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Great Britain. Ministry of Housing and Local Government.

Publication/Creation

London : H. M. Stationery Off, 1961.

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† Viscount Ridley resigned from the Sub-Committee on 25th February, 1960.

Preface

Terms of Reference

- 1 We were appointed by the Central Housing Advisory Committee "to consider the standards of design and equipment applicable to family dwellings and other forms of residential accommodation, whether provided by public authorities or by private enterprise, and to make recommendations".

Interpretation

- 2 We have understood our terms to mean that our primary task was to consider standards of internal design. This cannot be done sensibly without taking full account of the relation of the house or flat with its layout on the site, and we have had this inter-relationship constantly in mind. Moreover, we were given to understand that recommendations on certain aspects of layout, such as play space for children living in blocks of flats and storage for cars, would be welcome. These two topics we have considered in some detail; and we have also dealt with a number of other matters of the same kind which seemed to demand it.
- 3 The area of work assigned to us was extensive, and it was necessary, if we were to present our report in a reasonable time, to be selective in our treatment. This has meant leaving on one side certain matters on the fringe of our enquiry, for instance, specialised forms of residential accommodation such as hostels and lodging houses.

Proceedings

- 4 We have held twenty-four meetings, many lasting two days and some a day and a half. At our first six meetings, early in 1959, we made a preliminary survey of the problems with which we were to deal, and arranged to invite evidence, both in the Press and by letter. At the request of the local authority associations, we had prepared a questionnaire, originally intended to help the associations in consulting their members, but also issued to many other organisations and persons.
- 5 We were most anxious to ensure that we became familiar with the diverse outlooks and problems of householders and the many professions interested in housing, and with the variations in habit and opinion in different parts of England and Wales. In the summer of 1959 and the autumn of 1960, parties of members therefore undertook visits to towns and country areas in England and Wales, and between us we went over about 600 houses and flats put up since the war by private builders, housing associations, new town corporations and local authorities. The new town of Cumbernauld in Scotland was also visited. We considered papers of written evidence from some eighty bodies and persons, and we received oral evidence from more than thirty of them.
- 6 We also undertook an examination of a number of subjects on which extensive and detailed architectural and estimating work was required, and our remaining meetings have been occupied in assessing the implications of this work and in formulating our recommendations.

General Aim

- 7 In our general approach to the work, we have aimed at concentrating on the establishment of general themes which would set the guide-lines for the future, within which the many topics in need of detailed investigation would take their place in proper perspective. From our visits, from the evidence presented to us, and from our own experience, we have felt sufficiently equipped to suggest in general the future approach to the problems facing us without ourselves becoming involved in a lengthy and wide-ranging programme of social investigation. But for the approach which we have in mind in our report to bear real fruit, many follow-up studies through the years will be desirable, for example to obtain information on aspects of design, and to assess future trends and the effectiveness of new ways of meeting occupiers' needs.

Acknowledgement

- 8 A very large number of people indeed have helped to make this report a possibility by receiving us so kindly into their homes; by making the detailed arrangements for us in their localities; by showing us the houses they are building; and by spending long hours preparing invaluable memoranda of evidence. We are especially indebted to the many people who spared time and energy from busy lives to share their experience with us round a table. We extend our thanks and appreciation to them all.

Drawings by T. Gordon Cullen, F.S.I.A.

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New Patterns of Living

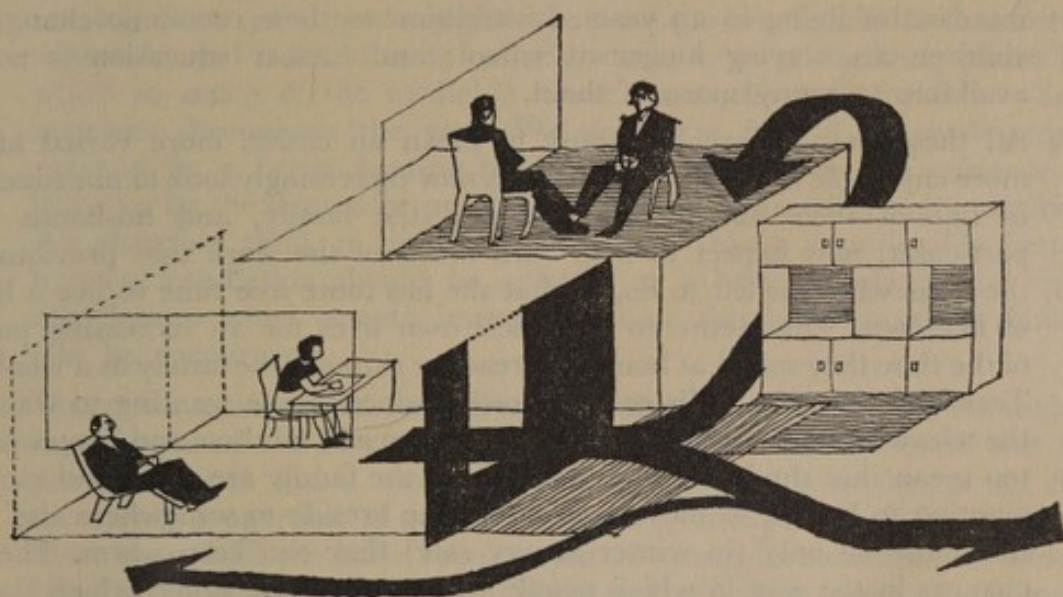
A major factor in the development of the new patterns of living is the change in the way in which the population is distributed. With the increase in the number of people living in the urban areas, the demand for housing has increased. This has led to the development of new patterns of living, which are more suited to the needs of the urban population. The new patterns of living are more compact and more efficient than the old patterns. They are also more flexible and more adaptable to the needs of the urban population. The new patterns of living are more suited to the needs of the urban population than the old patterns. They are more compact and more efficient than the old patterns. They are also more flexible and more adaptable to the needs of the urban population.

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CHAPTER I

New Patterns of Living

- 1 A thousand families every working day move into a newly finished home. With the continuing increase in the number of households, with the demand—because people are living longer—for more attention to the special needs of old people, and with the calls of slum clearance, overspill and urban renewal, not to mention the higher standard of living, the indications are that a high rate of house building is likely to continue for many years to come.
- 2 The problem of designing good homes is the same whoever provides them, and this report, which relates to England and Wales, is applicable to private enterprise and public authority housing alike.
- 3 Our predecessors, the Dudley Committee which reported in 1944, were necessarily working against the background of the 'thirties, now nearly a quarter of a century away, with vastly different problems, outlook and trends. Since the end of the war, the country has undergone a social and economic revolution, and the pattern of living is still changing fast. There is full employment, a national health service, and the various social insurance benefits such as family allowances and retirement pensions. In material terms people are better off than ever before; the average pay packet nowadays buys a good deal more than it did in 1939, and to this four million working wives and the teenagers add their own contribution. One household in three has a car; the same proportion

have a washing machine. Television sets are owned by two households in three; so are vacuum cleaners; and one household in five has a refrigerator. These possessions are spreading fast through all income groups, fastest of all in the lower brackets, and we are promised a doubled standard of living in 25 years. In addition to these economic changes, children are staying longer at school; and further education is now available to many more of them.

- 4 All these changes are beginning to mean an easier, more varied and more enjoyable home life. Housewives now increasingly look to machinery to lighten their household tasks; and the family, and husbands in particular, now expect to help with much of the work that previously the housewife was left to do, so that she has more free time to live a life of her own. This desire to live their own lives for an increasing part of the time they spend at home is spreading through the family as a whole. Teenagers wanting to listen to records; someone else wanting to watch the television; someone going in for do-it-yourself; all these and homework too mean that the individual members of the family are more and more wanting to be free to move away from the fireside to somewhere else in the home—if only (in winter at any rate) they can keep warm. These changes in the way in which people want to live, the things which they own and use, and in their general level of prosperity, and perhaps also the greater informality of home life, make it timely to re-examine the kinds of homes that we ought to be building, to ensure that they will be adequate to meet the newly emerging needs of the future, as well as the basic human needs which always stay the same.

Major changes required—space and heating

- 5 The major changes required can be summed up in two words—space and heating.
- 6 Additional floor space takes first priority in the evidence, and this call cannot and must not be ignored, for a good house or flat can never be made out of premises which are too small. As well as a place where the family can gather together, there must be room in every home for activities demanding privacy and quiet; there must be space to allow for better planned and better equipped kitchens with room in which to take at least some meals, and for more satisfactory circulation and storage.
- 7 Additional space is comparatively cheap, for the cost is not loaded with heavy overheads such as plumbing and equipment, and so may amount to much less than the average cost per square foot. Additional space is also an important long-term investment, for if a house or flat is large enough it can usually be brought up-to-date as it gets older; but if there is not enough space the improvements can be impossible, or at least unduly expensive. Homes are being built at the present time which not only are too small to provide adequately for family life but also are too small to hold the possessions in which so much of the new affluence is expressed. Moreover many of them have steep stairs, and mean halls and landings. Such places cannot be expected to meet the needs of their occupiers today, still less to hold their value in the long term.
- 8 Our views on this subject apply equally to flats, and we are recommending that they should in future be designed to provide floor space comparable

to that in houses. This will make a costly form of dwelling even more costly, but we believe that those who live in flats require at least as much space as those who live in houses.

- 9 After more floor space the first priority in the evidence was for better heating. During the greater part of the year, the two demands are scarcely separable, and it seems to us entirely wrong to go on building homes in which so much of the available space cannot be used for day-to-day activities throughout the year. We are quite sure of the widespread demand for a better heating service; even apart from the evidence it is shown by the figures for purchases of various types of portable heaters. We therefore think it right to recommend that a considerably better heating installation should be adopted as a basic standard, and that installations which are an improvement on this basic standard should also be encouraged.
- 10 There was a time when for a great majority of the population the major significance of the structure in which they made their home was to provide shelter and a roof over their head. This is no longer so. An increasing proportion of people are coming to expect their home to do more than fulfil the basic requirements. It must be something of which they can be proud; and in which they must be able to express the fullness of their lives. There is therefore an increasingly prevalent atmosphere in which improvements in housing standards will be welcomed and indeed demanded, and in which stress will be laid upon quality rather than mere adequacy.

New shape of Housing Standards

- 11 The present housing standards, with which houses and flats built by local authorities have to comply if they are to qualify for Exchequer subsidy, derive from the recommendations of the Dudley Committee in 1944, and are framed largely in terms of minimum sizes of rooms. Housing standards have been framed in much this same way ever since the report of the Tudor Walters Committee in 1919. Against a background of larger families than are common now, and a need to guard against overcrowded or cramped conditions of living, it was natural for the Dudley Committee to retain minimum room sizes as one part of their recommendations. At the same time, the Committee in setting its minimum standard of overall dwelling sizes gave a sufficient margin to allow for the rooms to be of satisfactory shape and for the circulation space to be adequate. When, however, under the impact of economic pressures, housing standards were reviewed in 1951, this margin, which gave an important element of flexibility, was to a large extent abandoned, room sizes and aggregate living area sizes becoming in fact the operative standards. The effect of these changes was to induce a standardisation and a lack of variety in the internal design of the local authority housing of the 'fifties. A similar uniformity has in general afflicted the plan forms of private enterprise houses, though in recent years there have been many notable exceptions.
- 12 Thus in the local authority field, emphasis on room sizes has focussed undue attention on working out a pattern of room areas which will comply with the standards, whereas the important thing in the design of

homes is to concentrate on satisfying the requirements of the families that are likely to live in them. Furthermore, the specification of standards of space by reference to individual rooms with specific labels—bedrooms, working and dining kitchens, and so on—tends to assume a conventional arrangement of the dwelling and the particular way in which a given room will be used. This inhibits flexibility both in the initial design and in the subsequent use of a dwelling. We have therefore preferred to approach the question of standards by looking at the needs as a whole of the intended occupants of a dwelling, and then setting the minimum sizes of the whole dwelling which we believe these needs to imply. Given these sizes, the designer should be free to arrive at the best way of arranging the space and equipment to meet the requirements of particular sizes of family.

- 13 As a result this report is not about rooms so much as about the activities that people want to pursue in their homes—which taken as a whole can be catered for in a wide variety of ways. This approach to the problem of design starts with a clear recognition of these various activities and their relative importance in social, family and individual lives, and goes on to assess the conditions necessary for their pursuit in terms of space, atmosphere, efficiency, comfort, furniture and equipment; organising together those activities that demand it, separating those which cannot be carried on together or near one another; considering frequency, time and sequence as well as place. The approach is flexible, questioning such widespread assumptions as that equal floor areas should be devoted to sleeping, dressing and sanitary needs as to all other needs put together, or that houses should generally have two storeys rather than one, one and a half, two and a half or three. The approach is also indirect. Arrangement and rooms are the results, and not the starting point; arrangement flows from the inter-relation of the ways in which the needs can be satisfied with the limitations and opportunities provided by the site, the structural possibilities and the cost; rooms grow from the needs and provide for the needs—they evolve as a consequence of thought and not in the copying of what has gone before.
- 14 The usefulness of a room depends as much as anything upon whether its shape and the position of doors and windows allow the appropriate arrangement of furniture. In order to ensure that a room is workable and enjoyable to live in, one must not only make sure that the furniture will fit into the space available in a sensible way, but also that there is sufficient space left to make the room comfortable and efficient in use. In other words the right approach to the design of a room is, first to define what activities are likely to take place in it, then to assess the furniture and equipment necessary for these activities, and then to design round these needs, plus others no less important such as aspect, prospect and communication with other parts of the home. The initial definition of what activities are likely to take place in a room depends on the way of life of the prospective occupiers, on the method of heating, and on what other rooms are envisaged. There are many standard plans of houses and flats, but to imply one or other of them in ordering the building is to lose half the advantage of employing an architect; for not only does it do half his work for him—it also restricts his scope, and makes new and worthwhile developments in house design all the less likely. We therefore do not

advocate particular forms of plan or revised minimum dimensions of rooms. Like an architect's brief, housing standards should therefore as far as possible be couched in terms which concentrate on the activities that the occupiers will want to pursue, and not on the numbers and sizes of the usual rooms and offices. We regard this approach as an extremely important means of releasing more of the creative energies of architects concerned with housing, and we have been especially careful to take the fullest account of it in our expression of standards in the following pages.

Homes for family needs

- 15 Thus it is that in Chapter 2 we first set out in general terms the needs of families of various sizes and circumstances and then go on to deal with particular aspects of the design of homes—heating, kitchens, storage and equipment. The chapter as a whole represents our view of the functional and performance requirements that homes to be built in the future must satisfy. In order to provide reasonably satisfactory safeguards, we also recommend minimum overall floor areas for the dwelling, related to each size of family; for it can be seen from post-war experience that, in practice, reasonably satisfactory homes result from certain minimum overall floor areas and that unsatisfactory homes result from anything smaller. Therefore in order to ensure that there need be no excessive overlap of activities in the same space, and to make possible a reasonable allowance of space for circulation and ease of movement, these overall area controls are essential.
- 16 It is important that these minimum floor areas should not be taken as maxima; they are nothing of the sort. For although satisfactory homes can be built to them, it may well not be possible to include within them some desirable features which may come to be generally required in the future.
- 17 Chapter 2 also considers some aspects of living in flats in so far as these are different from the requirements in houses.

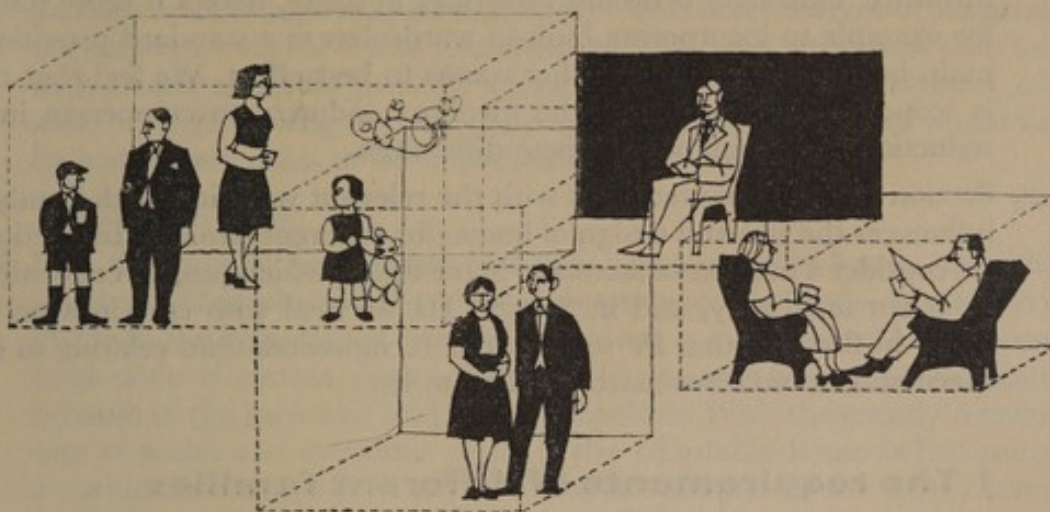
The home in its setting

- 18 In the past the setting of the home has too often been neglected by those who have been responsible for most of the houses and flats standing today. It has been left largely to the occupier to provide his own setting by planning his garden according to his individual taste. In recent years there have however been commendable efforts at landscaping housing developments, both of houses and of flats, and we should like to see much more attention paid to it. The rapid increase in the number of cars, bringing with it an imperative need for separating pedestrians from cars; higher land costs and higher densities; the need for play space for children, especially on high density estates—all these are factors which, taken together, will strongly influence, and perhaps revolutionise, the design of housing estates in the future. Our consideration of these matters is the subject of Chapter 3.

The need for urgency

- 19 Even though the times demand change and improvement in our new housing, it would be idle to pretend that they are entirely propitious. Rates of interest are still comparatively high; the price of land and the cost of building continue to rise. But times rarely are propitious, and we

are convinced that the urgency of the need calls for the difficulties to be overcome. The country already possesses a large stock of houses and flats that are becoming out-of-date and cannot afford to go on building more of them. Better homes will cost more money; but we are sure that a sufficient number of people, whether already local authority tenants or people looking for a home of their own, are prepared to pay the extra charges for the better article. And where for reasons of economic stability there may have to be a choice between standards and numbers built, we think that in future it should not be the standards that are sacrificed. For the homes of the country are one of its most important assets—assets which must be built to a standard at which they are likely to give reasonable satisfaction, and therefore hold their value, over the years.



CHAPTER 2

Homes for Family Needs

Introduction

- 20 The purpose of this chapter is to set out what we believe should be the guiding considerations for the internal design of homes. The principles on which good homes should be designed are the same whoever builds them, and we trust that all developers, private enterprise and public authorities alike, will find them a useful outline of the way in which good homes, fully reflecting the needs of the people who are to live in them, may be provided.
- 21 In translating these principles into practice, there is no substitute for skilled design, and this is obtainable only if qualified people are employed to undertake it. The belief that the design of homes is a job that anyone can tackle with success is entirely without foundation—it is one of the most difficult tasks in the whole field of architecture. Our recommendations are made on the basis that architects must be employed as the designers of houses and are framed in such a way as to allow for the wide variety of circumstances and site conditions confronting designers, and to leave them free either to develop conventional plan forms or to explore new living arrangements to suit changing needs.
- 22 As an aid to understanding between laymen and architects, and as a means of showing that plans are workable, we recommend that in all plans for residential building the main furniture should be shown. The Ministry should issue a guide to the standard sizes which should be assumed for this purpose. There is an intimate relationship between the design of

the home and the furniture which it is to contain. The size and quantity of the furniture can go some way to supplement the deficiencies of an inconvenient home, but an unsuitable choice of furniture can also make a well-designed home awkward to live in. The practice of marketing furniture, especially bedroom furniture, in suites, makes it more difficult for example to incorporate built-in wardrobes as a standard provision in main bedrooms or to plan other rooms to best effect. We feel that there is scope for architects and the furniture industry to co-operate in the reduction or elimination of these difficulties.

- 23 Section I of the chapter deals with the relevant ways in which family life influences the size and design of homes for different families. In Section II we consider a number of factors in home design which can, for convenience, be taken separately, and in Section III we deal with certain aspects of living in flats. Section IV sets out our recommendations relating to floor space and summarises matters allied to it.

I The requirements of different families

A HOMES FOR FAMILIES WITH CHILDREN

- 24 Family homes have to cater for a way of life that is much more complex than in smaller households. They have to accommodate individual and different group interests and activities involving any number, or all, of the family, with or without visitors; and the design must be such as to provide reasonable individual and group privacy as well as facilities for family life as part of a community of friends and relations.
- 25 At every stage in the life of the family the home has to provide for an extremely wide range of activities; and even when bedrooms come to be put to wider daytime and evening use, living areas in the family home will still be in use for children's play, homework, watching television, sewing and mending, hobbies, entertaining friends, and dealing with casual callers, often with two or more of these activities going on at once.
- 26 The many links with the district where they live—friends, schools, familiar haunts, the associations and memories of a lifetime—offer many people a dimension in their lives whose value cannot be measured. A wide variety of homes is therefore desirable in a district, so that families who move as their circumstances change can, if they wish, do so without too much disruption to their daily lives. Even so, family homes are bound to be occupied at different times by families at different stages of development, and we feel that it is important to take this into account in designing them.
- 27 The way of life changes radically over the twenty or thirty years of the average family's development. The first baby will mean that the mother begins to spend most of her time looking after the child and the house, and for several years, with further children coming along, the family will live with many interrupted nights, daytimes punctuated by rapid visits to the shops and by children's rests, and mealtimes after which the floor needs a good clean. Gradually, the children spend more time at play with other children; and there is mud about. There may be the start of infectious ailments, and in happier phases half a dozen small children from surround-

ing homes squatting on the carpet with every toy in the house around them. Soon they will all have started school, and some mothers take up part-time work. Within a few years, there may be homework, and the need for quiet every evening until it is done. Through collections, hobbies and perhaps more homework; through bigger beds and the stage of clumsiness, the children will evolve into young adults, most with incomes of their own; with greater needs for privacy, a larger accumulation of possessions, often noisy ways of passing the time, and for an increasing number a real need for somewhere quiet to work at their further education.

The adaptable house

- 28 It is thus not to be wondered at that the adaptable house—the house which could easily be altered as circumstances changed—is a recurring theme in the evidence we received and in our own thoughts. At the present stage of development, such a dwelling is some way from practical reality, because of the high cost and other difficulties. With the greatly increased rate of social and economic change, the adaptable house is becoming a national necessity. Not only would it be valuable for the family staying in one house for most of its life: it would allow much easier and perhaps more satisfactory adaptation to the changing general needs. We see the investigation of the practical possibilities of doing it easily and at reasonable cost as one of the most important lines of future research into the development of design and structure. The sooner it is started the better.

The hall

- 29 The general preference is for a hall, as providing a neutral space in which to deal with visitors whom one wishes neither to leave on the step nor to invite to meet the family, and as a place to store outdoor clothes and a pram. If a home is large enough it can have a fair-sized hall without detriment to other requirements, though in homes for small families a solution using a porch or lobby with outer and inner doors may be more satisfactory, taken as a whole.

Open planning

- 30 To judge by the evidence which we received on open planning, it has been disliked so far in local authority housing, mainly on the ground that it provides little privacy from view, from noise, or from distraction. These are weighty considerations, but as there has been little experience of it in local authority housing, it would be easy to attach too much weight to these views. In private enterprise housing, open planning is popular with purchasers, for it gives a sense of space, and it can certainly help in producing a very attractive home. With a suitable hall, good heating, and suitable arrangements (including heating) for activities needing privacy, open planning can offer advantages, especially in homes for smaller families. Further enquiries into its popularity with families of different sizes and different patterns of living should be undertaken.

Living area

- 31 The home needs to make provision both for the family to gather together and for its members to carry on their own separate pursuits. Subject to what is said in the previous paragraph, the objective in designing a home

for four or more people should be to provide at least one room in the living area which can cater for activities needing privacy and freedom from disturbance.

- 32 The living room must provide space sufficient for two or three easy chairs, a settee, a television set, small tables, and places suitable for a reasonable quantity of other possessions such as a sewing box, toy box, radiogram and bookcase. In planning how the furniture might be arranged, the designer should envisage that it will often be pushed back against the walls to give a clear space, and this should be allowed for.

Space for meals

- 33 We have found that people in all parts of the country, and in whatever social and economic group, have at least some meals in the kitchen. The general pattern is for breakfast to be taken, often in relays, in the kitchen; for lunch, where the man of the house is often not present, to be taken there; for the evening meal to be taken either in the kitchen or in the dining space (if this is separate from the kitchen), often depending on the age of the children. At week-ends, when the family is together as a whole, meals other than breakfast will usually be taken in the dining space, though if some members of the family are out other meals may be taken in the kitchen. It follows that even in a kitchen that is not planned for the family to eat in, and which is planned primarily as a working centre, there should be somewhere where two or three people can sit down to eat; because we are convinced that, whether or not there is room, that is what they will do. We have heard it said on more than one occasion that the kitchen should be planned so that it is impossible to take meals in it, with a view to raising the social and living standards of the occupiers. We believe that this is an unsuitable motive on which to choose a plan; and even if it were not it would be necessary now, after ten or fifteen years of trying it out, to recognise that it is misconceived.
- 34 In ascending order of preference, the various possible kitchen and eating arrangements might be listed as follows. First, a working kitchen enlarged to provide a meals space for the whole family, there being no other meals space. This arrangement, which is the average local authority "dining kitchen", does not allow for the separation of the work area from the eating area, whether for tidiness or to keep small children away from the cooking operations. An arrangement to be preferred is a working area with a meals space differentiated from it, but contiguous to it and with direct access to it. This allows a separation of functions within the dining kitchen and meets reasonably well the requirements of informal meals, family meals, and entertaining. In a third arrangement, suitable for rather bigger homes, there would be a separate room which would be used for meals with all the family present, for entertaining, and for activities needing privacy.

Bedrooms

- 35 The minimum bedroom provision for a family of four is two double rooms. Where the children are of opposite sexes this is unsuitable as they each need a room. Adolescent and adult children should preferably have a room each even if they are of the same sex, for they need a place of their own.

