THE FACTORS INFLUENCING THE PLANNING AND DESIGN
OF CONFERENCE AND EXHIBITION FACILITIES

A Thesis submitted for
the Degree of
DOCTOR OF PHILOSOPHY

by

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DECLARATION

None of the material contained in this thesis has been submitted in support of an application for another degree or qualification of this or any other University or Institution of learning.

Frederick Robert Lawson
November, 1980
SUMMARY

As a comprehensive study of the factors which influence planning and design this thesis examines the markets for conferences and trade exhibitions in relation to size, diversity, distribution and other characteristics which affect demand. The nature and extent of facilities provided for this purpose and their patterns of use are also analysed as a basis for planning future requirements.

Fundamental design criteria and the operational features of many of the facilities recently constructed in Europe, America and Asia are evaluated in order to establish technical standards for conference and exhibition facilities generally. Particular consideration is given to environmental requirements including the variations in standards which apply in different countries.

In light of the study findings, analyses are made of the feasibility of investment in conference facilities in hotels and in other centres.
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INTRODUCTION

Outside the United States conference operation on a large scale commercial basis is a relatively new but rapidly expanding segment of tourism. Whilst attracting widespread publicity and interest in facility investment this is a subject in which there are few reliable statistics and only a fragmented knowledge of the operating requirements which need to be taken into account in planning and designing new facilities.

Investment decisions are further complicated by the fact that, with few exceptions, conference facilities are not self-financing in themselves but must be judged in a broader economic context whether this in respect of a public or commercial investment. In either case, there is a need to consider features of design adaptation which will permit multifunction use.

To provide a comprehensive study of the factors which influence planning and design this thesis examines the markets for conferences, trade exhibitions and related functions, their size, diversity and other characteristics which affect demand. It analyses the nature and extent of facilities which have been provided and their patterns of use.

In view of the international distribution of conference markets and destinations the context of this study is international although national conference data and requirements, including regulatory standards, are analysed for the United States as well as for the United Kingdom and a number of other specific cases have been cited.

Fundamental design criteria are identified and compared against the operational features of most of the facilities recently constructed in Europe, America and Asia in order to establish broad standards for conference and exhibition facilities generally. Because of the need to provide high quality environmental control and information services, these aspects are examined in detail. Developments in equipment and their influences on design, including trends which are likely to have an impact on future conference requirements, are also discussed.

In light of the study findings, the economics of constructing and operating conference facilities are considered including the conditions under which such facilities can be profitable. Other benefits which justify investments in conference facilities are briefly taken into account together with alternative ways of financing projects.
The study is divided into two main sections:

**Part A** reviews the background to this subject and brings together the results of previous market surveys. It broadly reviews the types of premises used for conferences and the nature of accommodation and other services which conference delegates require.

**Part B** extends this knowledge using the results of field studies to evaluate conference demands in relation to specific types of facilities both for the purposes of planning and as a means of determining investment feasibility. This study is then developed into an analysis of the operational needs of conference and exhibition facilities and their interpretation in terms of design standards.
PART A

REVIEW OF EXISTING DATA
Chapter 1  INFLUENCES ON DEMAND

1.1  Background

In order to consider the various factors which have an influence on the planning of conference facilities it is necessary to extend beyond the physical and legal framework within which the role of the architect is normally circumscribed. Decisions on investments in facilities of this kind clearly need to take account of the market demands and the way these are affected by external circumstances. These, in turn, will dictate the type of facilities required and determine the extent to which such an investment can be self-financing.

However the business of conference organisation is not confined to one type of building designed specifically for this purpose: it extends to a whole range of different premises which may at other times be used for other more dominant purposes. Apart from conference centres as such, municipal and private halls, hotels, universities, condominium resorts and even cruise ships have a substantial conference trade\(^1\).

In deriving a 'design brief' for suitable facilities it is necessary to examine the nature and extent of this use, and the various features which, if not intentionally designed to accommodate conferences, can be effectively adapted to serve this requirement.

This difficulty in compiling a model specification for conference facilities is compounded by the variable nature of conference requirements themselves, which will change in scale and form from one meeting to the next as well as in time. To enable the architect to assess such changes it is important to examine patterns of existing use and trends in design, especially with regard to the applications of electronic equipment which are particularly significant in this subject.

Conference organisation involves the provision of a whole range of supporting services and accommodation for the participants. Whilst the availability of suitable meeting facilities is an overriding criterion in the choice of a conference venue, this is only one of a number of factors which will dictate the eventual selection. In an increasingly supply competitive situation the quality of supplementary accommodation is assuming increasing importance and leading to a radical reappraisal of the character of conference centres.

A study of design criteria for conference facilities must, therefore be broad ranging and multidisciplinary in approach: it must endeavour to
identify and quantify the market opportunities which exist and evaluate
the feasibility of designing specifically for this purpose as compared
with a multipurpose concept. In each of these subjects there are
considerable obstacles to research. "Conference tourism" itself is
merely a convenient colloquialism which is used to describe a variety
of different tourism forms covering business and non-business conferences
and gatherings on a local, national and international scale\(^{(2)}\). It is
interlinked with, and often interdependent on, exhibitions, trade
shows, fairs and incentive travel.

Markets for conference business are thus ill defined and largely
unquantified. It is this lack of information on demand which has led
to years of indecision by local authorities on the feasibility of
investments of this nature.

The economics of providing and operating conference facilities also
present difficulties for research. Few, if any, municipal projects of
this kind show a profitable return but are said to be justified by the
overall benefits they create by generating employment, sales and tax
revenues in the area\(^{(3)}\). In hotels, similar commercial considerations
apply, taking account of the guest expenditure in other departments.

As part of this study it is also necessary to examine the design
features introduced into recent projects and the trends which they
indicate as a reflection of the influence of new ideas and technology.

1.2 Need for meetings

The main drawing factor which generates a continuing demand for meetings
is the need for communication at a personalised level; the opportunity
for individuals, particularly in those activities which involve problem
solving and innovation, to exchange ideas and views. Electronic and
printed information cannot be a substitute for this personal contact.
The importance of a congress or convention lies not only in what is
said on the platform but the total atmosphere of the event and the
stimulation that is provided as a result\(^{(4)}\).

However, the enormous growth in congress and convention business
cannot be attributed to this motivating interest alone. Conventions
and incentive travel increasingly overlap;\(^{(5)}\) the staging of
conventions in exotic destinations is often deliberate, the attendance
being treated as a form of reward for the participants. This
particularly applies to corporate conventions, with international companies placing a strong emphasis on social events which attempt to create a global family atmosphere amongst employees normally separated by considerable distances and, often, cultural differences(6).

Similar considerations apply to international association meetings. Whilst Europe and America dominate in the choice of venue for practical reasons - because of their concentrated markets of membership, developed facilities and supporting interests - as well as their own attractions, there is an increasing tendency to stage some meetings in more remote centres, particularly in the third world countries in receipt of development aid and in those cities which are neutrally located between East and West(7). Adding to this trend is the considerable development of convention and accommodation facilities in exotic destinations like the Far East (Hong Kong, Singapore, the Phillipines) and their strong promotion in world markets(8)(9).

At national level the choice of location for most total association events, such as annual conventions, invariably reflects a balance of considerations. Factors such as accessibility for the majority of membership and the suitability of facilities are overriding requirements(10) but of considerable importance are the social and leisure attractions for delegates and their accompanying persons and often the need to stage exhibitions as an important part of the information programme(11).

1.3 Definitions

Whilst the meetings business is concerned with communications it is itself complicated by the lack of universally accepted vocabulary to define and qualify the different categories of meetings. This difficulty equally applies in describing the types of facilities provided for this purpose, which may include congress halls, conference centres, convention hotels, lecture theatres, meeting rooms and multi-purpose halls; depending on the particular emphasis of use.

Where surveys of meetings have been carried out, each has had to determine its own criterion of measurement.

The Union of International Associations, for example, providing
statistical details of meetings held by the organisations and associations which appear in the Yearbook of International Organisations, covers "the sittings of the principle organs, their regional sessions (grouping more than 3 countries), symposiums, study tours, congresses, etc." but excludes specified types of meetings (see Chapter 2.3)\(^{(12)}\).

In carrying out a study of the UK Conference Market in 1977 the British Tourist Authority defined a conference as a meeting held in hired premises, lasting a minimum of 6 hours, attended by at least 25 people and having a fixed agenda or programme\(^{(13)}\). An earlier survey of Scottish residential conferences was based on groups of at least 12 people meeting for more than social purposes\(^{(14)}\).

The threshold of numbers is critical in quantifying conference markets. As shown in later sections the vast majority of Company (corporate) meetings, as well as the committee meetings of associations and societies, are small in size but in aggregate form a significant proportion of total attendance figures.

1.3.1 Conferences

Definitions of 'congress', 'conference' and 'convention' have been drawn up by a number of representative bodies\(^{(15}(16)\) but the terminology used in conference organisation depends to a large extent on the country and international emphasis. The term 'congress' is preferred by many international associations because it carries a connotation of a serious working purpose which provides, in most countries, a semantic assurance of tax deductability of the costs incurred by the delegates\(^{(17)}\).

For the purposes of this thesis the word 'conference' has been used in its commonly accepted generic form to include all organised meetings. In terms of facility requirements, however, a distinction must be drawn between meetings of general assembly for the formal exchange of information and views and those requiring collective participation in reaching stated objectives or goals\(^{(18)}\). The former include the large meetings, congresses and conventions which necessitate an orderly formation of close seating in rows, with or without interspaced tables, whilst the latter are mainly smaller groups which more typically require face to face seating arrangements.
1.3.5 Other meetings

The difficulties of description mentioned above do not apply to other types of meetings and sub-groups. There is a broad agreement between English and American dictionaries and also with European interpretations of the terms 'seminar', 'workshop', 'symposium', 'forum', 'panel', 'lecture', 'institute' and 'colloquium'.

As implied in their definitions many of these are subsidiary meetings to larger conferences and congresses and, as such, require supplementary or separated rooms which have implications both in designing meeting facilities and for the economics of this investment; subjects which are considered in later sections of this thesis.

1.4 Growth

In hindsight, the growth of convention and congress business can be traced back to a number of factors. Some, like tourism in general, have arisen from an increasing affluence and propensity of travel, aided by the advances in technology in air transportation and handling capabilities. Others are due to more specific needs associated with the growth of international business and group interests.

An analysis of the former, with particular regard to tourism planning requirements, was undertaken in 1974 to 1977 as an initial part of this research programme(19). Reference should also be made to more specific studies of tourism marketing(20).

Amongst the more specific factors can be identified the growth of government and quasi-governmental organisations creating an increasing need for meetings within and between the public and private sectors and parallel developments in association interests, co-operatives, professions and pressure groups. At a commercial level there is a need to update information and methods through in-company management training(21).

On the supply side, the increasing market opportunities and apparent benefits from conference business have resulted in a dynamic acceleration in the services offered, particularly through the widespread establishment of convention/conference bureaux providing direct assistance for conference organisers. The construction of new bigger and more sophisticated conference and exhibition centres(22) together
with co-operative marketing, not only by tourism authorities but by consortia of hotels, universities (23) and other groups offering meeting facilities, has also played a significant part as has the involvement of airline carriers and other agencies in promoting conference and incentive tours (24)(25).

1.4.1 Benefits

In economic terms, international congresses and conventions offer many benefits to the host country when compared with other segments of tourism (26).

- per capita expenditure of congress delegates is higher than that of leisure tourists
- many periods of demand occur in the intermediary and low seasons outside the peak times for leisure tourism
- congress business is relatively stable: arrangements for accommodation and travel are fixed well in advance
- organisation is simplified, marketing is carried out through a relatively small number of intermediaries, who are in direct contact with their members
- transportation, accommodation and other services can be offered on a large scale basis with a high degree of standardisation
- secondary business may be generated through exhibitions, displays, visits, trade delegations. The host city and country has the opportunity to demonstrate its international standing in the subject
- congresses are generally indifferent to the lack of tourism attractions in a destination: other features and interests - social, technical, cultural etc. can be traded off
- no particular destination is normally compulsory: there is a relatively free field of competition
- facilities normally used for other purposes such as universities, municipal halls, theatres and concert halls, can also be used for meetings, generating additional revenue

For these reasons as well as for the benefits of tourism generally, convention business is highly competitive demanding a high degree of professionalism from tourist authorities and congress organisers (27).
The 'buyers' of congress facilities are increasingly selective in demanding the type of accommodation and service they require.

1.4.2 Elasticity of demand

As with discretionary expenditure on tourism the demand for congress and meeting facilities is affected by economic conditions generally as well as by individual purchasing decisions on the part of the organisation and participants. Some degree of substitution can be applied affecting, for example, the budgets allocated by companies for their annual conventions or the attendance at association meetings. Unlike leisure tourism, most decisions affecting international meetings have to be made 3 to 5 years in advance and must be largely based on the conditions prevailing at that time. To some extent the uncertainties of economic trends are tending to shorten this lead time but in the case of large congresses and trade shows it may need to be extended to ensure the additional facilities are available and reservations made.

Factors such as the relative costs of travel and of accommodation can have a bearing on choice and have tended to lead to incentive sales efforts and cost discounting particularly when large prestigious events are concerned. To attract off-season meetings and trade shows many cities and resorts will provide heavy discounts and free services, and this degree of competitiveness extends to airlines and hotel groups as well as amongst individual congress centres.

1.5 Scope of international competition

Many congresses and conventions are by their nature geographically limited in their choice of congress venue. In a 1975 survey nearly two out of every three international congresses were found to be 'tied' to their home areas by virtue of organisational or, in some cases, statutory restrictions.

Most of the decisions affecting the choice of venue for international associations stem from invitations made through their national branches or chapters. In some cases, particularly those associations with a medical, agricultural or political subject orientation, the rotation
of venues is done deliberately in order to provide opportunities for a wide membership to participate, for example, from the developing countries.

Information on the selection of venues for international corporate meetings is limited; these are invariably arranged directly by the company and there are no published lists of corporate meetings nor of the organisers involved. Some indication of the factors which influence choice are provided in studies of the American corporate market. For many meetings, such as those concerned with sales, market development or regional information, the location will necessarily be determined by company objectives.

1.5.1 Market geography

The geographical distribution of the market in terms of size and accessibility clearly exerts a considerable influence on the choice of congress destinations and even more when exhibitions and trade fairs are involved. An evaluation of time-distance and cost-distance catchment areas, the numbers of potential attendees and other visitors, revenue generation and organisational costs usually has to be made before the venue of a meeting is decided.

Sensitivity to the overall attendance cost, the time away from work, the tourism motivation and other criteria which determine venue choice tends to vary with different segments of the market. The US Travel Service study noted this market segmentation tended to follow lines of professional, occupational or avocational concern or interest with the decisive common denominators within each segment being the congress participant's disposable income, available time and overall lifestyle.

Geographic factors may in themselves contribute to marketing and promotion such as through the accessibility and convenience of travel, the tourist attractiveness of the location, links with related institutions, universities and research establishments in the area, the cultural background and interesting places to visit and opportunities for pre- or post-convention tours en route.

This last point is of particular importance in promoting destinations remote from the main originating markets in Europe and America. It has led to the development of airline 'convention packages' offering
route alternatives, of combined tour promotion, for example, by Australia and New Zealand, and of incentive tour-convention arrange-
ments such as in Japan, Singapore and Mexico (35).

1.5.2 Effects of taxation etc.

Taxation allowances have had a considerable influence on the growth of convention business. The fact that costs of attendance are tax deductible has provided an incentive to hold meetings in attractive places, particularly abroad. From an organisational viewpoint this has extended interest and improved attendance.

The sensitivity of convention and congress markets to taxation changes is most evident in those countries bordering the United States, as shown by the reported cancellation of 45 major conventions in Mexico in 1977 and of 110 conventions in Canada in the first six months of 1976 following the implementation of Section 602 of the Tax Reform Act by the United States Government (36). In broad terms the current legislation restricts tax deduction allowances to two foreign conventions a year, with tourist class air fare and total daily expenditure based on the same rates as those allowed for Government officials. Proof of attendance may be required (37).

Whilst it is debatable whether such restrictions have had any significant long term effects on the numbers of US conventions held abroad, strong counter arguments have been advanced to show the benefits gained from the exchange of information and ideas gained by attending meetings abroad (38). An important statistical indicator of the reducing effect of this legislation is given by a 1979 survey of meetings held outside the United States by associations represented by the American Society of Association Executives. Of the 1775 respondents, 13 percent had held a meeting outside the United States since 1976 and in 28 percent of these overseas meetings the attendance was higher than usual for the kind of meeting involved (39).

In other countries similar restrictions may be imposed as, for example, by the Israel Government introducing a tax charge on overseas visits. Visa requirements and other immigration or currency controls can also have a restrictive effect on the development of convention tourism.
1.6 Development of trade fair and exhibition facilities

Amongst several thousand of trade fairs held world-wide, some 500 have been identified as being of major international interest. These are located in some 200 cities, about two-thirds in Europe. Under the Code of Conduct adopted by the Association of Exhibition Organisers, the word 'international' may be included in the title of an exhibition only if it is intended to undertake considerable overseas visitor promotion or if foreign displays account for at least 10 percent of the stand space.

The trend in exhibition centres is not only to create sales, contact and market orientation but to exchange ideas and information between experts, exhibitors and visitors; the displays being integrated with conventions, conferences, seminars and symposia. In addition there is a clear trend towards more specific fairs with a distinct group of suppliers and a distinct target groups. These fairs though not very large are highly specialised, operated to a very high standard and increasingly international in emphasis. This demand for sophisticated but adaptable facilities has also led to the development of the permanent diversified mart, establishing regular patterns of fairs and exhibitions.

1.7 Resorts

Factors such as the climate, recreational facilities and the sightseeing, cultural and other extra curricular attractions rank highly in the selection of destination sites for American conventions, particularly where incentive trips are involved. Resorts like Atlanta, Miami Beach, New Orleans and San Francisco attract a high proportion of both association and company conventions. In 1979, California was the most popular state for major conventions attracting 10.8 percent of the total and Florida second with 6.4 percent.

Special problems face many of the traditional resorts in Europe no longer fashionable for holidays or spa treatments. In these, the hotels which are often outdated in style, lacking in facilities and faced with the economics of operating large lounges and ballrooms, have increasingly turned to conferences as an alternative market strategy.
Some resorts have invested in new conference centres in order to attract the large national and international meetings which generate new demands for accommodation and services. In other cases, the difficulties of reconciling costs and benefits has led to years of debate and indecision.

Amongst those completed or scheduled for completion by 1982 in the United Kingdom are six centres which in aggregate will provide a plenary seating capacity of 12650.

<table>
<thead>
<tr>
<th>Resort</th>
<th>Date Completed</th>
<th>Construction Cost</th>
<th>Capacity of main hall</th>
<th>Other Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brighton Centre</td>
<td>September 1977</td>
<td>£9.0 million</td>
<td>5,000</td>
<td>Concerts, Shows, exhibitions</td>
</tr>
<tr>
<td>Harrogate Conference Centre</td>
<td>Late 1980</td>
<td>£14.0 million</td>
<td>2,000</td>
<td>Concerts shows (separate exhibition hall)</td>
</tr>
<tr>
<td>Summerland Isle of Man</td>
<td>June 1978</td>
<td>£15.0 million</td>
<td>1,500</td>
<td>Leisure centre</td>
</tr>
<tr>
<td>Grand Hall, Scarborough (refurbishment)</td>
<td>1981</td>
<td>£2.0 million</td>
<td>2,150</td>
<td>Shows</td>
</tr>
<tr>
<td>Regis Centre, Bognor Regis</td>
<td>September 1977</td>
<td>£0.95 million</td>
<td>500</td>
<td>Leisure centre</td>
</tr>
<tr>
<td>Marina Centre Great Yarmouth</td>
<td>1982</td>
<td>£4.0 million</td>
<td>1,500</td>
<td>Leisure centre, Sports centre</td>
</tr>
</tbody>
</table>

Similar developments are noted elsewhere in Europe with new complexes recently completed in Monte-Carlo, Interlaken, Switzerland, Clermont-Ferrand, France, Torremolinos, Spain and Malta. The completion of the 2,500 seat Palais des Congrès et de la Musique in Nice is scheduled for completion by 1982 with the aim of extending off-season tourism to the Côte d'Azur, this also being the primary objective in most of the resorts mentioned.

In solving some of the problems of demand, conference centres tend to create new ones. In Brighton, for example, the shortage of high
international standard hotel accommodation required by conference
delegates has resulted in the participants being spread as far afield
as Gatwick airport and London. Apart from stimulating improvements
and extensions, the increasing demand generated plans for two new
hotels within two years of the Centre opening.

Whilst the congress demand is generally put forward as the main
economic justification for a resort congress centre, other benefits
are derived. As indicated above, none of the centres was planned for
congresses alone: all were multipurpose in function catering for a
variety of needs - meetings, public receptions, staged events,
sporting displays, musical or theatrical performances.

1.8 Promotion and organisation

The numerous organisations and bodies involved in this field, whether
operating on a commercial and non-commercial basis, can be grouped
into those concerned with 'buying' decisions for facilities and
services, those organising conferences, travel and other arrangements
and those involved in 'selling' and operating these facilities and
services. In each of these activities the individuals or companies
concerned tend to band together into associations and societies
representing their collective interests.

With over 6200 members generating conferences within and outside the US, the
American Society of Association Executives A.S.A.E., is an important
representative of the first group. (51)

Banding of conference organisers and product suppliers is primarily
for the exchange of marketing information. In America the largest
group, representing cities with official convention bureaux, is the
International Association of Convention and Visitor Bureaux (IACVB) (52).
Its European counterpart is the European Federation of Conference
Towns (EFCT) (53), and, within the United Kingdom, the British
Association of Conference Towns (BACT) (54).

Conference centres are collectively represented by the Association
Internationale des Palais de Congrès (AIPC) and other facility groups
such as the British Universities Accommodation Consortium (BUAC),
have their own representation in the marketing and promotion of
conference business.

Organisers of conferences form yet another group of associations, including the International Association of Professional Congress Organisers (IAPCO), the International Congress and Convention Association (ICCA) with 300 members and the American based Professional Convention Management Association (PCMA). The Association of Conference Executives (ACE) includes both 'buyers' and 'sellers' of conference products.

Hotels have their own associations both at national level and internationally through the International Hotel Association (IHA) and the management of hotels, convention centres, trade fairs and exposition centres their individual professional representation.

Collectively the eight main representative associations involved in buying, selling and managing convention facilities in the United States subscribe to a Convention Liaison Committee which publishes guidelines on organisational matters(55).

Much of the statistical background to this literature review is based on the surveys and reports produced by the authoritative sources for international data.
1.9 Discussions on Chapter 1

As witnessed by the rapid growth of commercial organisations offering services in this field and the increasing involvement of local authorities as well as national tourist organisations, conferences would appear to be a growing and profitable business. Yet this preliminary review produced few facts which would give substance to this optimism. It was even difficult to find common ground on which statistics and comparisons could be based, making it necessary to draw up definitions and parameters for this study.

Whilst the provision of conference facilities is a long-term commitment with a high proportion of fixed costs, the demand has been shown to be variable, being subject like tourism to economic and political influences. Although conference travel may be less sensitive to short-term changes than leisure tourism it could be argued that the delay in response, for example, to a reputation of falling standards and poor value\(^{(87)}\), is likely to be more prolonged.

Similarly, in assessing the prospects for conference development it is necessary to take account of the factors which influence the choice of conference destinations and venues. Whilst this has attracted a good deal of comment, very little factual research has been published on this subject. In defining the opportunities and constraints in planning for business tourism, the English Tourist Board was only able to comment that 'a high level of industrial and commercial activity will generate a local need for adequate conference and meeting facilities. However, in general, the conference trade in any particular area is not related directly to the level of business activity but is also likely to be influenced by the range of leisure resources in the area, the size of the conference venue and its ancillary facilities and the availability of good hotel accommodation.'\(^{(57)}\)

Much of the factual information about meetings was obtained from the United States\(^{(1)}\), including a survey by the United States Travel Service\(^{(7)}\) which would appear to be the only other comprehensive study of the international congress market.

Details of the domestic conference demand in the United Kingdom were found to be very limited and mainly based on assumptions. For instance, the British Home Tourism Survey\(^{(57)}\) put conference tourism at between
5 and 10 percent of the estimated business tourism - which would represent between 0.85 and 1.7 million conference trips per year. An earlier 'Conference on conferences'\(^{(58)}\) suggested a domestic demand of 2.05 million conference participants.

In order to study requirements for conference facilities it was evident that the size and structure of the conference market had first to be established in order to ascertain the adequacy or otherwise of existing facilities.
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Chapter 2  MARKET CHARACTERISTICS

2.1 Classification of market demand

Conferences and conventions are only part of a wide range of activities which involve participants or gathering together as a group to pursue a common interest. The conference may primarily have a social or work related purpose; it may overlap with attendance at an exhibition or trade show and with other forms of incentive travel. Meetings of an essentially political, religious or sportive nature are generally excluded from this classification as are the social and entertainment events which, at other times, may use the same facilities.

The difficulties of defining exactly what is to be measured, as discussed in the earlier sections, are thus compounded by the problems of determining the markets which are likely to use hired premises for meetings. Yet the feasibility of an investment in conference facilities can only be judged against projections of demand and appropriate facilities can only be provided with a knowledge of the potential users requirements.

Conference user markets can be broadly classified by the type of organisation involved, namely:

* International governmental organisations and their agencies
* International associations
* Federal, State, Regional and Local Authorities and quasi-non government organisations
* National, regional and local associations
* Corporate bodies, international, national and local companies

Each of these is considered in the following sections.

2.2 International governmental organisations

As an indication of the size and importance of this market about 16 percent of the personnel of the UN Secretariat are engaged exclusively in organising and servicing international conferences. The UN Department of Conference Services has an annual expenditure of some £34 million between 15 and 17 percent of the entire regular budget of the United Nations. On average some 3500 UN meetings each year are held in
New York and 5000 annually in Geneva\(^1\). These figures do not include the meetings arranged by specialist agencies such as UNESCO, FAO or ILO. Whilst these organisations generate a large and continuous demand for conference facilities it is apparent from a study of the conference lists that the vast majority of meetings are held in the city in which the headquarters or regional offices are situated, although specialist funding agencies such as UNDP, WHO and UNESCO also deliberately stage conferences in or near countries recipient of aid programmes.

2.3 **International associations**

These encompass some 80 group classifications of international trade associations, learned societies, scientific bodies and other organisations. Their meetings include international congresses, symposia and study tours. Regional sessions grouping three or more countries also fall within this category\(^2\).

Although this has been estimated as being only one percent of the total market for conferences the meetings of international associations are comparatively clearly defined and easily identified\(^3\). They are held in many countries, the venue usually being determined by the invitations of national branch members.

Summaries compiled by the Union of International Associations (UIA), based on the meetings reported by organisations and associations listed in the UIA Yearbook, indicate a total of 4345 international congresses were held in 1979 showing an average increase of 7 percent per year since 1975 but only marginally higher than the peak number of international congresses held in 1974\(^4\).

The UIA statistics exclude meetings or gatherings of an essentially religious, didactic, political, commercial or sportive nature. Also excluded are meetings which are either entirely national or of a strictly limited or specialised nature, the numerous regular sessions of committees or groups of experts and meetings on an intergovernmental level.

UIA figures provide a valuable pointer to the relative distribution of international association meetings and their trends.
2.3.1 Geographic distribution of meetings

Europe as the headquarters of two-thirds of international associations has long attracted most of the international congresses. However, since 1971, whilst increasing in absolute terms, the European share of the total progressively dropped from 70% to around 63% in 1976-78 increasing again to 66% in 1979.(4) Perhaps reflecting the shift in economic and political importance as well as the competitive costs of travel, the largest increase - from below 6% to over 11% - during this period was achieved in the Asian and Middle Eastern area, with countries like Israel, Japan, Malaysia, the Philippines, Singapore, India and Thailand becoming major destinations for international meetings.

Analysis of the UIA statistics provides a means of comparing the relative numbers of international meetings held in various destination countries. However, an examination of the lists of meetings held shows that many do not recur annually but at two, three, four or five year intervals. In its study of the international congress market the United States Travel Service based its calculations on the average of two years, 1973 and 1974, of the UIA figures.(5) A more accurate indication is provided by taking the moving average over a longer period and a list of the main destination countries and towns based on the period 1975-79 is given in appendix 1. From this it will be noted the United States is not only the main market for meetings and conventions but also the leading destination for international association meetings, attracting some 11.9 percent of the total. The American influence on conference development is clearly significant.

2.3.2 Total international association meetings

Many international meetings and associations are not reported or do not fall within the UIA listings. Under reporting was estimated in the United States Travel Service study to have reduced the 1973-4 regional figures by between 5 and 20 percent depending on the area.(5) Earlier studies by Professor Alkjaer estimated that the 2728 conference held in 1968 should be grossed up to a figure of 4,000 to allow for non-reported events.(6) A recent estimate by Gray-Porton put the total international
events as being between 6000 and 8000\(^{(3)}\).

In addition, many regional and national meetings which attract a large foreign participation are not classified in this category although the UIA provide a monitoring service for such events. Information provided by many European, Scandinavian and Asian convention bureaux indicates that meetings with a regional, as opposed to international, coverage are of considerable significance. Taking Helsinki as an example, in the three years from 1975 to 1977 there were 97 international and 57 Scandinavian congresses\(^{(7)}\) compared with a total of 104 congresses listed by the UIA for this period.

2.3.3 Size of international meetings

The great majority of meetings shown in the UIA analysis are small with attendances mainly in the range of 100 to 500 delegates. From the few press reports given, company meetings at international level rarely involve more than 200 people and the average is probably around 170.

Whilst the very large international conventions attract considerable publicity, the numbers of such meetings are few. For example, the analysis of meetings in 1978 by the Union of International Associations showed only 5 percent - about 185 meetings - had an attendance in excess of 3000, whereas 50.5 percent of the meetings reported attendances of 500 or less\(^{(4)}\).

The situation is somewhat different when trade shows and exhibitions are involved. These are generally aimed towards attracting larger numbers of delegates and visitors in order to justify their costs. In contrast with other meetings, some 10.8 percent of the exhibitions recorded by the UIA in 1978 had over 3000 attendees. A similar pattern of sizes was shown in the reports for previous years.

Sizes of meetings, as indicated, represent the total numbers of attendees. Whilst these are often quoted in press reports as international visitors, the totals normally include a large proportion of national participants. Neither the UIA nor most national organisations attempt to differentiate the overseas visitors. On the other hand, data may be obtained from other surveys of incoming tourists\(^{(8)}\).
In a few countries where this analysis has been made specific detailed information was obtained for further study.

2.3.4 Expenditure on international meetings

Analysis of participant expenditures have been carried out in a number of countries and there is a broad agreement in the percentage distributions obtained. In America the IACVB Surveys\(^{(9)}\), carried out in 1973 and 1978-9 were based on returns from 57 cities and distinguish international and national conventions from regional and state conventions. Details of association and exhibition expenditure are also provided. Other surveys have been carried out by the tourist offices of several cities in Europe including London from which the following summary of averages is prepared.

<table>
<thead>
<tr>
<th></th>
<th>European Cities (2)</th>
<th>US Cities (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation</td>
<td>44.8</td>
<td>39.0</td>
</tr>
<tr>
<td>Hospitality suites</td>
<td></td>
<td>4.5</td>
</tr>
<tr>
<td>Meals in hotels</td>
<td>7.7</td>
<td>10.7</td>
</tr>
<tr>
<td>Meals out</td>
<td>14.8</td>
<td>16.0</td>
</tr>
<tr>
<td>Accommodation and food (overall)</td>
<td>67.3</td>
<td>70.2</td>
</tr>
<tr>
<td>Entertainment</td>
<td>13.4</td>
<td>5.1</td>
</tr>
<tr>
<td>Shopping</td>
<td>14.6</td>
<td>9.8</td>
</tr>
<tr>
<td>Local transportation</td>
<td>-</td>
<td>4.7</td>
</tr>
<tr>
<td>Sightseeing tours</td>
<td>-</td>
<td>6.8</td>
</tr>
<tr>
<td>Admission fees</td>
<td>-</td>
<td>1.3</td>
</tr>
<tr>
<td>Others</td>
<td>0.1</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Sources: (1) IACVB Surveys 1978-9
(2) Median values of surveys in London and Dublin

The IACVB surveys also provide a valuable indication of the expenditures by Associations and exhibitors. Each association spent on average about £2524 on the hire of exhibit halls and meeting rooms in 1978 - about 9.6 percent of the association expenditure - and a further £1558 on equipment rentals. By calculation it would appear that the expenditure on hall and room hire is about 1.0 percent of the total incurred on conventions.
Somewhat higher figures are given by the Melbourne Convention Bureau which put the cost of room hire as 2.4 percent of overall convention expenditure \(^{(10)}\). It is perhaps pertinent to note that Melbourne is currently reviewing proposals to build a new convention centre. Comparative levels of expenditure by conference delegates as opposed to tourists in general are particularly significant in evaluating the cost benefits of investments in conference facilities. The IACVB income surveys put the average delegate expenditure at national and international meetings at £124.84 or £30.57 per day. Associations spent a further £11.65 per delegate on average and exhibitors a further £39.84 per exhibition. These figures were for 1978-9 and excluded the costs of travelling to the destination.

Considerably higher expenditure have been recorded in other destinations, for instance a survey of 20 congresses and conventions in London from April 1978 to March 1979 by MEW research showed the average expenditure of delegates and members of their family accompanying them from Europe to be £379, from North America, £333 and from other parts of the world £550. British delegates from out of town spent an average of £119 giving an overall average per delegate party of £307\(^{(11)}\).

In addition to the expenditure by delegates, congress organisers spent on average £60 per delegate per congress or convention.

Delegates stayed in London an average of 4 to 5 nights. Daily expenditure (including that by organisers) per delegate party from abroad was £88 and for UK delegates from out of town £62.

The London expenditures appear not to be representative of those for the UK as a whole. From the International Passenger Survey in 1978\(^{(8)}\) the expenditure per conference visit of 5.8 nights was estimated to be £225. This compares with an average for all visits of £198 for an average stay of 11.8 nights.

In addition to the expenditure by the participants it is important to have some indication of the numbers of accompanying persons in order to establish the type of accommodation and social facilities likely to be required.

According to the London survey the average number of people per delegate party was 1.62 with a range from 1.50 to 1.71 for the international visitors.
2.3.5 **Seasonality of meetings**

From the calendars of meetings published by ASLIB\(^{(12)}\), the British Tourist Authority\(^{(13)}\) and other agencies it is apparent that most meetings are held in the spring-early summer and autumn seasons of the year. However, compared with local and national meetings, a higher proportion of international meetings coincide with the peak vacation periods of July and August, enabling the delegates to combine a holiday with the working sessions in an overseas setting.

The pattern of the exhibition and trade show calendars also shows a drop in the summer vacation period but is more evenly distributed over the winter months\(^{(14)}\).

This variation in demand is particularly important in planning new centres. It emphasises the problem of ensuring that conference facilities will have a high occupancy continuously throughout the year. As a rule, the peaks of conference demand occur outside the peak holiday periods and this offers considerable benefits for those hotels which are situated in tourist and resort areas. In other cases, the hotel may generate seasonal markets by offering high standard recreational facilities and touring accommodation. The problem facing purpose built conference centres as a result of seasonal fluctuations in demand are similar and have usually been met by designing for adaptability to enable the premises to be also used for spectator sports or staged entertainment.

2.4 **International corporate meetings**

Estimates of the number of company meetings held abroad are even less precise. Most meetings of this kind have short lead times and are not reported to the official tourist offices. An average of 7.8 months is quoted by meeting planners as the time required to organise incentive travel for company meetings\(^{(15)}\) whereas large international association meetings may take 4 years or more.

Furthermore, corporate meetings, even at international level, are mainly small, regionally based and often combined with incentive travel movements.

The main source of this particular market segment is the United States.
Surveys of meeting planners in that country in 1979 indicated that some 22,600 incentive trips lasting an average of 5 days and having an average attendance of 174 were organised by US companies, this representing a total convention visitor market of 3.9 million. Compared with similar surveys in 1976-77, the total numbers involved had increased by 3.7 percent and the average group size by 10.1 percent\(^{(15)}\).

Earlier estimates by the United States Travel Service study put the annual total of corporate meetings originating from the United States at about 1600 of which 600 meetings per year were held in Mexico and Canada and about 1000 in Europe involving, in total, about 270,000 participants\(^{(5)}\). Much lower figures were suggested by another 1979 survey which, from calculations of expenditure gave a total of about 87,000 participants\(^{(16)}\).

Other major markets for company meetings abroad arise from the multinational corporations with their offices spread across Europe and abroad; from the extending industrial interests of Japan; and as a result of the intensive industrial and commercial developments in the Middle East, South East Asia and South America.

As emphasised by the wide discrepancies in the figures quoted, there are many difficulties in trying to quantify international corporate meetings. Apart from the practical problems of monitoring meetings, even if this could be arranged, there is no central source concerned with collecting such data. This lack of accurate information has tended to result in this market segment being omitted from studies of international convention statistics\(^{(17)}\).

### 2.5 National meetings

At national, state or local level meetings can also be classified as association or corporate events. It is not, however, meaningful to group averages together on an international basis since there are wide variations in practice from one country to another. To illustrate and quantify the markets for such meetings, the following details are taken from material published in the United States and United Kingdom - the latter representing the industrialised countries in Europe.
2.5.1 Association markets

Even though general economic growth has come to a halt with the continuing recession, technical and managerial expertise is still advancing rapidly. Each field of expertise has its professional or trade association and these are continuously increasing as subject areas split up into more tightly defined specialisms. Associations and societies are a significant market for meetings. Based on 1978 figures there were some 3500 associations in the United Kingdom \(^{18}\), and over eight times this number in the United States, the majority holding at least one meeting a year open to their total membership. In addition, most of the larger associations organised regional meetings as well as sub-section and special committee meetings. Scientific, professional and medical associations, in particular, were found to have held several seminars and special subject meetings during the course of the year.

Whilst the size of an Association or activities or interests does not necessarily give an indication of the number and size of meetings held, the great advantage is that they all have a secretary for information and details of meetings are usually published in advance\(^{19}\).

2.5.2 Corporate markets

Whilst it is the largest single market segment - calculated to be about 75% of all meetings and worth some 49% of the revenue generated - the corporate event is the most difficult to identify.

The executive responsible for venue selection and other decisions affecting his company's meetings often does this as a subordinate function to some other role. In the United States only 2 percent of the executives involved in meeting and exhibit planning were specifically designated as such\(^{20}\) and in 1977 it was estimated that 90% of all the meetings business in the UK was placed by part-time conference organisers\(^{21}\).

Changes have taken place in the structure of company meetings with emphasis on rationalisation and effective work purpose, reflecting the need to maximise benefits at a time when costs of travel and participants' time are escalating. At the other extreme, the need to provide
incentives and performance awards, perhaps also to engender company loyalty, has created a demand for company conventions which bring together work, social and leisure objectives in an attractive venue.

2.6 Association meetings in the United States

The total number of American associations recorded by SM/databank is in excess of 28,000. From surveys by the American Society of Association Executives in 1974 covering 234 associations, almost 80 percent reported they held an annual convention for their total membership and 15 percent held total membership meetings even more frequently. About 28 percent of these conventions lasted 3 days and 25 percent extended over 4 days with the trend over the previous four years towards shorter meetings of all kinds.

Statistical details of association meetings in 1979-80 have been provided by meeting planners subscribing to two of the leading magazines in this field. Allowing for differences in classification, they broadly agree the total number of association meetings of American based organisations is probably between 205000 and 214000 annually with an aggregate attendance of 30 to 35 million although other studies have given much lower figures for attendances. One survey in 1979 puts the number of international and national meetings at 9440 compared with 37820 state and regional meetings. In total these were said to have an attendance of 30.7 million, a mean average attendance of 394.

Educational seminars attracted a further 4.3 million participants.

The majority of meetings held by associations were small; of those reported to the American Society of Association Executives, over 60 percent had attendances of fewer than 300 and over 90 percent fewer than 1000 persons. Exhibitions, on the other hand, attracted much larger attendances: 50 percent had over 1000 persons and 12.5 percent over 5000 persons.

The major annual conventions for total membership attracted the largest attendances, in 1975 averaging over 1100 (without exhibits), almost 3800 (with exhibits) and 3000 for exhibitions alone.

From the various data collected, it would appear that there are approximately 8000 trade industrial and public shows annually in the United States of which about 5400 are associated with conventions.
More than half of the major conventions involved exhibits and displays, and in one in four of these conventions there were more than 100 exhibitors with over 1900 m² of exhibition space. On average, the number of exhibits at each event was 86, occupying a space of 1800 m².

2.6.1 Economic impact of association meetings

American association meetings can be divided into two main categories, namely, the major conventions which are mainly held as an annual event and are open to the total membership, and the other off-premises meetings which cover a wide range of activities such as Board meetings, Committee meetings, professional meetings and educational seminars.

Major conventions represent only about 7.2 percent of the total number of association meetings but account for over one third of the total attendance and almost one half of the total expenditure. As has been previously noted, they often include trade shows or exhibitions. The relative sizes and economic impacts of conventions and meetings has been indicated in surveys of meeting planners, said to cover some 70 percent of the total (15). In 1979, there were a reported 10,300 major conventions attended by 8.0m delegates spending £1602 million in addition to an association expenditure on major conventions of £120 million.

Total numbers of association meetings were reported to be 133200 representing a total expenditure of £3542 million. If the estimate of 70 percent is correct the United States association market had a value in excess of £5000 million in 1979.

These figures include the costs of travelling to the destination. Further details of the way the expenditure was incurred at the destination and provided in the IACVB surveys (9). From the latter figures it is calculated that the average expenditure by individual delegates on national and international conventions was some 40 percent higher than on state and regional conventions, a factor of some importance when reviewing the international data.

For many countries, particularly those bordering on the United States and within easy travelling distance, the American convention market is of major economic importance. The Hagen survey forming part of the ASAE study showed that over 55 percent of all American Associations had held
one or more meetings outside the US during the five years prior to 1975. 31 percent had held meetings in the Caribbean, 22 percent in Canada, 19 percent in Hawaii, over 17 percent in Europe and 17 percent in Mexico.

In a 1980 survey, 13 percent of a sample of 1775 American Associations confirmed they had held a meeting outside the United States since the previous study in 1976(24).

2.7 Corporate meetings in the United States

Off-premises meetings held by companies can be classified into eight distinct types each with fairly specific requirements. From the details provided by surveys in 1974, 1976 and 1978 by the "Meetings and Conventions" magazine(15)(24) the basic pattern of meetings has changed little over this period. With the exception of national sales meetings, new product introductions and incentive trips, all meetings had an average attendance of less than 100. The most numerous meetings, concerned with management, had an average attendance of 42 and training meetings, were for even smaller groups with an average group size of 29. Together these accounted for 51 percent of all the meetings held.

Overall, in average figures, there were estimated to be 140 meetings per company, each meeting with an attendance of 64 and a duration of 3 days.

Broadly, similar distributions of size were shown in surveys by the 'successful meetings'(16) magazine in 1979-80 although the average attendance at management meetings was put at a lower figure of 14.

Whilst the majority of corporate meetings are small in size the numbers of meetings involved are considerable. Allowing for sample size differences both surveys agreed that the total attendance in 1979 was about 50 million. The value of this segment of the meetings market can be shown by applying the expenditure survey results of the IACVB(9). Even taking the lowest estimates, it is calculated that American companies spent over £3450 million of meetings in 1979.

During 1979 there were an estimated 22,600 incentive travel movements by US based companies and the considerable impact of this market on international corporate meetings has been discussed in previous sections.
2.8 Conferences in the United Kingdom

Much of the basic data, on which many subsequent reports and calculations have been founded, originated from the 'Conference on Conferences' organised by the British Tourist Authority in 1972. Estimates of the numbers of conferences and participants and of the expenditure on meetings in 1972 gave the following totals:

<table>
<thead>
<tr>
<th></th>
<th>Domestic Association</th>
<th>Domestic Corporate</th>
<th>International All meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of meetings</td>
<td>12500</td>
<td>25000</td>
<td>650</td>
</tr>
<tr>
<td>Participants</td>
<td>1.8mn</td>
<td>1.25mn</td>
<td>0.3mn</td>
</tr>
<tr>
<td>Participant nights</td>
<td>5.4mn</td>
<td>3.75mn</td>
<td>2.1mn</td>
</tr>
<tr>
<td>Revenue</td>
<td>£45mn</td>
<td>£55mn</td>
<td>£30mn</td>
</tr>
</tbody>
</table>

Source: Conference on Conferences, BTA 1972

These figures were based on BTA research estimates from several sources and believed to be reasonably accurate if not precise. The international component was said to be calculated from the UK share of international association meetings reported by the Union of International Associations together with information derived from several sources including the National Economic Development Office, International Passenger Survey, airline studies and British Tourist Authority Surveys.

No information could be given on the attendance at trade shows and exhibitions although attention was drawn to the considerable growth in this category as evidenced by the development of exhibition facilities elsewhere in Europe.

Projections of the UK share of international conventions to 1980 suggested this was likely to increase from 650 to 1500 meetings with a corresponding increase in the number of participants from 0.3 million to 1.0 million.

A private survey carried out by P.A. Management Consultants estimated the UK conference market produced 40,000 conferences in 1972 with an anticipated growth to 52,000 conferences by 1977, equivalent to 4.5 percent per annum.
An earlier study by Young examining the determinants of demand for conferences in the UK by UK residents concluded that very little statistical information was available on this subject. Reference was made to two private studies by Horwath & Horwath (UK) Ltd. for the Economic Development Council for Hotels and Catering, 1967 and by Industrial Market Research Limited, also in 1967, which gave contradicting results. Young relied primarily on data from data on the American markets in order to derive his projected estimates to 1980 of 45250 domestic conferences having some 9.0 million delegates per annum\(^{(28)}\).

About this time several reports had been published, notably in the Times April 21, 1968 and July 7, 1971, the Spectator, November 22, 1970, Financial Times July 15, 1971, drawing attention to the growing need for improved conference facilities in London and culminating in a paper prepared by Alkjaer for the London Convention Bureau in 1972\(^{(29)}\) examining the background and growth of the international convention market.

The memorandum concluded that with suitable facilities London could attract, by 1980, between 31 and 67 of the very large International Association Conventions each having over 2000 delegates and lasting about 5 days. The median projection of 39.9 conventions would give a total of 19800 or more delegates per annum by 1980 not counting the conventions of smaller size.

2.8.1 U.K. conference market

A different approach was adopted in the British Tourist Authority survey of the U.K. conference Market in 1977\(^{(30)}\). In this case, information on the conferences held during the year was obtained from records kept by the suppliers of facilities. Some 92 hotels, 19 universities and 31 conference towns provided data for all or at least 11 months of this year and others for shorter periods. By combining these results with other information on the conference market the survey was able to deduce the number of conferences held that year in the UK was about 44,000 with a total delegate attendance of 5.0 million giving an average attendance per meeting of 115.

It was stressed that these figures could only be regarded as rough
estimates since there was no comprehensive listing of conference venues from which to select a properly representative sample for the survey.

This analysis provided an indication of the average numbers of conferences held in hotels, universities and municipal halls as well as average attendances and lengths of the various conferences involved.

<table>
<thead>
<tr>
<th>Conferences in</th>
<th>Hotels</th>
<th>Universities</th>
<th>Municipal Halls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average attendance</td>
<td>74.1</td>
<td>120.2</td>
<td>449.9</td>
</tr>
<tr>
<td>Average length</td>
<td>1.58 days</td>
<td>4.44 days</td>
<td>3.32 days</td>
</tr>
</tbody>
</table>

Source: The UK Conference Market.

An earlier survey of residential conferences in Scotland in 1975 showed that 69 percent were held in hotels and 31 percent in universities with average attendances of 46 and 70.6 respectively.

Many of the reports and articles produced subsequently used the BTA data as a base with added percentages per annum to show projections for the future. In two reports the numbers of corporate meetings were estimated to be about 15200 and those of association meetings 29000 in 1977 with projected increases of 4 percent (1978), 6 percent (1979) and 8 percent (1980) in each category giving a total of almost 52500 by 1980. These increases were derived from a general assessment of the expected growth of conference demand.

### 2.8.2 Conferences in major resort towns

Of the few comprehensive studies of conferences carried out since 1977, and the most informative, has been an examination of the conferences in nine resort towns carried out in 1977 and repeated in 1978.

From an aggregate of the individual results the total number of conferences in 1978 in the nine towns was estimated to be 4513 with an attendance of 59600 delegates giving a total delegate expenditure of £61.62 million. Some of the figures were estimates and, in other cases, the lack of a common base made precise comparison difficult. Allowing for rotational changes in national and international conferences the time scale was not sufficient to draw any firm conclusions as to trends, but from 1977 to 1978: the number of
conferences increased by 67 percent and the number of delegates attending conferences by 12 percent. In real terms the earnings from conference business were estimated to have increased by 20 percent.

Details of the expenditure incurred by conference organisers was provided by a survey Brighton Management Services Department. For small conferences organisers spent an average of £5 per delegate on items such as the hire of halls, official social functions and secretarial services but some large international conferences spent as much as £30 per delegate in 1978. Comparative figures for London taken from a MEW research study gave much higher expenditure on the organisation of international conferences held in the capital with a mean figure of £60 per delegate per conference (11).

2.8.3 Other surveys

More specific studies have been carried out in Edinburgh in 1978 (34) and in Northern Ireland (35) 1979, the former to examine the feasibility of private investment in conference facilities and the latter to determine the existing and prospective demand for conferences in the Province.

The Edinburgh study did not reveal any survey results but assumed a conference demand in year 1 of 36 residential conferences (average 550 delegates) 120 local conferences (average 50 delegates) and 200 local conferences (average 25 delegates).

In Northern Ireland the survey procedure involved dual studies, on the one hand of the actual and potential numbers of conference users, including visitors from the UK and abroad, and on the other hand a survey of the usage of existing facilities. 100 of the leading employers, the main social and professional associations, tourist and municipal authorities and the management of all hotels and conference halls were contacted. Some 40 percent of the employers and 85 percent of the others replied to the enquiries giving a fairly detailed profile of the conference and banqueting business in Northern Ireland. These results were clearly affected by the particular circumstances in the Province and cannot be regarded as representative. However, as a comparison a parallel study was made of some 20 selected hotels in other
parts of the United Kingdom which provided an indication both of the pattern of conference use and of the numbers of participants and revenues involved. Subsequent hotel surveys have extended this base and the results of this research are discussed in Chapter 5.
2.9 **Discussion on Chapter 2**

Information on conference markets is both fragmented and imprecise. Because of the publicity they generate, it is the large spectacular meetings which tend to be identified with the segment of tourism and this is often reflected in the planning brief. It must however be acknowledged that there are considerable obstacles to carrying out market studies in this field. Much of the data quoted in this and later chapters is not readily available. In most cases circulation of survey reports is restricted to contributing members of the association concerned. In others, feasibility studies involving an appraisal of the market demand have been carried out by consultants acting for individual public or private clients. Market information is commercially valuable to hotels and others in this competitive field and, has been found by most tourist authorities, it is difficult to secure co-operation in recording details of meetings.

However, within these restrictions there is clearly a need to examine the statistics which are or can be made available, to obtain more specific information for planning purposes. For example, analysis of the sizes of meetings, seasonal variations in demand and subject matter all have a bearing on the type of accommodation required and the cost effectiveness of this provision.

Other questions also arise from the information which has been quoted. If, for example, the 'UK conference market 1977' is taken as a fairly accurate survey of facility usage, the 3525 conferences recorded in a sample of 92 reporting hotels represents averages of 38.3 conferences per hotel, and 1.58 days duration - a total of 60.5 days utilization per year. In the same report, 40 reporting towns recorded a total of 505 conferences, averaging 12.6 conferences or 29.2 conference days per town per year.

Both of these figures must clearly be judged against the extent of accommodation supplied and the circumstances of each case but they suggest the conference market in itself is unlikely to finance the cost of new facilities.

Equally important are questions concerning the provision of exhibition facilities and the space and services required for this purpose.
Details of meetings and conventions in the United States, supplied in response to personal correspondence, are fairly complete. The total value of the American convention market from the users viewpoint is around £7045 million per year with between 30 and 35 million participating in company meetings. However, it is necessary to consider these figures in relation to the facilities provided and their geographical distribution, particularly in order to draw comparisons with the UK situation. As indicated by Young it is often assumed that the market data derived from the United States can be used as a basis for estimating the demand and future needs for conference facilities in the United Kingdom without examining differences in the characteristics of meetings.

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(4) Union of Internation Associations, "Some figures, 1971 to 1979" Brussels, Union International Associations, Annual reports, 1972 to 1980


(6) Alkjaer E, "Character and problems of congress tourism", in Tourisme de Congres, AIEST publication volume 10, Berne, 1970

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(8) International Passenger Survey 1978, Department of Trade, 1979


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(12) ASLIB, "Forthcoming international scientific and technical conferences", London, Association of Special Libraries and Information Bureaux, 1979 and 1980


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(15) Hosansky M, "The Meetings Market 1979-80", New York, Meetings and
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(16) Secretary, Successful Meetings, Extract from report "Corporate
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Association of Conference Executives, February, 1978

(22) ASAE, "Association meeting trends, 1976", Washington, American
Society of Association Executives, 1977

(23) Living, "The convening of America", Time Magazine, December 1978
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reports, American Society of Association Executives, June 1980

(25) BTA, "Conference on conferences", London, British Tourist Authority,
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(26) Middleton VCT, Special article No 11, "A profile of UK conference
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(27) PA Management Consultants, "Hotel conference market 1972", Private
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(28) Young G, "Accommodation services in Great Britain", M Phil thesis
University of Surrey 1969

(29) Alkjaer E, "Memorandum on the case for the Covent Garden
Conference Centre", Report to the London Convention Bureau, July 1972

Authority, 1978

(31) STB, "Residential conferences in Scotland, 1975", Edinburgh,
Scottish Tourist Board, 1976
Kenyatta Centre, Nairobi

Within this complex is a Plenary Hall of 2,400m² with seating for 4,000, a cone-shaped Amphitheatre, accommodating 700, and a multi-storey office tower. Conference facilities include a delegations lounge, restaurant, meeting rooms, a lecture theatre and a subsidiary room. All the main rooms are equipped with simultaneous interpretation, public address and sound recording systems.
Chapter 3  SUPPLY OF FACILITIES

3.1 Development of congress and convention centres

Public investment in purposely designed congress centres - also described as 'conference' centres in the UK and as 'convention' centres in America - has been one of the major features of recent tourism development.

From surveys of the international press over the last six years it would appear that many if not most of the major cities competing for the prestige as well as the economic benefits of hosting international and national meetings have announced proposals for modernising or constructing new conference facilities.

The first wave of congress centre building in the late 50's saw the completion, amongst others, of the Falkonercentret in Copenhagen; Aula Magna in Caracas; Palais des Congres in Brussels; Kongresshalle in Berlin; Palais des Congres in Liege; Sale Santitham in Bangkok; as well as the large congress halls of the United Nations buildings in Paris, New York and New Delhi. In 1966 the construction of the Kyoto International Conference Hall provided Japan with its largest purposely designed facility.


In the UK 7 major congress centres, other than individual hotels, were opened between 1975-1980 which, together, provided a total capacity for over 13,000 people. Other centres, due for completion 1980-82 will add a further 6,000 seats. Few of the halls built before this time were designed primarily for meetings; most are entertainment theatres, ballrooms or general purpose halls, patently ill-equipped for modern congress use.

3.1.1 General facilities

Most modern congress centres provide a range of accommodation for both large and small groups. Typically, the building would include one or two large auditoria seating from 1,000 to 3,000; two or three medium sized halls or lecture theatres with 200 to 500 seats and four to ten committee rooms seating 20 to 50. In some cases, the main hall may
be capable of being divided or extended - for example, by dividing off balconies or other sections.

For good acoustics and unobstructed sight lines the floors of the main auditoria are almost always raked or stepped in tiers. To provide greater flexibility in use, other halls may be separated by movable partitions although high standards of sound insulation and fire separation must be ensured. The majority of meetings are likely to be in the medium-size range and these will often overlap in programme requiring planned separation of circulation and facilities.

One of the main advantages of a congress centre is the speed of adaption to meet different requirements. In many cases only alterations to furniture layouts are involved since the rooms are permanently equipped with all the technical services likely to be required. For this purpose the standards of equipment and services must be high, both in extent and in performance quality. To allow such flexibility each room must have lighting and airconditioning control; most of the larger halls must be permanently equipped with sound amplification, film and slide projection and recording facilities; and simultaneous interpretation services must be provided to selected halls.

A feature of centres as opposed to congress halls, is the accommodation provided for meals and other requirements, all grouped together under the same roof. Banquet halls are generally adaptable in use but in most cases, separate restaurants and coffee-bars are also provided for the participants.

Frequently, exhibition galleries are provided to serve as an extension to the main exhibition floor, catering for smaller exhibits or separated to provide a general interest display area.

The entrance area to the centre is often the hub of its activities and the point at which delegates are received, registered and directed to their various halls. This area is also the one which creates the first and often most prominent impression and thus requires most careful planning and design.

Access to the centre is a primary consideration in selecting the site and involves questions of transportation policy which will often extend beyond the authority of the developer. Easy means of access - whether by private or public transport - for delegates, exhibitors
goods and services is an essential requirement and car parking will often take up a large part of the total area.

3.1.2 Hotel accommodation

Many of the new congress centres include hotel accommodation within the complex, such as in Hamburg and Monte Carlo, or immediately adjacent, with the advantage of combining many of the services and functions.

Overdependence on congress or exhibition centre as the primary source of business can, however, present difficulties for hotel operation, leading to pronounced peaking and wide fluctuations in demand. Most hotels in this situation endeavour to develop other balancing markets. In other cases, as in the Warwick Hotel, Birmingham, it may be more feasible to close down sections of the hotel at periods of low demand.

The provision of a congress centre will often lead to a shortage of accommodation in the locality for the delegates attending major congresses as experienced in Berlin (1). In other cases, Brighton for example, the existing traditional hotel stock has been found to be largely unsuitable for the higher standards expected by convention delegates.

On the other hand, the demand generated by a congress centre can be demonstrated to improve hotel occupancies and this is often put forward as an argument in support of municipal investment.

As an illustration it is estimated that visitors attending the Congress Centrum, Hamburg, account for 15 percent of the rooms demand for hotels in the city (2). The benefits claimed for resort development of congress facilities are even more considerable as explored in Chapter 1.

3.1.3 Profile of conference business

Whilst congress centres attract a high proportion of the international congresses, and in particular those of large international associations, the major part of their business is apparently concerned with smaller groups of 200-400. In Europe the major centres like Wembley, in 1978 had a market mix of some 70 percent corporate users, 30 percent
associations, with about 80 percent of the business coming from national sources, 15 percent intra-European, 5 percent international. Occupancies, only after two or three years of operation, generally rose to over 70 percent\(^{(3)}\). Both Wembley and Paris staged 10 or more congresses with more than 2,000 delegates during 1978\(^{(4)}\).

Most large congress centres incorporate a programme of shows, spectacles and entertainment to extend their use but experience indicates the proportion of meetings tends to increase as the centre becomes established, in the case of Wembley to a ratio of about 85 percent meetings : 15 percent entertainment.

The average duration of meetings, as opposed to trade shows, tends to be short. Most corporate meetings last one day, occasionally extended to one and a half or two days where syndicate discussions are involved. Association meetings generally are over two days and larger congresses three or four days. Based on analysis of events held in 1977 the average per meeting in Paris was 1.3 days.

3.2 Hotels: provision of meeting and function rooms

Investment in multipurpose meeting rooms in a hotel can be justified on several grounds. Firstly, meetings are often important sources of revenue, not only in creating a demand for meals, drinks, coffee and services included as part of the event, but from the resultant room sales. Furthermore, most meetings are held outside the peak holiday periods at times when the leisure tourism demand is comparatively low. Meetings, especially at the local market level, tend to be held on a regular basis representing repeat business.

The rooms used for meetings can be used for other functions - such as local banquets, private parties, receptions and dances - at other times, especially at weekends. Also, being adaptable, the rooms can serve both as a meeting area and as a banquet area for the same group and at a relatively small additional cost can be designed and equipped to cater for exhibitions, trade shows, product demonstrations and other needs.

The adaptability of the area is a clearly critical factor in providing for these alternative uses. In practice, the extent to which a particular hotel may develop its conference business will depend on its location and suitability for this purpose, particularly
in terms of standards. Operational limitations may also be imposed. Large groups of delegates tend to have a disruptive effect on the hotel services (bar, lounges, restaurants etc) for non-convention guests and the fact that the hotel is full as a result of conference booking may result in loss of valuable regular business. Where an hotel has an already high Monday to Thursday business occupancy, it may be necessary to limit the conference use, for example, to one third or, at times, one half of the total room occupancy\(^{(5)}\).

The optimum ratio of conference : business and other users will depend of management policy as well as on location but for most chain hotels 15 to 20 percent is generally regarded as the optimum balance.

Weekend demand, on the other hand, is often deliberately geared to encourage convention business, often with two thirds or more of hotel rooms available for the purpose. Similarly in 'low seasons' of the year tailored convention packages with special rates are often offered and backed by national or local sales campaigns.

All the major hotel groups have marketing and sales departments specifically for their conference and banquet functions. The local market potential for each hotel, depending mainly on its price, image and capacity, is invariably well defined and sales efforts tend to be directed towards specific industries and groups\(^{(6)}(7)\).

