

The story of post-war school building.

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The story of post-war school building



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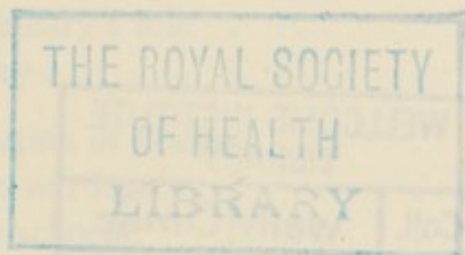
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The story of post-war school building

Ministry of Education

Pamphlet No. 33



London: Her Majesty's Stationery Office
1957

Foreword

This excellent publication was prepared during Sir David Eccles' term of office. I am happy to commend it together with the Preface which bears his signature.

Hailsham

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Preface

This pamphlet tells the story of post-war school building in England and Wales under successive Governments. It is a good story and deserves telling. It will serve, first, as a tribute to the people directly concerned with the events described—education officers in local authorities, architects and quantity surveyors in both local government service and private practice, teachers, manufacturers, suppliers and contractors in the building industry. Working with advice and guidance from the Architects and Building Branch of the Ministry of Education they have formed an efficient and enthusiastic team.

The pamphlet is also an account of the way in which some £360,000,000 has been spent. The taxpayer has the right to know what he has got for this great sum. The broad answer offered here is that he has had value for his money.

I want the financial facts to be widely known. But there is another side to this programme which should interest the layman: the quality of the schools built with his money. The vision and energy of a generation is often most strikingly embodied in the buildings it leaves behind. The post-war schools, like the mediaeval churches, dominate the local landscape. By their purpose and design they testify to the spirit of our age. They will show how far we applied our imagination and resources to the future of our children.

The standards we set must therefore express our confidence in the pace and direction of the social advance at which we aim over the next 50 years. At the same time we must remember that our resources are limited.

Investment in school building has to be initially sound and must not make unreasonable demands for maintenance. Hence schools should be well designed and soundly constructed. Between jerry building and magnificence there is ample scope to secure that the building fulfils its function and also pleases the eye.

I believe that we have achieved that compromise between elegance, efficiency and economy which should mark all great building programmes. The story which follows will help the public to understand our aims and methods, and to judge whether the expenditure has been justified by the results.

David Eccles

Acknowledgements

Introduction

The Ministry is grateful to those named below who have kindly given their permission for the reproduction of photographs used in this pamphlet:

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Introduction

1. The six following chapters attempt to tell the story of post-war school building in sufficiently broad terms to interest the general reader yet with enough detail to be useful and convincing to those with a more particular interest in educational building. For the specialists—those intimately concerned with the design, construction and economics of school building—the Ministry's series of Building Bulletins will already have covered in considerable detail much of the ground. All readers, however, may find it convenient to have a summary of the main outlines of the story.¹

2. Chapter I describes the size and nature of the problem. Between the end of the war and 1961 we must complete and bring into use at least 2,000,000 new school places. Thus the aim is to increase available places in schools by some 40 per cent in 15 years. Immediately after the war new places were needed mainly to replace or restore war damaged schools and to provide extra accommodation to allow the school leaving age to be raised from 14 to 15 years in 1947. Since then, however, we have had to build to provide new accommodation for the increased school population resulting from the higher birthrate during the years 1942 to 1948, and for children moving into new towns and housing estates. The effect of the 'birthrate bulge' will diminish after 1961, but as long as the development of new towns and housing estates continues, new schools will have to be built where there are no schools now. After 1961, we expect to replace each year some of the old and bad schools which are not up to the standards we desire for all children.

3. We are thus engaged in a race against time. We have already provided over three-quarters of the places needed in about three-quarters of the time available. We have not fallen behindhand, but since secondary

¹The story which follows is that of the post-war school, but the Ministry has been concerned with other kinds of educational buildings besides primary and secondary schools. A note on these kinds of buildings is given in Appendix 1.

schools take more time and resources to build than primary schools, the next few years may well prove the most difficult.

4. Chapter II discusses the kind of schools we ought to build and stresses the point that this will depend upon our current ideas of the aims and methods of education. These ideas have changed substantially since before the war. We now hold that there should be different kinds of schools to provide for variety in the ages, aptitudes and abilities of children themselves and to suit local circumstances. Further, the post-war school should be designed to offer a wider range of subjects than in the past. A great emphasis is now laid on practical activities. Again, teachers wish to break down the class or form unit into several smaller working groups, each following a different aspect of a subject. This variety of subject and approach necessarily calls for new kinds of teaching materials, aids and equipment. Finally, we see a school no longer as a mere machine for giving lessons, but as a social unit concerned with the all-round development of boys and girls. For example, in practically every school there is provision for school meals which requires special planning by the architect.