- 36 Given adequate heating, children's bedrooms are made available for a range of activities other than sleeping and dressing. They may be used for study, or leisure activities; or they may be used to some extent as bed-sitting rooms. Besides room for a bed or divan, a bedside table, clothes storage, and storage for personal possessions (as will be required in the ordinary single bedroom) a room designed as a study bedroom needs space for a desk, a chair and a book case. A bed-sitting room needs in addition space for at least one easy chair.
- 37 Double study bedrooms may produce difficulties if two lively children are expected to do their homework in them without supervision; but where this consideration is not rated highly, a bedroom for two children might reasonably be planned as a bed-sitting room. Space will be needed, in addition to space for two single beds, bedside tables, clothes storage, and storage for personal possessions, for two chairs and a table. Where the parents can provide 2-tier bunks for the children, the extra floor space made available could allow a room of this kind to be extremely useful.
- 38 The main double bedroom can normally be designed only for sleeping and dressing. There should be room for a double or two single beds, bedside tables, a dressing table, a chest of drawers and a double wardrobe. Other double bedrooms not designed as bed-sitting rooms require space for all these items except the wardrobe, which should be built in (see para. 103).
- 39 If the heating will need topping up, the planning of bedrooms should allow space for the heater to be used safely.
- 40 In recent years there has been some advocacy of the idea that bedrooms themselves might be reduced considerably in size, so that while preserving or indeed attaining privacy for the space used for sleeping and dressing, the designer can make available a reasonably large space for joint use, for example as a playroom. With these arrangements the bed and a store for clothes, and perhaps a chair and a small working surface, are provided in a small room, the doors of which can be shut when privacy is called for, and can be opened at night for increased ventilation. In this way, children can at any rate undress in private and sleep perhaps with less disturbance than if they shared a double bedroom. Such rooms may nevertheless not be large enough to nurse a sick child conveniently and keep him amused. In some arrangements the playroom could be used when there is illness, but if it takes the form of an enlarged landing or hall, the noise and disturbance will make it unsatisfactory for this purpose. The arrangement generally is perhaps more suitable for dwellings planned all on one floor, and may offer one practicable way of giving the adolescent children of families housed in flats a social area of their own. The use of these sizes of bedroom is of course not a means of reducing the minimum overall floor area, which we are proposing should be set by the number of people for which the house or flat is designed.

Pram space

- 41 A family home should always be planned with an inside space suitable for keeping a pram and a folding push chair. Mothers do not like to keep these articles in either garages or stores, whether within the four walls of the home or not, because even if they do not get cold and damp they are liable to get scratched. Just as important is the need to provide for easy

manoeuvring of the pram indoors, so that it can be used as a cot during the day if need be. Judging by the efforts which many mothers will make to get the pram up the stairway to the flat even when there is a ground floor store, pram space indoors seems to be called for even in blocks of flats with no lift.

Bathrooms

- 42 Some plans do little more than accommodate the bath and the other fittings, and give insufficient space for people to dry themselves and to bath a baby conveniently and without danger. The bathroom in the family home should always provide sufficient space for these purposes.

W.Cs.

- 43 In two- or three-storey houses, a second W.C., with one of them on the entrance floor, is preferred whatever the size of family. But the desirable is not always possible, and our conclusions on the minimum satisfactory scale of provision are as follows:

3 person families	1 W.C., which may be combined with the bathroom
4 person families and 5 person families in one-level dwellings	1 W.C., separate from bathroom
5 person and larger families in 2 or 3 storey houses or in two-level maisonnettes	1 W.C. combined with bathroom and 1 W.C. separate
6 person and larger families in one-level dwellings	

- 44 We received strong medical evidence about the importance of providing facilities immediately adjacent to the W.C. for washing the hands. The case for such facilities is the high incidence of gastro-intestinal infection, that is to say food poisoning and dysentery; the frequency with which these infections spread within the same family; and the fact that the major cause of the spread is lack of adequate hand-washing facilities. Without such facilities it is certainly impossible to train children in the importance of hand-washing, and we therefore think that, except where a W.C. adjoins a bathroom, a wash basin should be provided in the compartment.
- 45 It should be unnecessary to say so, but it is important to adhere to the principle that, except in bed-sitting room and one bedroom flats, there should be access from all bedrooms to a W.C. without passing through any other room.

Floor space requirements

- 46 Details of the floor space requirements which we recommend for 3, 4, 5 and 6 person families are given in Section IV of this chapter.

B HOMES FOR MARRIED COUPLES

- 47 Accommodation suited to a married couple will need to provide a living area, a kitchen, a double bedroom, a combined bathroom and W.C.
- 48 The living area must accommodate activities ranging from entertaining, watching television, or sewing and mending and hobbies, to writing letters, reading and relaxing. Space must be provided for two easy chairs,

a settee, a low small table and a television set, and places suitable for a reasonable quantity of other possessions such as sewing box, radiogram and bookcase.

- 49 The arrangements for eating should be designed in the light of paragraphs 33 and 34 above—some meals will often be taken in the kitchen, but a space in the living room suitable for meals should be provided, with room enough for guests.
- 50 The organisation and equipment of the kitchen are considered in detail in Section II of this chapter. Married couples are likely to own as much household labour-saving equipment as families with children, and storage space for it is a necessary provision.
- 51 The bedroom should be planned with space for a double or two single beds, bedside tables, a dressing table and a chest of drawers. Because of the widespread practice of acquiring a wardrobe at an early stage, built-in clothes storage is not normally required. But the practice is not universal and sometimes built-in clothes storage may be called for; cupboards are always useful.

Floor space requirements

- 52 Details of the floor space requirements which we recommend for this type of home are given in Section IV of this chapter.
- 53 Many married couples will require larger accommodation because they wish to have a spare room so that friends, or children who have left home, will be able to visit them. Some other two person families such as widow and child will in practice need larger accommodation because they need separate bedrooms.

C HOMES FOR PERSONS LIVING ALONE

- 54 With smaller dwellings, and especially with homes for persons living on their own, the design problem is somewhat simpler than it is with dwellings for families, because not only is there more space per person but also the contrivance of means by which conflicting activities can be carried on simultaneously is either less difficult, or with one person dwellings, not necessary.
- 55 Higher standards of living can be expected to give rise in the future to a demand from many single persons now living with their families or in lodgings for a self-contained home of their own. We believe that the self-contained bed-sitting room dwelling is likely to continue to be acceptable. The floor space requirements which we recommend for this type of home, and for the home in which a separate bedroom is provided, are given in Section IV of this chapter.

D ELDERLY PEOPLE

- 56 The great increase in the proportion of elderly people in the population means that one of the major tasks for at least the next decade is the provision of a large number of dwellings specially suited to their needs. But the needs of elderly people vary greatly. Some want to stay in the homes where they have spent their lives; many can continue active and

independent until an advanced age if they can have something smaller and easier to run than a family home; some, less active though not needing residential care and attention, need specially designed accommodation with some help close at hand if they are to remain independent.

- 57 In general it will be the smaller home which is likely to be built with the needs of active old people in mind, and on the present standards the floor space for old people's dwellings is lower than it is for married couples of working age. We do not think that this is right, and our recommendations do not differentiate in this way. There will of course be special safety precautions desirable for the old, such as a means to make it easier for them to get in and out of the bath—or a body spray, and cupboards and slot meters so planned that they do not have to climb on to chairs to get to them, and so on; but it seems to us that the sensible thing is to ensure that so far as possible bungalows and small flats are designed and equipped so as to be suitable for young and old alike, including the special provisions necessary for the old.
- 58 For old people who need help at hand, the Ministry of recent years have been active in promoting flatlets, and have published two booklets about them. Flatlets clearly meet the requirements of less active old people for a small and easily run home of their own, with a warden at hand to help in case of need and with the companionship of other people in the same block. It is early for us to express an opinion on the standards adopted, but we feel that the sharing of W.C's. should not be regarded as an essential feature of flatlet design. We have noted that the Ministry are themselves trying out a design with separate W.C's. in one of their development projects.
- 59 In our visits we saw a number of self-contained dwellings for elderly married couples where there were open double bed recesses, sometimes curtained, and large numbers of such dwellings have been built. The arrangement is an economical one and it has been argued that a room with a bed recess is warmer for old people than a separate bedroom. But we do not regard the arrangement as wholly satisfactory for two people and some old people do not seem to like it. Given reasonable heating in the future we see no advantage in building more of them: and we are glad to note that the Ministry in "More Flatlets for Old People" have made a definite recommendation in favour of two separate rooms for dwellings for two persons.

E VERY SMALL HOUSES AND BUNGALOWS

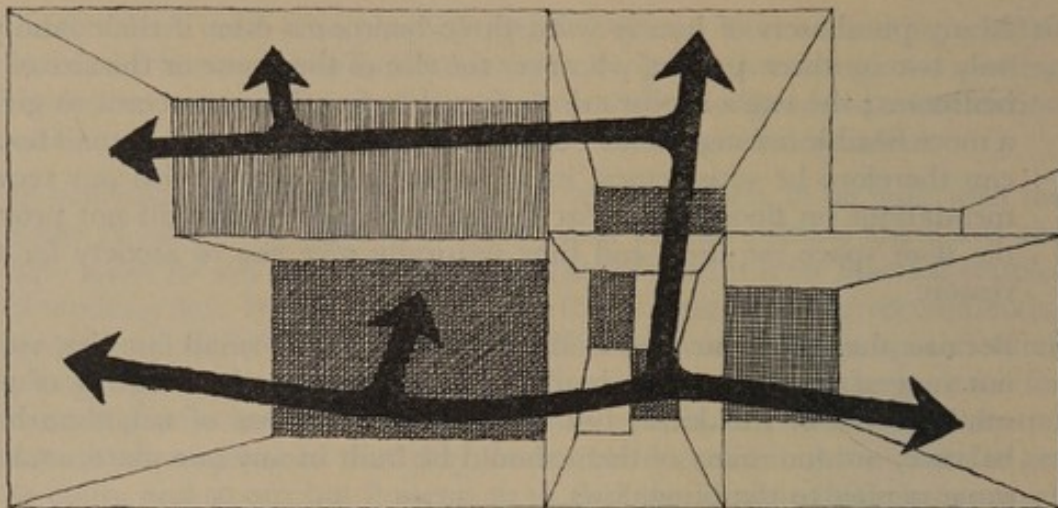
- 60 We were especially asked to consider the problem of the very small private enterprise house, a small number of influential witnesses representing to us that houses were being built to such inadequate floor areas as to lead to overcrowding, and with room sizes and aggregate living areas well below the present local authority standards. The problem—and we received little evidence that it is a large one—arises mainly with the house which, although small in total area, nevertheless has three bedrooms and hence could sleep a family of five. There is also the case of the small bungalow, which presents problems when built in relatively large numbers in one place, even though there may be little wrong with the room sizes.

- 61 Many purchasers of houses want three bedrooms even if their family is only two or three people, whatever the size of the house or the size of the bedrooms; the extra rooms are preferred to fewer larger rooms as giving a more flexible arrangement. For small households these very small houses can therefore be satisfactory, in so far as they comply with our recommendations on floor space. For larger households they will not provide the floor space required and they naturally give rise to anxiety for this reason.
- 62 Because they offer one way of meeting the needs of small families, we do not suggest that measures should be taken to stop the building of very small houses of this kind; but of course, for reasons of neighbourhood balance, not too many of them should be built in any one place, and the same applies to the bungalows.
- 63 We believe that the difficulties arising from the small dwelling can be mitigated, but we do not suggest that they can be overcome entirely. We understand that neighbourhood balance and the needs of the area are considerations which can be brought to bear, within the existing powers of planning authorities, upon applications for planning permission. With limitations of numbers on any one site, and with the common sense and relative mobility of the type of household concerned, we do not believe that the remaining problem will be large.

II Factors in home design

A HEATING THE HOME

- 64 Family life is both communal and individual. There is the process of coming together for activities in which the family joins as a whole—meals, conversation, common pursuits, and so on; and there is the need for privacy to pursue individual activities such as reading, writing, and following particular hobbies. This dual tendency in family life has always been handicapped during the winter months, except amongst the well-off, because of the inability of most people to afford heating in more than one or perhaps two living rooms. At least half the rooms in most dwellings have, therefore, been relegated for sleeping only—a habit which has set the pattern for the rest of the year as well. Yet it is strange that half of what we build, and therefore half of what we pay for, is reserved for use during the hours of darkness when we are unconscious of our surroundings.
- 65 Better heating is the key to the design of homes at the present time, for it provides an extra degree of freedom in meeting individual needs in the areas of the home which at present are too cold to be suitable for daytime and evening use except in the summer. But there is an increasing demand for higher comfort levels anyway; whether the design of homes takes radically new directions or not, the person moving into a new home increasingly expects to be *warm*. In factory and office such a standard is usually taken for granted, and the expectation is spreading to the home. The evidence on this point was emphatic; better heating took second



priority only to adequate space. It is clear from the figures for electric heaters (deliveries to the home market estimated as doubled 1954-60) and paraffin heaters (about three households in five now have one) that the demand for heat is insistent; and it is clear that sufficient people are prepared to pay for it, so long as the source is convenient and the expenditure under their own control, to necessitate a much higher heating standard in new dwellings if they are to give satisfaction.

- 66 We have considered whether this generalisation might be subject to regional variations, or to special local factors such as concessionary coal. Such variations as do exist appear to be very small, and we do not regard them as significant. We therefore think it is time to recognise that a home without good heating is a home built to the standards of a bygone age. The nation has enough of those already.

Present practice

- 67 In local authority houses, the common practice is to install only an open fire with backboiler. A small proportion have a high output backboiler which besides heating the water feeds one or two radiators. Some installations have an open fire in a living room, and an independent boiler in the kitchen for water heating. There are also examples of openable stoves in living rooms and of electric floor warming and gas warm air systems. In high flats, it is now increasingly common to provide either electric floor warming or gas warm air or some other system which demands neither the cartage of fuel to each flat nor the provision of individual fuel stores or bulky flues, which does not develop a concentration of atmospheric pollution and which allows the running cost to be wholly or mainly under the control of the tenant. In low blocks the cartage and storage of fuel and the bulk of flues present smaller problems and, unless there are tall blocks nearby, approved appliances to burn smokeless solid fuel are usually provided, though here too there is increasing use of electric floor warming and gas warm air. Whether in houses or in flats the main emphasis is on installed heat for the living room, usually to the exclusion of the kitchen, the circulation space, the bathroom and the bedrooms.
- 68 In private enterprise housing similar patterns and trends can be seen, although there may be a greater proportion of houses with two solid fuel

appliances, partly because this is a traditional expectation and partly because it can sometimes be supplied on demand as an extra item. It is likely that a larger proportion of private enterprise houses have electric floor warming or gas warm air, though the numbers can scarcely be large; and a higher proportion will have one or more radiators with or without a heated towel rail, the radiator surface in some few installations being sufficient to provide space heating for the whole house.

Standards

- 69 We propose that the minimum standard should be an installation capable of heating the kitchen and the areas used for circulation to 55°F. and the living areas to 65°F., when the outside temperature is 30°F. Where a home is equipped for this standard the necessary topping up for occasional use of bedrooms is not greatly inconvenient, and at little extra expense they can also be topped up for use as studies or bed-sitting rooms. But where family requirements are clearly going to demand such use as a matter of course—and this may become widespread within the life of the building—a more expensive installation capable of heating the bedrooms to 65°F. as well will represent the greater value for money.

Convenience

- 70 Whether the performance level adopted is the recommended minimum or something better, there is a clear trend of demand towards systems which are clean and require little or no attention. They must also be safe, and convenient in use. A mother looking after a family wants a system that does not take too much of her time and effort and quickly gives her a warm house when she returns from shopping and taking the smaller children to school—though here we judge flexibility to be less important than the general level of continuous heat at reasonable cost. A family out at work all day needs an installation which is labour-saving and will rapidly build up the temperature to comfort level when they return, not leaving them cold for much of the evening while it gets into its stride. On the other hand the heating system should be capable of being run at a low level. In many modern buildings freedom from serious condensation appears to depend upon the temperature not dropping below a certain point, and therefore in blocks of flats some developers are arranging to supply this necessary minimum of heat outside the control of the occupier.

Control of expenditure

- 71 In general, it is necessary for the occupier to be able to control the expenditure, and experience has shown that standing charges can present difficulties with some families. In the lives of most people there are times when they are short of money, and it is important that economies should be possible in heating costs. This means that except in very high income dwellings there is a general dislike of central systems where the supply cannot be metered and a fixed charge is therefore necessarily made.

Costs

- 72 Little information is widely available about the costs of providing and running good heating systems for houses. We therefore undertook a study of the available heating methods and the various fuels, and the results are given in full in Appendix 2.

- 73 Because in a house with an installation supplying a relatively poor standard of heat the occupiers will spend money on topping up, and because a good system can be under-run if the occupier prefers, there is likely to be little difference for a particular household in the total average annual bill for space heating and hot water whether the present average system is installed, or a system heating the ground floor only, or a system heating the whole house. The capital and running costs for the minimum standard seem to us to be well within the range of immediate practicability for local authorities and private builders alike, and of course some are already building to this standard and better. For systems heating bedrooms as well, the matter turns largely on capital cost, and the aim here, as with all the other minimum standards which we are recommending, should be a progressive raising of standards through the years.

Thermal insulation

- 74 Although there has been much improvement since the war, it is by no means the usual practice for a house to be designed for reasonably low heat loss as such. In private enterprise practice, for example, the supply of first floor ceiling insulation has usually been optional; and a sample taken in 1958 of local authority practice suggested that less than half of the authorities installed such insulation. The weather-stripping of external doors, which can save a large quantity of heat at low cost, is rare, and so are other measures to ensure the absence of draughts. Yet the consumer demand for these things is clear from the extent to which occupiers themselves attempt to overcome these deficiencies; and the case for them in terms of the reduction in the extra cost of better heating is extremely strong.
- 75 We were encouraged to note that in Circular No. 63/59 the Minister urged the adoption of a new model byelaw laying down higher standards of insulation. These represent a great improvement, and 700 local authorities have adopted the byelaw or are at present doing so. In view of the importance of thermal insulation when a better standard of heating, which we recommend, is provided, it is essential that when the matter is next reviewed, these provisions, or something better, should become universal.
- 76 As a number of witnesses referred to double glazing, we looked into the matter, and attach a note at Appendix 3.

Ventilation

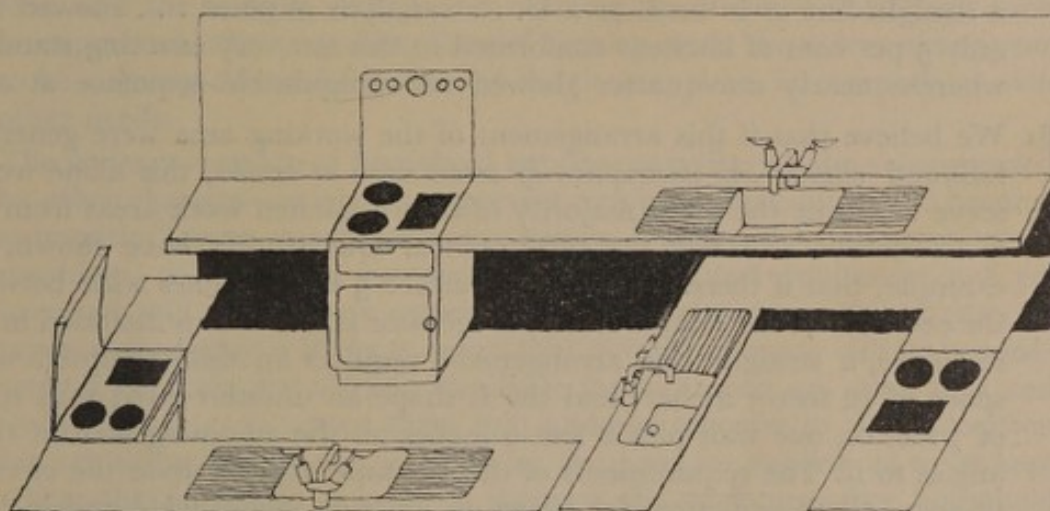
- 77 It was suggested to us that heating methods which dispense with the need for a flue make it necessary to pay special attention to ventilation. Most of the evidence on ventilation implied that the problem is normally to keep unwanted ventilation within reasonable bounds, and we think that this is right, though more information on the rates of air change in flue-less dwellings should be obtained.

B KITCHENS

- 78 We have already noted in paragraphs 33 and 34 the necessity for relating the design of kitchens to the widespread practice of taking at least some meals there. This Section is primarily concerned with the working area of the kitchen.

Organisation of the working area

- 79 The kitchen is the most intensively used room in the house and yet it is also the room which in many recent homes retains some of the character of the nineteenth century scullery. At the present time only a small number of kitchens in local authority houses are reaching the really high standard required, and although in private enterprise kitchens there is much more attention paid to appearance and cheerfulness there is lacking still the thought and organisation that can make a kitchen an efficient and satisfactory place to work in. A woman needs all the help she can get from her kitchen, whether or not she has a family to look after or has to run a job as well as a home. So for that matter does her husband; for him the kitchen is nowadays a place of work, too.



- 80 A great deal is already known about the organisation and planning of kitchens. For example there has been much study in the United States and Denmark; and the Netherlands Bouwcentrum have published an extensive study, available in English. The Building Research Station has published a number of articles, and in association with the Council of Scientific Management in the Home has done work published in "Meals in Modern Homes", which was widely distributed when put on sale by the Council in 1955. Following these studies the general principles on which a domestic kitchen should be planned do not appear to be in serious doubt, and they were summarised in the evidence prepared by the Building Research Station:

Kitchen Sequence

"Four important findings of these inquiries were:

- (a) In food preparation most moves take place between sink and cooker and work-surface and cooker, and very few moves take place between food stores (larder, refrigerator, dry goods store) and the working area.
- (b) Because pan-handles project, and pans have to be put down beside the cooker, a work surface on each side of the cooker is highly desirable.

- (c) One work surface must be quite large. The kitchen table traditionally serves this purpose, and provision of, or for, a table, which can also be used for meals, is strongly recommended. In that case one surface in the work sequence should be large enough for serving up a main meal.
- (d) Cooking utensils are most conveniently stored near to the sink and cooker (e.g. above the central work surface) where they are used. Small utensils and implements are also best located in a drawer in this area.

"These considerations led to the setting up of a work sequence standard designed to satisfy the above criteria; it should comprise work surface/cooker/work surface/sink/work surface (or the same in reverse order) unbroken by a door or other traffic way and arranged either in a straight line or in an L or a U. . . . analysis of plans . . . showed that only 5 per cent of kitchens conformed to this not very exacting standard whereas nearly one-quarter showed no recognisable sequence at all."

- 81 We believe that if this arrangement of the working area were generally followed *without any interruption by access doors or larders*, this alone would serve to rescue the great majority of future kitchen work areas from the worst defects of much present practice. Our studies have shown, for example, that if there is a working surface 3 feet 6 inches wide between the cooker and the sink, and if a refrigerator larder unit is included in the sequence, a straight line arrangement requires an uninterrupted wall-space of 12 feet 3 inches; and the L shape an uninterrupted wall space of 7 feet on one wall plus 8 feet 9 inches on the adjoining wall at right angles to it. The requirements of the U shape depend upon the circumstances. All these figures are based on units 21 inches wide and include one such width for a cooker and one for the refrigerator larder unit. Cookers and refrigerators wider than 21 inches, as they frequently are nowadays, obviously call for modifications; and slightly larger spaces should also be left if the equipment is not provided with the building. Again, where the food storage arrangements are not included in the sequence—and there is no necessity for them to be—the length can be reduced. A sequence of this general kind, uninterrupted by access doors and larders, we commend for general use. It should be noted that although for safety reasons and general convenience working surfaces at either side of the sink should be at the same height as the rim of the sink, and that those on either side of the cooker require to be at the same height as the boiling plates or rings, the work tops need not necessarily run at the same height throughout their length.
- 82 We noted occasionally in the evidence the view that the working area of a kitchen should be arranged so that a sequence of operations could be followed—delivery, storage, preparation, cooking and serving of food. We believe that this derives from large-scale catering practice, and is superseded by the research summarised in the Building Research Station evidence.

Domestic Appliances

- 83 In the years to come the numbers and size of household appliances in a home can be expected to increase steadily. Most washing machines

and driers at present marketed depend on the sink for the supply and disposal of water, and it seems desirable to store them near where they are to be used. The designer should therefore provide a sufficient space near the sink for this purpose.

- 84 A number of designers have worked upon the idea of utilising the bathroom as the room in which laundry is done, and where the washing machinery can be built in, so that there is no electrical danger, this is one solution. The thoughts of others, inspired by much American and continental practice, and by the recommendations of the Dudley Committee, have turned to the utility room. All of them aim at the separation of activities such as household washing from the kitchen, on the general assumption that the kitchen in the future will specialise in functions associated with the storage, preparation, and cooking of food and the serving, eating and clearing up of meals. Although such arrangements offer promising lines of development, there does not appear to be a strong demand for them at the present time, in comparison with other needs.
- 85 The wider ownership of household appliances is likely to be accompanied by other changes—machines at present requiring attendance will become automatic; some machines now rarely found, such as washing-up machines, will become increasingly common; and appliances not yet invented will make their appearance. The increase in the number of types of appliance is likely to mean that more floor space will be needed: some appliances are already available for mounting on work tops and walls, but space is scarce there too; and the increase in the proportion not requiring attendance may reduce the need for appliances to be kept where the housewife can watch them as she performs other household tasks. It would be asking too much to expect that kitchens could be designed so that these and other changes did not make them obsolete in time, but in the light of these considerations the designer should provide a space in or near the working area to accommodate household machines that may come into general use in the future.
- 86 If household equipment would normally have been provided, but because of economic conditions at the time of building cannot be afforded, the planning should allow for its inclusion at a later date.

Kitchen Storage

- 87 Storage for kitchen operations has to take account of operations which start there and end up there as well as those which are wholly or mainly done there. Of the latter, requisites for preparation, cooking, serving up, washing up and disposal of waste are clear examples. Operations which often start and end up in the kitchen include cleaning, and usually household washing and ironing. All of these operations involve storage requirements, and much of the storage can and should be arranged, with an eye to the way in which it is likely to be used, adjacent to the working surfaces and the kitchen table, though some can be elsewhere. Among the groups of items to be stored will be foods and drinks, crockery, pots and pans, kitchen tools and cleaning materials and equipment. These require a great deal of space and it is not to be wondered at that, as the Building Research Station have found, the average present provision in local authority houses, just over 40 cubic feet and 3 feet 6 inches of

shelving, is often inadequate. The average provision in 5 person houses built by local authorities in the early post-war years was about 90 cubic feet with 9 feet of shelving, and this may be generous. On the other hand, taking into account the floor polishers, mixers, ironing machines, toasters, bread slicers and all the other portable equipment likely to come into our homes as the years go by, we feel that at least 80 cubic feet of installed storage space in or adjacent to the kitchen is required in 4 and 5 person homes, and nearly as much in smaller ones.