Conferences are seen as an increasingly vital part of hotel operation\(^{(8)}\), particularly at a time when the British hotel industry is experiencing a decline in domestic and foreign tourism as well as rising costs and other difficulties\(^{(9)}(10)\). This is also the conclusion of a detailed study of the hotel and catering industry in 1980 which concluded that the business and conference market could supply a badly needed restorative\(^{(11)}\).

The arguments which have been advanced do not necessarily apply to banqueting which, in 1978 was said to have declined over the previous five years\(^{(12)}\).

3.2.1 Meetings in UK hotels.
It would appear from the limited information available that most of the meetings in hotels are by companies, and the great majority - two thirds or more - do not extend beyond one day although overnight accommodation
A survey by the BTA in 1976 indicated that 59% of all meetings in UK hotels were classified as business or commercial, with sales incentive and trade associations each representing 8% of the total, and professional and social groups each 6% of the total. The market mix for hotel meetings was about 3:1.

Whilst 67% of the UK hotel meetings lasted one day, only 20% extended to two days, 8% to three days, and 2% to four or five days.

Corporate meetings in hotels tend to be small. Excluding the sales-force meetings, which often involve 100 to 200 participants at national level, and product launches which can be almost any scale of promotion but tend to be in the range 50-200, the vast majority of management and training meetings are for less than 50 people. Even most of these are for groups of 12 to 20.

Association meetings in hotels, on the other hand, are often much larger - 100 to 400 or more delegates - and generally extend two, three or four days. Compared with corporate events, associations are generally more location and cost conscious in choosing accommodation.

Company choice of hotel venues is often first on the basis of location relative to that of the company. Other factors, rated in order of importance, are the quality of food service, standards of meeting rooms, standards of bedrooms, efficiency of billing and checking facilities, personal service by management, availability of good AV and support services.

In particular cases, proximity to airport, and/or convenience of access for delegates from a wide travel area may be important. Many hotels located near major international airports, notably Heathrow and Chicago, have extensive convention facilities and in some instances this is the major segment of their business.

Exhibition and display requirements may also be a consideration including the space and weight handling capacity available in the hotel. Product launches and trade shows, for example, represent important sectors of the corporate business in hotels and attract considerable expenditure on promotion and publicity. In 1976 for instance, the four Centre Hotels in London have an estimated turnover of £0.5 million from their
exhibition business, and exhibitions at the Royal Lancaster Hotel accounted for 25 percent of its function business\(^{(17)}\).

### 3.2.2 American hotels

About 85 percent of corporate meetings and over 80 percent of association meetings in the United States are held in hotels. A survey by 'Meetings and Conventions' in 1976-7 showed that executives responsible for planning meetings had used a range of different types of hotels for this purpose during the previous year\(^{(18)}\).

Relative extent of use by planners\(^{(b)}\) for

<table>
<thead>
<tr>
<th>Type of facilities used</th>
<th>Corporate meetings</th>
<th>Major Association Conventions</th>
<th>Other Meetings of Associations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Mid-town hotel (a)</td>
<td>25</td>
<td>40</td>
<td>26</td>
</tr>
<tr>
<td>Suburban hotel (a)</td>
<td>23</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>Resort hotel</td>
<td>21</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>Airport hotel (a)</td>
<td>16</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Private conference centre</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>University conference centre</td>
<td>4</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Condominium resort</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cruise ship</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes:

(a) Including Motor Inns
(b) Reduced to 100 percent: Some planners used more than one type of premises

Source: M & C 'The Meetings Market', 1976/77

Average attendance figures for regular off-premises corporate and association meetings in the United States are somewhat higher than those in Europe, but generally range from below 50 for management and board meetings to between 100-200 for most others.

Major conventions of associations are, however, often very large, particularly on a national scale. Almost one half (46 percent) attract over 1,000 members and 19 percent have in excess of 2,000 delegates\(^{(19)}\).
These attendance figures are important in drawing comparisons between the design requirements for American and European conventions. A feature of the typical American convention hotel is the huge ballrooms which are provided for banquet and convention use and the large number of guest rooms required to accommodate such gatherings.

3.2.3 Variations
Patterns of hotel functions, including meetings, are generally well defined depending on the locality. The main months for hotel meetings in the UK are from October to March: with about 73 percent of all meetings falling within this period. In other parts of Europe and North America the winter period - December through to February - is mainly avoided by the larger Association meetings. The main vacation months, July and August, are limited to association meetings and those company conventions which are linked with incentive travel. Apart from using hotels in resort areas, many association meetings at this time are held in universities.

Almost all corporate and local or state association meetings are staged weekdays, the latter tending to start Thursday or Friday. On the other hand, the large national and international association meetings in America have most frequently registered on Sunday\(^{(19)}\).

The pattern for other events can also be defined fairly precisely. Local cocktail parties, dinner-dances, banquets, buffets, wedding parties and other functions are generally seasonal in emphasis and many occur at times between meetings, such as at weekends and during the festive periods.

To attract conventions, the facilities of the hotel have to be up to international standards, including a full range of services. As indicated in Chapter 1, the quality of food and accommodation are key factors affecting choice. Although a high percentage of room occupancy for meetings will be for single guests the multiple occupancy factor can be high when social functions are involved.

With such a high proportion of meetings in hotels lasting for only one day, the scope for attracting accompanying persons is somewhat limited, but the BTA survey indicated that, on the whole, hotel conferences attracted about 10 percent non-delegates.
The multiple occupancy factor is believed to be much higher for international meetings, particularly in resorts and venues involving extensive travel.

3.2.4 Standards of hotel
To meet the requirements of convention organisers, the grading classification of hotel is often critical. Space standards for convention hotels are, on balance, much larger than those in other hotels of the same grade\(^{(20)}\). A high proportion of this space is taken up by the meeting/function areas themselves but, in addition, more spacious lobbies, reception, circulation and service areas are needed to cope with the greater extent of simultaneous use.

As a rule, it is not practicable for an hotel reception desk to cope with 150-200 or more delegates all arriving at about the same time and arrangements must be made for pre-registration or for a separate registration area to be set up for the purpose - this can often provide information and other specific services for the delegates. For a larger convention more highly organised arrangements will be required.

Similar difficulties may arise in other areas - inadequate car parking, restaurant service, cloakrooms, etc - unless specific provision is made in planning these facilities. The most common complaint of inefficient and slow food service often stems from unsuitable cooking and counter equipment as much as from the staffing arrangements.

3.3 Universities: Scope for meetings
Markets for meetings held in universities tend to have a strong academic orientation and membership, with scientific and cultural subjects predominating. Universities have the advantage of being provided with specialised facilities, adequate if not sophisticated accommodation which, for many delegates, is compensated by low costs and the availability of other sport and social facilities.

Meetings in universities are, in the main, limited to vacations and do not normally clash with the marketing of hotels. Attendance at university meetings is on average greater and for longer periods than those in hotels. For example, in Britain, university conferences or congresses were found to last an average four and a half days and
have an average attendance of over 120 delegates\(^{(13)}\).

The value of congresses and conferences to universities is rated highly; financially it goes some way to subsidizing student accommodation and social facilities, whilst in academic prestige and interest it helps to build links between research and industry.

Co-operative marketing of British Universities as conference venues is carried out through the British Universities Accommodation Consortium (BUAC). Almost all the universities also have a conference planning officer responsible for taking enquiries and reservations, planning, scheduling and co-ordinating meetings, providing the necessary equipment and services and accounting/budgeting the costs and charges.

Based on returns from 72 percent of the members of BUAC British universities, in total, were estimated to have let 1.920 million bednights of accommodation in the summer vacation 1978 earning some £12 million. This was a total figure covering conferences and courses but also including the renting of holiday and other accommodation\(^{(21)}\).

As an example of the scale of operation, Kent University, England, which has 900 study bedrooms available, hosts about 170 congresses and conferences each year, attracting over 15,000 delegates\(^{(22)}\).

3.3.1 Facilities

University accommodation in lecture theatres, classrooms and seminar or tutorial rooms is generally designed to expenditure limits and fixed space and facility standards or norms laid down by the capital funding authority: in the UK, for instance, by the University Grants Committee\(^{(23)}\), or, for other institutions, the Department of Education and Science. Similar guidelines are provided in the United States by the Department of Health, Education and Welfare. The criteria for planning and design are well documented and reference can be made to a number of authoritative sources on this subject\(^{(24)}\)\(^{(25)}\)\(^{(26)}\)\(^{(27)}\). The details given in this section are interpretative considering in particular any variations from the standard norms which may be desirable for conference use.

Non-specialist teaching areas, including associated storage are typically based on 1.85m\(^2\) for informal seating and tutorial rooms, 2.3m\(^2\) for rooms with tables or desks and 1.0m\(^2\) for lecture theatres and lecture rooms.
Projection room allows space for cine and slide dual projection, storage and editing.

Lecture Theatre
Plan and section illustrating the optimum layout for a lecture theatre seating 100, with projection facilities.
with close seating. For practical purposes, these design standards normally assume concentrated use and the minimum dimensions consistent with safe egress. When university or institution accommodation is used for meetings difficulties may arise from inadequate space, uncomfortable conditions, spartan surroundings and limited environmental control, particularly when smoking is allowed.

To some extent, this can be overcome in seminar rooms and halls by reducing the occupancy and substituting different furniture. In other cases, particularly where there are regular series of visitor seminars or conferences, certain rooms may be designed and equipped with more sophisticated furniture and engineering services.

Flexibility is less easily obtained in lecture theatres although a choice of different sizes of theatre may be provided, particularly in the 150 - 250 - 350 seat range.

3.3.2 Seminar and syndicate rooms

For conference use, rooms will usually be required for groups of 8 to 20 participants.

Compared with university and college student requirements this usually involves more space-about 2.5m²/participant - and a higher sophistication of furniture and furnishings. Further, to allow this flexibility, additional furniture and equipment storage space equal to about 25 percent of the room area is likely to be required.

For seminar rooms, daylight is essential but windows must be fitted with both glare and black-out blinds. A daylight factor of 2 percent and artificial illumination level of 300 lux provided for student use is equally suitable for conference and seminar purposes. Preferably, seminar rooms should be fully airconditioned to allow for smoking with variable controlled air flow rates to give 18 litre/s per person (28), about 8-10 air changes per hour. With natural ventilation at least 2 air changes/hour should be provided together with openable windows to allow freshening up between use. The incoming air should be tempered over a heating or cooling coil - bearing in mind the main uses will be during the winter or summer vacation periods with extremes of temperature variation.

Low equipment noise levels and high insulation standards in the
partitions, ceilings and doors to the rooms are important to minimise annoyance and encourage confidentiality and concentration.

3.3.3 Lecture halls
Larger groups of up to 80 or more may be accommodated in halls having flat floors allowing the alternatives of chairs grouped closely in rows or less formally arranged with individual or linked tables. Portable platforms may be used to improve sight lines and hearing conditions.

Recommended reverberation times for conference use are 1.0 to 1.5 seconds with the room empty. Extensive wiring facilities must be provided for sound amplification from numerous pick-up points, for remote operation of projection equipment with separate standard voltage and signal strength connections, for television filming and monitoring facilities and for alternative use for exhibitions. Furniture storage must be at least 20 per cent of the hall area and a separate service lobby (minimum 12m²) is required for food functions.

3.3.4 Lecture theatres
Lecture theatre design is determined by the need to satisfy a number of sets of functional criteria, covering aspects such as the viewing and acoustic conditions, means of ingress and egress, seating and note taking facilities and environmental standards.

To ensure unobstructed sightlines and direct sound to each seat, the floor must be raked. The stepped tiers may form a theoretical parabola but often this is reduced to a straight rake with equal tiers from one row to the next, although the latter gives less satisfactory viewing conditions from the rear and tends to increase the overall height of the auditorium.

Steepness of rake is determined by several factors including the height and distance of the speaker relative to the first row, the rise from row to row, the need to have a clear view of bench demonstrations and the proportions of steps between rows. For conference use a wide deep platform is essential to allow for panels of speakers and the chairing of meetings, for large displays and background material and for the televising of events. A minimum rise of 130mm is preferable,
giving an approximate setting line of 7\(^\circ\), which may avoid the use of steps, and providing for an informal and social atmosphere\(^{(30)}\).

Seating plans may be rectangular, with splayed sides or a wider fan-shape, the plan dimensions being determined by the limits to screen viewing angles and distances\(^{(31)}\). The seat layouts may be traditional with intermediary aisles to limit the number of seats to 7 or 14 per row as determined by legal standards or in permitted continental arrangements with the rows extending continuously across the auditorium to side aisles, usually in a curved format.

For congress use of auditoria upholstered self-lifting or tip-up seats are preferred and these may be fitted with retractable arm tablets to allow the option of note taking. Alternatively, writing shelves either fixed or pivoted to slide vertically down may be secured to the seat backs. In any event, it is essential for the moving action to be simple, quiet, and free from hazard - particularly for conference users unfamiliar with the equipment. The dimensions allowed per seat should also be more generous than the minima acceptable for student use.

For good visibility the maximum number of rows is usually 12 but this may be increased to 14 or even 18 using parabolic sections. The limiting distance without speech reinforcement is about 20 m.

To ensure good viewing conditions lecture theatre capacities without balconies, are normally limited to a maximum of between 400 - 500 but the largest auditoria can accommodate up to 1200, making them comparable in size to the purpose-built conference centres.

Measurements of a large number of lecture theatre plans indicate that the net areas per place within the seating area reduce with size from about 1.05 m\(^2\)/place (for up to 100 seats), 0.95 m\(^2\)/place (200 seats) to 0.85 m\(^2\)/place (350 seats). The seating area usually represents about 50 percent of the total floor area of the lecture theatre.

Typical volumetric ratios are 3.2 to 4.2 m\(^3\)/place, depending on the floor and ceiling slopes, but may be as high as 6.0 m\(^3\)/place in large auditoria used for multiple functions.
3.3.5 Engineering services
Apart from acoustics volumetric ratios affect the cost of lighting and air conditioning. Lecture theatres normally occupy the deep interior areas of the building enabling the perimeter to be used for ancillary work rooms, seminar rooms, concourses, promenades, coffee bars, etc. High standards of engineering services are particularly important in providing the range of conditions suitable for multipurpose use. Current trends are towards the use of preset self-regulating controls. For example, where tungsten downlighters are used over the auditorium each run may be balanced and locked on independent motorized dimmers to give an even level of illuminations over the whole area which can be held at an intensity from 0 - 150 lux\(^{(32)}\). Fluorescent luminaires with isolating controls may also be installed: where possible activating dimming relays to incandescent lighting in order to provide a gradual transition to lower or higher intensities.

Separate lighting circuits are invariably provided for the platform and teaching wall area - usually by means of screened tungsten halogen fittings mounted on lighting track in the ceiling immediately in front of the platform. The installation and maintenance of emergency lighting, both in the auditorium and its associated areas, are governed by legal requirements.

Ventilation requirements depend on the size and standards of the lecture theatre and summer climatic conditions in the area. In the UK and Northern Europe generally, mechanical ventilation with winter heating and humidification is most common. Each lecture theatre should have its own plant with individual supply and extract systems, and be situated in the main plantroom in order to give flexibility and economy in use.

Based on the CIBS standards\(^{(33)}\) typical rates of clean fresh air supply are:

<table>
<thead>
<tr>
<th>Condition</th>
<th>per place</th>
<th>air changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>14-15 litres/sec</td>
<td>about 12 air changes/hr.</td>
</tr>
<tr>
<td>Winter</td>
<td>9-10 litres/sec</td>
<td>about 8 air changes/hr.</td>
</tr>
</tbody>
</table>

Automatic time controls and thermostat and humidistat regulation, the latter to maintain relative humidity in winter to at least 30 percent, are essential, with overriding stop-start control in the attendant's central controller.
For air conditioning, recommended fresh air flow requirements are usually in the order 4-5 litres/sec. per place with an overall flow rate of 10-15 litres/sec per place assuming smoking is not allowed. In designing for air-conditioning, diffusers are usually provided in the ceiling preferably with extracts through the floor and in the vicinity of the teaching platform although crossflow arrangements are also used. The plant should be attenuated to ensure a noise level not greater than NR 25, appropriate for conference auditoria.

3.3.6 Design features
The need for practical economy to meet cost limits will usually restrict the choice of interior finishes. In universities painted plaster, blockwork or fair faced concrete is often used for the splayed walls together with sound absorbent panelling or applied linings on the rear walls facing the lecturer. Floors, including steps, should normally be carpeted to reduce noise. Under carpet cabling buried into the floor slab flush with the surface should be provided for microphone extensions and simultaneous interpretation systems as well as for relays to the projection booth.

Suspended ceilings of plaster on metal lath or panels are usually specified to enable ventilation ducting and luminaires to be housed in the ceiling void, although these also may be left exposed and treated as a feature of design. In small lecture theatres a horizontal ceiling is common but large auditoria may be designed with stepped or curved faceted ceiling profiles to reduce volume and also improve sound distribution.

Student, or delegate, entrances must be provided both at the rear and front to minimise disturbance and, for continental seating, intermediary exits/entrances will be required to provide suitable means of escape in the event of fire.

A separate projection room is essential and is invariably located at the rear of the lecture theatre although back projection has been used in some cases. The projection room must have a direct entrance for equipment and be sound insulated from the lecture theatre. Conferences may require highly sophisticated displays such as multi visual presentations of slides and provision must also be made for cine film projection.
For this purpose the minimum size of projection room is said to be 3.9 x 4.0m \(^\text{(35)}\).

Teaching walls may be permanently installed as in a lecture theatre or brought into position as required, for example by lowering the screen from the ceiling or stage or by folding back wall screens.

A teaching wall is usually divided into two distinct horizontal zones with a writing surface, extending from 900 mm to 2000 mm high and a large projection screen immediately above, the latter covering the entire width and height to allow flexibility in projecting single, dual or triple images from different sources. The screen should be matt white reflecting light uniformly over a wide reflection angle. It is usually mounted on a motorized tilt mechanism to suit both slide and overhead projector.

In formal sessions, conference speakers tend not to use chalk boards but there may be a need to support backcloths and displays. All controls for lighting, screens and communication services must essentially be simple in operation and self-regulating in performance.

The range and type of equipment is changing rapidly with the development of closed circuit television filming, recording and projection as well as improvements in the performances of projection equipment generally. To enable a lecture theatre to accommodate such changes without structural alterations it is essential for ductwork and conduits to be provided for any future wiring service requirements even though these may not be more than 50 percent used in the initial stage. In addition, space must be allocated for operational control and equipment storage and to allow for future development of television studio work, particularly if lecture theatre is to be used for major conferences. The developments in equipment are examined in later chapters.

3.4 Specialised facilities: Executive conference centres

The increasing demand for purpose built conference centres in the United States and Europe can be identified with a wide range of emerging needs for management development courses at all levels including mid and upper-management; for retraining and familiarisation with new techniques and company products; for information sessions to
Monte Carlo Congress Auditorium

Restrictions on height required the ceiling to be left open. In other respects this layout is typical of multipurpose conference auditoria.

Scanticon Centre

Established by a consortium of associations and societies in Denmark to provide facilities for management training courses, the Scanticon Centre has 14 well equipped conference units, a television studio, secretariat, hotel accommodation for 110, with a gymnasium, swimming pool and other recreational facilities.
cover prolific changes in legislation; and for revitalisation of interest and involvement (36).

Changes in attitude and objectives are also having a major influence on the design of conference centres. Those built in the late 60's were generally planned to offer seclusion, minimum distractions, the best possible audio-visual aid and meeting facilities and considerable staff expertise in handling learning groups. Programmes were invariably run with tight schedules, hard working groups and individual assignments, leaving little time for relaxation.

Conference centres designed in the mid 70's tend to show an alternative approach: the emphasis is invariably on sport, fitness and recreation. Many of the latest centres particularly those in America, have championship golf courses, tennis and squash courts, indoor and outdoor swimming pools, jogging trails and complete health clubs. They are intended to provide an environment in which delegates can both work and play hard to refresh alertness and stimulation. The growing concern with exercises and health, coupled with medical insurance requirements has led to many similar developments in Europe.

Most of the present conference centres provide numerous meeting rooms, usually 20 or more, for small to medium sized groups of 30-50 but with some linked rooms for 100-300, together with banquet facilities and some 200 to 250 guest rooms in an associated hotel. The buildings often cover an extensive campus with landscaped grounds for seclusion and recreation. Standards of facilities are high with the latest teaching aids, and executive style furniture informally arranged (typically U formation).

Training arrangements and programmes vary with requirements: large companies having continuous training commitments may operate their own centres or lease accommodation and offices on a long-term basis (typically 3 years). Others may book facilities on a regular or ad-hoc basis with their own lecturers or as a full training package. Most programmes are 3 to 5 day but longer periods may be required for scientific and technological coverage (37).

Planned conference centres are available on a design-build-own-operate basis, for example, Scanticon International responsible for the conference centre at Aarhus, Denmark are also involved in the provision of a $15 million conference centre-hotel facility for Princetown University (38).
3.4.1 Other premises

Many meetings fall outside the general coverage of statistics; they may, for instance, be held within the premises of the organisation concerned or in some other centre used specifically for this purpose. Meetings of trades' unions, government departments, and some trade associations largely fall into this category. In addition many of the larger companies provide their own committee rooms and board-rooms for management and training requirements.

Amongst the trends associated with the growth of trades' union power and organisation has been the establishment of trade union colleges as centres for training and conferences. The latest of ten such colleges was opened in the UK in 1978, converted from a large country house to provide guest bedrooms, restaurant, banqueting halls, teaching rooms and a congress hall for 500.

Direct government investment in congress facilities can be illustrated by the development of a £15 million international congress centre in Westminster, London. The new centre will be used for large government and inter-government congresses requiring special features for access, layout and security which make ordinary facilities unsuitable. Plans for the centre show a theatre type auditorium for 500 to 1000 according to the configuration of seating with a gallery for an extra 200. There will also be five conference rooms of various sizes - all with full interpretation facilities.\(^{(39)}\)

Trade centres also provide a comprehensive base for the multiple activities involved in developing international commerce and trade. In addition to a range of smaller meeting rooms and executive offices or suites for the use of individual companies, centres usually provide larger conference rooms, lecture and film theatres and display facilities for commercial shows and exhibitions.

3.4.2 Private accommodation

Off-premises company meetings are invariably held in hotels, usually combined with a private luncheon or banquet. Overnight stays are involved for about 50 percent of the participants. The need for regular meetings, often also requiring contact with other staff and back-up information, has led to most companies providing their own
conference and board-rooms. In many cases, multiuse training/display facilities are also provided.

In providing company conference rooms a number of additional benefits may be gained: from a public relations view point this is often the better way of promoting interest in the company and its products or services; necessary improvements in the standard of catering leads to better services for management and staff generally; and there is often a greater involvement of other staff without the same degree of time commitment. Against these are the costs, and, often, low utilisation of the space and the need for a company to travel to the 'market place' for effective representation. Often a compromise is reached by holding some meetings on the premises but many others elsewhere.

Accommodation is also a major consideration with escalating prices for hotel rooms adding greatly to the overall costs of holding city-centre meetings. The trend is, therefore, towards more company investment in apartments, condominiums and private accommodation in the places where meetings are regularly held. Often this is in the form of hospitality suites combining both residential and meeting facilities.

3.4.3 **Cruise ships**

A relatively small number of congresses hire cruise ships as the venue for their meetings. Cruise conventions offer several advantages as a concept but are handicapped by restrictions in space and cost-competitiveness. The estimated cost of a 20- to 30,000 ton cruise ship was around a minimum of £46 million at 1979 prices (40).
3.5 Discussion of Chapter 3

Much of the information on conference facilities is necessarily factual and, where appropriate, standards have been defined rather than debated. In this study emphasis has been given to the more specific needs of conference users, particularly in considering the ways in which hotels, universities and other premises could be designed or modified in design, to cater for these needs. Universities in particular, have been expanding their conference business and the pattern of development in the United States and Scandinavia suggests this may lead to the establishment of purposely designed conference centres linked with university facilities.\(^{(41)}\)

Already, the United Kingdom institutions like Cranfield\(^{(42)}\) have a major interest in postgraduate courses and management development programmes.

Whilst press reports indicated the numbers of new hotels, conference centres and other facilities which had been built, few details were published of the size, construction and technical services provided or about the costs and methods of financing projects. Surveys of proposed major conference centres have been carried out by the English Tourist Board\(^{(43)}\) but these only indicated the range of planning approvals. According to the study of 'Hotel prospects to 1980'\(^{(44)}\) there were a total of 33700 hotels in Great Britain during the peak season of 1974. The aggregate number of bedrooms was estimated at 497000 but 62 percent of the hotels were very small with only 4 to 6 bedrooms. Although the hotels offering conference facilities are not distinguished it is probable that these are mainly represented by the 3 percent of the total with 51 or more bedrooms, in absolute terms, about 1011 hotels.

This lack of precise data on the facilities available for conferences have previously presented one of the main difficulties in estimating the overall scale of conference business; a deficiency to which attention was drawn in the study of UK conference market in 1976\(^{(45)}\). It was important, as part of this research, to quantify the conference facilities provided in hotels and other premises and to measure their performances by comparing the extent and nature of their use.
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4.1 Planning Meetings

Planning programmes for major meetings usually encompass three ranges of activity - long, medium and short range planning. Due to the long time scales involved these programmes will often overlap. For the long term, which is usually 4 to 6 years ahead in the case of large association meetings, a typical procedure would involve the consideration of alternative sites, preliminary notification of the cities involved and subsequently, the preparation of detailed requirements. Before reservations are confirmed the hotels and other facilities are inspected by representatives and improvements may be stipulated. This is often a time of strong competition between alternative destinations, particularly for the large prestigious meetings, and the capacity and quality of facilities will clearly be a determining factor. For instance, it has been said there are few halls which can accommodate the very largest conventions and these tend to be reserved for years ahead.

In the interim period the information is continuously updated and medium term planning usually takes place in the period from 12 to 3 months before the meeting during which time programmes, schedules, exhibition arrangements, local tours and services and budgets are finalised. The short-term period of some 3 months is concerned with planning room layouts, equipment and day to day requirements for the delegates and staff organisation. At each stage there is often a heavy reliance on the assistance of local convention bureaux. According to Hosansky, these arrangements are concentrated into 4 to 6 months for most company meetings which are invariably smaller and tend to use the same company and, often, the same venue for their local meetings.

The time scale involved in planning meetings creates a number of difficulties for new facility development. In the first place, information about markets and trends is delayed as are the effects of increasing competition. Secondly, the equally long time scale involved in planning and constructing a new conference centre or hotel necessitates the introduction of a marketing and sales effort to create advance bookings long before the premises are completed. The feasibility of such a project is even more difficult to assess with, on the one hand, increasing building costs and, on the other, changing price inflation and currency values.
Formal contracts must be drawn up between the company or association arranging the meeting and the management of hotels, congress halls and other facilities and services which are to be furnished. This is usually in the form of a letter setting out, or confirming, arrangements for the terms and conditions of engagement together with a written reply of acceptance. In preliminary negotiations many of the bookings are provisional and the right to make changes (subject to limitations and conditions) is usually stipulated in the initial agreement. This also applies to exhibition needs which will require entry in advance of the event and possibly require special facilities including advance storage and security.

In the United States, guidelines for contracts and agreements have been drawn up between representatives of the users, namely the Society of Association Executives, and the various suppliers of facilities such as the Hotel Sales Management Association.

Amongst the matters which will usually be specified in such agreements are estimates of accommodation requirements, schedules of the meeting rooms and their uses, the services to be provided, food and beverage functions and the rates and conditions which apply. Questions of guarantees, changes and penalties will also be clarified.

Conferences and similar events are generally inflexible in time and location once agreements have been drawn up and any delay in building or modernisation programmes may give rise to contractual liabilities.

However, other operational difficulties can also arise. Kallas, reporting details of an extensive survey in the United States in 1972, quoted 41.9 per cent of conference organisers found that hotels did not hold aside the number of rooms agreed upon due either to previous conferences overstaying or to sudden influxes of business. More than 67 per cent of hotels admitted double booking.

### 4.2 Accommodation for delegates: hotel standards

There are considerable advantages in housing conference activities, inclusive of food services and hotel accommodation for the delegates, under the one establishment. This leads to better cohesion between delegates, control over their location as well as savings in time and
costs. An inclusive arrangement can also facilitate the dual use of space, for example for social functions and exhibits.

Where delegates and accompanying persons have to be accommodated elsewhere the arrangements are more complex involving a choice of hotel location and price and the organisation of local transportation and meal arrangements.

For the information of conference organisers and delegates the different categories of hotels must be indicated. Hotel classifications generally fall into five grades denoted by number or stars. Five star hotels, also described as 'de luxe', and, particularly, the four star category of 'high class' hotels are often designed as convention hotels offering extensive conference facilities together with high standard guest accommodation(7). All guestrooms have private bathrooms and in this class of hotel there is essentially a choice of restaurants. From surveys of their hotel specifications it is apparent that most of the international hotel chains require standards consistent with a five or four star hotel category as an essential marketing strategy to project an image identified with quality.

Three star hotels are usually large, providing broadly similar guest accommodation but at a lower level of sophistication. Many hotels of this type have been developed to meet the mass traffic demands of leisure tourism. Widening of this market orientation to include conference tourism is often seen as a means of extending the season or of increasing low season utilization of the facilities. This is evident, for example, in the promotional emphasis of many of the relatively new resort areas of the Mediterranean coast and inland ski complexes.

Whilst official hotel grading classifications are widely used in Europe, they are not universal and alternative ways of providing such information for potential customers are also adopted such as through the publication of commercial and official guides and manuals. Some of these are specifically aimed at conference users covering details both of the conference rooms and of the guestroom accommodation and other services on offer(8).

Standards are largely based on the physical facilities and amenities provided: it is difficult to quantify the intangible effects of good management and staff-customer relations although this strongly features in the direct promotion of individual companies and national tourist organisations.
Enquiries of most of the large groups hotel companies both in the United Kingdom and internationally, as part of the survey of conference facilities, shows a number of variations in specification practice. Companies like the Hilton International and Sheraton lay down broad guidelines but allow and even encourage individual variations. Others such as the Holiday Inns, Novotel, Howard Johnson, use the same precise specifications throughout in the interests of standardisation for management and marketing objectives. Some tourist authorities in Europe stipulate grading requirements which include room sizes but these are normally the minima and apply primarily to economy or standard tourist accommodation.

There are also general variations in room sizes from one country to another, based on traditional practices, as well as from city to rural locations resulting largely from the differences in land costs.

Studies of the plans and features of design adopted in many of the hotels constructed over the last ten years shows a general trend towards smaller guestrooms with built-in units to minimise space and to facilitate cleaning. The flexibility to meet different requirements is obtained by linking adjacent units together horizontally to provide suites or, in some cases, vertically to form duplex units. There are, however, exceptions with companies like Commonwealth Holiday Inns and Howard Johnson using double-sized bedrooms as part of their image promotion. The latter approach, whilst providing little flexibility to meet the greater demand for single bedrooms generated by conference users, is clearly aimed at a broader range of markets, required to offset seasonal and weekday-weekend variations.

4.2.1 Hotel users

Market sources and compositions vary with the location, grade, group image and individual reputation of each hotel as well as over time. The hotel may, as a matter of policy, direct its main selling effort to one specific market segment, such as in building up its conference business, or more generally to provide a balanced demand and the sales-emphasis will vary in intensity with changes in circumstances. An indication of the breakdown of business for a sample of mainly large international hotels is given in the Horwath International surveys.
The median figures for 1979 show user percentages of 40.2 and 10.7 for business persons and conference participants respectively. Over the previous five years the latter figure has fluctuated around the same level. However, within this sample are wide variations from one country to the next with hotel occupancies of under 10 percent conference participants in less developed regions, 10.8 percent in Europe and Mexico, 11.6 percent in South America, 13 percent in Australasia and 17.1 percent in Canada.

The hotel occupancy surveys operated on a monthly basis by the English Tourist Board and other regional Boards whilst giving details related to prices, area, location, length of stay and overseas arrivals, do not distinguish user categories, such as conference delegates or business groups.

This lack of statistical information on the conference use of hotels in the United Kingdom has been noted in previous studies and it would appear that this is in part due to a failure in communication between the different departments involved.

4.2.2 Economics of hotel operation

Compared with total sales, in a large hotel of international standard the gross income is about 50 percent plus or minus 8 percent. Departmental income from rooms contributes about 39 percent, from food and beverage sales, 9 percent and from minor operated departments, store rentals and other income about 2 percent.

Undistributed operating expenses such as administration marketing, energy, property operation and maintenance reduce the income before fixed charges to around 25 to 28 percent.

Within these averages there are wide variations from country to country and from one hotel to another depending on the general level of prices in the area, competition, management and national characteristics which particularly increase food and beverage sales as, for instance, in the Far East. The averages indicated are fairly representative of hotels in Europe but a proportionally higher room income of about 42 per cent.
is obtained in the United States. In an examination of pricing in the hotel industry, Rogers shows that price levels in hotels are not closely related to cost changes but are more market orientated and determined by competition. The increasing importance of conferences as a source of hotel business will, depending on the grade and location of the hotel, often lead to severe price reductions between hotels competing for the same conferences. However, it is noted that when a major conference is held in a town requiring accommodation with several hotels reduced prices are rarely necessary unless the demand is considerably less than the supply available.

This would appear to support the case for co-operative and municipal investment in large conference centres.

4.2.3 Condominium resorts

Condominium development of resorts is a relatively new phenomenon but one which has grown at an accelerating rate with many secondary derivations such as time-sharing of accommodation. Although condominium resorts were reported in the United States to be used by only 14 percent of corporate meeting planners and about 8 percent of association meetings planners in 1979 this use has almost doubled since similar surveys in 1976.

The condominium property like hotel rooms relies on lettings to generate income. In many cases the management of hotels and condominiums operate together using the latter to provide additional accommodation for the larger conventions which the hotels alone could not support. Alternatively, time sharing arrangements can be used by a company to secure a block of property permanently for a convention staged each year in the same resort. Such an arrangement can be shown to be financially advantageous particularly when linked to heavily discounted incentive travel.

Condominiums and other forms of shared cost investments offer considerable reductions in capital outlay together with the opportunity to benefit from a wide range of recreation and other facilities. This can extend into conference and exhibition facilities and is in many ways comparable to the concept of multiple office complexes sharing conference rooms and display areas.
4.2.4 **Economy accommodation**

Not all delegates will require or can afford the higher grades of hotel accommodation. In many congresses with academic emphasis, this may be a low priority consideration compared with the course content, quality of speakers and opportunity to participate. At the same time, quality is a relative factor: it relates more to the physical standards of space and amenity rather than the efficiency of management. A badly run establishment with poor standards of food service and inadequate attention to cleanliness and hygiene is unlikely to be acceptable regardless of cost.

The sector of congress demand for economy accommodation is largely met by the University and institutional establishments. In this case the accommodation infrastructure is already provided and the operating costs need only bear a proportion of the capital charges.

Commercial development of comparable facilities with purposely designed lecture theatres, tutorial rooms and on-site residential accommodation is represented by the executive conference centres. In these, however, the objectives are not economy but efficiency of purpose with emphasis on high standards of courses and physical recreation\(^{(20)}\).

Economy accommodation is also coupled with institutional development of training facilities, whether for young people or for retraining and rehabilitation purposes.

4.3 **Food and beverage services**

In the surveys by "Meetings and Conventions", 74 percent of the American planners involved in organising corporate meetings and 78 percent of those concerned with major association conventions rated the quality of food service very important in the selection of a hotel or other facility for off-premises meeting\(^{(21)}\). In every case, this was the highest or second highest factor affecting choice. A local survey in the United Kingdom showed that management, particularly at senior level, attached similar weighting to the quality of the food and beverage service in choosing meeting venues\(^{(22)}\).

Studies of this subject are complicated by differences in description and traditional attitudes. The practice of holding separate banquets is most strongly developed in the United Kingdom whilst in the
United States these functions are combined with conventions and are not therefore separately recorded. Nonetheless, according to the IACVB surveys the average expenditure by American associations on food and beverage functions in 1978-9 was £9467 compared with only £2524 on the hire of exhibit halls and meeting rooms (23).

In an hotel, food and beverage operations cover both residential and non-residential sales including banquets and lunches associated with local meetings. The ratio of sales to hotel quests depends very much on the location and main business of the hotel. In resort areas with mainly full board leisure and convention accommodation all meals will have a high residential take-up. In other cases, the market mix of hotel quests and the food plan arrangements for organised parties will affect the ratio of residential : non-residential users, particularly at lunch time.

Based on median values for the international hotels recorded by Horwath and Horwath in 1979, food sales in banquets amounted to 24.3 percent of the total value of food sales and beverage sales in banquets 17.9 percent of total beverage sales in the hotel; results which are also representative of hotels in Europe. In the United States these percentages were 35.0 and 25.3 reflecting the higher convention usage. The median numbers of covers served per banquet seat was 68 reducing to 53 in the United States (24). Both figures suggest a low utilization of the banquet area for food and beverage functions but a comparatively high average spend per head in this department.

4.3.1 Planning criteria

The requirements which need to be taken into account in planning food and beverage service instalations in hotels and institutions have been examined in previous studies of catering services (25(26) . However, conference facilities differ in that they require both permanent restaurants and other adaptable areas which can be used for a variety of food and beverage functions.

For intervals between sessions and for refreshments a coffee/tea service counter will need to be set up as a temporary service in the foyer or concourse. The serving area usually takes up 4m² or more, and, based on studies of typical operations one serving point should
cover 16-20 persons per minute. Maximum densities under crowded standing conditions are dictated by fire regulations and licensing conditions, which in the Greater London Council is normally assessed on the basis of 0.3m$^2$ to 0.5m$^2$ per person$^{(28)}$. The effects of queuing on congestion and obstruction of doorways, etc. and limitations on time in the programme need to be taken into account in deciding the number and position of serving points.

Permanent food service facilities in conference centres and hotels can be grouped into categories depending mainly on the price level, types of meals served, degree of formality and intensity of use, all of which determine the mode of operation and are reflected in the design concept.

Snack bars and self-service cafeteria are not normally appropriate for conference users although they may be required in large exhibition complexes for broader public use. In addition, a modified cafeteria arrangement is often used in staff dining rooms$^{(29)}$.

The coffee shop or cafe-restaurant has wider applications, being a standard facility in most large hotels as well as in many conference centres$^{(30)}$. In concept it provides an informal alternative to the traditional restaurant, offering a fast service of a more limited choice of food in sociable surroundings. To create this atmosphere the design is usually strongly themed and expressed throughout with individually designed furniture, fittings, tableware and uniforms.

4.3.2 Restaurants

Some form of restaurant service will usually need to be provided for invited speakers, guests, visitors and representatives attending conferences. In many cases this can be met by adapting part of the space to form a private dining room or banquet area but often a permanent restaurant will be warranted. Under these circumstances the size, character and mode of operation of the restaurant will need to be judged against the scale frequency and nature of demand to determine the feasibility of various alternatives. In an hotel at least one restaurant, and possibly more than one, will be required to meet the expectations of hotel residents although the actual residential user demand will depend on the location and nature of occupancy.
To balance demand the restaurants of most city centre hotels are open to non-residents and this is invariably necessary for conference centres and multipurpose halls. In a university or institution the main restaurant or refectory will usually cater for all conference meals, including banquets in the evening. For this purpose, the interior must be fully adaptable to allow for different layouts and presentations and include means of fully isolating the food service and preparation areas.

Several small restaurants may be required to cater for different occupancy needs as, for example, in multi-purpose halls and theatres (31). When exhibitions are held a number of individual hospitality rooms are likely to be required by the exhibitors or representatives and their clients.

4.4 Function rooms

Rooms and halls used for food and beverage functions must be designed to be adaptable to serve for a wide variety of purposes. Essentially, they must be grouped together so that they can be efficiently served by a central staff and their operation easily supervised and controlled. It is also economically advantageous for the restrooms, cloakrooms and foyer to be placed centrally to serve all the function rooms (32). At the same time, fire regulations and licensing conditions will have an influence on the layout and circulation arrangements.

Banquet requirements are often specific with table groupings and seat plans being determined by the user. In hotels, the banquet hall will also serve as the main meeting room and possibly be used for exhibitions thus requiring considerable storage space for furniture changes and other equipment. The design of banquet room furniture is greatly influenced by this need for easy assembly, dismantling, handling and storage with the minimum of noise and disturbance. In addition to chair stacking on movable dollies, the tables and platforms must be designed to allow simple folding or collapsing for compact transportation and storage, and a number of furniture systems have been developed to meet this need (33).
4.4.1 Convertible suites

Hotel suites serve a variety of roles: providing executive facilities for entertaining small meetings, for press conferences, hospitality suites, display and sample rooms and for boardroom style meetings or study groups. They are often grouped together to facilitate servicing and management. End shows a number of examples of suite design and arrangements for adaptability have been previously studied in several hotels.

Suites are particularly useful in catering for management and training groups which, although small in individual size, are said to be an important part of hotel business due to their repetitive nature. The rooms may also be used at other times as standard suites for guests thus, in theory, a dual day and night use is possible.

4.5 Lounges and bars

In the international hotels surveyed by Pannel Kerr, Forster beverage sales accounted for an average of 12.9 percent of all hotel revenues. Similar surveys by Horwath & Horwath indicate a median value of beverages sales to be 30.6 percent of the total sales of food and beverages in hotels. No information is available on sales in conference centres but it is likely to be in a similar ratio.

However, bars and lounges are not only revenue generating: they provide an opportunity for social relaxation and relief from the work related or formal atmosphere of the conference proceedings. The individual design and characterisation of bars tends to reflect this role, whilst also meeting the more specific functional requirements which have been summarized by Main.

4.6 Entertainment

Attendance at a meeting or exhibition invariably necessitates travelling often long distances and sometimes abroad. A typical meeting of 3-4 days is in some cases extended by a further 5 days for pre- or post-convention tours.

Entertainment and cultural attractions feature strongly in promotion
literature at national, municipal and centre level. As part of the
convention package, local convention bureaux are usually expected to
formulate programmes for delegates and their accompanying persons.
Often events are arranged specifically for convention visitors such
as a formal reception with civic dignitaries or a banquet in a famous
hall, in addition to the usual range of organised tourist attractions.

Entertainment on the premises will usually take the form of dinner
dances or discotheques with, in some cases, cabaret and light
entertainment, depending mainly on the scale of operation and range
of facilities available.

For these purposes the room or hall must essentially be adaptable in
seating plan, allowing tables and chairs to be re-arranged partly or
completely around the perimeter leaving a central area clear for a
dance square or temporary stage. Other needs will arise from this
extension of function such as changing rooms for the artists, and the
installation of appropriate lighting and sound equipment.

In some cases special licensing conditions may be imposed to regulate
this use.

Multipurpose halls offer a wider range of facilities which, in addition
to accommodating conferences, often includes permanent stage equipment
for theatrical productions and/or concerts. The design of such
premises is thus more closely related to that of a theatre or concert
hall and reference may be made to more specific information on this
subject by Ham (39) and Izenour (40).

4.7 Ancillary services

Both in hotels and conference centres the large numbers of participants
and accompanying persons arriving and departing at or about the same
time introduce special problems. Registration and checking out will
need to be planned and organised in a way which minimises delay and
congestion. The requirements for cloakrooms and sanitary facilities
must be considered as well as the effects of the high peak demands on
lifts, and on circulation and waiting areas.

Studies of probability factors of demand and their implications for
facility design have been undertaken by a number of researchers,
particularly Greene 41 and minimum empirical standards, on which Local Authority requirements are usually based, are indicated in British Standard Codes of Practice42.

4.8 Staffing requirements

Staff/customer ratios in convention hotels range from about 0.8 to 1 in a five-star hotel to 0.3 to 1 for a commercial three-star hotel. Median ratios for hotels of international standard are about 0.8 total employees per room in Europe and North America but may be as high as 1.2 to 1.4 total employees per room in less developed areas19.

According to the Horwath and Horwath surveys the distribution of staff in an hotel is about 28 percent involved with rooms operations, 44 percent in food and beverage operations and 9 percent in other operated departments. Some 12 percent are administrative and general staff and 7 percent of hotel employees are concerned in property operation and maintenance43.

No figures have been published for conference centres but the number will depend on the range of other activities in each centre.

Employees facilities are stipulated by legal requirements governing health, safety and welfare44. In the case of banquet service and food preparation, food hygiene regulations and other technical standards will also apply4546.
4.9 Discussion on Chapter 4

Whilst some conferences require only the hire of a room, many include one or more meal functions and a proportion involve the use of residential accommodation, either as part of the arrangements or incidental to the attendances. This last category of conference is particularly important in economic terms because of the high average per capita expenditure on accommodation, meals and other services. Standards of hotels can be defined in fairly precise terms and give a fairly close correlation to prices although, as shown by Rogers and by Kotas in an earlier survey of price trends in British hotels, room rates are also greatly influenced by location and competition. Reports from Hamburg and Copenhagen support the view that investment in municipal conference and exhibition facilities increases local hotel occupancies and unit performance.

The profitability of banquets is said to be open to question with relatively high operating costs suggesting a need for higher efficiency in food production. On the other hand, technical developments in food production and service are also advancing with the introduction of new catering and systems which appear to be particularly suited to this application. In other respects the needs of conference delegates are comparable to those of other hotel residents and it can be argued that similar principles of design will apply to areas such as restaurants, lounges and bars.

In considering the economics of investment in hotel conference facilities the additional revenue generated by higher average room occupancies and food and beverage sales is obviously significant but so also are the additional capital and operating costs. The latter thus requires an examination of trends in operational practice and their interpretation in the design of new facilities.
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PART B

EVALUATION OF PLANNING AND DESIGN CRITERIA
5.1 Aims and objectives

For the purposes of the study of conference facilities the original intention was to use existing data on conference markets and their requirements.

However, on examining the details of previous surveys it became apparent that such data was far from complete and, in many cases, open to question. Outside the United States, conference organisation on a large scale is a relatively new and fragmented industry. Sources of published material are very limited. Apart from a few ad-hoc surveys sponsored by tourism authorities, to which reference has been made in chapter 2, most statistics have been compiled by associations for the information of their members or by consultants reporting on specific projects. Copies of a number of associations and project reports were obtained for analysis but much of this information was found to be very limited in coverage and detail.

Therefore, in order to bring together, qualify and supplement the market data it was necessary to modify the aims of this research to include a more comprehensive examination of the subject. At the same time it had to be acknowledged that many specialists employed by hotel companies and tourist offices throughout the world would be involved in similar, if perhaps locally orientated, studies of their conference markets. As indicated by Gray-Porton, the lack of information about conferences is due in part to the absence of any central authority responsible for its collection.

Thus, one of the aims of this part of the study was to collect such statistics as were available from organisations working in the field with the objective of comparing and rationalising their results. In particular, because of their economic importance it was necessary to quantify the international meetings by examining the records at a number of destinations as well as published lists.

At national level the research was concentrated mainly on qualifying and extending the results of previous surveys in order to measure the economic impact on different facilities and, at unit level, the emphasis was placed on determining patterns of use and user requirements.
5.2 Methodology

In undertaking these surveys the difficulties previously mentioned could not be underestimated. Market surveys for individual hotels and conference centres are commercially expensive and operating statistics for such premises are highly confidential. In fact, as noted by the British Tourist Authority (3), few hotel companies go to the length of compiling detailed statistics on the use of their conference and banquet facilities, and the research by Gamble (4) explains some of the difficulties involved in this organisation.

At city and national level, the authorities are only able to comment on those conferences and exhibitions which have been reported to them and this information generally does not distinguish overseas and other 'out of town' attendances. Details of delegate origins, lengths of stay and expenditure involve special sampling surveys which only a few authorities have been able to undertake.

These restrictions influenced the approach to this study. Standard questionnaires and circulars seeking precise information, as tested in pilot surveys (5) were clearly unacceptable. To obtain the degree of collaboration necessary an individual letter had to be sent to each authority and company explaining the particular features of this study which were relevant to its own interests and seeking answers to specific points at issue.

In deciding this style of approach, three other factors were taken into account. First, as an international study the high postal costs had to be justified by a good response; secondly, the enquiries about statistics could, in many cases, be linked with questions about the facilities provided and third, the status of the Department as a source of information on this subject had to be established, to create the potential for further research development.

5.2.1 Levels of enquiry

Three levels of investigation were involved, namely;

* monitoring of the international trade press and professional journals from 1974 to 1979 to note references to reports, events and research;

* Correspondence with national tourist offices, trade embassies, associations and societies;
personal enquiries of individual conference centres, hotel
companies and city convention bureaux.

A detailed list of the main sources of information is given in Appendix 2
In total, including enquiries about the facilities provided, some 263
letters were sent, attracting a response rate of about 95 percent.

As indicated in Chapter 2, three other, more specific surveys were also
undertaken at this time. In the case of Northern Ireland a detailed
investigation of conference demand throughout the Province was undertaken
on behalf of the Belfast City Council.

A more general survey was also carried out amongst 20 selected hotels in
the United Kingdom to obtain an indication of the pattern of demand and
extent of variations from one establishment to the next.

The third field of specific enquiries was directed at 25 conference
organisers and agencies providing conference services in the United
Kingdom. Surprisingly, this produced the least useful information.

5.3 International Association meetings

The reports of the Union of International Associations are restricted to
contributing members and special arrangements had to be made for access
to the lists of the meetings from which the UIA annual summaries had been
compiled. This data was analysed by venue, size of meeting subject
matter, type of association, frequency, character and exhibition content.
To reduce the effects of cyclical variations in the organisation of meetings
and to allow for delays in compiling records the study extended over three
years 1977-79 although the last year was taken as the main basis for
statistical analysis.

Comparisons were drawn with other information prepared by ASLIB(7) and
by a number of tourist authorities and airlines(8) identifying other
association meetings not listed in the UIA Yearbook and confirming some
of the addresses of sponsoring authorities.

Contact with 52 conference destinations was made to obtain details of
meetings recorded by the national tourist office or city convention
bureau concerned. Two authorities had no information other than the
meetings notified by the Union of International Associations, 26
supplied summaries of the main meetings which had been reported and 24 were
able to provide comprehensive lists of all the meetings known to have been held, almost half of which included details of the origins of delegates. By comparing these lists it was possible to estimate the under-reporting of UIA meetings as well as the numbers of other international and regional meetings falling outside this category.

A similar approach to determine the extent of under-reporting of UIA meetings was used by the United States Travel Service survey (9) in 1974 but the results suggest this earlier survey was less comprehensive in coverage.

5.3.1 Numbers of International Association meetings

A detailed analysis of the numbers and sizes of international meetings based on the UIA amended figures is given in appendix 3. In regional terms this may be summarized as follows:

<table>
<thead>
<tr>
<th></th>
<th>1979 data</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UIA listed</td>
<td>Other meetings reported</td>
<td>Average size of meeting</td>
<td>Attendance '000</td>
</tr>
<tr>
<td>Africa</td>
<td>119</td>
<td>2</td>
<td>242</td>
<td>29</td>
</tr>
<tr>
<td>America</td>
<td>793</td>
<td>194</td>
<td>1557</td>
<td>1537</td>
</tr>
<tr>
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<td>479</td>
<td>192</td>
<td>596</td>
<td>400</td>
</tr>
<tr>
<td>Australasia</td>
<td>70</td>
<td>22</td>
<td>492</td>
<td>45</td>
</tr>
<tr>
<td>Europe</td>
<td>2884</td>
<td>848</td>
<td>545</td>
<td>2034</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4345</td>
<td>1258</td>
<td></td>
<td>4045</td>
</tr>
</tbody>
</table>

NOTES:
(a) National meetings with large international attendance reported to the UIA
(b) Based on details of 852 meetings and 92 exhibitions in 1979
Source: UIA Yearbook of Meetings 1979 together with additional information.

Comparisons with destination recorded meetings indicated an under-recording of some 17.6 percent producing the following amended totals,
<table>
<thead>
<tr>
<th>Region</th>
<th>Meetings reported</th>
<th>Average percentage un-reported (a)</th>
<th>Total meetings</th>
<th>Estimated total attendance (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>121</td>
<td>-(b)</td>
<td>121</td>
<td>29</td>
</tr>
<tr>
<td>America</td>
<td>987</td>
<td>22(c)</td>
<td>1204</td>
<td>1770</td>
</tr>
<tr>
<td>Asia</td>
<td>671</td>
<td>13</td>
<td>758</td>
<td>446</td>
</tr>
<tr>
<td>Australasia</td>
<td>92</td>
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<td>Europe</td>
<td>3732</td>
<td>18</td>
<td>4404</td>
<td>2363</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5603</td>
<td></td>
<td>6588</td>
<td>4658</td>
</tr>
</tbody>
</table>

NOTES:
(a) Based on reports from 24 destinations comparing 1977-78179 recorded meetings against those listed by the UIA
(b) No details received. The USTS survey suggested 5 percent.
(c) Includes meetings in Mexico, Canada and Caribbean classified as 'international'
(d) Calculated from the above averages plus additional meetings, the latter excluding exhibits.

5.3.2 Size distribution of international meetings
An analysis of 950 international association meetings reported in 1979 showed that almost a quarter of these meetings involved less than 100 participants and three-quarters of the total were for fewer than 500 participants. The regional distributions were also significant showing the relatively few large conferences held outside America.

<table>
<thead>
<tr>
<th>Size Distribution: International meetings of Associations 1979</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-100 101-200 201-300 501-750 750-1000 1001-1500 1501-2000 2001-3000 3001-4000 4001-5000 Over 5000</td>
</tr>
<tr>
<td>Africa % Meetings</td>
</tr>
<tr>
<td>% Meetings</td>
</tr>
<tr>
<td>21 65 7 7</td>
</tr>
<tr>
<td>Asia % Meetings</td>
</tr>
<tr>
<td>27 15 9 20 8 12 3 4 1</td>
</tr>
<tr>
<td>America % Meetings</td>
</tr>
<tr>
<td>20 12 7 18 5 11 4 8 6 3 1 5</td>
</tr>
<tr>
<td>% Exhibits</td>
</tr>
<tr>
<td>6 3 8 11 17 8 11 6 8 22</td>
</tr>
<tr>
<td>Australasia % Meetings</td>
</tr>
<tr>
<td>14 33 29 10 5 9</td>
</tr>
<tr>
<td>Europe % Meetings</td>
</tr>
<tr>
<td>26 21 16 17 5 7 2 3 2 1 1 2</td>
</tr>
<tr>
<td>% Exhibits</td>
</tr>
<tr>
<td>4 15 10 17 8 19 15 10 2 1 1</td>
</tr>
<tr>
<td>Total % Meetings</td>
</tr>
<tr>
<td>24 19 13 17 6 8 3 4 2 1 1 2</td>
</tr>
<tr>
<td>% Exhibits</td>
</tr>
<tr>
<td>6 11 7 14 9 16 11 10 3 3 10</td>
</tr>
</tbody>
</table>

NOTES:
(1) All percentages rounded to whole numbers
(2) Exhibitions combined with meetings. Excluding domestic exhibitions
Source: Analysis of 950 meetings listed by the Union of International Associations and other organisations together with reports of individual centres.
Compared with other meetings, those which included exhibitions attracted larger attendances. In Europe, the modal size for meetings with exhibitions was in the 750-1000 range, whereas over one-fifth of meetings with exhibitions in America had attendances in excess of 5000.

The size distribution of meetings and their exhibition requirements was particularly important in comparing the range of hall capacities in hotels and other centres.

5.3.3 Overseas attendance: scope for competition

Analysis of the delegate attendances of 2144 meetings held in 1977, 1978 and 1979 showed the numbers of overseas visitors attending international meetings to be much lower than the totals would suggest.

In Europe, the average number of foreign delegates per meeting was found to be 326; the Far East (Hong Kong, Singapore, Malaya, Indonesia) and Israel, with a smaller local participation, attracted an average of 254 foreign delegates per meeting; in Australia, this average was estimated at 294, whilst in Canada and Mexico, the close proximity of the United States market produced some 330 foreign delegates per meeting. The meetings in Japan tended to be large with an estimated foreign attendance averaging 578 per meeting.

Only a part of international associations have a free choice of venue for their meetings. Many are restricted by legal and political controls and in other cases, as shown by the figures for the United Nations (2.2) it may not be practicable to hold meetings away from the headquarters or regional offices of the organisation concerned.

To determine the extent to which international associations had held meetings outside the country of their principal origins, details of 2534 meetings in 108 destinations were compared with the addresses of associations responsible for their organisation. 35.4 percent of those meetings were held abroad suggesting that this is the order of meetings with a free choice of venue. A similar conclusion was drawn by the United States Travel Service survey.

The principal markets for international association meetings, as represented by the addresses of the associations, could also be identified. Some 8.4 percent of meetings stemmed from associations based in Paris, 7.8 percent from London, 6.1 percent from Geneva, 3.0 percent
from Rome and 1.9 percent from Brussels based associations. Associations in the United States were responsible for organising 17.0 percent of all international meetings and 95.9 percent of those meetings held within the United States.

Main recipients of association travel abroad were also indicated, such as Mexico with 76.2 percent of the meetings originating from overseas and Africa with 61.8 percent.

Details showing the organisation of international association meetings are summarized in appendix 4. Some of the principal organisations generating meetings and the range of destination choice are indicated in appendix 5.

5.3.4 Subjects of international meetings

The United States Travel Service survey suggested there could be some correlation between demand segmentation on the basis of subject interest and the choice of venue, the latter reflecting such criteria as distance, cost, time involvement, attractiveness of location and standards of accommodation. This aspect was examined by analysing the subject content of meetings held in 94 widely ranging destinations during 1977-79.

The results showed that many international congresses were concerned with social, cultural and political subjects although political meetings as such and the meetings organised by trades' unions were not included in these statistics. Science and technology also featured strongly particularly in those countries with a highly developed industrial base such as Japan, Europe and the U.S.A. Many meetings of this kind were organised by and held in, universities and most were accompanied by exhibitions and demonstrations of technical equipment and products. Medical subjects were also a significant segment.
### Typical subject analysis for international association meetings

<table>
<thead>
<tr>
<th>Subject of meeting</th>
<th>Third World Countries</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of all meetings (a)</td>
<td>% of all meetings (b)</td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Science and technology (other than medicine)</td>
<td>24</td>
<td>44</td>
</tr>
<tr>
<td>Social, cultural, legal and political</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>Commercial, business associations</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td>Religion</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Sport</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

(a) Analysis of 531 meetings in 26 countries  
(b) 1604 meetings in 21 countries.

There were individual variations from this pattern depending mainly on the characteristics of the country. In Japan, for instance, nearly 70 percent of the large international conventions were concerned with science and technology; in Hong Kong over 41 percent of the meetings were for business or commerce; international meetings in Israel were mainly concerned with medicine (almost 19 percent) social, culture, politics and law subjects (35.5 percent) and religion (12.5 percent).

#### 5.3.5 International Corporate meetings

As noted in Chapter 2.4 there are considerable difficulties in identifying international corporate meetings. Many of the figures quoted were based on unqualified estimates. If incentive travel movements are included, the United States market alone was estimated to have generated 22600 trips in 1979 involving a total of 3.9 million participants.
However, detailed examinations of the meetings recorded in 24 of the main countries and cities attracting conventions revealed only small fractions of this number as shown by the following estimates.

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of meetings</th>
<th>Average attendance</th>
<th>Total Attendance '000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>-(a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>America</td>
<td>1340 (b)</td>
<td>174</td>
<td>233</td>
</tr>
<tr>
<td>Asia</td>
<td>180</td>
<td>82</td>
<td>15</td>
</tr>
<tr>
<td>Australasia</td>
<td>20(c)</td>
<td>120</td>
<td>2</td>
</tr>
<tr>
<td>Europe</td>
<td>890(d)</td>
<td>160</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>2340</td>
<td></td>
<td>392</td>
</tr>
</tbody>
</table>

a) No meetings identified  
b) Based on reports from Mexico and Canada  
c) Limited information estimated from totals  
d) International meetings of European and American based companies.

Many company meetings were not reported and these figures probably represent only a small proportion of the meetings actually held.

### 5.3.6 Exhibitions and trade shows

Details of exhibitions and trade fairs were compiled from many sources (12)(13)(14) giving information about the location, type of exhibits, duration, international status and other characteristics. Individual details were then checked against the lists provided by the main exhibition centres. Out of a total of 2690 major exhibitions and trade fairs held in 1979&80, an average of 480 per year were identified as being international in classifications. The distribution of international exhibitions and fairs is given in appendix 6. showing the prominence of West Germany in this field, with cities like Berlin, Cologne, Dusseldorf, Frankfurt and Munich each attracting between 7 and 14 major exhibitions annually. Overall, almost 21 percent of international exhibitions were held in West Germany compared with 11.0 percent in the U.K. and 9.9 percent in France. Whilst only 7.4 percent of international exhibitions were held in the United States this was not a significant element compared with the overall total of 8000 trade and domestic exhibitions held in that country.
Many exhibitions were held in association with conferences and, in addition to attracting higher attendances, they generated higher average expenditures as shown by the IACVB Surveys\(^{(15)}\) in the United States.