5. All these trends are in the direction of securing greater opportunity for individual children. Accept this as reasonable and we must accept also that schools, if they are to provide for this variety, are likely to need more space and rooms so that the building is adaptable to many uses and must be scientifically designed for children and not for adults.

6. We thus face the dilemma that we want not only an unprecedented number of new schools, but also better planned schools and, on the face of it, more expensive schools. Chapter III shows how we tackled the problem of achieving these objects at a reasonable cost. School building had to come to a stop during the war. The staffs of architects and draughtsmen had to be got together again. These professional teams had to be built up so that they could cope in time, not only with the immediate tasks of repairing war damaged schools and preparing for the raising of the school leaving age, but also with the large scale programmes of new school building which lay ahead.

7. Chapter III describes the conditions that are essential to success. We had to know where and what to build first. This was made possible by the preparation by local education authorities of development plans for their areas and by drawing up annual programmes of projects sufficiently well in advance to allow of adequate preparation before building had to start. We had to ensure that each project came up to the

required standards. This was done by issuing statutory Building Regulations with which all new schools have to comply. First issued in 1945, they were replaced in 1951 and 1954, and each time made more general and less detailed in order to give local authorities, as their experience increased, more freedom to settle for themselves precisely how to achieve a given standard. We had finally to ensure that the cost of these schools was reasonable and broadly comparable. This was achieved by setting a limit on the cost of each new place to be built.

8. By 1949 the technique of annual building programmes had been established and momentum had been gained. The pursuit of value for money began in earnest with the introduction of limits of cost per place in 1950. From then until now the partnership between central and local government has rested primarily on the general principle that the Minister's approval will be given to any project in an approved programme which complies with the requirements of the Building Regulations and does not exceed the appropriate limit of cost per place. The Ministry's responsibility is thus to set reasonable and practical standards and limits of cost, while local education authorities have both the freedom and incentive to secure, according to their skill and preferences, the highest standards they can within the limits of cost laid down.

9. So far the story has been concerned with our main objectives—the number and kind of schools we want—and with the physical, administrative and financial machinery devised to secure these objectives. It is largely because our requirements were established at an early date and because they are known to architects before they have to design a particular school that the achievements recorded in Chapters IV, V and VI have been made possible. Technical and professional skill has been able to concentrate on the two factors which chiefly determine whether or not we get value for our money—the amount of space needed to provide a workable building and the amount of money needed for each unit of that space to ensure an adequate quality of building.

10. Chapter IV deals with the first of these two factors. It shows how the first post-war schools followed, in the matter of design, the same pattern as pre-war schools, with rows of single storey classrooms running parallel to each other. The *finger plan* school certainly provided much better physical conditions than its predecessor which was largely based on the pattern of the Victorian board school. The first post-war schools were better lit, better ventilated, and less noisy; but they were very extravagant both of land and floor space.

11. The next advance was therefore to reduce the total area without loss of physical standards and even with an increase in the amount of teaching space. Two principal means were used to this end. First, all the unproductive non-teaching areas—mainly corridors—were cut down to a minimum. To remove the corridors from a *finger plan* school is to remove the bone structure of the whole design. New designs were, therefore, produced that fundamentally altered the economics of school building. Secondly, we came to realise that one space, suitably designed, could often do the work of two spaces. A corridor could be both a circulation area and part of a classroom. An entrance hall could also be a dining room. An assembly hall could be designed to serve as a gymnasium as well. By making a space serve two purposes we can reduce the total area without restricting the amount or variety of the facilities provided.

12. So successful has this approach been that, during the last six years, the total area per child in primary and secondary schools has been cut by about 40 per cent. Within the smaller total area, however, the amount of teaching space per child has been maintained or slightly increased. Further, within this total amount of teaching area, ways have been found, by skilful design, of making individual spaces, particularly classrooms in primary schools, substantially larger.

13. Chapter V discusses the cost and quality of school buildings. What has been achieved must be seen against the fact that since 1939 building costs have been rising year by year. Between 1949 and 1956 they rose by over 50 per cent. It would have been easy to convince ourselves that, having reduced the area of our schools by 40 per cent, we had no option but to allow the cost of these schools to be carried upwards each year on the tide of rising building costs. Our 40 per cent saving on area would have been submerged beneath the 50 per cent rise in costs. Fortunately, skill, efficiency and experience came to the rescue. As a consequence, the cost per square foot of school building, which stood on average at about 58s. in 1949, has not risen as it would have in line with building costs to over 90s. today but has been held in check at about 71s. Thus, for each square foot of building we have saved about £1. As an annual building programme of new schools contains about 12,000,000 square feet, the cost of the new primary and secondary schools we shall start to build this year might well have been some £12,000,000 more than in fact it will be.