Food Storage

- 88 In some areas local legislation requires a new dwelling to have a larder, and usually requires that it should be ventilated to the outside air. In all areas provision of larders ventilated to the outside air is almost universal practice. In many types of dwelling with a restricted frontage, such as terrace houses and blocks of flats, the larder is to be found occupying an appreciable proportion of the scarce external wall, thus making a satisfactory run of working surface almost impossible.
- 89 The requirement for the storage of perishable food is a relatively low temperature, because above about 45° F. the bacteria likely to cause decomposition of the food and make it unfit to eat, and the food poisoning organisms which can cause disease begin to multiply very rapidly. Of itself, ventilation of the larder has no obvious value. With fresh vegetables, the position is in theory slightly different, because certain vegetables give off carbon dioxide. A person entering a large unventilated store where very large quantities of such vegetables were kept might therefore be overcome. This is unlikely to happen to anyone keeping a fortnight's supply of potatoes and a few green vegetables, and the case for ventilation of the modern larder on these grounds is therefore weak, not to say negligible; and if any case were thought to remain it would be a case for making some provision to ensure that the minute quantities of carbon dioxide can escape, though this would not necessarily mean ventilation to the outside air. The minimum requirement for the storage of perishable food is therefore a cool cupboard, which should be provided. If the only way to try to keep the cupboard cool is to pass air through it then by all means that should be arranged, if necessary by a duct to the outside air. The cupboard should be placed where it does not obstruct a good kitchen arrangement and not necessarily on the outside wall. Indeed if the outside wall faces south or west there are positive reasons for having the cupboard elsewhere.
- 90 The increasing proportion of food which is packaged allows the whole concept of the present-day larder to be thought out afresh, and in homes where the occupiers can be expected to have a refrigerator of reasonable size the larder is of declining importance so long as a cool place is available for the storage of vegetables in the quantities ordinarily kept nowadays. This will also allow the housewife to store such perishable food as she may not want to put into the refrigerator.

Condensation in Kitchens

- 91 The evidence we received made it clear that this is a widespread and serious problem, or at best one that is never far from being serious at certain times of the year if the kitchen is unheated.

- 92 Our recommendations on heating will help in this direction, but when water vapour is produced in quantity condensation is only to be expected unless special measures are taken. These may include double glazing, special treatment of wall surfaces, and mechanical extract ventilation, preferably arranged with hoods over areas where the water vapour is produced. These measures seem to us too expensive for general adoption having regard to other needs, but there is no doubt that improvements in this direction would be widely welcomed. Easily controllable fanlight or similar windows are of course always necessary in a kitchen where mechanical ventilation is not provided.

Miscellaneous

- 93 We should also like to mention certain other matters to which reference was made in evidence:
- (1) A person working at the sink should be able to see out of the window. This cannot always be done, but is a clear preference.
 - (2) There should be good light, especially to the cooker and sink, and to the interior of cupboards.
 - (3) The relation of the kitchen to the place outside where children are likely to play should be considered.

C STORAGE

- 94 Most people have some tendency to hoard, and there are often very good reasons why they should do so. Many things, such as summer or winter clothing, are only in seasonal use; other things such as luggage trunks are needed only from time to time; equipment useful in sickness may only be used at very long intervals; and yet other things, often quite bulky things, such as equipment for babies, may need to be stored for many years. We believe that even if the junk, of which everybody has some, were cleared out from the average home, the household would still not find its reasonable storage requirements met in the arrangements at present being provided, whether in private enterprise or in local authority dwellings.
- 95 This is of course not solely, perhaps not even mainly, a question of the number of cubic feet of storage—it is as much a matter of the positioning and accessibility of the space available. Things need to be stored near where they are used or if this is not possible where they are out of the way of other activities but still reasonably accessible. The storage has to be distributed therefore about the house and the garden or about the flat, and there may be positive advantage in not having it all in one place.

Garden equipment, bicycles, and general purposes

- 96 The present practice with local authority houses is to provide a store inside or outside the main walls of the house of about 50 square feet in area. These stores are sometimes designed to contain a dustbin and a fuel bin, and, if the house is in a terrace, sometimes provide a way through the house as well. We found it to be the universal feeling among the tenants of local authority houses of the sizes now being built that if the store contains the dustbin and/or the fuel, the accommodation is insufficient for the kinds of things that the tenant wishes to keep in it. If the store also serves as a passage, it is even more inadequate.

- 97 We recommend that the general storage area in the local authority house for 4 or more persons should be 50 sq. ft. exclusive of fuel bins, dustbins and access ways, with slightly less for smaller families. The storage space need not necessarily be all on the same floor, so long as the net ground floor storage is not less than 25 sq. ft.
- 98 In local authority flats and maisonettes, the usual practice is to provide no general storage space within the dwelling, but some authorities are at present providing one ground level store of about 20 sq. ft. for about 50 per cent. of the dwellings. There is a strong demand for storage space within the flat, and we recommend that 15 sq. ft. should always be provided in flats and maisonettes for 4 or more persons, with slightly less for smaller families. There should also be a separate store elsewhere of 20 sq. ft. for each dwelling. Multi-storey dwellings with individual gardens need additional storage for garden tools.
- 99 If there is a garage integral with or adjoining the house and going with it, we consider that any garage area in excess of 130 sq. ft. should be allowed to count for general storage. Where a garage for a flat is integral with or adjacent to the block, any excess garage area may be counted in respect of the external storage requirement. But because the required 20 sq. ft. minimum is too small to be useful if split up, the excess garage area should count only if it is 20 sq. ft. or more.
- 100 A summary of storage requirements is given at the end of this chapter.
- 101 In private enterprise dwellings the general practice is not to provide any such storage and to leave the occupier either to provide himself with a shed (or perhaps the builder puts it up at extra cost) or else to provide a garage, whether as an extra or as an inclusive item in the price. The occupiers normally provide themselves with storage facilities of some kind, or with a garage, soon after moving in, but this often leads to an unsightly assortment of buildings. In houses built for sale, considerable benefits to the ultimate appearance of the estate can be obtained if the houses are sold subject to restrictive covenants safeguarding the design of any additional outbuildings.

Use of roof space

- 102 The roof space of a house is of course useful for keeping many things of the kind that are used only at relatively long intervals. In local authority housing very little use is made of this valuable space, partly we feel because some authorities take the view that if the occupier is encouraged to use the space for storage he will put his foot through the ceiling, or will accumulate inflammable material. Some authorities even seem to specify that the trap door into the roof should be so small as to make it quite difficult to employ the roof space for any purpose other than the inspection of its structure. This was perhaps sensible in houses built with small section joists during the timber shortage. Nowadays, the balance of advantage lies in providing for occupiers to use their roof space as extra storage, by making it safe and convenient for them to do so.

Clothes and linen cupboards

- 103 Where built-in cupboards in or near the bedrooms are not available the occupier must provide some substitute for himself, possibly either a

wardrobe, or a rail, or shelves, or a curtain. Some families, on moving in, already own a wardrobe. From the evidence and the impressions gathered from our visits, we find at present that most married couples have a wardrobe for their own room, and it is not therefore so necessary to provide one for the main bedroom as it is for other bedrooms; though we believe that the long term trend is towards built-in wardrobes and it should be provided wherever possible. In other bedrooms, cupboards should be provided at the rate of 2 ft. of rail per occupier, not less than 21 ins. deep internally to allow for clothes on hangers. In planning the main bedroom, it may often be possible to contrive a recess which will either accommodate the wardrobe or be capable of being readily made into a cupboard by the occupier. (See para. 22).

- 104 There should always be space for hats, coats and outdoor footwear near the main entrance of the dwelling. In some localities additional and suitable facilities for leaving working clothes will be required, perhaps by the back door, preferably in conjunction with a lobby.
- 105 It is the general practice to provide a cupboard, which we regard as essential, for the storage of linen, usually in combination with the hot water cylinder. Such a cupboard is normally used for airing clothes and linen or keeping them dry. Where the tank is thoroughly lagged the heat escaping may sometimes be insufficient for these purposes, but we believe that alternative arrangements can reasonably be left to the householder.
- 106 In considering our recommendations on the subject of storage, we have been conscious of the lack of accurate information about the possessions which the average family in various income groups chooses to keep, with the result that designers are short of facts on which to base their work. We think it would be very helpful if a factual investigation were made.

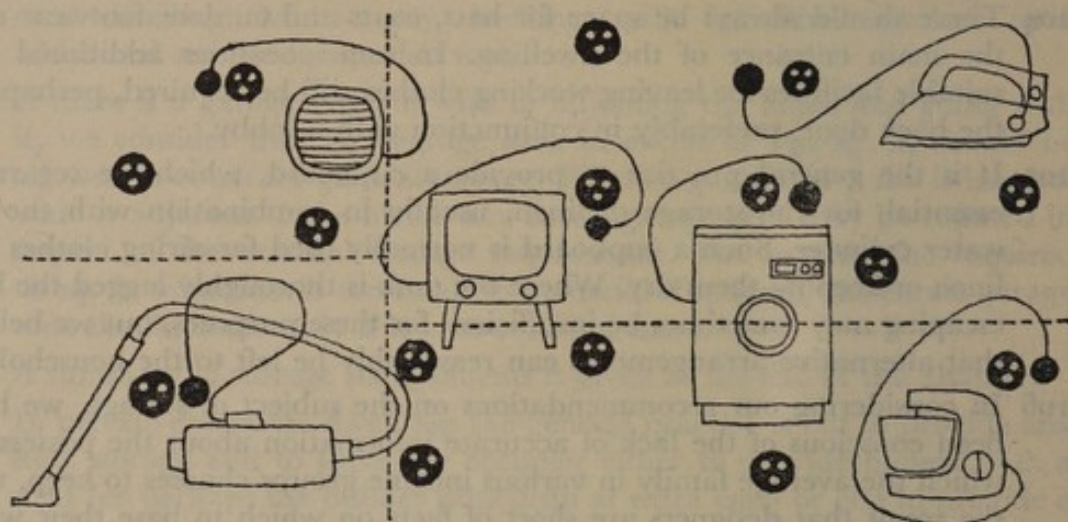
Solid fuel

- 107 A store for solid fuel should be so arranged that it is convenient to the householder and yet there is no need for the coalman to enter any part of the house or flat.
- 108 The desirable size of a fuel store is no doubt very large—the Coal Utilisation Council recommended to us 30 sq. ft. for houses—and the advantages in being able to purchase at summer prices and store a large quantity of bulky smokeless fuel are considerable. The comparison with the ease and speed with which paraffin can be obtained suggests nevertheless that there is scope for some of those who market solid fuel to improve their sales and delivery methods, and we were glad to learn that various schemes are in hand for this.
- 109 Having regard to the other calls on space and money, we think that the present Ministry recommendations for minimum solid fuel storage can stand. For houses they are 12 sq. ft. if one appliance is installed, and 20 sq. ft. if there are two, or in rural areas; for flats the figure is 9 sq. ft. if there is no auxiliary storage elsewhere.

D ELECTRIC SOCKETS

- 110 The general practice at the present time is to provide the minimum number of outlets for which the area Electricity Board in newly developed areas where they are empowered to make a charge will install the supply cable free. We understand that for the average house this number is six.

- 111 It is the common experience that, because of the inadequate number of sockets, domestic installations are characterised by adapters, long pieces of flex and general inconvenience. The Building Research Station has conducted a survey, published in the *Electrical Times* dated 12th November, 1959, of the numbers of appliances in use in 120 local authority dwellings. The conclusion of this survey was that in a house designed for five people about 15 electric points are required to meet reasonable present day needs. It was also found that the location of the sockets is important; for example where there are two sockets in a room (other than a double socket) they should not be near to one another but should preferably be on opposite walls.



- 112 We endorse these conclusions. The positioning of the sockets with an eye to their likely use is extremely important and we have found on our visits that in many dwellings the sockets have obviously been located with a view more to saving wire than with the aim of putting them in the place where they are most likely to be needed.
- 113 Between 1951 and 1957 expenditure on electrical goods rose by 130 per cent., more than two and a half times faster than the 51 per cent. rise in consumer expenditure generally in the same period. Although an increasing proportion of some entertainment goods such as radios and tape recorders may come to be powered by batteries, we feel that the trend is sufficiently clear cut to warrant, wherever it can be afforded, a figure of 20 sockets (some of which can be doubles, which are much cheaper than two single sockets, but without prejudice to the desirability of not concentrating the sockets in a room in one group). Where 20 sockets cannot be afforded, at least 15 should be provided.
- 114 Because the ultimate future demand is unknown, and because no matter how carefully socket outlets are positioned some will inevitably be located where furniture will need to be placed, we believe it is desirable to arrange the wiring so that it can conveniently service future outlets; and, further, that research is needed into methods of initial installation which will enable future outlets to be added at minimum cost and disturbance.

- 115 The following scale can be used for dwellings for other sizes of household as well:

<i>Part of dwelling</i>	<i>Desirable provision</i>	<i>Minimum provision</i>
Working area of kitchen	4	4
Dining area	2	1
Living area	5	3
First (or only) double B.R.	3	2
Other double B.R.'s	2	2
Single B.R.'s	2	2
Hall or landing	1	1
Store/Workshop/Garage	1	—
	20	15
Single study B.R.'s	2	2
Single bedsitting rooms in family dwellings	3	3
Single bedsitting rooms in self contained bedsitting room dwellings	5	5

E SAFETY

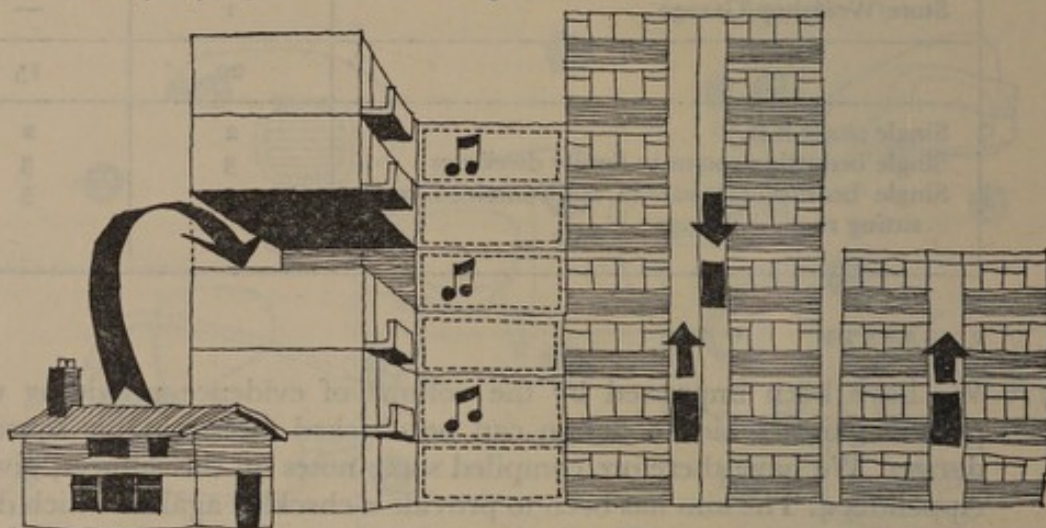
- 116 We have been impressed by the volume of evidence providing useful points against which a design can be checked for avoidable sources of danger. We have therefore compiled some notes on this subject, given in Appendix 4. The aim has been to provide a checklist against which details of plans can be tested. The list is restricted generally to points of design; it does not go into detail on matters which are the subject of byelaws or British Standard Codes of Practice. We understand that the Ministry has in preparation a publication on the design of dwellings for old people, and we have not, therefore, dealt with the special provisions required for them.

III Aspects of living in flats

Introduction

- 117 Local authority flats built since the war have been built to standards which before the war were scarcely dreamt of for anything but the luxury market. Above three storeys, or sometimes four, there is a lift service; the flats often have a balcony and are often better equipped than houses with kitchen fittings; and of recent years a beginning has been made with bringing the heating to a comparatively good standard and with improvements in sound insulation. Floor space standards, especially for the larger family, have nevertheless been inadequate, and we are recommending that standards of accommodation and storage should be made comparable with those for houses. With a higher proportion of the homes built in the future likely to be flats it seems to us essential that the families who move into them should have enough room to live in them comfortably.

- 118 The human problem for the future in the design of flats and maisonettes is to provide for people who live in them an environment which is as workable, and as satisfactory, as for people who live in houses. Often most of the needs are met in mixed developments of flats, maisonettes and houses, which provide the opportunity for larger families to live at ground level or near it. For other households, sometimes including families with children, the problems of living at a distance from the ground remain. Ways of meeting the need for outdoor space may come to be found in newer forms of access to the dwellings associated with covered space in the open air at the level of the home, and providing some of the virtues of the back yard and the pedestrian street. Some local authorities are already trying to do something on these lines.



- 119 The economic problem for the future, the high cost of flats and maisonettes, calls for attention in a number of ways. As well as a more realistic approach to the use of lifts—dealt with below—there is needed a rationalisation of the requirements for means of escape in case of fire. We are glad to note that there is a British Standard Code of Practice Committee considering these matters, and we hope that the outcome of their deliberations will be a unification and simplification of the provisions required, leading to a reduction in the total cost. Also needed is a progressive improvement in building technique. The speed of the advances made in the last decade suggests that there are many possibilities still to be exploited.
- 120 The post war rise in living standards has eased one problem associated with the design of flats and made another more acute. The arrival of household washing machines and driers in large numbers is solving the once important issue of whether communal laundries are required; but the increase in the quantities of the empty cartons and packages that people throw away each week is giving rise to difficulties with refuse disposal arrangements, a problem most acute in flats but also having relevance to houses.
- 121 This Section is devoted to a consideration of lifts, private balconies, sound insulation and refuse disposal. As a contribution to the thorough-going appreciation of the special needs of those who live on high density estates, the Section itself makes no more than a beginning. In designing the environment to meet these needs the general approach advocated in this report of basing the design on the needs taken as a whole provides

enormous possibilities for arriving at greatly improved answers to the problems of flat life, and we trust that these opportunities will be taken.

A LIFTS

- 122 The present Ministry recommendation for local authority blocks of flats is for a lift to be provided in buildings in which the entrance to any dwelling is on the fourth storey or above. This means blocks of flats exceeding three storeys, and blocks of maisonettes exceeding four storeys. In buildings of more than six storeys two lifts are required.
- 123 Generally these recommendations are followed but some local authorities are now building without a lift 4-storey blocks of flats, or 5-storey blocks with maisonettes occupying the top two floors; others are building high blocks of 9 or 10 storeys with only one lift, though this is usually done only where there are not more than 4 flats per floor.
- 124 We are not satisfied that the adoption of only one lift is adequate in blocks of 9 or 10 storeys, having regard to the acute inconvenience during household removals, breakdowns, servicing, overhauls, re-ropeing and replacement. We also believe that it is unwise in the long term to provide 4-storey blocks of flats and 5-storey blocks, with maisonettes occupying the top two floors without lifts.
- 125 We think it is right for the present that the existing practice should be the general standard; namely, there should be a lift in buildings in which the entrance to any dwelling is on the fourth storey or above, and in buildings of more than six storeys two lifts should normally be provided.
- 126 In buildings with more than one lift the installation should be arranged so that if one lift is out of action the other will serve the same dwellings. This normally only requires special consideration in staircase access flats, that is to say, slab blocks with two flats at each landing, and can be dealt with by providing a way across the roof in adjacent parts of the block connecting the staircases and lifts, so that when one lift is out of action people can take another up to the top and walk across the roof and down the staircase to their own flat.
- 127 We feel that lifts should be designed to stand up to the ordinary wear and day to day abuse which they actually receive, rather than for less arduous conditions.
- 128 At least one lift in any building should be of a size suitable to take eight persons. There should preferably be windows in the lift doors.
- 129 We have, however, been impressed by the practice in America, which indicates that residential lift installations in this country usually cater for passenger traffic loads which are well below their full capacity. We also feel that duplicate lifts are at the moment being installed here when one highly reliable lift supported by immediately available servicing arrangements would provide an equally good service at much lower cost. We accordingly welcome the fact that the Ministry propose to publish material on the relationship between the size of the lift cars, the speed and distance of lift travel, the arrangement of stops, and the number of people living in the building, taking account of the peak traffic times and the standard of service to be provided. When these considerations have been more fully

explored in the light of the frequency and availability of maintenance there may well be a case for reviewing the present standards for lift installations.

B PRIVATE BALCONIES

- 130 The functions of a private amenity balcony are to provide some sense of contact with the open air and to serve as a sitting out space. A private service balcony may provide access to refuse arrangements and a place for hanging washing. Occupiers often use a private amenity balcony as a place for hanging washing; and either type, especially if sheltered from the rain, will also tend to be used for the storage of various items for which at present there is no storage space elsewhere. Some balconies, naturally, are so placed as to serve all these purposes equally well. Others are too open in design and so provide no screening and little shelter.
- 131 The present Ministry recommendation is that flats and maisonettes which are likely to house families with young children should have a private balcony, preferably not less than 40 sq. ft. in area, and wide enough for a pram and also deck chairs.
- 132 In considering balconies, we devoted some attention to the effect that various kinds of balcony can have on the cost of the flat, and we also considered whether the area of the balcony might not better be taken within the containing walls of the dwelling as additional floor space.
- 133 As is shown in Appendix 8, the cost of a 45 sq. ft. balcony can be of the order of £150, sufficient to pay the cost of an enlargement of the rooms in the dwelling by about 75 sq. ft., even allowing for increased consequential costs of common halls and private circulation space. Expressed in another way, the cost of a balcony may be almost equivalent to the cost of a spare room—not quite because of extra partition costs.
- 134 This study is of considerable interest, but we feel that it would be wrong for us to conclude that balconies do not offer value for money. In many circumstances no doubt they do. We feel that nevertheless there is a more careful choice to be made here than has sometimes been made in the past; but that if a balcony is provided it should be of a size and shape and design suitable for the uses to which it is likely to be put.

C SOUND INSULATION

- 135 It is well known that there is a good deal of disturbance and friction between one tenant and another, particularly in blocks of flats, because of noise nuisance. The tap-tap of stiletto heels, the noise of children running and jumping in the flat above, the sound of the vacuum cleaner and of other pieces of electrical equipment, the radio or television programme—all are irritating and disturbing to neighbours. In some buildings where planning and insulation is particularly poor, the click of electric light switches, the W.C. flush and even conversation can be distinctly heard from flat to flat.
- 136 Clearly the more electrical equipment people buy for household and recreational uses the more the noise nuisance; and greater attention to sound insulation must be paid in future.

- 137 The methods of achieving a reasonably satisfactory reduction of noises carried through the structure are now widely known, though they require great care in design and construction. We note that the British Standards Institution have recently issued a new Code of Practice on Sound Insulation and Noise Reduction and we do not propose to take the matter further ourselves. We think however that the Ministry should see that the recommendations in the Code are widely known and put into practice, and that proper attention is devoted to improving the current standard of sound insulation.

D REFUSE DISPOSAL

- 138 Rising standards of living are creating problems in refuse disposal: new forms of packaging for food and other goods are causing an increase in its volume, and the gradual change in domestic heating arrangements means that people burn a smaller proportion of their rubbish and that some people cannot burn any of it. On older estates of flats this is having serious consequences, with the refuse overflowing the containers and building up in the chutes themselves.
- 139 It is moreover not to be expected that the labour situation will allow any greater frequency of collection in the future, and indeed circumstances have already arisen in which the existing frequency could not be maintained.
- 140 The views of the Institution of Municipal Engineers, which in general we share, were given in their evidence to us as follows:
“... a vast field of research is open to ascertain if more modern facilities could not now be adopted with particular regard to the disposal of the major portion of the refuse by means of smokeless and inoffensive incinerator units for large groups of dwellings or improved methods of disposing of the refuse by water borne systems or individual sink destructors . . . this may raise other complications such as additional water consumption, and increased foul sewage, but this would be no greater problem than our predecessors faced in the changing over from earth closets to a water-carried system. Whilst every effort is made by those responsible for refuse collection, the present unsavoury and insanitary combination of dustbin and dustcart is not in line with 20th century progress in other fields”.
- 141 While the evidence generally was extremely illuminating about the thought which so many people are devoting to this problem, and while many papers provided information on the essential conditions for the satisfactory running of the various possible arrangements, we are convinced that sooner or later public attention will direct itself to the antiquated nature of the facilities commonly provided, even when provided well, and will demand some more satisfactory arrangement.
- 142 With the issue last year of the British Standard Code of Practice, entitled “The Storage and Collection of Refuse from Residential Buildings” (CP306) and with the recent publication in the *Municipal Journal* of the results of research into occupier preferences carried out by the Council of Scientific Management in the Home and the Building Research Station, a code of good practice and an indication of relative choice are available. We commend these to the attention of all concerned.

- 143 The Code deals with conventional arrangements and does not concern itself with water borne systems or with dwelling or site incineration facilities. These appear to offer the major prospects for progress in this field, though we should like to mention also the progress being made in the design of refuse chutes. The turntable devised by the London County Council, suitable for holding up to six containers at the base of a chute, will allow an empty container to be pushed easily into position under the chute when the previous one is full. The saving in cost, compared with the larger number of chutes which are necessary to take the same output of refuse between collection times if the chambers will house only one or two containers, allows the one chute to be of larger diameter, thus reducing the risk of blockages. Chutes should of course be located so that the noise creates as little disturbance as possible to people living in adjacent flats.
- 144 *Sink grinder units*, costing £50 or so, have been available for a few years in this country and are widely used in the United States. The household water consumption increases: the sewers have to be in a condition to accept the increased and different flow; and the chemical composition of the effluent upsets certain sewage station processes. The evidence suggests that they are sometimes noisy in operation. Although they will not deal with the most bulky part of the refuse, they will deal with putrescible and a wide range of other material, and are likely to be increasingly popular.
- 145 *Communal water borne systems* provide a means of disposing of a range of refuse similar to the sink destructor, with the addition of tins and bottles, but again not the most bulky part. The effluent is water borne from individual sinks within the dwellings, through pipes to a settling tank at basement level, thence to a centrifuge and thence to a furnace. The residue is extremely small by comparison with the original bulk and arrangements can be made to incinerate the bulky refuse as well. In such circumstances the collection cost to the refuse authority in respect of the dwellings served is reduced, but because of the high capital cost of interconnecting drains from the buildings to the disposal plant, and of the central apparatus, the system is still comparatively expensive. An analysis of the costs at Birmingham is given in Appendix 5.
- 146 The prospects for communal water borne systems of this kind are not encouraging unless ways can be found of providing a greater variety of means for installing the system in buildings, of incorporating features which improve its ability to handle the changing nature of refuse, and of reducing the capital costs. One of the ways in which the capital costs can be reduced is being planned by the City of London. Each block of flats is to have a tank in the basement to which the refuse will flow, and from which it is to be collected in liquid form by Corporation tankers. Even including the amortization on the special tanker vehicles, this may approximately halve the total annual costs per dwelling, bringing them to within a shilling or so per week of the comparable costs of chutes. With this arrangement either incineration or separate collection of non-putrescible bulk refuse will be required as well.
- 147 Communal water borne systems on an estate basis are not so likely to be developed for houses, unless town systems analogous to existing sewage disposal systems come to be adopted.