To draw comparisons with European experience, details were obtained from the Bella Center, Copenhagen\(^{(16)}\) showing the proportions of expenditure resulting from a typical trade exhibition to be

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent of stands</td>
<td>22</td>
</tr>
<tr>
<td>Exhibitors expenditure</td>
<td>43</td>
</tr>
<tr>
<td>on other cost items</td>
<td></td>
</tr>
<tr>
<td>Visitor expenditure</td>
<td>35</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

As a proportion of total costs of participation, the stand rent was reported to be progressively becoming a smaller part as exhibitors spent more on the stand display and other more broadly based activities.

5.3.7 **Expenditure of delegates**

Compared with other segments of tourism, the congress or convention delegate had a higher average individual expenditure; in most cases, the daily spend was greater and, in others, the length of stay was longer. Apart from international visitors, there were also significant economic benefits from out-of-town delegates attending local meetings.

Reported surveys of the expenditure of delegates attending international conferences in Helsinki, Hong Kong, Ireland, Israel and Mexico in 1978 showed a range of £50 to £65 per visitor-day. Average congress expenditure per capita for foreign delegates, excluding transportation to the destination, ranged from £250 to £300 for a visit staying over 4 to 5 nights. To this must be added the expenditure by persons accompanying the delegates and by congress organisers. The latter included the cost of meeting rooms, meals, reception and translation facilities, transport and entertainment for delegates; in 1978 this amounted to an average of £60 per delegate per congress.

One of the main factors found to affect convention delegate expenditure was the distance travelled and the frequency of such visits. As a rule, the greater the distance from the countries of origin of the delegates and the less familiar they were with the destination, the longer their
average stay tended to be. Often these trips included pre or post conference tours. Average lengths of stay for 5 day conferences in far away places like Hong Kong ranged from 8.0 to 8.5 nights.

In contrast, conference visitors to Israel had a shorter stay than tourists in general but much higher expenditure per diem and per capita. Conference delegate, represented 4.1 percent of scheduled air tourists but 5.0 percent of total tourism revenue. Similarly, in Mexico conference participants represented 3.3 percent of all tourists but generated about 9.0 percent of all tourism revenue. These figures were calculated from the statistics supplied by the tourist authorities.

The non-participant attendance also has a significant influence on expenditure as well as on the type of accommodation required. Recorded percentages of the persons accompanying participants depended largely on the nature and length of the meetingd and on the 'tourist attractiveness' of the destination.

In Europe most international conferences attracted 14 to 20 percent accompanying persons but this was reported to be as high as 64 percent in 'exotic' locations like Hong Kong and the Caribbean.

Although little information was available on corporate meetings and incentive travel, it was evident that the social content featured strongly in their arrangements.

Average levels of expenditure per capita by conference delegates as compared with other tourists are important in evaluating the benefits which can be gained from investment in conference facilities. Two examples which are fairly representative of other cases, are summarized in appendix 7 to show the ratios of expenditure involved. In the UK analysis this also indicated differences in visitor origins and in the Chicago Summary the relative rates of expenditure on conventions, trade shows and corporate meetings.

5.3.8 Patterns of meetings
Peak months for the meetings of international associations were September, October and May followed by April and June. Whilst the winter months tended to be less popular the number of exhibitions held at this time have increased over the last six years. However, there were variations
from this model, depending to some extent on the peak season for leisure tourism and the result of the regional studies are shown in appendix 8.

As discussed in chapter 2.35 the seasonal nature of conference demand has implications both for investment analysis and facility design.

Most international conferences in Europe and America were found to extend over 3 or 4 days with some variations depending on the subject content and venue.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Average duration (days)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>3.4</td>
<td>Mostly 3 days: about 12% last 5 or 6 days</td>
</tr>
<tr>
<td>Science &amp; Technology</td>
<td>3.7</td>
<td>About 18% extend over 5 days</td>
</tr>
<tr>
<td>Commerce, business associations</td>
<td>3.2</td>
<td>Excluding company meetings which are 1 or 2 days (see below)</td>
</tr>
<tr>
<td>Cultural, social &amp; political subjects</td>
<td>3.0</td>
<td>About one third are 2-day meetings</td>
</tr>
<tr>
<td>Religion</td>
<td>variable</td>
<td>Many extend over long periods - 13 days common</td>
</tr>
<tr>
<td>Trade fairs</td>
<td>3.3</td>
<td>Usually 3 or 4 day events depending on size and coverage</td>
</tr>
<tr>
<td>Exhibitions (general)</td>
<td>5.5</td>
<td>Often 3,4,5 or 9 days</td>
</tr>
<tr>
<td>Festivals</td>
<td>8.5</td>
<td>8 or 9 days most common</td>
</tr>
</tbody>
</table>

(a) Based on 4960 conferences and exhibitions

Overall lengths of stay in the country depended on the extent to which meetings were linked with other tours. For example, in 1978 the average conference visitor stayed 6.4 days in Hong Kong whereas in Britain the average was 5.8 nights with a range of 3.4 nights to 9.0 nights depending on the country of origin of the conference visitor.

5.3.9 International meetings: synthesis

Whilst the questions of corporate meetings and incentive travel have not been fully resolved, it is possible to draw conclusions about international meetings.
First, the total number of meetings in 1979, even taking conservative figures, was about 9000 with some 5.05 million participants. The proportion of foreign visitors attending such meetings was about 58.8 percent. Expenditure generated in the destinations, not counting the multiplier effects in the local economy amounted in aggregate to about £1700 million. To this must be added the expenditures of persons accompanying the participants which, from the data is estimated to have been a further £200 million. Thus, international conferences in 1979 produced destination incomes of at least £1900 million.

If all the American overseas incentive travel movements are included the total number of international events in 1979 was about 29000 involving about 9 million participants spending a total of £2600 million in addition to the costs of travel.

Whilst these details, particularly the lower estimates, are founded on field studies there is no other source with which precise comparison can be made to substantiate the figures. A study by Professor Alkjaer which also provided the background for the figures quoted by the British Tourist Authority, estimated 6440 events in 1973 growing to 9461 events by 1978. For both years the average number of participants per meeting was estimated to be 499 giving a total participation in international meetings of 4.721 million by 1978. Figures for corporate meetings were not identified. Statistics compiled by the United States Travel Service survey, based on 1973-4 data, calculated a total of 4150 events attended by 1.698 million participants using similar method of approach to this research although with smaller samples. Neither of these studies gave any data on expenditure nor did they extend the coverage to include national surveys.

5.4 Meetings in the United Kingdom

Two possible approaches to this study area were considered. As with the international surveys the potential markets for conferences could have been analysed in order to determine the demand for meeting facilities. In fact, this was applied in Northern Ireland to assess the local potential for meetings and has been used as the basis for small scale interview surveys of conference organisers. However, such a study would have been too extensive and open-ended to produce the precise data needed for facility planning and even a full scale national
survey would not reveal the alternative uses for conference space. As was the case in international research, direct market surveys were found to be more valuable in qualifying the characteristics of user groups and their conference requirements.

Quantification of the conference demand was provided by analysing the usage of existing facilities. For this purpose extensive reference was made to the British Tourist Authority survey of the UK conference market, 1977 which, although providing only comparative information based on samples, represented the only comprehensive study of this kind undertaken in Britain. The main findings of the survey are summarized in chapter 2.8.1.

At the same time it was necessary to obtain and compare data from other sources in order to check the assumptions on which some of these conclusions had been based, to make corrections in light of additional information and to try to derive absolute figures of the numbers of conferences and conference participation in the country as a whole.

5.4.1 Conferences in hotels
An analysis of the size and location distribution of hotels in the United Kingdom was given in the EDC study of 'Hotel prospects to 1980' Out of the 33700 hotels surveyed in the peak season of 1974, only 3 percent (1491 hotels) had 51 or more bedrooms and, as discussed in chapter 3.5 it was apparent that most of the hotel stock was not equipped for conference use nor relevant to the statistics required for this study.

As an essential part of this research it was necessary to identify those hotels which were likely to be used as conference venues. This study involved a detailed examination partly by computer analysis, of all hotels listed in several tourist guides, company brochures, publications by the British Association of Conference Towns and commercial promotions. Hotels were categorised by location, size, conference accommodation, banquet and exhibition space and restaurant facilities. Details of this facility analysis are considered under later sections but in relation to conference supply, there were found to be 1678 hotels offering significant conference facilities.

Assuming the figures reported by the British Tourist Authority survey were applicable overall, conference usage of those hotels involved
64270 meetings attended by 4.762 million participants, a total which was 46 percent more than previously estimated.

Furthermore, this total did not take into account the smaller meetings held in hotels. According to the Marplan report (21) meetings of 20 or fewer represented 53 percent of all corporate meetings as was also found in the Northern Ireland study. Some 67 percent of meetings in hotels were held by business, commercial or sales incentive organisations to which this would apply. Hence, the structure of hotel conferences in 1977 may be summarized:

<table>
<thead>
<tr>
<th>Types of meetings</th>
<th>Conference and meetings held (million)</th>
<th>Participants (million)</th>
<th>Participant - days (million)</th>
<th>Expenditure (1978 value) £ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conferences for 25 or more</td>
<td>64270</td>
<td>4.762</td>
<td>7.524</td>
<td>225.72</td>
</tr>
<tr>
<td>Smaller corporate meetings</td>
<td>22820</td>
<td>0.308</td>
<td>0.486</td>
<td>14.58</td>
</tr>
<tr>
<td>TOTALS</td>
<td>87090</td>
<td>5.070</td>
<td>8.010</td>
<td>240.30</td>
</tr>
</tbody>
</table>

The average expenditure used in this calculation was derived from the 1978 surveys of major conference towns by RPA Management (25) to which reference has been made in chapter 2.8.2. Although hotel usage was not differentiated, the figures in these surveys indicated the number of conferences per resort hotel was probably less than that shown in the BTA study as was also found in an early survey of residential conferences in Scottish hotels (26).

With a view to checking the UK data, parallel studies were also carried out of hotel guestroom occupancy figures. This approach was later proposed by McCleary who commenting on the difficulties of measuring corporate meetings in the United States, concluded that the room occupancies attributed to conference users were a more reliable guide (27).

Average room occupancies for higher tariff hotels were quoted in the English Hotel occupancy survey for 1977 as ranging between 56 and 64 percent for hotels outside London and 81 percent for London hotels. The Horwath and Horwath reports of high standard hotels put this at 82.4 percent in 1977 (29) and the 'Outlook, Eurotrends Review' quoted 80.7 percent for 1977 (30). It was evident that these results were distorted by the exceptionally high London occupancy figures achieved that year.
and an average figure of 65 percent, indicated by a more specific survey of 20 conference hotels outside London in 1978, was probably more representative.

According to the BTA survey, a stated average of 41 percent of conference participants used overnight accommodation in hotels putting the total number of conference-nights at 2.077 million. In the 1678 conference hotels surveyed as part of this research there were on aggregate 136568 rooms. With an overall room occupancy of 65 percent the proportion of conference guests would be 6.4 percent and, if the higher room occupancy of 80.7 percent was taken, conference guests would represent 5.2 percent of the total. In each case, it has been assumed that the conference participants required separate rooms and the non-delegate attendance of 10 percent could be taken as part of the room occupancy so calculated.

The results of these calculations raised the question whether the proportions of conference guests could have been set too high even with the conservative figure of 41 percent accommodation usage.

A survey of 20 conference hotels selected as being fairly representative in size and business mix confirmed that the median figure representing the proportion of conference guests was 6.0 percent with an overall room occupancy of 65 percent although the modal group of hotels quoted 5 percent conference guests. On this basis the total number of conference participants would have been about 4.74 million. A slightly lower figure was given by the results of the Horwath and Horwath UK report for 1978 giving an average room occupancy for 45 high class hotels of 78.3 percent with 4.2 percent conference guests although the international results indicate a median of 10.7 percent conference guests using hotels in Europe.

Within these averages, there are wide variations, depending on the individual hotel location and management strategy. For example, two of the hotels studied in detail achieved an annual average of 20 percent conference guests as a result of specialising in this field and 10 percent conference usage was reported by a number of others.

Conclusions may be drawn from these research findings which, although not precise, represent a considerable refinement of the figures previously assumed. Even allowing for the lower averages recorded in the Scottish survey, it is reasonable to conclude there were over 64000 conferences
with 25 or more participants in UK hotels in 1977 involving a total participation of between 4.25 and 4.75 million. Another 0.31 million people attended smaller meetings in hotels. In terms of income a further 10 percent, representing the non-delegate attendance, could be added to these figures. The total conference market, based on 1978 values, was worth £240 million to hotels.

5.4.2 Conferences in universities

Only 72 percent of members of the British Universities Accommodation Consortium furnished returns of their vacation lettings but from overall data supplied by the Chairman some 1.923 million bednights in university accommodation in 1978 generated an estimated income of £12.0 million. This included a range of miscellaneous uses including self-catering holidays and to distinguish the conference element a study was made of the records provided by two universities for the years 1977 to 1979. The annual average per university was calculated to be:

<table>
<thead>
<tr>
<th>University</th>
<th>Conferences</th>
<th>Courses &amp; schools</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number held</td>
<td>30.5</td>
<td>63</td>
<td>93.5</td>
</tr>
<tr>
<td>Average attendance</td>
<td>126.4</td>
<td>45.4</td>
<td>71.8</td>
</tr>
<tr>
<td>Duration</td>
<td>3.73 days</td>
<td>8.09 days</td>
<td>5.59 days</td>
</tr>
<tr>
<td>Participant-days</td>
<td>14380</td>
<td>23140</td>
<td>37520</td>
</tr>
<tr>
<td>Daily expenditure</td>
<td>£93,500</td>
<td>£150,400</td>
<td>£243,900</td>
</tr>
</tbody>
</table>

(a) Based on analysis of 89 conferences, 140 courses or schools and 58 other uses.
(b) BUAC estimate for 1978.

The vast majority of the university conferences, about 92 percent, were held by associations or societies and only 8 percent by companies. These totals agree fairly closely with the results of the British Tourist Authority survey although this put the average number of conferences per university at 65.6 with an average attendance of 120.2 over 4.44 days producing a total of 35000 participant-days. Conferences were not distinguished from schools and courses although the latter were apparently included as shown by comparison with the present study.
It could be argued that the majority of summer schools and courses formed a separate market segment not subject to the same competition and external influences which affect conferences.

5.4.3  Conferences in non-residential establishments

In addition to the British Tourist Authority survey previously described, specific surveys have been carried out in 9 major conference towns in 1977 and 1978 by R.P.A. Management\(^{23}\). Information was also provided by the British Association of Conference Towns\(^{24}\) which co-operated in these surveys.

The earlier survey identified 505 conferences in municipal establishments and similar figures were given in the R.P.A. surveys, although using a smaller base. As an approximation, estimated from the samples, the total number of conferences was probably around 700 but this cannot be substantiated and a lower figure taken from the surveys and other known data has been used in this calculation.

As a conclusion, the non-residential component can be said to have included 540 conferences with an average attendance of 449.5 and an aggregated total of 243,000 participants. The average length of this type of conference was 2.32 days and the overall expenditure in the towns concerned was estimated to be almost £16.91 million at 1978 prices.

5.4.4  Foreign conference visitors to the United Kingdom

Estimates of the numbers of business conference and exhibition visits to the United Kingdom have been given by the International Passenger Surveys\(^{32}\).

In 1977 there were an estimated 165,000 visits made by people coming to the UK for the main purpose of attending a conference, representing about 1.4 percent of the total visits to this country. In addition, it was considered that probably between 50,000 and 100,000 other business visitors attended conferences in the UK.

The average length of stay for conference visitors in 1976 was 5.9 nights as compared with 12.4 nights for all tourists but the average expenditure was higher at £214 per conference visit compared with £166 per visit for tourists as a whole.
In total, the foreign conference market in 1976-77 generated an expenditure of £35.3 million from visits primarily for this purpose and, conservatively, a further £10.7 million from business visits which included a conference element.

In calculating the size of the UK conference market, the British Tourist Authority assumed there could be 7040 conferences attended by UK and foreign delegates although the basis for this assumption was not stated. The Union of International Associations, in fact, reported 375 meetings in 1977 to which a further 235 association meetings with a large international attendance can be added.

Analysis of the size distribution of international association meetings in the UK and their subject orientation are given in appendices 9 and 10. These were based on 1979 data to enable comparisons to be made with other international figures, and to show the contribution of the new centres at Wembley and Brighton. Over 51 percent of the meetings studied fell within the 200 to 500 size range, indicating the importance of medium capacity facilities.

5.4.5 Foreign visitors to trade fairs in the United Kingdom

No statistics of trade fair attendance were included in the British Tourist Authority survey although, as indicated in the American and international references, this is an important segment of group tourism and increasingly associated with conferences. Direct comparison with the 1977 data was not necessary and 1979 statistics were used instead to show the effects of the new conference and exhibition centres at Wembley, Brighton and Birmingham.

Based on the first 9 months of 1979 the International Passenger Survey estimated the number of visits to attend trade fairs in the United Kingdom to be 72,000, equal to 4.2 percent of business visits or 0.7 percent of all visits to this country.

To determine the relationship with trade fair facilities a detailed analysis was carried out of all the major exhibitions and trade fairs held in the United Kingdom during 1979 and during the first 9 months of that year. These details are summarized in appendix 11.

In the 9 month period concerned there were 78 trade fairs held in halls
and 117 in hotels. 37 of the fairs and exhibitions were classified as being international in status. Assuming that all these trade fairs attracted some foreign attendance the average number of foreign visits per fair was calculated to be 369, each extending over 6.6 days with an average expenditure of £250 per visit.

Relating this data to the annual calendar of 272 trade fairs showed a total visitor market of 99,000 with an expenditure valued at £25.9 million (1979 prices).

5.4.6 Meetings in the United Kingdom: synthesis

Accepting there are several gaps in the statistics - for instance from the lack of information about meetings held in commercial training establishments and executive conference centres - it is possible on the basis of this research to give a factual analysis of the UK conference market. Whilst the research has drawn on the surveys of the British Tourist Authority, which because of the enormous cost and practical difficulties could not be repeated, it has extended and expressed the results in absolute terms. This is important in considering the adequacy or otherwise of the facilities provided for meetings and as a means of identifying the potential for further development.

As a summary, the conference demand in the UK can be repeated in terms of the facilities used and in relation to the primary expenditure generated. Both of these factors are important in evaluating the benefits gained from investment in conference facilities.

In the case of international conferences, only the minimum figure of visits made mainly for this purpose has been used and, for trade fairs, only the international visitor component. It has been assumed that the national conference attendance would include associated trade fairs. For the purposes of this study no allowance has been made for the local expenditure by exhibitors and contractors in mounting displays nor for the other services involved such as the transportation of delegates and exhibits to the destinations. As was indicated in the Copenhagen study, exhibitor expenditure can represent as much as 43 percent of the total expenditure generated by trade shows and this element has been shown in the IACVB surveys to be an important cost item.

The total numbers of events is not very meaningful because of their overlap but the total number of participants in conferences and associated
trade fairs was in excess of 5.72 million in 1977 and the updated expenditure resulting from these events amounted to almost £285 million in hotels and similar establishments with a further £10.7 million spent in universities. Details of this analysis are shown in the following summary.

<table>
<thead>
<tr>
<th>Venue</th>
<th>Number of conferences and events held</th>
<th>Number of participants (million)</th>
<th>Total local expenditure (1978 values) (£ million)</th>
<th>Expenditure in facility (1978 values) (£ million)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All conferences in hotels</td>
<td>64270</td>
<td>4.76 m</td>
<td>225.72 m</td>
<td>218.14 m (a) (National participants)</td>
<td></td>
</tr>
<tr>
<td>Small meetings in hotels</td>
<td>22820</td>
<td>0.31 m</td>
<td>14.58 m</td>
<td>14.58 m</td>
<td>(National participants)</td>
</tr>
<tr>
<td>Trade fairs</td>
<td>(152) (b)</td>
<td>(0.06 m) (b)</td>
<td>14.47 m (b)</td>
<td>10.16 m (b) (International participants)</td>
<td></td>
</tr>
<tr>
<td>International conferences in hotels</td>
<td>(504) (d)</td>
<td>(0.10 m) (d)</td>
<td>21.43 m</td>
<td>15.04 m (c) (International participants)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>87090</td>
<td>5.07 m</td>
<td>257.92 m</td>
<td></td>
<td>(Total expenditure)</td>
</tr>
<tr>
<td></td>
<td>All conferences in non-residential halls</td>
<td></td>
<td></td>
<td></td>
<td>(National participants)</td>
</tr>
<tr>
<td></td>
<td>International conferences in halls</td>
<td>(240) (e)</td>
<td>14.98 m</td>
<td></td>
<td>(International participants)</td>
</tr>
<tr>
<td></td>
<td>Trade fairs in halls</td>
<td>120 (b)</td>
<td>11.43 m (b)</td>
<td></td>
<td>(International participants)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>660</td>
<td>0.28 m</td>
<td></td>
<td>(f)</td>
</tr>
<tr>
<td></td>
<td>Conferences in universities</td>
<td>1340</td>
<td>0.17 m</td>
<td>4.11 m</td>
<td>4.11 m</td>
</tr>
<tr>
<td></td>
<td>Courses and Schools</td>
<td>2772</td>
<td>0.18 m</td>
<td>6.62 m</td>
<td>6.62 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4112</td>
<td>0.30 m</td>
<td>10.73 m</td>
<td></td>
</tr>
<tr>
<td>Benefit to hotels:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from non-residential events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26.99 m (c)</td>
</tr>
</tbody>
</table>

**NOTES:**

(a) Total expenditures by national participants only

(b) Based on 272 trade fairs - 152 held in hotels, 120 held in halls assuming same proportions of international participants and expenditures. National participants assumed to be included in the total conference attendance.

(c) Calculated from 70.2 percent expenditure on accommodation and main meals. Not necessarily in same hotel.

(d) Calculated from international association meetings with a maximum of 300 participants plus corporate meetings, most of which were held in hotels.

(e) Calculated from larger international association meetings of 500 or more most of which were held in halls

(f) Expenditure in halls often subsidized.
5.5 Meetings in the United States

In view of the long established pattern in the United States of holding conventions and the influences of the large American market on international demand it was necessary to examine this area in some depth. Unlike the survey experience in the United Kingdom and Europe, the main difficulties in the American study arose from a surfeit of information most of which had been independently compiled and was often at variance with other findings.

However, the extent of sophistication in convention organisation in the United States allowed two separate approaches to be adopted. Statistical information covering the markets for conventions as a whole was obtained from the principal organisations involved in meeting planning, including data compiled by two of the leading journals from surveys of their readerships. Much of this information was supplied in response to individual enquiries as extracts from the reports which had been compiled for the association membership. Some of the conclusions which were derived from that data are discussed in chapter 2.6 and 2.7.

In response to individual enquiries, the convention and visitor bureaux of 18 American cities furnished details of the conventions and trade exhibitions which had been held in their areas. In most cases this was in the form of a summary but six authorities provided comprehensive lists of all conventions held, from which an analysis of size distribution and other convention characteristics could be compiled. Details of convention delegate expenditure were also supplied.

The primary object of this study was to compare the size, structure and economic value of the United States convention market with that in the United Kingdom. In particular, it was important to determine the distribution of convention income in hotels and other facilities.

5.5.1 Association meetings

The background to the meetings and conventions of American associations, based on a rationalisation of the statistics, is discussed in chapter 2.6 and 2.6.1. Depending on the way such meetings are classified, it can be concluded there were some 10,300 major conventions in 1979, most representing the total membership meetings of the national and US based international associations. Many attracted a large participation and about 54 percent
of these conventions were accompanied by exhibitions.

Other association meetings included most of the state and regional bodies Board meetings, professional and technical meetings and educational seminars. Although the average meeting attendance was only 105, the aggregate participation in such meetings, based on the statistics from two surveys, was nearly 20 million.

Excluding costs of travel to the destinations the overall expenditure on conventions was calculated to be £3507 million in 1978-79.

<table>
<thead>
<tr>
<th>Type of meeting</th>
<th>Total attendance (million)</th>
<th>Average expenditure per delegate (a)</th>
<th>Total expenditure 1978-79 £ million</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>by Association</td>
<td>by Delegates</td>
</tr>
<tr>
<td>Major conventions</td>
<td>11.0</td>
<td>11.67</td>
<td>124.84</td>
</tr>
<tr>
<td>Other meetings</td>
<td>20.0</td>
<td>11.67</td>
<td>88.60</td>
</tr>
<tr>
<td>TOTAL</td>
<td>31.0</td>
<td>11.67</td>
<td>213.44</td>
</tr>
</tbody>
</table>

(a) Source IACVB Survey\(^{(35)}\) with a conversion rate of $2.2 equal to £1

Out of the total delegate expenditure 55.5 percent was attributed to accommodation and main meals and the majority of association costs were incurred in room hire and incidental expenses. Thus, relating these figures to calculations of the use of different facilities, the distribution of economic benefits derived from association meetings could be shown as follows:

<table>
<thead>
<tr>
<th>Types of facilities used for association conventions &amp; meetings</th>
<th>Use (%)</th>
<th>Major Conventions</th>
<th>Other meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Delegates (b)</td>
<td>Expenditure (b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>million</td>
<td>£ million</td>
</tr>
<tr>
<td>Mid town hotel</td>
<td>43.0</td>
<td>4.73</td>
<td>382.92</td>
</tr>
<tr>
<td>Suburban hotel</td>
<td>13.4</td>
<td>1.47</td>
<td>119.33</td>
</tr>
<tr>
<td>Resort hotel</td>
<td>25.4</td>
<td>2.79</td>
<td>226.19</td>
</tr>
<tr>
<td>Airport hotel</td>
<td>4.9</td>
<td>0.54</td>
<td>43.64</td>
</tr>
<tr>
<td>Privately owned conference centre</td>
<td>3.5</td>
<td>0.39</td>
<td>31.17</td>
</tr>
<tr>
<td>University owned conference centre</td>
<td>3.5</td>
<td>0.39</td>
<td>31.17</td>
</tr>
<tr>
<td>Condominium resort</td>
<td>3.5</td>
<td>0.39</td>
<td>31.17</td>
</tr>
<tr>
<td>Cruise ship</td>
<td>0.7</td>
<td>0.07</td>
<td>6.23</td>
</tr>
<tr>
<td>Other</td>
<td>2.1</td>
<td>0.23</td>
<td>18.70</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0</td>
<td>11.00</td>
<td>890.52</td>
</tr>
</tbody>
</table>

(a) Based on "The meetings market, 1979-80"

(b) Based on the IACVB Convention Income Survey
5.5.2 Corporate meetings

Corporate meetings were identified by the type of meetings involved and quantified in terms of the number of meetings, their attendance, duration and value. The structure of the corporate market has been outlined in chapter 2.7 and, in total, this was found to have covered some 643,000 meetings or conferences which involved over 50 million participants. In many respects the pattern of company meetings and their size distribution were similar to those noted in the United Kingdom.

Average expenditure were calculated from the total figures quoted by meeting planners and the costs of travel deducted. Applying these averages to other survey data gave the following distribution of the total of £1650 million spent in meeting facilities in 1978-79.

<table>
<thead>
<tr>
<th>Types of facilities used for corporate meetings</th>
<th>Percentage used(a)</th>
<th>Total(b) participants Million</th>
<th>Total (b) expenditure £million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid town hotel (c)</td>
<td>23.7</td>
<td>12.01</td>
<td>391.05</td>
</tr>
<tr>
<td>Suburban hotel</td>
<td>20.9</td>
<td>10.59</td>
<td>344.85</td>
</tr>
<tr>
<td>Resort hotel</td>
<td>23.7</td>
<td>12.01</td>
<td>391.05</td>
</tr>
<tr>
<td>Airport hotel</td>
<td>15.3</td>
<td>7.76</td>
<td>252.45</td>
</tr>
<tr>
<td>Privately owned conference centre</td>
<td>6.0</td>
<td>3.04</td>
<td>99.00</td>
</tr>
<tr>
<td>University owned conference centre</td>
<td>3.2</td>
<td>1.62</td>
<td>52.80</td>
</tr>
<tr>
<td>Condominium resort</td>
<td>5.6</td>
<td>2.84</td>
<td>92.00</td>
</tr>
<tr>
<td>Cruise ship</td>
<td>1.6</td>
<td>0.81</td>
<td>26.40</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>100.0</strong></td>
<td><strong>50.68</strong></td>
<td><strong>1650.00</strong></td>
</tr>
</tbody>
</table>

**NOTES:**

(a) Calculated from data in "The meetings market, 1979-80"

(b) Assuming similar distribution of meetings. The relatively small variations in size suggests this is reasonably accurate.

(c) Including motor inns
5.5.3 Comparisons

According to the reports provided by convention and visitor bureaux the number of conventions and meetings held was less than that indicated by the meeting planners, presumably as a result of under-reporting. However, the calculated overall expenditure showed close agreement and can be assumed to be an accurate assessment of the situation. A list of reported attendances and expenditures in the eight leading convention cities is given in appendix 12.

Comparisons of the average amount spent by a convention visitor with that of other tourists, expressed as a ratio, showed a range of variation from 1.47:1 for the City of New York to 2.34:1 in Chicago.

The latter included a higher proportion of trade exhibitions which tended to increase the overall convention expenditure.

Lists of the conventions held in a number of cities also provided a means of checking the size distribution of meetings and exhibitions against the earlier results compiled by the American Society of Association Executives (36). These ranges of sizes are given in Appendix 13. One of the main differences between American and European practice is revealed by the high proportion of meetings in the United States with attendances in excess of 1000. Some 8.7 percent of all association meetings in America are in this category and 1.6 percent of these meetings attracted more than 3000 participants.

When exhibitions are included even larger numbers are involved. 45.7 percent of the trade shows and exhibitions in the United States were each attended by more than 1000 visitors and 12.5 percent had attendances in excess of 5000.

These size variations explain the characteristics of convention facilities in the United States which need to provide the large ballrooms halls and coliseums required to accommodate major conventions. The justification for such investments is indicated by the United States convention expenditure of £3036 million in hotels (1978-9). In comparison the conference expenditure in hotels in the United Kingdom was less than 8.5 percent of this amount.
References  Chapter 5


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(13) Correspondence with exhibition centres and organisers, 1978, 1979

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Chapter 6  PLANNING: SURVEY OF FACILITY PROVISION

6.1 Conference hotels in the United Kingdom

As indicated in chapter 5.4.1 in order to quantify demand it was necessary to have a detailed analysis of the hotels providing conference facilities. These surveys revealed not only the number of hotels but the extent of guest room accommodation available for conference visitors and the size distribution of conference and banquet halls. In the United Kingdom as a whole there were 1678 hotels in this category having an aggregate total of 1365,688 guestrooms, an average of 81.33 rooms per hotel.

The total conference space available in the hotels was determined from the maximum seating capacity of the main hall in each hotel and the total space provided in other halls and rooms. Small seminar rooms for groups of less than 25 were not included since, for larger conferences, these were found to be used in association with the other areas.

In the United Kingdom as a whole the conference capacity may be summarized:

<table>
<thead>
<tr>
<th>Capacities</th>
<th>Main halls</th>
<th>Secondary halls</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base: 1678 hotels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with 136568 guestrooms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of halls provided</td>
<td>1678</td>
<td>2587</td>
<td>4265</td>
</tr>
<tr>
<td>Ratio per hotel</td>
<td>1</td>
<td>1.54</td>
<td>2.54</td>
</tr>
<tr>
<td>Totals conference areas (m²)</td>
<td>347118 m²</td>
<td>230574 m²</td>
<td>577692 m²</td>
</tr>
<tr>
<td>seating capacities</td>
<td>321405</td>
<td>213495</td>
<td>534900</td>
</tr>
<tr>
<td>(theatre style or banquet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Averages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area per hall (m²)</td>
<td>206.9 m²</td>
<td>89.1 m²</td>
<td></td>
</tr>
<tr>
<td>seating capacity per hall (m²)</td>
<td>191.5</td>
<td>82.5</td>
<td></td>
</tr>
<tr>
<td>area per hotel (m²)</td>
<td>206.9 m²</td>
<td>137.4 m²</td>
<td>344.3 m²</td>
</tr>
<tr>
<td>seating capacity per hotel</td>
<td>191.5</td>
<td>127.2</td>
<td>318.7</td>
</tr>
<tr>
<td>conference area per guestroom</td>
<td>2.54 m²</td>
<td>1.695 m²</td>
<td>4.233 m²</td>
</tr>
<tr>
<td>conference seats per guestroom</td>
<td>2.355</td>
<td>1.564</td>
<td>3.920</td>
</tr>
</tbody>
</table>

Within these figures there were wide variations from one region to the next. London conference hotels were generally large, with an average of 280.84 guestrooms per hotel, and offered more conference space per hotel although the ratio of space per guestroom was lower than in other regions.
The main regional characteristics may be summarized:

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of conference hotels</th>
<th>Number of guestrooms</th>
<th>Averages per hotel guestrooms</th>
<th>Averages per hotel conference seats</th>
<th>Ratios: conference seats per guestroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>127</td>
<td>35667</td>
<td>280.84</td>
<td>500.79</td>
<td>1.783</td>
</tr>
<tr>
<td>England, other than London</td>
<td>1170</td>
<td>75495</td>
<td>64.52</td>
<td>303.29</td>
<td>4.700</td>
</tr>
<tr>
<td>Scotland</td>
<td>256</td>
<td>17348</td>
<td>67.77</td>
<td>253.24</td>
<td>3.737</td>
</tr>
<tr>
<td>Wales</td>
<td>60</td>
<td>4352</td>
<td>72.53</td>
<td>355.00</td>
<td>4.895</td>
</tr>
<tr>
<td>N.Ireland</td>
<td>27</td>
<td>1381</td>
<td>51.15</td>
<td>547.22</td>
<td>10.698</td>
</tr>
<tr>
<td>Islands</td>
<td>38</td>
<td>2325</td>
<td>61.18</td>
<td>409.21</td>
<td>6.689</td>
</tr>
</tbody>
</table>

The statistical results of these surveys suggested a considerable over-provision of conference and banquet facilities, particularly in the regions. Based on the overall figures, the conference space was almost four times the room capacity of hotels, and much more in excess if the bedspace capacity was considered. Even if it were assumed that half of this space would serve as the dining or banquet area for a conference, there was a 96 percent over-provision compared with the guestroom accommodation.

6.1.1 Relationship with demand

According to the British Tourist Authority survey, 41 percent of conference delegates used overnight accommodation and a further 17 percent possibly did so although this was not recorded. Compared with the ratio of conference space to guestrooms, this would appear to justify the over provision.

On the other hand, the average size of conference quoted in the survey was 74.1 delegates and the average conference space per hotel could have accommodated more than twice this number (159 delegates), even assuming that only half the area was used for meetings and half for group dining and other functions associated with the conference.

From the survey figures the average hotel sampled ran 38.3 conferences per year each lasting an average of 1.58 days. Thus, hotel conference facilities were used on average 60.5 days per year and for an annual total of 4483 delegates. The annual utilization of the actual conference
space provided was only 7.71 percent even assuming, as before, only half the area was used as meeting space.

Comparison with the Scottish survey\(^{(2)}\) was more difficult in view of the grossing up of those results. However, the average Scottish residential conference involved 45 delegates whereas the average conference space per hotel was capable of seating 253 delegates or at least 127 if dual meeting and dining areas were provided. Assuming the SCGC members to which the survey enquiries were directed represented most if not all of the conference hotels the utilization of conference space in those hotels was only 2.07 percent.

Surveys of hotels in Northern Ireland\(^{(3)}\) showed an even greater disproportion, with over ten times as much space provided for conferences than that which could be supported by guestroom accommodation. In this case the facility provision was more directly influenced by the local demand for banquets and functions with conferences playing a minor role.

### 6.12 Size distribution of hotel conference facilities

In the United Kingdom the vast majority of conference halls provided in hotels were found to be for fewer than 100 delegates. Even excluding the small seminar rooms, some 69 percent of the conference halls and rooms were of this size.

Taking only the main conference area in each hotel, the distribution of hall and room sizes may be summarized as follows:

<table>
<thead>
<tr>
<th>Main hall capacity</th>
<th>Percentage of hotels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100</td>
<td>42.0</td>
</tr>
<tr>
<td>101-200</td>
<td>32.1</td>
</tr>
<tr>
<td>201-300</td>
<td>13.3</td>
</tr>
<tr>
<td>301-500</td>
<td>9.8</td>
</tr>
<tr>
<td>500-1000</td>
<td>2.45</td>
</tr>
<tr>
<td>Over 1001</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Details of the size distribution are given in appendix 14. Only 98 of the hotels had conference halls seating over 500 and 13 hotels could accommodate conferences of 1000. Most of the hotels with extensive conference facilities were located in London and a few in the resort areas. In every case, these hotels has also well developed exhibition
and banquet markets and it would appear that the size was determined as much by these factors as by the conference demand.

As shown in chapter 5.32 almost all the large conferences were those held by associations and their choice of venue is usually limited by practical considerations to the gateway cities and resorts.

6.2 Non-residential conference facilities in the United Kingdom

The studies described in chapter 5.43 showed that 95 percent of the conferences held in municipal halls and other centres were for associations and these included most of the large national and international meetings. In view of the important role played by non-residential facilities it was necessary to survey the types of premises used and determine their suitability for this purpose. In particular, it was important to examine the need for public investment in conference centres and the contribution which this could best make to the existing stock of facilities.

Most of the background data for this survey originated from the returns made to the British Association of Conference Towns by practically all the municipal authorities in the United Kingdom\(^4\). This basic information was supplemented by individual enquiries to the authorities or management concerned.

An analysis showing the types of premises and their size distribution is given in appendices 15 and 16. The aggregate conference seating capacity of the main non-residential halls was found to be 338900 with space for an additional 60,200 in supplementary rooms. However, the premises said to be available for conference use ranged from the pre-war pavilions and Winter Gardens of seaside resorts to theatres, cinemas, clubs, town halls, institutional premises and post-war sports halls. The majority were patently ill-equipped for modern conference requirements: many were lacking air-conditioning and technical services and others had no banqueting areas nor seminar rooms. Most were of a capacity determined by other user requirements and few could adequately accommodate an audience of more than 1200.

The contribution by the new purpose-built conference centres was clearly evident: not only did they fill some of the gaps in the 1500 to 5000 range of size but they also met the need for more comfortable
listening and viewing conditions which were deficient in most of the older halls and arenas of this size. In reviewing the size distribution of international association conferences in appendix 9 it is apparent that many of these could not have been accommodated in the United Kingdom without the facilities of the Brighton and Wembley centres.

This also demonstrates the difficulties in evaluating conference facilities. If the British Tourist Authority figures are taken as being representative the majority of non-residential conference accommodation was not used, or, at best, used only a few times each year. However, most of this accommodation was only available for conferences at certain times or was subject to other restrictive conditions limiting its use. It was also evident from the changes in venue which had occurred that, as more purpose-built centres became available providing facilities specifically for the large association meetings, there would be a rapid substitution of demand away from the less suitable premises.

6.3 **Comparisons with European capitals**

In the period 1975 to 1979 London attracted on average 180 international association conferences each year, the highest number recorded for any city. Using the market data examined in chapter 5.3 it was calculated that the 1979 income from those conferences alone would be £34.7 million. There has been much discussion about the adequacy or otherwise of the conference facilities in the capital (see chapter 2.8) and a summary of the existing accommodation is given in appendix 16.

It was important to compare this provision with that in other capital cities which are competing in the same international markets, particularly Paris, Brussels and West Berlin.

From details of the congress facilities in Paris \(^5\) in 1979 there were some 405 halls or rooms equipped for conferences with a total seating capacity of 102,000 in the following range of sizes:

<table>
<thead>
<tr>
<th>Seating Capacity</th>
<th>Up to 100</th>
<th>101- 250</th>
<th>251- 1000</th>
<th>1001- 5000</th>
<th>Over 5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of halls</td>
<td>217</td>
<td>101</td>
<td>74</td>
<td>11</td>
<td>2</td>
</tr>
</tbody>
</table>

Hotels in Paris provided a total of 31,482 rooms of which 11,942 were in 4 star or luxehotels, 9,565 in 3 star hotels and 9,955 in 2 star hotels.
Although all these were used for conference accommodation the first two categories were most suited for this purpose.

To measure the amount of conference space provided in relation to the guestroom accommodation in the hotels a sample of the 25 leading hotels were selected having an aggregate of 11,068 guestrooms. In these mainly high class hotels the average space provided for conferences and functions was equivalent to 1.315 seats per guestroom. This ratio was much lower than that provided in London hotels. Furthermore, very few of the hotels of 3 star or lower category provided any conference space and the average for all hotels would have been considerably less. These figures did not include the more specialised banquet area of the Concorde la Fayette associated with the International Conference Centre.

A similar survey of 20 leading hotels in Brussels\(^6\) providing 4673 guestrooms showed a ratio of 1.657 conference seats per guestroom, somewhat higher than in London but also applying only to a selection of high class hotels. In Brussels there was accommodation for a total of 18,680 conference delegates in the main halls of 13 non-residential congress centres and auditoria.

West Berlin has placed strong emphasis on the development of conference facilities. A survey of 31 leading hotels having 3879 rooms showed that they provided an average of 2.220 conference seats per guestroom, a much higher ratio than elsewhere.

Even without the new Congress Centre, there was conference accommodation for 11,460 in non-residential halls and for 60,000 if the university halls were included\(^7\).

According to 'Berlin Congress' 250,000 people took part in conferences and meetings in 1978 which would indicate an average use of each space for 4.17 conferences per year or twice this number if half of the space was set aside for conference dining.

These figures did not include the new Berlin Congress Centre which has 10 halls with a maximum seating capacity of 10364, almost doubling the previous supply of non-residential facilities.

In Dublin\(^8\) the 6 major hotels, which together provided 1342 guestrooms had conference and banquet accommodation equivalent to 5.876 conference seats per guestroom. Whilst this was higher than in most other cities it compared with the results obtained in Belfast reflecting the characteristic emphasis on banquets and functions in Ireland.
6.4 **Comparisons with American convention facilities**

To assess the type and range of size of convention facilities in the United States details were compiled showing the number of hotels and guestrooms available in 1977, the largest meeting rooms and ballrooms in hotels and the non-residential facilities\(^9\)(\(^10\)). Those facilities which were under construction in 1978-9 were the subject of a separate study to determine trends in design.

The results showed a total of 37,400 hotels and motels provided, in aggregate, 1.345 million rooms and a detailed examination of those hotels offering convention facilities produced the following upper distribution of size.

<table>
<thead>
<tr>
<th>Capacity of main hall</th>
<th>500-1000</th>
<th>1001-1500</th>
<th>1501-2000</th>
<th>2001-3000</th>
<th>3001-4000</th>
<th>Over 4001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hotels</td>
<td>575</td>
<td>302</td>
<td>58</td>
<td>22</td>
<td>18</td>
<td>10</td>
</tr>
</tbody>
</table>

Whilst only the halls of 500 or more seating capacity are shown, the tendency towards large convention halls and ballrooms was in contrast to the survey findings of hotels in Europe in which only exceptionally were conference facilities provided for over 1000.

A parallel survey of non-residential halls produced similar results which emphasised this difference in scale of American conventions. Some 108 halls, auditoria and theatres in the United States provided a range of convention seating capacities from 2000 to 14,000. A further 46 coliseums and covered arenas extended this range from 8000 to 30,000 and more. Details of these sizes are given in appendix 17.

6.5 **Individual hotels**

Whilst the overall figures were valuable as an indication of the extent of provision made for conferences it was equally important to examine the arrangements of facilities and the patterns of their use. For this purpose the plans and operational procedures of 40 hotels were examined in detail. Planning criteria are discussed in later chapters but, for the purposes of evaluation, the following median
figures for space utilization were obtained;

<table>
<thead>
<tr>
<th>Seating Plan</th>
<th>Theoretical (a) area (m²)</th>
<th>Actual area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theatre style</td>
<td>0.8</td>
<td>1.00</td>
</tr>
<tr>
<td>Classroom style</td>
<td>1.6</td>
<td>1.80</td>
</tr>
<tr>
<td>Boardroom or U shape</td>
<td>2.0</td>
<td>2.52</td>
</tr>
<tr>
<td>Banquet layout</td>
<td>1.0</td>
<td>1.20</td>
</tr>
<tr>
<td>Reception</td>
<td>0.8</td>
<td>0.96</td>
</tr>
<tr>
<td>Dinner dance</td>
<td>1.2</td>
<td>1.38</td>
</tr>
</tbody>
</table>

NOTES:
(a) Calculated from model drawings

Comparisons between the design of post 1969 hotels in which conference facilities have been purposely provided, and that of earlier premises in which conference areas were often adapted out of obsolete lounges and ballrooms is not very meaningful and only the former group are described in this section. In addition, the few highly specialised facilities such as the conference suite in the Heathrow hotel have been discounted. The selection of hotels for analysis was made from 1974 listings, and other premises built since that time.

The standard formal adopted by most international hotel companies, was the provision of one large function hall or ballroom capable of division into 2 or 3 separate rooms, together with one or two meeting rooms of fixed dimensions, and a number of small syndicate or boardrooms. In operational terms this gave a wide flexibility to meet different meeting and function requirements.

In the sample of hotels examined, the main hall or ballroom invariably had a maximum capacity of 200, 250, 300 or 350 with division to provide areas seating about 60, 100 or 120. Other meeting rooms typically accommodated 40 to 60 and syndicate rooms 20 to 30 depending on layout.

The median ratio of conference seats to guestrooms was 2.033, considerably less than that calculated overall and reflecting a rationalisation in the design of conference areas in modern hotels.

Various patterns of use were examined using hypothetical models with different combinations of conference room size. The results showed the following optimum ratios to provide maximum flexibility for conferences giving 100 percent guestroom occupancy.
Typical hotel

<table>
<thead>
<tr>
<th></th>
<th>Theatre style</th>
<th>Banquet</th>
<th>Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main hall (With 3 sections : each)</td>
<td>240</td>
<td>200</td>
<td>130</td>
</tr>
<tr>
<td>Subsidiary room (With 2 sections : each)</td>
<td>200</td>
<td>170</td>
<td>110</td>
</tr>
<tr>
<td>Syndicate rooms</td>
<td>2 x 50</td>
<td>2 x 40</td>
<td>2 x 25</td>
</tr>
</tbody>
</table>

Ratio: Conference space : guestrooms 2.70

In practice, the conference occupancy of an hotel would rarely reach this level and other marketing factors would have an influence on the function room sizes required. However, this model demonstrates the excess provision which has been made in many older hotels.

6.6 International comparisons

The objectives of the surveys described in this chapter were to determine the extent of conference facilities in hotels and non-residential establishment with the view to assessing their degree of utilization and, hence the feasibility of investment. The results showed that in Europe, at least, there was clearly an excess of conference space although evidently much of it was ill-equipped for present day requirements.

Similar conclusions were drawn from an independent survey of the German convention scene in 1980 by Tagungsland Bundesrepublik Deutschland. The study which followed similar lines to this research indicated that, in one year, 8 German cities hosted 4407 conferences with a total 939,000 delegates and an estimated turnover of £150 million.

In the list of conference facilities, which contained only 183 entries and, therefore, represented a fraction of the total, the German Convention Bureau put the total plenary capacities of these premises at 265,343 seats. Theoretically, at least, the facilities had an average conference occupancy rate of less than 8 days per year. This was also confirmed by the findings of the Berlin Congress (chapter 6.3).

In view of the apparently low utilization of conference facilities in the United Kingdom, it was important to examine the situation in other countries. For example, the growth of international conferences in
South East Asia warranted further study, particularly in view of the massive investment in hotels and conference centres in that area. To obtain comparable details from America and Canada the statistics of meetings obtained from 12 cities were analysed in detail. The examples of Montreal and Shreveport-Bossier are quoted as being representative, the latter demonstrating the total extent of local use for conventions and other functions.

<table>
<thead>
<tr>
<th></th>
<th>Montreal</th>
<th>Shreveport</th>
<th>Hong-Kong</th>
<th>Singapore</th>
<th>Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of conference hotels</td>
<td>24</td>
<td>15</td>
<td>21</td>
<td>25</td>
<td>8</td>
</tr>
<tr>
<td>Total conference seating capacity</td>
<td>29763</td>
<td>3200</td>
<td>11905</td>
<td>11362</td>
<td>7170</td>
</tr>
<tr>
<td>Number of other centres</td>
<td>1 (a)</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Seating capacity</td>
<td>15000</td>
<td>5820</td>
<td>3312</td>
<td>7021</td>
<td>-</td>
</tr>
<tr>
<td>Number of conferences</td>
<td>314 (b)</td>
<td>311</td>
<td>-</td>
<td>119</td>
<td>61</td>
</tr>
<tr>
<td>Number of delegates</td>
<td>132313 (b)</td>
<td>69353</td>
<td>14582</td>
<td>14591</td>
<td>10693</td>
</tr>
<tr>
<td>Delegate use per year (c)</td>
<td>5.91</td>
<td>15.38</td>
<td>1.92</td>
<td>1.59</td>
<td>2.98 (d)</td>
</tr>
<tr>
<td>Days use per year (e)</td>
<td>23.64</td>
<td>8.64</td>
<td>6.36</td>
<td>11.98</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
(a) Bonaventure centre only. Other centres discounted
(b) Based on averages for 3 years. Includes 32 trade shows.
(c) Assuming ½ use for conference ½ for banquet or dining
(d) Conferences held in hotels only.
(e) Average taken as 4.0 days. Except Singapore - 4.5 days

Sources: National and local conference records and data on facilities supplied by tourist offices and convention bureaux.

These figures are higher than theoretically required since it would be possible for the same areas to serve both for meetings and banquets. Furthermore, only the most suitable non-residential meeting facilities have been taken into account and others would probably be used, particularly for the trade shows and largest events. University accommodation was not included.
Similar calculations were applied to a number of other cities in the United States, Canada, Australia and Europe where the number of conferences and delegates had been recorded. Median results suggest that the existing convention facilities were used about 18.5 days per year. This was also the case in the areas in which it was planned to provide a purpose-built conference centre such as in Sydney and Melbourne.\(^{(13)}\)

The figures quoted are based on 100 percent occupancy for each event which is unlikely to be achieved even with a high degree of organisation. Design capacities are frequently based on the maximum numbers likely to attend an important function or congress which might only occur once a year or less frequently. At other times the attendances will vary widely and even with a range of different sized and divisible halls and rooms a full room occupancy will be the exception rather than the rule.

Against this the numbers of delegates quoted are those attending plenary sessions with close grouped seating. For most working sessions classroom style arrangements are likely to be required giving about one-half of the seating capacity. To some extent this has been allowed for in the calculations.

### 6.7 Other uses of conference facilities

From the statistics quoted, even allowing for less efficient use of the space, it is evident that, in the majority of premises, the conference use is only a small part of the total occupancy. In the case of non-residential premises the primary use is normally well defined as a theatre, arts centre, sports hall, ballroom, exhibition area, university lecture theatre or other facility. Conference usage is thus seen more as a supplementary benefit, particularly when this occurs outside the peak periods of normal use.

Even purpose-built conference centres are rarely designed for this use alone. As indicated in chapter 1.7, the cost of providing a conference centre has usually been justified on the grounds that it will also provide a needed local facility as well as a stimulus to conference development. These variations in the brief clearly affect the design of the premises and are examined in later chapters.
Apart from residential conferences and trade fairs, hotel function areas cater for a wide variety of requirements which tend to be locally orientated with fairly distance sensitive catchment areas. Market demands for lunch meetings, banquets, dinner-dances, exhibitions, shows and displays, receptions and parties will depend largely on the location of the premises in relation to commercial and residential areas, its reputation and local competition. Furthermore, these demands are seasonal in emphasis with most of the social functions occurring at week-ends and in the November to January period.

A detailed survey of the types of functions held in 20 city and urban hotels in 1978 showed wide variations in range scale and frequency. However, with few exceptions, the range of utilization of function space gave the results summarized below. Exceptions applied to hotels in particular favoured localities, such as in the City of London generating a high demand specifically for lunch meetings. In other cases, there was a high social and entertainment use of the facilities.

For the purposes of this study the utilization was calculated from the annual totals of the numbers of participants compared with the capacity of the facilities provided.

<table>
<thead>
<tr>
<th>Function</th>
<th>% utilization (a)</th>
<th>Exceptions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lunch groups</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Lunch with meeting</td>
<td>2-7</td>
<td>60</td>
</tr>
<tr>
<td>Dinner</td>
<td>2-10</td>
<td></td>
</tr>
<tr>
<td>Dinner-dance</td>
<td>1-6</td>
<td>14</td>
</tr>
<tr>
<td>Exhibition</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Show</td>
<td>0.1 - 0.5</td>
<td></td>
</tr>
<tr>
<td>Cocktail party</td>
<td>0.1 - 2.0</td>
<td></td>
</tr>
<tr>
<td>Buffet</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Meeting</td>
<td>3-5</td>
<td></td>
</tr>
<tr>
<td>Discotheques</td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

Some of these functions overlap, using the same facilities but at different times of the day. In practice, this conversion was found to be not always possible and a high utilization was difficult to achieve due to the variations both in demand and in the numbers attending each function.

To draw a comparison with other hotels which had developed a substantial
conference business, the occupancy statistics of 4 conference hotels were examined in detail. In each case the utilisation of the conference space was 12-13 percent of the total function area provided or 24-26 percent if an equal amount of space was set aside for dining purposes.
6.8 Discussion

The objectives of this part of the research were to quantify the supply of conference facilities and to determine their extent of use for this purpose. Whilst many premises were put forward as being suitable for conferences very little research had been done to determine the ratios of space provided and the number of occasions those facilities were in fact used. This relationship between demand and supply was particularly important in considering requirements for new projects.

From the findings of the surveys it would appear that the provision of conference space in hotels was often excessive compared with the guestroom accommodation and very much under utilised for this purpose. However, this space was not used only for conferences: local requirements for lunches, meetings, banquets and social gatherings and events could justify a higher provision, although even this was not always evident.

Hotels gained other advantages in that the seasonal increase in conference demand tended to occur at times outside the peak holiday periods thus extending and increasing overall the guestroom occupancy. Other hotel services such as the restaurants, bars and minor operated departments also benefitted.

The credit gained from those secondary benefits and the extent to which the conference area in itself could be self-financing called for further studies in this subject, which are discussed in chapter 32.

In non-residential accommodation, conferences generally represented only part of their use and, in most cases, a subsidiary function. However, this relationship is tending to change as new and better equipped facilities become available. It was demonstrated by the analysis of demand and supply that the space available for conferences was greatly in surplus. As a result of the increased competition between destinations and the strong promotion of purpose-built centres described in earlier chapters, the standards demanded by conference planners and organisers have been repeatedly set at higher levels(14).

Therefore, in order to plan future facilities intended to be used for this purpose, even if this is a minor role, it was important to establish a set of design criteria and standards based on the most recent developments. To meet this objective the research called for a detailed examination of the new facilities which had been provided as well as those currently being modernised.
References  Chapter 6

(1) British Tourist Authority, "The UK conference market, 1977", loc cit Ch 1 (14)

(2) Scottish Tourist Board, "The residential market in SCGC member establishments, 1975, loc cit Ch 1 (15)

(3) Lawson FR, "Conference requirements in Belfast", Report to City Council", unpublished, Belfast, March 1979

(4) BACT, "Meeting places: a manual of conference venues in Great Britain, Scarborough, British Association of Conference Towns, 1979-80

(5) Tourist Office, Paris, personal correspondence 1979

(6) Brussels: Convention Bureau; personal correspondence, 1979

(7) Berlin Convention Bureau; personal correspondence, 1979

(8) Irish Tourist Board; personal correspondence, 1979

(9) United States Travel Service, "USA, Conventions, Congres, Kongress", United States Travel Service, US Department of Commerce, 1977

(10) Individual City Convention Bureaux; personal correspondence 1979


(12) Tagungsland Bundesrepublik Deutschland, TW Tagungs - Wirtschaft, March/April, 1980

(13) Melbourne Convention Bureau, personal correspondence, 1979

(14) Lawson FR, "Environmental standards for conference and exhibition halls", Environmental Health; to be published early 1981
Hamburg Congress Centrum This is a purpose built facility, opened in 1973, which can accommodate almost 7500 persons in groups of 30 to 3000. Within the building complex is the Hamburg Plaza hotel (1185 beds), subway and rail stations and underground garaging. Each main hall has its own foyer linked by terraces and stairways.
7.1 **Range of facilities**

Studies of the facilities provided for conferences and exhibitions involved contact with many of the architects and engineers responsible for the design and with the management concerned in the operation. The plans and outline specifications of 40 centres, including multipurpose halls, and of over 45 hotels were examined in detail.

Whilst each project exhibits individual features which are specific to its location, role and design, the facilities and services provided to meet operational requirements can be evaluated on a common basis. These have been analysed both in relation to the fundamental background to each subject and against operational trends in order to establish planning criteria and standards.

The range of facilities involved in accommodating conferences and exhibitions is extremely wide. At one end of the spectrum are the purpose built centres which may be individual buildings or part of a larger complex. In Wembley, for instance, the conference centre is self-contained with its own exhibition areas but hotel accommodation is separated. The centres in Hamburg, Monte-Carlo and Paris all include hotels as part of the development and this is also a feature of the multi-facility projects being planned in Canada and the United States.

Complexes such as those recently constructed in Winnipeg, Calgary and Georgia as well as the Bella Center, Copenhagen, McCormick Place, Chicago and Place Bonadventure, Montreal, are primarily exhibition centres although they also provide multi-purpose conference halls and other services. The National Exhibition Centre, Birmingham has also a multi-purpose hall although conference facilities are also provided in the hotel Metropole within the site.

In other locations new conference centres are adjacent to, and usually linked with, established exhibition grounds. This applies particularly in Harrogate, Berlin and Hamburg. The Philippine International Convention Center is also part of a complex of exhibition and cultural facilities being developed on the same site.

A modified form of development is represented by the development of the World Trade Centres in 16 of the leading commercial capitals from Hong-Kong and Singapore to New York and London. The majority of these
projects are vast schemes encompassing hotels, shops, offices, restaurants, commercial services and residential accommodation, and extending over several phases of building into the mid-1980's. All include conference facilities with associated hospitality suites and display areas.

Many of the large convention halls constructed in the United States are essentially multi-purpose, catering for indoor spectacular sports, staged events and road shows, and exhibitions as well as convention gatherings. These include the vast domed structures at Louisiana and Houston. Most of the American convention centres are linked with other community buildings which have been progressively extended to accommodate changing requirements. The Pennsylvania Hall built in 1979, is the latest addition to the Philadelphia Civic Center and large extensions are currently being built at Anaheim and Hartford.

A vast programme of convention centre building is currently underway in the United States. Seen as a way of stimulating the redevelopment of obsolete inner city areas, these projects invariably include offices and residential accommodation as well as shopping arcades, restaurants, one or more hotels and convention halls. The scale of such projects is illustrated by the Renaissance Center, Detroit. Amongst the large new convention and exposition centres due to open in 1980-81 are those at Virginia Beach, Pittsburgh and San Francisco.

The development of conference centres has not been confined to the industrial nations. Prestigious new buildings, in some cases with international funding, have been constructed in Khartoum, Mecca, Riyadh and Nairobi. The Sava centre in Belgrade covering an area of 50,000 m² represents one of the largest projects undertaken in Europe.

Elsewhere conference centres have been built in many resort areas, both in those recently developed like Malaga-Torremolinos, Portaroz and Puerto-Rico, and the traditional European resorts such as at Brighton and Monte-Carlo.

7.1.1. Hotels
Details of the extent of conference space relative to the guestroom accommodation are considered in chapter 6. Amongst the trends in the design of conference hotels has been the increasing use of atrium lobbies, often extending up to six or more storeys in height and exotically
Representative of the large American convention hotels, the Sheraton Waikiki, with 1,900 guestrooms, has 20 convention rooms occupying the second floor, including a divisible ballroom which can seat 3,500. The service kitchen is also located on this floor. Access is facilitated by escalator, staircase and a total of 11 lifts.

Architects: Wimberley, Whisenand, Allinson, Tong and Goo.
landscaped. Introduced as a feature of the Hyatt Regency Hotels this concept has been adopted in many of the latest Sheraton Hotels (Honolulu, Manila, Hong Kong) as well as by others. A similar approach has been used in the latest Holiday Inn at Portsmouth in which the lobby with a high sloping roof has been used as a linking structure between the tall guestroom block and single storey function room area.

The practical need to separate the structures of the cellular guestroom building and the large span function areas has, in most cases, been reflected in the design of multistorey guestroom blocks having podium extensions to accommodate the function rooms. In some of the larger hotels, such as the Four Seasons, Toronto and Miyoko hotel, Tokyo, these extensions are multistorey including shops, restaurants and other facilities which are linked by escalators and arcades.

To facilitate access the vast majority of conference and exhibition halls are at ground floor level or no more than one storey above or below. There are, however, exceptions, like the Y hotel in central London, where the limited site area required the conference suite to be located in the basement.

As indicated in chapter 6.7 hotel facilities are not only used for conferences but, depending mainly on local demand, serve for receptions, dinner dances, banquets, shows, exhibitions, formal dances, discotheques and other events. In essence, the conference halls are multipurpose in function and adaptable in size.

Surveys of the main conference hotels in the United Kingdom showed that this adaptability is achieved in two ways. Most of the hotels built prior to 1939 had converted lounges or ballrooms which although limited in re-arrangement had excess space which could allow a variety of events to take place. The problems of excess facility provision have been illustrated in chapter 6.

