buildings. Increasingly, however, they are partially open to the elements, with some recent designs using mixed mode ventilation and natural air-current smoke extraction (in the event of a fire).

To make the interior as comfortable as possible two problems have to be overcome:

- solar gain and glare
- noise abatement

Both are largely solved by a combination of interior and exterior measures. External screens and grilles help shade the terminal from direct sunlight and more substantial structures at the building face deflect the noise from aircraft (see **21**). The design of glazing also helps tackle these dual problems. Fritted or solar control glazing helps diffuse both high and low angled sunlight, whilst double or treble glazing reduce external noise to tolerable levels.

Sunlight can add sparkle to the terminal interior and aid the passengers' sense of location or direction. A balance has to be struck between the environmentally neutral interior and dramatic sun-filled spaces. Likewise some contact with external noise can give a sense of being at an airport and a degree of noise is tolerable in busy places. Where noise is unacceptable is in the tranquil areas, such as the transit departure or gate lounges and in office areas.



21 Stuttgart Airport, Germany (Arch: Von Gerkan, Marg & Partners) Acoustic protection

- Determine risk
- Establish smoke patterns
- Establish spread of fire
- Assess success of containment by compartmentation
- Establish 'risk islands' and use local sprinklers
- Assess structural response to fire
- Assess reponse times

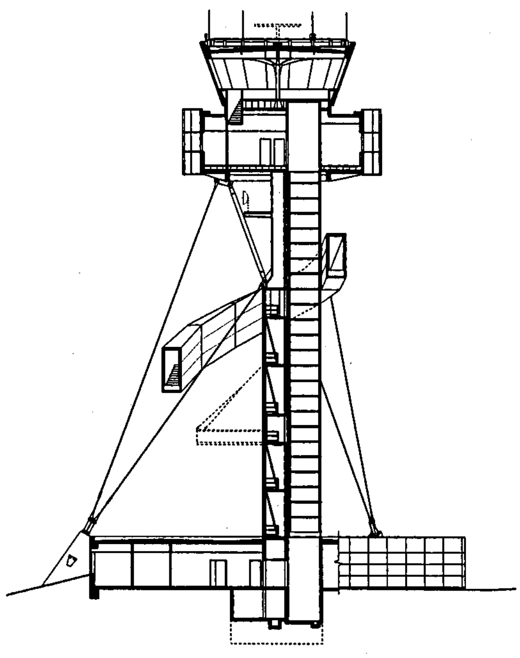
22 Fire safety design in terminal building

AIR TRAFFIC CONTROL TOWERS

These are amongst the most prominent and distinctive structures at airports. Their function is to control the skies around the airport, to organise the take-off and landing movements, and to ensure the efficient taxiing of aircraft on runways. Air traffic control towers need height, unobstructed views and good radar communication. Since they address mainly aircraft movement, air traffic control towers are positioned within the air-side zone, with good visibility of the terminal buildings.

Organisationally, there are two main elements: the control room at the top of the tower, and the means of reaching it (lifts, stairs, fire escape) (see **23**). Column free space and glare free visibility is essential for operational efficiency. Angled glass is normally employed to reduce solar gain and sunlight reflection which may interfere with pilot sightlines. Most tracking of aircraft is conducted on computer screens, hence the design of glazing and potential problems with screen reflection need to be carefully considered. The navigational and control systems in such towers have a relatively short life (8–10 years) with the result that three or four electronic refits occur within the life of the tower. Designing for upgrading of equipment with the tower still in operation requires a distinction to be drawn between primary structural elements and secondary fittings such as partition walls, cable systems, floors and ceilings.

Air traffic control towers are useful points of orientation within airports. Their three-dimensional form, shaped by operational needs, helps also to give these buildings the qualities of external landmarks. Many recent air-traffic control towers have used spiral or cascading forms to enhance their visual appeal in the hope of guiding people around the disorientating airport environment. Some air traffic control towers are built as rooftop extensions to the terminal (especially at regional airports) but this restricts their aesthetic possibilities.



23 Sydney Airport, Australia (Arch: Ancher Mortlock & Woolley) Air traffic control tower, section

BUSINESS PARKS

See also Industrial Buildings, Offices and Shops

INTRODUCTION

Attempts at the end of the 19th century to separate housing from industry gradually led to the development of purpose-built 'industrial estates'. Some of the most notable of these, such as Trafford Park near Manchester and Team Valley in Durham, were built in the early 20th century on greenfield sites with good connections to rail and (when possible) water networks. Although some office and ancillary facilities were provided (e.g. catering), these were seen as adjuncts to the main purpose, namely providing factory facilities, generally for light industry, in modern buildings.

Over the last 30 years or so, the emphasis has switched away from providing light industrial units to providing a range of buildings suitable for a variety of purposes: offices, light industrial, high technology (e.g. manufacture or assembly of electronic components). The term 'industrial estate' was considered to be unsuitable, although it is interesting to note that this term was itself invented to indicate a better level of provision than the normal Victorian factory premises. The phrase 'business park' therefore replaced 'industrial estate'.

In business parks a high level of building services is often considered essential, together with building designs which can be adapted for a variety of uses relatively easily. Flexible space is required to meet the needs of production, distribution, sales, service and office operations. Soft landscaping, sometimes to a high standard, is often provided, along with related facilities such as quality catering and health clubs. If the developer is also looking for occupation by international companies, extra facilities will be required, such as hotel accommodation. There will be an overall masterplan, but each individual building can have its own design.

Further refinements in terminology have led to 'commerce parks', which attempt to provide facilities between industrial estates (i.e. traditional manufacturing) and business parks (i.e. offices). These sites attempt to provide a greater mix of uses than traditionally available, often resulting from the revolution in information (or 'knowledge-based') technology.

Recent concern by local authorities and planners that greenfield sites can be isolated from local communities have led to attempts to provide a range of uses: for instance, housing arranged to provide a village atmosphere, together with community facilities, shops and schools (see **11**).

Good connections to the road network, particularly motorways, are considered essential; it is rare in the UK for there to be connection to the rail network, and even rarer for connections to the canal or river network. Car parking provision must therefore be generous, as bus services may be few. Access will also be required for large lorries (for lorry sizes, see the sections on Vehicle Facilities and Industrial Buildings), which require larger roads and turning bays.

	Size (ha)	Start date	Target markets	Linked universities/institutes		Main sponsors	Special features
				Main	Other		
Existing							
Brunel Science Park	3	1986	Spin-outs Local firms	Brunel University		Brunel University	Accommodates HQ of International Tin Research Council. Waiting list for tenants
South Bank Technopark	1	1987	Local technology and business service firms	South Bank University		Prudential Corporation	Innovation centre
Planned							
Brunel Science Park Phase III	1		Spin-outs Local firms	Brunel University		Brunel University	Aimed at accommodating existing demand for space
Croydon Science Park	13	1996/7	Local service and manufacturing firms Inward investment	Croydon College (University of Sussex)		South Thames Regional Health Authority and private developer	Former hospital site in green belt
Lee Valley Science Park	43	1995	Inward investment Local firms	Middlesex University	University of East London University of North London Guildhall University	London Borough of Enfield Thames Water	Physical regeneration project. Business and Innovation Centre completed - tenants moved in September 1995
Royals Science and Technology Park	10	1998/9	Spin-outs SMEs Inward investment	Royals University College	University of East London Guildhall University QMH Westfield College City University	LDDC LETEC and universities	Regeneration project. Part of Thames Gateway. Close to European Medicines Evaluation Agency
Harefield Medipark	21	1996	Healthcare firms	Harefield Hospital		Trafalgar House	Planning permission restricted to firms in healthcare sector. Private owner unwilling to proceed with these restrictions
Linked to London universities							
London Science Park, Dartford	up to 50	1996	Local and regional firms Inward investment	University of Greenwich	Glaxo Wellcome	Dartford Borough Council SE Thames Regional Health Authority University of Greenwich	Part of East Thames Corridor, and of larger development area including new campus for the university
Imperial Park, Newport	21	1992	Local firms	Imperial College	University of Cardiff	Welsh Development Agency Newport Borough Council	170 miles from related university
Silwood Park, Ascot	2		SMEs	Imperial College			Innovation Centre managed by Imperial College

1 Technology Parks in London (mid-1990s)
(from Segal Quince & Wicksteed Ltd, Technology Parks in London)

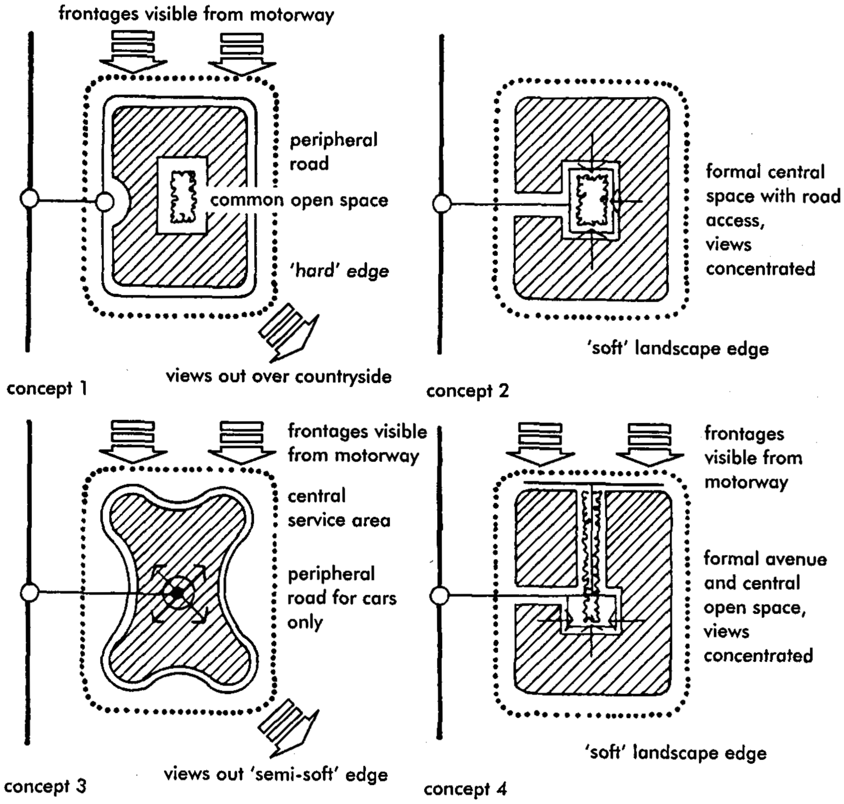
Science and technology parks

These sites attempt to provide a mix of uses, often intended for local or 'start-up' firms. They are associated with universities or research centres – there are over 40 in the UK, with an average size of 15 ha (see **1**), but ranging from a few hundred square metres in one building, to over 1000 ha.