- 148 *Smokeless incinerators* offer a promising field for development, both for communal use in blocks of flats where, with modern heating arrangements, there are problems in the disposal of surgical dressings, and for use in houses to deal with both putrescible and bulk refuse.
- 149 *Calcifiers*, low temperature incinerators which sterilise and dehydrate putrescible refuse and reduce its bulk, are available in the United States but not yet here. They are a promising development.
- 150 We can ourselves scarcely touch the fringes of an activity which seems to us in urgent need of a break through in technical development. We should nevertheless like to point out that advance is often obstructed by the fact that expenditure incurred by the developer on improved refuse arrangements, which would reduce the work falling upon the disposal authority, is normally not recoverable from that authority. This is especially serious where the developer is a local authority and where the whole cost falls on the Housing Revenue Account with no recoupment from the cleansing service. We think it is wrong that there should be this difficulty in the way of improvement in this field, and we feel sure that some better arrangement could be devised in the interests of the community as a whole.

IV Summary of recommended standards relating to floor space

- 151 As noted in the first Chapter, we believe that it is advantageous for standards of floor space to be expressed as sizes for the whole house or flat, thus giving the necessary flexibility to the designer while ensuring essential minimum levels of space for families of different sizes.
- 152 The Table below sets out the minimum areas which we believe are needed in houses or flats for families of various sizes together with the required general storage areas and W.Cs. Differences in the floor area needed to provide comparable accommodation in buildings of different kinds are considerable, and the figures reflect what we believe to be the differences necessary with dwellings planned along conventional lines.
- 153 The areas shown were arrived at as a result of the preparation and study of a wide range of plans, with a view to seeing that the requirements can be met within the areas concerned for orthodox plan types. In establishing the areas we have taken account of the fact that these minima are in no sense intended as maxima, so that designs which call for floor space greater than those which we set out—e.g. houses for four persons with three, rather than two, bedrooms—can and should be provided at figures in excess of the minima which we have set down.
- 154 These minimum sizes are intended solely to safeguard the general level of useful space per person in the various types of building. Floor areas larger than these will often be called for, and should be encouraged.
- 155 The present day 5 person house built by local authorities averages about 900 sq. ft. in area, including the general store. Our minimum 5 person terrace house is 910 sq. ft., plus 50 sq. ft. of store; an increase from the present average to the new minimum of 60 sq. ft.

- 156 The floor space standards for flats and maisonettes are assessed to provide accommodation equivalent to that in houses. The present day 4 person flat built by local authorities averages about 670 sq. ft., excluding general storage. Our minimum 4 person flat is 750 sq. ft., excluding storage, an increase of 80 sq. ft.
- 157 Of course with the new minimum sizes in operation, a proportion of houses and flats would be built to sizes in excess of them; so the average size would then be more than 60 or 80 sq. ft. greater than the respective present averages.
- 158 Further details and estimates of the costs of these proposals are given in Appendix I.

IV Summary of recommended standards relating to floor space

TABLE OF RECOMMENDED STANDARDS RELATING TO
FLOOR SPACE

A home to be built in the future for occupation by:

6 people	5 people	4 people	3 people	2 people	1 person
----------	----------	----------	----------	----------	----------

should be designed with a net floor area of at least:—

	square feet					
3-storey house *	1050	1010	—	—	—	—
2-storey centre terrace	990	910	800	—	—	—
2-storey semi or end		880	770	—	—	—
Maisonette				—	—	—
Flat	930	850	750†	610	480	320
Single storey house	900	810	720			

* These figures will require modification if a garage is built in † 720 if balcony access

and general storage as follows:

	square feet					
Houses †	50	50	50	45	40	30
Flats and Maisonettes						
Inside the dwelling	15	15	15	12	10	8
Outside the dwelling	20	20	20	20	20	20

† Some of this may be on an upper floor; but at least 25 square feet should be at ground level.

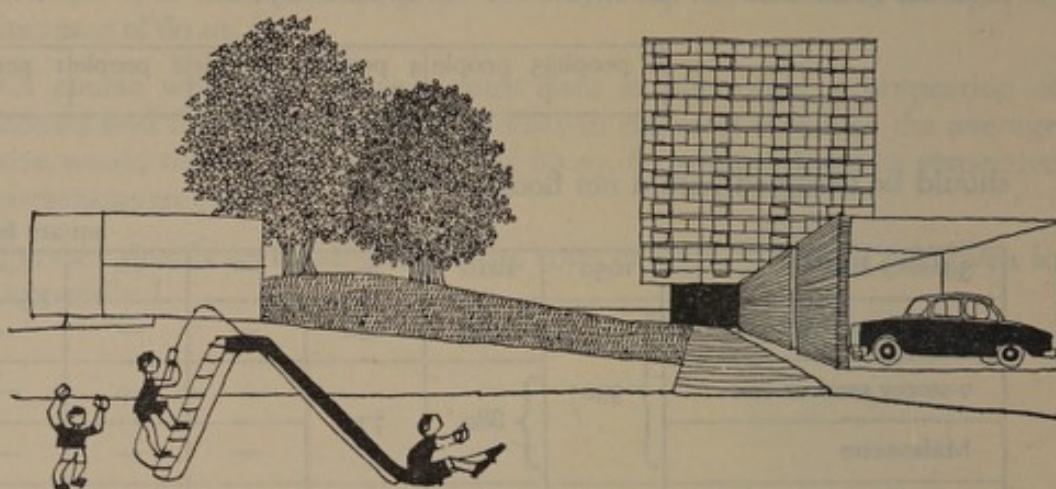
and W.Cs. should be provided as follows:

- A. In 1, 2 and 3 person dwellings, 1 W.C. is required, and may be in the bathroom.
- B. In 4 person 2 or 3 storey houses and 2 level maisonettes, and in 5 person flats and single storey houses, 1 W.C. is required, in a separate compartment.
- C. In 2 or 3 storey houses and 2 level maisonettes at or above the minimum floor area for 5 persons, and in flats and single storey houses at or above the minimum floor area for 6 persons, 2 W.Cs. are required, one of which may be in the bathroom.
- D. Where a separate W.C. does not adjoin a bathroom, it must contain a washbasin.

Definitions

Net floor area is the area on one or more floors enclosed by the walls of a dwelling and is measured to the opposing unfinished faces. It includes the area occupied by partitions, the area taken up on each floor by any staircase, the area of any chimney breast or flue, and the area of any external W.C. It excludes the floor area of any general store, dustbin store, fuel store, garage or balcony; any area in rooms with sloping ceilings to the extent that the height of the ceiling does not exceed 5 ft. 0 ins.; and any lobby open to the air.

General storage area is measured to exclude floor area occupied by any dustbin store, fuel store, or pram space, and any space required inside terrace houses as access from one side of the house to the other—taken as 2 ft. 3 ins. wide. See also para. 99 for excess garage area which may be counted in.



CHAPTER 3

The Home in its Setting

- 159 As a consequence of the social and economic changes referred to in the opening chapter problems are making themselves felt in relating homes to their setting because practice has not caught up with the changes that have taken place. Car ownership and traffic dangers have made the old pattern of housing estates out of date. The street may have been a safe place for children when the baker and the milkman came by horse and cart and everyone walked to work. With one family in three owning a car now, and with delivery and public transport and service vehicles often all using the residential street, new arrangements are required. Similarly, the garden, once highly important as a means of growing vegetables and fruit to supplement the diet of the large families of people who, by today's standards, were poorly paid and insecure, no longer serves that purpose. Again, the pressure on land and the need to rebuild in city centres is compelling the building of a larger proportion of flats, which increases the need to provide somewhere for children to play.
- 160 We have been to a number of estates where new forms of layout attempt to meet present day needs, and we wish there were more of them. In the years to come it is essential that there should be, for housing can become obsolete in its layout just as surely as in its internal design and facilities; and most of the present work is obsolete from this point of view when it is built. Layout is not within our terms of reference, but we have been obliged to formulate views upon it in our consideration of the provision which should be made for cars, and the play space which should be provided in relation to blocks of flats.

- 161 In addition to these two subjects, on which we were given to understand that advice on standards would be welcome, and on the access requirements of terrace houses, which markedly influence their internal arrangement, we propose to comment on two others—gardens and the general appearance of domestic building.

I External Appearance

- 162 After inspecting so many developments in all parts of the country, we feel bound to record our concern that there should be such a vast gap between the best housing schemes in the country and many of the others. Control of development by town planning cannot by itself produce good layout and appearance—the onus to achieve this lies with the developer himself, whether he is a private individual or a local authority. It cannot be achieved without using qualified professional people, architects and landscape architects, to design not only the individual house and house group but, every bit as important, the layout as a whole, and the landscaping. With the numerous examples in the local authority field and the best examples in the private sector there is no longer any reason why our town and countryside should continue to be spoilt by unimaginative buildings. Good layout and landscaping, together with the use of good and well chosen external materials and colours throughout an estate, go nine-tenths of the way towards creating beauty instead of ugliness, and it is in these broad and not necessarily costly ways, rather than in the laboured detailing of the individual dwelling, that housing development can be made pleasing and attractive to the eye.
- 163 This is applicable to local authorities and private enterprise alike, but it may be that those private developers who remain wedded to old plans grown dusty with the years, who are content with amateur layout, and who provide no landscaping but the good subsoil of the site, often do so because they fear conservatism on the part of the buyer and the building society. Whether or not some building societies are conservative, buyers are much less so; and it is a fact worth recording that many builders have been surprised to find that houses catering for the present way of life and conformable with the modern eye for good design displace from their order books older and more conventional plans which they had previously been offering. We therefore urge those developers who do not already do so to turn increasingly to qualified people for the difficult and indispensable work of designing the buildings, the layout and the landscaping. For design now sells, and, if other considerations do not appeal, that alone should provide the incentive.
- 164 It is essential that the landscaping should be designed for ease of maintenance as well as that funds should be provided for the maintenance both of the dwellings themselves and the spaces between them, including the landscaping. By ensuring that newly created property and its environment is properly looked after, its fresh appearance actually improves with the years as the lawns, trees and shrubs grow to maturity.
- 165 With notable exceptions, most private development displays no co-ordination of painting and planting, and lags far behind that of many local authorities, who as landlords can maintain the whole of the estate.

It must be admitted that many other European countries reach a far higher standard in their private estate layout than do we, very largely through the use of housing associations, which take full responsibility for both the initial landscaping and its maintenance. There are already in this country established ways of keeping owner occupied property in good and tasteful repair and the landscaping in good condition, by the use of restrictive covenants governing repainting and the maintenance of the landscaping. Non-profit-making companies, run by the occupiers, can see that the work is carried out, and these are proving successful.

Television aerials

- 166 The forest of roof top aerials brought into being by the growth of television and VHF radio stirs many people to strong condemnation, and we for our part share these feelings. Since television was introduced the increase in the power of the stations and the improved sensitivity of receivers have made outdoor aerials less necessary in many locations. Indoor or roof space aerials do not invariably give satisfactory performance even in strong signal areas, and there is therefore no easy or universal answer to this problem. But investigations, notably those of the Rowntree Trust at Earswick (York), where on a large estate it was found that almost all the houses could be satisfactorily served by indoor television aerials, have shown that people often think of buying expensive outdoor aerials when they need not do so.
- 167 Some local authorities building blocks of flats, and some New Town Corporations, are providing master aerial installations which amplify the signal received at one aerial installation and distribute it by wire to a number of dwellings. In many circumstances this is a necessary and sensible thing to do. In private enterprise housing there may be less scope for the use of master installations, except in blocks of flats, since there may not be an organisation to deal with its common ownership and maintenance, but in many areas there are relay companies which provide an aerial service on a commercial basis both to local authorities and to private premises. A broadcast relay station licence is required if a master aerial system, including a system provided by a local authority, serves two or more sets of premises, e.g. houses or blocks of flats, and applications for such licences should be made to the Post Office. Where it is not possible to provide a master aerial installation, and where a loft or indoor aerial is really inadequate, local authorities may consider standardising upon a suitable aerial, or requiring that tenants' aerials should be sited where they cannot be seen from the street or against the skyline, as has been done by a number of local authorities. In locations where an outside aerial is necessary a standardised aerial for each dwelling on an estate may perhaps be a practical possibility, and we commend it to the attention of developers.
- 168 This is a continuing problem, for if new frequency bands should be brought into use for additional or colour programmes another crop of aerials can be expected, and although at the much higher frequencies likely to be concerned the rods of the aerials will be only about one foot long, outdoor aerials erected clear of buildings are likely to be necessary even quite near to powerful transmitters. It is therefore important for the appearance of estates that local authorities and other large property owners should bear

in mind that, in conjunction with the local Post Office engineers, it is often possible to do a great deal to mitigate the nuisance; and they should take every opportunity to do so.

II Gardens

- 169 The post war improvements in the standard of living mean that few families now rely on the garden to keep them properly fed. It is now used for outdoor living, for children's play and the baby's sleep; and it is cultivated either for the pleasure of gardening or only because it has to be kept tidy. With the tendency for densities to increase at the same time as space has to be provided for more cars to be kept, it will be a temptation to squeeze garden sizes to a point where they will no longer cater for these things. The evidence we received suggests that any call for large gardens is declining as other interests, such as the car, come to take up more of people's leisure time. Where gardens are small, as they may well be when houses are built at densities which in the past have usually called for a proportion of flats, it will be important to plan for children's play space nearby.
- 170 In all gardens arrangements are required which will ensure a reasonable degree of privacy for sitting out and having meals outside. Present day gardens are often sadly lacking in this amenity.

III Terrace Houses—Access

- 171 Probably most of the terrace houses built since 1945 have been laid out in such a way that there is no garden gate giving direct access to the rear of the house, and various means have been adopted to provide for access from the front to the back—a tunnel between pairs of houses; a through store; a store leading through a utility room; or a store leading through the kitchen. Because of the need to provide pedestrian segregation and car storage, much future terrace housing will probably have access to both sides of the house, so meeting most of the requirements. The most important, to be met by house and layout taken together, are that there should be access, without entering hall, kitchen or any living room, for bicycles from road or public path to store; for garden tools from store to place of use; and for garden materials from place of delivery to place of use. There is also a requirement which we think should not be contravened in any circumstances—the refuse collector should be able to reach the dust-bin store, and the coalman the fuel store, without entering any part of the house; this must of course be planned having due regard to the convenience of the householder. Maintenance men also have to be able to get ladders to both sides of the house.

IV Play Space

- 172 "While the child's attendance at school is compulsory between the ages of five and fifteen, enjoyment of facilities for following his out-of-school interests is, and must remain, within the child's or parents' choice. It should be of as much concern to the general public that he has the necessary facilities for these leisure-time activities as that there is a school for him to attend".*

* "Out of School" the second report of the Central Advisory Council for Education (England) page 8.

173 We agree with this point of view, and also with the statement in the report of the Flats Sub-Committee published as "Living in Flats" in 1952 that "the provision of one or more playgrounds must be the first call on available space around flats, because it is on children that the inevitable restrictions of flat life press most hardly".

174 With some exceptions the provision at present being made is inadequate and unsatisfactory. This alone would suggest the need for some minimum standard to secure an improvement, but in addition the increased demands for space for parking cars and for amenity space around flats makes it essential to safeguard a proportion of the total space and to ensure that it is available for children's play. There is no lack of awareness of this as a growing problem, and local authorities and professional bodies have told us that they would welcome a standard. We therefore feel that guidance on the minimum amount of space that should be devoted to areas designed for children's play would be helpful as well as being essential for the reasons we have mentioned. The availability of a standard will also make it easier for the architect to evolve the layout with playspace as an integral part of the design.

Co-operation with other statutory or voluntary bodies

175 We do not suggest that it is possible to cater for all the interests of children within the layout of the estate. The best results are likely to be obtained in our view where there is active and willing co-operation between those responsible for housing, education, parks and open spaces and voluntary organisations including interested parents. There are difficulties here, because different local authorities may be concerned as well as different committees of the same authority, and also because the importance of play in the normal development of the child is not yet fully understood. Such co-operation can lead to joint use of school playgrounds, to some special provision for children under five such as a nursery school or part-time nursery school, or nursery play groups organised by a statutory or voluntary organisation. It can lead to supervision of some playgrounds by trained play leaders or the provision of a play centre on or near the estate. It could lead to comprehensive planning for out-of-school activities throughout the district; and if this were achieved, a more rational and economical use of land should result.

The interests of children

176 All children need the opportunity to play with other children, space in which to play in safety, and something to play with: they need sand, water, clay and wood and simple tools with which to make things; equipment on which to jump and swing and climb and slide; opportunities to play imaginative games, to test out and acquire skills, to travel on wheels or to walk on stilts; to play hide-and-seek, or build themselves a house; a place in which to kick or hit or throw a ball and a place set aside for children, in which to sit and read, sew, play table games, talk and be quiet, or shelter from the rain.

Siting of play areas on an estate

177 Play areas should be an integral part of the design and a pleasant focal point in the layout.

- 178 Those for older children especially should be sited where noise is least likely to disturb residents, but also in a pleasant place for children. If the play areas are completed when residents first arrive the noise is much more likely to be acceptable than if they are provided later.
- 179 They should be sheltered and whenever possible face south. Exposed sites should be avoided as children like a feeling of enclosure. Sometimes advantage can be taken of the levels of the ground to sink the playspace below the general level, reducing the noise and providing enclosure and shelter from winds at the same time.
- 180 A firm quick drying surface is the most suitable for ball games and many other play activities but when possible the lay-out should include some grass and uneven natural surface.
- 181 Good landscaping can help to give a pleasing appearance to the playground. It is often worth while to spend money on screen planting.
- 182 Any rigid segregation of age groups is undesirable, as children often go out to play as a family, the older ones taking responsibility for the young children, and many children enjoy playing with equipment designed for a younger age group or with companions older than themselves. But when a central playground is provided, there should be some part of it especially suitable for young children. Adolescents are discouraged from using play equipment for pre-school children if that equipment is small in scale and if other provision is made for their needs. Very young children like to play near their homes and where small play areas are provided for this purpose near the entrance to the flats they should be designed so that mothers can sit in comfort and watch their children play.
- 183 There will almost always be a need for an area for ball games to be specially provided, even if it has to be small. This is particularly necessary for the older boys, though there is normally no need to restrict its use to a particular age group. Such areas are of little value unless they have high netting and have been found to be more popular when goal posts are provided.
- 184 There are some advantages in the dispersal of fixed equipment throughout the estate, with play paths and individual features for landscaping which are attractive to children, such as boulders on which they can sit and low walls on which they can climb. This design may be particularly suitable on a small estate where only a few items of equipment will be provided. On large estates it disperses the children and lessens the amount of noise; but in some districts it is found impracticable because scattered equipment may lead to management problems caused by people not living on the estate.

Size of play areas

- 185 A number of factors affect the desirable size of a play area—the number of children who can play in it comfortably at one time depends on the type of play activities which take place and the age of the children. Moreover, some types of playspace are more attractive to children than others; the presence of a play leader or a particularly attractive lay-out and treatment may make a small space popular.

Formulating a standard

- 186 At first sight it seems logical to relate the total amount of play space required to the number of children who might be expected to use the play areas, but the number of children living on or near the estate may vary considerably over the years as may the number of children in any particular age group.
- 187 Similarly, in the absence of comprehensive neighbourhood arrangements for children's play, it would be impracticable to relate a standard for the minimum amount of space and facilities required within the housing area to the provision for children's out-of-school interests in the immediate environment. Enquiries show that a park a short distance away, particularly if there is a main road to cross, makes very little difference to the day-to-day needs of the children. Mothers prefer the younger children to play within the boundaries of the estate. There are also times when older children want to play near their home.
- 188 In the course of our visits we observed play areas on estates up and down the country and discussed the use made of them with residents and Housing Managers. We noted the recommendations of the National Playing Fields Association and studied information given to us by the Building Research Station and a survey financed by the Rowntree Trust; and the evidence provided us with many papers containing extremely useful information. Officers of the Ministry undertook for us a special study of children's play during the Easter holidays 1960 in some of the high density estates in the County of London: they also prepared a detailed bibliography and a comparative study of space standards in some other countries and those in current use by the L.C.C.

Minimum standard

- 189 Against this background we have assessed the minimum requirements for play having regard to the other calls on the space around buildings at the highest densities at which we now build. We recommend that space should be set aside for children's play calculated on the basis of at least 20 to 25 sq. ft. per person on the estate, not counting people in one and two person dwellings. At least 5/- per sq. ft. more than the cost that would otherwise be incurred on grassing should be spent on surfacing and equipment of the play areas.
- 190 On a typical 12 acre scheme at about 140 habitable rooms per acre, the amount of space required is likely to be between 4,300 and 5,400 square yards in all, that is, in the region of an acre.
- 191 Some allocation of money has to be made each year for running expenses, including such items as renewal of sand or turf and maintenance of equipment.
- 192 There is need for experiment with different types of play area and play leadership schemes which we hope that local authorities and others will undertake. Much is known about the type of play which children enjoy and which is essential for their normal development: and we have prepared charts suggesting some of the ways of meeting these needs which, together with a note on management, are given in Appendix 6. We hope that these will give basic guidance but we should like to stress how much scope there is in this country for research and experiment in this field.

Limitations of a standard of space and equipment

- 193 The establishment of minimum standards of space and equipment for play is only the beginning of an answer to this problem. Representations have been made to us that some form of supervision of play areas for children of all ages is highly desirable on large estates, and that in many cases young children living in blocks of flats and maisonettes are only allowed out to play if there are facilities with proper supervision. Play-leaders would ensure a safe environment and opportunity for a wide variety of activities. At the moment such facilities are rare, but there is an undoubted need for them to be expanded considerably.
- 194 The part-time nursery school on or near the estate or the supervised playspace are solutions to the problem for young children. In future it may also be possible to evolve forms of buildings which at high level give the advantages of a pedestrian street adjacent to the door of the flats or maisonettes. Mothers could then keep an eye on young children at play with others from neighbouring homes.
- 195 It is especially difficult to provide for the energetic activities of older boys within the layout of a small estate and in many neighbourhoods boys never have the opportunity to build and dig such as an adventure playground provides. In this respect children in new housing may be worse off than those living in old areas.
- 196 The recommendations about playspace in this report refer primarily to housing estates in which many families live in flats. The National Playing Fields Association represented to us that playspace provision should be compulsory in all housing, but we think that a recommendation to this effect would be beyond what we were asked to do. We nevertheless urge those responsible for the layout of all new housing developments to make generous and imaginative provision for children's play, especially where gardens are small.

V Provision for Cars

- 197 The estimate of the Road Research Laboratory is that by 1980 there will be an average of one car per household in Great Britain. Thus, in less than twenty years' time, for every car now on the roads of this country there will be three.
- 198 Each of these ten and a half million extra cars will need about two hundred and fifty square feet of scarce residential land or building space for overnight parking and for access to the place where it is kept. The many built-up districts not equipped with one car space per dwelling are not our problem; our concern is with the homes yet to be built, and in the face of these figures, even if it turned out that the increase was slower than the Laboratory believe it will be, it is impossible to do less than recommend that for every new home built in the future there should be space for a car.
- 199 We have reached this conclusion only with great reluctance, for the costs are likely to be considerable. Studies which we have made suggest that they will range from quite low figures in low density housing to as much as £300 per dwelling, and sometimes more, in very high density estates.

The details are given in Appendix 7. Costs of this order, even if not all are incurred at the outset, must lead everyone to hesitate; but to us the decisive consideration is that the country already has so large a proportion of residential areas unfit to cope with this flood of cars that it would be senseless to build more like them. Some few exceptions there can be, and these we refer to later.

- 200 The over-riding concern in designing with the car in mind must be to design for the pedestrian to stay alive. Since in a car-owning community a high proportion of the pedestrians and cyclists will be children, this will demand the segregation of pedestrian footpaths and cycleways from roads carrying motor vehicles, and preferably the organisation of these footpaths into a system leading from the quiet side of the houses to schools and shops and playspaces, so that children can go about their affairs with reasonable safety. Safety considerations also suggest the importance of arranging for cul-de-sac vehicular approach to residential development, so that vehicles adopt low speeds in the vicinity of homes and so that through traffic does not approach them at all.
- 201 These ideas are not new. They are the traffic elements of the Radburn system of layout, developed in the United States and widely known throughout the world. They have been used on a number of far-sighted developments in this country, and we were pleased to be able to see in the course of our visits the examples at Basildon, Coventry, Cumbernauld in Scotland, Northampton, Sheffield, Stevenage and Wrexham. We are sure that they represent the right general direction for the future. Of course, there may be ways in which particular schemes could be faulted—the architectural handling of the large volume of single storey garages in the cul-de-sac is never easy; and it is often difficult to make rear gardens fronting the cul-de-sac look presentable, especially when there are separate external stores. Difficulties arise too about which is the “front” door, though this can be overcome by house plans with a through hall and an equally presentable entrance on both sides of the house. Those responsible for these schemes and others like them are to be congratulated on their search, through difficulties, towards an answer to problems to which others had perhaps not given due weight at all. Their experience will be invaluable now that there is a general realisation that car ownership will spread to everybody everywhere, and that the design of housing estates must take account of it in the most far-reaching way.
- 202 The principles of Radburn are of course applicable also to high density development, and with the larger numbers of children and vehicles in a corresponding area there is all the more need for the layout to have safety built into it.

Appearance

- 203 The need to provide for cars, combined with higher densities, will have an immense impact on appearance of housing estates in the future. It is beginning to do so already; and all too easily, if there is inadequate thought and care, high density estates of the future could turn out to be jungles of concrete, asbestos and tarmac, housing the car but providing an environment of utter inhumanity. The various ways of accommodating the car must be integrated with the landscaping and the buildings;

and the final layout design must be a pride to the area, pleasing to live in, and pleasant to look down upon from the windows of upper flats. No one should underestimate the difficulty, and perhaps the cost, involved; but no one could over-value its successful accomplishment.

Preserving open space

- 204 The advent of car storage on the necessary scale means a new and major land use in high-density areas, and could easily lead to a drastic loss of useable amenity space around the buildings. It is important to seek ways of preserving this amenity space on a scale which falls little short of what is available now, although in future such space will inevitably include what is available on the landscaped upper decks. We therefore ask the Ministry to work out a formula for this which architects could use in designing layouts. We appreciate that this preservation of amenity space is likely to involve either two-level use of land, or multi-storey car parks, or a higher proportion of families living in tall flats, or some combination of these.

Location of car space

- 205 Some solutions to high-density parking problems will impose a considerable strain upon the self-discipline of the residents. If a mother brings the car back from shopping with a baby and another young child, she will prefer to park near her home, rather than in a ramped park, for example, which can take all the cars on the estate and which therefore may be some distance away. Factors of this kind, which are not purely selfish, may lead either to arguments with the management or to the estate roads being littered for most of the time with cars that people find it inconvenient to put away at once. Car space should therefore be provided as near as possible to the home.