In the post 1968 period most new hotels provided conference halls designed and equipped to some extent for adaptability. Specifically this research covers many of the 165 hotels having more than 100 bedspaces which were built or greatly extended since that time. The majority of these hotels - 141 - were, in fact, constructed under the stimulus provided by the Hotel Developments Scheme, and to some extent the design criteria have been modified to take account of later features.
To meet the varied needs indicated practically all the conference halls in these hotels have a simple rectangular plan which is capable of being divided or modified in space. Each divided section is provided with separate access for visitors and for catering and other services enabling it to function independently. The design of the engineering services, including air conditioning, illumination, electrical power and weak current installations allows for these separate requirements whilst, in each case, also providing a balanced system when the areas are combined.

Average space requirements are indicated in chapter 6.5. In most cases there is a reduction of about 4 percent in capacity when the room is divided. The optimum ratio of plan dimensions for halls of 250m² or more in area is usually 1:2 with the longer length being divided into 3 enabling a conference to be better serviced, for example, whilst one section is being used for a meeting another can be laid up for a banquet. In practice the middle zone is often used as a sound buffer and surplus furniture store.

In theory the ideal size division of the area should be 0.8, 1.0 and 1.2 (see chapter 6.5) but equal sections are invariably provided. The largest banqueting halls in the United Kingdom, seating up to 800 theatre style have clear spans of up to 20m, those for 500, have a median span clearance of 15.8m and for the more common 300 capacity halls the median span is 12.2m.

Halls seating 250 to 150 are more satisfactorily divided into 2 and the optimum plan ratio of dimensions is 2:3.

There is a wide variation in ceiling heights even if only post 1970 hotels are considered. As a rule the minimum height is 2.7m increasing to 3.0m for medium capacity halls and to 3.6m or even 4.2m for larger ballrooms. The corresponding median ratios of height: floor area range from about 1:60 to 1:80 and 1:120 or more with increasing size.

Excessive height can be a drawback when these large areas are divided, adding to the costs and difficulties potential visual, airconditioning and acoustic disadvantages in the narrower sections. In some cases the full height is limited to ceiling lighting wells. Ceiling clearance heights are often critical for exhibition requirements and this aspect is discussed in detail in chapter 9.
The main doors leading into a large ballroom are often 2.4m or more high and in some cases sections of partitioning separating the hall and foyer are removable enabling the two areas to be linked. Most circulation routes serve also as means of escape in the event of fire and need to comply with these specific requirements (see chapter 11.3).

Doors for service entrances must lead from a wide corridor or service lobby which is used not only as a waiting area but to reduce noise and possibly light intrusion from the banquet kitchens as well as to balance the ventilation extract.

7.1.2. Movable partitions
To allow for operational needs, movable partitions used to divide a hall into sections must be simple in mechanism, quiet in operation and capable of being fully assembled or stacked by one operator, folding or being stacked away into a purposely designed recess or adjacent store with minimum room disturbance. The concentrated weight or upthrust may be critical and limits may apply to the size or height of panels and methods of track laying. For space separation requirements, a 1½-hour fire resistance, with a class 1 rate of surface flame spread usually applies.

High standards of sound insulation are essential including the stopping of edge flanking paths. Most systems in present use are based on folding partitions suspended for overhead track and operated manually, from or by installed mechanism. Single panel fold partitions with a typical panel weight of 14.5kg/m² and suitable edge sealing, can give up to Sound Transmission Class (STC) 30(1) and may be used in parallel with the intervening space forming an acoustic isolator. Twin panel fold partitions with a mass of 34kg/m² can provide up to STC 43 and a higher insulation is achievable with heavy horizontal folding partitions although the latter may need curtain screening.

STC 40-45 is barely adequate to exclude loud speech and for exhibitions associated with meetings a standard of STC 50-55 is necessary. This will require a more massive structure and/or the use of dual partitions to create a separating void. For hotel requirements where the probability of high noise generating and noise sensitive activities occurring at the same time is low and to some extent controlled, this usually represents the practical and economic limit.
7.1.3 Technical services

In the halls described as 'ballrooms', the central one-half or one-third of the floor is specifically designed as a dance floor, usually sprung but secured and covered with carpeting for other uses. In other cases a permanently carpeted floor is provided which, for dances can be overlaid with interlocking panels to form a dance square or with illuminated floor panels for discotheques.

Stepped floors to elevate successive rows of seating are rarely installed although three hotels have permanent cinemas which also serve as lecture theatres. However, this specialised facility is in addition to the normal banquet hall provisions.

Most existing floor in hotel banquet halls are designed for a uniform loading of 4.8kN/m² although a few can take up to 24kN/m², particularly where the emphasis has been placed on exhibition needs. The normal practice, apart from the dance floor areas, is for the carpet to be laid on the treated concrete screed.

Conference halls in most existing hotels, even those of recent construction, provide only perimeter service connections for portable equipment, necessitating the use of long trailing leads for almost every conference and exhibition requirement. In the halls built post 1970 the best to average range of provision is one 13amp socket outlet per 10 to 20m² floor area, with 3 phase supplies to specific points. Microphone points are also in ratio of 1 per 10 to 25m² with a similar number of other line inputs. These arrangements and the extent of provision vary with the way the areas are divided.

For easy adaptation and variation in use more extensive electrical services are required. In addition to numerous outlets for standard voltage and 3-phase supplies, connections are required for installed signal control relays and other weak current systems. The latter include telephone jackpoints, closed circuit television relays, microphone and other line inputs to sound systems. Connecting terminals must allow for equipment to be used in different positions, relative to the alternative seating plans, and for direct or remote control.

All connections must be labelled, standardised and specific to each system. A plan of the layout will be required for conference and exhibition organisers.
Wiring enclosures to allow for future adaptation and extension can be grouped into three types of provision. Underfloor ducts are most common with distribution parallel to the room divisions but avoiding permanent dance floor areas. Perimeter services are usually in concealed wall ducts or skirting trunking whilst suspended equipment is serviced by ceiling ducts or cable trays with drop conduit to the terminals.

Provision must be made in the ductwork for separation of high and standard voltage and weak current and screened cables. Details of electrical installations are discussed in chapter 10.9.

Although rarely provided, induction loops or wired services for simultaneous interpretation and transmission of the recordings should be installed in at least one of the conference rooms of each major hotel. As with loudspeaker systems this must be related to both the whole and each separated area of the room or hall concerned.

Ceiling details are often complex, incorporating acoustic absorption, using tiles or fibrous plaster; airconditioning with ducts in the ceiling void and diffuser or grille terminals incorporated in the design; a variety of luminaire arrangements having separate switching and dimming facilities; and automatic fire protection with detectors, sprinklers and alarm relays.

To allow for frequent use a high standard of airconditioning must be installed to ensure removal of cigarette smoke, occupancy and food odours. Generally 6-8 air changes per hour are provided but freshening may need to be supplemented between use, by greatly increasing fresh air entry or by the use of absorption techniques. The ventilation must be fully balanced to allow for room division and adjustable to individual needs. Details of airconditioning design are discussed in chapter 10.6.

Most of the banquet halls surveyed have both fluorescent and incandescent luminaires, but, in many cases, with limited switching facilities. The luminaires must ensure an adjustable level of background diffused light with preset dimming and have separately controlled spot or feature lighting for mounting visual displays. Blackout blinds for windows are essential to allow screen projection and should be motorised to allow control with the lighting from a central lectern or operating panel.
Emergency lighting outlets - about 1 in 10 depending on local requirements - must be installed as well as exit signs.

Technical developments in lighting systems and controls are discussed in chapter 10.

7.1.4. **Purposely designed congress centres**

The need for flexibility in a purposely designed congress centre is usually met by providing a number of halls each catering for a specific use.

The main congress hall is invariably designed for large audiences with raked seating to give good sightlines and acoustics. The auditorium may, however, be capable of extension or partial closure to meet different needs and these arrangements are considered below.

A separate hall is normally provided for exhibitions, although in some cases such as in Berlin, Hamburg and the future Barbican scheme there are linked exhibition facilities elsewhere on the site. This hall may also be used for banquets and receptions.

For seminars, conferences and syndicate use a separate suite of meeting rooms of different sizes is generally included within the complex in addition to supplementation of meeting facilities by the hotels providing accommodation for delegates.

In some cases 'business suites' may also be available to companies using the centre. This practice is particularly evident in the United States.

Apart from this flexibility within the accommodation, the main congress halls are often used for other purposes, serving broader community needs as well as ensuring a higher utilization throughout the year.

Depending on its location and management policy the hall may be used as in Wembley and Paris to stage shows and spectacles, or sporting events as in Brighton. The Monte Carlo centre is equipped as a concert hall and others serve as theatres.

Each alternative type of use requires provisions to be made in the design and equipment: for example, in stage space and rigging; in orchestral space and modification of acoustics; in scenery storage, workshops, dressing rooms, practice rooms and in stage lighting and other requirements.
Sava Congress Centre, Belgrade

The first stage of the Sava Centre was designed and built in 12 months, 1976-77 and the annexe containing the Great Hall, which seats 4,000 followed in 10 months. Involving extensive prefabrication, the main structure is formed from prestressed concrete lattice girders and most of the facades are glazed. The central hall can seat 1,100 or be partitioned into smaller sections. There are 6 other halls and 35 individual suites of offices in addition to extensive catering services and press facilities.

Architect: S. Maksimović
Whilst some degree of flexibility can be accommodated at reasonable cost and with satisfactory results there is a limit to multiplicity of use. Apart from design difficulties, the costs of providing for different requirements and of operating a multipurpose centre may become disproportionately high.

Auditoria with raked seats can be divided into smaller areas in a number of ways. The most common arrangement, which is used, for example, in the Geneva International Congress Centre, is to vertically separate off a balcony or the area under a balcony by means of a vertical partition, thereby creating a number of smaller rooms. A similar arrangement to reduce the seating and volume of a theatre by lowering the ceiling to close off the balcony section is provided in the new Civic Theatres in Nancy and Plymouth. The Great Hall of the Sava Centre also has an adjustable ceiling and other examples of ceiling rigging in American theatres are given by Izenour (2).

The division of the floor area of the auditorium into two or more rooms is less practical but one such arrangement is provided in the Congres Centrum in Berlin in which the central stage area can be closed off between the two largest auditoria.

Changes in apparent size may also be achieved by increasing or reducing the levels of lighting over different areas of seating. By dimming the lights over, say, the rear of an auditorium, the activity and interest can be concentrated into the front section if the acoustics are appropriately balanced, particularly if continental seating arrangements are adopted.

In a very large auditorium, variety in choice of seating, an apparent reduction in scale, a sense of identify with a smaller group and a better acoustic orientation can be achieved by dividing up the seating into segments at different levels. In other cases, as in the Wembley Centre, sections of seating may be differently coloured.

7.1.5. Changes in seating

Unlike the use of halls which allow movable chairs and tables to be arranged on each occasion to suit the conference requirements, auditoria with raked seating are essentially fixed in layout. This has the advantage of increasing capacity per unit area and enables the acoustic
Completed 1977, the Brighton Centre provides a multipurpose hall capable of seating 5,000, together with a second hall (750m²) and mass media area with studio and press facilities. To allow flexibility in use the main hall has balcony seating around the perimeter with bleacher extensions into the central flat floored area. The latter can be used for exhibitions, shows, spectator sports or banquets. Architect: Russell, Diplock Associates
and viewing conditions to be more precisely determined.

Some changes, even in fixed furniture, are possible although usually at great cost and subject to licensing and other egress requirements. Writing tablets, capable of being folded when not required, can be fitted to the seat arm or writing shelves attached to the backs of the preceding rows. In both cases egress must not be obstructed and the movement must be simple, noiseless and free from hazard. Another means of adaptation, used in the Berlin and Barbican centres is to replace alternate rows of seats with desks, these being purposely designed to fit and lock securely in place. The change from theatre style to classroom style seating, whilst reducing capacity, offers scope for a wider range of conference - seminar - syndicate uses for the auditorium.

The most common form of hall designed for extensive changes in use is one with the central floor area flat with fixed perimeter seating in steps or tiers at a higher level. The flat area can thus be re-arranged to suit different requirements. To increase the seating the flat section can be converted to the stepped form as in the Brighton Centre, by means of bleacher seats or folded seating platforms.

Flexibility in layout and use is also commonly provided by the use of elevating thrust stages which, whilst reducing adjacent seating widen the directional angles of view.

7.1.6. Multipurpose Halls
Many of the halls used to accommodate conferences, particularly for the plenary sessions, were designed as concert halls or theatres and, in other cases, supplementary rooms serve for this purpose. For example, the Finlandia Hall, Helsinki staged 159 concerts and 171 conferences and exhibitions in 1976 with 184700 and 165400 visitors respectively. Other major halls used for dual purposes include the Oslo concert hall, Sydney Opera House and Kongresshaus Innsbruck.

The trend in designing theatres or cultural centres, particularly in provincial areas is to provide for a range of use which can include conferences and, in some cases, banquets. This concept has been used in the Hexagon, Reading, the Alfred Beck Centre, Hillingdon and in the Civic Theatres under construction in Cardiff and Plymouth as well as in the design of many of the cultural buildings in Europe such as at Felbach.
Centre Internationale de Paris with the 1000 room Concorde la Fayette hotel in the background. The main auditorium in the centre seats 3650. Architects: G. Gillett, H. Guibout & S. Malotetenkov

Wembley Conference Centre: The circular building encloses a wide fan-shaped auditorium. Exhibition/banquet halls occupy the rear extension. Architects: R. Seifert & Partners
The additional cost of adapting a theatre for congresses is small although the provision of banqueting facilities for the delegates - often as an extension to the foyer - may impose operational difficulties and it is generally not practical to include exhibition space for trade shows. Since the last two requirements tend to be directly associated with major congresses, the multipurpose civic hall may be at a dis-advantage unless suitable support facilities can be provided in the local hotels.

A similar approach has been adopted in some of the more recent university buildings. The Arts Faculty Building in Trinity College Dublin is also described as a university conference centre and provides facilities which are designed to accommodate this extension of use. A more specific development is represented by the Iktuuri Conference Village in Finland which provides full hotel and conference facilities associated with the student residences.

The concept of the University conference centre is more widely developed in the United States with a number of universities, notably Princeton, planning and operating executive conference centres.

7.2 Spatial relationships

The varied nature and scale of premises make it difficult to define spatial relationships and enclosure requirements in precise detail. In most civic theatres and multipurpose halls the auditorium and stage house occupy the major part of the building and this largely dictates its shape and the relative positions of the foyer and other subsidiary areas.

Large conference centres are mostly planned so that the main halls occupy the centre of the building, isolated and surrounded by circulation space and subsidiary rooms which require natural light. As in the Paris and Wembley Centres, the shape of the building may be closely related to that of the hall or the exterior may be determined by street frontage lines like that of the National Palace of Congresses in Madrid.

More exceptionally, the halls may form the perimeter of the building around a central circulation zone as illustrated by the congress centre at Malaga - Torremolinos.
Emphasis may be given to vertical integration with facilities on several floors as in the Kyoto and Berlin Centres or to mainly horizontal relationships between linked facilities and buildings.

In general terms the functional and constructional factors which affect the building layout and ultimately its architectural form can be grouped into structural features, user needs, operational services and environmental control.

For economy in structural design, it is necessary to identify and zone those areas which require large spaces free or relatively free from internal obstructions; areas such as the auditoria and exhibition halls.

As illustrated above, constructional zoning will be influenced by the relationships between the building and its site, by emphasis on vertical or horizontal circulation and by the need to group together associated user and user-servicing facilities or, in some cases, to provide means of fire and noise separation. Aspects of structural design are discussed in 7.3.

User requirements include convenient access to the various facilities arranged as far as possible in their sequence of use. Separation of activities particularly where there is a potential conflict of interests is also important to enable each to be given attention. This also applies to safety and means of escape in the event of fire.

Operational requirements demand particular attention to be given to the location of services relative to their use. Thus, for example, the location of stores relative to kitchens and kitchens to restaurants and banquet areas will have a major influence on both the horizontal and vertical layout.

Environmental control includes making the best use of natural daylight and vistas for those areas which will most benefit - restaurants, lounges, offices, meeting rooms, rest areas. Internally, the technical distribution of services and location of plantrooms will be related both to functional and structural requirements.
7.2.1. **Relationship with operational services**
Operational area such as projection, lighting, sound control and interpretation booths or rooms will need to be located in or immediately adjacent to the hall and this position is normally specific in relation to the plan and seating arrangement. Stage equipment both above and below the stage level is also determined by the operational requirements.

For flat floored halls the furniture stores must be easily accessible and preferably at the same level and this also applies to banquet service kitchens. However, if adequate lifts are provided the floor level of siting for the main kitchen or main store is not critical provided it is supplemented by a finishing kitchen adjacent to the point of service. Similar provisions apply to bar services and to the restaurants and coffee shops elsewhere within the premises.

Other service requirements are more flexible with different weightings of importance attached to their relative locations. For example, printing rooms, stores and workshops should have good access to the loading dock. Plantrooms may need to be near the areas served for economy but also grouped for operational control and efficiency.

The positions of restaurants and lounges are likely to be chosen for the vistas they provide and this will thus determine secondary circulations. As a rule the circulation of visitors, residential guests and service personnel must be independent coming together only at points where services are provided.

7.3 **Structural Design**
Structural design is dictated by the spatial arrangements within the building, by its architectural form and features and by the site and constructional conditions.

For rationalisation and economy it is necessary to identify and zone those areas which require large spaces free or relatively free of internal obstructions; areas such as auditoria and exhibition halls. As a rule these will occupy 2, 3 or 4 equivalent storeys in height and will need to be clear of superimposed unrelated building.

Structural design will also be affected by the spatial relationships discussed in 7.1.4 and 7.2. For multipurpose halls the requirements for stage housing will be a major consideration as, in the case of larger complexes, will be the relationship with taller slab and shearwall buildings.
accommodating hotel guestrooms.

Site conditions clearly affect the foundation design and costs, and restrictions in working space may in themselves influence the structural arrangement. In the construction of the Y hotel, for example, the bridging structure at first floor level is used to support the surmounted building and suspended lower floors.

The need to accelerate constructional programmes by extensive prefabrication of modular frames and other elements and the use of slipforming walls, as in the Sava Centre, can have a considerable influence on the eventual architectural form of the building.

Structural design and the planning of building engineering services must be closely integrated. The structural grids, particularly in large exhibition halls, have a modular format which relates to both constructional modules, such as panel sizes and to servicing modules in horizontal and vertical ducting.

7.3.1 Choice of structural design

For small auditoria the design of the enclosure structure will normally be influenced by the following criteria:

- superimposed loading from above level, whether roof load, storage or occupied floor;
- high point loads due to roof mounted plant and equipment;
- roof span between walls or supports;
- allowable depth of roof space;
- plan aspect ratio of enclosure;
- other factors such as aesthetic appearance, sound insulation standards and fire protection requirements.

Most designs consist of simple beams spanning across the enclosure between side walls or columns. Overall cost of construction is related to material cost and to speed and efficiency of construction especially where this facilitates early incorporation of services. In general, for small spans - up to 20m - possible solutions include steel, laminated timber and concrete (reinforced and prestressed) beams and steel and timber trusses.

Two-way spanning grillages such as coffered slabs and space frames
provide an alternative particularly where this structural form is to be expressed in the interior design. Typical spans for these various examples are summarized below.

Some measure of precasting or preassembly is usually incorporated up to a weight or size limit determined by transportation or lifting constraints. Where in-situ concrete is used, cost is heavily influenced by the complexity and repetition of use of the formwork. Other considerations affecting structural design and costs are requirements for fire resistance and the ability to sustain thermal and other differential movements. Steel structures, in particular, may have to be clad to upgrade their fire protection. The factors determining costs of construction are outlined in Chapter 12.

Larger roof spans are influenced by additional factors. Principally, the foundations and the overall stability requirements become more important as does the possibility of reducing the enclosed volume for acoustic and air conditioning control reasons. Spans in the range 20-50m are generally of the steel truss type which are advantageous in being relatively light and also permitting high strength connections of shorter elements. However, the double T prestressed concrete beam has been used for a number of medium sized theatre spans in the region of 20-30m.

Steel portal frames are efficient enclosures for spans of about 20m and also provide resistance to lateral loads. Trussed section portals permit much longer spans and have been used in the standard rectangular and trapezoidal or pseudo-arch forms.

Arch solutions in reinforced concrete which resist load by axial as well as bending forces are most efficient in the span range 30-50m. There are also various forms of shell roofs such as barrel vaults, domes, hyperbolic paraboloids and folded plates which seem to have become less popular in recent years since their zenith in the 1950-60s. Apart from reinforced concrete, there are examples of steel profiled sheeting and timber being used to form interesting shell and plate shapes up to 20m.

Larger roof spans (50-100m) have generally been of the tension-compression ring dome configuration, often using steel truss members. Other interesting large span structures are of the tent form such as cable stayed roofs or tension membranes between inclined concrete arches. For these hanging structures the aerodynamic behaviour and high foundation thrusts and uplifts are often critical design conditions.
meeting rooms. A central stage, with access bridge to the adjacent Fairgrounds, separates the largest hall (seating 5,000) from a 4,000 seat extension. The latter can be converted, when required, into a banquet hall by elevating the raked floor.

Architects: Schüller & Schüller Witte
7.3.2 Examples

Steel truss girders in either the N and V lattice form are most common. For example, Halls 1 to 5 of the National Exhibition Centre are based on 28m span multi-bay portal frames with box section, V trusses providing edge support for two-layer space frames (see Chapter 9.2.2).

The recent Hall 7, however, has a 90m span cable stayed steel roof.

In the McCormic Place Chicago, the 2-way roof truss structure is divided into 46m bays and extends to form a 23m cantilever outside the perimeter.

Trusses of the V (Warren) form are often fabricated from tubular steel sections as used for the 94m span exhibition hall in Kansas City.

In the Sava Centre Belgrade and a number of other recent constructions the lattice girders have been inclined to form a series of pseudo-arches supporting longitudinal beams.

The International Congress Centre Berlin uses massive 50m span prestressed concrete trusses supported on external access cores to carry the main roof beams.

Whilst the usual arrangement is for roof trusses of the N configuration to span across the auditorium as, for example, in the Hamburg Congress Centre, it is interesting to note that in the Wembley Conference Centre, the 6.5m deep trusses span 45m longitudinally onto the proscenium wall. Subsidiary roof members spanning between the main trusses may also be in lattice form but castellated section beams are also widely used.

Tent structures include the Mecca Conference Centre for which the roof canopy is a cable membrane suspended from external columns. The Swedish Trade Fair Centre is a tensile roof structure spanning between perimeter K supports, the bracing of which also provides the framework for tiered seating.

Examples of shell or surface structures include the intersecting barrel vault roof of the Good Hope Centre, Cape Town which with a 65m span, is the largest roof of this type constructed, and the 70m span inclined arch Kongresshalle in West Berlin. The latter structure recently collapsed due to suspected corrosion of prestressing tendons in the arches. There are many other examples of concrete shell structures with spans of about 50m such as the ribbed dome of the Coliseum at Madison Wisconsin. Concrete folded plate roofs have also been used extensively in the United States for halls of up to 30m span.
Rotational Shell domes include the 205m diameter Louisianna Astrodome which is the largest span enclosure in the world. This comprises 12 truss radial arches supported by 5 circumferential rings. In this design specific consideration must be given to the effects of wind lateral forces and uplift. The Astrodome perimeter is K braced and stability against upward forces is provided by a 75 tonne projection television gondola suspended from the centre of the dome.

7.3.3 Typical roof spans for simple beams

<table>
<thead>
<tr>
<th>Details</th>
<th>Beam depth (m)</th>
<th>Beam centres (m)</th>
<th>Typical span (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal steel section</td>
<td>0.4</td>
<td>1.5</td>
<td>12-15</td>
</tr>
<tr>
<td>Castellated section from above</td>
<td>0.6</td>
<td>1.5</td>
<td>15-20</td>
</tr>
<tr>
<td>Lattice beam lightgauge steel</td>
<td>0.6</td>
<td>1.5</td>
<td>12-15</td>
</tr>
<tr>
<td>Reinforced concrete beam</td>
<td>0.6</td>
<td>1.5</td>
<td>10-15</td>
</tr>
<tr>
<td>Prestressed concrete T beam</td>
<td>0.6</td>
<td>1.5</td>
<td>15-20</td>
</tr>
<tr>
<td>Lightweight concrete beam</td>
<td>0.6</td>
<td>1.5</td>
<td>12-18</td>
</tr>
<tr>
<td>Composite steel beam and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>concrete slab</td>
<td>0.4</td>
<td>1.5</td>
<td>15-20</td>
</tr>
<tr>
<td>Flat slab-reinforced concrete</td>
<td>0.3</td>
<td>-</td>
<td>6-8 square</td>
</tr>
<tr>
<td>Flat slab-post tensioned concrete</td>
<td>0.3</td>
<td>-</td>
<td>10-12 square</td>
</tr>
<tr>
<td>Coffered slab-reinforced concrete</td>
<td>0.6</td>
<td>-</td>
<td>12-15 square</td>
</tr>
<tr>
<td>Laminated timber beam</td>
<td>0.6</td>
<td>1.5</td>
<td>10-15</td>
</tr>
<tr>
<td>Portal frame-steel section</td>
<td>0.4</td>
<td>4.0</td>
<td>18-25</td>
</tr>
<tr>
<td>Portal frame-reinforced concrete</td>
<td>0.4</td>
<td>4.0</td>
<td>12-15</td>
</tr>
<tr>
<td>Portal frame-laminated timber</td>
<td>0.4</td>
<td>4.0</td>
<td>12-15</td>
</tr>
<tr>
<td>Steel truss-hollow sections</td>
<td>1.0</td>
<td>4.0</td>
<td>20-30</td>
</tr>
<tr>
<td>Timber truss-light members</td>
<td>-</td>
<td>2.0</td>
<td>10-15</td>
</tr>
<tr>
<td>Space frame-hollow steel sections</td>
<td>0.9</td>
<td>-</td>
<td>20-30 square</td>
</tr>
</tbody>
</table>

Notes (a) Span for imposed load of 3kN/m²
### 7.3.4 Examples of design solutions for larger span structures (Summary)

<table>
<thead>
<tr>
<th>Type</th>
<th>Span (m)</th>
<th>Example</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffered (waffle) slab</td>
<td>10-12</td>
<td>National Theatre, London</td>
<td>In entrance foyers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trinity College, Dublin</td>
<td>Exposed soffit forming ceiling</td>
</tr>
<tr>
<td>Prestressed Concrete beam</td>
<td>20</td>
<td>Many theatres</td>
<td>Relatively shallow roof depth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>eg. Farnham</td>
<td></td>
</tr>
<tr>
<td>Portal frames</td>
<td>20</td>
<td>Eisteddfodd Centre, Wrexham</td>
<td>Steel portal frame</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>NEC Birmingham</td>
<td>Warren truss with box cross-section</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>I.C.C. Berlin</td>
<td>Prestressed concrete portals spanning on to longitudinal trusses</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>Hall Rotterdam</td>
<td>1.3m deep laminated timber frames</td>
</tr>
<tr>
<td>Lattice girders</td>
<td>30</td>
<td>Georgia World Centre</td>
<td>Steel Pratt (N) truss</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>Bella Centre Copenhagen</td>
<td>Steel lattice beams with inclined legs</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>Wembley Conference Centre</td>
<td>Steel lattice girder</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>Sava Centre Belgrade</td>
<td>Post tensioned concrete truss</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>ICC Berlin</td>
<td></td>
</tr>
<tr>
<td>Space frames</td>
<td>12x30</td>
<td>Kongresshaus Innsbruck</td>
<td>Spanning between walls</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>NEC Birmingham</td>
<td>2-layer framing across bays</td>
</tr>
<tr>
<td>Shell roofs</td>
<td>30</td>
<td>Many examples USA</td>
<td>Folded plate</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>Coliseum Wisconsin</td>
<td>Ribbed dome</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>Good Hope Centre Cape Town</td>
<td>Ribbed barrel</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>Berlin Kongress halle</td>
<td>Inclined concrete arches supporting roof membrane</td>
</tr>
<tr>
<td></td>
<td>205</td>
<td>Louisianna astrodome</td>
<td>Steel dome with radial arches</td>
</tr>
<tr>
<td>Tent structures</td>
<td>30</td>
<td>Mecca Conference Centre</td>
<td>Cable hung membrane</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>Swedish Trade Fair Centre</td>
<td>Perimeter K supports to roof membrane</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>Hall 7 NEC, Birmingham</td>
<td>Cable stayed steel structure</td>
</tr>
</tbody>
</table>
Congress Centre, Monte Carlo

Constructed on an elevated 2.5ha platform and designed as a series of linked hexagons the Monte Carlo complex includes a hotel, apartment buildings, in addition to an auditorium-congress centre seating 1,200. The auditorium is used for concerts, shows, ballets and congresses, with rotating partition panels to vary the acoustics. Limitations on height required the ceiling to be left open.

Site requirements

The selection of sites for large scale development of exhibition and conference centres is largely dictated by the need for easy access. This applies particularly to developments outside the city centres. The siting, for example, of the National Exhibition Centre was largely determined by its relationship with the motorway network and this has also been the main factor in selecting the site for the Bella Center and new Exhibition Centre in Geneva. In both the NEC and Geneva developments there is also good access to an airport and new railway stations have been provided.

Within city and urban areas consideration must be given to the traffic flows along adjacent streets and the possible congestion which could arise from access to the site not only for visitors but for the servicing and exhibition requirements. This is primarily a matter of strategic and urban development planning which involves issues outside the scope of the project itself. The developments in Berlin and Belgrade, for example, required the construction of extensive highway intersections.

With virtually no land available in the centre of Monte Carlo the Congress centre-hotel complex is constructed on an elevated platform of 2.5ha astride two boulevards and jutting out over the sea.

Most of the projects currently being constructed in the United States form part of urban redevelopment schemes where the convention facility is seen as a way of regenerating interest and investment as well as appreciating property values and taxes.

This is also the case in many cities in Europe. In the United Kingdom conference centres with their associated hotels currently feature in urban redevelopment proposals for Belfast, Edinburgh, Southampton, Swansea and the London docklands.

Generally a level site is specified for savings in construction costs and easy access particularly for exhibition requirements. However, in some cases ground slopes have been utilized for economy in the construction of stepped floors and in forming sub-basements. Variations in level have also been used with advantage to separate the service access from other levels.

The area required for conference centre or hotel is extensive, particularly where external car parking is used. Parking requirements depend to a
large extent on the availability of alternative arrangements, such as municipal car parks, and their conditions of use. For hotels, many local planning authorities in the United Kingdom stipulate the following rates:

<table>
<thead>
<tr>
<th>User</th>
<th>Per car park space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banquet places</td>
<td>10</td>
</tr>
<tr>
<td>Conferences places</td>
<td>10</td>
</tr>
<tr>
<td>Hotel guestrooms</td>
<td>2</td>
</tr>
<tr>
<td>Motel guestrooms</td>
<td>1</td>
</tr>
<tr>
<td>Staff numbers</td>
<td>2</td>
</tr>
</tbody>
</table>

The spaces set aside for car parking by the large conference and exhibition centres are numerous. In Wembley the multistorey park holds 1400 cars and there is surface parking for over 6000 nearby. Underground parking in the Paris Centre can accommodate 1500 cars and in the Hamburg Centre 1100. These are fairly representative of city centre developments.

More extensive provision is required for exhibition centres, not only for the larger numbers of visitors but for contractors' and stand decorators' vehicles, which will require direct access to the hall. For the new 50,000m² exhibition centre in Geneva there is covered car parking for 2000 cars and open spaces for a further 3000, a rate of 1 space per 50m².

Further space is required for landscaping which is invariably seen as an essential part of the site development to provide screening as well as balancing and softening the dominance of the built environment. The attractiveness of the location was rated by conference planners in the United States as a major factor in the choice of a destination. Many complexes such as in Hamburg and Helsinki, benefit from being adjacent to parkland. In hotel development landscaping is often combined with recreation requirements providing an attractive setting for swimming pools, tennis courts and relaxation as well as an extension to the hotel restaurant, bar and function room activities thus having a revenue earning function.

This link with the natural conditions outside the building is often used to provide contrast and refreshment between the long periods spent in the complete enclosure of the auditorium. In many cases the natural environment has been extended inside the building and extensive glazed promenades and lounges provided to take advantage of particular vistas.
7.4.1. **Access**

The main entrance to the hotel or centre must be clearly indicated and easily recognisable by strangers to the area. Several techniques are used to identify both the building and its entrance including flags, symbols and company logos as well as distinctive signs and lighting arrangements.

Many of the large hotels studied have a separate entrance for their conference and function facilities apart from the main lobby but in every case off-street stopping and parking facilities are necessary. The arrangements usually involve a one-way system of traffic flow with two or three carriageway lanes, allowing space in front of the entrance for cars and taxis to stop to set down and pick up patrons under the cover of a canopy or portes cochère.

In the normal course of events many conference delegates will arrive and depart by coach, especially where transport from the airport is involved. Coaches will also be required for organised trips and tours. Some centres, such as in Berlin and Paris have a coach station and airport terminal within the complex as well as links with the underground services.

Studies of the patterns of arrival and departure show high concentrations with peak periods tending to occur within 15 to 30 minutes preceding the event and, in the case of a meeting, within 10 to 15 minutes of the end. Exit from a hall following a session is generally concentrated into a 5 minute period.

This high concentration of demand presents difficulties in determining cloakroom and sanitary accommodation requirements and in planning the various services such as for coffee breaks and other refreshments.

7.4.2. **Service access**

Separate entrances, roads and parking are required for the vehicles delivering goods and provide services to the premises. In a typical hotel operation these services include food, beverage, laundry, furnishings and equipment, maintenance and contract services, garbage and refuse disposal. Additional requirements will be imposed for exhibitions with contractors, decorators and exhibitors themselves requiring access, often for large pantechnicons or furniture vehicles, direct to unloading points giving easy entrance to the exhibition halls.
Service access must be screened from other areas to reduce noise and unsightliness particularly from garbage bins and compactors. In most cases a separate service road leads direct to a side or rear entrance but in some of the larger complexes the service entrance is ramped down to a more central loading dock, having service lifts to other floors.

Most premises also have separate staff entrances for security and control purposes as well as enabling the staff facilities to be more easily planned and managed.

7.4.3. Entrance and reception

A view of the interior is a means of promoting interest and identification. Vertical and inclined glazing, suitably tinted or screened to reduce air conditioning loads is extensively used in the front facades of hotels and other centres. Invariably entrance doors are also in glass, identified with prominent furniture and push plates designed with the logo or insignia of the establishment which is featured throughout as a unifying symbol. Several doors in parallel are often required entered through a draught lobby and under security surveillance from the reception desk or other manned control, including closed circuit television systems. For the disabled, and for trolleyed equipment, a convenient ramped entrance route should be provided.

The reception lobby is the first point of personal contact with the visitor or guest and this initial impression has a considerable influence on his valuation of and attitudes to the services. Courtesy is an important factor, such as provision for international flags, and attractive individual notices and directions, as discussed in 7.5.1.

Hotel lobbies, in particular, need to cater for a range of services to guests and visitors. A study of the operational practices and space requirements in 35 convention hotels showed that an average area of $0.9m^2$ to $1.2m^2$ per guestroom is typical for the main lobby. This allows for the front desk facilities and an associated lounge-waiting area.

Most large function rooms are provided with a separate entrance and foyer which, in many hotels, is divisible to allow the separation of groups of users. The median foyer area for assembly purposes and coffee service is $0.5m^2$/person when these areas are extended, reducing to a minimum of $0.3m^2$/person for the maximum density allowed for temporary crowding.
conditions which may arise following a meeting.

The ratio of space between the auditorium or hall and its foyer is typically 3:1.

In multipurpose arts centres the minimum provision is $0.5m^2$/person allowing for bar and refreshment services although a larger area on one level giving $0.8m^2$/person has in some cases been provided to enable this space to serve on occasions for receptions or social functions.

Box office and the associated management offices together usually amount to an average of $0.1m^2$/person.

Hotel registration counters are usually related to the guestroom size of the hotel. For an hotel of 200 rooms a counter length to accommodate equipment and service functions is about 7.5m occupying a registration area of some 18.5m$^2$. For a 400 room hotel this would increase to 10.5m and 30.0m$^2$ respectively.

For a large conference it is usually necessary to set up separate temporary registration facilities in order to relieve the demands on the hotel reception and at the same time provide information and conference services. As a guide a registration area of $9m^2$ likely to be required for each group. Including desks and attendance this would accommodate groups of 8 to 12 arriving together but, for larger conferences, an area of $14m^2$ is usually needed. This space must not encroach on circulation routes to avoid congestion.

Within and adjacent to a large hotel lobby are various concessionary shops and services for guests. These usually include tour agencies, car hire and theatre booking stands. Shops or kiosks are often provided for tobacco and newsagency and, in larger premises, gift shops may be entered from the lobby but invariably also with a street entrance. The area per shop is generally between 14 and 23m$^2$.

Public telephones are also located in this area of general circulation.

The area taken up by the administration offices associated with front desk operation is extensive. It will necessarily include separate areas for the reservations office, front office manager and cashier including safe deposit facilities. Usually the telephone switchboard is also located in this area and these alone will take up some 70-75m$^2$ for normal operational requirements.
Lounge areas associated with a hotel lobby typically allow about $1.5m^2$ per seat as a net area but for multipurpose halls, coffee lounges may have more concentrated seating to about $1.2m^2/seat$. Subject to fire escape requirements, which are examined in chapter 11.3, landscaping of lounge zones within the design scheme provides a softer and more intimate contrast to the essentially functional character of the front desk and other operational areas.

Lighting is also an important feature and where the ceiling is particularly high, such as over a staircase, this can be used to display long lighting pendants and chandeliers to advantage, as in the congress centres in Torremolinos and Manila, creating a feature of specific interest. The lighting over desks and counters is necessarily functional being largely concentrated, direct and screened but decorative luminaires are usually used locally in the lounge areas together with general diffusing and perimeter lighting for background illumination and architectural emphasis as described in chapter 10.1.

7.5. **Circulation planning**

Circulation planning involves a range of considerations which will also dictate the relationships between different areas. A primary factor is the operational need to service visitor requirements unobtrusively yet efficiently. This requires service access by corridors or lifts independent from the visitor circulation and establishes the relative positions of the servicing areas.

Legal requirements governing means of escape in the event of fire and the associated Building Acts or Codes specifying standards for ingress and egress to buildings used by the public will determine such matters as travel distance, widths, exit arrangements and staircase design as well as specific fire resistance, interior construction and isolation requirements.

Entrances, corridors and foyers provide transition zones of illumination and temperature between the exterior and interior of the premises. Together with service lobbies they also provide sound isolation between areas of high noise generation and noise sensitive areas.

In addition to circulation requirements, the corridors, promenades and concourses provide 'break-out' spaces, catering for the social and
refreshment needs of delegates between sessions of meetings. To induce a sense of relaxation these areas are usually strongly landscaped with restful pale blue or green colours emphasized in the decor. In the larger complexes, like to Sava Centre, the circulation areas are enlarged at intervals to provide lounge seating for informal gatherings whilst in others, such as in Khartoum and Nairobi, separate lounges are provided for delegates. In hotels the lounges are almost always associated with bar service this providing a revenue earning function.

The size of promenades and concourses are very much dictated by the form of the building. For lounge areas proper, the median space, allowing for bar and circulation requirements, was found to be about 2.0m²/user. Details of bar, service and storage requirements have been the subject of a separate survey which is summarized in chapter 4.5.

7.5.1. **Directions**

Within the lobby and at repeated intervals throughout the circulation areas it is necessary to provide directions and information, both as permanent signs and temporary notices. Interviews with conference organisers stressed the importance of good signposting both as a courtesy to individual groups of visitors and to establish confidence in the standards of management and their deliberation of purpose. For orderliness it is essential for this information to be presented with some degree of uniformity in size and consistency in 'house' style. As a rule, purposely designed notice boards with local lighting, selected to avoid veiling, must be provided, clearly visible from the direction of approach but to one side of the circulation in order to avoid congestion.

The optimum height and distance for viewing and the relationships between thickness, width, style and background for legibility have been well researched(3) although not widely adopted in practice.

Applying these principles suggests the following arrangements are most appropriate

<table>
<thead>
<tr>
<th>Type of notice</th>
<th>Directional sign</th>
<th>Information notice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum viewing distance</td>
<td>20m</td>
<td>10m</td>
</tr>
<tr>
<td>Minimum symbol height</td>
<td>50mm</td>
<td>25mm</td>
</tr>
<tr>
<td>Stroke width to height</td>
<td>1 : 5</td>
<td>1 : 6</td>
</tr>
<tr>
<td>Letter height to width</td>
<td></td>
<td>1 : 0.75 to 0.85</td>
</tr>
<tr>
<td>Style</td>
<td>Bold with initial capitals and following lower case.</td>
<td></td>
</tr>
</tbody>
</table>
Standard symbols are frequently used to denote places like toilets, cloakrooms, and transport and other services enabling these to be easily recognised.

Most conference centres use systems of colour coding and numbering to enable suites of meeting rooms together with their associated foyers and concourses to be distinguished. This colour is often incorporated into the decor as well as in the signs and symbols and in some cases is represented in the name of the suite.

The trend in larger centres is inevitably towards the use of more elaborate but less labour-intensive systems such as the arrangement of electronic signs installed in the International Congress Centre in Berlin which are programmed to indicate each day's events and routing.

7.6 **Sanitary facilities**

High standards of sanitary accommodation are necessary with the cloakroom and toilet facilities being subject to a high co-incidence of demand at the beginning and end of sessions.

Separate toilet accommodation is usually required for each main area of public use - restaurants and bars, banquet and meeting rooms and exhibition halls.

The legal standards, based on British Standard and other Codes of Practice are the minima and research by Green suggests that a higher provision may be needed to cope with a high probability of demand.

Based on 100 percent male or female audiences the sanitary accommodation related to seating capacity hall is calculated from typical layouts to be $0.10m^2$ per seat for males and $0.12m^2$ per seat for females. This is arguably double the theoretical minimum but is appropriate for halls seating up to 400. In larger halls each section of seating should have separate facilities.

Special provision must be made for the disabled and is preferably combined with a first aid room facility.

Separate sanitary accommodation must be provided for staff, to which specific legal standards also apply.
Design requirements for sanitary facilities are well documented and, therefore, are not detailed in this thesis.

Considered on an international basis the standards of sanitation provision and design are practically universal in application. In current practice the sanitary facilities are almost always located within the interior of the building requiring independent extraction, with automatic change-over to a duplicate system in the event of failure. The legal minimum in most countries is a rate of 3 air changes per hour but 6 air changes per hour are generally provided.

Cloakrooms must be located near the point of entry and preferably adjacent to the sanitary facilities for both convenience and supervision. The standard of provision in most hotels is one coat hook per banquet place and for other auditoria, one per seat.

In view of the peak rates of arrival and departure, as well as for security reasons, an attendant operated cloakroom is usually preferred, occupying an area of about $0.08m^2$ per seat.
References Chapter 7

(1) ANSI Standard Z24 19.1957, "Laboratory measurement of airborne sound transmission loss of building floors and walls", New York, American National Standards Institute


(4) Human Factors Group, "Design for legibility of visual displays", Baltimore, Bendix Aviation Corp, February 15, 1959 quoted in (3)

(5) BSCP 3, Code of basic data for the design of buildings, Ch VII, Engineering and utility services, 1950 (amended 1964-1970), London, British Standards Institute

(6) Green MF, Building design: application of probabilistic methods", loc cit Ch 4 (42)

(7) for example: "Offices shops and railway premises, Act 1963, Ch 41, London, HMSO
8.1 Acoustic design criteria

Fundamental requirements for a conference facility can be considered in terms of acoustic and visual clarity, means of ingress and egress, delegate comfort and safety and, in most cases, space and function adaptability. Each of these will involve sets of inter-related criteria. For example, in setting out design objectives for good acoustics in a hall or auditorium it is necessary to consider the psychological conditions as well as physical requirements.

In essence, the factors affecting acoustic design may be summarized as:

**Psychological conditions:**
- **relationship between the speaker and audience:**
  Size of audience, circumstances, spaciousness of surroundings, relative positions, elevation.
- **arousal and appreciation levels:**
  Environmental and physical comfort, sound strength and clarity, masking, distortion and distraction.

**Physical requirements:**
- **good direct sound:**
  Shape and dimensions of the hall, distance to rear and side seating positions, row to row sight line clearances, design of balconies.
- **early reinforcement of direct sound:**
  Position and construction of reflecting panels, provision of electronic amplification.
- **freedom from discrete echoes and strong envelopmental sound:**
  Selected absorption and diffusion, determination of reverberation for differing conditions.
- **control of noise entry:**
  Planning, zoning and separation of areas, appropriate noise insulation standards, acoustic specifications for engineering services and equipment.
- **multipurpose use:**
  Adjustment of shape, size and boundary conditions of stage and auditorium electronic modification of the growth and decay characteristics of sound.

Standards of sophistication in acoustic control have been continuously increasing, being set by competition between the many new conference centres and by the high quality of sound-music systems readily
Acoustic design is also undergoing fundamental changes in approach with a shift away from a dependence on physical features to a greater use of electronic equipment to achieve the desired acoustic effect. This is particularly important where the function and/or capacity of the hall has to be frequently changed.

8.1.1 Measurement
Methods of measuring, analysing and comparing the subjective effects of sounds are well defined both in ISO recommendations and national standards. Auditorium acoustics has also been the subject of extensive research originating, for example, from the work of Sabine, Knudsen, Beranek and Parkins. Other studies, particularly in the field of sound control, have been well summarized by Croome.

Millar describes how speech sounds are formed and the way they contribute to communication and the changing characteristics of the voice have also been studied by Sundberg. Much of the current research, particularly by Philips, is concerned with selective emphasis of the speech frequency bands important for clear articulation with compression of those liable to cause self-masking.

Good perception of English speech involves a frequency range of 200 to 6000Hz. Frequencies between 700 and 5000Hz account for some 80 per cent of speech intelligibility and those frequencies between 1000 and 2500Hz for 50 per cent. Representing most of the consonants of speech these high frequency sounds are relatively easily masked by other noise and tend to become distorted by absorption and transmission losses.

The dynamic range (ratio of maximum to minimum short time average power) for live and recorded speech is about 36dB with peak levels rising to a maximum + 12dB above this. For recorded music the dynamic range is also about 36dB with peaks of up to + 14dB, but in comparison live music, such as a symphony concert, has a much larger dynamic range of about 70dB, with peaks of + 15dB.

8.1.2 Standards
Standards for the acoustic quality of a conference hall or auditorium can be established fairly precisely.
Methods of measuring and assessing acoustic conditions for speech include subjective tests such as the percentage syllable articulation, frequency band analysis as in the articulation index method and measurement of reverberation times.

The acoustic design of conference halls and auditoria should ensure an articulation loss of less than 10 per cent consonants. A loss of up to 15 per cent consonants can affect the interpretation of complicated information, particularly if the speaker is untrained, and up to 30 per cent articulation loss renders communication difficult (9).

Perfect listening conditions, using the method described by Knudsen (3) give a percentage syllable articulation of 95 per cent; good conditions - 85 per cent; satisfactory but requiring concentration and fatiguing - 75 per cent, and unsatisfactory below 65 per cent.

In accordance with ANSI S3.5 (12) (13) the articulation index is measured in 20 (one third octave) frequency bands extending over the full speech range giving an analysis both of the intensity range of the sounds and the contribution of each frequency band to speech communication. Background sounds can be superimposed to show masking effects.

An articulation index of 0.6 to 1.0 represents excellent communication and from 0.4 to 0.6 a good standard (14). In the poor communication range below 0.15, the articulation index may alternatively also be used as a measure of privacy for individual conversations when there is a high level or background noise such as in a foyer or at a reception desk (18).

Reverberation calculations or measurements are used to assess the acoustic qualities of a hall in relation to its intended use. Standard formulae for the calculation of reverberation times, include those by Sabine (16) using overall room absorption, by Eyring (17) using a step by step dissipation of energy, and by Hopkins-Striker (11) which assumes a concentrated absorption of sound.

Computer calculations of reverberation times as developed by Gerlach (18) take account of the process of sound propagation and distribution and the relative positions of absorbing surfaces. By applying statistical analyses of reflector coefficients and transition probabilities the partial loss of energy after discrete intervals of time can be deduced and hence the total decay time.

Most projects involve the use of some modelling technique either by drawing and computer analysis or by tests on scaled models (19) (20). Current approaches towards reverberation analysis are not only concerned
with the overall decay time through 60dB but with the shape of the decay curve and, in particular, the reinforcing effects of early reflections in the first 20 to 35ms or the initial 15dB of decay. Decay patterns will differ with different sources of sound (instrument, voice, different surface absorptions, including the size of the audience) and their relative positions and the volume and shape of the enclosure. For speech an equal decay of all frequency components is preferable to avoid masking of consonants although for music the bass frequencies are often prolonged to improve tone colour.

Reverberant sound in an auditorium used for speech contributes to the sense of occasion and spatial responsiveness: it can increase the fullness of tone and strengthen voice signals. However, if excessive in loudness compared with direct sound and if prolonged, reverberation may mask the following transients of speech and thus affect clarity. Reverberation will also increase the level of distracting noise whether internally generated or intruding.

Thus optimum reverberation times for large auditoria are related to the volume, ranging from 0.8s (1000m$^2$) to 0.97 (10000m$^2$). In smaller conference rooms and lecture theatres, a range from 0.6s when full to 0.8s when two-thirds full is usually adopted.

8.1.3 Distance for speech

Without amplification there are limits to the distance speech can be clearly heard in an auditorium. This distance will depend on several factors

- power of voice projection, articulation, speed of speech depending on individual qualities and training;
- degree of clarity required particularly where interpretation is involved;
- proportion of direct sound reaching audience - depending on plan shape and individual sightlines;
- reinforcement of sound by corrected acoustic reflections or electronic means;
- extent of masking by background noise or delayed reverberation.

From a theoretical analysis, a purposely designed lecture theatre or conference hall with stepped or tiered seats, having a volume up to 2000m$^3$ should be able to accommodate an audience of 500 or so, seating up to about 20m from the speaker, without the need for an electronic
speech reinforcement system. However, the optimum conditions are not often met in halls which need to be adaptable in function and in a hall or room with a flat floor this limit will usually apply if the volume is in excess of $400 \text{m}^3$ or the distance more than 20m. With an auditorium extending round the sides of a platform - that is, outside an arc of $140^\circ$ facing the speaker - the sound is unlikely to be clearly heard further than 13m away.

In practice, the Association of Conference Executives recommend that amplification system should be installed in most halls and lecture theatres seating 100 to 500 and is essential for capacities in excess of 500.

This installation is also important to enable questions and comments to be relayed from the body of hall and helps to create a more informal relationship with the speaker or panel.

The acoustic conditions will change with changes in the number present, and with alterations to the hall volume - such as by removing or introducing partitions - and changes in the linings of the hall. Where multipurpose requirements are involved the acoustic design may provide for such changes in order to create the best listening conditions for each particular use.

Clarity of speech does not only depend on hearing. The facial expressions of the person speaking, gesticulations, nuances and other dramatic effects are important, serving as auditory cues particularly when speech interpretation is involved. Viewing distances and sightlines are critical in determining both seat layouts and the location of interpreters' and control booths.

8.1.4 Volumes

To achieve the optimum reverberation time for speech there must be a balance between the volume of the room and the degree of sound absorption. Within an auditorium the audience make up the most significant absorption surface, typically representing 60 to 70 per cent (at 500Hz) for theatre style seating. Allowing for some boundary loss the approximate volume per seat should be about 2.8 to $3.0\text{m}^3$ for meeting rooms and lecture theatres, up to $4.2\text{m}^3$/seat for large congress halls and between 4 and $5\text{m}^3$/seat for theatres. In comparison, typical volumes in small concert halls are between 5.7 and $6.4\text{m}^3$/seat and for large concert halls 6.4 to $8.5\text{m}^3$/seat, these higher volumes requiring reflectors.
Assuming a floor area of 0.8m\(^2\)/seat in auditoria the first figures represent ceiling heights of 3.6 to 3.9m or 4.2m in lecture theatres increasing to about 5.0m in large congress halls with larger volumes, surface absorption treatment becomes necessary.

8.1.5 Floor levels

Sound, particularly in the high frequencies, is strongly absorbed at a low grazing angle above and around the heads of the audience in addition to the view becoming obstructed when the audience is seated on one level. To some extent this can be improved by raising the source, such as on a platform or stage. Alternatively, the floor may be inclined and formed into a series of steps to elevate successive rows of seats.

To assess the situation sightlines can be drawn from representative seating positions in each row both across the longitudinal section of the hall and from other side angles which might experience obscuration.

The procedure for graphical analysis of seating clearances and the anthropometric criteria used in measurements for theatre planning have been well detailed by Ham (22) and Izenour (23). Compared with American standards based on a minimum clearance of 125mm (24), European designs tend to use a 100mm or even 75mm clearance. The design of lecture theatres is discussed in Chapter 3.3.4.

Profiles produced by the sightlines which give an equal clearance from row to row form a parabola although in many halls this has been modified to one or two straight rakes to allow equal risers between the rows. To achieve the same clearance this increases the hall height and volume. In a number of cases only the perimeter seating is permanently raked allowing a flexible use of the central area.

8.1.6 Reinforcement of direct sound by early reflections

Provided the interval between impulses of direct and reflected signals is not delayed more than 20-35ms, a path difference of 12m, the impulses blend together and intensify the sound (25).

However, the minimum time delay required to produce this effect will depend on the relative power of the voice compared with that of the reflected signal and on the tempo of speech. It will also vary for sounds of a difference nature - for instance the optimum for most music is between 150 and 250ms.
For clarity the amplitude of the direct sound and first reflections (within 20-35ms) must be much greater than that of the reverberant sounds which follow. The subjective impression of the directions and sequences in which reflections reach a listener, particularly in the first 60ms, determine the spatial responsiveness of an auditorium. Fullness of tone, important for music, depends on a good balance between direct, reflected and reverberant sound fields and their energy ratios affect the 'warmth' of tone.

Reinforcement may be provided by the use of reflections from the ceiling or from fixed or movable reflectors suspended over the auditorium and by early reflections from the walls.

In auditoria and large lecture theatres where speech is the primary source of sound the ceiling is normally the main reflecting surface and in most auditoria this is deliberately profiled to assist sound distribution. In other cases adjustable suspended reflectors have been provided to improve diffusion, correct deficiencies and generally improve acoustic balance.

For speech, the contribution of side walls to sound reinforcement is not so critical although the side walls adjacent to the sound source are usually angled to reflect sound towards the audience. Splaying or faceting to improve diffusion is often necessary to prevent cross-reflection and standing wave formation and in a very wide hall these areas may need to be made absorbent.

Side walls contribute to a sense of envelopment, particularly in multi-purpose halls which are used for music, but for clarity and directional orientation, the reflections must immediately follow the direct source (within 8ms). This also applies where lateral reflections are used to strengthen the periphery of the direct sound field in wide fan shaped rooms.

Reflecting surfaces must be smooth, non-porous with a high density, at least 5kg/m$^2$ for speech only and 25kg/m$^2$ for music\(^{(22)}\) to minimise low frequency absorption. This also applies to ceilings and to purposely designed acoustic reflectors. To give equal reflection over a wide frequency spectrum a reflector must have a large surface area.

8.1.7 Adjustment of hall acoustics

Diffusive surfaces are used to break up the wave patterns of sound in order to avoid delayed discrete reflection. Macro diffusion also
Wembley Conference Centre

Showing acoustic diffusers, lighting bars and control rooms, as seen from the stage.

Architects: R. Seifert & Partners
increases acoustic feedback to the source and balance of sounds in an auditorium.

Diffusion is obtained when a surface is separated into small areas each having different absorption characteristics producing diffusion edge effects, or modelled by facets, projections, coffers, etc. of various shapes and dimensions with a correct degree of randomness over the whole spectrum.

Macrodiffusion treatment may be required for side walls which produce strong lateral reflections, particularly near the source. This may be adjustable to increase or reduce the degree of dispersion: absorption:directional reflection in order to enable the acoustic characteristics of a hall to be changed for music or speech.

These techniques are also widely used to correct faults due to delayed, discrete or concentrated reflections such as from high domed ceilings, parallel surfaces or the normal modes of room resonance.

Changing the use of a hall to accommodate musical performances can create difficulties when the acoustic response is fixed, particularly where a long reverberation and balance is required for concerts and choral groups. In some halls provision has been made to physically increase volume by elevating the ceiling and extending it into balconies. Alternatively, the reverberation may be prolonged by electronic means, as is the case in the multi-purpose halls at Reading, Hillingdon and Felbach.

In the reverse situation, where larger volumes are provided in a multi-purpose hall acoustic conditions for speech and small music ensembles may be improved by the use of suspended reflectors over the platform and adjacent body of the hall. The location and design of reflectors to give reinforcement of the direct sound within 20 to 35ms with appropriate distribution over sections of the audience is usually provided by adjustable profiled diffusers as in the main auditorium of the Wembley Conference Centre. In the Hjertnes multi-purpose hall this has been achieved by lowering ceiling elements, including a canopy over the stage, and a similar mobile ceiling arrangement is provided in the Great Hall of the Sava Center, giving a variation in reverberation times from 2.0s for a large concert to 1.8s for a small concert reducing to 1.4s for large theatre and 1.3s for congress modes.

Examples of American halls with adaptable ceiling profiles are illustrated by Izenour (23).
8.1.8 Noise environment

Design objectives for good acoustics in a hall will not only depend on the clarity of sound. Psychological conditions, as determined by the relationship between the speaker and audience, will have an influence with factors such as the size of the audience, the circumstances, spaciousness of surroundings, relative positions and elevations each playing a part. Flynn (26) shows how voice characteristics and intensities change with different speaker-audience relationships.

The level of arousal and appreciation will also be affected by environmental and physical comfort of the audience - which are discussed under their respective headings - and on the extent of sound masking, distortion and distraction.

With increasing background noise a speaker tends naturally to increase his vocal effort in order to be heard (27) but the masking effect of background noise is most marked in trying to distinguish consonants and is most distracting when it represents mainly pure tones or impulsive noises.

Ambient noise levels and their limits for particular situations are determined by sets of noise spectra covering the octave bands affecting speech. The most widely used criteria are the ISO recommended Noise Rating (NR) curves or the American Preferred Noise Criteria (PNC) curves which, although different in emphasis, have a similar numerical value.

For large auditoria NR-25 is generally recommended and for banqueting halls or multi-purpose areas, NR-30 (28).

Noise rating criteria are widely used in determining performance standards for air conditioning and other noise generating or transmitting equipment. They also provide a basis for assessing standards of insulation against noise intrusion. In addition to determining levels of air-borne noise more specific analysis of Impact Noise Ratings is required both in relation to the structure and the operational equipment.

Control of noise entry is achieved in a number of ways - by planning and interpositioning of foyers, lobbies and other rooms between noise generating and noise sensitive areas; by physical separation and isolation using constructional techniques; stopping flanking paths and absorption of vibration.

Standards of sound insulation are usually defined in terms of the
Sound Transmission Class\(^{(29)}\) which will depend on the uses of the adjacent areas. For multi-purpose halls the standards of isolation usually recommended are STC 55-60 from the exterior and from noise generating areas like kitchens, toilets and plant rooms; STC 50-55 for separating other halls, restaurants and exhibition areas; and STC 45-50 from corridors, lobbies and foyers. Comparable standards for meeting rooms and exhibition halls are some STC 10 lower in each case.

These standards are representative but much higher provision may be required in specific cases. For example, many conference facilities are located near airports with noise climates sometimes as high as 80-90PNdB, or adjacent to major roads having day noise climates of \(L_{10}^{75-80}, L_{90}^{63} \text{dBA}^{(30)}\). In the former, roof exposure to noise is most severe resulting in greater structural mass and requiring special screening of roof ventilation.

Sound insulation requirements of conference rooms, particularly in hotels and multi-purpose halls, are complicated by the frequent changes in use which can result in noise sensitive and noise generating activities occurring in adjacent areas.

### 8.2 Viewing criteria

In addition to the requirements for good acoustics seating plans are determined by the limiting angles of view for projection screens and other visual aids. The criteria for screen viewing are well defined, both in BSCP 412\(^{(31)}\) and DIN 108\(^{(32)}\), and are almost universally adopted in purpose built facilities. For optimum viewing the maximum viewing angle is usually taken at 45° from the extreme edge of the image rather than the centre giving an image distortion ratio between line and perceived image of 10:0.7.

Assuming that the quality of projected material satisfies standards of image brightness – depending on the projection equipment and screen characteristics – and legibility, which is mainly determined by symbol and character size and proportions, the limits to viewing distance are generally related to the width of the projected image. As a rule, the maximum viewing distance is up to 6 times the image width and the absolute minimum is 1.4 times and preferably no nearer than 2 times the image width.
Purposely designed conference and lecture theatres invariably have permanent single or more commonly, multi-screen installations which may be fixed or retractable, when not required, and are usually adjustable in height and angle of tilt. Whilst direct projection is almost always used, indirect or back projection arrangements have been installed in some grouped conference suites, enabling one projection room and operator to serve a number of rooms without the need to set up temporary equipment.

The majority of hotel conference halls rely on portable equipment with projectors and screens set up within the area. In the majority of cases studied this was invariably a standard 2m screen with 16mm or 8mm projector and was often inadequate for the seating area required.

Technical equipment for audio-visual aids is undergoing rapid change with the development of multi-vision equipment and projection television, the latter allowing simultaneous recording and projection of the proceedings both within the hall and elsewhere. Large scale Eidophor projection systems have been installed in the Congress Centres in Paris, Berlin and Hamburg amongst others, and smaller self-contained units are increasingly finding application in hotels and other premises.