14. Five ways are described by which costs have been held down.

Introduction

First, we have found out systematically and in detail more and more about 'where the money goes' in a building. We have thus become better able to compare and control expenditure on constituent items of a building. Secondly we have reduced not only the area but also the cubic content of schools. The critical question is how to lower ceiling heights while still maintaining satisfactory standards of natural lighting. Thirdly we have called successfully upon science and industry to find new, better and cheaper ways of solving many of the problems which the architect and builder alone are not fully equipped to tackle. Fourthly money has been saved on many items—wash hand basins, sanitary fittings, tables, chairs, lockers, for example—because we have deliberately designed small articles suitable for children and not adults. Lastly we have stuck to a simple straightforward architecture and to plain, functional buildings, designed and constructed first and foremost to do their job efficiently though none the less pleasantly.

15. In 1949 the cost of a place in a primary and secondary school was about £200 and £320 respectively. Today the average cost is below the current limits of £164 and £264. Thus, the money cost of a 1956 school is about 20 per cent less than a 1949 school, in spite of the rise in building costs of over 50 per cent. If prices had been stable during this period we could claim that we had almost exactly halved the cost of school building. The outstanding question is the standard of the schools obtained after so great an economy. Opinion varies on this point but nobody asserts that standards have been halved. This document does not hide the fact that some attractive features have been reduced or cut out, but it tries to show that the inessential has been sacrificed to safeguard the essential. We have spent our money increasingly on what has been of first importance—and here our standards have not been diminished. The story is thus one, primarily, of securing value for money.

I. The size and nature of the problem

16. For every 100 children attending schools maintained or assisted by local education authorities in England and Wales in 1938, there were about 91 in 1946 and 102 in 1949; today there are 120; and by 1961 there are likely to be more than 125; thereafter the number should start to decline.¹ This growth in the number of school children is the kernel of the post-war school building problem. There are two reasons why it happened.

17. First, although there were fewer school children just after the war than immediately before it, there was a substantial increase in the birthrate during the years 1942 to 1948. The period from about 1947 till the early 1960s represents the years during which this enlarged school population is passing through the primary and secondary stages of their education. This is what is meant by the term 'the birthrate bulge'.

18. Possibly a better metaphor than a bulge is a wave. The enlarged school population is moving like a wave through the schools, breaking first on the infant schools, then on the junior schools and finally on the secondary schools (though, of course, it will continue thereafter on its way through the universities and colleges of further education). But it breaks on the junior schools before it has cleared the infant schools, and on the secondary schools before it has cleared the junior schools. Thus the wave gets bigger as it moves forward and the general level of the water is always rising. When the wave passes out of the secondary schools, the level, though it may well sink slowly, will still be higher than before the wave started. The wave in fact passed through the infant schools from about 1948 to 1954; it broke on the junior schools in about 1951-1952 and will clear them by about 1957; and it began to break

¹The total number of children in grant aided schools was about 5,600,000 in 1938, 5,100,000 in 1946, 5,700,000 in 1949, 6,800,000 in 1956 and is expected to be more than 7,000,000 in 1961. A further 500,000 children are estimated at the present time to be attending independent schools.

The size and nature of the problem

upon the secondary schools in 1955-1956 and will be passing out of them by 1961. At this last date the level of water—that is, the number of children in schools of all age ranges—will be at its highest.

19. The second reason for the growth in the school population was the raising of the school leaving age in 1947. From 1922¹ until then children had to stay at school until they were 14 years of age. Since then they have had to stay until they were 15. By 1949 about 350,000 children were staying on at school for another year, who three years before would not have done so. Thus, although there were only 102 children attending school in 1949 compared with each 100 in 1938, about ten of the 102 were in the new age range of 14 to 15 years.

20. Taken alone this growth in the school population would have set a school building problem of considerable size. But two other factors both complicated and augmented the problem—house building and war damage.

21. The building of new houses has been carried out on a considerable scale since the end of the war. Wherever new houses are concentrated in estates or new towns, there will be a need for new schools. The children who will occupy these schools will come from widely scattered homes, some perhaps comparatively local but others far afield. They will leave behind one or two vacant seats in a large number of schools, but seldom enough in any one place to make it unnecessary to build a new school in that area for the local birthrate bulge. But when they are concentrated in their new neighbourhood, they create a demand for a new school. Thus the number of new school places is always greater than the number by which the school population is increasing. It must also be remembered that when the school population ceases to rise in 1961 it will be necessary to continue to build new schools to take account of the movement of population.