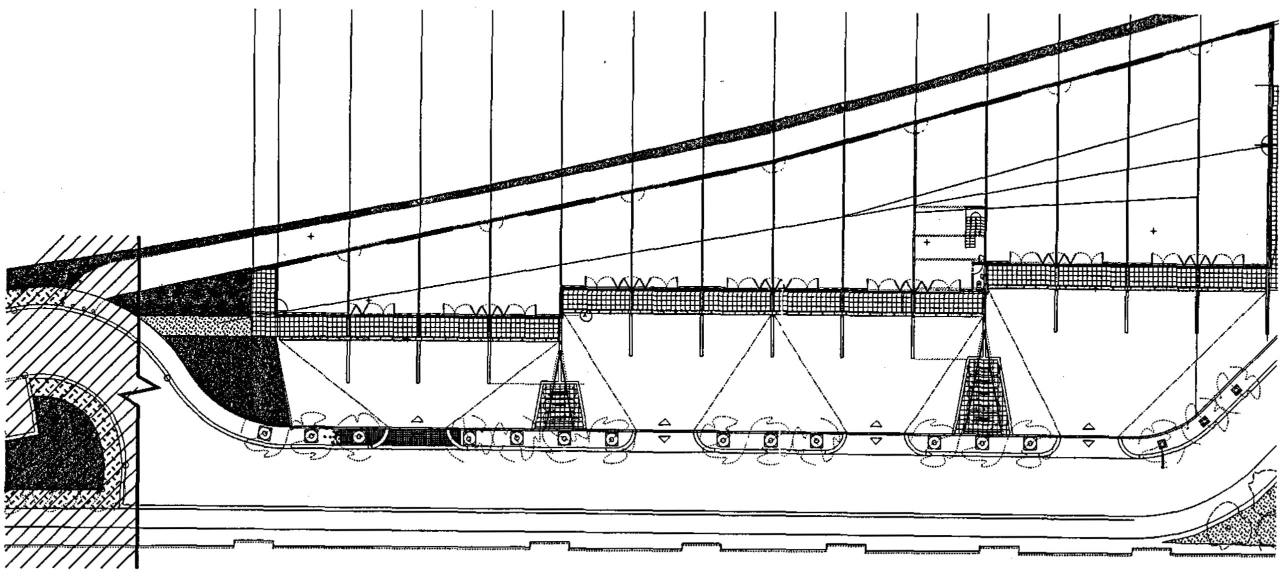
Breakdown of activity in science parks

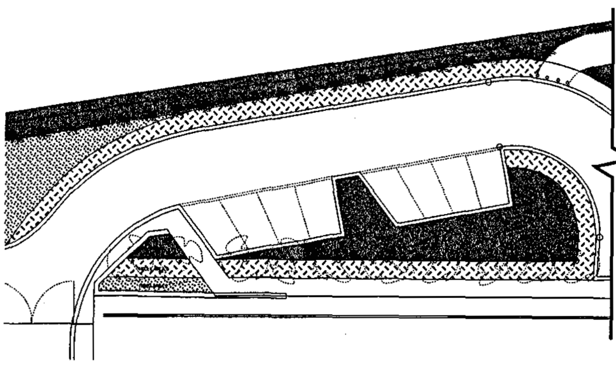
29%	computer related
21%	electronics related
17%	biotechnology related
16%	contract R&D
15%	technical consultancy
17%	business services
17%	engineering design
29%	other

(from Science Park Network survey, carried out by Segal Quince & Wicksteed Ltd in 1993–4 for the EC)



2 Schematic layouts (four variants)
(from English Estates Industrial & Commercial Estates, Planning & Site Development)





3 Barley Shotts Business Park, Westbourne Park, London (Developer: North Kensington City Challenge; Arch: Robert Ian Barnes Architects)
An attempt to 'pump prime' an inner-city location (disused railway land) to provide various facilities. A series of B1 units is the first phase and provides affordable, low-maintenance work-spaces, built to a tight budget to a standard commercial brief. A broad range of unit sizes is provided. The steel frame is designed to allow a future mezzanine office area if required. Roof lights provide natural lighting, and combined with wall glazing allow natural ventilation

DETAILED CONSIDERATIONS

Small-scale 'nursery' units meet the need to integrate a group of units into an existing urban or rural community to encourage small local firms. The minimum size is $50\,m^2$. Similar terms are 'incubator', 'innovation' or 'seedbed' centres. **5** shows 'nursery' units with a variety of rental areas and grouped goods access. Speculative developments for rental are often built in various forms of terrace to allow flexible space allocation.

Mixture of sizes of unit can be achieved by variable location of cross-walls in the terrace or by providing two or more groups of buildings of increasing size.

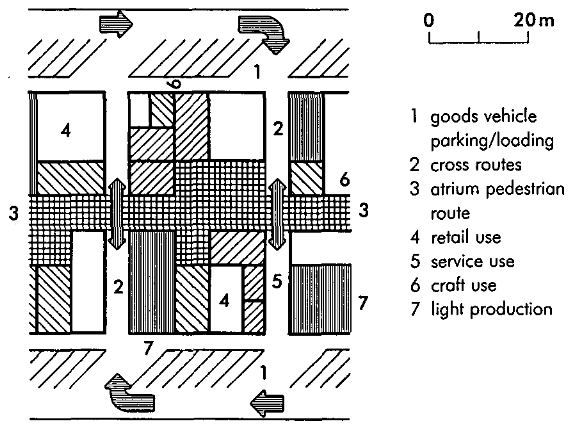
Office and amenity accommodation can be either integral within the volume of building (where site area is restricted) or as an attached block (where the developer requires the maximum rental from production/storage area).

Goods access Sufficient heavy goods vehicle manoeuvring and parking areas must be allowed (see also Industrial Buildings – 'loading bays').

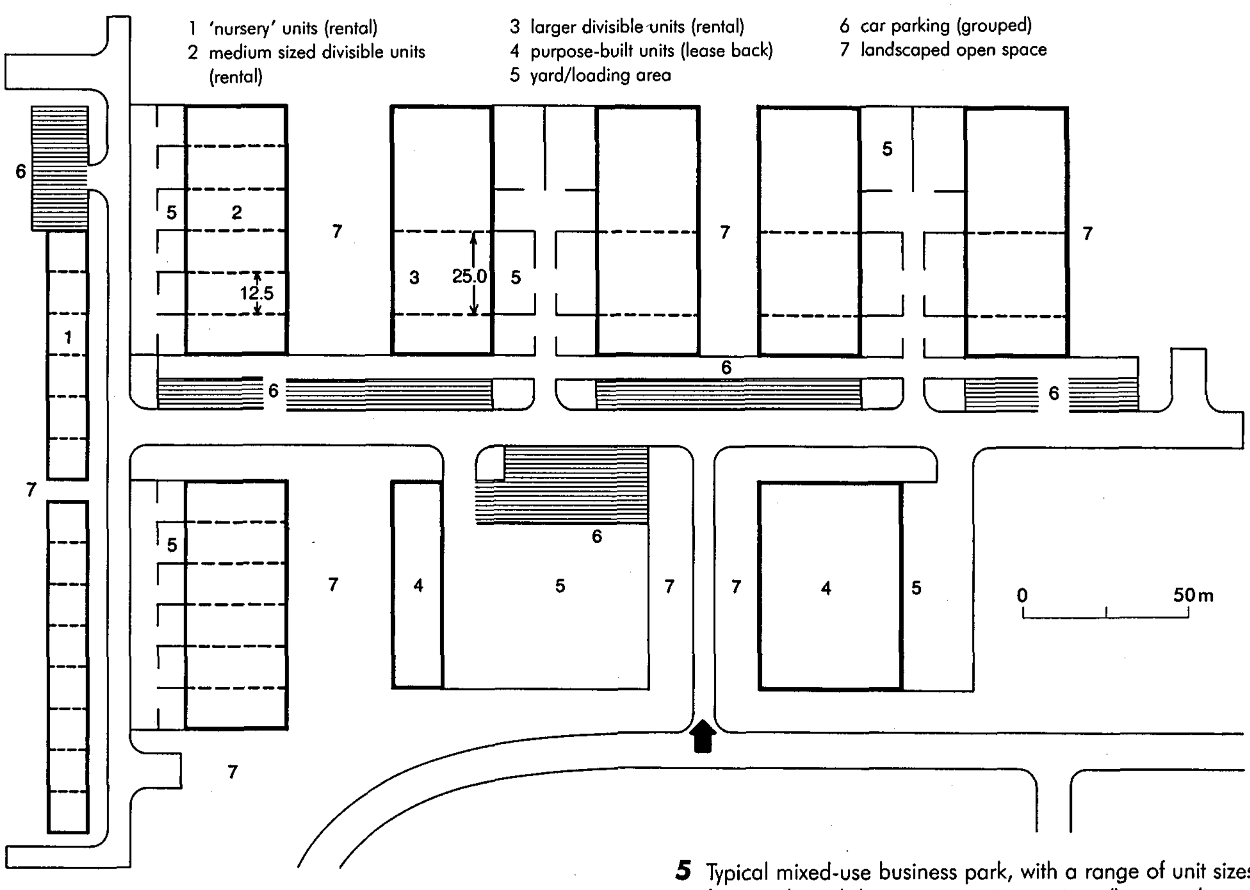
Security is important – both physical (mainly theft of high-technology equipment) and intellectual (loss of staff to neighbouring firms).

Car parking Required for occupants and visitors (check local requirements).

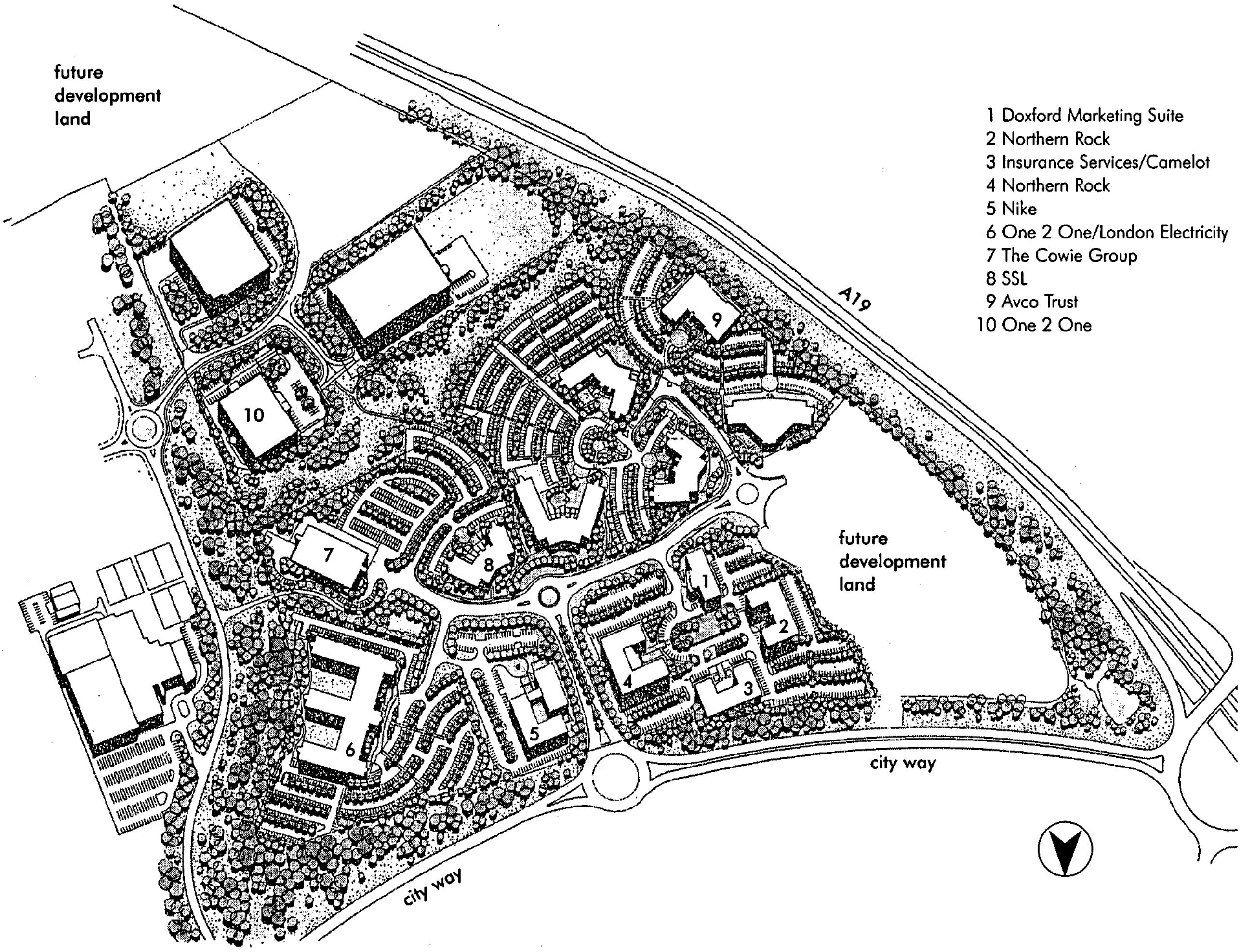
Planning permission may need considerable negotiation due to the variety of uses required by developer. Class B1 was introduced to cater for such developments (see the list of classes in the Industrial Buildings section) but the planning authority may attempt to restrict use with a 'section 106' agreement. This is a voluntary agreement by both parties to restrict use to an agreed list, but the real problem is attempting to legally define high-technology or knowledge-based activity.