The criteria for television projection viewing are similar to those for cine projection screens and the same limiting angles apply to television monitor viewing if the linearity of the subject matter is critical.

8.2.1 Platform and stage design

The design of the platform or stage will depend on the intended uses of the hall. It may range from a fully rigged stage suitable for theatrical productions to a lecture theatre equipped with a teaching wall.

The height of the platform determines the focus of the sightlines. It should not be less than 0.6m if a loss of command over the audience is to be avoided nor more than 1.2m to prevent screening the rear of the stage from the front rows of the audience. For conference use, the minimum depth is 2 to 3m and width 4m to 5m allowing a full range of activities such as discussion panels and supporting displays.

The stage must be fully serviced with a mobile lectern and a full range of sockets for electrical microphone and communication connections from a number of alternative positions.
Platforms must be strong and rigid when assembled, giving an even, level surface. The construction will need to satisfy legal and insurance requirements.

8.3 Hall plans
Plans of the various halls used for conferences, including those designed for multi-function use, can be grouped into four main geometric forms and their variations, these being determined to a large extent by practical requirements, including the need for functional adaptability. The acoustic characteristics of these forms are discussed in the following section. Structural design features have been examined in Chapter 7.3 and environmental aspects are considered in Chapter 9.

8.3.1 Rectangular plans
This is the most common plan for multi-purpose halls with flat floors being uncomplicated in construction, easily changed in use from a banquet hall or ballroom to a congress hall and easily divisible by partitions into smaller halls. Arrangements for access to the divided areas can simply be provided by linking entrance foyers and service lobbies.

Rectangular halls are almost always designed for maximum flexibility, with loose furniture and movable stages or platforms.

The capacity of a hall will be limited by the obsuring of sight lines and the high attenuation of sound at a low grazing angle around the heads of the audience restricting both the view and clarity of sound at the rear of the hall. To some extent this may be corrected by raising the level of the person speaking on a platform or dais but the elevated angle of view from the front seats should not exceed 30° for comfort.

For screen projection, the limiting angle of view from the sides may restrict the usable width of rows in the front of the hall.

A narrow rectangular shape is generally not ideal for speech acoustics. Lateral sound reflections crossing from wall to wall may produce standing wave resonance and echoes unless the side walls are made diffusive or absorbent. If the ceiling is high relative to the width the extended reverberation of sound will reduce speech clarity and this may call for the installation of suspended acoustic panels to shorten the reflection path characteristics.
However, a rectangular hall with height, width, length ratios of say 3 : 4 : 8 or 2 : 3 : 5, the traditional 'shoe-box' design of concert hall, is said to be the optimum for music giving a high uniformity of sound, a good balance between direct and indirect sound distribution and good orientation from lateral reflections.

To satisfy both functions such a hall would need to have adjustable panels suspended over the area in front of the stage and preferably incorporate a ceiling rigging which can be lowered to reduce both height and volume for theatrical performances or congress use.

8.3.2 Fan shape plan

This enables the maximum number of seats to be concentrated within the arcs giving the best viewing and listening conditions. In speech the maximum strength of voice projection is directionally concentrated into an arc of 135° but an apex angle of about 90° is preferable for audience command. To avoid distortion the viewing angle for screen projection should not exceed 45° and for lecture theatres and cinemas the relative width of the screen will determine the seating plan.

To enable side walls to add to sound reinforcement, particularly for music, the angle of splay of each wall should be no more than 25°. The wall angle may be acoustically reduced by the use of serrated or faceted walls or by introducing vertical panels inclined at a smaller angle to the longitudinal axis. Panels of this kind may be adapted, as in the Monte Carlo auditorium, to change the acoustic conditions of the hall by increasing or reducing absorption thus catering for different uses.

Fan or trapezoidal shaped plans are most commonly used for lecture theatres. The dominance of ceiling reflectors is generally not ideal for music. For multi-purpose use the splayed area may be used to eliminate cross reflections adjacent to the stage but combined with a rectangular or hexagonal plan for the main body of the hall.

Rows of seats may be set in concentric curves, as in 'continental' seating, to provide each with a forward facing view of the stage. Alternatively, if dividing aisles are provided, the side rows may be set at an angle to the longitudinal axis. In a wide hall, these side sections of seating may also be separated and raised to a higher level than those in the centre in order to create variety in seating as well as more even lateral distribution of sound.
Of hexagon plan, the Palace encloses the Erasmus Hall which has a split level auditorium seating 2,000 - reducible to 1,000 - which has excellent acoustic qualities as a concert hall but is also equipped for congresses. For example, the seats have fold-over writing tablets, there is simultaneous interpretation for 5 languages and a range of projection, recording and press facilities.
The rear wall of the auditorium can be straight or concave to conform to the seating layout. In either case, but particularly for the curvature, this wall must be made highly absorbent or dispersive over the full frequency range.

Balconies are usually limited to the rear of the hall. The relative height of the front edge of the balcony and its facial treatment, particularly if concave, as well as the depth of seating under the balcony have a significant affect on the acoustics.

Extended fan shapes, forming a wide quadrant, have been used, for example, in the Wembley Centre to increase seating capacity without extending the distance from the stage in large congress halls. Smaller audiences, can be concentrated in the central seating areas giving a wide flexibility of use. In the main auditorium of the Hamburg Congress Centrum the balcony has been extended down the sides to reduce the apparent size whilst also providing this flexibility in use.

8.3.3 Hexagon shape

The hexagon and its extended or modified forms has been used extensively as the basic plan shape for multi-purpose theatre-congress-concert halls, such as in Strasbourg. It provides a compromise, giving good direct sound, controlled ceiling and lateral reflections and scope for variations in seating arrangements and levels, including balconies, within the auditorium.

The polygonal roof form may be partly expressed internally as in the Reading Hexagon, with large inclined surfaces to provide additional reflections from above and to the side of the audience, but this must be carefully balanced to avoid distortion.

To satisfy the short reverberation times required for clarity of speech the volume, up to 4m$^3$/seat, is usually inadequate to provide good listening conditions for music. For the latter purpose the sound will usually need to be electronically modified by assisted resonance or extended reverberation to achieve satisfactory blending and quality.

The basic hexagon plan is particularly suited to large stage productions such as choral concerts and for theatre and staged group shows or displays allowing half (180°) or over half (210° to 220°) encirclement by the audience. For proscenium stage or side masking arrangements the
sight lines from the extreme sides of the hall are liable to become too acute and obstructed requiring sections of seating to be closed off. Similar screen viewing restrictions may also apply when the hall is used for a congress or convention.

To allow flexibility the main floor level is often made flat with retractible seating around the perimeter. By using loose chairs in the central area this can be arranged to suit different events and stage formations.

Balconies usually extend round three sides with fixed seats at appropriate inclines both in plan and section.

Modified forms of this building geometry include the emphasized polygonal shaped hall like that of the amphitheatre of the Kenyatta Centre and the horse shoe shape based on the style of the traditional Georgian theatre.

8.3.4 Circular or oval plans
Arenas and coliseums are also used for major conventions and congress meetings in addition to serving a wide range of community needs - indoor recreation and competitive sports, expositions, displays, rallies, pop concerts, etc. The size of such enclosures and distances over which sound has to be transmitted requires the installation of a complex loudspeaker system. Each section of the audience is regarded as a sound absorbing area at which the sound signals of calculated amplitude are beamed from loudspeaker columns avoiding the carry over of sound which could cause reverberation and echoes. Interval time delays are also introduced to synchronise the transmitted and direct sound.

The acoustic design of the enclosure is not a significant factor although local sound reflectors may be located around the source.

Whilst the limitations for good acoustics are a drawback, the coliseum type of enclosure is able to accommodate extremely large numbers of people and generate the atmosphere of excitement and occasion. Most conventions only require plenary sessions at the beginning and end of the programme, the major part and more specialised contents being covered by smaller groups. Nonetheless, the ability of a hall to cater for all delegates together is an essential selling point in attracting the large international and American conventions.
8.4 Ceiling profiles

Design criteria for ceilings of halls are largely dictated by functional needs, which are considered under their individual headings in other chapters. As a summary, the ceiling construction in a large conference hall will typically satisfy these requirements, as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic requirements</td>
<td>Profiled reflector panels and adjustable diffusers to ensure even distribution of sound over the whole seating area</td>
</tr>
<tr>
<td>Lighting requirements</td>
<td>Lighting bridges for access and supporting frame work for spot and stage lighting in ceiling space over auditorium. Lighting slots in ceiling construction providing screening. Auditorium lighting equipment including emergency lighting. Cabling trunking and connections.</td>
</tr>
<tr>
<td>Air-conditioning</td>
<td>Air ducts, diffusers and balancing dampers, noise attenuation and monitoring equipment, together with supporting hangers and means of access for servicing.</td>
</tr>
<tr>
<td>Stage production</td>
<td>Extended fly tower, gridiron and pulley suspension system for flying stage scenery, safety curtains, and other equipment, including separate access.</td>
</tr>
<tr>
<td>Fire control requirements</td>
<td>Automatic drenchers, sprinklers and smoke vent releases.</td>
</tr>
<tr>
<td>Screen projection</td>
<td>Clearance for ciné film and slide projector beams and adequate height for screens and associated equipment.</td>
</tr>
<tr>
<td>Viewing requirements</td>
<td>Particularly in the case of balconies: the lines of sight from the most distant seats under and on balconies.</td>
</tr>
</tbody>
</table>

Ceiling heights must be proportionate to the scale of the area: they are also determined by volumetric acoustic requirements and ventilation standards. For example, for concert halls a volume of about $9 \text{m}^3/\text{person}$ is desirable whilst for convention use only a volume of about $3-4 \text{m}^3/\text{person}$ is probably adequate. To allow for multiple use the smaller volume may be adopted together with extended reverberation of sound by electronic means. Standards of ventilation generally require a volume of at least $3 \text{m}^3/\text{person}$. 
8.5 **Space and seating requirements**

In order to compare the factors which determine maximum occupancies and seating arrangements a detailed study was made of the legislation and code recommendations governing conference halls in the United Kingdom and in the United States. In particular, extensive reference has been made to the example of Greater London Council (GLC) legislation including the London Building Acts (Amendment) Act 1939 and the Regulations and Rules for Places of Public Entertainment, together with the Code of Practice for means of escape in case of fire (33). For comparable legislation in the United States the Building Code of the City of New York 1970 (NYC) has been cited (34). Reference has also been made to the National Fire Protection Association Codes (NFPA) (35) which are widely adopted in the United States and internationally.

More specific aspects of safety are discussed in Chapter 11.3.

Maximum densities for fixed close seating under the GLC Code are based on 0.5m$^2$/person compared with 0.65m$^2$/person under the NFPA Code and 0.74 to 1.1m$^2$/person in New York. All these densities are based on seats rigidly anchored or ganged together to preserve the row integrity. For informal conference groupings both the GLC and NFPA Codes stipulate a maximum density of 1.5m$^2$/person.

In practice gross areas per fixed seat in an auditorium, including aisles and exits but excluding the stage areas, work out at 0.65-0.75m$^2$/person for traditional seating and 0.74-0.84m$^2$/person for continental seating.

8.5.1 **Seating arrangements**

Seating layouts and densities are largely dictated by legal requirements for the safe evacuation of the occupants in the event of fire. Other factors which must be considered are the aesthetic unity of the seating arrangement, ease of cleaning and maintenance, sight lines and orientation to the speaker and visual aids, and the need for subdivision or rearrangement to accommodate different group sizes. Rearrangement is simplified by the use of loose chairs rather than fixed seating but the same legal standards will apply. In close seating, particularly to achieve high densities, portable chairs will have to be ganged or fastened together in rows or blocks.
Auditorium seating: Traditional seating layout for 3000, with side and rear balconies. (Hamburg Centre). The ends of rows could be straightened by adjusting seat widths.
Depending to a large extent on the shape of the room and the positions of aisles the rows of seats may be in parallel straight lines, with the side rows set at an angle to those in the centre or with the rows set to a curved plan so that each seat broadly faces the centre of the stage.

Seats of varying widths may be deliberately introduced to create staggering of seating positions from one row to the next in order to improve the lines of sight.

Two main systems of seat spacing are used, namely: traditional, with seats separated into blocks by parallel or radial aisles to limit the number of seats per row and continental, with seats more widely spaced and arranged in continuous (usually curved) rows, the seatways extending to side aisles from which there are numerous exit doors leading to a fire separated passage or foyer.

Continental seating is more efficient in providing a higher capacity and is more adaptable to different auditorium configurations. It allows the seating to be concentrated in the most important central area of command and gives more individual leg space and greater room for delegates to pass along the rows.

Where flexibility is required in the depth of seating area used, continental seating enables the rear sections to be closed off without affecting fire escape provisions, each 3 to 5 rows having individual separate exits.

The main disadvantage lies in the distance to be traversed along each row to reach a central seat.

8.5.2 Row spacing

Spacing of rows of seats is determined by the seatway clearance between the edge of the seat and the back of the one in front which enables people to pass along the row. For traditional rows of up to 14 seats with aisles at both ends, or 7 seats with an aisle at one end, the minimum seatway is 305mm and in the Greater London Council (GLC) Code - but not in the City of New York (NYC) - this increases by increments to 405mm for rows of up to 22 seats and 11 seats, respectively.
In addition, the minimum distance overall from one seat back to the next is specified, in the case of the GLC as 760mm and in the NYC as 810mm.

In practice, row spacings are usually more generous than this. At the minimum space of say 810mm there is a small amount of room - about 25 to 50mm for the knees to clear the backs of the seats in front, assuming average body dimensions. At about 890mm seat occupants can comfortably cross their legs but it is difficult to pass along the row without stepping on the feet of others.

Based on this study of auditoria, typical row spacings for traditional seating are 910mm for self-rising seats and 990 to 1020mm for loose chairs fixed in gangs.

Continental seating rows are typically spaced between 990 and 1020mm but this is increased to 1130mm where the seats are rigidly fixed. Under GLC requirements the seatway should be a minimum of 400mm to a maximum of 500mm. Travel distances to an exit are limited to 15m.

The NYC code makes no provision for continental seating but NFPA recommendations stipulate increasing seatways from 460mm for rows of 18 seats to 560mm for 46 or more seats/row. Although the latter allows up to 5 rows per exit, in practice, separate side exits are usually provided for every 3 rows of seats.

8.5.3 Aisles or gangways

Minimum widths of aisles are determined by the number of seats served and whether they provide the primary or secondary escape route. Maximum travel distances to safe exits are also stipulated by legal requirements. At least two separate, independent means of egress must be provided from halls and auditoria with the exits located remote from each other to allow alternative directions of escape.

Provided the travel distances are not excessive, and depending on construction, 2 exits can serve up to 500 occupants. Under the GLC regulations an additional exit is required for every 250 occupants or part above this number.

Widths of aisles and passageways are based on the unit width of a person, nominally 560mm. A minimum width of 2 units is required for aisles, the GLC specifying 1100mm and the NYC Code 1120mm. In the latter Code this width may be reduced to 930mm in certain cases, for example if there are fewer than 300 occupants or adjacent walls with
exits relatively near together.

Aisle widths must be increased to accommodate larger numbers. Some authorities in the United States allow the aisles to be tapered increasing gradually in width along the direction of travel to the exit. In the case of the GLC the widths must be uniform but with a width related directly to the number of occupants, from 1100mm for up to 200 to 1600mm for 400-500 persons.

In the City of New York, the widths of aisles, exit doors, stairs and corridors are calculated from the number of persons allowed per unit width (560mm). For close seating in a convention hall, concert hall or exhibition hall this is generally based on a capacity rating of 90 persons (aisles), 80 persons (doors and stairs), 100 persons (safe corridors), 125 persons (doors from safe area). Reductions of 20-25 persons in each case are made for close seating in a restaurant or ballroom.

8.5.4 Travel distance
To ensure safe evacuation from the hall or auditorium within a limited time, the longest distances of travel on each floor to a safe exit are specified in detail. Under the GLC Regulations, for instance, actual travel distances must not exceed 18m from any aisle or gangway for traditional seating nor 15m from any seating position in the Continental arrangement. For parts which are not used for close seating such as banquet halls and exhibition areas the maximum travel distance is increased to 30m.

Unlike most American codes, no increase in these distances is allowed for premises protected by automatic sprinkler systems.

The City of New York Code limits the travel distances to primary exits to 30.5m (convention and exhibition halls) or 25.9m (restaurants, ballrooms) and to any secondary exits - 38.1m, but all these distances may be increased by 50 per cent if the premises are completely equipped with automatic sprinklers. NFPA recommendations also allow an increase in travel distance from 46 to 61m if automatic sprinklers are installed.

Other requirements
The dimensions of steps and landings and limits to the steepness of inclines are also specified in detail in all legislation. In general, the risers of steps in the aisles must be uniform unless they are
separated by a wide tread. No steps are allowed in the cross aisles. To make the steps more distinctive, nosings should be in contrasting colour and provided with step lights. Aisles must be illuminated at all times with at least 5 lux.

Protective guards are required, extending at least 760mm high and, where necessary, provided with toe guards, along the fascia to balconies and other elevated areas. The height of the guards must be increased to 900mm at the bottom of stepped aisles and where cross aisles are adjacent to seats at a lower level. Guards, at least 660mm high, are also required at the open ends of bleacher seating.

Rails designed as barriers should be able to withstand a lateral force of 222N with a vertical force of 445N applied simultaneously (NYC Code).

8.5.5 Fixed permanent seating
Fixed theatre style seating is generally used in purposely designed auditoria or lecture theatres with stepped or inclined floors. Higher seating densities with greater comfort and better viewing and listening conditions are obtained. Equipment such as the controls and cabling for simultaneous interpretation can be incorporated in the frames and hollow arm rests of individual chairs and for more sophisticated arrangements, such as in the York Theatre, Heathrow Hotel, writing ledges and television monitors can be built into the backs of the preceding seats.

To reduce row spacing, individual seats may be of the fixed self lifting or retracting type.

Fixed seating may be removable to allow some flexibility in use; for instance alternate rows of seats, even in steps, can be covered or replaced by purposely designed tables. Movable seats may also be elevated in steps on retractable floor platforms.

In many multipurpose halls and arenas permanent fixed seating is limited to stepped perimeter areas, leaving a central or flat area for various alternative uses, or as an extension to the seating capacity by adding loose furniture, retractable or bleacher seating.
Seat comfort

Seat design must aim to provide a satisfactory standard of comfort over long periods of constrained movement. For this purpose the ranges of anthropometric dimensions for different groups of conference users, based on the marketing data must be considered. These will show a wide variation depending on racial characteristics, sex, age groups and socio-economic classifications. Tolerance of discomfort varies markedly between generations and from one situation to the next. The spartan seating appropriate for a university hall or recreation stadium is unlikely to be acceptable for older groups attending a convention.

Seat dimensions are generally based on median dimensions of the user population with adjustability allowed in the shape, by means of upholstery and springing, to cover a design range of about 90-95 per cent.

Much of the data on sitting postures and comfort originates from research by Akerbolm and anthropometric studies in the United States and these principles are applied in BS 3044 to the design of office chairs and tables. Practical recommendations on the choice of restaurant and banquet furniture are given by the Design Council and this was also the subject of a case study by the LV Trust. Objective design criteria and sitting comfort ratings have been more specifically researched by Jones and Bainbridge.

Whilst those details are of general application there is a lack of specific information on auditorium seating. Enquiries of all the major manufacturers in the United Kingdom and United States showed wide dimensional variations in seat design and only a limited amount of research had been carried out to assess standards for comfort.

For conference requirements a balance must be maintained between a relaxed posture for comfort and one which is kept erect for alertness and note taking. This depends on the padding, seat height and width, angle of seat and backrest, backrest and arm support and space for legroom and movement. The sitter must not be held in any particular position: changes in posture are extremely important in delaying fatigue.

Seat height and inclination determine how the weight of the body is mainly supported and provided there is sufficient legroom a height of 430mm is usually recommended.
The depth of seat is determined by aesthetic, constructional and comfort considerations. Overall seat plus back depths, based on median figures, are 650mm reducing by 230mm when the seat is lifted.

Widths must allow for both hip and shoulder measurements and the minima are stipulated in both the GLC and NYC Codes. In practice, ranges of seat widths are typically 560 to 610mm for chairs with arms and 500 to 560mm for chairs without arms. Variations in seat widths are often deliberately introduced, particularly in American practice, to allow staggering of rows and to tidy up row ends when seats occupy a non-rectangular plan.

Writing surfaces may be provided in several ways, depending on the extent of specialisation, and include continuous fixed shelves, retractable writing shelves or arm tablets and removable table covers. In all cases the mechanism must be simple noiseless, robust and free from hazard.

8.5.6 Seat construction

Fixed seats usually have a central pedestal secured to the floor or riser either by wood screws into battens or by bolts through the screed into the concrete. The seat may be fixed, tip-up or self-lifting, swivelling or sliding retractable.

Seat construction is generally based on a metal framework supporting 5 ply back and 7 ply seat panels, the latter having a balancing seat weight secured to ensure self tipping. The strength and flexibility of the frame and its secure attachment to the floor or riser are critical, as are the design and fastening of the seat hinges, which must be easy and quiet in movement.

In current manufacture padding is mostly with moulded high density polyurethane foam but fire considerations may require this to be encapsulated or for self-extinguishing polyester reinforced with glass fibre to be used. Surfaces may be upholstered in woven fabric or in polyvinylchloride with fabric base reinforcement, the latter preferably slightly porous to absorb perspiration. Fabric surfaces should be capable of easy recovering using slip-on covers secured by hidden tacks or staples. There must not be any sharp or rough projections from any part, including the back or underside of the seat. The upholstery must be of high durability, tough, shrink proof, resistant to snagging, shading, fading and staining, free from stretch lines, creases and
wrinkles. Possibly the best materials are the wool, acrylic or nylon velours and moquettes. The arms, in particular, tend to be subject to marking from grease, ink and cigarette burns and may be designed to allow separate replacement whether of wood, plastic or upholstery.

The arrangement and fixing of seats must allow for easy floor cleaning, particularly when there are rapid changeovers in use, for example, from a day conference meeting to a theatre or concert hall role in the evening.

8.5.7 Movable seating
The need to provide adaptability to cater for the activities requiring a flat floor as well as those requiring high seat densities with good sight lines has led to the development of a number of moving floor systems. In the more elaborate arrangements, as in the Berlin Congress Centre the whole of the stepped floor can be elevated into the ceiling.

Most systems, however, are based on retractable or telescopic platforms which include Bleacher systems using continuous wood or upholstered benches and seat platforms for individual fixed or folding seats. The former are primarily designed for sports halls and display arenas and, generally, are not appropriate for conference use.

Elevating platforms are also used in stage adaptation to provide aprons, orchestra pits or extensions to the adjacent seating areas.

8.6 Other furniture requirements
Loose furniture is required in halls where there is a need for frequent changes in arrangement and in the use of the room. This is typical of most banquet halls which are used not only for serving table and buffet style meals, but for meetings, displays and exhibitions. Loose chairs and tables are also used in small conference and seminar rooms. Chair and table heights must be related and the same standard heights must be used throughout to allow linking.

Selection of chairs and tables is generally made from standard manufactured ranges, the choice largely depending on questions of relative comfort, functional utility and aesthetic design. The capital costs of exclusive design and short run manufacture are usually significantly higher and, in addition, a large number of spare units need to be purchased in the first instance, increasing costs and storage requirements.
The standard furniture used for meetings is also used for banquets and other meal functions although it is debatable whether the more erect posture supported by a dining chair is appropriate for the longer sitting periods involved in conference sessions.

Compared with other areas the furniture used in conference and function rooms will be subject to greater handling and damage. To meet the conditions of use likely to be experienced, detailed consideration must be given to the following criteria:

- **Strength** - method of folding, breakdown and assembly, strength of components, simplicity of fixing and locking, strength and security in use, safety of guests from sharp, serrated or protruding parts.
- **Durability** - of materials against handling, stacking.
- **Ease of handling and storage** - weight, method of stacking, possibility of damage in stack, types of trucks and dollies available for transportation, space occupied in storage.
- **Interchangeability** - of components such as table tops and bases, scope for multiple use of chairs, tables and platforms, replacement and maintenance facilities, methods of linkage and extension of units, compatibility of size and designs.

### 8.6.1 Seating arrangements for meetings

Furniture requirements for meetings can be mainly categorised by group size, work related purpose and degree of formality.

Round-the-table conferences or discussion groups involve participation on an equal level by all the people attending. Management and committee meetings are generally of this kind. Syndicate groups may also be formed out of larger meetings to discuss particular subjects on a working level. The grouping may be informal or semi-informal, the latter giving greater prominence to the chairman of the meeting.

Room arrangements are almost always based on seating around a central table or central set-up of tables.
Seating plans: Alternative arrangements for conference seating in a hotel banquet area with theatre style, Classroom style, parallel and round-table formations. The last two are also used for banquets.
Single or sectional round tables from 1.0 to 2.5m diameter can be used for groups of 4 to 12 but boat shaped or rectangular tables are more space economical and generally used for between 8 to 22 participants. Standard table heights are 710-740mm with related chair seat heights of 430-460mm.

Furniture of this type is generally semi-permanent room furnishing and a high quality design and finish is usually specified with matching suites of sideboards and cabinets.

For larger meetings, standard tables are set up into the various formations required. For most discussion groups this will be a solid rectangle, or a hollow square or oval; semi-formal groups centred on the chairperson are usually U or horseshoe shaped and more formal arrangements include parallel or inclined rows facing the chairperson and panel or speakers in the 'classroom' style.

Standard tables are normally 760mm wide in lengths of 1.2m, 1.8m and 2.4m. They may be linked by quadrant or semi-circular corner pieces.

As a rule the solid rectangle is appropriate for up to 20 participants; beyond this the room area tends to be used inefficiently. Hollow squares are suitable for up to 50; longer distances giving rise to communication difficulties particularly from the remote corners. Horse-shoe arrangements facilitate the use of visual aids and are at an optimum for groups of 25-35.

In all cases the minimum spacing along the table is 600mm and table dimensions are generally a multiple of this. A wider area may be required for spreading out papers and folders.

Training sessions and information meetings are generally more structured and often extend over several days. They include all forms of training and information requirements for sales representatives, labour unions, management and technical staff. Furniture arrangements are based on a class-room style enabling delegates seated at tables to be addressed by a speaker with visual aids.

To reduce distance, tables of 450mm width are most practicable arranged in rows 700mm apart and 3.6m long seating 6 people, on each side of a wide central aisle.

Group sizes are limited to about 6 rows (72 people) unless the person speaking is raised on a stage or platform. The maximum coverage without speech reinforcement is about 13 rows (156).
An arrangement of tables perpendicular to the person speaking may be required for certain groups. In this case the standard 760mm tables are used but the spacing is more generous to allow for delegates turning to face the speaker and to leave aisles between adjacent rows of seats. For these reasons the table length per person is increased to 760mm and the rows are kept 1.4m apart.

For large conferences, particularly in the plenary sessions, the chairs are arranged in rows 'theatre' style without tables.

For close seating arrangements the chairs must be secured together in lengths of 4 or more. Usually seats flanking the front, back and cross gangways and those near the exits must be fixed. Where floor fixing is impracticable, such as on polished dance floors, floor bars joining 3 adjacent rows may be required.

8.6.2 Furniture handling and storage
To carry heavy stacks direct from the room to storage dollies and trucks must be strong, light-weight, easily manoeuvrable with silent running castors and of a width which will pass through the doors, elevators and passages (including access to understage and other storage spaces).

Dollies are generally purposely designed to fit stacking chairs and equipment and the number required is determined by the maximum number of chairs divided by their convenient stacking height.

Trucks may also be designed to take folding chairs, tables or racks or may be general purpose platform trucks.

Storage is often underestimated both in space and in accessibility. Lack of suitable storage will lead to congestion, additional handling costs, extra damage and restrictions on use. In setting up a function time is usually critical: often the banquet area will need to be laid out whilst another function or meeting is going on, in order to be ready for the following session. High utilization depends on a rapid changeround in room function.

To achieve this involves smooth, efficient, almost silent movement of furniture from one section to the next including to and from storage when required.

Access demands transport on the level direct to store or to elevators provided for this purpose. Doors must be double swing, fenders and
buffers must be strategically provided to reduce scraping and damage; openings must be designed for the large sets which may be required, particularly if the hall is used for multi-purpose shows and displays.

Where there is a permanent stage separate access at stage level must be provided from the rear with suitable local storage for stage equipment and any scenery or background sets required.

Storage rooms must be well lighted to 150 lux, ventilated with at least 1 air change/hour to avoid mustiness in upholstery and curtains, and be free from damp, extremes of temperature, dust and fumes. The area must be of rodent and insect proof construction with gauze covered ventilators and concrete, brick or blockwork separation. A high standard of fire-resistance is required for the enclosure because of the large fire load and potential risk of 'flashing' from the gas build-up of smouldering materials. A minimum of ½ hour resistance increasing to 1 hour adjacent to public areas and 2 hours or more adjacent to possible fire escape routes are usually specified.
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(14) Fletcher H, "Speech and hearing in communication", Van Nostrand, 1953


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(36) Akerblom B, "Standing and seating posture", AB Nordiska, Bokhandelm, Stockholm

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9.1 Relationship with conferences

The use of exhibition facilities either alone or combined with meetings is tending to increase and represents a major component of congress centre operation.

For example, in the Wembley Centre in 1978 there were 95 sizeable trade shows each having about 150 stands. The Paris centre mounted 51 exhibitions in 1977, only one year after opening, and these attracted over half a million visitors.

There is a considerable overlap between the use of congress centres for trade shows and, in reverse, the use of exhibition centres for congresses and meetings. Regardless of location, most association meetings involving education, science, technology and medicine, are accompanied by an exhibition of related equipment and products, and this is encouraged partly as a means of financing the meeting as well as of extending interest. Many congress centres themselves sponsor trade fairs and exhibitions in order to establish a regular calendar event for the trade associations and buyers concerned.

Meetings are invariably generated by exhibitions and shows, often requiring hospitality 'suites' rather than assembly rooms.

Apart from trade shows and general exhibitions a good deal of the business for congress halls requires high standard display facilities as a principal feature, such as in sales promotion, product launches, competitions and demonstrations, fashion shows.

Facilities for exhibitions can be considered in two main categories: those in hotels and conference centres are generally concerned with the specialist trade exhibitions which tend to be associated with meetings; in the large purpose-built exhibition centres the exhibitions are considerably larger in size and coverage, they usually follow a set calendar with repetition every one, two or four years and, in many cases, they are unrestricted in attendance. The latter also include the large public exhibitions and permanent trade marts.
9.2 Specialist trade shows in conference centres and hotels

Exhibition halls for this purpose are generally provided in congress and convention centres, trade centres and the larger hotels. The halls are often multipurpose in design to allow the space to be used for banquets or meetings as required, thus providing for flexibility.

From studies of the patterns of use and analysis of a large number of events most specialist trade shows associated with meetings can be accommodated within a net area of about $900m^2$ although some require up to about $1,500m^2$. About 50 to 60 per cent of the space in an exhibition area can be utilized for display, the balance of space being taken up by aisles, emergency fire escapes and support services for the visitors. Gross areas generally range between $1800m^2$ and $3000m^2$ in conference centres whilst banquet/exhibition halls in large hotels are more typically around 400 to $600m^2$ in the United Kingdom and $900m^2$ in the United States.

For flexibility and better space utilization, purposely designed exhibition areas are often designed with two or three sections which can be separated if required or opened to provide visual continuity and free circulation from one section or hall to the other for larger exhibitions. In larger halls, such as those associated with conference centres, part of the area may have a balcony or mezzanine floor to provide greater utilization of the space whilst providing a more compact area for small exhibits and stand displays. This may also allow changes in floor level to be introduced provided good access is maintained for visitors and exhibit material with both stairs and lifts to each floor. Compared with hotel exhibition/banquet halls in which the ceiling height is usually between 3.6 and 4.2m, the clear height over at least part of a purposely designed exhibition hall should be at least 6m high or more to accommodate tall exhibits and display features. Under any balcony, a minimum height of 3.6m should be provided where separation is possible, individual means of access and services to each part must be provided, allowing fully independent use, either for storing or setting up one exhibition whilst another is still operating or for part of the area to serve for meetings, banquets or social uses associated with the exhibition.
9.2.1 Space requirements

For planning purposes booths or stands are generally based on a modular layout although provision must be made for a wide variety of stand locations and servicing requirements.

As a broad guide, small display booths are usually about 3m wide x 2.5m or 3m deep giving a net area of some 9m² per booth. For larger exhibits an average area of 15m² would be more typical.

A major trade show held in parallel with a conference would have about 100 stands and cover an area of about 2000m² but the larger shows of this kind have some 150 stands requiring 3000m² as a standard.

Most exhibition halls forming part of a complex are in this order of size although American and Canadian convention centres tend to attract larger shows of 250 to 300 stands and an exhibition area of 4600m² or more is common.

For flexibility it is advantageous to limit any one space to about 2000m² but to cater for major shows the area should be adjoining with removable partitions to allow extension from one to the other. Each area of 2000m² may also serve for a large meeting of some 2400 delegates or as a banquet hall seating 1600.

9.2.2 Modular grids

Modular dimensions for structural, building and utility servicing components of the building must take account of booth or stand dimensions and allow for reasonable flexibility in show layout. To cater for every variation will add considerably to building and engineering servicing costs as well as breaking up the continuity of the floor and/or ceiling. On the other hand excessive trailing cables, exposed pipework and shadowing can cause hazards and affect the presentation itself.

To some extent, the stand design can accommodate service requirements in channels along the partitions and under floor platforms and this is helped by the use of modular units.

In halls purposely designed for exhibition use the engineering utility services may be taken in modular grids provided by floor channels with access covers at intervals, or in ceiling raceways or trunking. Typical service grids may be 2.5 or 3m apart.

Structural grids are kept as large as practicable. For lightweight roofs with internal heights of 10m to 15m or more, as required for
large exhibition halls, column spacings of 30m centres are often adopted. The trusses spanning the bays are usually 'N' or Warren type lattice, in some cases with a box section serving also as walkways to give access to overhead services.

In the National Exhibition Centre at Birmingham, the truss supported roof construction is based on two-layer space frames and in other cases lattice, open web or castellated purlins are widely used to provide support for the roof decking. (2)

Smaller halls associated with congress centres are often based on a 10m or 15m structural grid. The location of columns has a considerable influence on booth layout and hence on circulation planning and utility service grids.

9.2.3 Floor construction
Floor loadings specified for trade exhibits rarely exceed 14 to 17 kN/m\(^2\) as a uniform load although local concentrated loads could be as high as 200kN/m\(^2\) or more to take heavy wheeled loads and static units of equipment including point loads. Much higher loadings can be expected in the large exhibition halls (see 9.5).

It is advantageous for both user access and design purposes to support exhibition floors directly on the ground and the form of construction is usually reinforced concrete slab on a granular sub-base. The wearing surface of hall floors which are left exposed is often a composition mix which retains a degree of flexibility and can be fairly easily repaired. Floors which are to be covered by carpeting, as in most hotels and conference centres, are generally screeded ready for carpet laying.

Floor surfaces need to be able to withstand hard use, the scraping of items dragged across the floor, rubber and plastic skid marking and spillages of paint, water and other materials.

Exposed flooring tends to be noisy and utilitarian but is essential for the heavy traffic and floor servicing requirements of a large exhibition. Floor levelling is critical, not only for stand and exhibit erection but to facilitate cleaning and drainage.

Where carpeting is provided, squares should be cut out over the access covers to utilities. Alternatively, removable carpet tiles may be used for floor covering also allowing variations in tile colour or shade to
mark out the circulation areas. Developments in carpet construction using bonded bristles, or polypropylene and polyamide fibres enable carpeting to withstand severe wear and soiling whilst being relatively easy to clean and restore.

For stands requiring floor services over, say a carpeted floor, the stand design will normally include a platform about 100mm high with space below to run the cabling and pipework to suitable terminals.

9.2.4 Walls
Problems are likely to arise from the damage caused when exhibits are uncrated and set up or broken down, particularly during transportation. The lower areas of walls should be resistant to scraping and in vulnerable places, like external corners, corridors and entrances to goods doors or service elevators, extra protection by covers or fenders is required.

Other requirements are concerned with combustibility of the materials, surface flame spread characteristics and - where fire division is involved - the period of fire resistance. It is also important to consider alternative uses to which the hall may be put. For meetings, a sound diffusive surface will invariably be necessary to avoid echoes and air resonance from cross reflection. In the case of banquets a decorative, easily cleanable surface will be required and this will also apply for social use, discotheques, dances, etc.

Based on the cases studied, wall linings may be constructed of:
- concrete with self-textured surfacing or applied forms of rendering;
- plain concrete or plastered walls painted or vinyl covered;
- laminated sheeting on metal framing fixed to structural concrete or block or brickwork infill;
- fair faced brickwork, softened at high levels (above 2m) by plastering using lightweight aggregate for sound absorption.

9.2.5 Ceilings
As a rule the ceilings of exhibition halls are left open for economy and to allow access to ceiling mounted equipment. In the case of a hall providing a clear height of 10m or more, the view of the roof structure and associated engineering equipment is above 35° from
eyelevel over most of the floor and the visual intrusion will be minimal. If necessary this can be further camouflaged by mounting lighting battens and other terminal equipment in the same horizontal plane so that the spaces above are screened by the controlled distribution of light below this level and by having a uniform matt dark colour in the ceiling void.

For halls of lower height, a formed ceiling construction is usually desirable particularly if the hall is to serve for other purposes. The ceiling must be panelled to allow access to the equipment above and satisfy other criteria, namely:

- easy access, without damaging the panels;
- easy cleaned, permanent surfaces for wiping off hand marks;
- robust to withstand handling;
- incombustible or with a Class 0 or Class 1 very low rate of surface flame spread;
- modular with luminaires, air diffusers, loudspeakers, sprinkler systems and other mounted equipment;
- sound absorbent - the method of treatment depending on multiple use of hall;
- aesthetically acceptable for use as banquet hall or congress hall.

Technical details of equipment and services are discussed in the following sections.

9.2.6 Engineering utilities
The engineering services required for a trade show or exhibition held in a conference centre or hotel are generally less sophisticated than those installed in the larger exhibition halls. In the former, provision must be made for single and three phase electricity - at 240/420 volt or other stated voltage determined by the locality - for lighting and power.

Telephones and closed-circuit and broadcast television extension lines should also be provided. Potable water supplies, waste and floor drainage, gas supplies and, where possible, compressed air lines and exhaust connections for internal combustion engineers and fume producing demonstrations should be available but whether these are extended over all the area of the hall will depend on the nature and frequency of its use for exhibitions.
The vast majority of exhibits in the type of trade show held in hotels and multipurpose centres need only lighting and power supplies. If water and drainage are required, for example in vending machines, local containers are often built into the equipment, avoiding the need for plumbing. This also applies to the use of portable gas instead of main supplies.

Depending on size and specialisation for exhibition use a hall may provide the following engineering utility connections:

<table>
<thead>
<tr>
<th>Engineering Utilities</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ceiling grids</strong></td>
<td>Electric cabling or busbars in trunking or raceways in the ceiling, usually in a grid with 2.5m or 3m modular spacing. Cable connections to stands or booths are run down through booms and extended to the terminal points by means of conduit or purposely designed channels built into the stand partitioning.</td>
</tr>
<tr>
<td><strong>Wall trunking</strong></td>
<td>Enclosed raceways or trunking extending round the walls of the hall unobtrusively at skirting level, 150mm above floor, or as a cornice near ceiling level. This enables distribution boxes to be connected from which lines of cabling can be run over or through the stand partitioning to the required outlets.</td>
</tr>
<tr>
<td><strong>Terminal boxes</strong></td>
<td>Terminal boxes enclosing connections to engineering utilities may be provided at fixed points around the hall in the walls, floor or enclosures to the structural columns. This limits the layout flexibility and must be related to the modular dimensions of the stands or booths.</td>
</tr>
<tr>
<td><strong>Floor grids</strong></td>
<td>Engineering utilities may be run through floor channels or trenches constructed in grid lines across the floor and covered by removable continuous trays or, where the floor is carpeted, with access covers at intervals of 1, 2 or 3m. Grid lines must fall within the modular dimensions of the stands or booths and are usually to 3m modules.</td>
</tr>
</tbody>
</table>
in halls of medium size and to 6m in the larger, commercial exhibition halls. The lines of trenches may be connected to a service walkway under the floor or direct to a basement, housing the mains and plant. Access to the utilities is thus possible with minimum disturbance to the hall use.

Apart from individual exhibitors' requirements, a hall will require good ventilation and air conditioning, and the installation of sound relay systems with speakers adjusted in direction and balance to allow for the interval delay, subjects which are considered in detail in later chapters.

9.3 Operational details

9.3.1 Stands or booths
Exhibitions generally have two main sections, namely:

- shell or booth schemes in which stands or booths of fairly regular size are arranged in rows as wall stands or island blocks, and

- free form space or salon schemes with exhibit areas individually designed within a block rented area of the floor. Usually the exhibition organiser will lay down conditions such as limits on height related to set back, but the design is governed largely by the type of material to be exhibited, such as vehicles, plant or erected displays. Free form spaces are usually located in the centre of the hall or in a separate hall allocated for this purpose. Salon schemes often encompass groups of exhibitions sharing a collective enclosure.

Shell or booth schemes may be grouped into the display booths, which are common in America, and conventional shell stands which are individually constructed on site.

In the United States and Canada booths are traditionally separated by drapes hung on tubular aluminium framework providing adjustable screening about 2.5m high at the rear and 1.2m high at the sides. The drape equipment is often supplied by a professional show decorator under a rental agreement with the sponsors. Booths are generally provided with drapes, a duplex 110 volt electric outlet and standard sign, additional
equipment being rented or brought in by the exhibitor. From studies of layouts the standard unit sizes of booths are 3m wide x 3m or 2.5m deep and aisles are normally 3m or 3.5m wide.

Stand construction on site for conventional shell schemes is usually based on a 3m x 3m module but can accommodate wide ranges of size. A standard shell scheme uses 2.75m high wall panels giving an overall net height of 2.85m. If floor platforms are used a further 100mm must be added and, allowing a working clearance of about 450mm, requires the hall, or balcony, ceiling height to be 3.55m without obstructions.

Depending on fire regulations, main aisles or gangways are usually: 3.0m wide for trade shows and 3.5 to 4.0m wide for larger exhibition. Secondary aisles are normally 2.5m, or in large exhibitions, 3.0m wide.

For economy of space as well as easy identification, the main aisles should be planned to run from fire-exit to fire-exit.

Details provided by contractors indicate that stands are almost universally constructed from a framework of timber and/or aluminium channels usually with ply-, block-, chip- or fibre-board panels and fascia, and decorated on completion. As much of the work as possible is prefabricated in the stand contractor's workshops, although fitting and assembly etc. must be done on site. Site labour costs are quoted to be at least twice those in a workshop for the same output.

9.3.2 Modular shell stands
The trend in shell design is towards the use of modular components which can be rapidly assembled on site saving labour, rental time and material costs as well as allowing tighter scheduling programmes for shows and hall use. Modular designs are generally based on 1m units with a standard shell of 3m x 3m, capable of extension. Each modular design relies on a proprietary jointing system which enables frame, fitting and panel components to be easily connected together. As a rule, systems - of which about 6 are widely used - are not interchangeable.

The components have permanent finishes particularly anodised aluminium, chromed, enamelled or stainless steel and laminated board. Stands are usually square or rectangular but may be octagonal or with rounded corners depending on the system.

Modular designs may be offered by the hall operators as an exhibition service, but are more often supplied through nominated exhibition contractors. Distribution of the many components to stand locations may
be facilitated by the use of preloaded trucks or racks and in a large exhibition hall, these are coupled into trains pulled by tractors.

9.3.3 Safety requirements
The materials used in stand construction must not present a fire hazard within a hall. Essentially, the materials must be incombustible, inherently non-flammable, or made flame resistant by impregnation or proofing. Plastics must be self-extinguishing in addition to having an acceptable flame resistance.

No matter how well planned, the space allocated to exhibition stands should not be greater than twice that allocated to aisles or gangways.

The number of exits required from a hall will be determined by the travel distance for evacuation, which under both the Greater London Council Code and New York City Code should not exceed 30m measured along the aisles. The latter allows an increase of 50 per cent if a complete system of automatic sprinklers is installed. At least two alternative exits must be provided plus an additional exit for each 167m² area or part increase over 333m².

Exit widths are calculated from the maximum capacity of the hall, using an assumed standard of 1.5m² per person, increasing by increments from a minimum of 1.1m for a hall of 133m² to 1.6m for a hall up to 333m² in area.

Other fire requirements and circulation details are given in Chapters 8 and 11.

9.3.4 Environmental requirements
Apart from the operational services to individual exhibitors, provision must be made for air conditioning, lighting, fire protection and other environmental requirements of the hall itself. In multipurpose halls these will need to be designed for other uses which may impose higher standards of provision. For trade shows or exhibition use the following requirements are typical, although the studies showed some variations determined by local conditions.

Internal design temperatures from 16°C to 18.5°C for winter conditions and from 21.5°C to 23°C for summer will cover the normal range of exhibition needs. 10-15 air changes/hour is the standard recommended for halls which need to cater for other needs, such as banquets, with
control over the proportions of fresh : recycled air. For large halls used primarily for exhibitions a lower rate of 6 – 10 changes/hour is usually adequate. It may be necessary to supplement heating to ensure quick recovery of temperature after a show has been set up, and air curtains may be provided over the large loading doors to reduce wide fluctuations.

The positioning and design of diffusers must avoid air being blown into any particular exhibit area and short-circuiting by the obstructive effect of the stands. Discharge velocities of diffusers, and hence the distribution and cross-sectional areas of air handling ducts, will be determined by the ceiling or mounting height and the limits to noise emission. The latter will particularly apply if the hall is to be used for meetings or banquets and, in this case, velocities of 4m/s for high ceilings reducing to 2m/s for smaller rooms may be the limit, depending on the degree of attenuation provided.

In larger commercial exhibition halls with heights of 10.5 to 15m, discharge velocities of 6m/s to 10m/s will be necessary to achieve effective distribution. The return air ducts must be designed to ensure a balanced airflow distribution.

Packaged air-handling units are usually mounted on the roof or adjacent to each hall to provide independent zoned systems. For energy conservation the individual units should have time and thermostat controls monitoring both external and internal conditions and giving automatic regulation. The associated equipment will include an air intake, mixing chamber to give a variable proportion of fresh and recirculated air, automatic filter, cooling coil with refrigeration equipment, heater (usually gas fired) and supply and return air fans. The installation weight, in the order of 5 tonnes for a large unit, access and servicing requirements of this equipment will need to be considered in relation to structural design. Separate ventilation extract is necessary for areas such as toilets, kitchens and refuse handling plant.

Supplementary heating will invariably be required in entrance lobbies, cloakrooms, etc. whilst offices and suites used by exhibitors as well as guest rooms in the hotel are generally provided with individual adjustable fan-coil units.

Separate air conditioning zones must be installed to supply restaurants, lounges and other public areas, providing for flexibility in use.
9.3.5 Lighting

For exhibition use some degree of natural lighting is advantageous, improving the daytime working environment and reducing energy costs. However, the proportion of glazed area must be limited to avoid heat loss/gain difficulties; windows must be located out of the direct line of the sun to avoid glare and must be at a high level, well above the exhibit space, to avoid diminishing the illuminated impact of displays.

Lower windows present a security risk and may lose the impact of launching a new product. In any event the internal appearance of a hall being set out for an exhibition is poor and even during the show only the backs of stands are generally visible. If windows are required for other purposes, blackout blinds or screens must be installed.

Luminaire design depends on the height and character of the hall. The minimum service value of illumination should be 400 lux with switching facilities to reduce this to about half when the hall illumination is supplemented by stand displays. In a large exhibition hall colour corrected 1000 w high pressure mercury discharge lamps are probably most suitable to compensate for the high level fixing whilst in other situations balanced fluorescent lighting, on battens or in suspended luminaires, may be more appropriate.

In addition to providing separate lighting circuits to each section of the hall to allow flexibility of control an independent emergency system maintaining an average level of 5 lux should be installed.

Details of lighting systems for congress halls and displays are given in Chapter 10.

9.3.6 Security and communication systems

Based on the surveys of facilities and insurance requirements, the facilities for security and control comprise an important aspect of exhibition standards with valuable and sometimes unique material on display.

Control and information services overlap in function and can be considered to include public address systems, closed circuit television, automatic detection and alarm and telephone systems. A public address system with loudspeakers zones by area and adjusted for time delay and balance must be installed throughout the halls and their associated areas. Depending on the scale of exhibition use a separate control room with observation windows overviewing the hall may be provided. Control rooms of this type are typically equipped with sound control console,
background music and announcement facilities, closed circuit television monitors and fire indicator panels. However, in an hotel this equipment is more likely to be centralised with other services.

Closed circuit television is used to monitor the operation of the hall and to maintain a security watch on goods entrances, lobbies and other areas. The cameras should be motorized on swivel mountings to span an arc of coverage. Broadcast television services may also be required for stand demonstrations. There is an increasing demand for television filming of exhibitions and display material and the access requirements for cameras, lighting and other equipment must be determined. These subjects are considered more specifically in Chapter 11.

Detectors for smoke and heat must be installed, together with automatic alarms and manual breakglass units. Sensors are also installed to indicate the operation or isolation of automatic sprinklers and other fire control equipment.

For commercial exhibition purposes, automatic sprinkler systems are practically essential, and CO\textsubscript{2} installation will also be required in electrical substations.

Telephones may be required for individual stands and suitable lead points must be available. Public telephones with enclosures or acoustic hoods must also be provided within the vicinity.

### 9.3.7 Exhibition operation

From the statistical details discussed in Chapter 5 typical programmes for exhibition may be summarized:

<table>
<thead>
<tr>
<th>Hotel or congress centre: small trade shows and specialist exhibitions</th>
<th>Exhibition centre: large trade shows commercial exhibitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build up time for marking, setting up construction and decorating</td>
<td>2 - 4 days</td>
</tr>
<tr>
<td>Show open period</td>
<td>3 - 4 days</td>
</tr>
<tr>
<td>Break down and clear out hall</td>
<td>1 - 2 days</td>
</tr>
</tbody>
</table>
There are, however, wide variations from this pattern: some consumer exhibitions and international trade fairs lease an exhibition centre for a month taking 10 to 14 days to build-up. Leasing charges to an exhibition organiser are generally based on the overall time and floor areas involved. The organisers' rates for exhibitions are more often based on the net areas and open period of the show, with conditions stipulated about the time allowed for entry and removal of exhibits.

Construction programmes were found to follow a similar pattern whether in America or Europe. The exhibition organiser is not only concerned in allocating space but usually appoints or nominates the main contractor for stand shell construction and subcontractors for electrical installations. The individual exhibitors, using their own designers and subcontractors, then set out the stand displays and special decorations.

9.3.8 **Access**

All exhibitions require good access for vehicles, construction equipment and exhibit items. The time allowed for setting up an exhibition is short and many vehicles will need to unload at the same time.

Even if one main contractor is nominated for all the shell construction, 4 - 5 large pantecnicons may be required to build an average show covering 2000m². Vehicles bringing in exhibits, decoration materials and equipment will arrive shortly afterwards. The breakdown of one show may overlap with the arrival of shipped exhibits for the next, requiring local warehousing.

Essential requirements for handling exhibits to ensure a high turnover of hall use, include:

- Adequate parking for goods vehicles and trucks with direct access to unloading docks. In large exhibition halls, vehicles may be able to drive to the stand locations, unload and drive out by an alternative route.
- Supervision of vehicle entry to reduce congestion, combined with security control
- Facilities for unloading and transporting exhibits and equipment direct to the exhibition hall, where possible, at one level
- Doors, corridors and entrance to allow headroom and width clearance
- If transportation to other floors is required at least two large
heavy duty goods elevators must be installed.

9.3.9 Storage

Two main categories of storage are involved - for the hall, or hotel management and for the exhibitors and contractors. The former will include space to store furniture removed from the hall for the exhibition and more specific storage for operational equipment such as light fittings, signs, display items and audio-visual aid equipment and materials. Crate and box storage for the exhibitors may be off-site incurring extra charges for extra handling and space costs, or on-site to increase the speed of setting up.

As a broad guide, the essential storage space must be some 10 percent of the net space used. In an hotel this will be entirely taken up by furniture and further provision will need to be made for crates. Stores introduce a fire hazard and must be located away from emergency exits or staircases and have high standards of fire resistance provided in the enclosure construction.

9.4 Other accommodation requirements

In mounting an exhibition or trade show, even of moderate size, additional offices and employee facilities will be required. The facilities found to be required in all conference centres and large hotels may be summarized as follows:

- Sanitary facilities for contractors and other pre-opening labour. In an average hotel about 20 workers are likely to be involved at any one time and it may be practicable to use other employee facilities if these are suitably located. In a larger exhibition hall specific facilities must be provided.

- First aid room including a clinic sink and treatment facilities. A disabled person's toilet is usually located adjacent and an intervening reception area provided.

- Press room providing offices, telephones, interview room.
- Exhibition organisers office with typing/reception room. In a large exhibition, a suite of rooms may be required.
- Hospitality suites and sample rooms for exhibitors. Convertible hotel guestrooms may be used for this purpose.
- Visitor Services such as a travel bureau, information stands and concessionary shops.
- Catering requirements are covered by the general hotel or centre facilities but the larger numbers and concentrations of use must be taken into account.
- Media room for television and photography work associated with the exhibition. Suitably equipped rooms for hire by exhibitors and agents are provided in most of the new conference centres.
- Additional offices may be required for administration and agency letting such as by marketing, promotion and transportation services. In the large American centres, offices and suites are usually available on long leases.

9.5 Major exhibition centres

Differences between the purposely designed exhibition centres such as the National Exhibition Centre, Birmingham, with 91,000m\(^2\) of usable floor space, or the Düsseldorfer Messen (126,000m\(^2\)), and the exhibition facilities provided in conference centres and hotels are mainly matters of scale and specialisation.

Exhibition centres provide a range of halls of different sizes to serve any kind of exhibition required: from a usable floor space of 4000m\(^2\) up to 25,000m\(^2\). Furthermore, the halls are designed so that separating walls can be removed to open up the full area for major consumer exhibitions. Heights of halls are typically about 12m for general exhibition work; 16m to 22m for tall exhibits and displays, and 8m, this lower height serving more varied requirements such as local fairs, congress meetings and receptions or banquets.
Rebuilt in 1971 following a fire the McCormick Place contains 55,700m² of exhibition area, a 4,300 seat theatre, 9,300m² of meeting rooms and 3,900m² of restaurants and cafeteria. Maximum flexibility is provided in the arrangement of space with separation of public and service circulations.
Bella Center, Copenhagen

Architect: Ole Meyer.

The Bella Center is planned as a series of individual halls linked by glass roofed circulation galleries and having common access through a tall glass covered entrance lobby. Included within the complex are a congress hall for up to 4,000, a cinema seating 600, a restaurant and cafeteria.

McCormick Place

Architects: C.F. Murphy Associates.

The roof structure, formed from a 2 way roof truss system, is divided into 45.7m square bays, cantilevered out 22.9m around the perimeter and supported by steel clad r.c. columns of cruciform section 15.2m high.
Each hall is usually self-contained in that it can provide all the services required for exhibitors and visitors independently from the use of other areas, so that overlap between exhibitions is practicable. Facilities are also provided for outside exhibitions or extensions to allow the construction or installation of plant, buildings and structures for lake-based displays for boats, and spectator shows.

Good road access to a large market area is essential, together with parking and public transport facilities for the large numbers attending. For example, Dusseldorf has over 20,000 parking spaces for cars and 1,000 parking lots for exhibitors. The NEC provides over 15,000 car parks and 300 spaces for delivery vehicles and coaches. (2)

With very large numbers of arrivals during the first few hours of an exhibition opening, circulation planning must take account of the capacity of feeder and access roads and intersections, the locations of parks, coach and taxi stands and public transport stations, walking distances to the reception lobby and individual halls, and means of directing circulation.

To facilitate circulation within the site the halls may be grouped around a central reception area. In other cases, covered high level pedestrian bridges may be provided to facilitate the cross-over between separated halls. Uniform and repeat sign posting, together with the use of identifying symbols, numbers and colour codes are essential for orientation and direction to particular areas.

Maximum occupancies of exhibition halls are based on 1.5m² per person but larger gross areas are required in practice. For congress meetings a net close seated capacity of 0.6m² per person is possible and this would also represent the crowding limit to an entrance lobby or circulation area. For practical purposes an area of 0.8m²/person is more appropriate.

Statistics of the Dusseldorf Trade Fairs suggest that there are usually about 2 visitors for each m² of rented stand area in specialised trade fairs. (3)

9.5.1 Hall design

Halls are invariably single storey, modular in design, using standard structural systems to facilitate prefabrication. Tall vehicle access doors must be provided to enable constructional materials and exhibits to
be taken direct to the stand locations with separate exit routes to
minimise vehicle manoeuvring within the hall.

Heavy floor loads will be involved and design specifications are typic-
ally based on a uniform loading of 200 kN/m² with up to 50 kN on a
300mm square plate base. Composition floor finishes are mainly used and
should be capable of taking fixings for tall exhibits where necessary.

Although there are wide variations in exhibit requirements, individual
stands are usually planned on the basis of 9m² to 15m² units but free
form displays may take up much larger areas.

Engineering utility services to the stands are invariably run in
underfloor duct or channel systems with 3m or 6m spacing with access to
services provided by underfloor galleries and basement plantrooms.

In most respects, the environmental standards for multipurpose exhibition
halls are applicable except in that the criteria for noise control are
usually less stringent. To achieve effective air distribution from
high level diffusers, and to reduce stratification, much higher discharge
velocities, in the order of 6 to 10m/s are involved and the degree of
sound control resulting from hall reverberation is not easy to regulate.

However, all centres include at least one hall designed for conferences
and other uses such as banquets, receptions and local product shows.
This must have a lower ceiling, preferably no higher than 8m, together
with acoustic absorption incorporated into the interior design. Most
of the exhibition centres in the United States have a purposely designed
convention hall as part of the facilities.

9.5.2 Catering services

A comprehensive range of services must be offered to both visitors
and exhibitors. This will include a choice of food and beverage service,
cloakrooms, toilets, first aid facilities, offices, hospitality rooms,
travel and hotel reservations, public telephone, paging and announce-
ments, a press centre, and some shopping facilities.

These are comparable to the facilities required in conference centres
outlined in 9.4 but with provision for the larger numbers involved.
However, more specific arrangements are generally required in catering
for the large consumer shows.

For operational reasons food service areas, bars and kitchens are
usually grouped together to form service modules which can be largely
standardised in basic design. Separate modules may need to be provided in each main hall or divided section to allow each area to be used independently. Although large numbers of people will be involved it is an advantage to limit the size of each restaurant or cafeteria in order to provide better individual service, control and flexibility.

A restaurant with table service and a la carte menu seating up to 150 will take up an area of about 300m² and a self-service cafeteria with seating capacity of up to 300 will occupy about 450m² excluding counter space. Whilst the food service areas need to be open for most of the time an exhibition is in progress, the peak demand invariably occurs between 12.00 and 14.30 hours. Seat utilization during this peak period is normally about 2 times in the restaurants and 3 to 4 times in cafeteria.

The numbers of places required will depend on many factors, particularly the location of the exhibition hall and alternative facilities available, the nature of the exhibition, number of attendances per day and exceptional circumstances creating concentrated peaks of demand. As a rule, the main use of restaurants is likely to arise from specialist trade fairs, whereas public exhibitions generate a much greater need for snacks and self-serving facilities.

From analyses of exhibition attendances and patterns of use, in most cases, 30 to 45m² of hall floor area will require 1 restaurant or cafeteria place plus about 1m² of bar and lounge space.

In addition, snack bar and refreshment services must be provided for hall users either by means of permanent bars or by portable counters which can be stationed in and adjacent to the hall as required. A refreshment service to stand attendants and a restaurant for exhibitors are usually required in addition to hospitality suites. Provision will also need to be made for the banquets and receptions which are held in association with exhibitions. (5)

Organisation of catering in exhibition centres is usually based on part centralisation of food production, including the preparation of snacks and sandwiches, in a commissary kitchen together with bulk storage of food and beverages, laundry and other services.

Distribution requirements for food and beverages taken to the finishing kitchens in service modules and for the disposal of waste must be planned separately from the visitor circulation. Because of the distances
involved, final preparation of food and dishwashing usually need to be decentralised. Details of catering requirements are similar to those described in Chapter 4.3.1 and 4.9.

(2) AJ Building study: "National Exhibition Centre" Architects Journal, May 12, 1976, pp 931-946

(3) Dusseldorfer Messegesellschaft mbH, "Basis fur business", NOWEA, Dusseldorf, 1979


10.1 **Illumination requirements**

Attendance at a conference or exhibition usually involves the delegates spending most of the time within the confines of the hotel or centre, including long periods within an auditorium or hall which is completely isolated from the outside. Environmental quality is, therefore, an important aspect of design, contributing to the occupants' comfort and appreciation of the events taking place and providing for their health and safety.

Standards of environmental control are made all the more demanding by the need to accommodate large numbers of participants within a concentrated area and by the changing requirements from one time or situation to the next. On one occasion the aim will be to stimulate interest or to compel attention whilst on the next it may be to encourage social participation or to provide a suitable ambience for relaxation.