Timing of provision

- 206 There is no necessity to provide car storage or standing space at the outset in any quantity exceeding the immediate demand, for this depresses the charges that can be made. The basic necessity is to design the scheme at the outset for this ultimate one to one provision so that, as the requirements for parking come about, the necessary facilities can be made available in accordance with a soundly conceived original plan.
- 207 In central areas immediate provision at the full ratio may sometimes be called for, especially where the site is small and the only practicable form of both meeting the ultimate need and preserving useable space around buildings is to adopt particular constructional solutions, such as two-level use of land, which cannot readily be added, if at all, after the buildings are complete. In such cases the parking space may be capable of immediate use by other motorists in need of it. Conversely, it may very occasionally be possible to rely for some part of the anticipated future need upon the availability of a piece of adjoining land. This would be permissible only if ownership and planning control made its availability certain.

Additional vehicles

- 208 In planning the parking arrangements, visiting vehicles must also be taken into account. Moreover vehicles such as motor-cycles and mopeds

belonging to people living on the estate must not be forgotten, and it will normally be possible to make special arrangements for these within the general parking areas.

Exceptions to the general standard

- 209 The studies on which we based our assessment of cost did not extend above about 180 persons (160 habitable rooms) per acre. At densities beyond this we feel that the extreme difficulties of making provision for cars on the basis of one per dwelling, together with the likelihood that in the central schemes of this kind some people may prefer to rely on public transport, may justify working to some slightly lower figure in exceptional cases; although here we think that there may be scope in special circumstances for exploring the possibilities of using the same car parking facilities in a dual capacity—at some hours reserving them exclusively for residents' cars, and at other times allowing parking by the general public.
- 210 In small schemes at whatever density which are wholly or mainly designed for the accommodation of old people, provision at something less than the general ratio of one car-space per household may be satisfactory, though with such developments there is often found to be a larger than usual need for space for visitors to park.

Conclusion

- 211 The war is sixteen years and three and a half million houses away. Our work has been to take stock of accumulated experience; to evaluate the social and economic trends which are reshaping our lives; and to formulate recommendations, which, while ensuring sound and well-designed homes, will also encourage among architects and all concerned a creative response to the requirements of our age.
- 212 Success in translating these twin objectives into homes to live in lies in other hands. The form of the standards which we recommend places a very heavy responsibility on the architect, but it should provide him with the flexibility that is essential for him to respond creatively to the changing environment and the changing way of life. It is of vital importance that all those people—members of housing committees, housing managers, builders, sales managers, and many others—who are concerned, with the architect, in working out those changes in building terms, should get into each others' minds, see the problems facing each other, and work together as a genuine team. If they fail in this, the buildings they put up will be the worse for it, and the nation the poorer.
- 213 In particular, a great responsibility is falling on private enterprise, which is now supplying more than half of the new homes erected. Prospective purchasers of these homes should be able to rely on getting homes that are both well-designed and soundly built. We have already stressed the need for private builders to engage qualified people for the design of the buildings and the layout of the estates. As a means of ensuring sound construction, we should like to see all builders working to the specification of the National House Builders Registration Council, and operating under the conditions of their scheme for providing the purchaser with a two-year guarantee.
- 214 Good homes are worth paying for, even at the sacrifice of some other things; and compared with expenditure on many luxuries they offer outstandingly good value for money. We believe that people are coming increasingly to this point of view, and that enough people are now willing to pay more for a really good home to make our proposals workable and realistic, expensive though some of them are. In establishing minimum standards we are most anxious not to discourage building to still higher standards. Indeed if the standard of living doubles in the next 25 years, as some people envisage, and if building research leads to advances in technique, we believe there will be a demand for a progressive upgrading of the minimum standards contained in our report.

Secretariat

We desire to express our warmest thanks to our Secretary and our Technical Secretary. Our Secretary, Mr. S. W. Gilbert, gave us very valuable help in assembling the evidence and in preparing our Report. Our Technical Secretary, Mr. P. G. Negus, carried out and presented to us a considerable amount of research which has been invaluable to us. Both eased our task in every possible way.

(Signed)

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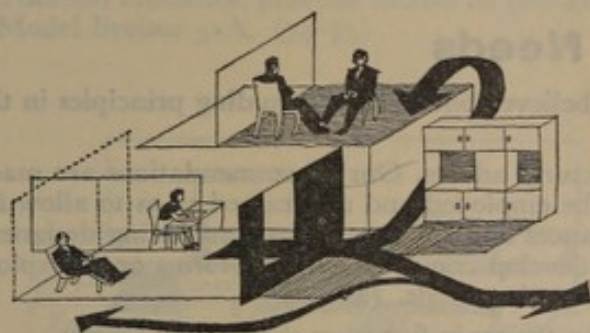
A. A. Bellamy (Assessor)

S. W. Gilbert (Secretary)

P. G. Negus (Technical Secretary)

August, 1961

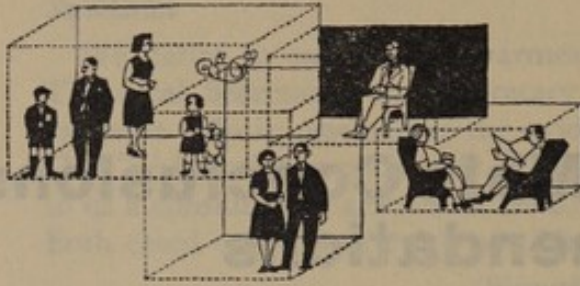
Summary of Main Conclusions and Recommendations



CHAPTER I

New Patterns of Living

- 1 The social and economic revolution since the war, the greater general prosperity, and the easier and more varied home life now possible make timely a review of the sorts of homes now built.
- 2 The review has included private enterprise housing, now providing the majority of the output, as well as local authority housing. (1-4)
- 3 To meet the needs of the future there should be space for activities demanding privacy and quiet, for satisfactory circulation, for better storage generally; space to keep the new household machinery, and kitchens arranged for easy housework with room in which to take at least some meals. (5-7)
- 4 The family living in a flat or maisonette needs at least as much space as the family living in a house. (8)
- 5 There must also be a satisfactory heating installation. (9)
- 6 The present standards are in a form that puts emphasis on compliance with patterns of rooms of fixed areas. (11-12)
- 7 The starting point for thinking about houses and flats must be the activities that people want to undertake in them. This approach to the problem of design starts with a clear recognition of these various activities and their relative importance in social, family and individual lives, and goes on to assess the conditions necessary for their pursuit in terms of space, atmosphere, efficiency, comfort, furniture and equipment.
- 8 Our recommendations are not therefore based on minimum room sizes but on functional requirements and levels of performance, with minimum overall sizes for the dwelling related to the size of family. (13-14)
- 9 Our recommended minima are not to be taken as maxima. Many desirable features which may come to be required may not be possible within them. (16)
- 10 The proposals we make will cost more money. We believe that enough people are ready to pay more for the better article, and that the country already has sufficient houses and flats of standards below those that we have in mind. (19)



CHAPTER 2

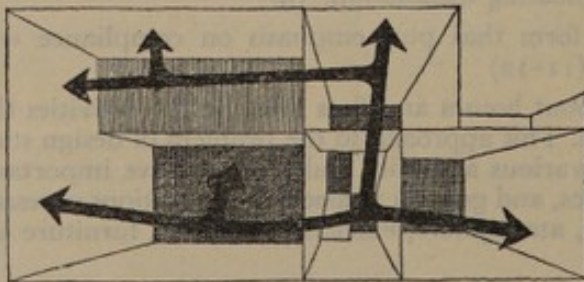
Homes for Family Needs

- 11 This Chapter sets out what we believe should be the guiding principles in the internal design of homes.
- 12 There is no substitute for architectural advice. Our recommendations are made on the basis that architects must be employed and are framed so as to allow for the very wide variety of circumstances and site conditions confronting designers, and to leave them free either to develop conventional plan-forms or to explore new living arrangements to suit changing needs. (20-21)
- 13 In all plans for residential building the main furniture should be shown.
- 14 There is scope for co-operation between architects and the furniture industry. (22)

Section I

The requirements of different families

- 15 Homes should be designed so that they fulfil the reasonable requirements of the way in which prospective occupiers are likely to want to live and work in them, furnish them and store their possessions.
- 16 Our view of the factors to be borne in mind for families of different sizes is elaborated in paragraphs 24-59. We stress the wide variety of activities of which account must be taken in designing the family home (24-27), and the widespread practice of taking at least some meals in the kitchen. (33-34)
- 17 Very small houses sometimes put up by private enterprise can largely be dealt with by limiting the numbers built. (60-63)
- 18 A summary of recommended standards of floor space, general storage and sanitary provision is given in paragraphs 151-158 and the Table on page 35.



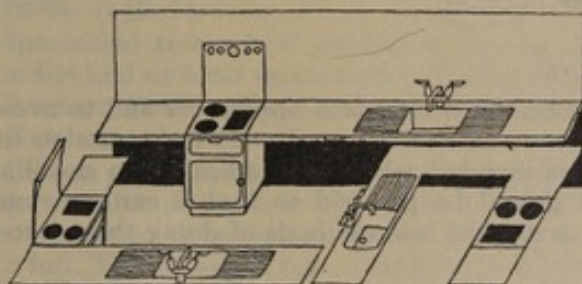
Section II

Factors in home design

A HEATING THE HOME

- 19 Better heating is the key to the design of the home, and the demand for it is strong. (64-66)

- 20 The minimum provision should be an installation capable of heating the areas used for work and circulation to 55° F. and the living and dining area to 65° F., when the outside temperature is 30° F. Wherever family requirements will demand it, a more expensive installation capable of heating the bedrooms as well to 65° F. will represent the greater value for money. (69)
- 21 Whether the minimum installation is provided or something capable of heating more of the house, there is a clear trend of demand towards systems which are clean and have little or no work associated with them. (70)
- 22 It is desirable that the occupier should be able to control the expenditure on heating (71)
- 23 The costs of various ways of heating houses are considered in Appendix 2.
- 24 Thermal insulation practice should be brought up to at least the level of the new Model Byelaw 51A. (74-75)



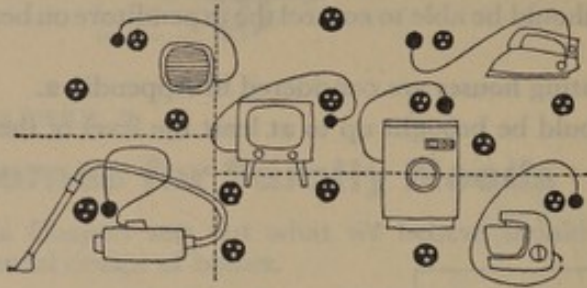
B KITCHENS

- 25 Kitchens must be designed for efficient working and equipped with adequate drainers and worktops. A sequence is commended for general use. (79-81)
- 26 The design must provide for the housewife to keep washing machinery near the sink and space in or near the working area for additional machinery in the future. (83-86)
- 27 Kitchens must have adequate storage, which we put at 80 cu. ft. for family houses. Almost as much is required in smaller homes. (87)
- 28 Accommodation for the storage of food should be reconsidered. A cool cupboard is nevertheless required. (88-90)
- 29 Condensation in kitchens is a widespread and serious problem to which there is no inexpensive answer. (91-92)

C STORAGE

- 30 The requirements for general storage are given in full in the Table on page 35.
- 31 Storage for garden equipment, bicycles, and other purposes is required for 4 and 5 person houses at the rate of 50 sq. ft. per dwelling, clear of refuse containers, fuel bins and access ways. The storage space need not all be on the same floor, so long as there is at least 25 sq. ft. on the ground floor. (97)
- 32 Flats and maisonettes should have storage comparable to that in a house. Four or more persons require 15 sq. ft. of general storage within the flat. There should be a separate store elsewhere of 20 sq. ft. for each flat, whatever the size of family. If the dwelling has a garden, additional storage is required for garden tools. (98)
- 33 The storage arrangements in private enterprise dwellings should be improved upon. (101)
- 34 The roof space should be put to wider use. (102)
- 35 For all except the main bedrooms (and preferably these as well) there must be clothes cupboards at the rate of 2 ft. of rail per occupier, not less than 21 ins. deep internally to allow for clothes on hangers. (103)

- 36 There should be space for hats, coats and outdoor footwear near the main entrance of the dwelling. (104)
- 37 Every home must have a cupboard for the storage of linen that can also be used for airing or keeping dry. (105)
- 38 Storage for solid fuel can remain at 12 sq. ft., 20 sq. ft. for two appliances or in rural areas, and 9 sq. ft. for flats. (107-109)

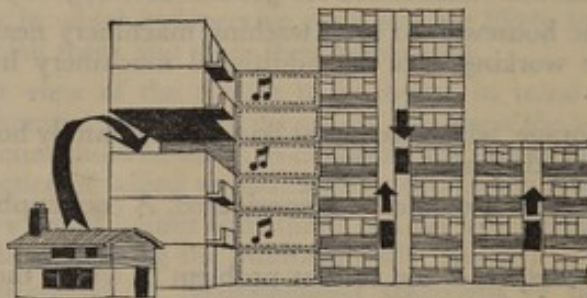


D ELECTRIC SOCKET OUTLETS

- 39 To cope with the increasing ownership of electrical appliances and to avoid the dangers of trailing flexes, we recommend at least 15 electric socket outlets for the 5 person house. A scale is recommended which is applicable to dwellings of different sizes. The installation should be planned so that it can conveniently service future outlets. Research is needed into methods of doing this. (110-115)

E SAFETY IN THE HOME

- 40 A list of points against which a design can be checked for safety is given in Appendix 4. (116)



Section III

Aspects of living in flats

- 41 The human problem for the future in the design of flats and maisonettes is to provide for people who live in them an environment as workable and as satisfactory as for people who live in houses. The economic problem is to reduce the costs. (117-120)

A LIFTS

- 42 Present practice indicates that a lift service should be provided in buildings in which the entrance to any dwelling is on the fourth storey or above. In buildings of more than 6 storeys two lifts should normally be provided. (125)
- 43 At least one lift should be large enough to take eight persons. (128)
- 44 Lift installations should be designed having regard to the capacity of the lift, the speed of travel, the arrangement of stops, the number of people living in the building, the peak traffic times and the frequency of maintenance. Insufficient information is available. (129)

B PRIVATE BALCONIES

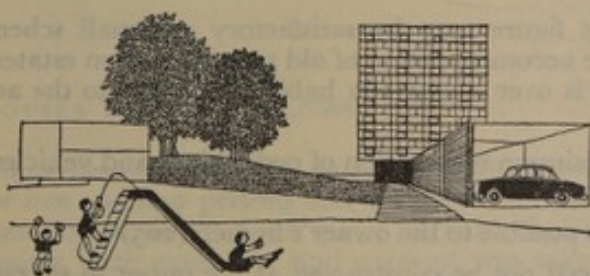
- 45 The costs of balconies should be carefully weighed against the costs of other things which could be provided for the same expenditure. (130-134)
Comparative costs are given in Appendix 8.

C SOUND INSULATION

- 46 Noise nuisance between one flat and another causes much disturbance and friction. More electrical household and recreational equipment will increase it, and the matter requires more attention in future. (135-137)

D REFUSE DISPOSAL

- 47 New forms of packaging for food and other goods are resulting in more refuse, and less is being burnt by the householder. On existing estates of flats this is producing difficulties. The frequency of collection is unlikely to increase. (138-139)
- 48 The dustbin and dustcart are not in line with 20th century progress in other fields. (140-141)
- 49 Intensified research is needed in developing low cost waterborne systems and individual or local incinerators. Meanwhile, the recent British Standard Code of Practice, BSCP 306, provides a guide to good practice with well-known methods. (142, 144-149)
- 50 Certain points in relation to refuse chutes should nevertheless be noted in addition. A turntable at the base of a chute, as devised by the L.C.C., will allow an empty container to be pushed easily into position under the chute when the previous one is full. The saving in cost compared with the larger number of chutes with single or double chambers needed to take the same output of refuse allows the one chute to be of larger diameter, thus reducing the risk of blockages. Chutes should be located so that the noise creates as little disturbance as possible to people living in adjacent flats. (143)
- 51 Advance in this field generally is obstructed because savings accruing to the local authority committees responsible for refuse collection do not accrue to housing committees, and other developers, on whom the extra expenditure would fall. (150)



CHAPTER 3

The Home in its Setting

- 52 The general appearance of the majority of layouts could and should be greatly improved. Most layout practice is out-of-date, failing to take proper account of the effect of vehicles. Prosperity is affecting the generally desirable size of gardens; the increasing proportion of flats calls for more attention to the needs of children's play. (159-161)

I External Appearance

- 53 Ways of securing improved external appearance are suggested (162-165) including ways of dealing with the problem of television aerials. (166-168)

II Gardens

- 54 Gardens are no longer generally relied on for necessary food. Other new interests take up more of people's leisure. But they must not be made so small as to detract from their usefulness. Arrangements for reasonable privacy must be made. Where gardens are small, space for children's play will be needed elsewhere nearby. (169)

III Terrace Houses—Access

- 55 Terrace houses must be arranged to provide suitable access from one side of the house to the other. It should never be necessary for the coalman or the refuse collector to enter any part of the house. (171)

IV Playspace

- 56 Playspace must be the first call on available space around flats where there are children, and with some exceptions the present provision is inadequate and unsatisfactory. (174)
- 57 The best results in providing for children's needs are likely to be obtained where there is willing co-operation between those responsible for housing, education, and parks and voluntary organisations including interested parents. (175)
- 58 Play areas should take account of the interests of children and be intelligently sited. (176-185)
- 59 Space should be set aside for children's play calculated on the basis of at least 20-25 sq. ft. per person, omitting one and two person dwellings. At least 5s. od. per sq. ft. more than the cost that would otherwise be incurred on grassing should be spent on surfacing and equipment. (189)
- 60 Supervised facilities should be expanded considerably. (193-194)
- 61 Suggestions on playspace design and management are made in Appendix 6.

V Provision for Cars

- 62 Estates should be planned from the start on the basis of one car per dwelling, and with provision for visitors. The visual effects of this must be carefully considered. (197-199, 203)
- 63 Some small departure from this figure may be satisfactory on small schemes wholly or mainly designed for the accommodation of old people, and on estates in central areas where the density is over about 160 habitable rooms to the acre. (209-210)
- 64 Estates should be planned for maximum segregation of pedestrians and vehicles in both low and high density development. (200-202)
- 65 The car should be kept as near as possible to the owner's home. (205)
- 66 The garages or standing space need not be constructed at the outset in excess of the immediate demand, for this depresses the charges that can be made. (206)
- 67 Research must be undertaken to devise a yardstick for preserving at the design stage the space around buildings (whether at ground level or as useable upper decks) against encroachment by car parking, and it would be helpful if the Ministry would devise a formula for this purpose. (204)
- 68 Motor bikes and motor scooters must also be accommodated, within the area needed for one car per dwelling. (208)

Cost implications of recommended minimum standards

INTRODUCTION

- 1 This Appendix summarises the estimated extra costs of the improvements in minimum standards which we recommend, for various types of dwellings.
- 2 The estimated costs are at a level comparable with average competitive prices obtained in local authority contracts for housing schemes in provincial urban areas in mid-1961: they do not include for price increases in labour and materials operative after September 1961. The figures can be taken as representing a broad section of local authority housing prices, though prices for local authority housing over the country as a whole show a wide variation.
- 3 The figures are based on studies of the most commonly built types of local authority dwellings, which were carried out for us by our officers to assist us in coming to our decisions. We have not had detailed cost estimates prepared for types such as six-person houses which are not built in large numbers; in general, it may be assumed that the increases for these will not differ widely from those for other similar types.
- 4 The estimated costs of our higher standards are calculated as extras over the present average cost of a dwelling of the type concerned; a constant specification has been assumed. Details of the standards of present dwellings which we have assumed for the purposes of estimating extra costs are given in the following sections; some authorities will already be building to standards higher than these in some respects, in which case the increases will be less than those shown.

HOUSES AND BUNGALOWS

- 5 The types of houses and bungalows which were studied were two-storey houses for five and four persons and bungalows for old couples; the estimated total extra costs for these types are given in Table I. The studies of five and four person houses were extensive, and account was taken of the variations in cost which arise with types of house which differ in means of access and storage provision. In the Table the ranges for these types are given as well as the average extra costs.
- 6 It must be emphasised that the average figures are based on simple averages of the extra costs for each type included in the studies. It is difficult to forecast the actual effect of the higher standards, because we do not know the proportion of each type that will be built or whether new types will be developed: but the fact that types which achieve the new minimum standards most economically will tend to be favoured means that the average figure is likely to be an over-estimate.
- 7 The estimated extra costs are expressed both as sums of capital cost and as percentage increases over the present average cost of a typical dwelling of each type. The average present cost quoted for each type of house and bungalow includes a notional figure for site development, but excludes the cost of land.

TABLE I
Estimated Total Extra Costs
Houses and Bungalows
 (Average Costs Based on Provisional Prices for Local Authority Housing at mid-1961)

Type of Dwelling	Average Present Cost (including site development but excluding land)	Estimated Extra Cost of New Minimum Standards	
		Average	Range
	£	£ %	£ %
2-storey houses			
5-person (3 bedroom)	1,900	209 11	163-287 8½-15
4-person (2 bedroom)	1,800	160 9	100-215 5½-12
Old people's bungalows			
2-person	1,500	97 6½	—

FLATS AND MAISONNETTES

- 8 Our studies of multi-storey dwellings covered flats designed for four persons, two persons and one person, in blocks of eleven storeys and three storeys; we have taken these as representative generally of high and low blocks, and the cost increases as generally applicable to maisonnettes as well as flats.
- 9 In multi-storey buildings the cost picture is much more complex than it is in two-storey houses. The cost per dwelling of land and site development varies so widely with situation and density that a total present cost cannot usefully be quoted: in Table II the extra costs are therefore expressed as extras over the costs of buildings and external works only (excluding the cost not only of land, but also of major estate development).
- 10 The constructional cost of a flat or maisonette can vary by as much as several hundred pounds, depending on the size and type of block and the form of construction used; moreover, a single block will often contain dwellings for families of different sizes, and the price of a particular dwelling cannot be separated out with any certainty from the total price for the building as a whole. The figures of average present cost are therefore notional in the sense that they are subject to very wide variations.

TABLE II
*Estimated Total Extra Costs**
Flats

(Average Costs Based on Provisional Prices for Local Authority Houses at mid-1961)

Type of Dwelling		Average Present Cost (excluding land and major site development)	Estimated Extra Cost of Improved Minimum Standards†	
		£	£	%
4-person	11 storey	2,500	245	9½
(2 bedroom)	3 storey	1,700	193	11½
2-person	11 storey	2,200	66	3
(1 bedroom)	3 storey	1,450	56	4
1-person	11 storey	1,850	99	5½
(bed-sitting room)	3 storey	1,200	78	6½

† Note: There may in some cases be extra costs for heating, not included in these figures (see paragraph 30).

* These are the total extra costs incurred on the dwellings themselves: there will also be extra costs for car storage (Appendix 7) and, in family dwellings, for playspace (Appendix 6).

THE BUILD-UP OF THE TOTAL EXTRA COSTS

- 11 The total extra costs quoted in Tables I and II include improvements in the following items (not all of these necessarily apply to all types of dwelling):
- 1 Floor space (including storage space and, in 5-person houses, a second W.C.)
 - 2 Washbasins in compartments of W.C.'s. not adjacent to a bathroom (5-person houses only)
 - 3 Heating
 - 4 Kitchen fittings
 - 5 Socket outlets
 - 6 Bedroom cupboards

In the following sections we deal with each of these aspects in turn: and in Tables III and IV at the end of this Appendix we bring together the estimated extra costs for each type of dwelling. Table V shows the effect of changes in capital cost on rents and mortgage payments.

- 12 In general, the costs of washbasins, bedroom and kitchen cupboards, socket outlets and heating by a given system do not vary greatly with the plan of the dwelling in which they are provided, and these are therefore dealt with in general terms, covering all the types of dwellings to which these improvements apply. The costs of higher floor-space standards can, however, vary widely with the plan-form of the dwelling and with the position of the general store. Moreover, the cost of providing a second W.C. also varies with the plan-form; for in some plans a second W.C., inside the dwelling, can be introduced with little or no disturbance of the arrangement of the ground floor, whereas in others, the provision of a second W.C. may necessitate a complete replanning of the ground floor, and produce a disproportionately larger area. For this reason the cost of the second W.C. in a 5-person house is included under the heading of "Floor Space".

FLOOR SPACE

5-Person Houses (3 Bedrooms)

- 13 The study of 5-person houses covered semi-detached houses and terrace houses of various types; the main variations in terrace houses are the position of the store (i.e. whether it is inside or outside the house) and the type of access i.e. whether the house has access from a road on one side only (with access to the back by either a tunnel passage or a through-store) or whether it has access from a road on one side and a footpath on the other. These variations affect the cost of increasing space standards, and it was for this reason that the study was extensive.
- 14 The standards assumed as typical of present houses were based on those in "Houses, 1952": this was taken to mean a house of approximately 900 sq. ft. gross, with one W.C. in a separate compartment. The house plans prepared for the study were based on an upgrading of this standard to provide what we considered to be satisfactory amounts of space in the kitchen, the living area, bedrooms, circulation space and stores; a second W.C. was also provided inside the dwelling on the ground floor, the other being in the bathroom.
- 15 The estimated extra costs of the extra space and the second W.C. varied from £68 (in a semi-detached house) to £195 (in a through-store access house, which we have taken as an upgrading of the present local authority store-kitchen access house, where present standards have been especially inadequate); the extra cost averaged over the range of types was £113. The distribution of this extra cost between floor space and the second W.C. varied so greatly from one house type to another that it would be misleading to quote separate figures here.

4-Person Houses (2 Bedrooms)

- 16 The study of 4-person houses again covered a range of types including semi-detached houses and terrace houses with variations in the means of access.

- 17 The typical present-day house for 4 persons was taken to be of about 780 sq. ft. gross area, and to be designed in accordance with the space standards of "Houses, 1952", and with the W.C. in the bathroom. The house plans prepared for this study were again based on an upgrading of the space standards, and on the provision of the W.C. in a separate compartment.
- 18 The estimated extra costs of this upgrading ranged from £32 for a semi-detached house to £147 for a terrace house with a through-store, with an average of £90.
- 19 These figures were based on the assumption that two double bedrooms would be provided. We would consider the provision of one double and two single bedrooms to be a desirable standard where it is possible, and this would of course lead to a greater increase in cost over the present average for a 2-bedroom house.

2-Person Old People's Bungalows

- 20 The room sizes in bungalows specially designed for old people have in the past been smaller than those of equivalent rooms in family dwellings (i.e. 140 sq. ft. minimum for the living room and 120 sq. ft. minimum for the bedroom); we have assumed for the purpose of estimating that these sizes lead to a gross area of about 480 sq. ft. We have come to the conclusion that 2-person dwellings should, as far as possible, be suitable for either old or young couples. We have also proposed a standard of storage space* of 40 sq. ft. compared with the present assumed average of 20 sq. ft. The estimated extra cost of these changes was £48.