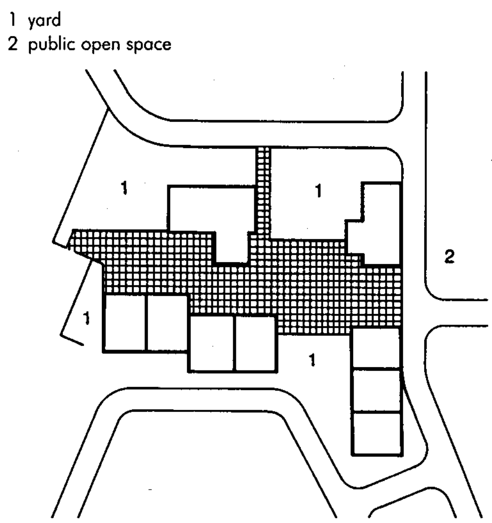
4 Trade mart concept: can be used to revitalise inner city areas; divisible space under a common roof allows a high degree of planning flexibility. Development can mix retail, craft, electronic and light industrial occupancy to stimulate local working community



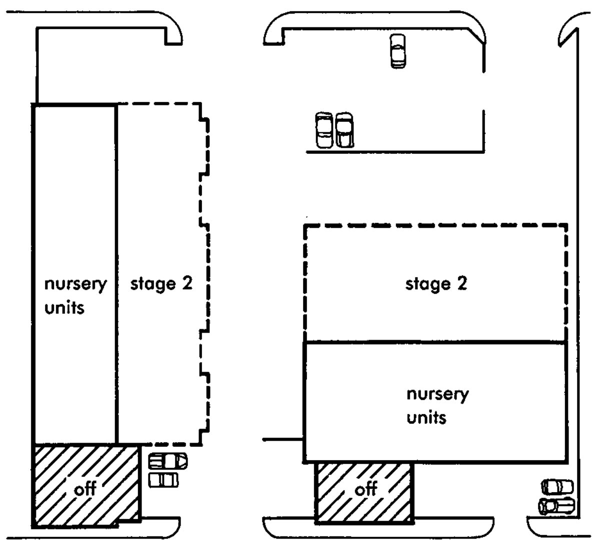
5 Typical mixed-use business park, with a range of unit sizes for rental, each having expansion options (by extending into adjoining unit); grouped parking and yards for each property; landscaping is essential to improve what can be a desolate environment



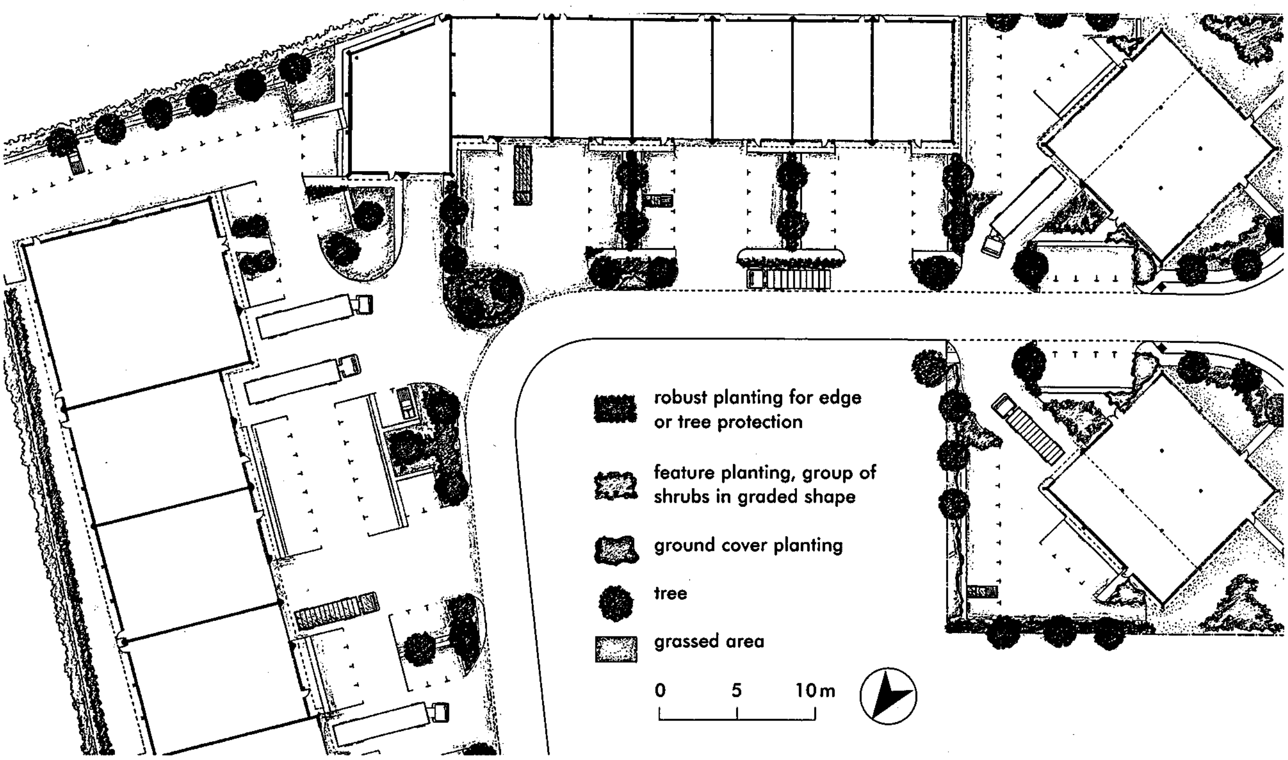
6 Doxford International Business Park, Tyne & Wear (Arch: Aukett Associates)
A 32 ha development in at least five phases by developer Akeler. Buildings are mostly 'loose-fit' to allow for a variety of users



7 Nursery units: minimum unit area is 50 m^2; minor access road will not permit heavy goods vehicles. Goods/service access and car park need to be shared (compare **8**)



8 Nursery units: layout allows for expansion, but in urban infill sites this may have to be at expense of yard area. Layout provides for heavy goods access: vehicles must enter and leave access roads in a forward direction; goods access is separate from car parking area (compare **7**)



9 Business Park, Letchworth (Arch: Triforum) site plan (part)

Business park specification (see *9,10*)

Typical specification for speculative light industrial units in a business park location:

Structure Traditional concrete strip foundations to external walls, concrete pads to columns. In-situ concrete ground floor slab. Uniformly distributed load to be 30 kN/m². Steel frame structure. Height to underside of rafter at eaves to be 5 m.

External walls Traditional construction of facing brick, cavity and insulating blockwork, giving a U-value of 0.6 W/m²K, and a curtain wall system of aluminium sections with a polyester powder-coat finish, double glazed factory sealed units to windows, and composite infill.

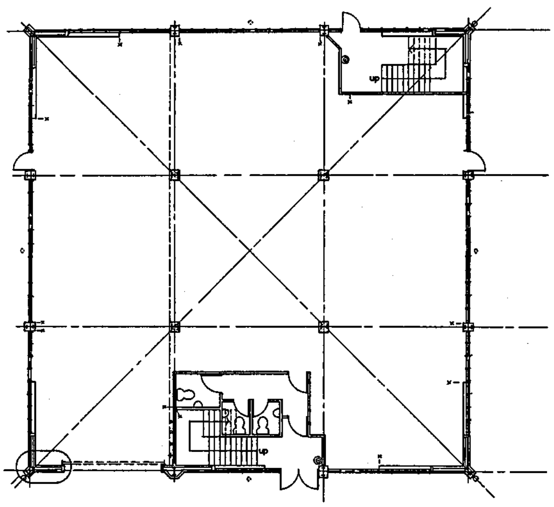
Pitched roof structure Profiled galvanised sheeting fixed to galvanised steel purlins with composite insulation, giving a U-value of 0.6 W/m²K. Double-skin roof lights provided to 10% of the ground floor area.

Suspended floors Pre-cast concrete floor planks on steel beams, designed to carry a superimposed load of 5 kN/m² plus a partition dead-load of 1 kN/m². First floor office areas: units have either a partial-access floor system, or a screeded floor. Floor finish to be carpet.

Internal walls Party walls of 215 mm concrete blockwork; partitions of 100 mm blockwork at ground floor and metal-stud system with plasterboard finish at first floor.

Ceilings Suspended ceiling of 600 mm × 600 mm tile with modular lighting panels.

Loading doors Sectional overhead shutter doors match the curtain wall system.



10 Plan of 'diamond' unit (see **9**)

Power Ground floor distribution board for wiring by occupant.

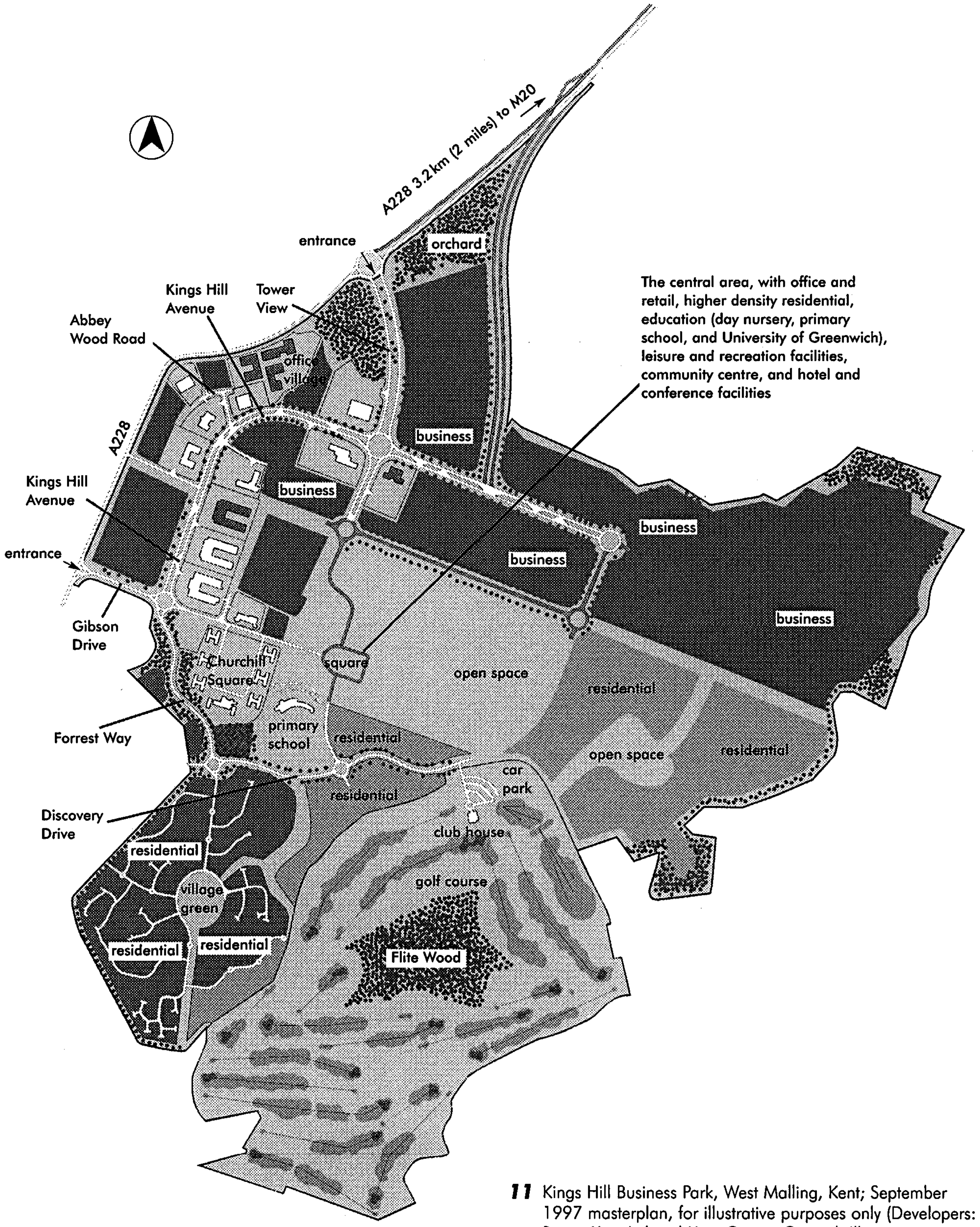
Heating and ventilating A gas-fired boiler and water radiator system. Some units have provision in the roof space above the offices for installation of air-handling equipment by the occupant (including allowance for 300 mm high ductwork and louvres if required).