The environmental services also have more specific roles: for example, lighting is a primary consideration in display of exhibits and in the architectural modelling of design features of the building and its interiors.

This study examines the fundamental background to each requirement in order to identify the ways in which these can be met and the standards of performance which should be provided. Comparisons are drawn between the standards in the United Kingdom and those in Europe and the United States and the technical requirements for effective lighting and air conditioning in hotel meeting rooms and conference centres are set out, together with alternative ways of achieving these.

The conclusions are based on current practice as revealed by the international surveys of facilities of recent or current construction. To avoid complication, individual case examples and variations have not been cited.

10.1.1 **Exterior lighting**

Floodlighting and other forms of exterior lighting have a commercial
function in promoting awareness and interest in the centre or hotel, in
demonstrating the character and architectural form of the buildings and
in extending the activities of the building into its surroundings. Good
exterior lighting also reduces the incidence of accidents and facilitates
the surveillance of people entering and leaving as an aspect of security.

Functional requirements of exterior lighting include a general
illumination of 10-20 lux over car parks and footways, private access
roads and fore courts, both for visitors and for service, delivery and
maintenance requirements. Main entrances and exits need to be identified
by a higher illumination (20 lux) and 100 lux is normally specified for
control points such as entrance gates and loading docks. Enclosed car
parks generally require lighting to 50 lux. The photometric luminance
of signs must be related to their individual backgrounds.

Consideration must also be given to the day time appearance of the columns,
brackets and lamps as well as to the design and compatibility of street
furniture generally, including signs. In most countries statutory
regulations apply to traffic signs and the use of illuminated signs and
advertisements is also subject to legal control under planning and area
restrictions.

The main applications of exterior lighting, found to be commonly used in
conference centres and hotels, are summarised as follows:

- upward illumination to emphasize vertical features, provide
  contrasts and define specific elements of the structure giving
  form and shape.

- concealed illumination under arches, in window recesses and
  penetrating spaces

- flood lighting of external facades. The intensity of illumination
  will depend on the type of surface and surroundings ranging from
  about 50 lux for fairly clean light concrete or imitation stone
  in well-lit surroundings to 150 lux for clean concrete, dark stone
  or red brick. In poorly lit surroundings this would be reduced
  by half but should be doubled where the surroundings are brightly
  lit. Average utilization factors are in the range 0.25 to 0.35(1).

The economic choice of light source is usually between high pressure
sodium having typical efficacies of 100 to 120 lumen/W, and mercury
haldide lamps producing 67 to 95 lumen/W, the light source being
selected to enhance the colour structure of the material and to
give a contrast with other lighting in the vicinity

- screened floodlighting of trees, monuments and other features
  preferably in contrast to that of the buildings

- symmetrical lighting of walks, balconies, terraces, entrance
drives using pillar or column lamps or wall lanterns

- downlighting below canopies, portes-cochères and entrance lobbies,
to distinguish the main entrances.

10.1.2 Criteria for Interior lighting

Lighting is used both for decorative and functional purposes although
the distinction between these roles is tending to reduce as aesthetics
are translated into precise technical standards of designed appearance
lighting. In functional terms the installed lighting must provide for
good task visibility as well as a satisfactory visual environment.

The standards of service illumination for various interior areas as
recommended by the Illuminating Engineering Society (IES) of America
and the Commission Internationale de L'Eclairage (CIE) are widely used
as the basis for lighting design. Current (1977) national Codes for
Interior Lighting adopted in Great Britain (2), France and Switzerland,
for example, show a close measure of harmonization in their recommenda-
tions for illuminance values although there is some variance in methods
of determining discomfort glare and colour rendering. A summary of
illumination standards for conference related areas is given in 10.1.3.

Comprehensive lighting design requires an evaluation of the total visual
environment. In addition to the illuminance of the working plane this
must include the scalar illuminance, balance of brightness between
surfaces, glare limitation, emphasis and directional qualities. Multiple
criterion design (MCD) (3) and similar methods of luminaire selection to
achieve the optimum luminance ratios are appropriate for conference
rooms in which the luminaire arrays are regular.

However, the trends in lighting design, prompted in particular by the
introduction of energy conservation legislation in the United States (4),
are towards non-uniformity of illumination using more precise
determination of the luminaire geometry to achieve higher lighting effectiveness factors (LEF)\(^{(5)}\).

Such developments have implications in conference rooms in which both illuminance and directional qualities of light - expressed as the equivalent sphere illumination (ESI) - can be determined in relation to the various seating positions. Broadly similar approaches to visual performance evaluation are proposed in CIE Publication 19, which applies the contrast rendering factor (CRF) as the criterion\(^{(6)}\).

Other consequences, both from legislation and financial assistance for energy saving projects, are indicated by the increasing use of air-handling luminaires, providing some 50 to 75 percent heat recovery, and improvements in the luminous efficacy and colour rendering of lamps thereby providing a wider range of choice in luminaire selection.

Unlike the areas in which conditions of use are relatively constant and can be defined precisely, the lighting design of a conference auditorium or hall must provide for multiple activities with variations in use from day-time to evening and from formal to social emphasis. Thus a wide range of lighting options is called for, including adjustment control of both peripheral and ceiling lighting.

In conference areas generally, and entrance halls and lobbies particularly, the levels of luminosity and patterns of light are important in setting the 'mood' of the interior and of drawing attention to appropriate features\(^{(7)}\). By varying the relative luminance architectural features may be emphasized or visual faults in the space corrected\(^{(8)}\). Strong modelling contrasts and peripheral lighting are also used with deliberation to provide visual relief and relaxation from the concentration of conference proceedings.

10.1.3 Illumination standards

Service illuminances based on studies of operational requirements in a number of projects and the relevant Code recommendations are summarized below. In most situations the illuminance stated is that required on the working plane - i.e. the desk or table surface. In circulation areas a scalar illuminance at a height of 1.2m is taken. Steps in illuminance are based on CIE publication 29\(^{(9)}\) and the standards generally are those
recommended in the IES Code for Interior Lighting, (UK), Recommendations relatives à l'éclairage intérieur (France) and Innenraum beleuchtung mit Künstlichem Licht (Switzerland).

An increase of 100 lux is recommended for windowless rooms.

<table>
<thead>
<tr>
<th>Building area</th>
<th>Service illuminance (lux)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Circulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrance halls, lobbies</td>
<td>150</td>
<td>Increased to 300 lux in resort areas to reduce contrast with exterior daylight Signs separately illuminated</td>
</tr>
<tr>
<td>Enquiry desks</td>
<td>500</td>
<td>Screening essential.</td>
</tr>
<tr>
<td>Hotel reception</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and cashier desks</td>
<td>300</td>
<td>Downlighters usually built into canopy.</td>
</tr>
<tr>
<td>Passages, corridors</td>
<td>100</td>
<td>Increased to 150 lux for daytime use.</td>
</tr>
<tr>
<td>Lifts, stairs, escalators</td>
<td>150</td>
<td>At tread level</td>
</tr>
<tr>
<td>Foyers</td>
<td>75</td>
<td>Increased to 150 lux where entered direct from street during daytime.</td>
</tr>
<tr>
<td>Cloakrooms</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td><strong>Meeting Areas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditoria, theatres, concert halls</td>
<td>100</td>
<td>At seating height, luminaires dimming must be provided.</td>
</tr>
<tr>
<td>Congress halls, lecture theatres</td>
<td>300</td>
<td>500 lux on vertical plane of chalkboards and displayed information.</td>
</tr>
<tr>
<td>Multipurpose halls</td>
<td>100–500</td>
<td>Allowing wide variation of luminance.</td>
</tr>
<tr>
<td>Exhibition halls</td>
<td>500</td>
<td>On vertical plane, with reduction to 150 lux or below for light sensitive exhibits.</td>
</tr>
<tr>
<td>Conference &amp; seminar rooms</td>
<td>500</td>
<td>Adjustable</td>
</tr>
<tr>
<td>Building area</td>
<td>Service illumination (lux)</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Meeting Areas (Cont.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stages and platforms</td>
<td>50</td>
<td>Special lighting requirements minimum. Increased for multiple use.</td>
</tr>
<tr>
<td>Cinemas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projection rooms,</td>
<td>150</td>
<td>Increased to 300 for servicing, editing, etc.</td>
</tr>
<tr>
<td>control rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service lobbies</td>
<td>150</td>
<td>Limiting glare index 22. Controlled by Food Hygiene Regulations.</td>
</tr>
<tr>
<td>Kitchens - working areas</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Stores, workshops</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Restaurants</td>
<td>100-200</td>
<td>Depending on character.</td>
</tr>
<tr>
<td>Lounges</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Bars, coffee bars</td>
<td>150</td>
<td>300 lux or more over bar counter</td>
</tr>
<tr>
<td>Function rooms</td>
<td>100-150</td>
<td>Allowing for variations in use.</td>
</tr>
<tr>
<td>Other Functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staged sporting events</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxing ring</td>
<td>2000</td>
<td>Screened spotlights required</td>
</tr>
<tr>
<td>Billiards, snooker,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>table tennis</td>
<td>500</td>
<td>Special lighting effects</td>
</tr>
<tr>
<td>Ballroom dancing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10.1.4 Lighting of foyer and entrance hall

The foyer serves as a meeting and assembly place, a circulation area with information and directions and a common area giving access to refreshments, bars and cloakrooms. In such spaces the quality of lighting will be judged largely by the manner in which human faces are revealed and by the brightness of the vertical surfaces. For this purpose lighting
giving a vector/scalar ratio in the range 1.2 to 1.8 is generally considered to give a pleasing effect, the lower ratio being more suitable for informal or close communication, the higher for more formal or distant communication (2).

The preferred vector direction for facial illumination is between $15^\circ$ and $45^\circ$ below the horizontal - showing the desirability of side windows and/or light coloured decoration to modify the harsher modelling effects of downward light.

Higher local service intensities - up to 500 lux - with downward spotlights or floodlights at vertical angles of $60-80^\circ$ - must be provided over enquiry and reception desks. Specific features and signs are usually illuminated by upward directional spotlights or luminaires in concealed recesses or canopies. Peripheral lighting is generally combined with architectural features such as in underlighting arches and recesses, wall washes of panels, edge illumination of staircases and upward lighting of columns.

In most cases general illumination is provided by downlighters inobtrusively recessed in the ceiling but, in large hotel lobbies, individually designed multilamp fittings are often employed as a decorative feature.

To comply with the legal requirements in the United States and Europe, emergency luminaires at steps, stairways and exits must give at least 0.25 lux and over circulation routes generally, 0.2 lux. Emergency signs must be separately illuminated.

10.1.5 The use of natural light

Daylighting of conference halls has many disadvantages: it varies in level and directional characteristics, involves greater heat loss and air conditioning loading on services, adds to sound insulation difficulties, presents design limitations in flexibility of use and layout, provides possible distraction and adds to the complexities of operation such as the need to use blackout blinds. On the other hand, complete dependence on artificial lighting as is typical in most large auditoria, involves greater costs of luminaire installation and in operation. The standards of emergency lighting and of generating
capacity also need to be increased.

In either event psychological relief from prolonged enclosure under artificial conditions must be provided for congress delegates. As noted in planning spatial relationships this can be achieved by the use of restaurants, promenades, reception lobbies and other supplementary areas which have windows on glazed or open balconies allowing visual contact with the exterior. It is also essential to provide intermediary areas such as passages, halls and lobbies with graduated controlled lighting and temperature variations to reduce excessive contrasts between the inside and outside conditions.

The acceptability of windowless rooms depends very much on the volume and levels of lighting provided. As a guide, in halls and auditoria of 200 to 300 capacity or more, lack of natural lighting is not a drawback particularly if the ceiling is high. In rooms of less than 100 capacity the threshold at which a sensation of enclosure and oppression begins to impair concentration depends very much on the level of illumination, the space allowed per person, the room ceiling height and ambient temperature. European and American Lighting Codes specify that, for windowless rooms, standard service illuminances should be increased by one step on the subjective scale \(^9\). Generally a level of 400 lux or more (on horizontal plane) is required if a windowless room is not to give the impression of a closed space \(^{10}\). Other factors such as the duration of the meeting, the variety of changes in lighting and activities and the time and sociability of the occasion also play a strong part.

It is desirable to provide the smaller meeting seminar rooms with windows in order to allow contrast and relief from the formal situation. In any event such rooms have usually to cater for many different types of day-time functions, such as receptions, wedding parties and private dining requirements for which natural lighting may be essential.

Average daylight factors for entrance halls and reception areas should be 2 percent (minimum 0.6 percent) increasing to 5 percent (minimum 1.5 percent) for seminar rooms - in each case measured at desk height. Sunlight and daylight criteria must be taken into account at the building planning stage \(^{11}\).
10.2 Lighting design in conference halls and auditoria

Lighting design is significantly affected by the visual and photometric features of the boundary surfaces, their relative sizes and viewing distances. Generally, ceiling and floor cavity reflectances of not less than 0.6 and 0.2 - 0.3, respectively, are recommended to avoid excessive contrasts and, for the same reason, the specified reflectances for writing surfaces are usually in the order 0.2 - 0.3.

In large halls and auditoria the greater viewing distances allows colours of high chroma to be employed in wall decoration without being unduly obstructive nor with much reduction in general illumination. Small well defined areas of strong colour are often used to provide visual stimulation and give relief to the uniformity of colour and form. For conference rooms, generally, wall reflectances are normally above 0.4 (Munsell value 7) but below 0.8 (Munsell value 9.5), the high values being necessary for walls in which there are windows and desirable in the smaller meeting rooms.

Where wall surfaces are to provide a source of indirect light, such as through wall washes, a high reflectance is necessary to minimize shading contrast and glare. Illuminated surfaces must be non-specular but may be finished either uniformly smooth or deliberately textured to give relief shading effects.

The colour appearance and colour rendering characteristics of the various light sources are critical in all conference areas both to compliment and supplement natural light in daytime and to create a desired 'warmth' of colour for social and evening use.

To provide a high reading visibility with minimum illuminance the lighting installed in the ceiling of a large auditorium is mainly direct with a general direction of about 10° to the vertical from slightly behind and over the shoulders of the audience. To avoid glare, a cut off angle of view for any light source must be above 40° and direct luminaires are usually of the dark, fully or partly recessed type to provide screening. Alternatively, the light fittings may be concealed in the stepped recesses formed in the ceiling construction. Spotlights and other stage lighting equipment may also be housed in the ceiling voids.

For uniform illumination as well as a sense of order and orientation a large number of luminaires must be used, arranged in regular patterns.
A completely luminous ceiling however, is generally unsuitable, producing a depressing effect unless the luminosity is excessively high. In addition, the reflections from glossy diffusing ceiling panels can be distracting when slides or films are shown.

Totally indirect lighting of a ceiling tends to have a soporific effect particularly when the lighted ceiling is unbroken and of low brightness (13). However, where the ceiling is of strong structural form this may be emphasized by floodlighting from the rear of the hall (14).

Indirect luminaires are often used for perimeter lighting either as washes or wedges of light over specific areas. Perimeter lighting reduces strong contrasts as well as providing a brighter and more relaxing environment but it must not be so pronounced as to create visual distraction from the stage or speaker and, to be effective, the illumination must be positive, uniform and regular. A visual cut off angle of at least 45° is required.

10.2.1 Visual comfort

Strong contrasts of brightness or direct light sources within the field of vision can reduce acuity as well as causing discomfort and eye strain. Glare discomfort is proportional to the brightness of the source compared with the background, its apparent size and position relative to the direction of view. The various methods used to evaluate discomfort include the IES glare index (15), luminance curve system (Europe), visual comfort probability (VCP) (US) and the CIE interim system of glare limitation. Comparative glare limitation requirements for conference rooms, are IES glare index 19, luminous curve class 1.5, CIE class 2, or VCP 65 percent.

In auditoria and congress halls problems from contrasting levels of brightness tend to be accentuated where

- the illumination of the subject is in sharp contrast with the spatial background
- there are frequent and rapid changes in lighting, such as in slide projection
- reflected light or direct light, including leakage from window
blinds or luminaires and other exposed sources, are within the field of view from particular seats.

The geometry of the luminaire system including angles of light incident to highly reflective surfaces must be checked for glare and for veiling effects on printed papers etc.

10.2.2 Variations in auditorium lighting levels

To allow screen projection and staged theatrical shows, luminaires must be dimmed. Eye adjustment requires 5-10 seconds (optimum 6 seconds) but this delay can become irritable if repeated several times during a lecture (10). A delay of 3 seconds is generally recommended.

Two balanced and pre-set levels of reduced lighting are usually provided:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Illuminance (lux)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cine and slide viewing</td>
<td>5 - 10</td>
<td>Minimum. Notes just perceptible. 30-50 lux provided at lecturer's desk.</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>80</td>
<td>For easy note taking. May be increased to 80-100 for television monitor viewing.</td>
</tr>
</tbody>
</table>

For these reduced lighting levels it is preferable to provide purposely screened luminaires directing light nearly vertically down at about 80° angled from behind the positions of the delegates to avoid light shining on the face.

Where required, the operation of blackout blinds must be co-ordinated with the lighting, allowing simplified control from the desk of the speaker with duplicate control from the projection operator's booth.

Standards for emergency or maintained lighting are governed by local legal requirements and should be related to the normal illuminance of the room. For lecture theatres and auditoria the minimum required level is 0.2 lux, increasing to 0.5 lux for theatres and halls which are normally lit to 500 lux. The illuminance need not be uniform but may be increased up to a ratio of 4:1 over the escape routes, particularly over steps, stairs and exits.
10.3.1 Display and exhibition lighting

In display and exhibition work lighting is used to create visual variety and stimulation. Whilst direct lighting is generally more emphasized, giving higher illuminances, extreme contrasts of brightness must be balanced by some diffused and background light to avoid discomfort glare.

The average brightness of the display and the masking of light sources must be considered from the different positions in which it will be viewed and against the general level of lighting in the vicinity. For most gallery displays an illuminance of 500 lux should be provided on the vertical or horizontal plane as appropriate but this may need to be increased to 1000 lux for more distant viewing of exhibitions in trade shows or product launches.

Natural shadows have a reduction from one third to one tenth of the illumination of the direct sunlight and similar ranges of contrast are reproduced in display lighting. Optimum acuity is achieved when the difference between the general brightness of the subject (foveal vision) and the immediate spatial background (peripheral vision) is from 1:1 to 4:1. For more distinctive contrast subject : background brightness should be increased to 10 : 1.

Significant reductions in visual acuity occur if the subject is seen silhouetted against a more highly illuminated background such as a window, illuminated backcloth or reflective screen. Even small subject : background brightness ratios of 1 : 20 reduce visual acuity to about 20 percent (16) and these reductions multiply as the background brightness increases. In trade shows and exhibitions the high concentrations of light on other displays competing for attention influence stand design and screening.

To provide modelling, directional light on displayed items usually requires key, fill and backlight components and, with correct angled light beams, a display depth of at least 1.2m is required (17). Viewing angles for a single aspect display extend over about 120° and may approach 180°. Multi-aspect displays seen from all sides require careful positioning of luminaires with precise cut-off angles using shutters, louvres or baffles, to prevent visual glare.

Some rationalisation of the number and range of luminaires is needed
to provide an orderly array. For key lighting, high intensity spotlights of 100-150W are most common whilst fill lighting is usually with reflector floodlights of similar wattage. Low voltage lamps may be installed to give highly concentrated beams.

The lamps may be partly or fully recessed into the surface or mounted on brackets to provide the required offset for correctly angled illumination. Lighting tracks are also extensively used to facilitate repositioning both in temporary stand design and in general exhibition areas.

The colour spectra of 'white' light sources may be critical in providing correct reflectance and 'warmth' of impression. To avoid any distortion of the appearance of the products strong coloured light is not normally directed on the displayed items except, perhaps, for small parts of the whole but may be used to change background colouring contrasts.

More precise specification of colour temperatures and maximum illuminance is required for displays of works of art, antiques and rare or valuable exhibits. To reduce the destructive effects of light on organic material and paintwork, illumination levels need to be kept down to 150 lux generally, and to 50 lux for more delicate articles. For this purpose, lamps having a low relative damage factor - determined from the ultraviolet and visible radiation spectrum - must be used.
Stage lighting design

Directional lighting for display and exhibition work, for television and photography requirements and for illuminating the persons speaking from a stage or platform is essentially made up from a number of sources to provide a good balance of luminance and modelling.

Key lighting is usually concentrated and intense, illuminating the face from above, with an optimum 45° vertical angle, and from one side, at 30-60° to the axis. Fill light is softer and less intense, directed from above and from the other side to cross roughly at right angles in order to soften shadows. Additional backlighting, with a steep angle of incidence, to separate the subject from the background, and footlights are generally required in modelling, stage, television and photographic work, but may be omitted in platform lighting if the contrasts are not excessive.

Whilst there are wide variations depending on the location, status and extent of specialisation of the facility, the surveys suggest that most 1000 - 1200 seat theatres or concert halls, including those having a dual conference use, require some 240 to 280 stage lighting circuits with 600 - 700 possible connections of lanterns, each with its associated 5kw or 2.5kw dimmer. In a 350 - 500 seat theatre for plays and visiting companies 100 circuits are typical, providing some 180 connections for 5 kw or 2.5kw dimmers of which possibly 60 would be required for a production. Multi-purpose halls with adaptable facilities for conference and staged presentations generally have 60 - 80 dimmer circuits installed.

Studies of a number of multipurpose theatres of some 1000 - 1200 seat capacity, showed that most had 3 and some 4, lighting bridges across the auditorium in addition to the lighting bars fitted over the stage. The need for ceiling access presents difficulties in designing adjustable ceilings for changing the capacity and acoustics of a hall. Lighting bridges must also be movable to maintain the same relationship with the ceiling equipment.

Lighting controls

Generally lighting controls are concerned with two main areas: the
lighting of the stage and auditorium lighting.

Stage lighting controls enable a smooth transition from one lighting sequence to the next. In large auditoria this regulation is usually operated automatically, the setting details being recorded in a memory control. Depending on the sophistication of stage presentation a typical memory system usually has between 48 and 120 circuits connected.

Detailed studies of the technical developments in lighting systems indicate a trend towards an increasing reliance on programmed control providing automatic self-adjustment and balancing of lighting without the need for skilled attention. Together with minaturisation and mobility of equipment this has extended the scope for sophisticated lighting control to a wide range of smaller premises (18)(19).

10.4.1 Lighting control rooms

Sophisticated control of lighting is essential. In a conference hall or multipurpose theatre this equipment is normally housed in a purposely designed control room at the rear of the auditorium enabling the operator to observe conditions directly. Conference and exhibition operation requires a minimum internal area 2m wide x 1.5m deep, increasing to about 3m x 2.5m or more if the stage is to be used for theatrical or musical productions. Lighting equipment should be located near to the projection booth and sound equipment room allowing access from one to the other without spillage of light into the auditorium. These areas may be combined, as in most lecture theatres, but fire safety requirements, the different requirements of operation and avoidance of interference in equipment performance are best served in larger centres by providing separate rooms.

Access to control rooms should be from outside the auditorium and preferably separate from the main public circulations. Mechanical ventilation must be provided, meeting requirements for dust exclusion, fine temperature control to avoid condensation and minimum noise generation. The room itself must have high sound absorption and have dark non-reflective surfaces.

Heat and noise generating equipment such as the large thyristor dimmers,
transformers, generators, batteries and mains controls are housed in separate plant rooms which can be located in other parts of the building - taking into account economy of cable runs. Large storage rooms with suitably designed and labelled shelving, racks and benching, will also be required for the numerous lamps, electrical cabling and connections and spares which must be kept.

For the varied needs of hotels providing space for banqueting, ballroom, exhibition or conference users, lighting controls may be mounted on trolleys enabling the control unit to be located anywhere within the area. Controls of this type can be used to record and reproduce precise intensity levels for each sequence of use.

10.4.2 Local control equipment

Control requirements will depend on variations in lighting conditions required in each area. Based on studies of existing premises the minimum requirements may be summarized as follows:

- restaurant, cocktail bar, lounge - 4, 6 or 8 lighting circuits with dimmer switches (which may be preset) controlled locally by head waiter, bar manager etc. Separate emergency lighting giving a minimum of 0.5 lux is normally required.

- lobby, foyer, circulation area - individual lighting circuits for each section, separate for spotlights, down lights. Local control panels must be installed in or adjacent to each area.

- function rooms - depending on the room size and range of equipment, controls may be housed in wall panels with numbered and coded switches, the panels preferably being mounted in the service lobbies adjacent to the room. In addition, local switches controlling some of the lights must be provided within each room at the point of entry.
10.5 Air conditioning, ventilation and heating requirements

10.5.1 External conditions

Heating and air conditioning requirements of a building are determined by the interacting effects of the internal activities, insulation standards and external conditions. As a basis for calculating maximum heat gain or loss the extreme conditions likely to be experienced in the locality must be determined. Design conditions for hotels and similar premises are usually based on a 2\% percent probability occurrence for summer and 97\% percent probability in winter although in the latter case the median of extremes is sometimes taken.

10.5.2 Requirements for comfort

Internal design standards depend on the type and degree of activity involved. As a basic requirement for the comfort of occupants ASHRAE Standard 55-66(25) recommends an internal temperature (dry bulb) of 23-25°C with a relative humidity below 60 percent and an air motion of between 0.05 and 0.23m/s. Limits are also set for the rates of change in the conditions and the mean radiant temperature.

These standards are widely adopted as a basis for air conditioning design of auditoria in the United States but most European standards specify lower temperatures where rooms are mainly heated. For lecture theatres in educational buildings a range 18 - 21°C (± 2°C) is recommended(26).

10.5.3 Seasonal variations

Design standards for winter are usually based on a lower indoor temperature to allow for heavier clothing and climatisation.

Transient conditions, such as in an entrance lobby or foyer, are normally intermediary between those outside, particularly in summer, and the temperature of the auditorium or hall. For example, the UK summer temperature (dry bulb) may be reduced from 29.5°C external to 24°C transient then to 21°C for continuous occupation; together with a corresponding reduction to 50 percent in relative humidity. External winter conditions, usually taken as -1.1°C.
would be raised to an internal temperature of 20–20.5°C in one or more steps.

10.5.4 Surface temperatures
This is an important consideration when conference or function rooms are used intermittently and there is a time lag in the temperature of the room surfaces adjusting to that of the warmed or cooled air. The same condition applies when the building fabric, particularly glass, windows, and lightweight panelling has a high local thermal transmittance value, producing a fall or rise in surface radiant temperature relative to the ambient air temperature. Areas of particular concern are entrance lobbies, exhibition halls with large opening doors, intermittently used congress halls. In these cases the effective temperature of the room should be raised or lowered 1°C for each 1°C the mean radiant temperature falls or rises above 20°C.

Provision must also be made in the design of the heating/air conditioning system for variations in temperature within the room to be reduced, such as by the use of air curtains or perimeter jets.

10.5.5 Air movement
Motion of air has a considerable effect on comfort and tolerance of temperature extremes and is taken into account in determining 'effective temperature scales'.

Air velocities at head level below 0.1m/s give a feeling of stagnation. However, the extent to which the air velocity can be increased without discomfort, represented as draughts, will depend on the temperature difference between the air stream and ambient air, the activity of the occupants, the part of the occupant's body feeling the air movement and the sensitivity of the individual concerned. Occupants are more sensitive to temperature differences and higher velocities on the neck than on the ankle.

Maximum tolerable air velocities also depend on the type of activity.
<table>
<thead>
<tr>
<th>Situation</th>
<th>Heating</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long sitting in auditorium, office, conference room</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Short sitting in restaurant, light work, shops, exhibition areas, bar</td>
<td>0.35</td>
<td>0.2</td>
</tr>
<tr>
<td>Heavier work; dance halls, kitchen</td>
<td>0.45</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Source: Based on CIBS Guide B3, 1977

10.5.6 Relative Humidity

A relative humidity of 45 per cent or more is considered significant in contributing to the "freshness" of the air: air with less than 35 per cent relative humidity is liable to cause dryness of the serous membranes and discomfort, whilst an increase much above 65 per cent may produce excessive perspiration and condensation, particularly in the absence of higher air velocities.

For auditoria an optimum condition of 50 per cent relative humidity ± 5 per cent is generally used for design purposes. The Greater London Council stipulates a maximum relative humidity of 55 per cent if the proportion of recycled conditioned air is to be increased to 50 per cent. In a sophisticated arrangement humidity control, based on dewpoint, is maintained by determining absolute humidity in the return air lines, outside conditions and treatment plant.

In areas used for exhibition of works of art and other delicate materials conditions must be even more closely controlled. Depending upon the exhibits, the specification may require a temperature controlled precisely at 21°C ± 1°C and a relative humidity maintained at 57 per cent ± 7 per cent RH as well as correct lighting.

Specific conditions of temperature and relative humidity will also apply to certain technical equipment rooms for example, automatic telephone exchanges, computer equipment, photographic equipment, and sound reproduction equipment.
10.5.7 Fresh air requirements

Supply rates of air to conditioned spaces are based on two sets of criteria, namely the need to supply fresh air to the occupants and for other purposes and the rate of air change needed to maintain suitable conditions.

Outdoor air supply rates may be described by volumetric rates of air change per hour or by rates of air flow per unit area or per person.

Recommended outdoor air supply rates for air conditioned spaces, showing a comparison between the standards used in airconditioning design in the United Kingdom and those in the United States, may be summarized as follows:

<table>
<thead>
<tr>
<th>Type of space</th>
<th>Outdoor air supply</th>
<th>Per person</th>
<th>Per m² floor area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Recommended Litre/s</td>
<td>Minimum Litre/s</td>
</tr>
<tr>
<td></td>
<td>UK (a)</td>
<td>US (b)</td>
<td>UK (a)</td>
</tr>
<tr>
<td>Multiuse theatres (c) (d)</td>
<td>8</td>
<td>7.1</td>
<td>5</td>
</tr>
<tr>
<td>Ballrooms/banquet halls (c)</td>
<td>12</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Entrance lobbies</td>
<td>8</td>
<td>4.7</td>
<td>5</td>
</tr>
<tr>
<td>Cafeteria</td>
<td>12</td>
<td>5.7</td>
<td>8</td>
</tr>
<tr>
<td>Restaurants, Bars</td>
<td>18</td>
<td>7.1</td>
<td>12</td>
</tr>
<tr>
<td>Conference halls</td>
<td>18</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Conference &amp; Meeting rooms</td>
<td>25</td>
<td>23.6</td>
<td>18</td>
</tr>
<tr>
<td>Offices (private)</td>
<td>12</td>
<td>14.2</td>
<td>8</td>
</tr>
<tr>
<td>Corridors</td>
<td></td>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td>Kitchens (e)</td>
<td></td>
<td></td>
<td>20.0</td>
</tr>
<tr>
<td>Toilets (e)</td>
<td></td>
<td></td>
<td>10.0</td>
</tr>
</tbody>
</table>

Notes
(a) Based on CIBS 'Guides'
(b) Based on ASHRAE 'Handbook of Fundamentals'
(c) Statutory requirements may require higher provision
(d) Allowing for some smoking
(e) Rate of extract may be the overriding factor
Ventilation standards in the United Kingdom for halls, theatres and other places of public assembly usually stipulate a minimum fresh air supply per occupant of 8 litre/second together with a proportion of recycled conditioned air. The Greater London Council allow ratios of 75 per cent fresh air: 25 per cent cleaned recycled air or ratios of 50 per cent fresh air: 50 per cent fully air conditioned recycled air, in the latter case subject to the relative humidity being kept below 55 per cent.

In halls with very high ceilings such as those used for banqueting or exhibitions where volumetric standards may not be appropriate an alternative standard of 6 litre/second/m² of floor area may be adopted. This is also used for areas with variable occupancy such as orchestral areas, etc.

10.5.8 Conditions
Air conditioning, cooling and heating requirements for internal space are determined to a large extent by the need to counteract heat losses or gains from the building and from the internal activities and processes involved. Heat losses are affected by the site and degree of exposure affecting surface resistance and infiltration; planning of buildings, such as the ratio of volume to external envelope and height; constructional features particularly thermal transmittance values and edge losses; and operational considerations.

The last factor will vary from one room to the next taking into account daylighting and ventilation requirements - particularly the need to exhaust impurities.

Heat gains result both from external temperature and solar conditions and from incidental uses of the building. All activities within an hotel or congress centre generate heat to some degree, which has to be removed to maintain design conditions. Particular areas of large heat gain requiring separate calculation of ventilation requirements include boiler houses, generating plant, transformers, machine rooms, kitchens, laundries, stage lighting and dimming equipment and projection rooms.

Within most meeting rooms and associated areas the principal sources of heat are the lighting loads and the occupants themselves.
<table>
<thead>
<tr>
<th>Room function</th>
<th>Average heat output/person for design purposes (a) W/person</th>
<th>Ratio sensible:latent heat at 24°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theatre</td>
<td>115</td>
<td>1 : 0.5</td>
</tr>
<tr>
<td>Meeting/conference room</td>
<td>145</td>
<td>1 : 0.9</td>
</tr>
<tr>
<td>Restaurant</td>
<td>160</td>
<td>1 : 1.0</td>
</tr>
<tr>
<td>Foyer, bars, assembly areas</td>
<td>205</td>
<td>1 : 1.4</td>
</tr>
<tr>
<td>Dance hall</td>
<td>265</td>
<td>1 : 1.5</td>
</tr>
<tr>
<td>Kitchen, laundry</td>
<td>410</td>
<td>1 : 1.8</td>
</tr>
</tbody>
</table>

(a) Assuming mixed audiences

(b) Allowing 9W sensible heat plus 9W latent heat for food

Source: Based on CIBS 'Guide' and ASHRAE 'Handbook of Fundamentals.'

Most meeting rooms and auditoria, particularly in urban situations, must be fully sealed - against noise, pollution, distraction, climatic variation - and be fully air conditioned to satisfy the high standards of environmental quality required. Reduction of solar energy transmission through the fabric is necessary for integrated and balanced environmental control even where mechanical cooling is not installed.

In most centres, direct penetration of radiant energy is reduced by recessing or screening windows and by the use of reflective or tinted glass having a low transmissivity. More elaborate arrangements include the use of vertically moving screens between dual or triple glazing.

Current design emphasis, particularly for hotels, is directed towards the utilisation of solar energy for intermittent space heating and domestic hot water requirements. Recovery and storage of solar heat for the former purpose is most effective in areas of high diurnal fluctuation in temperature and in contributing to the internal heating requirement in winter.

10.6 Air conditioning systems

Many factors have had an influence on the choice of air conditioning, heating and ventilation systems for conference centres and hotels but they
can be grouped together into three main considerations, namely the scale and complexity of the project concerned, local legal requirements and the operating conditions for which specific provision must be made, and the capital and operating costs involved.

Different spaces - the auditoria, halls, restaurants, lounges, etc - within a conference centre complex will require individually regulated air conditioning, which is usually supplied from central station plant located near the area concerned. In a hotel, full air conditioning, may be limited to public areas: the guestrooms and small meeting rooms having natural ventilation with space heating or, in other cases, being provided with unitary equipment.

Licensing requirements and codes usually stipulate the minimum amount of fresh air to be supplied per occupant. Legal requirements will also govern the ventilation of workrooms, kitchens, bars, dining areas and toilets.

Capital and operating costs include those incurred in installation and subsequent replacement, the latter taking account of difficulties in access and disruption. Costs of energy, personnel and maintenance are factors which not only affect instrumentation and centralisation of control but have an increasing significance in comparing the 'costs-in-use' of alternatives. (27)

10.6.1 Systems of air conditioning
Unitary equipment has limited applications in conference facilities because of the noise and relatively low capacity. However, split packaged systems, with ratings up to 17kW, are sometimes used for individual meeting and function rooms, restaurants and other associated areas in small hotels and office buildings, particularly in modernisation of older premises.

Central station systems have much wider applications in new hotels and centres, they facilitate maintenance and operation independent from the area supplied with sophisticated control over air quality and airflow rate and enable energy savings to be introduced through monitoring, recycling and integrated engineering design.

The choice of system depends largely on the volume of space and number of occupants, range of functions and the extent to which conditions need to be controlled generally or locally. Two main arrangements are
used: **monozone system** supplying individual auditoria and halls and **multizone or variable systems** for wider ranging requirements.

Outlet velocities for air conditioning systems are determined by acceptable noise levels.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Maximum outlet velocity m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound studios</td>
<td>1.75 - 2.5</td>
</tr>
<tr>
<td>Private offices,</td>
<td></td>
</tr>
<tr>
<td>dual purpose meeting rooms</td>
<td>2.5 - 4.0</td>
</tr>
<tr>
<td>Theatres, restaurants</td>
<td></td>
</tr>
<tr>
<td>lecture rooms, ballrooms, banquet halls (a)</td>
<td>4.0 - 5.0</td>
</tr>
<tr>
<td>Workshops, kitchens, arenas</td>
<td>5.0 - 7.5</td>
</tr>
</tbody>
</table>


(a) Depending on proximity to occupants and terminal design.

10.6.2 **Monozone systems**

Low pressure monozone systems are usually installed in large halls and auditoria to enable the room conditions to be monitored - within the room, externally and in the return and supply ducts - and adjusted centrally. Directional air movement can be controlled as well as providing optimum conditions for the comfort of the occupants. Monozone systems are also used in basement areas in which conditions are broadly constant.

Systems of this kind involve large supply and return ductwork which must be integrated with the hall design. Air flow velocities are typically 5.0m/s reducing to 2.5m/s in noise sensitive situations.

Ducts are normally formed from rectangular section galvanised sheet steel or polyvinyl chloride and fibre glass, with increasing emphasis on pre-fabrication. The ductwork is usually housed in ceiling voids, vertical service cores and rooftop installations. In auditoria with fixed seating either supply or discharge ducting may be incorporated in hollow floor voids.
Acoustic treatment, including attenuation, directional flow streamlining and insulating support, is necessary to reduce noise transmission and generation.

Recommended design criteria are NR 25 for congress halls, lecture rooms and concert halls; NR 30 for multipurpose halls and cinemas.

10.6.3 Distribution

Movement of conditioned air through a large hall or auditorium may be downwards, upwards or across the space, this being largely determined by the direction and momentum of the inlet air\(^{(28)}\).

Downwards movement is created by the jet action/displacement of supply air discharged through jets or diffusers in the ceiling or through high level grilles in selected walls. The air is usually exhausted through floor or wall grilles.

The air movement, particularly from side inlets, may be difficult to control, it is liable to stratify and may not overcome the effects of natural convention. Jet action is normally circular but may be linear. A high velocity is usually acceptable if the ceiling is high: for diffusers a discharge velocity of up to 4.0m/s in auditoria and 2.5m/s in halls is usually suitable. Higher temperature differentials can also be allowed, reducing the quantity of air supplied. A difference of 4.5 to 8\(^{\circ}\)C for cooling and slightly more for heating is typical in auditorium design\(^{(29)}\).

Downwards distribution tends to hold cigarette smoke in suspension - some cross extraction at high level is necessary to draw the smoke away from projection beams - and to create a higher fire risk. Some regulations, such as those of the Greater London Council, require the flow to be reversed for emergency use.

Upwards movement: Low level distribution of supply air under the fixed seats of an auditorium may be through grilles or mushroom outlets - in the floor or stepped risers - or through hollow perforated plinths incorporated as part of the seat design. In other halls, grilles are usually provided in the perimeter walls.

Low level discharge (or exhaust) velocities are usually reduced to about 1.5m/s and temperature differentials kept to 2.2 to 3.3\(^{\circ}\)C\(^{(30)}\) to avoid discomfort. The upward movement also tends to hold dust in suspension. This arrangement is limited to auditoria with fixed seating.
Cross flow: A variety of alternative directional arrangements are possible. In auditoria lateral movement usually gives rise to unequal distribution of conditioned air and a tendency for this to become stratified. There is also a possibility of draughts near the points of discharge.

For banqueting and other halls in which the floor must be kept clear, exhausted air must be removed through wall grilles or by reverse flow through the ceiling. The inflow must be balanced with extract from the service lobbies and kitchens.

Generally a monozone system for a hall will provide a range of programmes from normal operation to 100 per cent fresh air and to the maximum allowed recycling of conditioned air (determined by Regulations or Codes) each with automatic control. To allow for flexibility, air handling capacities for multipurpose halls and auditoria are usually based on a maximum distribution per occupant of 60m³/hr with up to 30m³/hr fresh air.

10.6.4 Multizone systems
Multizone or variable systems are used in other areas such as meeting rooms and hospitality suites in which the occupancy conditions and activities may vary requiring local adjustment. Systems of this kind use high velocity air flow distribution with air speeds in the order of 10-20m/s. Ducts for the purpose are often spirally wound galvanised steel in circular or oval section with flexible connections to mixing boxes and terminals.

Of the main systems currently in use dual duct systems provide the widest flexibility to meet local variations in heat gain/loss, arising from external conditions and changes in room use and occupancies. However, the sound power emitted through the discharge may result in unacceptable sound pressure levels in sensitive areas.

Induction units, based on 2- or 4-pipe, zoned or changeover systems, may be sited under windows for perimeter applications or at a high level under a ceiling space or bulkhead, as in hotel guest rooms. They are most suited to multiroom, multifloor buildings such as offices and hotels where the occupation load is evenly distributed.

As a rule they are not suitable for rooms over 6m in depth unless supplemented.
Fan coil units are similar in installation and are most suitable for intermittent use of individual rooms such as in hotels. Noise emission levels are generally related to fan speed.

10.6.5 Ventilation systems
Many rooms do not require air conditioning but need to have an air supply for ventilation, usually with separate space heating to regulate temperature. Depending on the situation a local air exhaust system may be provided to remove impurities or a plenum system, with air filtration and heating as necessary, may be used to balance air movement. Rooms in which ventilation only is required include print rooms, photographic laboratories (with the air filtered and preheated), battery rooms, technical equipment and plant rooms, transformers, generating equipment, garbage rooms (having air extract), cloakrooms and toilets (with separate extracts), kitchens (provided with both extract and supplementary make-up air).

10.6.6 Air conditioning plant
Plant should be located as near to the supply zone as possible but positioned and designed with suitable mounting, isolation and enclosure to avoid transmission of noise and vibration. Access is required for maintenance and eventual replacement.

Generally roof mounting is most economic because of the shorter ducting involved and close proximity of intake and cooling equipment, but additional concentrated loading on a large span roof structure may introduce design complications.

Air conditioning plant is practically limited in unit capacity to about $50,000m^3/hr$: normally at least two sets of equipment, each capable of supplying 60-70 per cent of the total load, will be installed for flexibility in operation and maintenance. In larger schemes, two or three units will be usually provided for each of the main operational areas of the complex.
10.7 Specific areas

10.7.1 Entrance lobbies
High rates of ventilation are likely due to infiltration and stack effect and air exhaust may not be required. Cooling is provided by equipment which has a high output in relation to its air handling capacity, such as fan-coil units, enabling space and duct size to be kept to a minimum. Primary air supply can normally be reduced to less than one change/hour. In very tall lobbies air conditioning and heating plenums are often suspended vertically in the space with discharge nozzles at one or more levels. In a number of the new conference centres these are revealed as specific features of design with strong colouring and emphasized form.

For extensive areas of glazing, air curtains using recirculated air may be installed along the perimeter. Air conditioning is also required to be concentrated over the main areas of activity in a lobby or foyer, near reception desks, coffee bars, etc., together with balanced exhaust.

10.7.2 Restaurants, cocktail lounges, coffee shops
Air may be supplied from separate air conditioning units or from primary plant with local heating/cooling to provide variable control. Ceiling diffusers are usually installed: a flow of 290-380 litre/sec. per diffuser and a temperature differential about 8°C cooling and 10°C heating is usually suitable for ceilings of average height.

Air flows may be concentrated over or under windows to counteract heat loss/gain, and also within the area of the food servery or cocktail bar. Balancing exhaust grilles in the front of these areas will be required to draw off cigarette smoke and fumes. High rates of extraction must be provided over displayed cooking equipment and this may be balanced by supplying tempered air around the perimeter of the hood.

Negative pressures should be maintained in any adjacent kitchen to which ventilating air from the dining room may be partly exhausted. It is, however, important to avoid excessive draughts being created through service doors and across service counters.
10.7.3 Auditoria

Monozone systems are normally used with plant exclusive to this area and in a large hall, two or three separate air conditioning units may be installed to meet the operational requirements. Alternative air distribution arrangements are summarized in Section 10.

Air supply, exhaust and emergency requirements will normally be subject to legislation, particularly if the auditorium is designed with a stage for multipurpose use as a theatre or concert hall. The Greater London Council, for example, require a fresh air input per occupant of 28m$^3$/hr reducing to 21m$^3$/hr for part recirculation of treated air and to 14m$^3$/hr if the recirculated air is fully conditioned.

Up to 75 per cent of the air admitted can be mechanically exhausted; of this about 40 per cent is usually extracted from the stage, 60 per cent from the auditorium. If the latter is through floor extracts, an additional high level extract fan above the proscenium arch will usually be required with automatic changeover from floor to high level extract when the safety curtain is lowered.

In addition to the occupancy load much of the heat gain will result from the lighting installation. Many of the spotlights and other equipment used for stage lighting will be suspended over the auditorium: in an arena theatre with all the lighting in the auditorium this can represent a load of 200kW or more. The energy dispersion from a typical suspended spotlight is about 35 per cent light, 25 per cent radiation, 40 per cent convection, and in many cases this heat can be ducted away and recovered for space heating.

Stage ventilation must be separate and presents specific problems because of the height, heat load from equipment and the variable space occupied by the stage equipment. One solution is to install a low pressure system using fresh air, with a capacity of about 20m$^3$/hr m$^2$ area, the air being processed and discharged through ducting around the walls at above one-third height. Used air is exhausted through the roof to give a slight negative pressure. During the winter supplementary heating, at several levels will usually be required.

Provision must be made for escape of smoke in event of fire with automatically opening roof ventilators - such as haystack ventilators.

Orchestral areas below the stage will need to be provided with separate air conditioning, preferably independent from that of the hall. A low
pressure system with a capacity of $60 \text{m}^3/\text{hr}$ per $m^2$ of the area is normally used, supplied with fresh air only and exhausted through the stage. The inlet temperature should be controllable from the orchestra area.

10.7.4 Small meeting rooms, private dining rooms

Because of intermittent use the air conditioning system must have a wide range of adjustment. Multizone systems are generally installed with induction or fan coil units to provide terminal cooling/heating of air recycled from the room. Cross flow of air should be provided with exhaust to service lobbies or corridors.

Adaptable guest rooms which can also serve for small meetings must have high standard air conditioning installed to allow rapid change in use. Additional means of odour absorption by means of activated charcoal, electrostatic precipitation, fine filtration or ionization may be provided to facilitate this.

10.7.5 Ballrooms, banquet halls, congress halls

Function space of this type in hotels and other premises is usually designed to allow division into separate areas. Each area must have its own air conditioning system capable of being operated independently. When the divisions are removed the combined distribution must provide a balanced system.

If a monozone system is installed, air supply and exhaust branches to each division must be suitably balanced with preset dampers for isolation when necessary. In hotels this is often a self-contained system independent from the air conditioning of other parts of the premises.

With multizone systems dual duct or terminal cooling/heating may be provided to allow individual adjustment to suit different requirements. Limits to noise levels must be specified, which for meeting rooms is usually NR25. Sound carry-over from one section to another via ductwork must also be considered.

A slight positive pressure should be maintained to ensure directional flow towards service lobbies and kitchens.

10.7.6 Foyers, concourses and bars

Assembly areas associated with halls and auditoria are generally occupied
for short periods and precise standards of control may not be practicable. To meet the peak loadings of high density occupation and smoking it is an advantage to provide two-speed ventilating fans giving at maximum speed a high rate of air change (say 30 to 50 changes/hour) and air movements of up to 0.25 to 0.4m/s in the occupied zone.

10.7.7 Operational areas
Requirements for heating and ventilation of operational areas are generally dictated by exhaust conditions to ensure the removal of heat and impurities. Special considerations apply in the following areas:

Kitchens
High rates of extraction over cooking equipment will be necessary giving rise to large ventilation flows:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Air changes/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over kitchen</td>
<td>20</td>
</tr>
<tr>
<td>Over general cooking zone</td>
<td>40</td>
</tr>
<tr>
<td>Over banquet cooking zone</td>
<td>60</td>
</tr>
</tbody>
</table>

Easy removable grease filters, allowing for frequent cleaning, and sealed access points must be provided, and automatic fire dampers installed.

Some 60-80 per cent of the extraction flow should be made-up by tempered air, warmed or cooled as required, supplied to the kitchen with the remainder entering from the restaurant or service lobbies.

Special ventilation - with cooling - is required in food and wine stores and butchery sections.

Public toilets
8 to 10 air changes/hour are usually provided through a separate exhaust system balanced by air inflow from cloakrooms and adjacent corridors.

The extraction fans must be duplicated with automatic change-over in event of failure. Exhaust air cannot be recirculated.

Enclosed car parks
Special requirements apply to avoid risk of fire and exhausted smoke being discharged to other areas including provision for high fire resistance in separation, fire dampers, safe siting of discharge outlets and the use of spark proof machinery.
Space heating is mainly combined with air conditioning, supplemented by local heating using air curtains and fan convectors, in entrance and perimeter zones and by means of radiators and convector heaters in work stations, particularly where there is a high exhaust rate, dressing and changing rooms and in individual offices and guest rooms having natural ventilation.

In addition, domestic hot water must be provided to the various draw-off points for the sanitary accommodation, individual bathrooms, employee facilities, restaurant and banquet kitchens, service bars, dishwashing equipment and laundries and this may need to be circulated at different temperatures - in most cases at 60°C for personal washing and at 82°C for dishwashing and laundry requirements.

Heat transference may be by low pressure hot water, medium/high pressure hot water or steam. The higher temperatures involved in medium pressure (120°C) and high pressure (150-180°C) systems necessitate enclosure of the pipes and equipment and this is generally limited to primary or district circulations.

Domestic hot water is generally supplied from calorifiers, preferably located near to the place of use. In some cases, electrode boilers have been used for convenience.

Boilers for heating purposes are usually installed at ground or basement level, taking into account weight, access, fuel supplies and maintenance needs, but will usually need to be closely associated with air conditioning plant. Medium viscosity oil or methane or propane/butane gas is normally used as the energy source although light distillate oil may be economical in smaller premises.

10.9 Electrical services

Electrical installations are normally subject to codes and regulations which lay down standards in the interests of safety. In addition to local mandatory requirements, reference is often made to the National Electrical Code (NEC) of the National Fire Protection Association of America (31) and to equipment approved by the Underwriters Laboratories (UL). In the United Kingdom compliance with the Institution of Electrical Engineers (IEE) Regulations is normally specified (32).
Conditions for connection to mains supplies, including the testing of installations, will also be laid down by the utility undertakings concerned.

10.9.1 Primary supplies
Mains supplies to premises are generally 3-phase 4-wire AC with a cycle frequency of 50 or 60 Hz. Supply voltages vary from one country to another and will also depend on the load requirements of the building. For large developments, such as a congress or exhibition complex, the supply will usually need to be brought in from medium or high voltage distribution lines to one or more substations or transformers on site, each serving a supply zone. In other buildings transformer equipment may be located internally in a transformer room using dry-type or askarel transformers, or in a vault, meeting the necessary access, drainage, ventilation and protection requirements against fire, smoke, explosion and noise transmission. As a rule switchgear must be housed in a separate room, metal clad and arranged to facilitate access, control and servicing. Mains terminals, transformers and main secondary distribution systems should be duplicated where necessary to avoid the failure of any part affecting the whole system. The main panel boards for subcircuit distribution must also be located in equipment rooms or ducts which will allow working access independent from public circulation.

10.9.2 Emergency supplies
Automatic changeover in the event of failure to emergency battery supplies must be provided. In larger installations this will be automatically supplemented by generating equipment. Based on the legislation mentioned and practical needs emergency supplies must be sufficient to maintain the following services:

- lighting: all exit signs 50 per cent of stairway lighting
  20 per cent of corridor lighting
  10-20 per cent of lighting in public areas
- telephones, fire alarms and warning devices
- fire fighting apparatus (pumps, compressors)
- all sewage pumps and water pumps where necessary to maintain hot and cold water supplies
- passenger elevator (with selector switch to operate each elevator in turn
Battery rooms must comply with specific requirements for separate ventilation, fire resistance, drainage and water supplies, storage and operating space. The batteries must be kept constantly charged, usually by trickle charging.

10.9.3 Demand loads

Equipment loading and phase distribution requirements are often difficult to assess in premises such as multipurpose arts centres, which need to provide stage facilities. Maximum demand conditions must be assumed and no diversity factor can be allowed. Branch circuit and feeder requirements must be determined from the full load current ratings of the specific equipment connected, together with ampacity factors usually calculated at about 1.25 for motor or combined loads. However, general lighting loads in other areas, including socket or receptacle outlets of 15 amp or less rating for lamps and portable appliances, can usually be assessed on an average unit rating:

<table>
<thead>
<tr>
<th>General lighting load</th>
<th>W/m²</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congress halls, banquet halls</td>
<td>40-55</td>
<td>To allow flexibility in use and layout.</td>
</tr>
<tr>
<td>Function rooms, conference rooms</td>
<td>30-55</td>
<td>Lower ceiling heights.</td>
</tr>
<tr>
<td>Restaurants</td>
<td>20-30(a)</td>
<td></td>
</tr>
<tr>
<td>Shops, coffee shops, cafeteria</td>
<td>30-55(a)</td>
<td>Servery counter and bar separately assessed.</td>
</tr>
<tr>
<td>Lecture theatres</td>
<td>30-55</td>
<td></td>
</tr>
<tr>
<td>Auditoria: multipurpose</td>
<td>10-45(a)</td>
<td>Excluding stage lighting</td>
</tr>
<tr>
<td>Reception areas</td>
<td>55</td>
<td>Front desk area</td>
</tr>
<tr>
<td>Circulation halls, corridors</td>
<td>6(a)</td>
<td></td>
</tr>
<tr>
<td>Storage spaces</td>
<td>3(a)</td>
<td></td>
</tr>
<tr>
<td>Hotel rooms, hospitality suites</td>
<td>20(a)</td>
<td></td>
</tr>
<tr>
<td>Offices</td>
<td>55(a)</td>
<td></td>
</tr>
<tr>
<td>Exhibition halls</td>
<td>220-270</td>
<td>For equipment connection</td>
</tr>
</tbody>
</table>

(a) The lower figure is based on NEC minimum conditions and 100 percent power factor.
10.9.4 Voltage

Installations are generally separated into:

- **High voltage**: Over 600V (NEC) or 650V (BS 205: 1943). Special requirements apply with regard to separation, guarded enclosures, notices, space, ventilation, means of isolation and protection.
- **Medium voltage**: 250–650V (BS 205: 1943). Typically 3-phase supplies to heavy duty equipment and panel boards.
- **Standard or low voltage**: Under 250V Standard single-phase supplies to appliances, and lighting sub-circuits.
- **Low energy power**: With limited voltage and current. Separated from above. Reduced protection.
- **Low voltage signal circuits**: Protected from interference from higher voltages and equipment, e.g. thyristors.
- **Communications**: Telephones
- **Radio, television antenna systems**: For signal reception. Separation from other circuits and equipment - including lightning rods system - required.
- **Computers**: Separate stabilized supply may be required in addition to signal lines.

10.9.5 Stage wiring

Where a stage or platform is installed separate wiring will be required for stage lighting, supplying footlights, borderlights, proscenium sidelights, etc. As far as practicable the cabling should be permanently installed to reduce the extent of trailing connections. Each branch circuit loading is limited to 20 amp unless heavy duty lamp-holders of the non-interchangeable type are provided.

Sub-circuit connections, fuses and controls should be centralised in protected distribution boards, whether fixed or mobile, accessible to the stage operator.

For protection against fire and damage whilst allowing access for extension or alteration, stage wiring may be installed in metal trunking or clipped into metal trays or raceways. In the latter case, mineral
insulated metal sheathed or aluminium sheathed cabling should be used. All switchgear and distribution boards must be clearly labelled to indicate the circuits controlled (with wiring diagrams).

Lighting battens, equipment and fittings must be of robust construction, usually in 20 gauge, sheet steel, well ventilated and spaced at least 75mm horizontally, and 900mm vertically away from scenery, drapes, hangings or combustible material. Curtain motors are also subject to control.

10.9.6 Protection of installations
Requirements for the protection of electrical installations are well established, following the guidelines laid down by approving bodies such as the Institution of Electrical Engineers Regulations in the United Kingdom and the National Electrical Code in the United States. Compliance with the appropriate recommendations is invariably written into specifications as a condition of contract.

All safety requirements for electrical installations tend to follow a similar pattern covering the correct rating of conductors and protection against damage and overloading, provision for effective electrical insulation and separation of cables carrying different voltage supplies and for earth leakage circuits. The types of enclosures for conductors and the extent to which the cables may fill the cross-sectional area of ducts and trays are also specified.

In conference and exhibition centres special provision may be required to reduce fire risk by the use of mineral insulated metal sheathed cable and the fire-stopping of ducts and risers passing through separated compartments. Protection must also be given against excessive heat - such as in stage lighting - and by the sealing of cableways against condensation during cold or variable conditions.

In kitchens, garages, plantrooms and other high risk areas specific provisions apply to both the electrical installation and the type of equipment used.


(7) Waldram JM, Transactions of the Illuminating Engineering Society (London), 1954, 19, 95


(10) Aschoff V, "Planning the large lecture theatre", in Duncan, CJ (Ed) "Modern lecture theatres", Newcastle-upon-Tyne, Oriel Press 1966

(11) DOE, "Sunlight and Daylight - Planning criteria and Design of Buildings", London, Department of the Environment, 1971


(19) Rank Strand Electric, Study of technical research and equipment, Brentford, Rank Strand Ltd, 1978


(22) DES, "Guidelines on environmental design in educational buildings", London, Department of Education and Science, 1972


(24) CIBS Guide B3 "Ventilation and air conditioning", London, Chartered Institution of Building Services, 1977


(26) Building Services, "Giving art a good home", London, Chartered Institute Building Services, May 1979

(27) Lawson FR, "After the fuel crisis", Catering Times, February 7, 1974


11.1 The influences of technical developments

The raison d'etre of conference facilities is to provide a suitable environment in which information can be communicated and exchanged on a group or personal level. Design features for good acoustics and the means of controlling environmental quality have been discussed in earlier chapters. Equally important, particularly in view of the responsibilities undertaken in hosting a meeting, is the need to ensure the safety of the delegates and to provide the technical equipment and services needed to facilitate effective communication.

Studies of existing premises suggest that, even in buildings of recent construction this latter aspect has been underestimated. Most conference hotels have no audio-visual aid equipment and although this can be hired or brought in by the users, there is often only a limited provision for the services and operating needs of such equipment.

In conference centres and multipurpose halls difficulties tend to arise from technical obsolescence of equipment and, in some cases, from structural restrictions affecting the feasibility of changes.

Technical developments in communication systems are accelerating with the advances in microprocessor technology and electronic engineering. This chapter examines the equipment currently available for conference and exhibition use, trends in development and the provisions for space and services which need to be made to accommodate these systems. It examines the related interests of security and administration and compares the legal provisions for safety from fire which have an influence on the design and operation of conference facilities.

11.2 Security

By bringing together groups of people who may represent valuable business interests, professional expertise, political authority and other sectors of influence, conferences and other meetings present a degree of risk. Security must be provided for the delegates, speakers and other visitors, for the exhibition and display equipment and for the premises generally. The main areas to be considered are:
• surveillance of people entering the building and at strategic points in the circulation area;
• detection and warning of unauthorized entry to particular areas;
• security of grounds;
• checking of vehicles entering and leaving the premises;
• staff entry and exit controls;
• special protection for valuable articles, documents, records, computer data;
• periodic inspection of premises during and outside normal hours of use.

11.2.1 Surveillance
Closed circuit television is increasingly used as the means of remotely observing and monitoring the use of areas both inside and outside the building. Systems are made up from one or more cameras linked via co-axial, multicored or twin cables, depending on distance and complexity, to junction boxes for transmission and d.c. power supply, then relayed to monitor screens.

CCTV cameras fall into several categories depending on the intended internal or external location, camera position, angle of views available, lighting conditions and the extent of remote adjustment of lens and head operation required.

In current practice black and white video cameras and monitors are generally used with scanning systems based on 625 lines, 50 fields/s or 525 lines, 60 fields/s. The minimum reflected light required for picture resolution depends on the type of video camera tube but can be as little as 0.7 lux to allow operation in darkness, particularly in external security of entrances, buildings and grounds, a silicon-vidicon camera may be mounted in parallel with two infra-red searchlights.

Lighting of exterior and interior areas acts as a psychological deterrent to intruders and enables better observation by security staff. Practical and economic aspects such as the degree of illumination, colour rendering, location of luminaires, particularly in relation to CCTV and other security equipment, need to be considered in the early stages of planning. Security lighting can often be combined with exterior floodlighting of the building and the illumination of external circulation ways.
Monitors range from a 4.5in screen miniature desk top unit to 24in unit for clear viewing of fine details - often with switch-over facilities and remote control of brightness and contrasts. In large installations the monitors are generally rack mounted and built into control consoles together video recording and communication relay facilities.