22. Over 5,000, or about one in five or six of the country's schools were damaged during the war. These schools had to be repaired or rebuilt at the same time as local education authorities were attempting, and in some cases before they could attempt, to concentrate their maximum

¹Towards the end of the 19th century it was not uncommon for children to remain at school voluntarily until the age of fourteen and certain local authorities used the powers granted to them in 1900 to make bye-laws requiring children in their area to stay at school until fourteen. It was Section 8(1) of the Education Act of 1918, however, that required pupils to attend school compulsorily until the end of the term in which they reached their fourteenth birthday and the introduction of this Section was delayed until 1st July, 1922.

effort on the building of new schools to meet the needs of the increased school population and of new housing.

23. In a matter where so many considerations overlap it is clearly difficult to state in hard figures exactly how many new school places in all will be required to meet the post-war needs described above. To say that it will certainly be more than 2,000,000 is to reveal the magnitude of the problem and the scale of effort required to solve it. By the end of 1956, over 1,772,000 new places had been provided, including places repaired or restored because of war damage. Of these some 1,066,000 were in new primary and secondary schools, about 85,000 in major extensions to existing buildings, about 431,000 in minor additions to existing buildings and about 168,000 in HORSAs accommodation.¹ Because the bulge appeared in the primary schools before the secondary schools the majority of these 1,772,000 new places are primary school places—about 1,041,000 compared with about 731,000 secondary school places of which the 168,000 places for the HORSAs programme formed part. During the year 1956, about 238,000 new places were provided. About 108,000 of these were primary school places compared with 130,000 secondary school places; this was the first year when more secondary than primary school places were produced. Roughly two out of every three places in all the new schools starting to be built in this and later years will be in secondary schools and they will be completed in increasing numbers during the remaining years of this decade to house the growing number of senior children. It will, however, be 'touch and go' whether every secondary school will be finished in time to meet its own local peak of children.

24. Post-war school building has therefore been a race against time. We have covered about three-quarters of the course in about three-quarters of the time available. It is less important that we have created a record, which we have, in the amount of new building carried out in an effective period of about ten years, than that we have not fallen behind schedule. What really has been achieved? Of the 120 children now in grant-aided schools compared with each 100 in 1938, about 17 are taking all, or nearly all, their lessons in a post-war school of permanent construction, and a further 9 spend all or some of each school day in a post-war building of some kind attached to schools built before the last war. To complete the picture of the sort of schools which the other 94

¹HORSAs stands for the Huttred Operation for the Raising of the School Leaving Age. This is described in more detail in paragraph 46.