Access road Set out to local authority adoption standards.

Servicing and parking area Pavior block finish on a concrete base. Footpaths: pavior block.

External lighting Pole-mounted estate lighting. Individual loading-bay lights fitted over the delivery areas.

Landscaping Shrubs, trees and grassed areas; 1.8 m high perimeter fencing.



11 Kings Hill Business Park, West Malling, Kent; September 1997 masterplan, for illustrative purposes only (Developers: Rouse Kent Ltd and Kent County Council. Illustration designed by Wordsearch Communications, reproduced by kind permission of Rouse Kent Ltd.)
An old airfield, turned into a mixed-use development by a county council and a private developer. The existing Ministry of Defence barracks have been converted into flexible 'starter' business units. Note also the residential development around a village green

CINEMAS

Helen Dallas

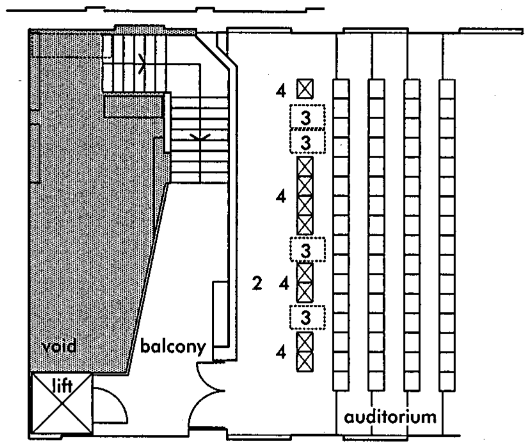
See also auditoriums in the Theatres and Sports sections

INTRODUCTION

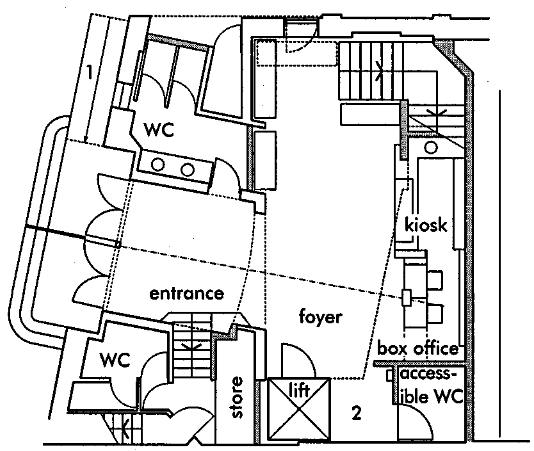
Despite the advent of videos, cable and satellite TV, cinemas continue to be popular. Generally, commercial cinemas are run by the large film companies although there are still some small independent cinemas (see **1**) and individual club cinemas screening specialised films for members.

The trend in cinema design over recent years has been to offer the public a choice of viewing at individual venues. This has resulted in the conversion of big cinemas into two or more auditoria and the birth of the purpose-built multiplex offering between six and fourteen screens, often on out-of-town sites with ample parking. However, such locations are becoming limited and operators of varying size will be encouraged to maximise existing town-centre sites.

The design of the modern cinema seeks to find a successful balance between the existing site conditions, individual auditorium size, raking of seats to provide an unobstructed view together with good sound and picture quality for the customer. Strong competition has meant operators are increasingly looking to improve comfort for cinema-goers with quality design, particularly in entrance areas, and additional entertainment facilities.

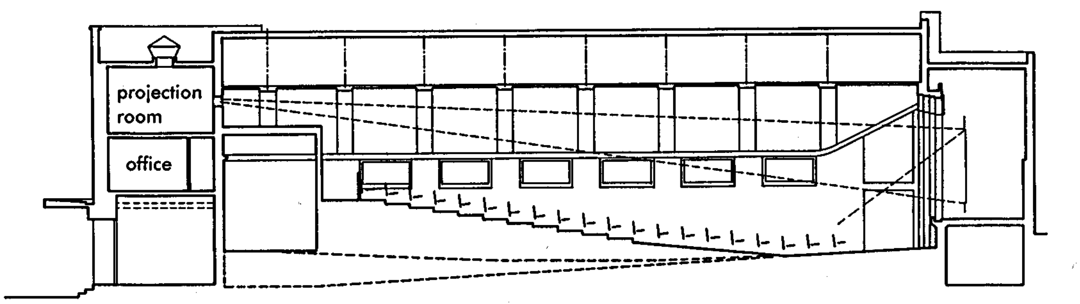


ground floor entrance foyer (as proposed)

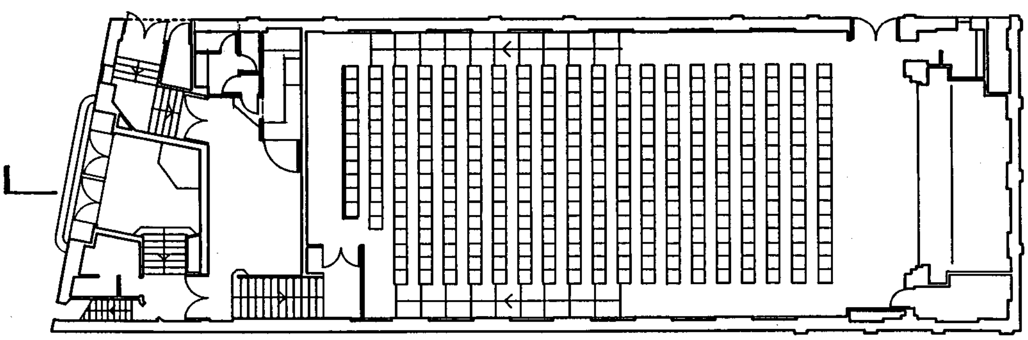


first floor foyer area (as proposed)

1 proposed ramp; 2 wheelchair turning space; 3 wheelchair spaces; 4 all seats in rear row can be removed to create space for wheelchairs

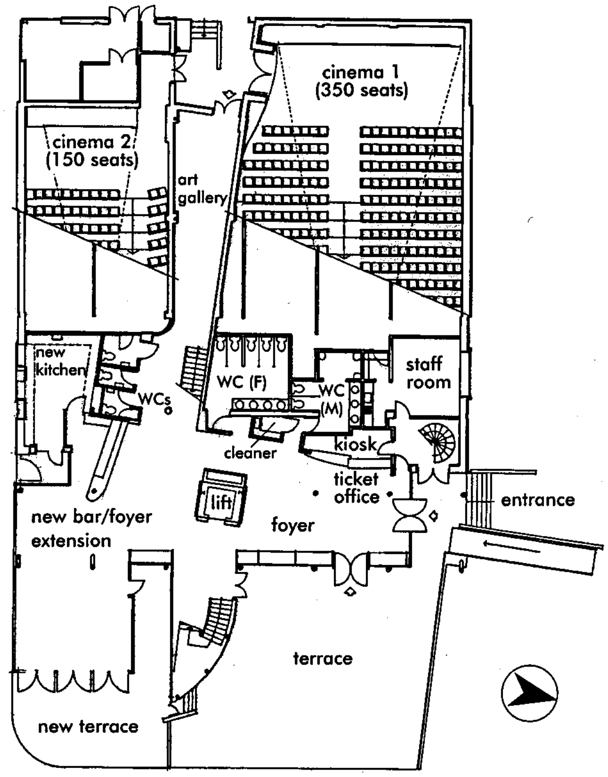


section (as existing)

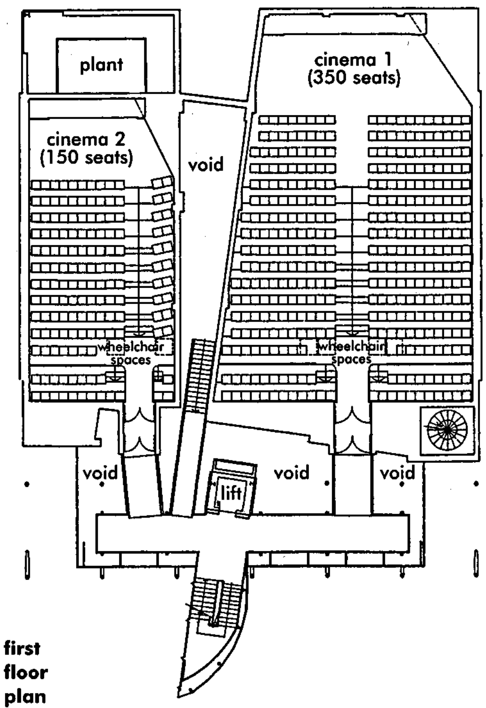


plan (as existing)

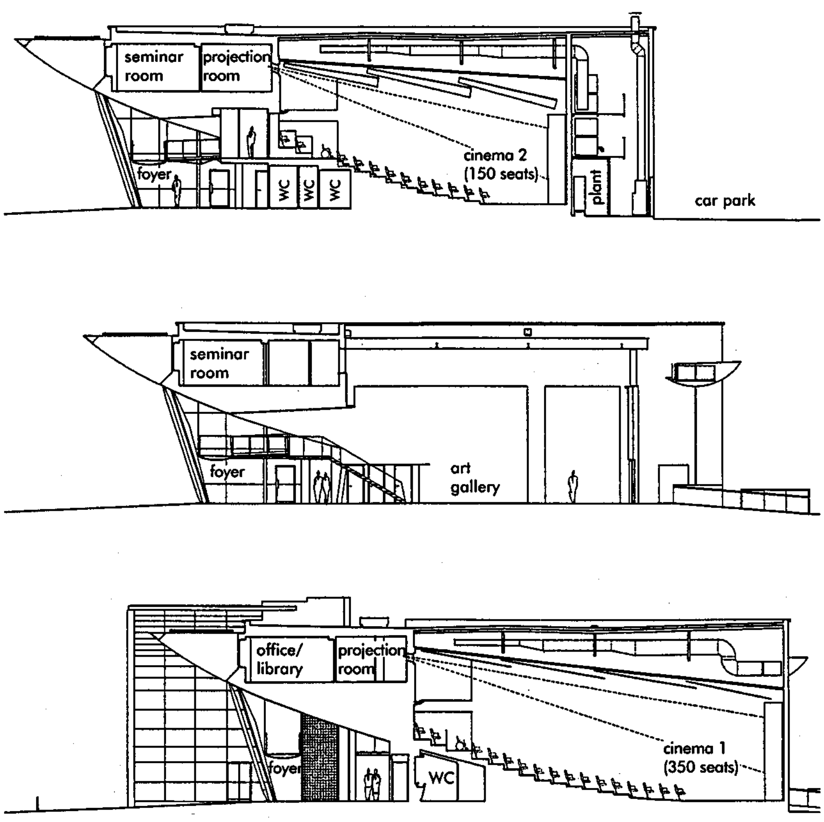
1 Phoenix Cinema, East Finchley, London: originally opened in 1910, this is a good example of one of the few remaining independent cinemas (note access provision for people with disabilities) (Arch: Pyle Associates)



ground floor plan



first floor plan



sections

2 Harbour Lights Cinema, Southampton
(Arch: Burrell Foley Fischer)

DETAILED DESIGN

Siting In town-centre locations, open space is required around the cinema to accommodate means of escape, create an identifiable entry and allow for possible queues. New multi-screen cinemas should provide easy access and ample parking to meet Local Authority requirements.

Multiple auditoria These are considered vital in commercial cinemas (see **2**, **4**). Various theories are used to apportion the total number of seats between different auditoria in the same building. In dual cinemas, ratios of 1:2 or 2:3 are used, and 1:2:3 for triple cinemas. Further progressions in seat totals may be used in larger multiples but they rarely exceed a 1:3 ratio between the smallest and largest screens. As well as offering visitors a choice of programme, such venues allow the operator to judge the business potential of each film so as to show it in an auditorium that matches public demand: if the film is playing to half-capacity audiences, it can be switched to a smaller auditorium, and vice versa.