11.2.2 Other anti-intrusive systems
In addition to the various locking systems and physical barriers to restrict unauthorized access many hotels and centres have installed permanent means of detecting entry to the more vulnerable areas. The economic justification for such provision is given by the reductions in insurance costs and security manpower requirements. Whilst the existing arrangements are most often based on infra-red beams or simple electrical contact or discontinuity of circuits, the trend is towards the use of more complete spatial protection. Changes in ultra-sonic or microwave wave patterns or, in some cases, in air pressure when a room is entered or the contents disturbed can be sensed, amplified and transmitted through a recording and warning system.

Security facilities for individual guest rooms and offices are one of the services provided by integrated hotel systems, the control being effected by coded card operation of the equipment. Similar provision is made in staff identification systems which are increasingly integrated with time, entry and status recording devices as a means of management control of the movements of staff and of the operating conditions in each area.

Concealed articles can also represent a threat to security and control. Luggage of guests, items carried by visitors, staff and service personnel, and posted or deposited parcels may conceal weapons, explosives or material stolen from the premises.

Search operations must be carried out as quickly and discreetly as possible to avoid causing innocent people inconvenience and invasion of privacy, and to minimize delay and congestion during entry and departure.

Equipment used for search and detection includes low dosage X-ray inspection of hand luggage and similar articles, sonar detection of metal objects, fluorescopic examination of letters and parcels and electronic screening devices. As a rule stringent safety requirements have to be met in operating such equipment and the exposure or dosage must be carefully regulated to avoid damaging sensitive material.
The extent to which the management need to provide security equipment will depend very much on the location, circumstances and nature of use of the centre. For specific occasions - such as an international congress attended by prominent politicians or by groups with extremist views - security services may be hired. However, hotels and congress centres are often prominent targets for the publicity of an unrelated cause, providing, as they do, the accommodation used by journalists and reporters.

11.3 Safety from fire
In addition to general building codes and regulations, many authorities stipulate operational requirements for fire safety in places of public assembly or public entertainment either in the form of technical regulations or as conditions for licencing the premises for this particular use. The following details are broadly based on requirements of the Greater London Council (GLC) and City of New York (NY) as representative authorities together with recommendations of the British Standards Institute (1) and National Fire Protection Association (2) as two of the specialist organisations responsible for establishing technical standards for premises and equipment. Standards depend to some extent on the proposed purpose of the hall: whether it is to be used only as a lecture room, exhibition hall, banquet hall or dance hall or to serve all these purposes at various times, as is usually the case. If the scope of multi-purpose use is likely to extend to that of a theatre or opera house, even for occasional programmes, the legal requirements applicable to those classes must be met.

11.3.1 Fire resisting construction
As a rule, external enclosures, internal walls, partitions, floors, staircases and balconies must be constructed of non-combustible materials although certain exceptions such as wooden dance flooring and platforms may be permitted subject to conditions.

Standards of fire-resistance are similar in most countries, being based on the periods over which the constructional elements must be able to withstand the effects of a fire, measured under test conditions, without loss of function or other failure: the period being determined by the need to allow evacuation, to check the speed and scale of fire and enable fire controls to be brought into use. Means of escape in event of fire, in both the United Kingdom and the United States are calculated on an
evacuation time to a safe exit within a period of 2½-3 minutes depending on construction.

Fire resistance periods for load bearing walls, floors, columns, beams and other constructional elements for an assembly hall accommodating over 500 persons are generally 2 hours, but may be reduced to 1 hour where smaller numbers of people are involved.

The construction of walls separating the hall from other areas, including dressing rooms, cloakrooms, corridors and staircases, must provide at least 1 hour's fire resistance. High standards of fire resistance of 2 to 4 hours may be required to provide separation from areas of high hazard, such as scenery stores, paint shops, stage workshops and electrical and mechanical plant rooms.

Lobbies will be required to separate the hall or platform from dressing rooms and, where there is permanent close seating in the hall, from cloakrooms, kitchens and serveries. Both separating walls and doors to a lobby must satisfy the fire-resistance standard.

11.3.2 Lining materials
In a hall where large numbers of people may congregate, and along escape routes, the rate of propagation of flames spreading across the surface of the ceiling or walls is particularly important. Requirements of the Greater London Council stipulate that wall and ceiling surfaces must be incombustible or Class I standard of Surface Flame Spread, with limitations on the thickness of the lining material, method of fixing and fire stopping of cavities. Where curtains or drapes are permitted they must be flame proofed.

Broadly similar conditions are specified in the City of New York Code which requires exits and shafts to have a Class A rating and halls and assembly rooms and short corridors and lobbies Class B rating.

If sprinkler systems are installed the New York Code allows one class higher rating.

Recommendations of the National Fire Protection Association specify that, in addition to surface flame spread, the behaviour of lining materials under fire should be considered with regard to the density of smoke developed and the toxicity and irritability which may be produced by burning plastic materials. The risks of melting, distortion, shattering
and detachment must also be taken into account, and the use of untreated or unreinforced glass or plastic diffusing panels is restricted in auditoria. Further details on this subject are given in Building Research Establishment publications (5).

11.3.4 Emergency lighting and ventilation
To comply with statutory and licencing requirements, emergency lighting must be provided at all times the premises are in use. The emergency lighting must be fed from an independent source, this normally being a continuously charged electric battery or separate generator with automatic switchover.

Electric charging equipment, rectifiers, transformers and switchgear must be isolated in a substantial enclosure. An area of about 0.15m$^2$ is required for every 100W of safety lighting provided, with a minimum area of 2m$^2$. Generating plant must also be housed separately from high voltage mains equipment.

Requirements for emergency lighting vary from 50 lux stipulated by the City of New York Code and 10 lux allowed under NFPA recommendations to a minimum of 1 lux in foyers and exit routes and as little as 0.25 lux in assembly halls during film projection as provided by BSCP 2560.

Signs must also be illuminated, normally by internal lighting if the room is to be dimmed for projection, although fluorescent type signs are permitted for viewing distances up to 24m (6). The fixed height, size and style of lettering for exit signs are prescribed.

Several provisions are made for ventilation in the event of an emergency such as fire or explosion:

- smoke and hot gases: high level outlets above the stage or platform. Generally these are of the 'haystack' lantern type with outward opening sashes of thin glass which shatter under heat. The total opening area should equal about 1/10th that of the stage.

- separation of ventilation from different parts of the premises where there is a high fire risk including separate ventilation of any stage isolated by safety curtain.

- direct ventilation of passages and staircases used for fire escapes to the open air where possible,
- pressurized ventilation of protected enclosures used for fire escape to prevent entry of smoke or fire.

11.4 Information and communication systems

Communication systems are a vital part of any security arrangements in addition to being essential for other user and management services. In addition to the installation of a Private Automatic Branch Exchange for external line connections most large hotels and centres will provide an internal network and independent exchange systems to facilitate control and communication between departments. Radio telephones and receivers are also widely used for staff location and instruction.

Telephone systems are becoming increasingly sophisticated, the cables being used to activate and record the use of individual room facilities and to distribute information as a service to individual guests.

Conference centres generally have extensive press facilities with telephone, telex and television services to provide and, in some cases, to directly transmit information about the events taking place both in recordings and interviews. The interface of communication which takes place within the framework of a conference and that transmitted to a wider audience via the broadcasting media is tending to become indistinct. Frequently, the whole or edited proceedings are conveyed to other rooms within the premises for information and recording and, increasingly, meetings in different premises are linked together by television relay. The rapid development of business communication and information systems is one which has many implications for the future of conference facilities and this aspect is examined in Chapter 13.

11.4.1 Computerised services

Developments in computers have had two main impacts on conference management. Firstly, computerised systems are widely available for various management services, ranging from airline and hotel reservations to market research and promotional activities. Increasingly these are being made compatible and thus capable of being unified into comprehensive systems. At the same time computers themselves are becoming smaller, portable, less expensive and simple to use without specialist knowledge or training.
From the indications of greater collaboration between the various elements of the conference industry, as discussed in Chapter I, and the rationalisation which is already taking place to reduce the laborious, costly and often repetitive processes of organisation, it is inevitable that unified systems will develop further.

Conference delegates of the future should thus be able to receive one encoded ticket (or credit card) which will serve as their conference registration confirmation, hotel reservation confirmation, airline ticket, security check at various points, operating key for the room and hotel services and account record.

Specific applications of computer systems in conference organisation include the production of selected mailing lists, word processing and the printing of letters, addresses and information, coding of individual reservation details and requirements, travel data for international meetings, informational retrieval, editing and selective printing.

In building engineering services computerised programmes are widely used in controlling lighting and acoustic reproduction and quality as well as for monitoring temperature variations and the regulation of air conditioning.

11.5 Sound systems

Systems of equipment for reproduction, transmission and amplification of sound have many applications in congress centres and hotels. The type of equipment and quality of performance specified will depend very much on marketing and economic considerations, i.e.:

- standards of accommodation offered; extent of specialisation in conference business; marketing and promotion requirements;
- scale of operation; size of hall; frequency of use; relative costs of installation, maintenance and operation;
- hire facilities available; comparative charges and services;
- other uses of the hall, need for music reproduction and broadcasting facilities.

Two main trends are evident: there is an escalating use of electronic systems for communication and control, including computerised processes;
and there is an increasing tendency to use hired facilities.

Sound systems in use in hotels and conference centres include public address announcements and background music, sound relay of conference proceedings, speech reinforcement within a hall, simultaneous interpretation, acoustic modification of sound by extended reverberation and other electronic techniques, sound reproduction from cine film, recording and broadcasting of interviews and proceedings, closed circuit and Ultra High Frequency television distribution and high fidelity music reproduction for concerts, theatres and discotheques.

11.5.1 Permanency of installation
Changes in audio-video equipment occur continuously as existing items become defective or obsolete and as new developments become available at competitive cost. Maintenance charges are high and the trend is towards planned life-cycle replacement of equipment or components. At the same time regular servicing and cleaning is essential to maintain good standards of performance.

To facilitate repair, replacement and extension, all equipment must be readily accessible. Standard modular design is essential using interchangeable components: in the case of control panels and consoles, the trend in equipment design is for the modules to be mounted in racks allowing any to be removed and replaced without major rewiring.

Equipment for which the positions are fixed, such as loudspeakers and motorised controls, must be incorporated into the design of the room, whilst allowing for access and eventual replacement. Other equipment may be portable and set up in a variety of positions when required. As indicated in Chapter 10.9, provision must be made for accessible, separated and screened cableways to be installed and extended to suitable terminal points to which equipment can be connected.

11.5.2 Performance specifications
Audio systems are made up from complementary sets of equipment which receive inputs of sound patterns or broadcast frequency waves, change these into electronic signals, pre-amplified as necessary; correct, balance and further amplify the signals and transmit them to loudspeakers or headsets from which sound waves can be emitted at the required level of loudness and quality.
Details of sound systems and individual types of equipment are covered in a number of specification standards, with some overlap in content and recommendations.

In particular, reference has been made to the British Standard Specification and Codes of Practice outlined below and the corresponding recommendations of the International Electrotechnical Commission (IEC), a number of which are in course of publication.

<table>
<thead>
<tr>
<th>British Standard</th>
<th>IEC</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCP 327 :</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part 3: 1964</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS 5428: 1977</td>
<td>Publication 268</td>
<td>Specifying and measuring the characteristics of sound system equipment.</td>
</tr>
<tr>
<td>Part 1: 1977</td>
<td>Parts 1 9A 18Z</td>
<td>General</td>
</tr>
<tr>
<td>1972</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parts 5 to 12</td>
<td></td>
<td>Under publication</td>
</tr>
</tbody>
</table>

Specifications laying down overall standards of performance for sound systems must take account of the purpose of the equipment and also the quality of sound likely to be expected by the audience. The latter will depend on the particular listening conditions.

British Standard Code of Practice 327 recommends three main categories of quality:\(^{(9)}\)
<table>
<thead>
<tr>
<th>Type</th>
<th>Quality</th>
<th>Listening conditions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Highest quality of reproduction for speech and music</td>
<td>Critical listening under good acoustic conditions</td>
<td>Auditoria: for reinforcement of speech and music. Music reproduction for concerts and theatrical use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intelligible and natural sounding</td>
<td>Listening conditions suitable, or capable of being made suitable by minor interior changes</td>
<td>Small halls and function rooms where acoustics limit 1. For speech amplification generally.</td>
</tr>
<tr>
<td></td>
<td>Good reproduction of music quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Intelligible but not so natural in sound. Acceptable music quality</td>
<td>For secondary interest, such as in background music. Where acoustic conditions poor: for example high background noise or prolonged reverberation</td>
<td>Background music in lobbies, bars, restaurants.</td>
</tr>
</tbody>
</table>

Amongst the characteristics which must be considered in evaluating performance requirements in each of these categories are the maximum variation allowed in frequency response measured at the rated output and the frequency range over which this applies; the distortion – measured from the total harmonic content –; levels of electric hum and noise; balance of stereophonic speakers and limitations on cross-talk between channels; and the electrical stability of the amplified chain.

11.5.3 Output power of an amplification system

The output power of a sound system must be capable of providing the maximum loudness required without undue distortion of the frequencies and peaks of loudness, excessive resonance and equipment noise.

Power requirements will depend on the situation, particularly the background activities and ambient noise level.

For clarity of speech the quietest sounds (consonants) should be at least 6dB above the ambient noise level and the mean level of speech some 12dB above.
Sound systems may be intended to convey essential information such as speech reinforcement in an auditorium or announcements over a public address system, or to provide background music and 'atmosphere'. Mean levels of required sound intensity (re 10-12w/m²) are normally about 80dB for speech in a hall or auditorium, 60dB for background music in lounge or lobby and 90-100dB for announcements in noisy areas such as lobbies, foyers and exhibition halls.

Typical ranges of sound inputs are about 30dB for speech, which can be increased up to 20dB for changes in distances from the speaker's mouth to the microphone, and about 70dB for orchestral music.

Capacities of systems should be determined to meet the peak conditions plus a margin of power output below the limits of distortion specified. The margin will depend on the application but, for auditoria, should be at least 10dB.

Limiting devices, such as filters and equalizing networks, include peak clippers to limit abnormal peaks of output and overloading. The latter cause some distortion which is particularly noticeable in music although for speech the effect of clipping peak intensities does not greatly affect intelligibility.

Power output requirements will also depend on the type of loudspeakers, their efficiency and directional characteristics and the size and reverberation time of the space.

Assuming reverberation times are near the optimum, sound power requirements are directly proportionate to the volume of the space. Using loudspeakers with 10 per cent efficiency, the rated power output of an amplifier and the power handling capacity of loudspeakers will be about 0.3W per 1000m³ for purposely designed auditoria, with 10dB margin for peaks increasing to 4W per 100m² for large exhibition halls and tall lobbies allowing 3dB margin for peaks.

Increase in reverberation such as in large banquet halls and ballrooms may allow a reduction in power output by up to 10dB but this must be balanced against the background noise. The output circuits of power amplifiers should be designed to provide adequate damping to the loudspeakers.

11.5.4 Control of audio equipment

Audio equipment is easily damaged by mishandling, by dust and moisture.
There is also a security risk involved. Operational access for regulation and servicing must be provided and in a more complex installation an operator may need to be continuously in attendance whilst the equipment is in use to make recordings, announcements, adjustments, etc.

Control facilities generally fall into four main groups:

Public address and background music in hotel
Components mounted in racks and housed in metal cabinets which can be located in a general operational room with other equipment - usually near the reception area. The enclosed equipment must be adequately ventilated and fitted with indicator lamps to show when working.

Sound amplification and recording.
Sound equipment should preferably be housed in a separate control room in which the operator can see and hear conditions in the theatre or auditorium. This should be adjacent to the lighting control room although these facilities are usually grouped together for small lecture theatres.

Reproduction from tape, film, disk, in lecture theatre and congress hall

Simultaneous interpretation of speech
Separate booths are required for interpreters.

Mobile equipment for sound reproduction and control
May be provided in hotel banquet halls, exhibition halls and other areas to provide local adjustment, amplification, background music and announcements. More exotic facilities are installed in discotheques and ballrooms.

Three main groups of controls are involved, volume or gain control, tone control and selective input and output switching. Simultaneous fading in and out of programmes is preferable and prewarning signals may be automatically provided prior to announcements through a public address system.

Controls are generally preset during the initial commissioning or realigning of the equipment. However, adjustment of volume and tone is important to allow for changes in audience numbers, ambient noise or conditions. Continuous manual control by trained operator is provided for in more sophisticated systems.
All equipment including controls must be robust, designed for continuous operation, electrically and mechanically noiseless with no short circuiting between channels during switching nor causing interference of radio and television reception.

11.5.5 Sound control rooms
Control rooms are usually located at the rear of the auditorium providing means of monitoring proceedings and operating the equipment without distracting the audience. Entrance ramped for trolley access, should be from outside the auditorium, preferably separated from public circulation, but also giving access to lighting and other control rooms.

The operator must be able to see and hear conditions in the hall if required, such as through a large sliding sash window, otherwise sound insulation from the auditorium and other control rooms must be high to prevent intrusion of equipment and fan noise.

Space requirements depend on the range of equipment but an area 3m wide x 2.4m deep should be adequate to accommodate a sound mixer console with adjacent tape and disk equipment plus storage on both sides and some standby equipment.

Control must be provided to allow screening and adjustment of illumination up to 1000 lux for editing and repair work, to limit velocity of air flow to 0.2m/second and noise levels to NR25, and to maintain the temperature between 18 and 22°C with a Relative Humidity kept between 45 and 65 per cent.

11.5.6 Microphones
Microphone performance depends on its technical specification and acoustic directional response characteristics, the latter being chosen for the particular use and location. Currently the main types of electroacoustical transducers used in microphones for conference systems are electrostatic (condenser and electret types), and electrodynamic (moving coil type). Sensitivity to sound arriving from different directions is represented by polar diagrams and may be expressed by the front-to-rear sensitivity index distinguishing omni-directional, cardioid, hypercardioid and bidirectional microphones.

Directional properties are used to discriminate against reverberant and other background sounds, to reduce the rise of regenerative feedback from speaker to microphone and to enable the distance between the
person speaking and microphone to be increased as in stage work.

In planning microphone installations variations in the use and seating plans must be considered. Conference requirements for a hall seating 100-500 or more include microphone facilities for the principal speakers - including the option of a miniature lavalliere microphones - for chairing meetings, for delegates' questions and interpreters, the microphones being connected in correct phase relationship and isolated when not required to avoid adding to reverberant noise. In auditoria, permanent microphones may be built into arm rests or recessed backpanels of seats, the minimum provision being 1 microphone per 3 seats in the same row or 1 microphone per 4 seats in two rows (10).

11.5.7 Sound recording and other equipment
High quality recording of conference proceedings is important in transcribing and translating the information. For accurate monitoring tape recorders should have separate screened recording and reproducing heads. Performance and playing time are related to the recording speeds and spool size, ranging from $3 \frac{3}{4}$ ips for interpretation and editing of speech to $1 \frac{1}{2}$ ips for recording proceedings. Technical specification criteria are indicated in 11.5.2.

11.6 Sound reinforcement
Conditions requiring the reinforcement of speech have been indicated in Chapter 8.1.6. Sound reinforcement in an auditorium may also be required for orchestral and instrumental music, for reproduced music or speech from disk, tape or film or for sound transmitted from other areas.

In designing sound reinforcement systems a number of acoustic and technical criteria must be satisfied, namely to:

- ensure reinforcing sounds arrive at every part occupied by the audience within 20 to 35ms of the direct sound;
- create the impression that the reinforcing sound originates from the person speaking by delaying the reproduced signal so that it follows the original with an optimum delay of about 10 to 15ms and by adjusting the amplitude appropriate to this delay up to a maximum increase of 10dB.
• provide an output power sufficient to meet the peak requirements with an adequate margin and which can be adjusted to suit variations in sound input (speech, music) and in room conditions, audience numbers, reverberation times, etc.;

• avoid distortion of frequencies but with the means of adjustment to improve the naturalness of the sound such as by restricting the bass response in speech;

• allow flexibility in use and layout of the room

11.6.1 Loudspeaker systems

Loudspeaker arrangements in an auditorium may be broadly classified into two systems:

Central or high level systems use a few loudspeakers located near the source - usually above and to one or both sides of the person speaking and tilted forward 5 - 10° so that the beam is mainly projected over the rear two thirds of the audience. The reinforcing sound has thus the same directional and time characteristics as the original direct sound. Difficulties from the feedback of sound to the microphone and from a possible uneven amplitude of sound can be avoided by directional control.

Distributed or low level systems have a larger number of loudspeakers usually located in the ceiling, over sections of the audience where there is a need for sound reinforcement - normally starting 6 - 8m from the source. The reinforcing signal must have a time delay which is calculated from 2.94ms per metre difference in distance travelled by the direct and reinforcing signals, plus 10 to 15ms for the correct sequencing of the sounds.

To avoid echo the distance between two successive loudspeakers should not exceed 15m. If the loudspeakers are installed more than 10m above head level the perceived sound level may be lower than the reverberant sound level with loss of intelligibility.

Loss of clarity will also occur if a listener can hear sound from a number of loudspeakers. The volume and beam characteristics should be adjusted to ensure limited distribution over a specific section of the hall.

Types of loudspeakers

In current practice four main types of loudspeaker are employed.
The direct radiator or cone loudspeaker uses a comparatively large diaphragm - usually cone shaped - vibrated by a moving coil. The frequency range of each diaphragm is generally limited and at higher frequencies, directional beaming and side distortion become pronounced. This effect reduces with diameter and to extend the frequency range multiple speakers of different sizes are assembled together in cabinets, flat baffles or directional baffles. Acoustical efficiencies are in the order 1 to 5 per cent.

Cone loudspeakers of 200-250mm diameter, having a power range of 2.8 watts, are often mounted in the ceilings of foyers, lounges and restaurants for background music and announcements. Mountings must be vibration free and accessible for adjustment and servicing. The coverage spreads at about 45° around the centre line determining the spacing. For ceilings higher than 6m line source loudspeakers are more appropriate.

The use of a horn coupled to a small diaphragm with a moving coil enables sound to be radiated in a fairly narrow beam and gives efficiencies of about 10 per cent or more. For lower frequencies horns must be large and, in this size, are folded to take up less space. Multicell units are generally used with two or more exponential horns in one flare forming splays up to 90°.

Horn assemblies in cabinets are often used in cinemas. Horn loudspeakers in exhibition halls are mounted to beam sound over a specific section of the occupants to give high local absorption and thus limit reflection.

Line source loudspeakers have several loudspeakers, usually of the radiator type, connected in phase with signal loudness tapered, and mounted in vertical columns. The radiation pattern forms a flat shaped beam concentrated vertically with a horizontal angle of about 110°. The concentration increases with length which should be at least 1.2m and may be up to 3.3m for very reverberant conditions.

Compared with other single sources the intensity is increased and this does not fall off so quickly with distance. The front may be curved to reduce side lobe formation.

The beam characteristics are particularly suitable for speech with tone control filters fitted which can be bypassed for music.

Typical sound outputs range from 6-8W for speech reproduction with minimum feedback for poor acoustic conditions in halls, 12-20-32W for music or speech in multipurpose halls to 60-75W for high fidelity music in theatres, etc.
Electrostatic loudspeakers are generally of very high quality but more expensive units of this type are also more slender and suitable for medium sized rooms.

Technical specifications for loudspeakers are described in BS 5428: Part 11, 1977.

11.6.3 Headphones

Individual headphones or earphones are used for simultaneous interpretation systems. The most common are the 'stethoscope' type having a single miniature receiver acoustically coupled to twin earpieces. Most headphones operate on the moving coil or electro-magnetic principle. The ear pieces should be removable for cleaning and disinfection.

A minimum 1.7m length of flexible cord should be provided with strain cords or cord grips at both ends. Connections to the permanent installation may be made through terminals in the arms of individual seats or in the hollow backs of the seats in front.

11.7 Simultaneous interpretation systems

Three types of simultaneous interpretation systems are available:

A cable or hard wired system is a permanent installation of the required number of language selector cables with built in terminals located conveniently to hand for each conference participant. The cabling is usually run through the bases of seats in ducts extending from row to row and across aisles in ring mains. Wired systems usually provide facilities for delegates to participate in the discussions including request indicator lamps, microphones and holding switches.

Equipment controls may be built into the hollow arms of chairs or into panels provided in the backs of the preceding seats.

Portable microphone units may also be provided for conferences. These are normally placed on the desks in front of delegates and used together with individual headphones or small loudspeakers. The units are connected in series to a central control desk and then to the interpreter's sets for translation and relay.

The induction system uses transmission by a magnetic field generated by a looped wire around the auditorium. The field, which is subject to broadcasting regulations, generally allows up to six carrier frequency
bands which can be picked up by a small portable monitor provided for each participant.

Limitations in the induction loop system arise from the restricted frequency range, generally 50 to 100kHz, which only allows a narrow waveband width for each of the carrier channels thus limiting the audio frequency bandwidth to about 3.6kHz - a quality comparable to the sound of a telephone.

The induction system is fairly flexible in seating layout and allows participants to move about. There is, however, some loss of security from transmission outside the room and a risk of distracting crosstalk between channels or transmission interference from adjacent rooms.

Modulated infra-red radiation from a number of sources in the room is used to transmit signals at different channel frequencies covering up to 9 frequency bands. In contrast to induction systems the frequency coverage is wide ranging between 55 and 300kHz, allowing large channel separation and high transmission quality. In a room with normal lighting one power radiator with 4 channels active should cover an area of up to 50m².

Typically 4 radiators are required in medium size conference rooms, preferably one located across each corner of the room. The radiators may be temporarily mounted on microphone stands or permanently installed.

Receivers are portable, battery powered and connected by plug-in leads to headphones.

One of the advantages of infra-red transmission is the effectiveness of screening by walls, partitions, etc.

11.7.1 Simultaneous interpretation booths

Requirements for booth design and equipment are laid down in ISO 2603 - 1974(8).

Booths must be elevated and built at the back or side of the hall to allow an unobstructed view of the persons speaking, the chairman, blackboard and projection screen. They should be grouped to enable interpreters to communicate visually through side windows at least 0.45m wide and have indirect but easy, quick and safe access between booths with entry from outside the hall through an area not normally used by delegates or members of staff.
Television may be installed for auxiliary close-up viewing but direct vision of the hall is essential. Windows to the hall must extend the full width of the booth, 0.8m high, and be inclined with the upper edge towards the hall to avoid acoustic reflection and mirror effects. The windows must satisfy the sound insulation standards.

Minimum booth dimensions to allow for 3 interpreters sitting side by side are 2.50m width, 2.40m depth and 2.30m height. A working surface for each interpreter at least 0.5m square clear of equipment, must be provided, together with an adjustable chair. Low ambient noise levels are essential and environmental standards include regulation of the air temperature between 18 and 22°C, with a relative humidity between 45 and 65 per cent RH and an air speed not in excess of 0.2m/s, the air inlets being positioned to avoid draughts and contamination. Lighting must be independent from the hall, adjustable between 100-1000 lux and screened.

In addition to the booths an ancillary room is required for both relaxation and study of documents, equipped with telephone and cloakroom facilities.

The sound system equipment must provide the correct reproduction of audio frequencies between 100 and 12000Hz at ± 3dB with a maximum distortion of 5 per cent at maximum power. The signal plus noise : noise ratio must be better than 50dB. These standards are comparable to the type 2 systems defined under BSCP 327 Part 3, 1964(9).

The source of sound may be a speaker's microphone, radio transmission or direct sound from a film projector or tape recorder. Each interpreter must have an adjustable headset, microphone and a separate control panel with a selector giving clear switching to each language. Facilities should be provided for alternate use of outgoing channels, for communication with the speaker or chairman and for tone control. For safety, plugs should be distinctive to prevent wrong connection and a red or amber lighted switch fitted to indicate when the sound equipment is 'on'.

11.8 Film and slide projection

Equipment for film projection ranges from specialist requirements of permanently installed cinemas to portable slide and cine projectors which may be required for meetings in small conference rooms. The latter equipment is often hired for the occasion. Depending on the type
of film and nature of use, cinematograph exhibitions are generally subject to fire safety regulations and licensing conditions.

11.8.1 Technical details
Most projection equipment incorporates automatic threading and tension adjustment and the trend is towards automatic control avoiding the need for continuous supervision. More sophisticated installations provide automatic start and changeover of projectors, lens and mask plate changing and light replacement in event of failure.

Depending on the scale of equipment, light sources include incandescent lamps with integral reflectors to focus the beam on the gate, tungsten halogen lamps with dichroic reflectors to reduce heat transfer to the film and Xenon arc lamps for large screen projection.

Normal lens focal lengths of 180 or 250mm may be substituted by shorter throw lenses (85, 60, 50mm) reducing projection distance but giving less uniform brightness as the acute angle of light striking the screen increases.

11.8.2 Projection systems
Direct projection is the standard method employed using a projector located at or near the rear of the hall. The light is projected through the space occupied by the audience requiring clearance above head level, or within aisle width, and below ceiling obstructions such as suspended lamps and beams.

Standard screen dimension ratios, based on film frame sizes, are 1.375 width to 1 height, whilst aspect ratios for the wide screens used in commercial cinemas are 1.75 width to 1 height.

The projection axis should be as nearly normal to the screen as possible to avoid distortion of the image. Maximum angles of tilt are particularly critical for screens with directional characteristics but even with white matt screens the projection axis must not be inclined more than 19° for 16mm film, nor more than 15° for 35mm film. The screen may be tilted back 1/3 or forward 1/2 of this angle.

Viewing requirements for screens affect both the seating plan and sectional elevation of the room. Limits to the acuteness of the angles from extreme side seats, sight line clearances from row to row and vertical
Indirect projection involves the use of mirrors to project light from equipment sited below or behind the screen, and is most suitable for cinema or lecture theatre conversions where height and other structural restrictions may limit alternative methods. Generally, indirect projection tends to cause some loss of definition, from dust on reflectors or misalignment, and difficulties for servicing.

Back projection may be practicable for 16mm film and slide presentations where sufficient space can be provided behind the screen. A short throw wide angled lens is employed. Lateral reversal of the picture is required either by specially adapted projectors and sound heads or by using mirrors, including mirror-lens assemblies. Back projection screens tend to be directional in light diffusion, limiting the arc of viewing. Stray ambient light from the rear or in front of the screen can obscure the image. Screen edge masking and the sealing - for light and sound exclusion - of the rear projection area are important. The illuminance of the hall or lecture theatre must be sufficiently low to provide contrast and consideration must be given to the screen reflection factor and gain.

Projection distances behind the screen are approximately 2 x screen width for short throw lens and 1.5 x screen width for mirror projection.

Back projection offers a number of advantages compared with other methods permitting higher room illuminances, provided light is not directed at the screen, enabling a central projection room to serve lecture theatres and rooms backing from more than one side and facilitating multiple screen slide, television and cine presentations.

11.8.3 Overhead projectors

Overhead projection of images on to a screen behind the speaker from transparent sheets or rolls of acetate can be grouped into 3 types.

The ellipsoidal mirror projector with a fan cooled internal lamp source (500-1000W) gives a sharp, clear, large image with minimum glare and is more appropriate for large halls and lecture theatres. The fresnel lens type is similar but with less definition and more light scatter, whilst projectors with a focusing reflection surface, having the projector lamp housed beside the objective lens, require no cooling fan and use a short focus lens more suitable for confined spaces.
Overhead projectors are normally mounted on the speaker's table at a distance from the screen equal to screen width (10in lens) or 1.6 screen width (14in lens). With shorter distances the image shows angular distortion and colour fringing. This may be to some extent reduced by tilting the screen forward up to 20-25° maximum. In small seminar rooms the screen may need to be set back across a corner to give the required projection distance.

Episcope projection is used for opaque copy, the reflected light being projected on to the screen. A high intensity of light is required with fan cooling, and the screen illumination is only about 10 per cent that obtained with transparent slides.

11.8.4 Slide projection

50mm slides having a formal size of 24 x 35mm are standard in most equipment. Specifications for portable equipment suitable for conferences in hotels usually require a twin carousel or moving carriage slide projector with 250W tungsten halogen lamp source and interchangeable 85mm or 180mm front projection lenses and 60mm lens for back projection - the lens assembly depending on distance. Remote hand control having forward-reverse movement and focusing adjustment is essential and the projector with its associated equipment must be mounted on a stand to appropriate height with locking devices for stability.

The trend in projection equipment is towards automatic self-focusing and adjustable speed dissolve with the option of control by hand or by pulsed cassette replay.

All portable equipment must be simple, have high performance, rugged whilst being reliable to withstand frequent transportation and handling with varying conditions of use and inexperienced operators.

Multiple screens arranged side by side or in blocks are used to present different slides or cine films and slides simultaneously. For example, different views of a product or film with supporting technical details can be shown together. Multiscreen productions are increasingly used in visitor centres for tourist information and orientation and for backgrounds to exhibitions and discotheques.

The system may range from a 3-screen 6-projector arrangement, either temporary or permanent, up to 60-screen 120-projector set-ups.
In planning multiscreen presentations consideration must be given to the viewing requirements for screens which limit the maximum viewing distance to $6-10 \times$ width of the projected image, with a maximum edge angle to any image of $35^\circ$, and maximum elevation of $30^\circ$. The balance of size and definition of different projected images will depend on lens focus, position and lumen output of the projectors. Wide screens may be curved on plan or have side screens set at $170^\circ$ to the centre to reduce edge distortion.

For multivision presentations the sound system must be integrated with speakers behind each screen to distinguish between the different sources of sound.

11.8.5 Projection Room

Most hotels use portable 8mm or 16mm projectors with lamp power requirements up to 1200W which can be sited within the conference hall, subject to spacing and other conditions. For higher intensity tungsten halogen or xenon arc sources, which require independent ventilation or cooling, a separate projection room must be provided. From the optimum viewing data (8.2) this is necessary for conference halls seating 250 or more. Alternative locations are discussed in 11.8.2.

Allowing for working space, median internal dimensions for a projector room having a minimum of 2 cine projectors, amplifier and controls are 4m width x 2.9m depth. If slide projectors and spotlights are included these dimensions increase to 5.5m x 3.9m. In both cases a height of 2.5m is essential. Fire requirements depend on whether flammable film is used but this is exceptional. Normally the standard isolating resistance is adequate. A separate room is required for lighting switchgear, emergency supplies and rectifiers.

11.8.6 Screens

Essential criteria for screen selection are flatness, or even curvature where employed, good reflective properties, and correct size and location. The optimum size will be determined by the numbers and seating arrangements of the audience judged against the film size, light intensity and distance of projection.
Screens for projection may be of treated fabric or plastic and may have a matt white finish, with or without a perlux, glass beaded or silvered lenticular coating to improve gain. The last two are directional in characteristics and used primarily for curved screens.

For back projection special screens with good light transmission and colour reproduction are required.

Permanent screens may be standard or wide aspect: flat screens are generally used in conference centres but curved screens with directional surface reflection are common in purposely designed cinemas. A space at least 1m wide must be left behind the screen for speaker assemblies.

For typical viewing conditions the brightness of the screen should range from 100-160 asb.

Temporary screens may be straight screens which are retracted or covered when not in use, roller screens or collapsible screens with hinged or pivoted frames, the type depending mainly on the frequency of use required.

11.9 Television

Closed circuit television may be used within any auditorium to supplement information, particularly in specialised medical, scientific and technical conferences and can also be used to record and/or relay proceedings to other rooms in the hotel or complex, for example to the

- administration offices - to monitor progress and time tabling, security and control

- projection and other operational rooms - where difficult to maintain direct contact and for subsequent editing and transcription of proceedings

- foyer - to inform latecomers and support staff

- kitchen - for timing and monitoring of food service, bar operations, etc.

- seminar rooms - for separate discussion and evaluation
The optimum viewing area depends on the monitor screen size and resolution but limits to viewing distance are generally 10-12 times the screen width within an arc extending 45° to either side of normal and with a maximum elevation of view 10° above horizontal (11).

Video systems are essentially modular in concept, integral with sound systems and capable of adaptation for particular situations. For example, the cameras may be adapted for hand holding, tripod mounting or fitting to other equipment including telescopes and endoscopes. To cover the wide variations in filming requirements for conferences, fashion shows, product launches, stage productions and sporting events, connections for power and screened transmission must be left at suitable spacings around the hall and stage. Levels and planes of lighting and also the relationship of the camera to lighting points are critical and usually need supplementation.

External network television broadcasts of conference proceedings and stage events in a hall require special consideration. To film occasional events, the generating, monitoring and transmission equipment is contained in vehicles which need unobstructive parking space near the building and easy runs, including access ports, for the numerous heavy cables which are required both for lighting and transmission.

For frequent broadcasts special monitoring rooms will need to be provided as well as interviewing rooms and supplementary operational areas.

11.9.1 Projection television systems

The projection of video images onto a screen rather than on the internal surface of a cathode ray tube overcomes many of the viewing limitations mentioned and offers another dimension of interest and scope for conference development. Projection television can be used for broadcast frequency and closed circuit television systems, whether simultaneously or from video-recording of proceedings or events.

The rate of system development has been rapid. At the present time, for conference and exhibition centre applications, single or three tube refractive type equipment is more common in medium sized units whilst, in the largest halls, three tube reflective systems are used to provide brighter images. For conference purposes these systems offer many advantages:
- Larger groups can see live and pre-recorded television pictures and in greater size and detail.
- There is a greater cohesion and interchange within the group viewing the same screen - as opposed to several monitors.
- Rapid developments for the domestic market have made available and at competitive costs portable systems for small groups as well as for larger audiences.

Disadvantages at the present time are the higher capital and operating costs - particularly for groups over 100; possible limitations in the position of the projector relative to the screen which may present difficulties in existing premises with fixed rows of seats, the size and weight of the equipment, and, in some cases, the need for special screens.

Three main types of projector television systems are currently available, grouped according to the size of image produced.

Large screen projectors using Xenon arc lamps give up to 7000 lumen producing an image size up to 16 x 12m. At this size the luminance of a screen with a gain of 1.6 is 56 asb increasing to 233 asb for a screen of 8 x 6m.

The vertical projection angle is from + 5 to - 15° determining the position of the projection room. Viewing distances should not be less than 1.5 to 2 times image width nor more than 10 times. Projection distances range from 10m (f. 150mm lens) to 50m or more and special screens are not required. Back projection equipment may also be used.

The minimum size of projector room to house the projector and electronics is 4m x 3m depth and a separate rectifier room must be provided for the 160amp Xenon lamp current. Typical weights of equipment are 5kN.

Television projection equipment has similar servicing requirements to large cine projectors: direct extractor and ventilator to provide cooling is essential and the noise generated (up to 67dBA) will require noise absorption and insulation treatment of the enclosure.

Medium sized screens range up to 2.4m x 1.8m and are more suitable as portable equipment. Rear projection is possible but special highly reflective curved screens are generally required limiting the viewing arc.

Small screens with the option of remote infra-red type control, extend into the domestic range and are increasingly competitive in costs and versatility. Screen sizes are about four times that of a 26in (660mm)
television tube. Direct lighting falling on the screen should be avoided but this system can be used in most conference and seminar rooms as well as in small lecture theatres.

Distances are generally not critical in television transmission and the current developments in business communication systems using network time and independent satellite transmission suggest that it should be commercially feasible for centres to be linked together directly by video transmission by the mid 1980s. As an illustration of such trends, the 1979 World Symposium on Humanity was held simultaneously in Los Angeles, London and Toronto with an attendance of 3000 in each centre.

(2) BSCP 3, Chapter IV, 1948, "Precautions against fire", and BS 476, Parts 4 to 8, 1968 to 1972, Test methods


(9) BSCP 327, Part 3: 1964 , London, British Standards Institute


12.1 Levels of analysis

Two main levels of financial appraisal are used for investments in conference facilities: project cost feasibility analysis and cost benefit analysis. The latter is generally applied to public financed or supported projects and takes into account wider issues such as the social and economic benefits to the area as a whole. At this macro level the analysis may be broadened to evaluate alternative proposals and strategies for public investment and will depend on the extent to which the provision of such facilities will meet long term planning objectives.

Cost feasibility appraisal involves an evaluation of the cash flows, discounted to a common basis of time, of costs and revenues generated over the life of the project. This applies both in assessing the profitability of commercial investments, such as in hotels, and in determining an appropriate level of financial commitment for publicly funded projects. However, even for hotels, the investment in conference facilities cannot be judged on their profitability alone. Other advantages are likely to stem from the wider range of sales resulting from conference packaging, particularly if this extends the seasonality of use. There are also intangible benefits which are not costed in accountancy terms such as the publicity and repeat business, justification for better guest facilities and contributions to the cost of services that might otherwise not be viable.

Financial analysis of conference facilities is in itself complicated by the variable nature of use and by the difficulties of identifying and apportioning costs which are not separated for accounting purposes.

12.2 Project cost feasibility

Cost feasibility of projects generally involves two separate methods of approach. Discounting methods enable the costs-in-use of investments to be compared and the net effects of revenues on cash flows to be determined. This is particularly useful in examining alternative or additional investment opportunities and strategies for the use of conference space, in evaluating the effects of tax relief and grant aid and in demonstrating the sensitivity of profitability or viability to changes in investment conditions, such as in interest rates or operating costs. In the context of conference facility design,
sensitivity analysis can be used to show the consequences of changes in the lives of components and in the life-cycle of the project as a whole \(^2\).

Discounting techniques can also be used to calculate the maximum investment which can be justified by a particular set of conditions, thus providing a means of relating capital costs of investment or improvement in facilities to a known market potential. This may be used to choose between alternative investment decisions, particularly where multiple use of conference space is involved, and to determine the optimal project size \(^3\).

A more detailed year by year account of cash flow projections is provided for most investment proposals. Financial projections generally extend over the first five years of the operation although a longer period may be taken to show the repayment of short term loans. The analyses summarized in financial projections indicate the cash balances and levels of profitability or loss expected, particularly in the early years of the project life, and provide a financial plan against which actual performance may be measured.

In evaluating conference facilities, cost items include those which are fixed regardless of sales such as site and construction costs, equipment costs, financing of loan, pre-opening costs, depreciation, rent, rates and taxes and administrative overheads. Investment costs in respect of land, building and equipment generally attract different rates of allowances.

Semi-fixed costs include undistributed operating expenses such as administration, marketing, energy costs and property operations. They are usually expressed as percentages of the Gross income although they necessarily include a fixed component.

Variable costs are directly related to the volume of sales in each department and cover categories of labour, materials used and consumed, and hired services.

Revenue generated by conferences and exhibitions will result from room hire, letting of exhibition space, sales of food and beverages, letting of concessional space and services and charges for other services to delegates and organisers (secretarial, design, promotion, marketing, etc.) In the case of a hotel, credit should also be given for other departmental income generated as a direct consequence of meetings such as the sales of guestrooms and hospitality suites.
12.2.2 Effects of taxation and allowances

Grants, subventions and investment allowances have a significant effect on project feasibility, by reducing capital financing costs and, in the case of a commercial investment, enabling the costs to be set against current or future taxation. For the purposes of this study, the former has been assumed and the present value (PV) of tax allowances have been calculated as follows:

- For initial building allowance
  \[ PV = \frac{K + R}{(1+r)^L} \]
  \[ K = \text{relevant capital outlay} \]
  \[ t = \text{tax rate (0.52)} \]
  \[ R = \text{initial allowance (0.2)} \]
  \[ d = \text{writing down allowance (0.04)} \]
  \[ L = \text{lag in years payment (0.5)} \]

- For writing down allowance
  \[ PV = \frac{Kt}{(1+r)^L} \left[ d + \frac{d}{N} \left( \frac{1}{(1+r)^N} - \frac{1}{(1+r)^N} \right) \right] \]
  \[ N = \frac{(1-R-d)}{d} \]

The figures quoted are based on the Industrial Building Allowances for hotels in the UK, introduced in the April 1978 Budget. Plant, equipment and furniture costs and repairs and maintenance carry 100 percent allowance. Corporation tax has been taken at the current rate of 52 percent.

12.2.3 Effects of inflation

In evaluating and comparing building projects the variations in prices and values caused by inflation give rise to considerable difficulties in predicting future cash flows. In particular, the capital costs of hotels and other buildings depend on the base dates for completion. Because of the long time intervals involved in planning and construction, initial estimates of costs and even tender prices often bear little relationship to the eventual building investment costs. This inflationary trend also affects subsequent replacements and lifecycle planning.

Inflation in the values of buildings and sites effectively reduces the rates of interest charged on investment capital\(^4\). However, the value of a building such as a hotel does not show a uniform increase but will depend as much on the commercial success of the operation and its
profitability, as on the product life cycle.

Interest rates also tend to be geared to inflation and, in the long term, inflationary changes in costs tend to be balanced by corresponding increases in prices and revenues. In determining net present values the discount rates for individual costs and revenues may be differentially adjusted to take account of relative changes in their price indices. For most purposes this is not practical and present day values are normally taken. An exception may, however, be provided for energy costs which, for a number of years, have shown an escalating rate of increase rather than uniform series of annual costs. The present value is thus determined from (5):

\[
P(V) = \sum_{j=1}^{N} \frac{A}{(1+r)^j} = \frac{A}{r-\epsilon} \left[1 - \frac{(1+\epsilon)^N}{(1+r)^N}\right]
\]

where \(\epsilon\) = annual escalatory rate of \(A\)
\(r\) = discount rate
\(N\) = period (years)
\(A\) = annual sum at year 1

Capital depreciation allowances do not normally apply to the site which is regarded as a continuing asset on which only interest is chargeable. The infrastructure development costs may attract other forms of grant aid (12.3.1). Large scale projects such as hotels generally involve joint investment and/or sale and lease back arrangements for financing long term capital.

12.2.4 Cost benefit analysis

Much wider issues need to be considered when the overall benefits to the area - city, region or country - from public investments in conference and exhibition centres are evaluated. Macro-economic studies necessitate the measurement of:

- revenue generated throughout the area as a direct effect of visitor spending and local direct expenditure by congress and exhibition organisers, for example, on hotels, catering, transport, distribution and other services;
- employment created and the multiplier effect of these incomes inducing greater local consumption expenditure;
- indirect effects of secondary and tertiary purchases by the hotels, etc., on food, drink, construction, manufactured equipment and goods, gas, electricity, water, transport, distribution and
other sectors;

- direct and indirect contributions to local property taxes, tourist taxes, rates and value-added tax on purchases;

- intangible benefits (promotion, prestige, association with subject, commercial and trading contacts, public relations);

- community benefits, including the provision of needed local amenities through the multiple use of facilities for entertainment and cultural interests justifying the commitment of local authority finance.

Detailed studies of the economic impacts of tourism using multiplier techniques and input-output analysis have been carried out in a number of destinations and reference may be made particularly to the work of Archer and Richards in this field. In the cost-benefit analysis of large-scale projects involving public finance, some form of social discount rating will need to be applied to assess the time and opportunity costs of the resources employed.

In comparing conference facility investment with tourism development in general, there are several direct advantages: expenditure per capita is invariably higher; accommodation is mainly in hotels with high employee:guest ratios compared with the trend in leisure tourism towards economy and self-catering facilities; the demand is less seasonably concentrated; and there are requirements for high value secondary services such as secretarial, interpretation, promotional, technical and exhibition services.

Analyses of individual and overall expenditures are detailed in chapters 2 and 5. Based on the 1977-79 data, the average ratio of expenditure per conference visit compared with all tourist visits was 1.47:1 in New York, 2.06:1 in Chicago and 1.29:1 in London (appendix 7). Of the delegate expenditure in the destination cities some 30 percent in the United States and 23 percent in Europe was spent on local services and purchases other than accommodation and food. To this must be added the expenditures by conference organisers and associations, which represented a further 9.35 percent on major American Conventions and 19.5 percent on conferences held in London.
Harrogate Conference Centre

Linked to the existing exhibition hall complex, the 2,000 seat circular auditorium is part of a large scale development which includes an office building, shops and future hotel, as well as a 2,000m³ exhibition/banquet hall. Sale and leasing of associated development land helped to finance the conference centre.

Architects: Morgan Bentley & Partners
12.2.5 Development policy

The planning of a large conference centre or exhibition complex cannot be considered in cost-benefit terms alone. It is necessary to look at the long term impacts of the resulting changes, both desirable and otherwise, and to co-ordinate other development and future infrastructure needs. In most cases this will require the formulation of a strategic or master plan providing a framework within which orderly development can take place ensuring the best use of resources to achieve the desired outcome.

Planning objectives or goals in drawing up development proposals may be:

- to revitalise a declining resort by introducing new markets - such as in the traditional seaside resorts and spas;
- to extend the use of resorts - for example, in extending the season of a leisure resort or to create an out of season demand for ski resorts;
- to promote the redevelopment of inner urban areas through comprehensive projects encompassing hotel, shopping, conference, recreation, commercial and housing accommodation;
- to improve the commercial and industrial competitiveness of a city or region by providing exhibition and conference facilities for local promotion as well as international trade;
- to justify and offset the cost of a locally needed facility such as a concert hall, theatre or social centre.

All of the conference centres built or planned in the last decade have had one or more of these objectives as the underlying motivation for public investment in conference facilities.

Associated developments in the private sector are similarly encouraged and regulated by a combination of incentives and controls.

Planning processes have become increasingly sophisticated with the use of computer modelling and analysis techniques which cover not only network programming and resource allocation but the financial implications of different courses of action and the sensitivity of a proposal to changes in conditions. Planning procedures for tourism development have been the subject of a previous study(10).
 Calgary Convention Centre, Alberta

The £1.8 million convention centre is part of a complex which includes a 387 room hotel and self-contained museum and art gallery. Within the centre, a foyer separates the MacLeod Banquet hall (1,860 m²), which is equipped for banquets, meetings (seating 2,300), dances and staged shows, and a 2,200 m² exhibition hall. These three areas can be combined. There are also 10 smaller function rooms grouped around a central kitchen.
12.3 Capital finance
Financing of conference facilities by means of public funds may take
the form of a direct investment in the project or that of indirect
support, by means of grants and financial aid, for other funding.
The latter will usually apply to investments from either public or
commercial sources.

Studies of the financing arrangements for the major conference centres
built since 1969 show a wide variety of alternatives have been used
to raise the necessary capital. In some instances, financing has been
entirely through central government, in the case of the £15m Westminster
Centre, for example, administered by the Property Services Agency.
The Congress Centrum Hamburg (£23.5m) was funded by the City Council
whilst finance for the ICC Berlin (£187.0m) was provided partly by the
Berlin exchequer and partly through Federal funds.

Financing of the International Congress Centre in Paris was organised
through the Paris Chamber of Commerce and Industry, and most Scandinavian
conference and exhibition centres were financed through similar local
arrangements.

The Calgary convention centre (£3.6m), typical of many Canadian
projects, was funded by City Council loans but is part of a £16.3m
complex which includes a museum funded by the Province and a hotel
leased to the Four Seasons Hotel Company. The loan finance is covered
by a 1 percent business tax levied by the City on the business communi-

Similar provisions have been made through the issue of tax bonds to
finance convention centre projects in the United States. In Orlando,
for instance, a proposed £12m phased investment in convention and
exhibition facilities is being financed through a 2 percent tax on
hotel and motel rooms and camping sites in the area.

Contributions towards the initial cost of new or modernised centres
are often provided through the sale of local authority property. In
Harrogate, the £18.2m capital finance for the new conference centre
has been provided by capital receipts (£4.0m) a 40 year loan (£3.8m)
and deferred purchase over 7 years (£10.3m). It should be noted
that the estimated building cost of the centre increased from £4.0m
to £11.0m during the programme of building.
The funding of the Brighton Centre was jointly through a consortium of banks (£5m) and the local authority (£5m). The £17m Wembley Centre, on the other hand, was entirely privately financed although a substantial contribution to the capital charges is made through the leasing of adjacent office premises. Similar combinations of private and public finance have been used in a number of other countries, notably in Switzerland, where the Cantonal governments generally provide support through guarantees.

Many of the recent projects in Europe have attracted grant aid from Tourist Boards and the European Economic Community. This applied, for example, to the £1.5m renovation scheme of the Grand Hall in Scarborough. In Cardiff and Plymouth, EEC grants have been made for multipurpose theatre projects. International organisations, notably the World Bank Group (IBRD, IDA, IEC), have provided loan finance for conference centre projects in developing countries, as in Khartoum.

The building of large hotels and executive conference centres is often financed by development companies, and investment agencies acting on behalf of institutional and private investors, such as insurance companies, pension funds and unit trust holdings. Most of the national and commercial airline operators have substantial holdings in hotel companies and together with banks provide joint stock companies for hotel investment such as by the Penta group. Commercial hotel companies may fully own the property or have a minority interest as well as providing the management and technical expertise. Hotel properties are also operated under franchised or management contracts with independent financing arrangements.

12.3.1 Indirect support

Federal or State funds for development are usually specific, designed to encourage private investment or improvements in accommodation and facilities. For this reason they are normally limited in availability to particular regions, specific types of projects, limited periods for application and completion of works, and subject to conditions. Amongst the methods which have been used to aid hotel and conference centre projects are:

- grants and subventions - for hotel building, extension and improvement. Normally limited to 25-30 percent although regional and schemes may be as high as 50 percent (Northern Ireland). The European Regional Development Fund (11) has provided grants
for projects designed to aid the development of tourism and financed wholly or in part by public authorities (up to 20 percent of investment cost and 30 percent of direct infrastructure costs);

• special guarantees to foreign investors and assistance in securing loans from other sources;

• fiscal measures such as relief from direct or indirect taxes for specified periods; assistance in training and promotion.

Methods of finance in centrally planned economies also include state and local government participation in capital investment sometimes with the assistance of international hotel companies.

12.4 Costs

Construction costs of conference facilities cannot be compared precisely. The cost per unit area or per unit occupancy will depend on standards of sophistication particularly in the engineering and special services installed. It will also vary with the scale of operation and the range of other facilities provided each of which will have a different unit cost of construction and furnishing.

Increasingly the conference centre is part of a larger development and some apportionment of cost must be made. The example has been cited of the Calgary Centre, which is representative of many urban redevelopment projects in North America. This also applies in the case of the World Trade Centres now under development in Hong Kong, Singapore and New York. As the latest addition to the conference facilities in London, the Barbican Centre is part of larger arts complex with an estimated final capital cost of £82 million.

Additional expenditure may be incurred in making a hall adaptable for several purposes, both in equipment costs and in extra storage and circulation space.

Direct comparison of unit costs are made difficult by the varying rates of inflation in different countries and changes in building cost indices over time. Examples of the costs of recently built centres are quoted in 12.3.

12.4.1 Cost analysis

The following cost analysis is based on the details of construction of a number of conference centres and large hotels with prices adjusted
to the first quarter of 1979 as the base data for comparison. It is intended to show relative costs, taking into account the constructional features, finishes, fittings, services and special equipment generally involved in these types of premises.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost per m²</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminaries and insurance</td>
<td>£93.75</td>
<td>12.5</td>
</tr>
<tr>
<td>Work below lowest floor finish</td>
<td>£26.25</td>
<td>3.5</td>
</tr>
<tr>
<td>Structural elements</td>
<td>£120.00</td>
<td>16.0</td>
</tr>
<tr>
<td>Structural frame and upper floors</td>
<td>£98.25</td>
<td>13.1</td>
</tr>
<tr>
<td>Roof and roof lights</td>
<td>£32.25</td>
<td>4.3</td>
</tr>
<tr>
<td>Staircases</td>
<td>£3.00</td>
<td>0.4</td>
</tr>
<tr>
<td>External walls</td>
<td>£22.50</td>
<td>3.0</td>
</tr>
<tr>
<td>Windows &amp; external doors &amp; shutters</td>
<td>£21.00</td>
<td>2.8</td>
</tr>
<tr>
<td>Internal walls</td>
<td>£11.25</td>
<td>1.5</td>
</tr>
<tr>
<td>Internal partitions and folding screens</td>
<td>£7.50</td>
<td>1.0</td>
</tr>
<tr>
<td>Internal doors</td>
<td>£11.00</td>
<td>1.4</td>
</tr>
<tr>
<td>Ironmongery</td>
<td>£3.75</td>
<td>0.5</td>
</tr>
<tr>
<td>Finishes and fittings</td>
<td>£210.00</td>
<td>28.0</td>
</tr>
<tr>
<td>Wall finishes</td>
<td>£21.75</td>
<td>2.9</td>
</tr>
<tr>
<td>Floor finishes</td>
<td>£37.50</td>
<td>5.0</td>
</tr>
<tr>
<td>Ceiling finishes</td>
<td>£24.00</td>
<td>3.2</td>
</tr>
<tr>
<td>Staircase finishes</td>
<td>£16.50</td>
<td>2.2</td>
</tr>
<tr>
<td>Kitchen and bar fittings</td>
<td>£22.50</td>
<td>3.0</td>
</tr>
<tr>
<td>Furniture</td>
<td>£33.75</td>
<td>4.5</td>
</tr>
<tr>
<td>Services</td>
<td>£156.00</td>
<td>20.8</td>
</tr>
<tr>
<td>Sanitary appliances</td>
<td>£2.25</td>
<td>0.3</td>
</tr>
<tr>
<td>Waste soil and overflow pipes</td>
<td>£10.50</td>
<td>1.4</td>
</tr>
<tr>
<td>Hot and cold water services</td>
<td>£15.00</td>
<td>2.0</td>
</tr>
<tr>
<td>Airconditioning and heating</td>
<td>£99.00</td>
<td>13.2</td>
</tr>
<tr>
<td>Electrical services</td>
<td>£64.50</td>
<td>8.6</td>
</tr>
<tr>
<td>Elevator and lift installations</td>
<td>£12.75</td>
<td>1.7</td>
</tr>
<tr>
<td>Stage equipment</td>
<td>£9.75</td>
<td>1.3</td>
</tr>
<tr>
<td>Communication equipment</td>
<td>£18.00</td>
<td>2.4</td>
</tr>
<tr>
<td>Fire control equipment</td>
<td>£7.50</td>
<td>1.0</td>
</tr>
<tr>
<td>Acoustic control</td>
<td>£6.00</td>
<td>0.8</td>
</tr>
<tr>
<td>Other special services</td>
<td>£9.00</td>
<td>1.2</td>
</tr>
<tr>
<td>Drainage</td>
<td>£9.75</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£264.00</strong></td>
<td><strong>35.2</strong></td>
</tr>
<tr>
<td><strong>Area 18000m²</strong></td>
<td><strong>£750.00</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
12.4.2 Adaptable theatres: equipment details

Cost analysis of 14 theatre projects based on the work of Izenour (13) give a more detailed breakdown of the equipment costs for multipurpose theatres.

<table>
<thead>
<tr>
<th>Item</th>
<th>Overall Averages percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>General construction</td>
<td>59.1</td>
</tr>
<tr>
<td>Heating ventilating airconditioning</td>
<td>10.4</td>
</tr>
<tr>
<td>Electrical wiring</td>
<td>8.5</td>
</tr>
<tr>
<td>Plumbing</td>
<td>3.5</td>
</tr>
<tr>
<td>Passenger elevators</td>
<td>1.1</td>
</tr>
<tr>
<td>Auditorium seating</td>
<td>3.3</td>
</tr>
<tr>
<td>Furnishings</td>
<td>3.3</td>
</tr>
<tr>
<td>Orchestra pit-apron lifts</td>
<td>1.4</td>
</tr>
<tr>
<td>Stage lighting</td>
<td>2.5</td>
</tr>
<tr>
<td>Stage and auditorium special steel</td>
<td>4.1</td>
</tr>
<tr>
<td>Stage and auditorium rigging</td>
<td>3.8</td>
</tr>
<tr>
<td>Sound reinforcement system</td>
<td>1.1</td>
</tr>
</tbody>
</table>

12.4.3 Range of costs

The variations in costs for a purposely designed conference hall, a multipurpose arts centre and a hotel banquet facility are demonstrated. These have been compiled from priced Bills of Quantities for a number of projects and are representative of construction costs in the first quarter 1979. In the case of the hotel, the costs of central engineering services and plant have been apportioned. Only the areas specifically required by conference and exhibition users have been costed. Guest room accommodation is excluded from this analysis but an appropriate allowance has been made for conference reception and associated services.
**Range of Costs**

<table>
<thead>
<tr>
<th>Function</th>
<th>Purposely designed Congress Centre</th>
<th>Multipurpose Arts Centre</th>
<th>Hotel Banquet/Conference Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Largest group accommodated</td>
<td>2000</td>
<td>600</td>
<td>240 (c)</td>
</tr>
<tr>
<td>Auditorium or Banquet hall</td>
<td>2000 @ 0.9 1800</td>
<td>600 @ 0.8 1200</td>
<td>240 @ 1.0 240</td>
</tr>
<tr>
<td>Foyer</td>
<td>(2000 @ 0.5) 1000</td>
<td>(600 @ 0.5) 300</td>
<td>240 @ 0.5 120</td>
</tr>
<tr>
<td>Meeting Rooms</td>
<td>600 @ 3.0 1800</td>
<td>100 @ 2.0 200</td>
<td>150 @ 2.0 300</td>
</tr>
<tr>
<td>Exhibition space</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurants</td>
<td>200 @ 2.5 500</td>
<td>100 @ 2.5 250</td>
<td>(a)</td>
</tr>
<tr>
<td>Catering</td>
<td>400 @ 1.5 600</td>
<td>100 @ 1.5 150</td>
<td>240 @ 1.5 360</td>
</tr>
<tr>
<td>Stores and toilets</td>
<td>8200</td>
<td>2100</td>
<td>1020</td>
</tr>
<tr>
<td>Reception</td>
<td>60% 4900</td>
<td>20% 420</td>
<td>40% 408</td>
</tr>
<tr>
<td>Circulation</td>
<td>18000</td>
<td>3060</td>
<td>1836</td>
</tr>
<tr>
<td>(e) Cost analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td>£ 142</td>
<td>£ 125</td>
<td>£ 110</td>
</tr>
<tr>
<td>Envelope</td>
<td>96</td>
<td>97</td>
<td>80</td>
</tr>
<tr>
<td>Internal divisions</td>
<td>43</td>
<td>27</td>
<td>62</td>
</tr>
<tr>
<td>Finishes-fittings</td>
<td>172</td>
<td>279</td>
<td>86</td>
</tr>
<tr>
<td>Services</td>
<td>297</td>
<td>252</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Maximum seating in halls and meeting rooms</td>
<td>2600</td>
<td>700</td>
<td>390</td>
</tr>
<tr>
<td>Area excluding gross exhibition space</td>
<td>13600m²</td>
<td>3060m²</td>
<td>1836m²</td>
</tr>
<tr>
<td>Cost ('000s)</td>
<td>£10200</td>
<td>£2387</td>
<td>£1028</td>
</tr>
<tr>
<td>Cost per place</td>
<td>£3923</td>
<td>£3410</td>
<td>£2636</td>
</tr>
<tr>
<td>Exhibition space (gross)</td>
<td>4400m²(a)</td>
<td></td>
<td>702m²(b)</td>
</tr>
<tr>
<td>Cost ('000s)</td>
<td>£3300</td>
<td></td>
<td>£393</td>
</tr>
<tr>
<td>Cost per m² net</td>
<td>£1650</td>
<td></td>
<td>£1008</td>
</tr>
</tbody>
</table>

**Notes**

(a) Exhibition space + 120% services, stores and circulation.
(b) Banquet hall and foyer + 80% services, stores and circulation.
(c) Based on 200 bedroom Hotel (see chapter 6.5)
(d) Not included in cost of banquet/conference area.
(e) Prices to lst quarter 1979: Include 4% allowance for external works and 10% total for fees.
12.5 Repairs and maintenance

Future maintenance and life-cycle replacements must be considered at every stage of the planning and design process. Not only do these items represent a significant cost but the success of a hotel or conference facility will be judged largely on the satisfaction of its performance. Losses will be incurred by breakdowns, closures and inefficiencies affecting the financial balance and also the goodwill of the users and staff alike. The sensitivity and reaction of a user to discomfort and failings in expected standards introduces a strong subjective factor which must be taken into account in life-cycle cost analysis.\(^{(6)}\)

Real costs of maintenance are difficult to assess, since this work overlaps with other budgets. The tendency in hotel and conference centre operations is to lease equipment, to purchase items on a supply and maintenance contract or to fully contract out the service. This applies particularly to the more specialised requirements.