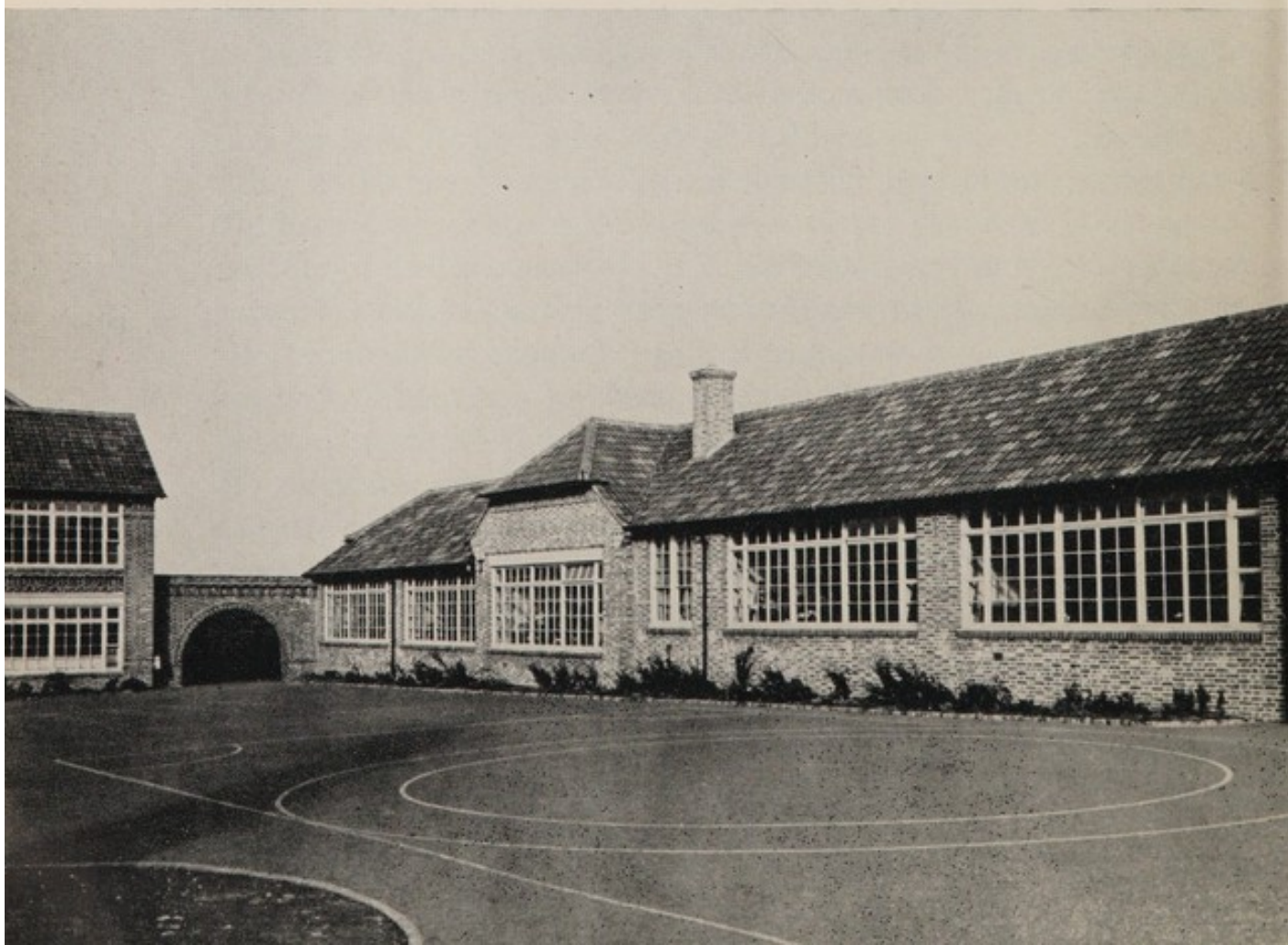
Schools for younger children

The four following photographs show how schools for younger children have changed during the last 60 years. Each is typical of its time. The first was built as a Church school before the turn of the century. The local children then probably attended no other school than this, leaving to seek employment at about 13 years of age. The school is now owned by the local education authority who run it as a primary school. The second of the buildings illustrated was built as an elementary school in the mid 1930s for children up to the age of 11 who thereafter continued their education for another three years in a separate senior school or department. The third and fourth examples are of primary schools—one designed immediately after the last war and the other more recently. At about 11 years of age all the children from these schools will transfer for at least a further four years to a separate secondary school.