An auditorium width should not exceed approximately twice that of the screen and its length no more than three times the screen width. To achieve the best sound quality the opposite surfaces of floors, ceilings and walls should not be parallel to each other. Where the ideal fan shape is not possible, singular angled walls, raked ceilings or acoustically absorbent features can be used.

Seating In addition to being comfortable and easily accessible, seating must be designed such that all members of the audience have a clear and unobstructed view of the screen. Seating for customers with disabilities should be integrated within the main body of the seating (see **1**) although this is not always possible because of requirements for refuge points and emergency exits.

Seating areas of auditoria should be within 0.85–1.05 m^2 per person. The distance between the backs of seats should be a minimum of 900 mm although up to 1.2 m is often used for maximum legroom and comfort. Seat widths vary between 500 and 750 mm, with a suggested maximum of 22 seats per row.

To provide acceptable sight-lines, seating is normally raked, varying between 5 and 10%. Larger auditoria often include stepped seating towards the rear (see **3**).

The distance from the screen to the front row of seats is determined by the maximum allowable angle between the sight-line from the first row to the top of the screen and perpendicular to the screen at that point. The recommended angle is from 30° up to 35° although 45° is used as the maximum in some circumstances. The 35° sight angle limit above the horizontal produces a distance to the screen on the centre-line of 1.43 times the height from the front row eye level to the top of the picture (see **3**).

Gangways These should have a minimum clear width of 1.05 m. In small auditoria (100–250 seats), a single central gangway is sufficient; for medium size venues, a gangway on either side is acceptable, causing less visual distraction; and in large auditoria (400–600 seats) the preferred solution is to have twin gangways set in 0.25–0.35 of the cinema width from each side.

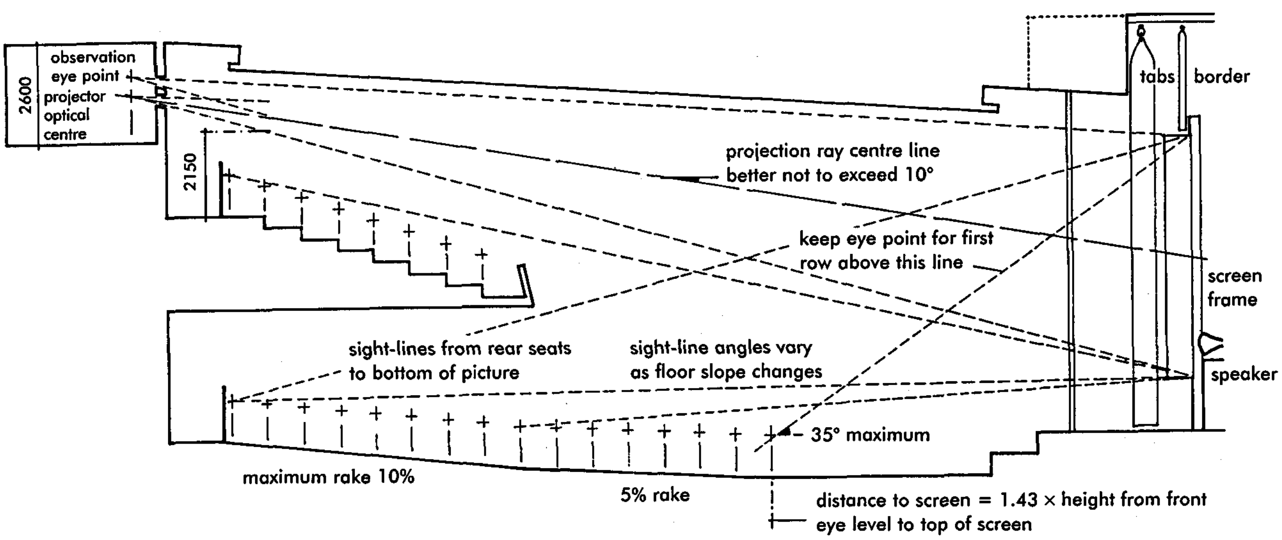
Public areas The public areas are important in conveying an image of class and comfort to customers and the decor should therefore be attractive and designed to high standards. The space may include payment booths, advance booking facilities, ticket machines, refreshment kiosks, merchandising stalls, forthcoming film advertising and information on current screenings. There should be sufficient room for queuing comfortably and clear signage to public toilets, auditorium entrances etc. Suitable access, toilets and lifts are required for visitors with disabilities.

Additional accommodation Other requirements in the design layout of a cinema include: plant room, staff rooms and facilities, cleaners' store, manager's office, film store, kiosk stock room and refrigeration for ice creams, projection booths and a treasury/secure cash room.

Multiplex cinemas may offer a wider range of entertainment. The designer may, therefore, need to consider extending the traditional catering facilities to provide bars and restaurants as attractive integral features. Cinemas are also now combined with other commercial and leisure activities such as shopping malls, computer games arcades, virtual reality centres, bowling alleys etc.

SERVICING FACILITIES

Projection rooms Traditionally these were divided into separate compartments for rewinding and projecting film, with dimmer room, battery room, spotlight room, workshop and store room, each forming a 6–10 m^2 suite. Automated systems currently in use include projection areas with rewinding benches, sound equipment, dimmer and switch facilities. To cater for future trends, a minimum area of 5.5 × 4.0 m per screen should be allowed, with a minimum ceiling height of 2.6 m. Continuous playing equipment enables one operator to control several screens.



3 Basic requirements for auditorium levels

In multiplex cinemas, a long continuous projection room behind the screens can be installed, or two-way projection rooms for back-to-back screens. Advanced techniques employ variable height and width pictures: the size of arc lamp used is determined by the picture area and the maximum effect is obtained by using different ratios of equal areas.

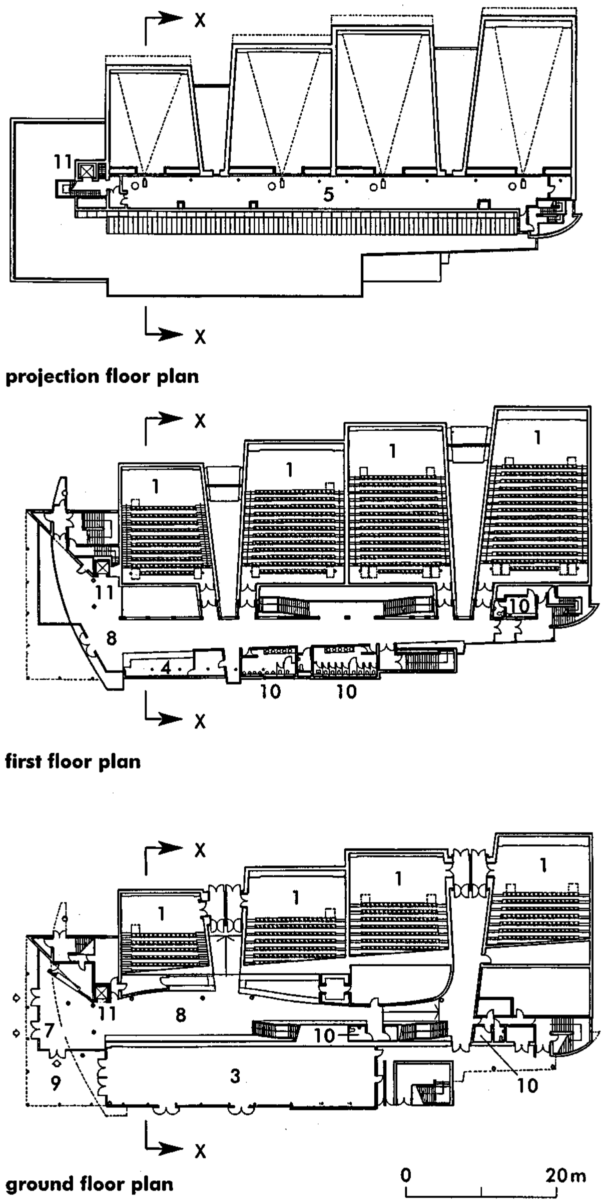
Projection rooms require a separate system of mechanical or natural ventilation, water cooling facilities, suitable positioned lighting and sufficient heating (or cooling) to maintain a minimum temperature of 10°C.

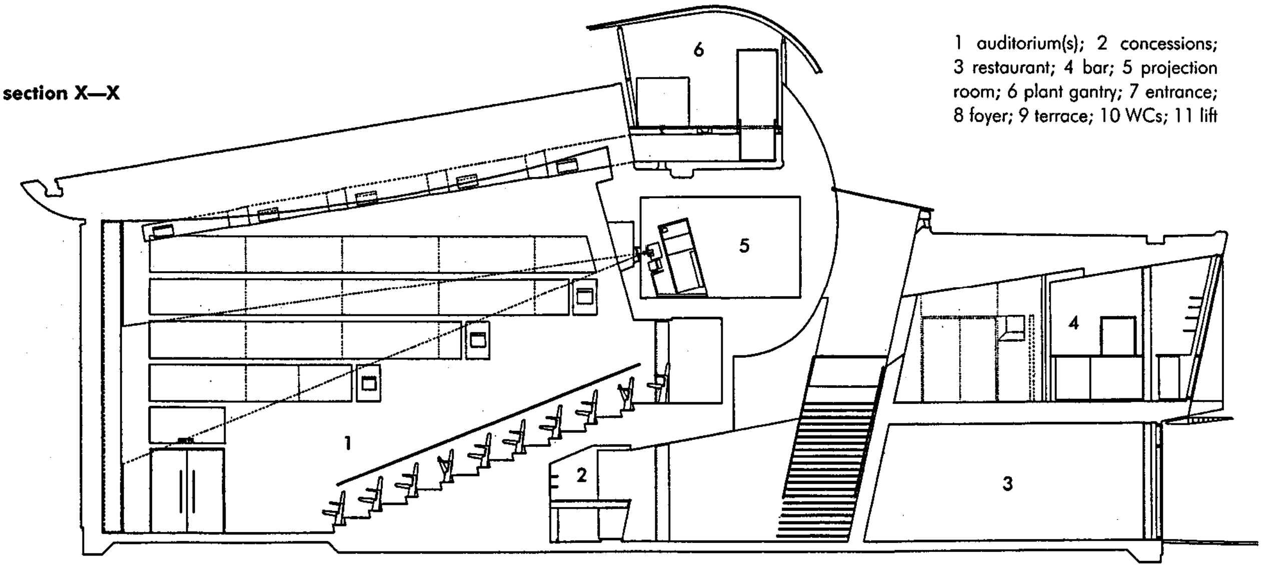
Screens The aim should be to use as large a screen as possible, up to the limits defined either by given maxima or width of seating. The proportions are 1:1.75 height to width and black masking is used around the edges to preserve the maximum brightness on the screen.

Within large auditoria, curved directional screens were originally developed to overcome problems of dispersion of reflected light from flat screens. Modern cinemas, with better screen material, are able to use the curvature of the screen to reduce the amount of apparent distortion to side sight-lines. However, too much rise of chord can give problems with focus over the whole picture area.

Screen construction is generally pvc or metallised fabric stretched over a metal frame. It should be remembered that the surface will deteriorate over time. (Consult BS 5550 for relevant specifications on screening and projection.)

A minimum depth of 1.35 m is required behind the screens for the installation of speakers, the number and position of which usually depends on the type of sound system and the size of the auditorium. Space must also be left for the tabs (curtains) and mechanical systems to the side of the screen.