4-Person Flats (2 Bedrooms)

- 21 We must emphasise again here that the figures which we quote for the extra costs of more floor space in flats of all sizes are only very broad approximations, for the cost of increasing the size of a flat depends not only on the plan of the individual flat, but also on many other factors, in particular the size and shape of the block as a whole.
- 22 The present standards for 4-person flats were assumed to be a net area of about 670 sq. ft., with the W.C. in the bathroom, and storage provision of one 20 sq. ft. store outside the dwelling for every two flats.
- 23 The principal change in standards for these flats is the upgrading of floor-space standards to bring them into line with those for houses; also, the W.C. is now to be placed in a separate compartment. We have also proposed a minimum standard of 15 sq. ft. of storage space inside the flats, and one 20 sq. ft. outside store† for each flat. The estimated extra costs of the increased living and storage space (including the extra heating involved in increasing the former) were £193 and £141 for 11- and 3-storey blocks respectively.

2-Person Flats

- 24 In 2-person flats we consider that present standards of living space are reasonably satisfactory, and the only changes have been the addition of 10 sq. ft. of storage space within the dwelling and the provision of a 20 sq. ft. outside store for each dwelling; the present provision was assumed to be one 20 sq. ft. store for every two flats. These changes were estimated to cost £35 and £25 in high and low blocks respectively.

1-Person Flats (Bed-Sitting Room)

- 25 We consider that there is a need in 1-person flats for some extra living space, because the area of a present-day flat (which we have assumed to be about 300 sq. ft. net) is not generally large enough to allow for sufficient kitchen equipment; we also recommend the provision of 8 sq. ft. of storage space inside the dwelling, and of one 20 sq. ft. outside store for each flat, compared with the present practice of one outside store for every two flats. The extra costs of these improvements were estimated to be £73 and £52 respectively in high and low blocks.

* For purposes of estimating the storage space was assumed to be in an outbuilding.

† For the purpose of estimating, it has been assumed that in 3-storey blocks outside stores will be in an outbuilding, and that in 11-storey blocks they will be within the main building.

- 26 We have recommended that, where a W.C. compartment is not adjacent to the bathroom, a washbasin should be installed. The only place where this recommendation will normally lead to extra costs in houses planned on conventional lines, is in 5-or 6-person houses where the second W.C. will normally be on the ground floor. The cost of a washbasin in this W.C. compartment (including connection to hot and cold water services and drainage) will vary with the plan of the house and the position which this dictates for the second W.C. The estimated extra costs in our study of 5-person houses ranged from £12-£16 according to the type of dwelling: the average was £14.

HEATING

5- and 4-Person Houses

- 27 We assumed for the purpose of calculating extra costs that the present provision in 2-storey houses was generally an improved open fire in the living-room with a back-boiler to heat the water. We are aware that although this is what is commonly provided a number of authorities already adopt a higher standard than this. Our minimum standard of performance can generally be achieved by an open fire in the living-room with a high output back-boiler and radiators in the kitchen and the hall: with this system, an indirect hot water cylinder would be required instead of a direct one. The estimated extra capital costs of this installation in the various house types studied were as follows:

			Range	Average
5-person houses	...	...	£30-37	£33
4-person houses	...	...	£30-35	£32

- 28 Although in most plans this system will meet our minimum standards of performance, we feel that it may not be acceptable in all circumstances because of questions of convenience and the degree of flexibility in use. The extra cost of meeting our minimum heating standard may therefore differ from the figures quoted, but we have used these figures here because, although some other types of installation may be cheaper in capital cost, this is the system which meets our standard at the lowest all-in cost. Because we feel that some people may in the future wish to consider other methods of heating, and systems heating more of the dwelling, we have given in Appendix 2 some further information on other ways of meeting our minimum standard which may be more convenient in use, and on systems giving a higher standard.

Old People's Bungalows

- 29 Heating is in need of improvement in old people's bungalows also. Here we assumed that the present provision was likely to be an open fire in the living-room with a back-boiler for water heating. We consider that in this case at least the bedroom as well should be heated and that this could be achieved most economically by means of a high output back-boiler with a radiator in the bedroom. The estimated cost of this improvement is £20; this estimate includes for an indirect hot water cylinder instead of a direct one, which may not be necessary in all plan types. There has recently been a considerable increase in the use of systems which heat the bedroom in these dwellings, and our average extra cost may therefore be an over-estimate in this case.

Flats and Maisonettes

- 30 We have recommended as a minimum standard that the whole of the living area of a dwelling (i.e. living-room, kitchen and hall in a conventional 2-storey house) should be heated by the basic installation. In our studies of flats in both high and low blocks, we took as bases against which to calculate the extra costs of our proposals flats provided with installations capable of meeting the minimum standard. We have not therefore included a figure for heating in the extra costs of flats, apart from the extra costs of heating more space, which are included in the costs quoted for floor space. We recognise that heating of the kitchen is not always provided in flats at present being completed and that flats in low

blocks may at present be heated to the same standard as houses: to the extent that this is so, there will be extra costs for heating not included in the figures quoted in Table II.

KITCHEN FITTINGS

- 31 As we have explained in our report, we have accepted in principle the recommendations of the Council of Scientific Management in the Home (C.O.S.M.I.T.H.) on kitchen fittings. In 5- and 4-person dwellings our interpretation of these recommendations for the purposes of our design and cost studies gave about 80 cu. ft. of enclosed storage space (including the larder and a broom cupboard, 5 ft. run of shelving and 15 sq. ft. of worktop (including draining boards). This compares with a present average provision of about 40 cu. ft. of enclosed storage space, 6 ft. run of shelves and about 9 sq. ft. of worktop (including draining board). The estimated extra cost was £25 in 5- and 4-person houses, and slightly more (£27) in flats, because of the generally higher costs for this type of building. In dwellings for 1 or 2 people, the amount of fittings required may be somewhat smaller; we have assumed for the purpose of estimating that one standard width (1 ft. 9 in.) unit would be omitted from the scale used in family dwellings. The extra costs were estimated to be £18 if the dwelling was a bungalow, and £20 if it was a flat.

SOCKET OUTLETS

- 32 Our recommendations on socket outlets are expressed in terms of the provision required in each room. If these are applied to conventional plans, the minimum standards for dwellings of different sizes, compared with average present provision, and the extra costs will be:

	<i>Average Present Provision</i>	<i>New Minimum Provision</i>	<i>Estimated Extra Cost</i>
<i>2-storey houses</i>			
5-Person	6	15	£13
4-Person	5	14	£13
<i>Bungalows</i>			
2-Person	4	10	£11
<i>Flats</i>			
4-Person	5	14	£13
2-Person	4	10	£11
1-Person	3	6	£6

These figures assume the use of some twin sockets.

BEDROOM CUPBOARDS

- 33 We have recommended as a minimum standard that wardrobe cupboards should be provided in bedrooms other than the first. The present practice varies widely, but we assumed for the purpose of estimating extra costs that one bedroom cupboard is generally provided in a house, and none in a flat. The estimated extra costs varied according to the plan arrangement from £10 to £14, and the average extra costs were:

<i>Houses</i>	5-person	£11
<i>Flats</i>	4-person	£12

TABLE III BUILD-UP OF AVERAGE* EXTRA COSTS

Houses and Bungalows

	2-storey house		Old people's bungalows
	5-person	4-person	2-person
1 Floor space (including storage space)	£ 113†	£ 90	£ 48
2 Washbasin in W.C. compartment	14	—	—
3 Heating	33	32	20
4 Kitchen Fittings	25	25	18
5 Socket Outlets	13	13	11
6 Bedroom Cupboards	11	—	—
TOTALS	209	160	97

† This figure includes the cost of a second W.C.

TABLE IV BUILD-UP OF AVERAGE* EXTRA COSTS

Flats

	4-person		2-person		1-person	
	11-storey	3-storey	11-storey	3-storey	11-storey	3-storey
1 Floor space (including storage space)	£ 193	£ 141	£ 35	£ 25	£ 73	£ 52
2 Kitchen Fittings	27	27	20	20	20	20
3 Socket Outlets	13	13	11	11	6	6
4 Bedroom Cupboards	12	12	—	—	—	—
TOTALS	245	193	66	56	99	78

* Note: All the figures quoted in these tables are averages, and they are therefore subject to the qualifications mentioned in paragraph 6.

TABLE V

Effect of Increases in Capital Cost on Weekly Rent or Mortgage Payments

<i>Capital Sum</i>	<i>Increase in Weekly Rent (See Note 1)</i>	<i>Increase in Mortgage Payment per Week Without Tax Relief (See Note 2)</i>	<i>Effective Increase in Mortgage Payment per Week With Tax Relief (See Note 3)</i>
£	s. d.	s. d.	s. d.
50	1 3	1 7	1 2
100	2 6	3 2	2 5
150	3 8	4 9	3 7
200	4 11	6 4	4 10
250	6 2	7 11	6 0
300	7 5	9 6	7 3

Notes

1. The calculation of increases in weekly rent has been based on the following assumptions:

that the capital sum is borrowed from the Public Works Loan Board at the current rate of $6\frac{1}{2}$ per cent;
that the loan is charged over 60 years, and that payments are equalised over this term, with half-yearly rests; and
that a rent-year of 52 weeks is used, with no rent-free weeks.

2. The calculation of increases in mortgage payments has been based on the following assumptions:

that the capital sum is borrowed from a Building Society at the current Building Societies' Association rate of $6\frac{1}{2}$ per cent; and
that the term of the mortgage is 25 years, and that payments are equalised over this term, with yearly rests.

3. The figures in this column (which are based on the same assumptions as that in the previous column) show the actual extra costs of borrowing larger sums. They are less than the sums payable to the Building Society because of the effect of tax relief.

The tax relief is calculated for the first year of the term. With equalised repayments, the interest component diminishes throughout the term; the amount of tax relief therefore diminishes as well, until in the last year of the term, it is negligible.

For the purpose of these calculations, it has been assumed that tax is payable at the standard rate on the full amount of the interest component, subject to earned income relief restriction.

4. The rates of interest used are those current on 7th July, 1961.
5. The increases in payments are given to the nearest 1d.

Heating in two-storey houses

INTRODUCTION

- 1 In our report we have recommended that the minimum standard of heating installation should be one capable of heating the kitchen and the areas used for circulation to 55° F. and the living and dining areas to 65° F., both temperatures attainable when the outside temperature is 30° F. Although in a house equipped with an installation of this kind, it will be a reasonably simple matter to heat the bedrooms when required, we consider that, where daytime and evening use of bedrooms is likely to be considerable, it will be worth-while to adopt a higher standard and provide an installation that is capable of heating the bedrooms to 65° F. as well.
- 2 In calculating the likely capital costs of the recommended minimum standards in Appendix 1, we have included sums of £33 and £32 for better heating installations in 5- and 4-person houses respectively; these figures relate to the provision, instead of an open fire with back-boiler, of an open fire with a high output back-boiler and two radiators. In this Appendix we discuss this system and others which can provide the same service, and also systems which provide direct heating in bedrooms as well.
- 3 We have confined our attention here to the heating of conventional 2-storey houses because the heating of dwellings in multi-storey buildings raises complex technical questions, and because it is in houses that the effect of our recommended minimum standards is likely to be greatest. (See Appendix 1, para. 30.)

GENERAL CHARACTERISTICS OF FUELS AND HEATING SYSTEMS

- 4 Before we deal with the actual systems which we have considered, we set out what seem to us to be the main characteristics of the various fuels used for domestic heating (irrespective, as far as possible, of the system in which they may be used) and the characteristics of heating systems in general terms; we also consider briefly the broad types of system using various methods of heat distribution.

The Characteristics of the Fuels

- 5 In considering the characteristics of the fuels, we give assessments of the relative costs of using the different fuels; these are based on the use of appliances of approximately comparable efficiencies to provide continuous heating with each fuel, and on approximate average fuel prices (see paragraph 34). The prices of some of the fuels vary widely from one part of the country to another, and the generalisations about the relative costs of using the fuels may not hold good in all areas.
- 6 *Solid Fuel* generally gives the lowest fuel costs for providing a given service with a given system except for short period heating. Because the fuel is cheap, the marginal extra cost of a higher output is low; this means that solid fuel systems are especially economical where continuous heat is required. A solid fuel installation will generally provide hot water as well as space heating from the same appliance, and a towel rail in the bathroom can be heated with little additional fuel cost. Domestic solid fuel appliances do not require specialist servicing.
- 7 But although solid fuel is generally the cheapest fuel, it is also the least convenient. Even a semi-automatic system (e.g. a thermostatically controlled gravity-feed boiler) has to be refuelled periodically, and ash has to be removed; installations suitable for small houses are likely to continue to require some attention, even when types are developed which produce little or no dirt or dust. Fuel storage is also required, and arrangements have to be made for fuel deliveries. We understand that the solid fuel industry is attempting to overcome some of these disadvantages, by taking steps to ensure cleaner fuel, and by bringing into operation better methods of marketing, such as packaged fuel.

- 8 *Oil* is generally more expensive in fuel costs than solid fuel, but less expensive than gas or electricity. It does, however, have the advantage of being cleaner and more convenient in use, and of being better adapted for short-period heating, because automatic ignition (which can be operated by a time switch) is possible. An oil-fired system generally provides water heating as well as space heating from the same appliance.
- 9 Fuel storage is still required, but delivery arrangements are likely to be simpler and cleaner than those for solid fuel. Regular specialist servicing of the equipment is necessary.
- 10 *Gas*, like oil, is clean and convenient in use, and well suited to short-period heating as well as to continuous heating. It has the additional advantage of drawing from a piped supply so that no storage is needed, and no fuel deliveries are required. Some systems using gas will provide water and space heating from the same appliance: with others, separate appliances are required.
- 11 Fuel costs with gas installations are generally higher than those of solid fuel or oil systems.
- 12 *Electricity* is perhaps the most convenient of all the fuels, and it is very clean for there are no products of combustion and no residue: electrical heating requires no flue and therefore imposes no restrictions of any kind on the planning of the dwelling or on the placing of appliances. As with gas, there are no requirements relating to fuel storage and deliveries.
- 13 The disadvantage of electrical systems which rely entirely on on-peak power is their high fuel costs. These costs can be reduced by the use of thermal storage systems which enable electricity at the cheaper off-peak rates to be used, but with these there is some loss in flexibility; some use of on-peak electricity is still required with these systems.
- 14 With electrical systems of space heating, water heating is by a separate appliance.

Characteristics of Heating Systems

- 15 In this section we first list the sort of factors that will have to be considered in deciding what sort of heating system to use; and then set out briefly the types of systems which are at present available. It will be seen that the various types of system have various advantages and disadvantages, and that the fact that different fuels can be used as the source of heat with the same system of heat distribution introduces further complications.

Initial Capital Cost

Capital cost of appliance(s) and of installations, including the effect on the design and structure of the house.

Whether provision for storage of fuel is required.

Running Costs

Fuel costs (likely consumption and relative fuel costs in the area).

Degree of control of running cost by the occupier.

Whether water heating is provided as well as space heating.

Probable life of appliances and equipment.

Whether specialist servicing is necessary.

Comfort Characteristics

Temperatures attainable.

Temperature gradients.

Room ventilation rates, and air movement.

Noise.

Subjective factors (such as liking for an open fire).

Convenience

Amount and frequency of attention required.

Maintenance required.

Method of supply of fuel.

Other work arising from the use of the system e.g. incidental cleaning.

Controllability

Speed, range and automation of control of output.

Flexibility of distribution of output.

Whether water heating is independent of space heating.

- 16 Different systems meet these criteria in different ways: there is no system that can claim to fulfil all of them better than any other system. The differences between systems are in fact as great as, if not greater than, the differences between the fuels, and the question of which system (using which fuel) will best satisfy the occupants of a dwelling depends to a very large extent on their way of life and on their own preferences.
- 17 Many systems can be designed to use any one of the fuels which are generally available. The three main types of system, with their main characteristics and the fuels which they can use may be briefly summed up as follows:
- (a) *Warm-air systems* have the advantage of extreme flexibility and of providing heat quickly where it is required. On the other hand, if the system is used very intermittently, the structure of the house may get colder than when a system which provides a reserve of heat is used. Warm-air systems can be used to distribute heat produced by electricity, gas, oil or solid fuel.
 - (b) *Hot-water radiator systems* are not quite as flexible as warm-air and they have a rather slower response. They have the advantage of providing more continuous background heat which may keep the structure of the house warm. They can be fired by gas, oil or solid fuel.
 - (c) *Thermal storage systems* are relatively inflexible, but they have the advantage of providing a continuous supply of heat. If thermal storage is provided in the floor, the temperature gradient produced is claimed to be low; this means that there is little difference between the air temperatures at floor and ceiling levels. Excessive temperature gradients tend to lead to discomfort because they make it difficult to keep both the feet and the head at comfortable temperatures at the same time. The only thermal storage system in common domestic use at present is electric underfloor heating.
- 18 Besides these central heating systems, there is, of course, a wide range of independent room heaters. An important development in this field is the trend towards high efficiency appliances—e.g. electric convectors and fan heaters, gas room heaters (radiant convector fires), flued oil convectors, and improved solid fuel appliances. As we have considered mainly systems which heat several rooms from a central appliance, we have not dealt with independent room heaters. We have noted, however, in the evidence which we received that experience has in several cases shown that, although the lack of an open fire may be unpopular at first, people are unwilling to go back to one once they have experienced the higher standards of heating obtainable with a higher efficiency appliance. (The appliance referred to in our evidence was a free-standing solid fuel stove.)

SYSTEMS IN USE

- 19 We now turn from the general to the particular, and consider ways in which a conventional 5-person house, built to our minimum space standard, might be heated. Approximate capital, fuel and all-in costs for some of the systems we consider here are given in the final section of the Appendix.

Systems Heating Directly the Whole of the Ground Floor

- 20 We have taken an open fire in the living room, with a high output back-boiler heating the water and radiators in the kitchen and hall as our basis for cost comparisons, and refer to it hereafter as 'the basic system'. Such a system would give the required temperatures, but as all the heating depends on the use of an open fire, which is essentially a continuous burning appliance and which requires fairly frequent attention, it might not meet people's requirements in all circumstances. Questions of convenience and flexibility become especially important where a house is unoccupied during the day. When the whole family is out all day, they may prefer a system which involves no work at all, and which will ensure that the house is warm when it needs to be—in the early morning and during the evening. Even when one member of the family is home all day, some people will, we feel, prefer a more convenient system, and, if necessary, be willing to pay for it.

- 21 For convenience and flexibility, the warm-air method of heating would be a suitable choice and in some forms would not be much more expensive in capital cost than the basic system; running costs would depend on the fuel used, and the length of time for which the house was heated. An under-floor thermal storage system with a panel fire in the living-room would be equally convenient, but not as flexible in use; depending on the house plan, the capital cost of electric under-floor heating with embedded cables would probably be little more, and might be less than that of the basic system. Including the on-peak current used, the running costs would be about 50 per cent higher than those for the basic system.
- 22 If central heating with hot-water radiators on conventional lines were preferred to a warm-air or thermal storage system (and if an open fire with back-boiler were considered unacceptable as the main heat source) this could be achieved by installing an independent boiler; the capital cost would depend on the type of fuel to be used, but it would be substantially greater than the cost of the basic system. Running costs would again depend on the fuel used; but if the boiler were fired by solid fuel, the annual fuel costs would probably not differ greatly from those of the basic system. An independent boiler would provide a considerably better service than the basic system, for it would be a more convenient source of continuous heating, and the supply of hot water would be ample.
- 23 An independent boiler can be used to heat the whole of the ground floor with radiators in all rooms, but an individual room heater may be preferred in the living-room. This might be a simple open fire or a more efficient solid fuel appliance, an electric panel fire or convector, or a flued gas or oil convector fire.* The gas convector fire would have particular advantages where the independent boiler was gas-fired, because where a two-part tariff is used, the actual cost per therm decreases as consumption increases. The use of a fuel other than solid fuel for heating the living-room might be found especially desirable if the boiler were fired by solid fuel, as most of the work involved in running two solid fuel appliances would be in connection with the appliance in the living-room—especially if it were a simple open fire.

Heating of Bedrooms

- 24 All the systems referred to so far would provide some warmth on the bedroom floor for they all include direct heating of the hall. If bedroom doors were left open during the day, sufficient background warmth could be maintained so that topping up to comfort temperatures would be relatively cheap and easy. Thus, if only occasional daytime and evening use of bedrooms were envisaged, it might be reasonable to provide an electric under-floor system on the ground floor with electric panel-fires in the bedrooms.
- 25 But with the greater use of bedrooms which we envisage, direct heating of bedrooms from the main installation may be considered to be a worth-while investment, for it will probably lead to lower running costs than the use of individual appliances if the bedrooms are used regularly. Here a large warm-air installation could be used or a hot-water radiator system with one of the larger independent boilers. Although these large boiler installations would be considerably more expensive in capital cost than the basic system, they would cost only some £30-£40 more than comparable boiler installations to heat the ground floor only, and may therefore be considered to give the best value for money if it is decided to use an independent boiler system.
- 26 With these larger independent boiler installations it would again be possible to heat the living-room with a separate appliance.

COMPARATIVE COSTS OF SOME SELECTED SYSTEMS

- 27 The costs which we give here are based on a study which the Ministry undertook for us, covering a wide range of systems, from the present minimum of an open fire with a small back-boiler only, to installations heating both the ground floor

* This assumes that the independent appliance is installed as part of a comprehensive system of heating: portable heaters could of course be used, but we have not considered them, as our minimum standard is based on the provision of an installation.

and two double bedrooms. The form of the study was decided at an early stage, and it has some shortcomings in the light of our later consideration of this subject. Nevertheless, we think that the results are worth publishing here, because very little comparative work on different fuels and systems is available.

- 28 In order to simplify the picture, we deal here only with systems which meet either our minimum standard or which come nearest to whole-house heating. Our aim has been to consider space heating, but it is impossible to do this without touching also on water heating. For the sake of consistency, we have assumed that, in all cases, a form of water heating which provides storage of hot water would be used. As the use of a storage system for hot water leads to considerably higher capital and running costs with one heating system (gas warm-air) we give alternative costs for a cheaper form of water heating with this system (paragraph 48).

Capital Costs

- 29 The study was based for the sake of simplicity on one type of dwelling—a 2-storey, 5-person terrace house with a gross area of about 1,050 sq. ft. This house was planned with heating systems of different kinds. In order that the comparison of cost should be as fair as possible, the basic house plan was adjusted to suit each system, and the same floor space standards in rooms and circulation areas were retained throughout; this means, for example, that the savings in cost because fuel stores are not required are reflected in the prices quoted for gas and electrical systems.
- 30 The estimated costs relate to particular systems, designed for this type of house, and take account not only of all the builder's work involved, but also of other services which are affected by the different heating installations. Different plan arrangements—the disposition of rooms, fuel stores, flues, etc.—would give different costs, and the relative capital costs of the systems might therefore be different if other types of house plan were studied.
- 31 The capital costs are intended to be appropriate only to local authority housing schemes for which competitive tenders would be obtained and where trade prices of the appliances would be applicable. They do not relate to private enterprise housing where systems may be designed to suit individual requirements.
- 32 The capital costs of all systems other than the basic are for thermostatically controlled schemes; all the gas and oil systems are fully automatic with electric clock controls. The costs for the gas warm-air and electric under-floor systems allow for one room thermostat. If a room thermostat were added to any of the systems based on an independent boiler, the extra capital cost would be about £15.
- 33 In order to discover what were the appropriate systems for attaining the required standards in a house of the type concerned, we approached the Coal Utilisation Council (acting for the National Coal Board), the British Electrical Development Association and the Gas Council and the systems were designed with their assistance. These bodies also helped us with the estimated costs for the various systems. Shell-Mex and B.P. Limited were consulted on the costing of the oil-fired systems. With one exception, we have considered systems in which all the heat required is provided by one or, at most, two appliances; and we have not therefore dealt with the wide range of individual room heaters, except when they form an essential part of one of our systems. This is a field of almost infinite complexity and we had to restrict the study to manageable proportions.

Fuel Costs

- 34 In estimating the likely consumptions of the various systems, we have relied on information supplied to us by the organisations mentioned in the previous paragraph. We have, of necessity, based our calculations of costs on average fuel prices. These are again based on figures supplied by the industries. The costs of some of the fuels vary from one part of the country to another, and we quote here the figures which we have used, so that the actual fuel costs can be adjusted for fuel prices ruling in any particular area. The fuel prices are:

Solid Fuel (coke)	gs. per cwt.
Oil	1s. 7½d. per gallon.

Gas		1s. 4d. per therm (and a standing charge of 39s. a quarter).
Electricity	off-peak	0.8d. per unit (and a rent of 10s. a quarter for the off-peak meter and time switch).
	on-peak	1.17d. per unit.

With electricity there is also either a standing charge or a block tariff with a higher charge for the first units consumed, but as these charges will be incurred in any case because of the use of electricity for lighting, we have not included them in the heating costs. The economics of gas systems will be affected to some small extent by the choice of fuel for cooking, laundry and refrigeration, which may spread the standing charge.

- 35 The fuel costs for all systems allow for a supply of 250 gallons per week of hot water at 140° F. (assuming a temperature rise of 90° F.). The actual consumption of hot water will depend on many factors, such as the age of children and the family's bathing habits, as well as the degree of control that can be exercised over the amount of hot water produced and the cost of the fuel used. It is claimed, that in practice, the weekly consumption of hot water is lower than 250 gallons when electricity or gas are used for water heating.

All-in Costs

- 36 The all-in costs which we quote are again based on local authority conditions—that is, they include as well as the annual fuel costs, the amortisation of the total capital cost of each heating system over 60 years at 6 per cent; replacements of equipment where these are likely to be needed; maintenance (e.g. sweeping of flues, etc.); and servicing on a well organised and economical basis. The servicing charges included are:

oil installations	£6 a year.
gas installations	£2 a year.

SUMMARY OF COSTS

1 Basic System—Open fire with high output back boiler and two radiators.

- 37 The annual consumption with this system (to give the temperatures on which our minimum standard is based, for 16 hours a day during the heating season) is estimated on the basis of experience of such systems in use, to be 73 cwts., which gives an annual fuel cost of £33. This assumes that summer water heating would be by the back boiler; there could be savings in fuel costs if an electric immersion heater were used instead during the summer—sufficient to cover the capital cost of the immersion heater within about 5 years. A gas water heater could alternatively be used, with savings in fuel costs.
- 38 The capital cost of this basic system is estimated to be about £33 more than that of an open fire with back boiler providing water heating only, and the all-in cost £9 extra a year. We have taken the costs for this system as our basis for calculating the capital and all-in costs of the other systems.