1. About 1900.
2. The mid 1930s.
3. 1949-1950.
4. 1954.

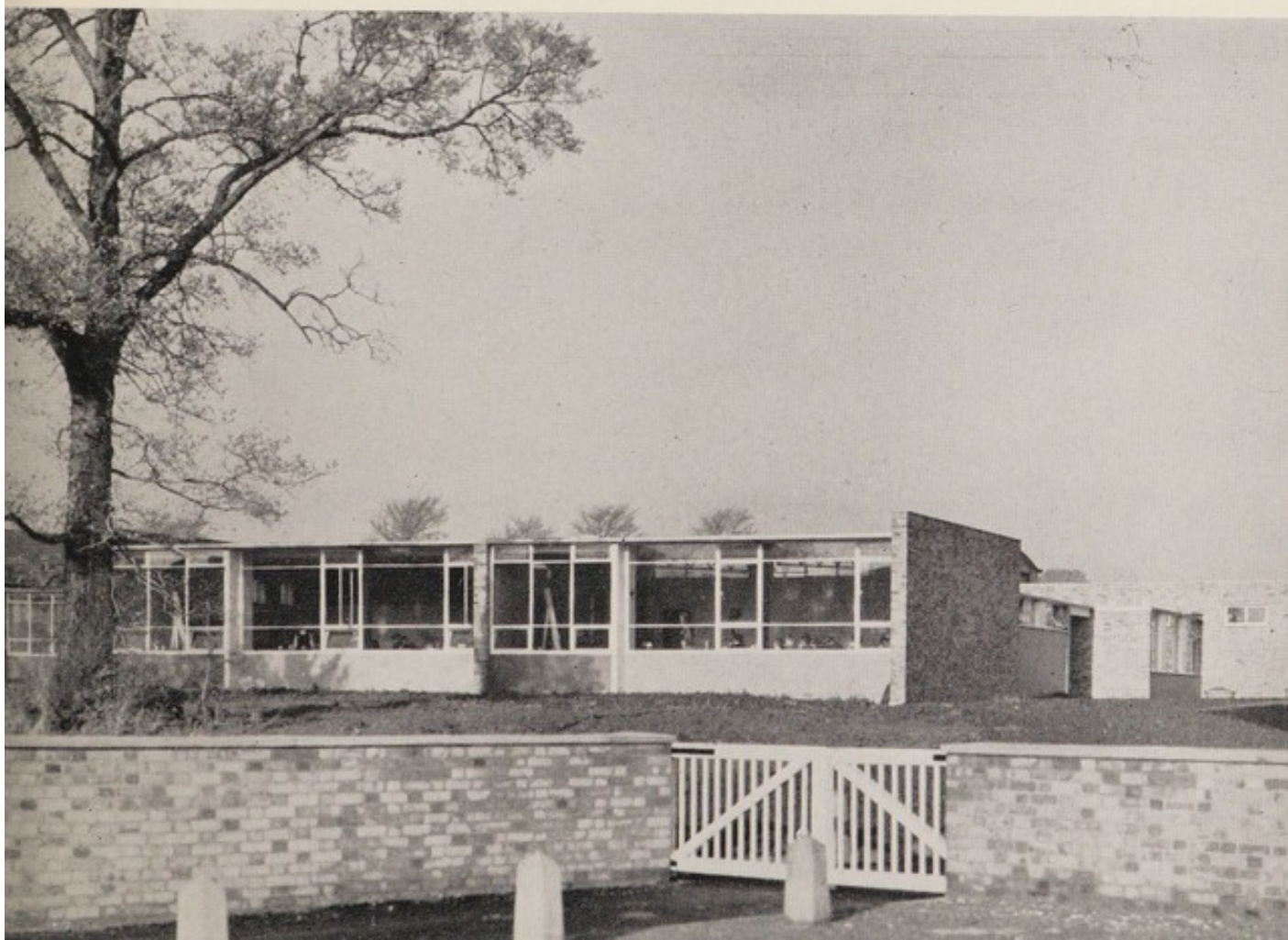


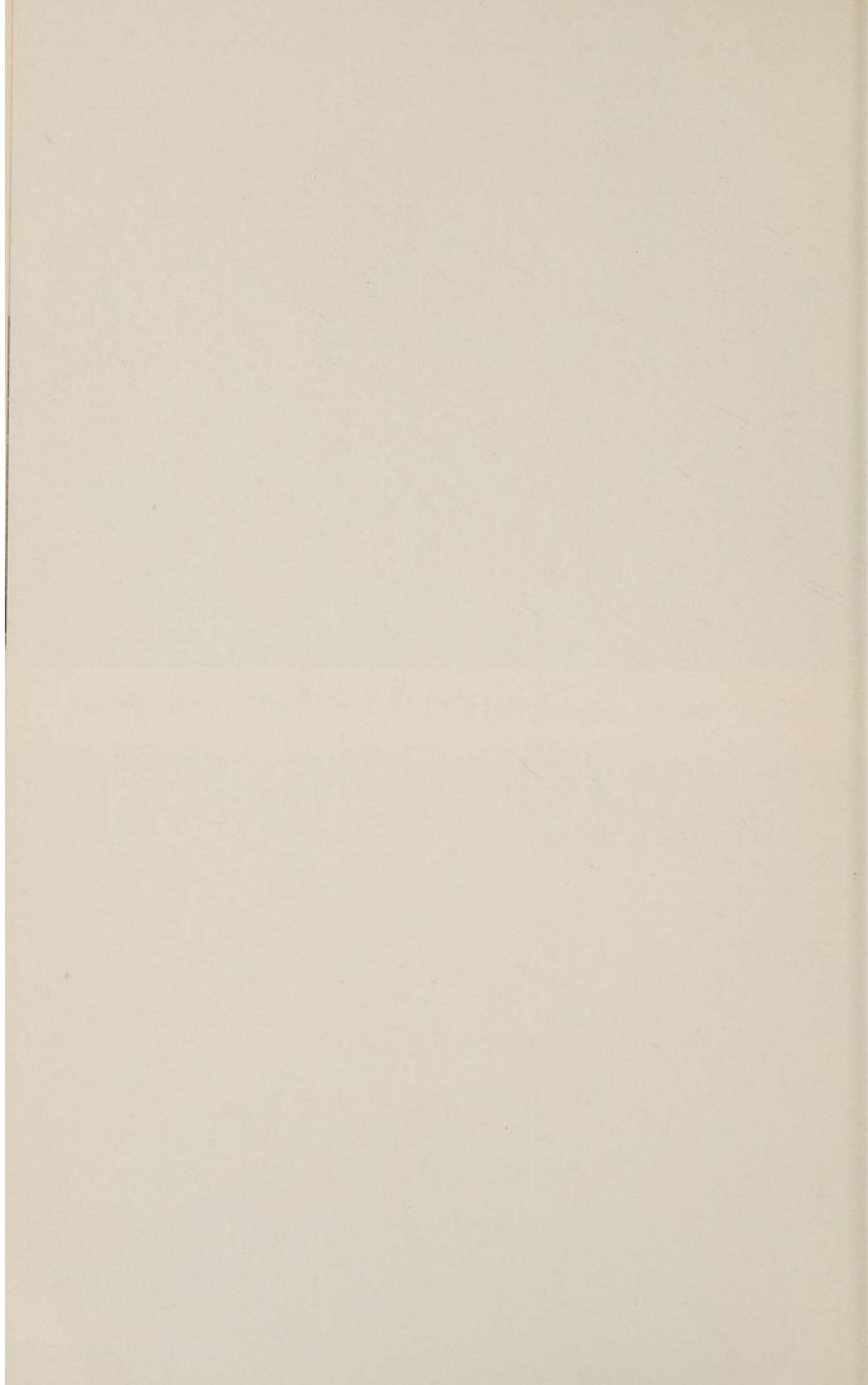
1 (*above*) About 1900 ; 2 (*below*) The mid 1930s