4 Stratford East Picture House, London (Arch: Burrell Foley Fischer)

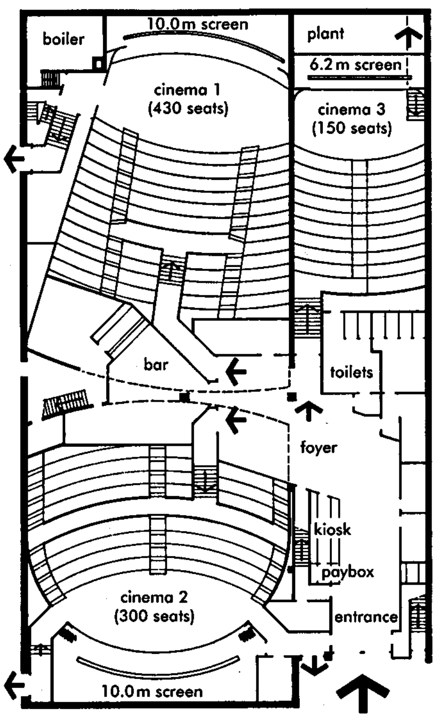
Sound systems Considerable developments have been made over the years, with the early problems of handling magnetic sound recordings of film being solved by Dolby encoding optical systems. Digitally recorded sound is now also being used. With both systems the sound is decoded in the projection room to achieve the effect desired for the particular film (e.g. Dolby surround sound for action films or a traditional rear screen transmission). Typically, five speakers are used, one being specifically for bass sounds, and often with a sixth as an auditorium speaker. Very wide screens and side sound sources can produce acoustic problems: generally for cinemas reflected sound paths should not exceed direct paths by more than 15 m.

General servicing

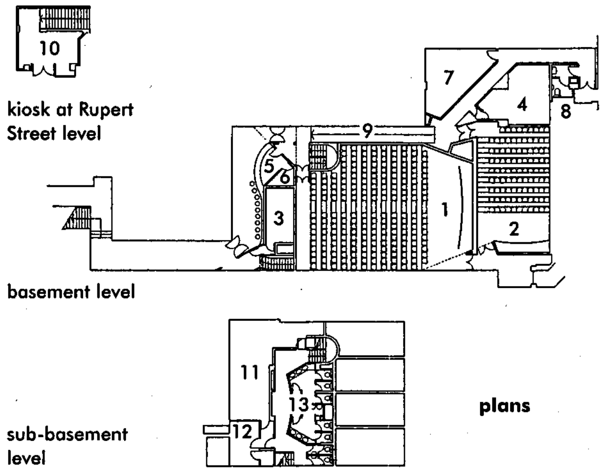
Decorative lighting and any required spotlighting installed in the auditorium must, obviously, be capable of being dimmed when the film is showing. Illumination of seating areas and gangways is required during the film programme but none of the light should fall on the screen or walls. The auditorium system is also used as emergency lighting under management control. Safety lighting is needed to all public, key staff and exit boxes throughout the building. This must be kept on as part of the maintained system and, should the main electricity supply fail, a safety system must be able to provide sufficient light to allow the public and staff to leave the building safely.

A good standard of mechanical ventilation and/or air conditioning is required throughout all public areas, and especially the auditorium, to maintain comfort levels.

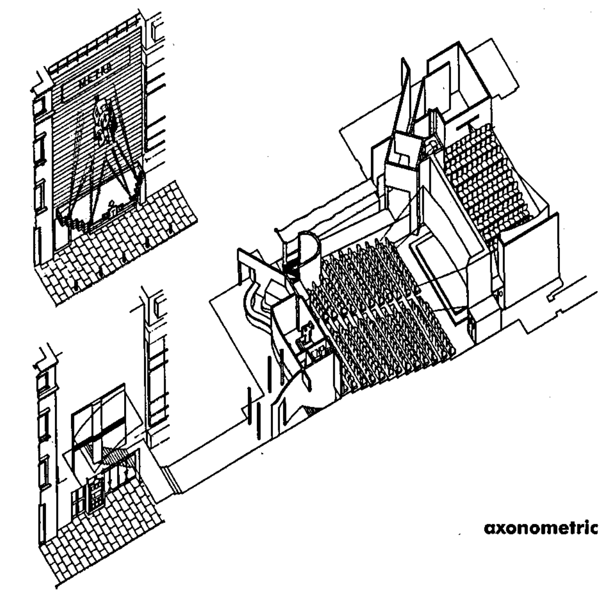
Acoustic separation is necessary at entrances to each auditorium and also between the projection rooms and the auditoria. At entrances, this is achieved with lobbies and sound reducing doorsets.



5 Cinema in Putney, London: multiple auditoria with high-level common projection room; part of a commercial building



1 cinema 1; 2 cinema 2; 3 projection 1; 4 projection 2; 5 bar; 6 store; 7 viewing; 8 WC (dis); 9 ramp; 10 kiosk; 11 plant room; 12 staff restroom; 13 WCs



6 Metro Cinema, Piccadilly, London: a former theatre converted to a cinema
(Arch: Burrell Foley Fischer)

ALTERNATIVE CINEMA ACCOMMODATION

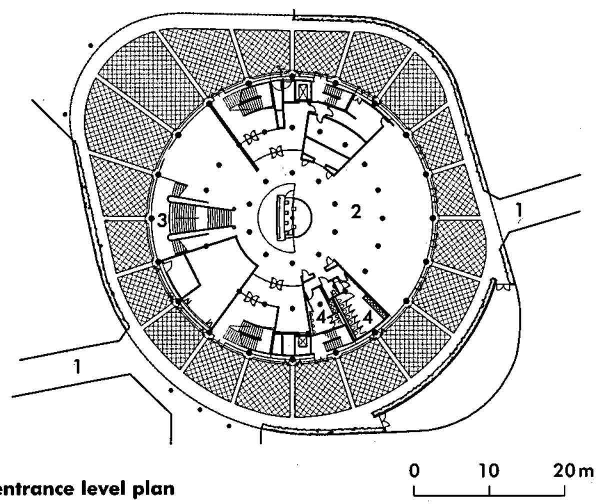
Drive-in cinemas Popular in the USA, these are designed on the principal of the amphitheatre, with individual speakers for each car. Designs with both single and multiple screens are now used.

The layout should provide a view of the picture at no more than 45° from the perpendicular at the centre of the screen and ramps should be designed so that spectators can see clearly over the cars in front. With large screens the distance from the front row to the screen is often more than 50 m. The typical screen size is 30.4 × 13 m and it should face between east and south to make early evening screenings possible. The height of the screen above the ground depends on the site profile and this in turn determines the angles for the car ramps.

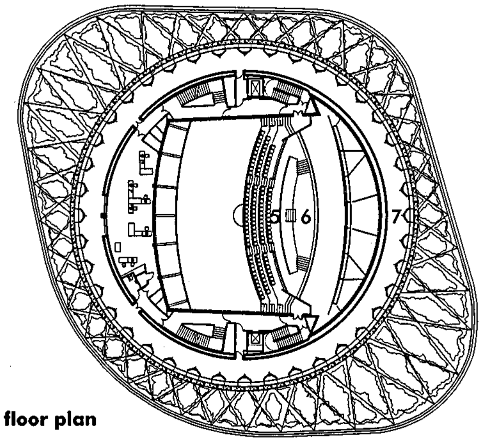
Ticket booths are needed and ample space for queues should be allowed. The design should provide for separate entrances and exits.

Circarama Used successfully in Disneyland, this system uses eleven projectors to give audiences a sense of participation and full involvement. Seating is not practical but handrails are necessary to prevent the viewers from falling over.

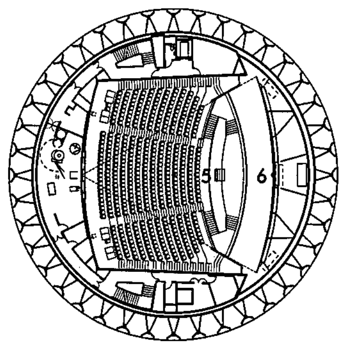
Interactive systems These are a development used in theme parks and now in 'Experience' theatres around the world. They use an audio-visual technique of automated multiple projection of still pictures with auditorium effects and multi-track magnetic sound systems. Closed-circuit TV systems are feasible with electronic line enhancement, giving 2.43 × 1.83 m pictures. With 'Eidophor' screens, sizes up to 9 × 12 m are possible. There have been developments of interactive cinema systems where seating is programmed to move relative to the screen action.



entrance level plan

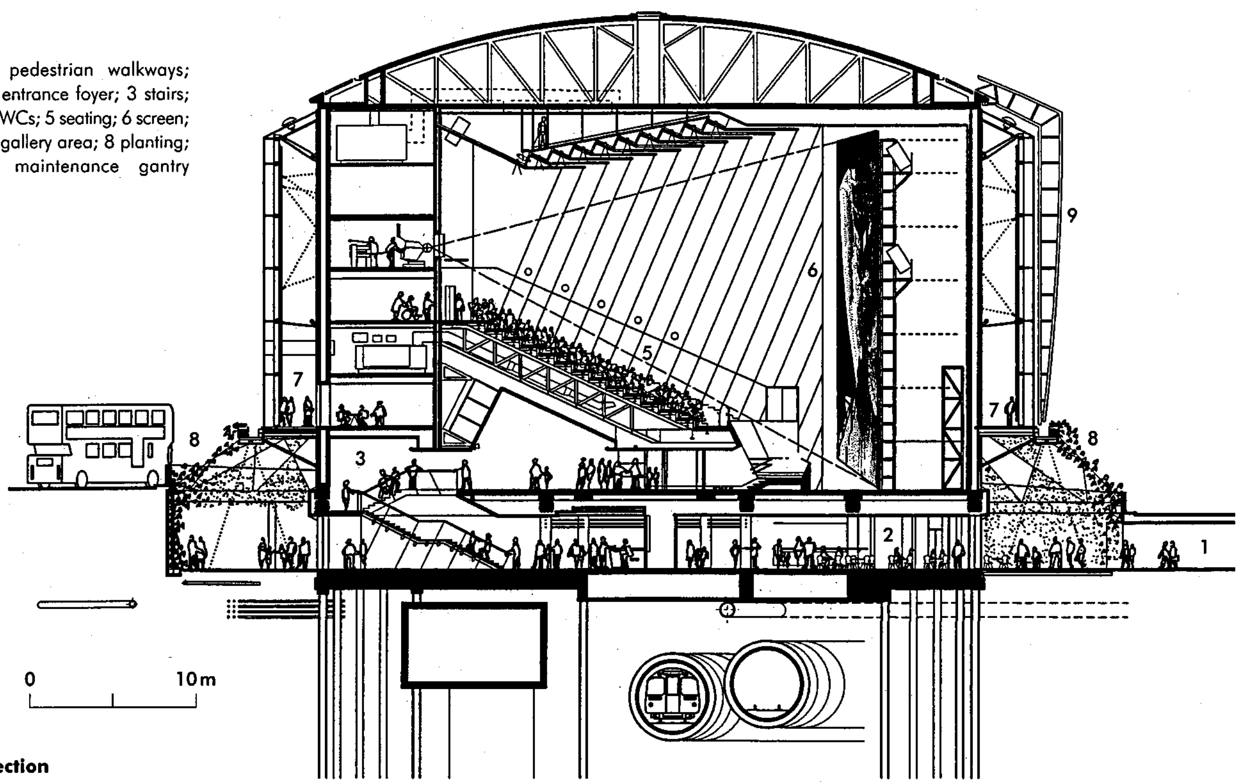


second floor plan



fifth floor plan

1 pedestrian walkways; 2 entrance foyer; 3 stairs; 4 WCs; 5 seating; 6 screen; 7 gallery area; 8 planting; 9 maintenance gantry