2 Independent Boiler Systems

- 39 We have considered independent boiler systems fired by solid fuel, gas and oil to meet either our minimum standard (2 radiators), or a higher standard of 65° in all living rooms and 2 double bedrooms (4 radiators). In all cases, heating of the living-room is by an open fire in order to reduce the number of variables; we would, however, draw attention to our remarks on independent room heaters in paragraphs 18 and 23 above. These systems provide the firmest basis for comparisons of fuel costs as the service is much the same in each case and the consumptions have been based on theoretical calculations of the heat inputs required. The figures quoted assume full heating to the appropriate standard for 16 hours a day, and do not allow for under-running the system: the effect of under-running on fuel costs will vary from one fuel to another.
- 40 The estimated annual fuel consumptions and costs for space and water heating, and the estimated capital and all-in costs (which include the annual fuel costs) compared with those for the basic system, are given in Table I.

TABLE I

Independent Boiler Systems. Space and Water Heating

			Capital Cost	Annual all- in Cost
	Annual Fuel Consumption	Annual Fuel Cost	(Compared with basic system)	
GROUND FLOOR ONLY				
Independent boiler with 2 radiators and open fire:				
Coke-fired boiler	46 cwts. coke	£30	+£71	+£3
Open fire	20 cwts. coke			
Oil-fired boiler	325 gallons oil	£35	+£122	+£18
Open fire	20 cwts. coke			
Gas-fired boiler	470 therms gas	£48	+£68	+£23
Open fire	20 cwts. coke			
GROUND FLOOR AND TWO BEDROOMS				
Independent boiler with 4 radiators and open fire:				
Coke-fired boiler	65 cwts coke	£38	+£102	+£13
Open fire	20 cwts. coke			
Oil-fired boiler	475 gallons oil	£48	+£164	+£34
Open fire	20 cwts. coke			
Gas-fired boiler	690 therms gas	£63	+£97	+£39
Open fire	20 cwts. coke			

Note.—The calculations of fuel consumptions are based on the formula used by the Institution of Heating and Ventilating Engineers in their recently published book *Central Heating in Your Home* and on the following thermal efficiencies:

coke-fired boiler	65 per cent
oil-fired boiler	70 per cent
gas-fired boiler	77 per cent.

The basing of calculations of fuel consumption on efficiencies of this order has recently been challenged in a report of the Heating and Ventilating Research Association. This is still a matter of controversy, and for the purpose of these calculations we have therefore accepted the efficiencies put forward by the industries; in any case, the relative positions of the fuels in order of efficiency are unlikely to be altered, even if the efficiencies used here are shown to be pitched too high.

3 Warm-Air Systems

- 41 The warm-air systems which we considered were gas-fired, and we selected 2 sizes of heater—one of 17,500 B.T.U. capacity, which will meet our minimum standard, and one of 22,000 B.T.U. capacity which will also heat directly two bedrooms. Water heating in each case was by a gas circulator with a storage cylinder (see para. 48).
- 42 With warm-air systems, fuel costs depend to a very great extent on the way in which the house is used, because the system is very flexible and may also be used selectively—i.e. the whole of the heat output may be directed into the room where it is required at any time.
- 43 In order to give figures which are reasonably comparable with those quoted for the independent boiler systems, we quote here figures for the smaller installation based on maintaining a temperature of 65° in the living-room and 55° elsewhere

for 16 hours a day, with short-period heating to 65° in the dining-kitchen. For the larger installation, we quote figures for the same service with the addition of heating the bedrooms to 65° for 25 hours a week during the heating season; the figures for the larger installations are not therefore directly comparable with those for the larger independent boilers.

- 44 The estimated annual fuel consumptions and costs are given in Table II.

TABLE II

Gas Warm-Air Systems. Space and Water Heating. Family at Home all the Time

	<i>Annual Fuel Consumption</i>	<i>Annual Fuel Cost</i>	<i>Capital Cost</i>	<i>Annual all-in Cost</i>
			<i>(Compared with basic system)</i>	
Ground Floor only	620 Therms	£49	+£21	+£20
Ground Floor and short-period heating of two bedrooms (25 hrs. a week)	645 Therms	£51	+£61	+£25

- 45 As flexibility of control is a major advantage of warm-air systems, we quote below figures for the same systems, with the consumptions and fuel costs based on maintaining the required temperatures for 8½ hours a day for 5 days a week, and 16 hours a day for 2 days a week; with the larger installation, bedroom heating to 65° for 25 hours per week during the heating season is again allowed for.
- 46 The estimated annual fuel consumptions and costs, based on the above assumptions, are given in Table III.

TABLE III

Gas Warm-Air Systems. Space and Water Heating. Family out most of Weekdays

	<i>Annual Fuel Consumption</i>	<i>Annual Fuel Cost</i>	<i>Capital Cost</i>	<i>Annual all-in Cost</i>
			<i>(Compared with basic system)</i>	
Ground Floor only	510 Therms	£42	+£21	+£13
Ground Floor and short-period heating of two bedrooms (25 hrs. a week)	535 Therms	£43	+£61	+£17

- 47 The figures quoted in Tables II and III for gas warm-air systems are based, like those for the independent boiler systems, on calculations of the heat inputs required. It is claimed that the flexibility of warm-air systems makes theoretical calculations of this kind misleading, and that experience of the system in use is a more reliable guide to likely fuel consumption. The Gas Council claim that even when the house is occupied all day so that continuous heating is needed, consumptions of the order of those quoted in Table III are generally obtained and found satisfactory in practice.
- 48 All the figures quoted for warm-air systems are based on the use of a storage system for hot water. If an instantaneous gas water heater were installed instead the costs would be reduced, according to various factors, by approximately the following amounts:

capital costs	£25 to £35
annual fuel costs	£3 to £4
annual all-in costs	£4 to £5.

4 Thermal Storage System

- 49 The thermal storage system which we have considered is electric underfloor heating with embedded cables, providing direct heat in living-room, dining-kitchen and hall; the loading is 6.56 kW. with a 2 kW. panel fire in the living room. Water heating is assumed to be by off-peak current with a storage cylinder.
- 50 The consumptions which we quote here are based not on theoretical calculations but on experience of systems of the type concerned in use in houses similar to the one studied. It is claimed by the British Electrical Development Association that these consumptions are typical of the system in normal use for continuous heating.
- 51 The system could be extended to provide direct heating in the bedrooms by the addition of panel fires. The figures for a system of this kind which we give below are based on the assumption that heating of the 2 bedrooms to 65° would be required for 25 hours a week during the heating season.
- 52 The estimated annual fuel consumptions and costs for these systems are given in Table IV.

TABLE IV

Thermal Storage System. Space and Water Heating

	Annual Fuel Consumption	Annual Fuel Cost	Capital Cost	Annual all-in Cost
			(Compared with basic system)	
Ground Floor only	9,200 units off-peak 3,700 „ on-peak	£51	£12 less	+£17
Ground Floor and short-period heating of two bedrooms (25 hrs. a week)	9,200 units off-peak 4,200 „ on-peak	£53	+£12	+£22

Appendix 3

Double glazing

- 1 In view of the importance which we attach to improved standards of heating, we have considered whether we should recommend the use of double glazing, especially as windows are not dealt with by the recent building byelaw on thermal insulation.
- 2 The insulation value of a window consisting of a single sheet of glass (expressed in terms of U-value) is about 1.00. (U-value is a measure not of insulation, but of thermal transmittance, i.e. of the amount of heat that will pass through a given area of wall, floor, roof, or window in a given time and in certain conditions. The lower the U-value, therefore, the higher the insulation value of a material.) This compares with a U-value of about .30 for an 11 inch cavity brick wall. It can be improved to about .60 to .50 by the use of two sheets of glass with an air-gap between them.

METHODS OF DOUBLE GLAZING AND COSTS

- 3 In order to see whether it could be reasonable to recommend the use of double glazing, we obtained details of the types at present available, and of their costs. There are two main types which have been developed for domestic use; other types are available, but we considered that it was sufficient to look at the likely costs of these two, as the other types are unlikely to be cheaper.

(a) *Double Casements*. These are, in effect, two completely separate windows, i.e. two separate sheets of glass, each in its own frame. The two casements are fixed together by special couplers which allow them to be opened or closed as one unit: the casements can also be opened separately for cleaning. There must be adequate air filtration into the space between the two sheets of glass in order to prevent condensation, but this does not materially affect the efficiency of the insulation. Standard double casements of this type are produced both by members of the English Joinery Manufacturers' Association and by metal window manufacturers. The costs given below are for double wood casements.

(b) *Double Glazing Units*. These consist of two sheets of glass in a single frame with a hermetically sealed gap between them. The optimum size of this gap is $\frac{3}{4}$ inch, but as this would require larger timber sections than usual, a $\frac{1}{2}$ -inch gap is normally used, with a slight reduction (14 per cent) in efficiency. The costs given below are for this type of double glazing unit.

The London County Council have developed a type of double glazing unit, using normal sized timber frames, with the two sheets of glass fitted into a butyl rubber strip with a $\frac{1}{2}$ -inch air space between. This method allows either sheet of glass to be replaced separately, and it is also possible to place an absorbent material in the cavity to eliminate condensation if the seal should leak.

- 4 Table I below gives figures of the approximate additional costs of these methods of double glazing over the cost of single glazed standard wood casements, for a local authority terrace house built in accordance with our new minimum standards. These figures must be taken as approximate indications only, for the costs will depend not only on the overall window area, but also in some cases on the number of opening windows required.

TABLE I
Additional Cost of Double Glazing

Type of double glazing	Whole House (Window area 130 sq. ft.)	Living room only (Window area 26 sq. ft.)
Double wood casements	£40	£8
Double glazing units in wood casements	£60	£12

- 5 It is necessary to consider also the amount of heat that double glazing is likely to save, in order to see whether an expenditure of this order gives value for money. The Building Research Station has carried out some research (in which a difference of 12° F. between inside and outside temperatures was assumed) on the savings likely to result from double glazing and from other methods of reducing heat loss either by conduction or ventilation, the results of which were published in its monthly Digest No. 35 (October, 1951). This research was based on a semi-detached house of about 1,000 sq. ft., with a considerably larger window area (170 sq. ft.) than that quoted above for a terrace house, and the costs of double glazing would therefore be larger. The order of savings does, however, give some indication of the relative value of double glazing, as compared with other ways of reducing heat loss. Table II shows the savings estimated by the Building Research Station.

TABLE II

Savings in Heat with Various Types of Insulation

<i>Type of Insulation (or draught-proofing)</i>	<i>Estimated Saving in therms per heating season</i>
Weather-stripping two external doors (assuming that windows are reasonably well-fitting)	90
Roof insulation	89
Wall insulation (inner leaf of insulating blocks)	47
Double glazing—to whole house —in living room only	45 13*

* Revised from B.R.S. Digest No. 35.

- 6 The costs of weather-stripping, roof insulation and wall insulation are unlikely to exceed about £10 each and they may be considerably less (especially for the last); double glazing is, therefore, relatively expensive in relation to the amount of heat saved, and it appears that, at present, roof and wall insulation and weather-stripping of doors (and windows) are likely to give better value for money. We have, therefore, concluded that we would not be justified in recommending that the use of double glazing should be made a requirement.
- 7 This does not mean that we would consider the provision of double glazing an extravagance, provided that attention had first been paid to other, cheaper ways of saving heat. Moreover, the actual amount of money that any improvement in insulation or draught-proofing will produce will depend on the running costs of the heating system used; it may therefore be worth considering the use of fairly expensive methods of insulation where heating is by a relatively expensive system.
- 8 It has also been argued to us that, because double glazing reduces radiation loss from the body to the outside air, it allows the floor-space near windows to be used in greater comfort in cold weather. This is important, and it could well be the decisive factor in deciding whether or not to use double glazing.

Appendix 4

Safety in the home

The Kitchen

Accidents in the kitchen centre round the cooker, high-level storage cupboards and the electrical installation. The use of the sequence of equipment recommended in our report, with worktops on both sides of the cooker and the sink adjoining it, and the provision of adequate storage space at the normal height of reach and sufficient socket outlets, will do much to reduce the risk of accidents, but the following points should also be considered:

- 1 The planned position for the cooker should be away from draughts, and from curtains.
- 2 If a ceiling airer is provided, it should not be over the cooker.
- 3 The swings of entrance and cupboard doors should be carefully considered; sliding or folding doors may have to be used in some cases.
- 4 Adequate electric light points should be provided, especially in the working areas.
- 5 Socket outlets should be placed so as to discourage the use near the sink of portable appliances which may be defective.
- 6 Floor finishes should be non-slip.

The Bathroom

- 1 There should be no socket outlets for movable electrical equipment (apart from a socket for an electric razor).
- 2 Any fixed electrical equipment should be properly earthed.
- 3 The Institution of Electrical Engineers Regulations on switches should be observed.
- 4 Light fittings should be enclosed, so as to discourage their use for portable appliances.
- 5 There should be handgrips to the bath.
- 6 Floor finishes should be non-slip.

Stairs and Steps

- 1 Risers should be not more than $7\frac{1}{2}$ inches and treads not less than $8\frac{1}{2}$ inches.
- 2 There should be a hand-rail on at least one side. Rails should be at least 2 feet 9 inches vertically above the level of the nose of the steps.
- 3 If winding steps are used, they should be near the bottom of the stairs.
- 4 Special attention should be paid to both natural and artificial lighting; two-way switches should be provided.
- 5 Windows and artificial lights should preferably throw light toward rather than down the stairs in order to avoid shadows.
- 6 Single steps should never be used.
- 7 No door should open directly on to the top of the stairs or swing so as to obstruct the top or bottom of the stairs.
- 8 Windows should, if possible, be so placed that they are easily accessible for cleaning.

Heating Appliances

- 1 Every open fireplace should be provided with fixing points for a guard in accordance with B.S. 2788. In local authority houses, a guard may also be provided.
- 2 Fixed electric and gas fires should be provided with adequate guards.
- 3 In small rooms, a fixed electric fire is safer than a movable one.

- 4 A fixed fire of whatever type, should be placed in such a way that all the furniture required can be placed at least 3 feet from it.
- 5 There should be a raised surround to a hearth.

The Electrical Installation

The minimum standard of socket outlet provision which we recommend will do much to reduce the dangers which arise from trailing flexes and overloading of sockets, and the whole electrical installation should of course be in accordance with the Institution of Electrical Engineers Regulations. But the following points should also be considered:

- 1 Special attention should be paid to the positioning of socket outlets, so that long trailing flexes are, so far as possible, avoided.
- 2 Meters and fuse boxes should be placed so that they are readily accessible.

The Gas Installation

- 1 Gas taps should be of a type that cannot be turned on accidentally.
- 2 Meters should be so placed that they are readily accessible.

Windows

- 1 Accessibility for cleaning should be carefully considered, especially with windows over stairs, and windows with fixed obstructions under them, e.g. in kitchens and bathrooms. Special arrangements for opening high level windows may also be needed in these circumstances.
- 2 Windows on upper storeys should be so designed that the occupier can easily make them safe for children. In particular, secure fastenings should be provided.

Lighting

The need for good natural and artificial lighting on stairs and in kitchens has already been mentioned: but the lighting of all parts of the dwelling should also be considered with safety in mind.

Safety in Multi-storey Buildings

The points mentioned above will apply to dwellings in multi-storey buildings, especially those on the design of windows and stairs. There are also the following points to be considered:

- 1 Windows in high blocks should be designed so that both surfaces can be cleaned from inside the building. (The aim here may alternatively be achieved by providing balconies). Safety catches should be fitted.
- 2 Balcony fronts should be at least 3 feet 9 inches high and should be designed so that a child can see out without having to climb on to any object or on to the parapet: there should be no horizontal bars or projections which might encourage children to climb. If balcony fronts are formed of bars, the clear spacing between the bars should not exceed $3\frac{1}{2}$ inches. The balcony should be so designed that it is possible for an occupier to fit a protective net screen easily.
- 3 If outside staircases are used, they should be protected from rain and the risk of ice in frosty weather.

Appendix 5

Water-borne systems of refuse disposal: comparison with costs of chute system

The figures given below were supplied to us by the Birmingham City Council. They are based on the assumption that the estate to be served will ultimately contain at least 250 dwellings.

COST TO THE HOUSING AUTHORITY

Water-borne System

	Annual Cost per Flat
Capital Cost £109—40 years at 6 per cent	£7 4 4
Running Cost—Labour	£3 11 0
Gas	£2 2 9
Electricity	4 3
Maintenance	£5 18 0
	10 0
TOTAL	£13 12 4

Chute System

	Annual Cost per Flat
Capital Cost £23—40 years at 6 per cent	£1 10 5
Running Cost	£1 10 0
Maintenance	1 6
TOTAL	£3 1 11

Additional cost to the Housing Authority of a water-borne system compared with the chute system (per flat per annum) £10 10s. 5d.=4s. 0½d. *per week.*

COST TO THE REFUSE AUTHORITY

Water-borne System

	Annual Cost per Flat
Collection Cost	£1 4 3
Disposal Cost	12 1
TOTAL	£1 16 4

Chute System

	Annual Cost per Flat
Collection Cost	£3 10 1
Disposal Cost	£2 1 8
TOTAL	£5 11 9

Saving to the Refuse Authority from the use of a water-borne system compared with a chute system (per flat per annum) £3 15s. 5d.=1s. 5½d. *per week.*

TOTAL COST

If the full amount of the saving to the Refuse Authority is deducted from the extra cost to the Housing Authority, the total extra cost of using the water-borne system (per flat per annum) is:

$$\begin{array}{r} \text{£10 10s. 5d.} \\ \text{less £3 15s. 5d.} \\ \hline \end{array}$$

£6 15s. 0d.=2s. 7d. *per week.*

Playspace design and management

SUPERVISION

All playspace needs some degree of supervision, even if only to ensure the safe working of the equipment and the general tidiness of the estate. These functions a good caretaker will normally take in his stride. Supervision of play, however, is different. For school age children, its purpose is to allow a range of play activities otherwise impossible for the children as a group, because materials are needed that can be borrowed freely and taken back afterwards, as for painting and gardening, or tables games, or building with wooden blocks. For the very young, it provides an introduction to groups of other children at an age when they can only play contentedly, however simply, if there is an adult nearby to act as a focus for the group and see that all is well. Supervision of play opens up much wider opportunities than this bare outline suggests, as anyone will know who has seen children at supervised play—but these two purposes are its basic justification.

DESIGN OF PLAYSPACES FOR DIFFERENT AGE GROUPS

Nursery School Age Group (2-5 years)

Siting: Sheltered from the wind, facing south, with some shade: enclosed by low wall or fence: as near to W.C. and the children's own homes as possible.

Examples of the type of provision when the most that can be done is to make arrangements for keeping the playspace and equipment in good order:

- a Paved area. For tricycles, dolls' prams, push and pull toys.
- b Grass area. With small banks and mounds.
- c Low walls and steps. For balancing and jumping.
- d Rough ground. In which the children are allowed to dig.
- e Sand box or sand pit.
- f Low water tray. For sailing boats and playing with water toys.
- g Low weatherproof fixed tables and chairs.
- h Shelter open on two sides.
- i Seats (with backs) for mothers.
- j Additional features. A small slide.
A small climbing frame.
A piece of play sculpture.
Cradle swings.

Examples of additional equipment which can be provided when either a statutory or voluntary body is able to provide supervision of the children:

- a A paddling pool.
- b Other types of climbing frames.
- c Wooden blocks for building.
- d Simple materials for imaginative play—e.g. planks and boxes.
- e Constructional toys.
- f Wendy house.
- g Wigwam tents.
- h Clay and paint.
- i Low tables and chairs.
- j Shelter.
- k Lock-up storage space.
- l W.C.

Primary School Age Group (5-11 years)

Siting. At a focal point in the housing layout. Pleasant landscaping and some screening. Sheltered from the wind: facing south, with some shade: where noise is least likely to disturb residents: near W.C. Some division within the site for different activities, e.g. ball games, equipment, free play.

Examples of the type of provision where the most that can be done is to make arrangements for keeping the playspace and equipment in good order:

- a Gymnastic Equipment. Slides, swings (with guard rails), climbing frames, etc.
- b Rough Ground. Preferably with small shrubs and bushes for imaginative play.
- *c Sand Pit.
- d Fixed Logs.
- e Play sculpture, or animal shapes in wood.
- f Fixed table and benches.
- g Concrete equipment—shaped as boats, forts, etc.
- h An enclosed area for ball games. (It may sometimes be possible to use a school playground or an area primarily intended for older children.)

* On some estates may not be possible without more supervision.

Examples of additional equipment which can be provided where either a statutory or voluntary body is able to provide supervision of the children:

- a Paddling pool.
- b Wood and simple tools for building and making things.
- c Wigwam tents.
- d Wendy houses.
- e Stilts.
- f Table games requiring skill.
- g Individual and small communal gardens.
- h Tables and chairs.
- i Easels for painting.
- j Clay for modelling.
- k Shelter.
- l Lock up storage space.
- m W.C.

Secondary School Age Group (11 years and over)

Siting: It is sometimes necessary to arrange for joint use of the ball game area by the secondary school age group and the younger children, whether because of the impossibility of arranging for more than one space in the layout large enough for the purpose, or because it is preferred to obtain the advantages of the larger combined size. But if so the possibility of some disturbance of the younger children's play must be accepted.

Examples of the type of provision that can be made where there are arrangements for keeping the playspace and equipment in good order:

- a *Area for ball games.* Enclosed with netting 12 ft. to 14 ft. high with pegs in a safe place for players' jackets.
 - Suggested sizes: 110 ft. × 60 ft.—very good area.
 - 105 ft. × 55 ft.—netball court with 5 ft. surround.
 - 100 ft. × 50 ft.
 - 80 ft. × 40 ft.—still useful.

Below these sizes on a small estate it is still possible to give boys an opportunity to kick into a goal, or knock a ball about in a cricket net, and for girls to practise netball.

The area can be marked in three different colours (red, yellow and white are the best) for different games: for example, for 5 a side football, netball and basketball. Slots can be made in the ground to take light tubular steel equipment (goal posts, etc.). It is very desirable to have such equipment. Storage for 10 ft. netball posts.

Flood lighting should be considered.

- b *Other ball games.* A narrow strip of land might be totally enclosed for cricket practice. In some circumstances the children may be able to use a tennis court provided for the adults.

- c Concrete table tennis table in a place sheltered from the wind.
- d Cycling and roller skating.

Additional provision

It may be possible to provide on a neighbourhood basis, the constructional and other activities of an adventure playground, which requires supervision, and is of interest to children of all ages.

The spare time of children of this age group undergoes, sooner or later, gradually or suddenly, a transition from activities akin to those of the primary school child to those of the young person. Many of the children take up one or more, or a succession, of special interests, often including some form of service to others; and many, not excluding these, start in time to look for the informal activities of the modern youth club or the coffee bar.

MANAGEMENT OF PLAYSPACES

Care of equipment

Regular care should be taken of the equipment which should be checked for safety once or twice a day: it is unfortunate if equipment is allowed to stay out of order for long periods. Adequate insurance for the most adventurous of playgrounds is available.

Sand

Local authorities have told us that they have great difficulty in keeping sand in a satisfactory condition. Some of the difficulties can be overcome if the sand pit can be drained properly and the appropriate sand used. The specification for sand for this purpose should include the following points:—

- 1 The largest particle should be less than an eighth of an inch across. This is to ensure that it does not contain stones and chips.
- 2 It should not contain crushed sand; the sharp edges are uncomfortable to handle.
- 3 The sand should be washed to such a degree that it does not stain the hands. Sand of all kinds will stain light coloured cloth, but if it does not stain the hands the stain will probably be capable of being washed out of children's clothes with no great difficulty.

Possible sources for suitable sand include estuary or natural sea sand so long as it is free from oil pollution; and some sand workings. Most building sands will not be suitable usually because they stain the hands and the clothing. In practice it is essential to approve a sample and to check that the sand delivered is of comparable quality.

The sand pit should be covered or closed at night and raked over and cleaned regularly. There should be fresh supplies of sand at regular intervals. Where there is plenty of other equipment with which to play the concentration of children of all ages round the sand pit can be avoided. We think that local authorities should persevere with this provision, in spite of complaints from parents that the sand gets in the house, or from caretakers that it has to be swept up, because of the enjoyment which it gives to the children. Some authorities appear to have no trouble.

W.C.'s.

A serious problem on some estates is the absence of W.C.'s. which can be used by children at play; often young children are unable to reach the lift controls and have to walk upstairs to their home. We think it important that some provision should be made; some authorities allow the children to use the lavatories in communal laundries.

The personal contribution

Whilst planners and architects can design interesting play areas for children, we recognise that there is often a problem of housing management. When difficulties arise it is often because children have previously been deprived of adequate facilities for play. We should like to pay tribute to caretakers and others who, in addition to their normal duties, are patient with children and take a personal interest in the care of their play equipment; without this co-operation the best of playgrounds may not be successful.

Appendix 7

The attached report, prepared for us by the Ministry, sets out the material on the cost of providing for one car per dwelling, on the basis of which we have made our recommendations.

The cost of providing for one car per dwelling

INTRODUCTION

- 1 The purpose of this report is to consider what are the likely capital costs of providing for one car per dwelling in housing schemes at various densities. It does not pretend to tackle the design problems involved, although certain assumptions about the form of the buildings, the estate layout and the car accommodation have had to be made especially where high densities are concerned.
- 2 We have considered only the cost of providing for vehicles used by the occupants of the dwellings in the estate, at an average ratio of one car per dwelling. Additional provision may have to be made for visiting vehicles, but, as there is no material on which to base an estimate of what would be required, we have not been able to take account of this.
- 3 The increase in car ownership is already making its impact on the space around the buildings in housing areas of all kinds. In any layout a comparatively small proportion of the site is occupied by buildings in order to allow daylight and sunlight to reach the buildings. The space left between buildings has many uses, the most obvious of which is the circulation of vehicles and pedestrians: but there are other uses of this space which are equally important—for private gardens, for children's play, and for providing a pleasant environment to live in. It would be possible even at quite high densities to solve the problem of finding space for cars at the expense of these other uses; but we have assumed that such solutions would be socially unacceptable and that the aim must be to preserve most of the space around buildings from encroachment by cars. (Some small use of such space for cars will probably be acceptable, and we deal with this in paragraph 16(1)).
- 4 There are, then, two distinct, though inter-related, factors to be considered here—the construction of accommodation for the cars (in garages, on hard-standings, etc.) together with the means of access to this accommodation; and the creation of sufficient space in the design of a housing scheme to allow for the housing of all the cars in an acceptable way. As the creation of space for cars can, in some circumstances, be a complex question, we deal with it at some length in the following section.