3 (*above*) 1949-1950 ; 4 (*below*) 1954





The size and nature of the problem

children attend is a difficult calculation in a complicated field. But it is probably not too wrong to say that about 47 of them will be in schools built before 1902, 20 in schools built between 1902 and 1918 and 27 in schools built between the wars from 1918 to 1938.¹

25. In leaving this brief description of the size and nature of the problem, it will be well to emphasise that there can be no easy or exact correspondence between the number of children and the number of new school places. A broad picture is possible of the national position, but the situation in each area must be settled in the light of local circumstances. But one thing is true of both the national and the local scene; nowhere can we attempt to ensure that the number of new school places to be *designed* in new schools is equal to the number of children during the bulge years. To do this would be to *design* more places than will be needed when the peak declines. Everywhere, therefore, schools are having to take in more children than they were designed to hold. Overcrowding is the price we have had to pay for the past few years, and will have to pay for a few more to avoid building more or bigger schools than will ultimately be needed.

¹These figures can only be approximations. They are based on work done by Dr. Kathleen Ollerenshaw, published in 'Education' Vol. No. 2748, 23rd September, 1955.

II. Changes in the educational background

26. Most people will recognise that motorcars in 1956 look very different from pre-war ones. They distinguish fairly easily between today's fashions in, for instance, clothes or interior decoration and those of 1939. But in general few people realise that changes of similar scope have taken place since before the war in our ideas, practice and organisation of education. There is in fact a contemporary scene in education and, if we are to build the right kind of schools and make judgments about how fit they are for their purpose, we must know something of this educational background. The taxpayer who pays his rates and taxes to meet the cost of today's schools was himself more than likely educated in a different kind of school and against a different educational background. What changes have occurred since he was at school?

27. Brief histories tend to be a roll call of famous dates. The history of education is often told in terms of the dates of the Acts of Parliament which have shaped the course of educational progress. The Education Act of 1944 was such a turning point. Already, in the short term of 12 years, a remarkable distance has been covered in the new direction set by the Act. It is not the purpose of this document to describe the aims or achievements of the Education Act of 1944, but, in telling the story of post-war school building, it would be an omission not to quote from Section 8 the words which are commonly regarded as something more than the mere legal definition of the duty of local education authorities to secure the provision of primary and secondary education:

' . . . the schools available for an area shall not be deemed to be sufficient unless they are sufficient in number, character, and equipment to afford for all pupils opportunities for education offering such variety of instruction and training as may be desirable in view of their different ages, abilities and aptitudes, and of the different periods for which they may be expected to remain at school, including practical instruction and training appropriate to their respective needs.'

Changes in the educational background

28. The key idea which this passage is expressing is that schools are built for children, and that, if there are children with differing needs, there must be schools of different kinds. The Act does not specify what kinds. The terms *infant*, *secondary modern*, *secondary technical* and *grammar*, as descriptions of kinds of schools, do not appear in the Act. Nor do the terms which are now part of educational jargon such as *bilateral grammar/techs.* (that is, schools which provide secondary grammar education for some children and secondary technical education for others, but with each type of education kept separate), or *multi-lateral* schools (that is, schools which provide secondary modern, secondary technical and secondary grammar education for all the children in a given area, but with each type separately organised), or *comprehensive* schools (that is, schools similar to multi-lateral schools but without an organisation in three clearly defined sides). These types of school are all attempts to give expression to the spirit of the Act calling for schools sufficient in number, character and equipment for children of varying ages, abilities and aptitudes. The facts that the law does not lay down what kinds of schools shall be built, that there are several different kinds being built, and that there are still sharp controversies about how children differ in aptitude and abilities and to what sort of school each is best suited are all evidence of the typical British instinct to let matters of this kind work themselves out in the light of experience and experiment.