section

7 The British Film Institute London IMAX Cinema, Waterloo, London (Arch: Avery Associates Architects)

COMMUNITY CENTRES

Peter Beacock and Fiona Brettwood

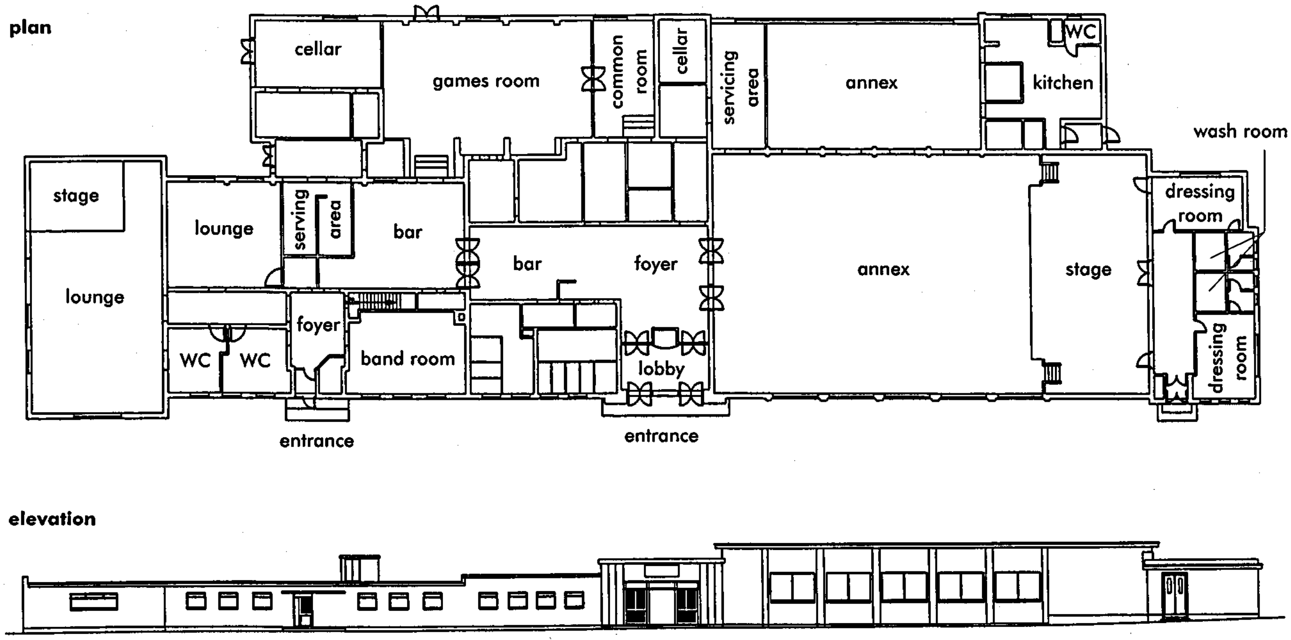
INTRODUCTION AND BACKGROUND

With the decline of the influence of the church and the movement of people from small isolated communities into urban centres, facilities for the local community were initially provided by philanthropists, and were intended as centres for education and public lectures. After World War I a number of different organisations were set up to provide community facilities, such as the Village Clubs Association, which were designed to be 'the centre of communal life and activity'[1]. It was seen as important that 'the foundation of all schemes should be the reliance upon the communal spirit, so that everything which is attempted would not be imposed from the top, but built up from the bottom'[2]. This led to the building of a great variety of village clubs responding to local requirements. Generally, they had a multifunctional main hall, and small meeting room or rooms, but could also include separate boys' and girls' rooms, a gymnasium, rifle range, billiard room, library, or reading rooms. These clubs were mainly self-supporting, with funding for construction of the building supported by the Urban or Rural District Council, or Parish Council[3].

In areas of industrial development, where the majority of the community was directly or indirectly involved in particular activities, resources were provided by employers or unions, as for example in the Miners' Welfare Halls and Clubs in the coalmining areas of the country. These were 'the product of an enforced liaison between miners and their employers resulting from the 1920 Mining Industries Act'[4] (see **1**).

In the 1970s and 80s, communities in Britain 'came to rely on a range of self help activities ... to meet a variety of needs not met by standard Local Authority services'[5]. Finding funding to build and run facilities became increasingly difficult with changes in government policy and society's values. There has, however, been a resurgence in the commissioning of community facilities in recent years, because of funding packages available through European Regional Development Fund, Lottery funding and the setting up of a number of charitable foundations by wealthy private companies. The procurement process has consequently become very protracted, with the early stages of the design process being particularly important.

The need to provide a community centre will usually be generated either by the need to update, modify or replace an existing facility that has genuinely served a need, or to provide a totally new facility intended to encourage the re-establishment of a sense of community. In all cases, funding will need to be sought from a variety of sources, and community groups will have to demonstrate that the proposal is founded on a sound business plan, moving towards financial self-sufficiency. Funders need evidence that the proposed facility and management strategy meet the needs of the local community it is intended to serve. This is best provided by extensive local consultation.

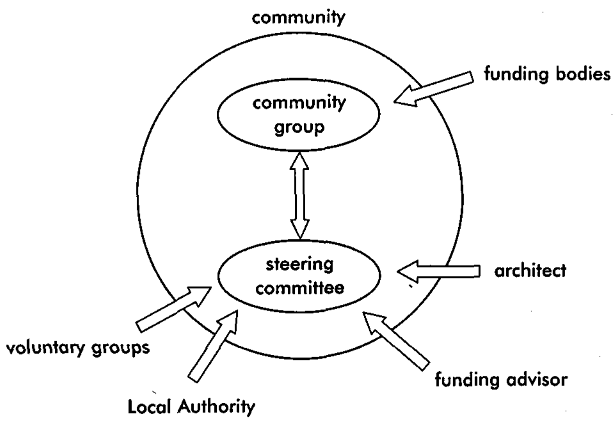


1 Vane Tempest Welfare, Seaham, Co Durham: provision for the needs of a local mining community

Key stages in community consultation are (see **2**):

- working with community organisation or organisations to consult the local population as to perceived needs and requirements
- identifying other local provision to avoid duplication of facilities
- developing a design brief and accommodation requirements from the consultations
- consulting with the Local Authority on funding potential, planning and highways issues.

It is important that the early consultation phase is carried out rigorously if the completed building is to meet the needs of the community and be viable.



2 Organisations likely to be involved from the early stages of development

COMMUNITY CONSULTATION AND BRIEFING

Local issues

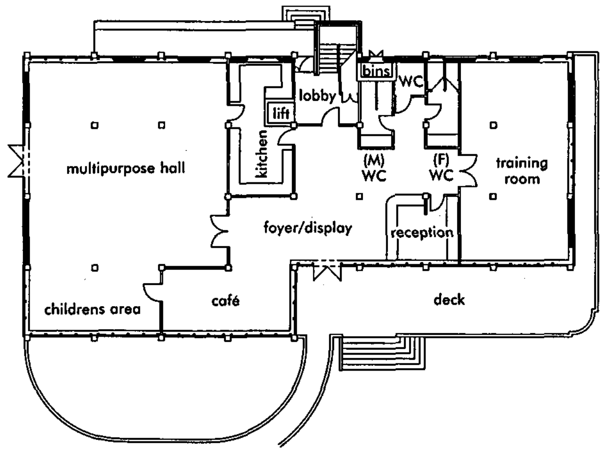
If the proposed centre is to satisfy local needs and satisfy funders that it is viable, early community consultation and data collection is essential to develop the community profile and identify community needs. The community profile will typically consist of:

- demographics
- employment statistics
- existing facilities
- population changes
- geography
- transport infrastructure.

Identification of community needs requires in-depth consultation with existing groups and societies, and broader based dialogue with the wider community. Consultation can be carried out using a range of methods – questionnaires, open days, exhibitions, public meetings, focus groups, themed workshops and similar activities – to give the chance for individuals of all ages to express their opinions and concerns.

SUSTAINABILITY

The idea of community provision, and the encouragement of the community to use local facilities, is very much in the spirit of Agenda 21. There is the opportunity to use the centre to encourage approaches to sustainability, by designing for minimum energy use and water use, choosing locally sourced, or other low environmental impact materials, and involving the community in its construction. For example, the community centre at Meadow Well, North Tyneside, involved local trainees in its construction, and the Robin Hood Centre in Nottingham adopted a Walter Segal design approach, in which the local community participated in the project (see **3**).



3 Robin Hood Chase Neighbourhood Centre, Nottingham: constructed with community involvement using 'self-build' techniques; ground floor plan
(Arch: Carnell Green Bradley)

DESIGN ISSUES

For community centres to be viable, they must be seen to provide for and be welcoming to the community; they are often a key factor in an area regeneration strategy. Key design issues areas follows.

Image

The centre must be welcoming to all ages, and have a positive impact in the community. Although security is a major consideration, it must not be at the expense of making the building unwelcoming, and well-lit entrance areas can provide an appropriate atmosphere (see **4**). New buildings often have a more noticeable impact but the refurbishment of existing facilities is often more economically viable. If existing facilities are to be retained it is important that the exterior of the building reflects the changes inside the centre, as it is the outside appearance which advertises the improvements within.

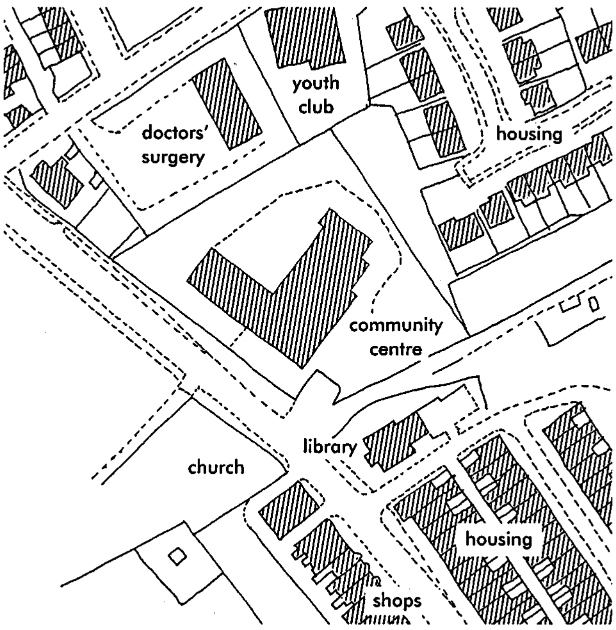
4 The New Social Welfare Centre, Choppington, Northumberland: sketch of entrance area, an open and welcoming space
(Arch: WHHLP)

Site and location

Ideally, the centre should be as close to the heart of the community as possible, near other facilities (shops, school, library), and accessible by public transport (see **5**). A flat site is preferable because the construction costs are lower than with sloping plots and it allows for easier access. It should have adequate space for parking cars and bicycles, and may need additional external space for facilities such as play areas, gardens, and sports provision. The profile of the local residents is an important consideration.

Organisation

The building must be easy for the staff to manage. Layout and circulation routes should be clear, and ample storage space is needed. Consider noise, type of activity, likely timing of activities and age groups when locating facilities. A reception area or office at or near the entrance will assist in the monitoring of visitors and provide a focal point for information and organisation (see **6**,**7**).



5 Bowburn Community Centre, Co Durham, site plan: located at the centre of the village; note relationship to other community facilities, as well as housing and open space (Arch: WHHLP)

Circulation

Economical planning is necessary to keep costs down, so all opportunities should be taken to minimise corridors, and make spaces useable for more than one function. Central circulation space doubling up as a café/informal meeting area is a typical solution. Circulation space must be easily monitored and have robust and hard-wearing surface finishes. Vertical circulation in multi-storey buildings must be visible from a central control point or management office to avoid potential misuse of lifts etc.

Accessibility

The building will need to cater for all age ranges, from children in prams and push chairs to ambulant disabled adults and wheelchair users. Location of bus stops, walking distances from residential areas, provision of disabled parking all need to be considered, as should colour and contrast in the interior design scheme. The implications of sloping sites, changes of level and designs with more than one floor level need careful consideration at the outset. Lifts and chair lifts are expensive to install and maintain, and prone to abuse.

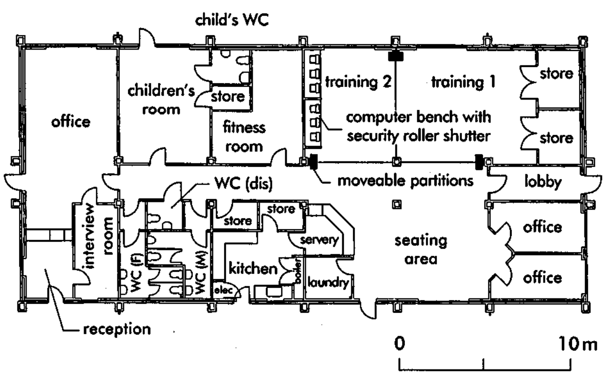
Opening hours and management policies of the building also need to be considered from the earliest stage and can often be subject to planning restrictions to avoid disruption of immediate neighbours.