Costs of repairs and maintenance are generally divided into two categories. On-going maintenance or property operation costs of conference hotels average 4.2 percent of gross revenue. Replacement of furniture, fittings and equipment takes place at the end of their estimated life periods. A detailed study of replacement schedules in hotels showed the following optimum periods for renewals.

<table>
<thead>
<tr>
<th>Renewals</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decorations, furnishing fabrics</td>
<td>2-4 years</td>
</tr>
<tr>
<td>Carpets, fittings and furniture in</td>
<td></td>
</tr>
<tr>
<td>Bars, cocktail lounges</td>
<td>4-6</td>
</tr>
<tr>
<td>Coffee shops</td>
<td>4-6</td>
</tr>
<tr>
<td>Restaurants</td>
<td>5-8</td>
</tr>
<tr>
<td>Conference and seminar rooms</td>
<td>5-8</td>
</tr>
<tr>
<td>Capitalised leased equipment</td>
<td>5-8</td>
</tr>
<tr>
<td>Electronic equipment - control</td>
<td>4-6</td>
</tr>
<tr>
<td>communication, accounting</td>
<td></td>
</tr>
<tr>
<td>Office equipment, photographic and reprographic equipment</td>
<td>4-6</td>
</tr>
<tr>
<td>Food service and catering equipment</td>
<td>7-10(^{(14)})</td>
</tr>
<tr>
<td>Instrumentation, HVAC and electrical equipment</td>
<td>10-15</td>
</tr>
<tr>
<td>Major engineering plant</td>
<td>15-20(^{(15)})</td>
</tr>
</tbody>
</table>

Hotel buildings have a life in excess of 20 years but major conversion and modernisation of conference and banquet halls is invariably necessary by this time. A project life of 20 years has been assumed for this analysis.
12.5.1 Refurbishing and improvement

Unlike new investments the cost of refurbishing and upgrading an existing hotel or centre are a commitment. Without such expenditure, the earning capacity will progressively reduce and the value of the property as an investment decline. The alternative options of moving into a lower grade and perhaps less discriminating market or of converting the premises to some other use, are often an uneconomic use of the site or building.

Costs of modernisation represent a high reinvestment of capital and such modernisation work in hotels tends to accumulate during difficult years of low profitability and/or uncertainty. The impact of taxation allowances and improvement grants is often dramatic. Mostly, grants are directed towards the modernisation of bedrooms in the interests of tourism development but the alteration works usually encompass public rooms and convention facilities as well as basic infrastructure. For example, post war investment in UK hotels was negligible prior to 1969: in the period 1969-71, with the financial stimulus of the Hotel Development Incentives Scheme, 70,000 new bedrooms in nearly 3000 hotels were constructed in addition to extensive modernisation work. Further hotel investment virtually ceased after 1972 until the Spring budget of 1978 which provided changes in building allowances for taxation purposes. Within 18 months, practically all the UK hotel companies had embarked on major upgrading and refurbishing programmes involving a capital expenditure of over £80 million - £25 million in London alone. Much of this improvement involved the alteration and refurbishing of conference rooms - in the case of 15 hotels with new or greatly enlarged conference areas.

Amongst the reinvestment programmes planned by major companies in 1979 were:

<table>
<thead>
<tr>
<th>Company</th>
<th>Million</th>
<th>Company</th>
<th>Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adda International</td>
<td>1.0</td>
<td>Norfolk Capital</td>
<td>1.2</td>
</tr>
<tr>
<td>Centre Hotels</td>
<td>15.0</td>
<td>Reo Stakes</td>
<td>1.0+</td>
</tr>
<tr>
<td>Commonwealth Holiday Inns</td>
<td>1.6</td>
<td>Sheraton Hotels</td>
<td>3.0</td>
</tr>
<tr>
<td>Cunard</td>
<td>4.0+</td>
<td>Swallow Hotels</td>
<td>10.0</td>
</tr>
<tr>
<td>Embassy</td>
<td>3.1</td>
<td>Thistle Hotels</td>
<td>7.0</td>
</tr>
<tr>
<td>EMI</td>
<td>3.0</td>
<td>Trust Houses Forte</td>
<td>24.5</td>
</tr>
<tr>
<td>Friendly Hotels</td>
<td>1.0</td>
<td>Independent Hotels</td>
<td>4.2</td>
</tr>
<tr>
<td>Grand Metropolitan</td>
<td>7.0(a)</td>
<td>Hotels in Channel Islands</td>
<td>5.0</td>
</tr>
<tr>
<td>Holiday Inn (UK)</td>
<td>4.5</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

(a) Part of an ongoing programme expected to reach £25.0 million
12.6 Feasibility analysis of projects

In considering the feasibility of investments in projects it is necessary to examine both market and financial opportunities and their implications. The methodology of market analysis for tourism projects involves demand forecasting techniques such as multivariable regression analysis, gravity and trip generation models, Delphi-modelling and the classical approaches based on market surveys. Market feasibility will depend on an analysis of both demand and supply including an evaluation of trends and possible future patterns. The factors to be covered in a study of an hotel or conference centre project may be summarized as follows:

**Demand analysis**

| Quantitative | Extent of catchment area, population.  
| | Numbers of existing users, origins, mode of travel, length of stay, average spend. |
| Qualitative | Customer profiles, socio-economic groupings, expenditure breakdowns |
| Motivational | Reasons for attraction, repeat use, levels of satisfaction, impressions |

**Supply analysis**

| Quantitative | Competitive facilities, capacities, costs, accessibility |
| Qualitative | Comparative standards, charges, range of products and services, new developments |
| Alternative | Costs of providing and operating alternative proposals.  
| | Potential increase in numbers, or/and increase in charges.  
| | Breakeven and profitability ratios |
| | Effects on other operations - additional costs/losses and benefits. |

The factors affecting the markets for conferences and exhibitions and scales of operation have been indicated in chapters 1 and 5.
12.6.1 **Investment appraisal**

Separate studies were carried out of the investment revenues and operating costs of conference facilities in hotels and in non-residential conference centres. For the former, four hotel groups provided their relevant operating data and reference was also made to the 1979 annual survey of the hotel industry by Horwath and Horwath\(^{(17)}\), Pannell Kerr Forster and Company\(^{(18)}\) and two reports by Green Bellfield Smith and Company\(^{(19)}\).

The accounting procedures indicated in "Hotel prospects to 1985"\(^{(16)}\) were adopted and tax allowances calculated on the basis of the Spring 1978 Budget. Comparisons of the taxation benefits from allowances in other countries have been demonstrated in earlier Economic Development Council Studies\(^{(20)}\).

To assess prices charged for conference services, the quoted rates charged by 20 'modern' conference hotels were compared and median figures taken. Data was also obtained from two projects in the United States.

The evaluation of large scale investments in conference centres required a detailed analysis of the year's operating accounts supplied by the Brighton, Wembley, Harrogate and Scanticon Conference Centres who collaborated in this study. This, and the data provided by hotels was given on a confidential basis. Six congress centres abroad provided partial information and projected figures for other proposed conference centres were taken into account\(^{(21)}\).

For the purposes of this initial study, the objectives were to determine levels of utilization required to finance capital investment of conference facilities and the conditions under which such investment could be justified on economic grounds.

12.6.2 **Capital analyses of hotel projects**

All calculations were based on the unit cost per conference place, taking the maximum capacity of halls and meeting rooms provided, with a construction cost of £2636 \((4.70m^2)\) gross as determined in 12.4.3. Building construction was assumed to take 2 years with two-thirds expenditure in the first year and one-third in the second year\(^{(16)}\).

Cost analysis was taken from the time the hotel was ready for occupation.

The proportions of expenditure on land and equipment were based on median values obtained by surveys of over 20 hotels constructed since 1970, including 4 hotels in course of building. The percentages have been rounded and typical ranges are indicated.
<table>
<thead>
<tr>
<th>Expenditure on:</th>
<th>Year (pre opening)</th>
<th>Cost 1979 Values</th>
<th>Percentage of total</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>-2</td>
<td>527</td>
<td>15</td>
<td>10-35</td>
</tr>
<tr>
<td>Building</td>
<td>-1</td>
<td>1172</td>
<td>50</td>
<td>50-55</td>
</tr>
<tr>
<td>Plant &amp; machinery</td>
<td>0</td>
<td>586</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furniture, fittings and equipment</td>
<td>0</td>
<td>878</td>
<td>25</td>
<td>20-25</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>352</td>
<td>10</td>
<td>10-15</td>
</tr>
</tbody>
</table>

A separate analysis was made of hotels built in London where land costs are near 30 percent (£1054) of the total cost and prices of conference packages are generally higher.

Tax allowances were calculated as indicated in 12.2.2. As indicated in 12.5.1, taxation allowances have a significant impact on the feasibility of investment: at current 15 percent interest rates, these allowances represent almost 29 percent of the present value investment cost for conference facilities outside London and 20 percent in London. With interest rates at 12 percent, the investment benefit from tax allowances increases to almost 40 percent and 29 percent respectively.

Furniture, fittings and equipment replacements were based on 10 percent replacement after 5 years, 50 percent after 10 years, 10 percent after 15 years and 30 percent at 20 years, at present values, with 100 percent tax allowance. Loan repayments on the net capital costs were calculated as equal annual payments over 20 years, in respect of the estimated life of the project. No provision was made for company taxation, nor for any salvage value on the argument that the real costs of modernisation would equal those of rebuilding. Taking a current interest level of 15 percent, the annual income to finance this investment is calculated to be £529 in London and £418 in the Provinces. With a lower interest rate of 12 percent, the annual charges are £423 and £323 respectively.

Investment calculations were also made for the alternative of building on leased land at current interest rates. This would have the effect of reducing annual income requirements by some 11 to 12 percent.
In addition to the financing costs provision must be made for the fixed costs of insurance on the building and contents and local rates and taxes. These are related to capital value and median charges have been estimated. A detailed analysis of the costs is given in appendix 19.

12.6.3 Revenue

Median prices were determined from a survey of the charges quoted by 20 representative conference hotels of recent construction, excluding VAT but including service and supplementary charges. The data (appendix 18) agreed closely with other surveys (17) (18) and the same operational expenses are quoted.

<table>
<thead>
<tr>
<th>Median prices (a)</th>
<th>24 hour package</th>
<th>Day package</th>
<th>Banquet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>London</td>
<td>Provinces</td>
<td>London</td>
</tr>
<tr>
<td>Single guestroom</td>
<td>£ 23.50</td>
<td>£ 17.65</td>
<td>-</td>
</tr>
<tr>
<td>Food and Beverages</td>
<td>£ 20.42</td>
<td>£ 17.99</td>
<td>£ 7.23</td>
</tr>
<tr>
<td>Conference room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>theatre style (200)</td>
<td>0.87</td>
<td>0.70</td>
<td>1.74</td>
</tr>
<tr>
<td>boardroom style (15)</td>
<td>2.61</td>
<td>2.00</td>
<td>1.74</td>
</tr>
</tbody>
</table>

(a) taken for 2nd quarter 1979
(b) including individual purchases

For large meetings and banquets the cost of the conference room was often discounted. Comparable studies of two proposed executive conference centres in the United States gave the following projected prices to 1983:

- Guestroom 64.00
- Food & Beverages 41.00
- Conference Room & services 28.00

Assuming an inflation rate of 10 percent, the charges for guestroom and conference room services are proportionately much higher than in the UK.
In the same way that overall expenditures of conference visitors were compared with that of other tourists, the overall daily expenditures of different categories of guests in four hotels were compared with those of individual travellers:

<table>
<thead>
<tr>
<th>Category of guest</th>
<th>Ratio of daily expenditures&lt;sup&gt;(a)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference delegates</td>
<td>2.38 : 1</td>
</tr>
<tr>
<td>Exhibitors</td>
<td>2.38 : 1</td>
</tr>
<tr>
<td>Individual travellers&lt;sup&gt;(b)&lt;/sup&gt;</td>
<td>1 : 1</td>
</tr>
<tr>
<td>Tour groups</td>
<td>0.77 : 1</td>
</tr>
<tr>
<td>Airline staff</td>
<td>0.72 : 1</td>
</tr>
<tr>
<td>Corporate bookings</td>
<td>1.24 : 1</td>
</tr>
<tr>
<td>Travel agent bookings</td>
<td>1.20 : 1</td>
</tr>
</tbody>
</table>

(a) Net of VAT but including service charge second quarter 1979

(b) Based on rack rate charges

The conference user purchases more of the hotel services than other guests and is worth over twice the value of individual or tour group bookings and almost three times that of heavily discounted contract arrangements such as with airlines.
12.6.4 **Operational analysis**

To ensure comparability with other data the costs and expenses of hotel operations were based on the 1979 surveys by Pannel Kerr Forster and Company (18) and Horwath and Horwath (UK) Ltd (17) supplemented by more specific figures, as summarized in appendix 18.

The departmental operating profit from food and beverage operations was 17.5 percent in London and 24.4 percent in the Provinces. Against this undistributed expenses proportionate to sales amounted to 20.6 and 23.1 percent respectively. Food and beverage operations in conference and banqueting facilities, based on median figures, would appear not to contribute significantly to the investment costs of the building.

Charges for the room hire ranged from a median of £2.61 for boardroom style to £0.87 for theatre style seating in London with corresponding charges of £2.00 and £0.70 in the Provinces. Departmental costs for conference room services are moderate since most audio-visual and equipment is supplied on a direct rentable or chargeable basis. Hence the contributions per delegate-day to financing costs, rents, rates and other fixed costs are:

<table>
<thead>
<tr>
<th>Gross area</th>
<th>London</th>
<th>Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>m²</td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Boardroom style</td>
<td>13.50</td>
<td>1.68</td>
</tr>
<tr>
<td>Theatre style</td>
<td>4.70</td>
<td>0.56</td>
</tr>
</tbody>
</table>

To meet such financing costs an occupancy rate of some 250 percent would be required thus it is evident that charges for conference space are not self-financing and one must look towards other justifications for this investment.

Income from guestrooms after deducting operating and fixed costs is estimated to be £9.28 per delegate-night in London and £5.12 per delegate-night in the Provinces (Appendix 18).

In the great majority of hotels it is the rooms income which provides the main source of profit particularly if a high room occupancy can be achieved throughout the year. Conferences generate sales of accommodation mainly at times when the demand is otherwise slack and this benefit can be credited to the cost of the facilities. The net income from other sales to conference users (telephone, hire
of equipment, secretarial and other services) and from associated rented space (displays, concessionary lettings), which typically amount to 2.5 percent of sales, should also be taken into account.

The required level of room occupancy by delegates to finance the conference facility may thus be calculated:

<table>
<thead>
<tr>
<th>Net income from:</th>
<th>London</th>
<th>Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guestroom sales</td>
<td>£ 9.28</td>
<td>£ 5.77</td>
</tr>
<tr>
<td>Conference room</td>
<td>£ 0.56</td>
<td>£ 0.43</td>
</tr>
<tr>
<td>Rentals &amp; services</td>
<td>£ 1.14</td>
<td>£ 0.88</td>
</tr>
<tr>
<td>Food &amp; Beverages</td>
<td></td>
<td>£ 0.23</td>
</tr>
<tr>
<td>Per delegate</td>
<td>£ 10.98</td>
<td>£ 7.31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Investment rate of return</th>
<th>London Days</th>
<th>% annual occupancy</th>
<th>Provinces Days</th>
<th>% annual occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 percent</td>
<td>52</td>
<td>14.5</td>
<td>63</td>
<td>17.4</td>
</tr>
<tr>
<td>12 percent</td>
<td>42</td>
<td>11.5</td>
<td>51</td>
<td>14.0</td>
</tr>
<tr>
<td>10 percent</td>
<td>36</td>
<td>9.8</td>
<td>44</td>
<td>12.0</td>
</tr>
</tbody>
</table>

(a) 24 hour package

This is a higher utilization than the average conference business in existing hotels but, given a suitable location and standards of operation, such levels could be achieved, as has been demonstrated by a number of the hotels studied. However, the feasibility analysis does indicate the difficulties experienced in commercial investment in new hotels generally. With land and building costs high relative to earnings, in addition to high interest rates, it is difficult to achieve a reasonable balance of income.

For this reason hotel companies have tended to modernise and extend their existing properties rather than to build new hotels, thus limiting expenditure to those areas which will derive maximum benefit.

In the light of this study it may be concluded that conference facilities do offer a means of increasing and extending the earning capacity of a hotel. Residential conferences, in particular, generate
high guest expenditures. Day conferences and the dual or alternative use of conference rooms for private meal functions and banquets are generally not profitable but cover their costs and undistributed expenses, thereby enabling the hotel to offer a wider range of services and to charge a high tariff.

The economic size of the conference space is, however, important: it must be related to the residential capacity of the hotel as proposed in chapter 6.5, and will be more dependent on the pattern of demand for accommodation than on local requirements for larger banqueting facilities. From the occupancy analysis of a number of hotels, the latter results in few guestroom sales and will need to be justified on other grounds such as the charging of higher tariffs and extension of use for other revenue earning products (exhibitions, trade shows, discotheques, dinner-dances, etc), the feasibility of which can be analysed using a similar methodology.
The difficulties of obtaining an adequate return from non-residential conference facilities are reflected in the 1979-80 operating accounts of the ten conference centres studied in detail.

Rates for the hire of halls (1979 prices), divided by the areas concerned generally were within the range £0.85 to £1.50 per m² per day depending on the hall size and function. In this respect the letting rates were comparable with those for hotels. All the centres operated differential rates: for exhibitions the daily charges for preparation and dismantling were about 50 percent those for exhibition-days and reduced charges were usually allowed for social events. In a number of cases, Brighton for instance, conference hire costs were met by the Council.

Allowing for differences in methods of accounting all the centres showed annual trading losses. The short-fall in revenue to cover annual operating expenses ranged up to 28.8 percent but was mostly in the order of 22 to 26 percent. Compared with the initial capital costs the trading losses per year were calculated, in most cases, to represent between 3.1 and 3.4 percent per annum and realistically, this should be taken into account in the evaluation of new projects.

In every case, the catering services were intended to cover their operating costs but, in fact, several indicated a deficit in this account.

Operating accounts depended on the range of activities accommodated and the percentage of days - occupancy achieved. Because of wide variations, particularly in the former, comparison of incomes is difficult but most centres achieved overall occupancies of between 55 and 70 percent. The ratio of conferences and exhibitions: entertainment depended greatly on location and emphasis. In most cases this was in the order of 70:30 but some resort centres operated on a 50:50 basis and the more specialised facilities on a ratio of 80:20. A comparison of the accounts for the different activities showed that in many cases the net operating losses on conferences and exhibitions were some 2.3 times those on entertainment events.

Overall running costs depended on these variations but median figures showed that 42 percent of costs could be attributed to the premises (repairs, maintenance, insurance, rates, utilities, energy costs, rents, licences etc).
<table>
<thead>
<tr>
<th>Income</th>
<th>£'000</th>
<th>%</th>
<th>Expenditure</th>
<th>£'000</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhibitions</td>
<td>84.0</td>
<td>7.2</td>
<td>Employees</td>
<td>407.0</td>
<td>34.9</td>
</tr>
<tr>
<td>Conferences</td>
<td>157.0</td>
<td>13.5</td>
<td>Premises</td>
<td>487.0</td>
<td>41.8</td>
</tr>
<tr>
<td>Entertainment</td>
<td>250.0</td>
<td>21.4</td>
<td>Supplies &amp; services</td>
<td>169.0</td>
<td>14.5</td>
</tr>
<tr>
<td>Catering</td>
<td>373.0</td>
<td>32.0</td>
<td>Miscellaneous</td>
<td>65.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Short fall</td>
<td>302.0</td>
<td>25.9</td>
<td>Establishment</td>
<td>38.0</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>1160.0</td>
<td>100.0</td>
<td></td>
<td>1160.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

These figures do not include any provision for financing costs of the conference centres. Capital and interest charges varied widely depending on the building costs, grants and subsidies and interest charges levied. In most cases a preferential rate of interest had been allowed. Some of the projects, such as in Harrogate, had been partly financed by the sale of council owned property and by the incomes from rented commercial offices and an hotel lease forming part of the overall development. The centres at Wembley and Hamburg also benefit from associated developments.

12.7.1 Justification for investment

It is evident that, at least in the short term, the investment in non-residential conference centres cannot be financed out of net income and, in most cases, the latter will need some form of subsidy to cover annual operating losses. From the data supplied on conference centre operations in North America and Asia this would appear to apply universally.

To justify such investment it is necessary to consider its effects on the local economy beyond the question of project feasibility. As indicated in 12.7 the patterns of use of conference centres were found to vary widely and the confidentiality of this data prevents individual cases being cited. For the purposes of this study a model has been selected based largely on median figures and reflecting the characteristics of conference tourism identified in the earlier market and financial analyses. Comparisons have been drawn where appropriate with actual cases. The space and facility provisions are those described in 12.4.3 which are also based on representative figures.

Benefits to the local economy arising from this investment extend back to the construction stage and even the site purchase or designation can
be shown to have an appreciating effect on land values and to stimulate further developments. Studies of this nature extend beyond the scope of this subject and calculations are based only on the operation of an established centre.

Operational figures, taken for the second quarter 1979, are given by the analysis detailed in appendix 20. The overall occupancy of the centre is 255 days/year (70 percent) of which 112 days are occupied by conferences, 32 days by exhibitions, 28 days by exhibitions with conferences and 83 days by entertainment and social events. Group sizes for conferences and exhibitions are based on the average distribution determined by surveys and charges are typical of those levied by the majority of conference centres in Europe.

Allowances have been made for the hire of hospitality suites, administrative offices, press and media facilities in accord with the patterns of use actually recorded. Although entertainment and social use represents only 32.5 percent of the days use, this accounts for over half of the rental income from the halls. The charges for catering assume a balance with the departmental expenditure although this is difficult to achieve in practice.

Direct local benefits from the operation of the centre arise from

<table>
<thead>
<tr>
<th>Source</th>
<th>%</th>
<th>£'000</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>93</td>
<td>378.5</td>
<td></td>
</tr>
<tr>
<td>Premises</td>
<td>53</td>
<td>258.1</td>
<td>Repairs, maintenance, local contracts, rates, licences</td>
</tr>
<tr>
<td>Supplies &amp; services</td>
<td>65</td>
<td>109.9</td>
<td>Variable - depends on supply contracts</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>60</td>
<td>39.0</td>
<td>Local transport, deficit on car parking etc.</td>
</tr>
<tr>
<td>Establishment</td>
<td>100</td>
<td>38.0</td>
<td></td>
</tr>
</tbody>
</table>

Indirect local benefits stem from the conference and exhibition visitor demands for hotel accommodation and other purchases. Based on the 1978 IACVB surveys plus a median increase of 16.4 percent the average expenditure per visitor is taken as £35.58. This agrees reasonably closely with the findings of the 1978 RPA surveys (2.8.2)

The total number of visitor-days per year attending conferences and associated exhibitions is 129500. Although not included in this total persons accompanying the delegates represent an estimated 10 to 15 percent
and extended stays a further 20 percent use of accommodation and amenities.

<table>
<thead>
<tr>
<th>Income</th>
<th>%</th>
<th>£000</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation</td>
<td>67.3</td>
<td>3100.9</td>
<td>Analysis based on 2.3.4</td>
</tr>
<tr>
<td>Entertainment</td>
<td>13.4</td>
<td>617.4</td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td>14.6</td>
<td>672.7</td>
<td></td>
</tr>
<tr>
<td>Local Transport</td>
<td>4.7</td>
<td>216.5</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.0</td>
<td>4607.5</td>
<td></td>
</tr>
</tbody>
</table>

A study of the Wembley Conference Centre estimates the number of overseas visitors to be about 25 percent of the total and similar findings have been reported by other centres in Europe. Based on the IPS and MEW surveys, the conference visitor expenditure per diem averaged £45.15 (1979) and £88.00 in London (2.3.4). Thus the contribution to tourism earnings is generally £1.462 million, or £2.849 million for a London location.

In addition, the entertainment facility is calculated to attract audiences of some 125,000 per year, mostly from local sources.

The initial benefits from the centre illustrated represent an annual cash flow of £5.431 million into the local economy compared with an annual trading loss of £0.259 million and loan repayments of some £1.366 million (at 12 percent). Even discounting the multiplier effects of this input the economic benefits would appear to justify such an investment particularly when combined with the facility of a concert hall or theatre. Compared with individual conference halls in hotels the conference centre provides a wider range of capacities thus extending marketing opportunities to the larger international conferences with higher per capital expenditures together with the prestige and publicity which such meetings attract.
References

(1) Bathurst PE and Butler DA, "Building cost control techniques and economies", London Heinemann, 1973, Ch 8 pp 45-51 and Ch 18 pp 125-131


(4) Institution of Civil Engineers, "An introduction to engineering economics", London Institution of Civil Engineers, 1969 pp 29-33


(7) Archer BH, "Tourism multiplier : The state of the art", Bangor Occasional Papers in Economics No 11, University of Wales Press, 1977


(11) EEC Regulation No 724/75, as amended 214/79, Brussels, European Economic Community, 1979


(14) Lawson FR, Property: "Keep your assets in good shape", London, Catering Times, October 11, 1973


CHAPTER 13  CONCLUSIONS, TRENDS AND FURTHER RESEARCH

13.1 Conclusions

The main objectives of this research were twofold: first to obtain original data on the various factors which have an influence on the planning and design of conference facilities and secondly to interpret these factors into appropriate criteria and standards, taking into account current practices and trends.

In view of the close association between conference and exhibition requirements, the latter were also studied as another aspect of this research.

In addition to collecting data on market demands, facility supply and utilization, a large number of recently constructed projects were examined as case studies and the results of analyses together with interpreted conclusions are given under their respective chapter headings.

Broader conclusions, drawn from the whole of the research findings seen in perspective, may be summarized as follows:

The apparent economic advantages of conference business has led to a surplus of facilities being provided or adapted for this purpose, the majority of which are ill-equipped and greatly underutilized.

As a consequence of the growing competition between destinations, more precise briefing and specification must be given on the requirements for conferences and exhibitions.

For this purpose it is important to draw international comparisons between the standards required in different countries, particularly for environmental control and safety.

Few conference and exhibition facilities are used for those purposes alone and it is necessary to examine the features used in multipurpose design and adaptation. The rapid advances in technical services also requires an awareness of the most up to date developments and trends.

Conference facilities in hotels are largely financed by the additional sales of guestroom accommodation and the higher charges this provision allows. Thus, the guestroom capacity determines the most economical size for conference provision. The financial balance for such investment is highly sensitive to changes in grants, allowances and interest rates.
There are marketing and economic advantages in providing larger and more specialised conference and exhibition facilities on a regional or co-operative basis. Benefits are derived, in particular, by the hotels and this is usually reflected in a general improvement in hotel standards throughout the area.

At the same time, the introduction of this high revenue generating segment of tourism is increasingly used as a stimulus for secondary commercial development as well as a means of adding to the social and cultural attractions of the area.

13.2 Developments

Most of the trends in conference centre development have been identified and described under the relevant chapters of this thesis. They include the increasing use of executive conference centres and conference facility suites operated on a leasing or time-sharing ownership basis. Whilst the rapid advances in business communication technology would suggest a reduction in the need for personal meetings this is not evident from the statistics. Indeed the greater dispersion of offices facilitated by improved communication tends to generate a greater need for regular conferences.

The influences of American conventions and sales promotion methods are having an increasing impact on the design of facilities in Australasia, Japan and Asia. In the industrialised nations the main demand is for small participative type meetings, preferably combined with sport and recreation facilities.

Technical developments has also been indicated in earlier chapters. To facilitate management and control hotels and centres are increasingly operated with integrated systems. Extensive changes in video recording and television projection, fascimile reproduction and laser transmission are already being introduced. Acoustic regulation by electronic means is likely to have a significant effect on the traditional design and delineation of hall functions.

Catering technology has already undergone significant changes following the introduction of cook-freeze and cook-chill processes. Current trends are towards a complete systematisation of the food production
process. Energy monitoring and automatic regulation of environmental control equipment is also of particular importance for this intermittent use of space.

Not least is the increasing awareness of the need for greater emphasis on cost-analysis and maintenance management of modern buildings, reflecting the rising costs of deterioration and obsolescence.

13.3 Further research

A broad ranging study of this nature generates questions in many subject areas which cannot be answered without further and more specific research. Many of the subjects so identified would appear to require the employment of considerable resources and collaboration with industry in order to produce appropriate results. Amongst this category were the following studies:

Market research: Further quantification of market demands over time to determine changing patterns and trends in both the association and corporate sectors.

Economic benefits: Regional studies of the cost-benefits of investment in conference centres with a view to producing econometric models. Proposals for a collaborative European university study of the subject with governmental and European Economic Community support were prepared in November 1980.

Costs-in-use: A detailed analysis of costs-in-use of hotel and conference facilities including studies of energy consumption patterns. Awards, totalling over £80,000 were made in the period up to December 1980 to finance a comprehensive study of energy usage in such premises.

Space Conversion: An examination of the capabilities and costs-in-use of alternative systems for adapting areas to meet different requirements of space and function.
Appendix 1  Ranking order of 20 destinations in which most
meetings of International Associations were held
1975-1978

<table>
<thead>
<tr>
<th>Country</th>
<th>Average number of meetings/year 1975-1979</th>
<th>Town</th>
<th>Average number of meetings/year 1975-1979</th>
</tr>
</thead>
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Source: Union of International Associations: Reports 1975-80
Appendix 2  Sources of information

Statistics and other information from the following organisations, in particular, were used in this study:

National Tourist Organisations, City Visitor and Convention Bureaux

Australia, Melbourne, Perth, Sydney, Tasmania; Austria, Salzburg, Vienna; Belgium, Brussels, Ghent, Ostend, Utrecht; Bulgaria; Canada, Calgary, Montreal, Ottawa, Toronto; Denmark, Copenhagen; Egypt; Finland, Helsinki, Turku; France, Paris, Strasbourg; Hong Kong; Indonesia; Ireland, Dublin; Italy; Israel, Haifa, Jerusalem, Tel Aviv; Japan, Kyoto, Tokyo; Luxemburg; Malaysia; Mexico, Mexico City, Acapulco; Netherlands, Amsterdam; Norway; Philippines; Singapore; Spain; Sweden, Gothenburg, Oslo; South Africa; Switzerland, Geneva, Lausanne; Thailand; United States, Chicago, Dallas, Detroit, New York, Shreveport; United Kingdom, Belfast, Brighton, Harrogate, London, Scotland; West Germany, Berlin (West), Cologne, Dusseldorf, Hamburg; Yugoslavia, Belgrade, Zagreb.

Associations

American Society of Association Executives (ASAE)
Association Internationale des Intrepretas de Conference (AIIC)
Association Internationale des Palais de Congres (AIPC)
Association of Conference Executives (ACE)
Association of Special Libraries and Information Bureaux (ASLIB)
British Association of Conference Towns (BACT)
British Universities Accommodation Consortium (BUAC)
European Federation of Conference Towns (EFCT)
International Association of Convention and Visitor Bureaux (IACVB)
International Association of Professional Congress Organisers (IAPCO)
International Congress and Convention Associations (ICCA)
International Hotel Association (IHA)
Union of International Associations (UIA)
Individual Conference, Congress and Exhibition Centres

Plans, technical and operational details were obtained in respect of the following centres. In some cases, this included data on occupancies and finance.

Alfred Beck Centre Hillingdon  Malta Conference Centre
Anaheim Convention Centre  Monaco Congress Centre
Barbican Conference Centre  Nairobi: Kenyatta Centre
Belgrade Sava Centre  N.E.C. Birmingham
Berlin I.C.C.  Paris I.C.C.
Brighton Conference Centre  Philadelphia Civic Center
Calgary Convention Centre  Philippine I.C.C.
Cape Town: Good Hope Centre  Plymouth Civic Theatre
Copenhagen: Bella Center  Portoroz: Avditorij
Costa-del-Sol Centre  Reading: Hexagon
Detroit: Renaissance Center  Salt Lake Convention Center
Dusseldorf: Exhibition Centre  Scanticon Conference Centre
Geneva I.C.C.  Scarborough Spa Grand Hall
Guernsey Beau Sejour  Sejour Cultural Centre, Korea
Hamburg I.C.C.  Shreveport Convention Center
Harrogate Conference Centre  Singapore: World Trade Centre
Hong Kong: World Trade Centre  St. Katharines: World Trade Centre
Innsbruck Conference Centre  Strasbourg Congress Centre
Ikituuri Conference Centre  Stockholm Congress Centre
Jersey: Regent Centre  Wembley Conference Centre
Kyoto Conference Centre  Weymouth Civic Centre
Lausanne Palace de Beaulieu  Westminster Conference Centre
Louisiana Superdome  Winnipeg Convention Centre
Madrid Congress Centre  York Theatre, Heathrow Hotel
Appendix 3. Numbers and sizes of International Meetings and Exhibitions 1979

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of meetings &amp; exhibitions</th>
<th>Average size</th>
<th>Total attendance 1979</th>
<th>Average size excluding largest exhibition</th>
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Sources: After U.I.A. reports and national data.
Appendix 4. Origins of International Association meetings, 1979

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<th>Geneva</th>
<th>Rome</th>
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Source: After U.I.A. statistics and national data.

Notes: (a) 9.2 percent from Eastern Block countries
(b) 0.2 " " " " " "
(c) Includes duplicated figures.
### Appendix 5. Examples of principal organisations generating meetings 1979

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<th>Meetings</th>
<th>Main locations</th>
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<tr>
<td>Council of Europe</td>
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<td></td>
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<tr>
<td>European Fed. Chemical Engineering</td>
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<td>European Management Forum</td>
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<td>European Society Opinion Marketing Research</td>
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<tr>
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<td>Inter-University Centre Post Grad. Studies</td>
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<td>Inter-governmental Oceanographic Commission</td>
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<td>Int. Astronomical Union</td>
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<td>Int. Atomic Energy Agency</td>
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<td>Int. Centre Co-operative Criminology</td>
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<td>Int. Civil Aviation Organization</td>
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<td>Canada</td>
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<td>Int. Council Building Research Studies</td>
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Source: After U.I.A. reports.
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<td>W. Germany</td>
<td>78</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2</td>
<td>Greece</td>
<td>8</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1</td>
<td>Ireland</td>
<td>4</td>
</tr>
<tr>
<td>Singapore</td>
<td>12</td>
<td>Italy</td>
<td>37</td>
</tr>
<tr>
<td>Japan</td>
<td>2</td>
<td>Spain</td>
<td>5</td>
</tr>
<tr>
<td>Israel</td>
<td>5</td>
<td>Sweden</td>
<td>24</td>
</tr>
<tr>
<td>Arabian Gulf</td>
<td>5</td>
<td>Switzerland</td>
<td>19</td>
</tr>
<tr>
<td>Asia (other)</td>
<td>2</td>
<td>Yugoslavia</td>
<td>25</td>
</tr>
<tr>
<td>South America</td>
<td>1</td>
<td>UK</td>
<td>46</td>
</tr>
<tr>
<td>Canada</td>
<td>2</td>
<td>Europe (others)</td>
<td>4</td>
</tr>
<tr>
<td>United States</td>
<td>13</td>
<td>Bulgaria</td>
<td>5</td>
</tr>
<tr>
<td>Austria</td>
<td>18</td>
<td>Czechoslovakia</td>
<td>7</td>
</tr>
<tr>
<td>Belgium</td>
<td>14</td>
<td>Poland</td>
<td>6</td>
</tr>
<tr>
<td>France</td>
<td>48</td>
<td>E. Germany</td>
<td>3</td>
</tr>
<tr>
<td>Holland</td>
<td>25</td>
<td>Hungary</td>
<td>10</td>
</tr>
<tr>
<td>Norway</td>
<td>2</td>
<td>Romania</td>
<td>3</td>
</tr>
<tr>
<td>Portugal</td>
<td>9</td>
<td>USSR</td>
<td>1</td>
</tr>
<tr>
<td>Denmark</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total International Exhibitions</strong></td>
<td></td>
<td></td>
<td><strong>482</strong></td>
</tr>
</tbody>
</table>

**Sources:** Exhibition Bulletin, British Airways, Lufthansa Airlines, Exhibition Centre lists.
Appendix 7. Comparative expenditures 1978-79

United Kingdom
Comparisons between visitors coming to the UK for the main purpose of attending a congress or convention and other tourists.

<table>
<thead>
<tr>
<th>Main areas of origin</th>
<th>Total visits '000's</th>
<th>% of visits</th>
<th>Average length of stay compared</th>
<th>Ratios of average expenditures, congress or convention visits : tourists</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conference visitors (nights)</td>
<td>All Tourists (nights)</td>
<td>per visit (ratio)</td>
<td>per day (ratio)</td>
</tr>
<tr>
<td>(1) Europe</td>
<td>110</td>
<td>67</td>
<td>4.3</td>
<td>9.5</td>
</tr>
<tr>
<td>N. America</td>
<td>35</td>
<td>21</td>
<td>7.7</td>
<td>12.6</td>
</tr>
<tr>
<td>Rest of world</td>
<td>20</td>
<td>12</td>
<td>11.8</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>165</td>
<td>100</td>
<td>5.9</td>
<td>12.4</td>
</tr>
</tbody>
</table>

(a) Not including visitors from the Irish Republic


Chicago

<table>
<thead>
<tr>
<th>Purpose of visit</th>
<th>Number of events</th>
<th>Attendance total '000's</th>
<th>% of total</th>
<th>Spending US $ millions</th>
<th>% of total</th>
<th>Ratios of spend per visitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure visitors</td>
<td>-</td>
<td>5389</td>
<td>70.3</td>
<td>494</td>
<td>50</td>
<td>1 : 1</td>
</tr>
<tr>
<td>Convention visitors</td>
<td>896</td>
<td>379</td>
<td>4.9</td>
<td>72</td>
<td>7.2</td>
<td>1 : 2.06</td>
</tr>
<tr>
<td>Trade Shows</td>
<td>140</td>
<td>1287</td>
<td>16.8</td>
<td>365</td>
<td>36.9</td>
<td>1 : 3.09</td>
</tr>
<tr>
<td>Corporate Meetings</td>
<td>19225</td>
<td>615</td>
<td>8.0</td>
<td>58</td>
<td>5.9</td>
<td>1 : 1.03</td>
</tr>
</tbody>
</table>

(a) Compared with pleasure visitor spending

Source: Derived from visitor statistics supplied by Chicago Convention & Visitor Bureau.
Percentages of meetings held each month: by Region
### Appendix 9. Size distribution of International Meetings in UK

<table>
<thead>
<tr>
<th>Group (a) Size (nominal)</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meetings outside London</td>
<td>3.9</td>
<td>5.3</td>
<td>9.2</td>
<td>2.6</td>
<td>10.5</td>
<td>1.3</td>
<td>1.3</td>
<td>3.9</td>
<td>1.3</td>
<td>2.6</td>
<td>1.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Meetings in London</td>
<td>11.8</td>
<td>6.6</td>
<td>23.7</td>
<td>3.9</td>
<td>2.6</td>
<td>1.3</td>
<td>3.9</td>
<td>3.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Meetings</td>
<td>15.7</td>
<td>11.9</td>
<td>32.9</td>
<td>6.5</td>
<td>13.1</td>
<td>1.3</td>
<td>4.2</td>
<td>4.2</td>
<td>3.9</td>
<td>1.3</td>
<td>2.6</td>
<td></td>
</tr>
</tbody>
</table>

(a) Based on 371 meetings

**Source:** Analyses of U.I.A. meetings and local statistics

### Appendix 10. Subject distribution of International Association meetings in UK.

<table>
<thead>
<tr>
<th>Subject of meeting</th>
<th>Medical</th>
<th>Scientific</th>
<th>Educational</th>
<th>Sociological</th>
<th>Legal</th>
<th>Financial</th>
<th>Commercial</th>
<th>Primarily Social</th>
<th>Religious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meetings % outside London</td>
<td>0.8</td>
<td>22.7</td>
<td>6.2</td>
<td>1.6</td>
<td>0.6</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meetings % in London</td>
<td>4.4</td>
<td>41.6</td>
<td>11.1</td>
<td>3.8</td>
<td>5.7</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Based on 371 meetings

**Source:** Analyses of U.I.A. meetings and local statistics
### Appendix 11

**Major trade fairs and exhibitions in UK**

<table>
<thead>
<tr>
<th>Location</th>
<th>Length of general exhibitions</th>
<th></th>
<th>Length of trade fairs</th>
<th></th>
<th>Number of International Exhibitions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 3 4 5 6-7 8-9 10+</td>
<td>1 2 3 4 5 6+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>London</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earls Ct.</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>4 6 8 5</td>
</tr>
<tr>
<td>Olympia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wembley Centre.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>11 6 1</td>
</tr>
<tr>
<td>Other halls</td>
<td>3</td>
<td>3</td>
<td>6 5</td>
<td>4 3</td>
<td>1 2 7 2</td>
</tr>
<tr>
<td>Hotels</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>7 20 9 1</td>
</tr>
<tr>
<td>Outside London</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.E.C.</td>
<td>3</td>
<td>3</td>
<td>4 1</td>
<td>2</td>
<td>5 4 6 1</td>
</tr>
<tr>
<td>Harrogate Ctre.(a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brighton Centre.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2 2</td>
</tr>
<tr>
<td>Other halls</td>
<td>6</td>
<td>18</td>
<td>30 34</td>
<td>23 2</td>
<td>18 37 27 8</td>
</tr>
<tr>
<td>Hotels</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>11 11 46 12 1</td>
</tr>
<tr>
<td>% distribution.</td>
<td>13.5 16.2 19.2 18.4 12.0 13.5</td>
<td>7.2</td>
<td>4.1 13.2 48.0 25.2 7.8</td>
<td>1.7</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Analysis of exhibition lists.
## Appendix 12. Convention attendance and expenditure in nine leading convention cities in the United States of America. 1978

<table>
<thead>
<tr>
<th>City</th>
<th>Delegates (million)</th>
<th>Spending ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>3.75</td>
<td>600</td>
</tr>
<tr>
<td>Chicago</td>
<td>2.4</td>
<td>510</td>
</tr>
<tr>
<td>Dallas</td>
<td>1.6</td>
<td>363</td>
</tr>
<tr>
<td>San Francisco</td>
<td>0.8</td>
<td>296</td>
</tr>
<tr>
<td>Atlanta</td>
<td>0.8</td>
<td>212</td>
</tr>
<tr>
<td>Washington</td>
<td>0.75</td>
<td>247</td>
</tr>
<tr>
<td>Houston</td>
<td>0.63</td>
<td>166</td>
</tr>
<tr>
<td>Kansas City</td>
<td>0.6</td>
<td>225</td>
</tr>
<tr>
<td>New Orleans</td>
<td>0.54</td>
<td>139</td>
</tr>
</tbody>
</table>

**Source:** Convention and Visitor Bureaux statistics.

Total convention expenditure in the United States was estimated to be $1500 in 1978-9. Over 60 U.S. cities have constructed municipal convention centres and another 11 were in process of construction in 1979. Amongst the convention and exposition centres due to open 1980-81 are those at Virginia Beach, Pittsburg, Ohio and San Francisco, together providing a total exhibition space of 56140m². Work has also started on the $375 million New York Centre due for completion 1984.
Appendix 13  Size distribution : American Association meetings

% of all meetings

<table>
<thead>
<tr>
<th>Number of participants</th>
<th>% of all meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 100</td>
<td>5</td>
</tr>
<tr>
<td>101 - 200</td>
<td>5</td>
</tr>
<tr>
<td>201 - 300</td>
<td>10</td>
</tr>
<tr>
<td>301 - 400</td>
<td>15</td>
</tr>
<tr>
<td>401 - 500</td>
<td>20</td>
</tr>
<tr>
<td>501 - 600</td>
<td>15</td>
</tr>
<tr>
<td>601 - 700</td>
<td>10</td>
</tr>
<tr>
<td>701 - 800</td>
<td>5</td>
</tr>
<tr>
<td>801 - 900</td>
<td>5</td>
</tr>
<tr>
<td>901 - 1000</td>
<td>10</td>
</tr>
<tr>
<td>1001 - 2000</td>
<td>20</td>
</tr>
<tr>
<td>2001 - 3000</td>
<td>5</td>
</tr>
<tr>
<td>3001 - 5000</td>
<td>5</td>
</tr>
<tr>
<td>over 5000</td>
<td>0</td>
</tr>
</tbody>
</table>

### Appendix 14. Size distribution of hotel conference facilities in the United Kingdom

<table>
<thead>
<tr>
<th>Nominal capacity of hall</th>
<th>London</th>
<th>UK - other than London</th>
<th>Totals: size distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main halls</td>
<td>Secondary halls</td>
<td>Main halls</td>
</tr>
<tr>
<td>3000+</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1100-1200</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>950-1000</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>850-900</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>750-800</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>650-700</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>550-600</td>
<td>2</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>450-500</td>
<td>6</td>
<td>3</td>
<td>59</td>
</tr>
<tr>
<td>350-400</td>
<td>7</td>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td>250-300</td>
<td>19</td>
<td>8</td>
<td>206</td>
</tr>
<tr>
<td>150-200</td>
<td>32</td>
<td>37</td>
<td>506</td>
</tr>
<tr>
<td>100</td>
<td>29</td>
<td>81</td>
<td>431</td>
</tr>
<tr>
<td>50</td>
<td>19</td>
<td>182</td>
<td>218</td>
</tr>
<tr>
<td><strong>Totals: halls</strong></td>
<td>127</td>
<td>320</td>
<td>1551</td>
</tr>
<tr>
<td><strong>Ratios halls: hotel</strong></td>
<td>1.0</td>
<td>2.52</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Sources:**
British Association of Conference Towns listings
Tourist Board data and hotel guides.
### Characteristics of halls

<table>
<thead>
<tr>
<th>Types of buildings</th>
<th>Age</th>
<th>Nominal size of main hall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Townhalls, Civic centres,</td>
<td>Prewar</td>
<td>59</td>
</tr>
<tr>
<td>Conference centres,</td>
<td>Postwar</td>
<td>17</td>
</tr>
<tr>
<td>Institutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ballrooms, pavillons,</td>
<td>Prewar</td>
<td>6</td>
</tr>
<tr>
<td>Winter gardens, Halls</td>
<td>Postwar</td>
<td>11</td>
</tr>
<tr>
<td>Cinemas, Theatres</td>
<td>Prewar</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Postwar</td>
<td>20</td>
</tr>
<tr>
<td>Sports centres</td>
<td>Prewar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Postwar</td>
<td>1</td>
</tr>
<tr>
<td>Private halls, other</td>
<td>Prewar</td>
<td>21</td>
</tr>
<tr>
<td>premises</td>
<td>Postwar</td>
<td>54</td>
</tr>
<tr>
<td>Totals: halls</td>
<td>All</td>
<td>209</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total seating capacity</th>
<th>Main halls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prewar</td>
</tr>
<tr>
<td></td>
<td>Postwar</td>
</tr>
</tbody>
</table>

(a) Excludes Earls Court, Wembley Arena, N.E.C.

Sources: British Association Conference Towns listings

Tourist Board statistics and direct surveys.
## Appendix 16. Non-residential conference facilities:
### Size distribution.

<table>
<thead>
<tr>
<th>Nominal capacity of hall (maximum)</th>
<th>London</th>
<th>UK totals</th>
<th>Distribution: Main halls %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of main halls (a)</td>
<td>Number of secondary halls</td>
<td>Number of main halls</td>
</tr>
<tr>
<td>5000-5600</td>
<td>1</td>
<td></td>
<td>4 (c)</td>
</tr>
<tr>
<td>3000-3500</td>
<td>2 (b)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>2500</td>
<td>3</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>2000</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>1800</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>1600</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>1400</td>
<td>2</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>1200</td>
<td>4</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>1000</td>
<td>2</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>800-900</td>
<td>2</td>
<td>1</td>
<td>47</td>
</tr>
<tr>
<td>600-750</td>
<td>6</td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>400-550</td>
<td>11</td>
<td>3</td>
<td>87</td>
</tr>
<tr>
<td>200-350</td>
<td>19</td>
<td>12</td>
<td>122</td>
</tr>
<tr>
<td><strong>Total seating capacity</strong></td>
<td>51,600</td>
<td>12,600</td>
<td><strong>338,900</strong></td>
</tr>
</tbody>
</table>

### Notes
1. (a) Excludes Earls Court, Wembley Arena
2. (b) Includes Alexandra Palace
3. (c) Excludes N.E.C.

### Sources
- British Association of Conference Towns,
- Tourist Board listings and direct surveys.
Appendix 17. Convention facilities in U.S.A. Size distribution for meetings of 500 or more.

<table>
<thead>
<tr>
<th>Nominal capacity of main hall (maximum)</th>
<th>Hotels</th>
<th>Halls, Auditoria Theatres.</th>
<th>Coliseums Covered arenas</th>
</tr>
</thead>
<tbody>
<tr>
<td>500-1000</td>
<td>575</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500-2000</td>
<td>360</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2500-3000</td>
<td>22</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>3500-4000</td>
<td>10</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>4500-5000</td>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>5500-7000</td>
<td></td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>7500-10000</td>
<td>1</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>10500-15000</td>
<td></td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>15500-20000</td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>20500+</td>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Aggregate totals

Seating capacity for meetings of 500 or more: 956,000

Hotel and Motel guestrooms in district: 902,100

Sources: United States Travel Service listings, City Convention and Visitor Bureau statistics.
Appendix 18

Revenue and operational analysis

Median prices charged to conference groups were determined for the second quarter 1979, excluding VAT but including service and supplementary charges. Figures for beverages include the median cost of individual purchases plus that of a formal reception (24 hr package). Charges for conference rooms depend on group size and nature of function.

<table>
<thead>
<tr>
<th></th>
<th>London</th>
<th>Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Theatre style (say 200)</td>
<td>0.87</td>
<td>0.70</td>
</tr>
<tr>
<td>Boardroom style (15)</td>
<td>2.61</td>
<td>2.00</td>
</tr>
<tr>
<td>Banquet (a)</td>
<td>0.87</td>
<td>0.70</td>
</tr>
</tbody>
</table>

(a) Often discounted for large banquets.

Operational analysis

<table>
<thead>
<tr>
<th>Per delegate</th>
<th>Guestrooms (single)</th>
<th>Food &amp; Beverages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24hr package</td>
<td>Day package</td>
</tr>
<tr>
<td>London</td>
<td>£</td>
<td>%</td>
</tr>
<tr>
<td>Sales</td>
<td>23.50</td>
<td>100.0</td>
</tr>
<tr>
<td>Less:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of sales &amp; departmental costs</td>
<td>18.00</td>
<td>76.8</td>
</tr>
<tr>
<td>Undistributed expenses (allocated)</td>
<td>13.20</td>
<td>56.2</td>
</tr>
<tr>
<td>Costs of investment &amp; fixed charges</td>
<td>9.28</td>
<td>39.5</td>
</tr>
<tr>
<td>Provinces</td>
<td>£</td>
<td>%</td>
</tr>
<tr>
<td>Sales</td>
<td>17.65</td>
<td>100.0</td>
</tr>
<tr>
<td>Less:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of sales &amp; departmental costs</td>
<td>12.99</td>
<td>73.6</td>
</tr>
<tr>
<td>Undistributed expenses (allocated)</td>
<td>8.71</td>
<td>49.4</td>
</tr>
<tr>
<td>Costs of investment &amp; fixed charges</td>
<td>5.77</td>
<td>32.7</td>
</tr>
</tbody>
</table>
Appendix 19.  Capital financing requirements for hotel
Conference Hall

Analysis based on data given in chapter 12.6.2.

1. **Total investment**
   Total costs including interest on pre-opening expenditure:
   - **Land and building in London**: £4028
   - **Land and building in Provinces**: £3391
   - **Furniture, Fittings & Equipment**: £352

2. **Tax allowances**
   Calculated from year of opening 0.
   Tax rate 0.52; tax lag 0.5 years
   - **Initial**: Building: year -1 20%
     - £127.8
   - Building: year 0 20%
     - £58.1
   - Plant & machinery 100%
     - £435.3
   - F.F.E. 100%
     - £174.5
   - **Writing down**: Building: year 0 4%
     - £34.9
   - Building: years 1-20 4%
     - £326.3
   - **Total tax allowances NPV**: £1157

3. **Present value of net capital costs**
   - **Land & building in London**: £3046
   - **Land & building in Provinces**: £2409
   - **Furniture, Fittings & Equipment**: £177.5

4. **Required annual profit (PV)**
   Loan capital & interest over 20 years.
   - **Land & building in London**: £357.8
   - **Land & building in Provinces**: £282.9
   - **Replacement of F.F.E. (net) (b)**: £27.7
   - **Insurance, rates & fixed costs (c)**: £10.9

5. **Required annual profit (PV)**
   Loan capital & interest over 20 years on building with leasehold site.
   - **Building in London**: £315.0
   - **Building in Provinces**: £251.3
   - **Replacement of F.F.E. (net) (b)**: £27.7
   - **Insurance, rates & fixed costs (c)**: £10.9

<table>
<thead>
<tr>
<th>Rate of return (a)</th>
<th>10%</th>
<th>12%</th>
<th>15%</th>
<th>20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£</td>
<td>£</td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>10%</td>
<td>4028</td>
<td>4099</td>
<td>4206</td>
<td>4388</td>
</tr>
<tr>
<td>12%</td>
<td>3391</td>
<td>3438</td>
<td>3509</td>
<td>3629</td>
</tr>
<tr>
<td>15%</td>
<td>352</td>
<td>352</td>
<td>352</td>
<td>352</td>
</tr>
<tr>
<td>20%</td>
<td>1157</td>
<td>1114</td>
<td>1064</td>
<td>1002</td>
</tr>
<tr>
<td>30%</td>
<td>3046</td>
<td>3158</td>
<td>3313</td>
<td>3553</td>
</tr>
<tr>
<td>40%</td>
<td>2409</td>
<td>2497</td>
<td>2616</td>
<td>2794</td>
</tr>
<tr>
<td>50%</td>
<td>177.5</td>
<td>179</td>
<td>181.3</td>
<td>185</td>
</tr>
<tr>
<td>10%</td>
<td>357.8</td>
<td>422.8</td>
<td>529.3</td>
<td>729.6</td>
</tr>
<tr>
<td>12%</td>
<td>282.9</td>
<td>332.3</td>
<td>417.9</td>
<td>573.8</td>
</tr>
<tr>
<td>15%</td>
<td>27.7</td>
<td>30.7</td>
<td>35.3</td>
<td>43.6</td>
</tr>
<tr>
<td>20%</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
</tr>
<tr>
<td>30%</td>
<td>315.0</td>
<td>378.0</td>
<td>478.9</td>
<td>663.2</td>
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<tr>
<td>40%</td>
<td>251.3</td>
<td>298.7</td>
<td>374.4</td>
<td>511.4</td>
</tr>
<tr>
<td>50%</td>
<td>27.7</td>
<td>30.7</td>
<td>35.3</td>
<td>43.6</td>
</tr>
<tr>
<td>10%</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
</tr>
</tbody>
</table>

**Notes**
(a) Dual rates have not been used for this illustration
(b) 10% after 5 years, 50% after 10 years, 10% after 15 years,
    30% at 20 years. 100% tax allowance.
(c) Median costs taken.
Appendix 20. 

Conference Centre Analysis

Overall occupation of hall 70% = 255 days
Conferences 67.5% = 172 days. Entertainment 32.5% = 83 days
Conferences only: 112 days. Exhibitions only: 32 days. Combined: 28 days

<table>
<thead>
<tr>
<th>Programme</th>
<th>Number of events</th>
<th>Average length (days)</th>
<th>Total use (days)</th>
<th>Charge per day (£)</th>
<th>Revenue per year (£'000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Conferences</td>
<td>38</td>
<td>2</td>
<td>76</td>
<td>1200</td>
<td>91.2</td>
</tr>
<tr>
<td>Banquets</td>
<td></td>
<td></td>
<td></td>
<td>1000</td>
<td>7.0</td>
</tr>
<tr>
<td>Small Conferences</td>
<td>32</td>
<td>2</td>
<td>64</td>
<td>600</td>
<td>38.4</td>
</tr>
<tr>
<td>Supplementary rooms</td>
<td></td>
<td></td>
<td>140</td>
<td>120</td>
<td>16.8</td>
</tr>
<tr>
<td>Other charges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>Exhibitions</td>
<td>20</td>
<td>3</td>
<td>60</td>
<td>1000</td>
<td>60.0</td>
</tr>
<tr>
<td>Preparation</td>
<td></td>
<td></td>
<td>20</td>
<td>500</td>
<td>10.0</td>
</tr>
<tr>
<td>Supplementary rooms</td>
<td></td>
<td></td>
<td>60</td>
<td>200</td>
<td>12.0</td>
</tr>
<tr>
<td>Other charges</td>
<td></td>
<td></td>
<td>83</td>
<td>3000</td>
<td>249.0</td>
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Exhibitions

<table>
<thead>
<tr>
<th>Group size</th>
<th>Event</th>
<th>Total</th>
<th>Delegate days: total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>9</td>
<td>18000</td>
<td>65250</td>
</tr>
<tr>
<td>1500</td>
<td>12</td>
<td>18000</td>
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<tr>
<td>1000</td>
<td>15</td>
<td>15000</td>
<td></td>
</tr>
<tr>
<td>750</td>
<td>9</td>
<td>6750</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>15</td>
<td>7500</td>
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</table>

Conferences

<table>
<thead>
<tr>
<th>Group size</th>
<th>Event</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>6</td>
<td>12000</td>
</tr>
<tr>
<td>1500</td>
<td>4</td>
<td>6000</td>
</tr>
<tr>
<td>1000</td>
<td>12</td>
<td>12000</td>
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<tr>
<td>750</td>
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<td>6000</td>
</tr>
<tr>
<td>500</td>
<td>26</td>
<td>13000</td>
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</tbody>
</table>

Conference room

<table>
<thead>
<tr>
<th>Group size</th>
<th>Event</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>20</td>
<td>6000</td>
</tr>
<tr>
<td>200</td>
<td>28</td>
<td>5600</td>
</tr>
<tr>
<td>100</td>
<td>36</td>
<td>3600</td>
</tr>
</tbody>
</table>

Delegate days: total 64200

(a) See chapter 5.3.2. and 5.3.5.

Summary

<table>
<thead>
<tr>
<th></th>
<th>Conferences</th>
<th>Exhibitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitor days</td>
<td>64,200</td>
<td>65,250</td>
</tr>
<tr>
<td>Income</td>
<td>£157,000</td>
<td>£84,000</td>
</tr>
<tr>
<td>Income/visitor</td>
<td>£2.45</td>
<td>£0.74</td>
</tr>
<tr>
<td>Catering</td>
<td>£373,000</td>
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<tr>
<td>Average cost/visitor</td>
<td>£2.88</td>
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</table>