MAKING SPACE FOR CARS

- 5 A car takes up about 250 sq. ft. in standing space and its access, and this amount of space has to be provided within a housing scheme for every car housed. If there is not enough room to house all the cars acceptably within the amount of space around buildings provided in present layouts, then space will have to be created by designing for a different arrangement of buildings on the site.
- 6 Space can be made for cars in either or both of the following ways:
 - (a) by using some of the space within buildings for cars;
 - (b) by using some of the ground space at present occupied by buildings for cars.

If the residential space lost to cars is not replaced elsewhere on the site, there will be a net loss in the number of dwellings provided. We have assumed that it will be impracticable to reduce densities in this way and that the residential

space occupied by cars will have to be replaced within the scheme. Because at high and, perhaps, medium densities, this will involve the use of a higher proportion of high buildings, which are more expensive than low buildings, it will lead to an increase in the cost of the dwellings (irrespective of the cost of car accommodation). This extra cost, which must be incurred when the estate is built, even if the car accommodation is added later, becomes increasingly important as densities rise. In the rest of this report, we refer to this factor in the cost of providing for cars as "the extra housing cost".

- 7 Another approach to the problem of making room for cars is the use of forms of car accommodation which involve dual use of land; for instance, hard-standings, either at ground level or below, can be roofed over and the upper surface paved so as to provide usable space equivalent to the ground occupied. Although car accommodation of this kind is likely to be more expensive in itself, its use may lead to a reduction in the total cost of providing for the car, for the covered cars would not represent an intrusion into the existing space around buildings and the "extra housing cost" would therefore be less than it would if space had to be made for these cars by using more high buildings.
- 8 More intensive use of land may also be achieved by increasing the density of the car accommodation—i.e. by putting the cars on more than one level. Here too, constructional costs will be higher but the "extra housing cost" will be less than it would be if single level car housing with no dual use of land were used.

TOTAL COSTS AT LOW AND MEDIUM DENSITIES

- 9 At low densities (up to 30-40 habitable rooms per acre) there will be enough space in the layout to accommodate one car per dwelling acceptably; although the layout may need to be different in order to deal with the cars satisfactorily, there need be no "extra housing cost", and the cost of housing the car will be only the cost of whatever form of car accommodation is used.
- 10 At medium densities (say 60-70 habitable rooms per acre) there may be already some use of 3-4-storey buildings in present schemes. Although there will still be enough space to take the cars, it may be necessary to incorporate a small proportion of the garages in the buildings in order not to encroach to an unacceptable extent on the space around buildings. This will lead to a small "extra housing cost", as the space in buildings occupied by cars will have to be replaced by the use of more 3-and 4-storey buildings; the cost of some of the car accommodation will also be somewhat higher, because of the use of incorporated garages.
- 11 However, even at medium densities, the average cost of providing space and accommodation for a car is unlikely to be so high that it cannot be covered by the rents which can be charged; the evidence which has been received points to the fact that at these densities there is no difficulty in letting garages, hard-standings, or whatever form of car accommodation may be provided, at economic rents. We have not therefore considered in detail the costs of providing for cars at low and medium densities.

TOTAL COSTS AT HIGH DENSITIES

- 12 High densities tend, naturally, to be used where land is scarce and expensive, and the higher costs of higher buildings are accepted because of the saving in land. Provision for the storage of one car per dwelling introduces into this situation a new and major land use. (On an estate at a density of 160 habitable rooms per acre with a typical average dwelling size, the space per acre required for cars is about 1,200 square yards—almost a quarter of an acre).
- 13 The space to take the cars could still be found in the existing space around buildings, even at densities as high as 160 habitable rooms per acre. But, in a typical estate layout, the space for cars, together with estate roads, would take up no less than half the space at present available—and this figure does not include any provision for visitors' or tradesmen's vehicles. The sea of vehicles, hard-standings and single storey light-weight garages or car ports would not be tolerable

visually either at ground level or from the windows of buildings, and the remaining open space would be split into small areas scattered about the estate, so as to be of little use either for visual relief, or for the various other uses of space around buildings referred to in paragraph 3.

- 14 We have attempted to assess the likely cost of providing for one car per dwelling at various levels of density; our approach has inevitably been limited by the fact that there is little or no practical experience of making provision for cars at this scale. Moreover, our assessments of cost are largely theoretical; the way in which cars are accommodated on a particular site will be a complex question, for there will be factors to consider which we have not been able to take account of—e.g. site levels, whether, on a redevelopment site, there are existing cellars, whether the immediate demand for garaging is likely to be large or small, etc.
- 15 The density affects the “extra housing cost”, because of its effect on the selection of building types. For instance, there will already be more high buildings at 160 than at 100 habitable rooms per acre before any provision is made for cars; and the average extra cost per dwelling of increasing the number of high buildings in a scheme which already contains a considerable proportion of them is relatively less than the cost of adding high buildings to a scheme which has only a few such blocks. The “extra housing cost” will therefore tail off at the higher densities, the density at which this occurs varying with the average dwelling size of the estate. (The average dwelling size also affects the problem in other ways and we deal with its effect in general terms in paragraphs 28–35). In our assessments of cost, which cover estates at 100, 140, and 160 habitable rooms per acre we assume a medium average dwelling size of 3.77 rooms per dwelling and site areas of a sufficient size to accommodate the various forms of mixed development which provide the basis of our costing.
- 16 In deciding on what types of solutions to consider, we have had necessarily to work to certain principles. These are:
 - (1) that a limited proportion of the cars can reasonably be accommodated in the amount of space around buildings provided in present layouts without unduly affecting amenity or using up space required for other purposes; on the basis of experience of present layouts, we have taken it as a working rule that it is reasonable to use not more than about 10 per cent of the space around buildings for cars
 - (2) that, as far as possible, space for the car should be closely related to the dwelling. This means that we have not considered solutions that would involve concentrating very large numbers of the cars in one place. (The importance of this factor will, of course, vary with the density and the size of the site).

Basis of the assessments of costs

- 17 For the purposes of costing we have made the following assumptions:
 - (1) that in all cases the overall housing density would be held constant, i.e. space would not be made for the cars by putting fewer dwellings on a site;
 - (2) that the present layouts, on which we have based our estimates of “extra housing cost”, were good average mixed developments, reasonably economically designed, without an excessive proportion of high buildings; and
 - (3) that no car accommodation would be provided in present layouts.
- 18 By making these three assumptions we have concentrated our attention on the worst case. Granted that there must be no loss in density, the extra costs may still in some circumstances be lower than those that we have quoted, either because more than adequate space around buildings has been provided in present layouts or because provision for cars on a considerable scale is already being made.
- 19 The approximate constructional costs of the types of car accommodation which we have considered are set out in Table I below. These costs include all surfacing and access roads to the accommodation (other than estate roads as provided in present-day layouts), and are based on average provincial prices in mid-1961.

TABLE I

<i>Type of Car Accommodation</i>	<i>Average Cost per Car Space</i>
(a) a hardstanding	£36
(b) a lock-up in a grouped garage compound	£125
(c) a garage incorporated in a house or in a 4-storey block	£190
(d) a space in a ramped 2-level car park without roof	£210
(e) a space in a ramped 2-level car park with light-weight roof (not providing useable space)	£250
(f) a hardstanding place decked over and paved to provide useable space	£325

- 20 This is by no means a complete list of the types that can be used, but it does provide a reasonable selection for theoretical assessments of cost. More expensive types, such as multi-storey lift garages and communal basement garages, at about £550 and £1,000 per car place respectively, are too costly for general use at the densities which we have considered, and may also require staff to man them.

ESTATES WITH TYPICAL AVERAGE DWELLING SIZE (3.77 ROOMS)

- 21 With this average dwelling size, 10 per cent of the space around buildings (see paragraph 16(1)) will accommodate about one-third of the cars, and the "extra housing cost" is therefore the cost of making space for the remaining two-thirds. We have taken it as a working rule that the number of cars which can be accommodated in the existing space around buildings can also be left in the open without unduly affecting the appearance of the estate, and the costs quoted are based on this assumption. It may be considered desirable that all the cars should be covered. If, in the examples which we have considered, this were done by decking over the open hardstandings, there would be an average increase in cost of £100 per dwelling (as the extra cost of a decked-over hardstanding compared with an open one is about £290, and the proportion of cars on hardstandings is about 35 per cent).

1 Examples at a density of 100 habitable rooms per acre

- 22 At this density, a typical present layout is likely to consist very largely, or entirely, of low blocks, including a proportion of houses, and this will make it reasonable to use a considerable number of garages closely associated with the dwellings. The use of two-level car accommodation may lead to excessive concentration of cars, but this solution may be appropriate in some cases (e.g. on small sites), and we have therefore considered it as well.
- 23 The selection of building types in a present-day estate at this density might be:
- 40 per cent in houses
 - 60 per cent in 3- or 4-storey blocks.

This is the basic pattern which has to be changed in order to make space for the cars.

Solution 1: Cars on One Level—No Dual Use of Land

(a) New selection of building types:

- 25 per cent in houses
- 60 per cent in 3- or 4-storey blocks
- 15 per cent in high blocks

Extra housing cost —about £140 per dwelling

(b) Car accommodation:

- 25 per cent lock-up garages at £125
- 40 per cent incorporated in buildings at £190
- 35 per cent hardstandings at £36

Average cost of car accommodation —about £120 per dwelling

Total Cost £260 per dwelling

Solution 2: Cars on Two Levels

(a) New selection of building types:

- 25 per cent in houses
- 70 per cent in 3- or 4-storey blocks
- 5 per cent in high blocks

Extra housing cost —about £75 *per dwelling*

(b) Car accommodation:

- 65 per cent in 2-storey car parks with roofs
at £250
- 35 per cent hardstandings at £36

Average cost of car accommodation —about £175 *per dwelling*

Total Cost £250 *per dwelling*

Note.—If solution 2 were used, it might be considered acceptable to have the cars on the upper deck of the 2-storey car park uncovered; this would mean that about two-thirds of the cars would be visible from the windows of high buildings although only one-third would be visible on the ground. If the upper deck of the 2-storey park were not roofed over (cost per place £210 instead of £250), this would reduce the average cost of car accommodation to £150, and the total cost to £225 *per dwelling*.

2 Examples at a density of 140 habitable rooms per acre

- 24 At this density, the proportion of high buildings would already be approaching 50 per cent in typical present layouts, and some use of 2-level car accommodation would perhaps be more acceptable than at 100 habitable rooms per acre, as the greater concentration of dwellings would make it reasonable to have some concentration of the cars. At 140 habitable rooms per acre the use of a high proportion of open hardstandings and single-storey garages together is likely to be unacceptable and solutions involving dual use of land may be preferable: nevertheless, we give the approximate cost of a solution relying on the use of single-storey garages (solution 1) to show that it is not in fact cheaper than the better solutions, because dual use of land produces savings in "extra housing cost" which compensate for the higher costs of the car accommodation.
- 25 The selection of building types in a present-day layout might be:
- 15 per cent in houses
 - 35 per cent in 3- or 4-storey blocks
 - 50 per cent in high blocks.

Solution 1: Cars on One Level—No Dual Use of Land

(a) New selection of building types:

- 10 per cent in houses
- 20 per cent in 3- or 4-storey blocks
- 70 per cent in high blocks

Extra housing cost —about £140 *per dwelling*

(b) Car accommodation:

- 30 per cent incorporated in buildings at £190
- 35 per cent lock-up garages at £125
- 35 per cent hardstandings at £36

Average cost of car accommodation —about £115 *per dwelling*

Total Cost £255 *per dwelling*

Solution 2: Cars on One Level with Dual Use of Land

- (a) New selection of building types:
10 per cent in houses
30 per cent in 3- or 4-storey blocks
60 per cent in high blocks
Extra housing cost —about £80 per dwelling
- (b) Car accommodation:
30 per cent incorporated in buildings at £190
35 per cent hardstandings decked over and paved at £325
35 per cent hardstandings at £36
Average cost of car accommodation —about £185 per dwelling
-
- Total Cost £265 per dwelling

Solution 3: Cars on Two Levels

- (a) New selection of building types:
10 per cent in houses
30 per cent in 3- or 4-storey blocks
60 per cent in high blocks
Extra housing cost —about £80 per dwelling
- (b) Car accommodation:
65 per cent in 2-storey car parks, with roofs at £250
35 per cent in hardstandings at £36
Average cost of car accommodation —about £175 per dwelling
-
- Total Cost £255 per dwelling

Note—If the upper deck of the 2-storey park were not roofed over, the cost of car accommodation would be £150 per dwelling, and the total cost £230 per dwelling.

3 Examples at a density of 160 habitable rooms per acre

- 26 A further rise in density will increase the effect of the trends mentioned in paragraph 24. In particular, solutions relying on the housing of all the cars on one level without dual use of land will probably be entirely unacceptable, and for this reason we have not considered this type of solution here.
- 27 The selection of building types in a present-day layout might be:
10 per cent in houses
25 per cent in 3- or 4-storey blocks
65 per cent in high blocks.

Solution 1: Cars on One Level with Dual Use of Land

- (a) New selection of building types:
10 per cent in houses
20 per cent in 3- or 4-storey blocks
70 per cent in high blocks
Extra housing cost —about £30 per dwelling
- (b) Car accommodation:
10 per cent incorporated in buildings at £190
55 per cent hardstandings decked over and paved at £325
35 per cent hardstandings at £36
Average cost of car accommodation —about £210 per dwelling
-
- Total Cost £240 per dwelling

Solution 2: Cars on Two Levels

- (a) New selection of building types:
 10 per cent in houses
 10 per cent in 3- or 4-storey blocks
 80 per cent in high blocks
 Extra housing cost —about £95 per dwelling
- (b) Car accommodation:
 65 per cent 2-storey car parks with roofs at £250
 35 per cent hardstandings at £36
 Average cost of car accommodation —about £175 per dwelling
- Total Cost £270 per dwelling

Note.—If the upper deck of the 2-storey park were not roofed over, the average cost of car accommodation would be £150 per dwelling, and the total cost £245 per dwelling.

THE EFFECT OF VARIATIONS IN AVERAGE DWELLING SIZE

- 28 In the preceding section we have set out the likely costs of providing for cars in high density estates when the average size of dwelling (in number of habitable rooms) is at a level typical of many present-day schemes (3.77 rooms per dwelling). When the average dwelling size is larger or smaller, the pattern will be much the same and we have not made detailed assessments of the likely costs. There are, however, some factors which may have a bearing on the cost of providing for cars in schemes with different average dwelling sizes, and we deal with these in general terms in the following paragraphs.
- 29 At a given density, the average dwelling size determines the number of cars per acre (because the density is expressed in terms of rooms, or persons, whilst the number of cars is related to the number of dwellings). Thus the number of cars per 100 rooms will vary with the average dwelling size as follows:
- | 2 rooms per dwelling | | 50 cars per 100 rooms | |
|----------------------|-------|-----------------------|---------|
| 3.77 | " " " | 27 | " " " " |
| 4.5 | " " " | 22 | " " " " |
- 30 Our assessments of costs for estates with a typical average dwelling size have been based on the assumption that 10 per cent of the amount of space around buildings provided at present can acceptably be used for cars (paragraph 16(1)) and that the number of cars that can be housed in this amount of space can also be left in the open (paragraph 21). If these assumptions hold good for other average dwelling sizes, then the approximate proportions of cars that can be housed in the space around buildings, and that can be left in the open, will be as follows:
- | 2 rooms per dwelling | | about $\frac{1}{3}$ | |
|----------------------|-------|---------------------|---------------|
| 3.77 | " " " | " | $\frac{1}{3}$ |
| 4.5 | " " " | " | $\frac{1}{2}$ |
- 31 As open hardstandings are the cheapest form of car accommodation, the average cost per dwelling of car accommodation will be higher when the average dwelling size is small and lower when it is large. The fact that space for a larger number of cars has to be created in the layout when the average dwelling size is small would seem to lead to higher "extra housing costs" as well but other factors which are dealt with in the next paragraphs may lead to a different result.
- 32 The amount of floor-space per person is not constant in dwellings of different sizes: although a dwelling for 4 persons is larger than one for 2 persons it is not twice as large. This means that, on a given site at a given density, the total amount of floor-space that has to be provided in buildings depends on the average size of dwelling: there will be a greater volume of building when the average dwelling size is small and a smaller volume when it is large, although the density in rooms (or persons) per acre is the same.
- 33 The volume of building that has to be provided influences the selection of building types at a given density. Thus, at any level of density there will tend to be more high buildings when the average dwelling size is small, and vice versa.

- 34 As we have pointed out in paragraph 15, it is relatively cheaper to increase the proportion of high buildings when a scheme already contains a high proportion of them, and relatively more expensive when the proportion previously used is small. Whether a change in average dwelling size increases or decreases the "extra housing costs" incurred in creating space for cars depends therefore on the level of density, because the volume of building to be provided (which on a given site, is determined by the combination of density and average dwelling size) affects the selection of building types in the scheme. Within the high density scale which we have considered, the indications are that the "extra housing cost" incurred in creating space for cars in a given way will be higher in estates with a small average dwelling size than in estates with a typical average dwelling size at 100 habitable rooms per acre, but that at 160 habitable rooms per acre the "extra housing cost" will be lower.
- 35 The effect of variations in average dwelling size on the total cost of providing for cars is not, therefore, easy to assess in general terms. Granted the assumptions on which this report is based, it is, however, probably true to say that costs will tend to be higher when the average dwelling size is small for the following reasons:
- (1) more cars will have to be covered, leading to greater use of more expensive forms of car accommodation; and
 - (2) even if the "extra housing cost" incurred is somewhat less, the housing of a large number of cars per acre acceptably will present such difficult problems especially at higher densities, that costs are likely to be high in practice, even if theoretical assessments show them to be low.

Conversely, when the average dwelling size is large, costs will probably tend to be lower.

CONCLUSIONS

- 36 The advent of car ownership at a ratio of one per dwelling introduces a major new land use into housing areas. The general aim in making provision for cars must be to ensure that the amount of space around buildings available in present schemes is not greatly reduced.
- 37 Some use of the space around buildings for cars may be acceptable; the figures given in this report are based on the assumption that 10 per cent of the amount of space generally provided in present high density schemes can be used for cars. Whatever standard is accepted here, a formula will have to be worked out to ensure that the loss of space is limited to the extent desired.
- 38 If it is accepted that space around buildings must be safeguarded (subject only to some small diminution), extra housing costs will be incurred in layouts above about 60 habitable rooms per acre.
- 39 At low and medium densities, the extra costs of providing for cars are unlikely to be high, and the evidence shows that economic rents can generally be charged for whatever form of car accommodation is provided.
- 40 At densities between 100 and 160 habitable rooms per acre and at a typical average dwelling size, the total cost per dwelling is likely to be in the region of £250-£300. (This figure is based on the assumption that 10 per cent of the space around buildings can be used for cars, accommodating about one-third of them at a typical average dwelling size; and that this proportion of the cars can be acceptably accommodated on open hardstandings).
- 41 Costs are likely to be higher when the average dwelling size is small, and lower when the average dwelling size is large.
- 42 The general factors which have come out in our consideration of this question as needing to be borne in mind in deciding how to provide for cars at high densities may be summed up as follows:
- (i) *The effect on the space around buildings:* for instance, the use of two-level car accommodation leaves free more space at ground level, which can be used for grass and trees, than the use of decked-over hardstandings, which may lead to a preponderance of hard landscaping, unless a considerable amount is spent on the landscaping of the upper decks.

- (ii) *The placing of car storage in relation to the dwelling:* the effect of this factor varies with density and average dwelling size. Concentration of cars will be more acceptable where there is considerable concentration of dwellings in very high buildings than where the dwellings are more widely spread.
- (iii) *The effect on the selection of building types:* for instance, dual use of land may make it possible to use more low buildings and, therefore, to keep more families with children near the ground.
- (iv) *Overall cost:* the sum of the "extra housing cost" and the cost of car accommodation. These will often vary inversely to one another, so that the overall costs of different solutions may be much the same. The choice between different solutions giving much the same overall costs will then depend on the operation of the other factors.

The cost of private balconies

- 1 We have set out in paragraph 130 of our Report what we consider to be the main functions of a private balcony. In this Appendix we give approximate costs of different ways of providing for some or all of these functions, together with estimates of the amount of extra floor space that could be provided within the dwelling for the same cost.
- 2 The costs have been calculated for a typical local authority flat in an 11-storey block (on the basis of average provincial prices in mid-1961); and each of the extra costs is expressed as extra over the cost of a dwelling of the same room areas with a window in place of the balcony.
- 3 The cheapest way of giving people living in high blocks some sense of contact with the outside air is by providing full height doors, opening into the room and a safety railing; this is the first type of provision in the table below. For all the other types, the balcony areas, which vary slightly, are about 45 sq. ft., and it is assumed that the balcony will be of good average design; some types of balcony at present in use are more elaborate, others less so, and the costs therefore vary. The elevational treatment of a block also has an influence on the extra cost of a balcony.
- 4 The estimated costs are set out in Table I, together with assessments of the amounts of extra floor space which it would be possible to provide at the same cost. The areas quoted are net; they do not include the additional space that would necessarily be provided in circulation space both inside and outside the flat in the course of enlarging the rooms. The costs also make allowance for the fact that the provision of more space involves increased costs for enclosing it with both partitioning and division walls.
- 5 Two separate figures of extra floor space are quoted for the more expensive types of balcony. The first figure in each case is based on the assumption that the extra space would be added to existing rooms. If it was decided that the money saved by not providing a balcony could be better spent on providing an extra room, then the costs of enclosure would be higher; the second figure is an estimate of the size of extra room that could be obtained in each case.

TABLE I

Type of Provision	Estimated Cost	Approximate area of Balcony	Amount of Floor Space that could be provided at the same cost	
			In enlarged rooms	In a separate room
	£	sq. ft.	sq. ft.	sq. ft.
1 Inward-opening full height doors with outside railing	35	—	17	—
2 Wholly projecting balcony with railing at front and sides	100	45	50	—
3 Part inset, part projecting balcony with railing	124	45	62	50
4 Wholly projecting balcony with railing at front and full height screens at the sides	140	45	70	55
5 Wholly inset balcony with railing	150	45	75	60

List of organizations and individuals who gave evidence to the sub-committee

LOCAL AUTHORITY ASSOCIATIONS

- *County Councils' Association
- *Association of Municipal Corporations
- *Urban District Councils' Association
- *Rural District Councils' Association
- *Metropolitan Boroughs' Standing Joint Committee
- Association of Metropolitan Borough Engineers and Surveyors

LOCAL AUTHORITIES

Evidence from individual local authorities formed the basis of the Local Authority Associations' evidence: 76 local authorities also sent copies of the evidence which they supplied to their Association direct to the Ministry. Four local authorities had already undertaken to supply evidence direct before arrangements were concluded with the Associations, and they did so. They were:

- *City of Birmingham
- City of Cambridge
- Hemel Hempstead Borough
- Heston and Isleworth Borough

Evidence was also received from the *London County Council, and from the Chelmsford Borough Council.

NEW TOWN DEVELOPMENT CORPORATIONS

- | | |
|-----------|---------------------------------|
| *Aycliffe | Harlow |
| Basildon | Hemel Hempstead |
| Bracknell | Peterlee |
| Corby | *Stevenage |
| Crawley | Welwyn Garden City and Hatfield |
| *Cwmbran | |

OTHER ORGANISATIONS

- | | |
|--|--|
| Association of Electrical Housecraft Advisers | Committee on the play activities of children under school age living in high flats (Chairman: Mrs. Eirene White, M.P.) |
| Association of Public Health Inspectors | Electrical Association for Women |
| British Electrical and Allied Manufacturers' Association | Electrical Contractors' Association |
| *British Electrical Development Association | Electricity Council |
| British Lighting Council | English Joinery Manufacturers' Association |
| British Refrigeration Association | *Federation of Master Builders |
| Building Research Station | *Federation of Registered House-builders |
| *Building Societies' Association | Furniture Development Council |
| Church Army Housing Limited | *Gas Council |
| *City and Borough Architects' Society | Guinness Trust |
| *Coal Utilisation Council | |

* Denotes oral as well as written evidence.

- | | |
|--|--|
| Housing Centre Trust | *National Union of Agricultural Workers |
| Institute of British Launderers | National Union of Townswomen's Guilds—numerous branches |
| *Institute of Housing | *Norfolk Women's Housing Council |
| Institution of Electrical Engineers | *Royal Institute of British Architects |
| Institution of Heating and Ventilating Engineers | Royal Institution of Chartered Surveyors |
| *Institution of Municipal Engineers | Royal Society for the Prevention of Accidents |
| *London Standing Conference of Housing Estate Community Groups | *Royal Society of Health |
| National Corporation for the Care of Old People | *Shell-Mex and B.P. Ltd. |
| National Council of Women of Great Britain | *Society of Housing Managers |
| National Federation of Housing Societies | *Society of Medical Officers of Health |
| National Federation of Property Owners | Sutton Dwellings Trust |
| National Federation of Women's Institutes—numerous branches | *Town and Country Planning Association |
| *National Housing and Town Planning Council | Women's Advisory Council on Solid Fuel |
| National Old People's Welfare Council | Women's Gas Federation |
| National Playing Fields Association | Women's Group on Public Welfare (Council of Scientific Management in the Home) |

PRIVATE INDIVIDUALS

- †Lady Allen of Hurtwood, F.I.L.A.
- *Miss May Abbott, of *Woman's Mirror*
- Mr. W. H. Beesley, A.R.I.B.A., F.R.I.C.S., Director of Housing and Borough Architect, Paddington M.B.C.
- Mr. J. A. Carpenter, Gold Medallist of the Royal Institution of Chartered Surveyors
- Mr. R. Rosner, A.R.I.B.A., A.M.T.P.I., T.P.Dipl., Architect and Town Planner, Hamburg
- †Mr. A. Silverman, Assistant Commissioner for Management of the United States Public Housing Administration
- *Mr. L. E. Waddilove, Executive Officer, Joseph Rowntree Memorial Trust
- Mr. S. G. Wardley, B.Sc., M.I.C.E., M.I.Mun.E., City Engineer and Surveyor, City of Bradford

* Denotes oral as well as written evidence.

† Denotes oral evidence.

Visits made by members

Members visited dwellings provided by local authorities, development corporations, housing associations and private builders in the following places:

Basildon New Town
Birmingham C.B.
Cardiff C.B.
Cardiff R.D.
Chester-le-Street R.D.
Chichester R.D.
Coventry C.B.
Cumbernauld New Town
Gateshead C.B.
Gosport B.
Harlow New Town
Leeds C.B.
Leicester C.B.
Liverpool C.B.
Loddon R.D.

London (Estates by the L.C.C., the City of Westminster and the Metropolitan Boroughs of Paddington and Wandsworth, as well as private enterprise estates).
Northampton C.B.
Norwich C.B.
Ottery St. Mary U.D.
Plympton St. Mary R.D.
Plymouth C.B.
Pontypridd U.D.
Sheffield C.B.
Stevenage New Town
Stoke-on-Trent C.B.
Wrexham B.



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— June, 1960

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