Flexibility

Consultation with client groups will identify needs, and these will usually encompass a wide variety of uses by a range of age groups. The building design must allow for maximum flexibility of use, which will need to be considered both in the short term to cater for current requirements, and in the longer term, as needs will change with time. For short-term change, moveable walls or partitions to divide spaces may have some applications (see **6**) but there are problems with the poor acoustic performance of some screens and the operational complexity of large systems. Design solutions that give flexibility through planning and space organisation as well as the provision of a range of different sized spaces are to be preferred. For longer term change, designs that can easily accommodate internal reorganisation through appropriate initial structural design and by allowing space for future extension are desirable.

Maintenance

There should be careful consideration of maintenance implications of all specifications to help to minimise running costs and ensure long-term viability of the centre. Specify robust high-quality materials and products wherever possible and avoid unusual fixtures and fittings (such as taps, toilets, boilers and shutters) that may cause maintenance difficulties for the management group through cost, availability of spares etc. Limit external maintenance liabilities by minimising the use of render and other painted surfaces. Consider also vulnerable surfaces; avoid materials and accessible roofs that may be subject to vandalism. It is important, however, to avoid designing a 'fortress'.



6 Sherburn Road, Durham: plan, showing moveable partitions for flexibility (Arch: WHHLP)

Security

Consider physical measures to protect the building but, to preserve a welcoming image, ensure they are discreet and not overly visible when the building is open. A central, open location for the building encourages self-policing by the local community, and good external and internal lighting is also useful as a deterrent. Planning and internal arrangement should limit access points and allow good overall supervision.

If security shutters are needed, consider installing electrically operated units as they are easier for the management group to operate and avoid the building remaining shuttered even when it is open, which often happens with manually operated shutters. However, maintenance issues also need to be weighed up.

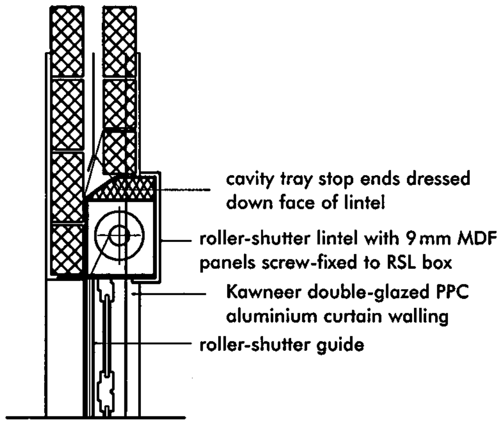
Early consultation with the local police and potential insurance companies will ensure that all aspects of building security are considered and that specifications are to an appropriate standard.

Environment and services

The building should be designed for low energy and water use. Funders are likely to look for evidence of design for high levels of energy efficiency to reduce running costs. Consideration should be given to alternative sources of energy as appropriate: for example, novel forms of energy supply such as solar water heating may be economical, and may be supported by national or local grant aid. Innovative and experimental technology should be avoided, as systems are often expensive to install and need sophisticated controls and specialist maintenance.

Heating, lighting and security systems should be zoned with simple, robust, tamper-proof controls to allow ease of use. Low temperature radiators must be used where elderly people and children are the main users of the space and all supply pipework should be covered or concealed. Consider provision for computers and the future expansion of computer/cable-based information systems.

Consider the maintenance requirements of all systems including boilers, ventilation and extraction systems and alarms. Avoid inaccessible light fittings and unusual bulbs that would be difficult to replace.



8 Concealed shutter system, shutter detail: Eastlea Community Centre, Seaham, Co Durham
(Arch: WHHLP)

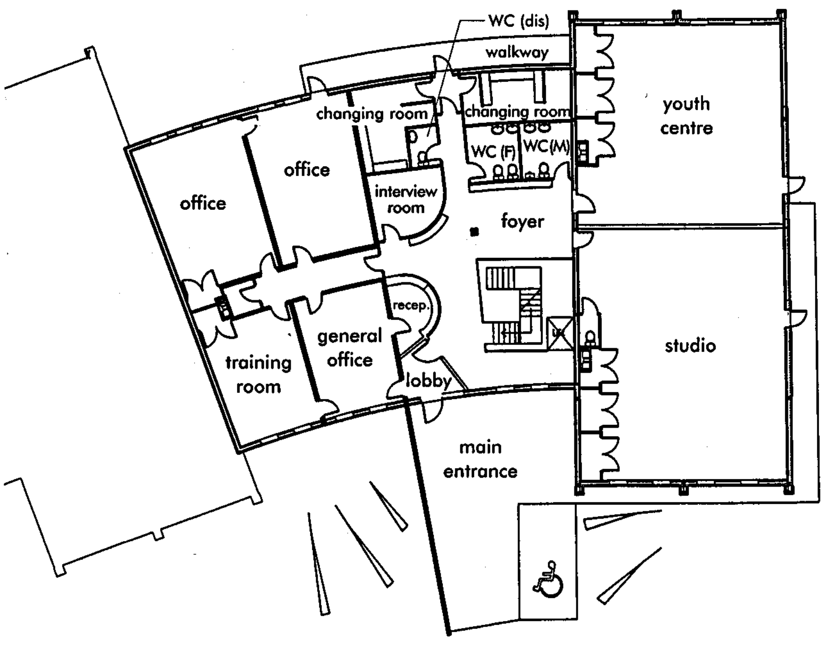
Typical elements

All community centres will be different, as they are designed to meet the needs of specific local needs but there will be common elements in every building.

Halls Often the main space, the size and shape will be determined by identified activities and uses. Typically the main issue in the design of a hall is whether or not a permanent stage is needed and also the associated changing rooms and storage for chairs and equipment. Floor type is important – if dancing or activities such as aerobics are likely to be popular, hard-wearing sprung flooring, although costly, is essential.

Meeting rooms If more than one is provided, sizes should accommodate a variety of functions, and if they are used for young people's activities, consider location to minimise noise disruption to other areas. There are also privacy issues if these rooms are to be used for counselling.

Computer room Frequently in demand, these provide a good base for college outreach education. Consider the location to minimise heat gain and ensure security. A security mesh may be necessary in wall cavities and roof spaces to provide additional physical security.



7 Salterbeck Community Centre, Workington: plan; note location of reception and disabled access and circulation
(Arch: WHHLP)

Offices The number and type will be determined by the management system in place and the number of organisations using the facility as a base. The management office needs to be near the main entrance for security reasons.

Café/bar Creating an attractive and welcoming social meeting area is often the key to the popularity of a centre. It should be sized and located for maximum flexibility, and to be useable for as much of the day/evening as possible. Providing a licensed facility will be determined by local demand and custom or practice, and will raise many issues of security, staffing, and location.

Kitchen Usually a small servery/preparation area is all that is required, but larger commercial facilities may be called for. The implications of health regulations and costs of storage and space provision must be fully considered when deciding the viability of a catering kitchen.

Changing rooms The size and layout will be determined by the internal/external sports provision and potential for performance use in association with the main hall.

Storage It is vital to have sufficient storage space in appropriate locations, as chairs, tables, and equipment will need to be moved and stored if maximum flexibility is to be achieved. Many user groups will have their own equipment needing on-site storage. Detailed consultation with user groups should identify the exact requirements for each one.

Circulation Cost restrictions will mean minimum circulation space to minimise construction area, but there will need to be enough provision in the entrance area for accommodating different groups of users arriving at the same time (e.g. elderly, infirm, parents with young children).

External facilities These will vary from all weather sports facilities to external play space for toddler's groups. Relation to internal spaces and changing facilities is important.

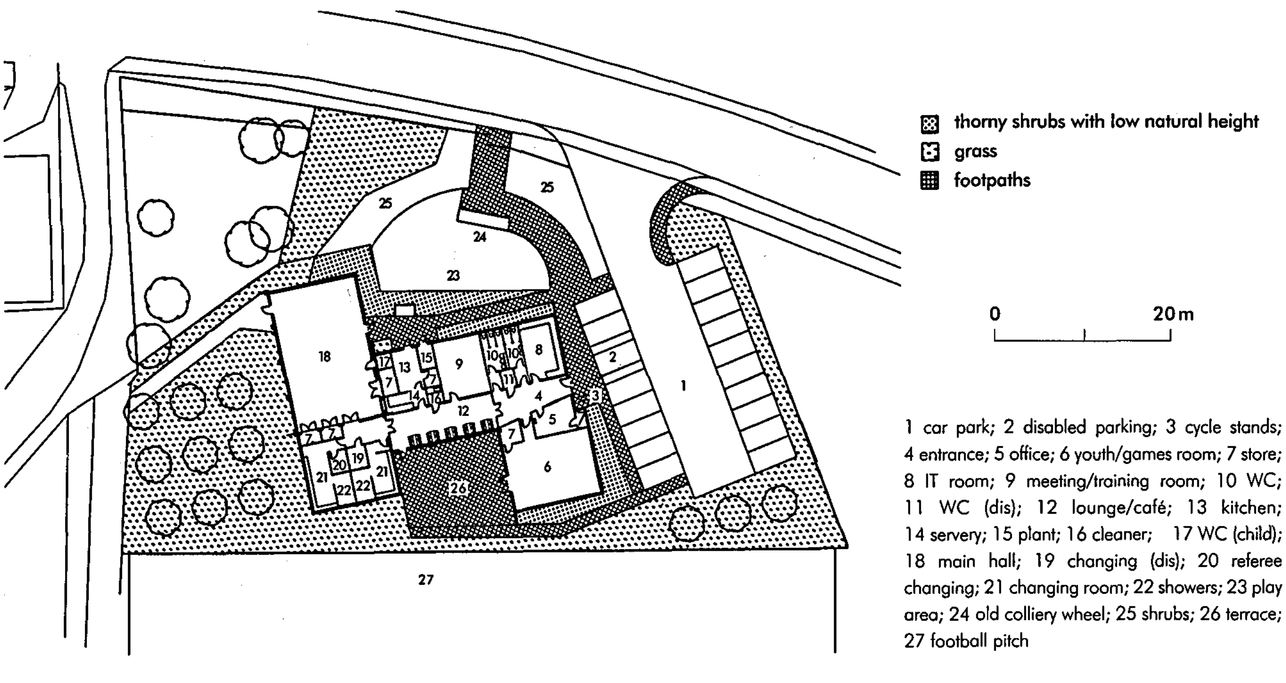
Unusual elements

There may be need for a number of other elements, according to local demand.These might include:

- Laundrette: this will have implications for water and heating costs as well as space and maintenance; management and payment arrangements must be considered.
- Fitness room: fitness centres are becoming increasingly popular. Consider the space requirements and cost of equipment as well as the insurance implications of specialist equipment, and the relationship to showers/changing areas.
- Sports halls: these large-volume spaces have a major impact on both construction and running costs. Consider requirements of associated storage and changing/showering facilities. Sports halls will need to seen as part of the Local Authority strategic provision if they are to be publicly funded.
- Provision for doctors, nurses, community advisors: space may need to be provided for external users. Consider space provision, planning, security, and privacy.

References

(1) Weaver, L. (1920) *Village Clubs and Halls*, Country Life, London, p. 3.
(2) Ibid., p. 2.
(3) Ibid., pp. 93, 94.
(4) Hanson, D. (1971) *The Development of Community Centres in County Durham (excluding County Boroughs) 1919–1968*, MEd Thesis, University of Newcastle.
(5) Taylor, M. (1983) *Resource Centres for Community Groups*, Community Projects Foundation, London.



1 car park; 2 disabled parking; 3 cycle stands; 4 entrance; 5 office; 6 youth/games room; 7 store; 8 IT room; 9 meeting/training room; 10 WC; 11 WC (dis); 12 lounge/café; 13 kitchen; 14 servery; 15 plant; 16 cleaner; 17 WC (child); 18 main hall; 19 changing (dis); 20 referee changing; 21 changing room; 22 showers; 23 play area; 24 old colliery wheel; 25 shrubs; 26 terrace; 27 football pitch

9 Thornley Community Centre, Co Durham: ground floor plan; the central circulation space doubles up as a café (Arch: WHHLP)