29. It is only fair to say that many people were concerned with these matters in the 1930s. The war and the Act of 1944 seemed to crystallize the problem and to give a powerful impetus to the search for the right answers. It should be remembered that the Act is only 12 years old and that its short lifetime has been not only a race against time to provide enough new schools in the right places to accommodate the expanding school population but also a period of change and developing ideas about the sorts of schools needed. How big should they be, how designed, how constructed, how used and, of course, how much should they cost? The answers to these questions are of direct interest to many people, quite apart from the children themselves—to the teachers who have to work in these schools, to the ordinary citizen in his capacity both as a parent and a taxpayer, and to the architects, educationalists and administrators who must plan and build the nation's new schools.

30. First, therefore, there has been a change in our ideas about the kinds of schools best suited to children with differing needs. A

second important change has taken place in our ideas about the process of education itself.

31. It is one of the greatest prides of British teachers that nobody can dictate to them what or how they must teach. In some other countries curricula are laid down from 'above', but we rely upon the skill and vocation of the teachers in the schools to chose the subjects to be taught, the way they are taught and the text-books and materials to be used. The aim and the result is a great variety of curricula, and the post-war years have seen many developments in this direction. It would be wrong to think that there are new subjects to be taught. The difference is rather that there is a growing diversity of the forms taken on by the old subjects and a greater variety of ways in which they are combined in the timetable. Music, drama, dancing, social studies, local studies, pottery, weaving, needlework, horticulture and animal husbandry, engineering, building and commerce—these are some of the commonplaces of the primary and secondary school timetable today. Those who look back 40 or 30 years to their schooldays will recognise few of these as part of their education and those who look back only 20 or even 15 may not recognise them all. This variety of subjects means that, in the secondary schools in particular, each child can be offered a choice. Thus varying abilities and aptitudes can be catered for not only by different types of schools but also by alternative courses within a particular school.

32. It will not escape notice that most of the subjects mentioned in the last paragraph by way of illustration are practical subjects; the child does not necessarily have to sit at a desk or table to follow them. In this we can see another developing trend in the educational process. It is more commonly recognised today that there is an important distinction between 'learning' and 'teaching'. It does not follow that what the teacher 'teaches' the child 'learns'. Given guidance a child can learn a great deal for himself, and his understanding may be quickened by doing things—by using tools and materials through which he actively acquires knowledge and skills rather than passively absorbs them. Many teachers now realise that the 'chalk and talk method' whereby lessons are taught from a blackboard to 30 or 40 children in formal rows of desks is not suitable *for all occasions* or *for all children*. We must be careful not to think that formal teaching in this way is now unnecessary; it is still needed for many purposes. But for other purposes, other techniques are more suitable. Arithmetic can be learned by measuring out quantities

Changes in the educational background

of water or by measuring and cutting wood as well as by repeating arithmetical tables in unison. History and geography are often more easily grasped by making, for example, models of a Viking ship or a pyramid or relief maps of the local district, than by book or blackboard teaching. These are but two examples of how more active ways of learning are followed in subjects which are usually thought of as wholly bookish.

33. In passing, teaching materials as well as teaching methods should be mentioned. In particular, widespread use is now made of what are called 'audio-visual aids'—radio, film or filmstrip projectors or epidiascopes. Immediately after the war this development probably went too far and some schools were equipped with special projection rooms at the rear of the assembly hall which could be used more or less as a cinema. The basic need, however, was not for this arrangement but for one which allowed these mechanical aids to be used quickly and informally as teaching instruments within the classroom, as required by the teacher. It would be wrong to say that their introduction has substantially affected the design of schools, but it has complicated it. Many carefully located power points, storage for the equipment when not in use and, in particular, methods of blackout must all be thought of. So far, television has not made a direct impact on school design, but it is probably not too early to start reflecting on the problem it is sure to set the teacher and the architect.

34. Another significant change concerns the size of the teaching group. It is well known that the fewer children a teacher has to teach, the better he or she can do his or her job. No one will deny that classes have always been much larger than is desirable, or claim that at the present, with a still increasing number of children entering school each year, overcrowded classes can be avoided in many areas. But there is good hope that as the school population ceases to increase and begins to decline in number during the 1960s, there will be a heartening reduction in the size of classes.

35. But a distinction must be made between a class and a teaching group, for, although many primary school classes contain more than 40 children and secondary school classes more than 30 and although classes of this size are often taught as a whole at the same time, there has been since the war a general and successful attempt to break the class into smaller groups for certain teaching purposes. Thus in primary schools teachers will often divide their classes into several groups. Some groups

in the classroom will make or do something on their own—part of the process of learning by experience—while the teacher concentrates for a time upon another group where a direct teacher-child relationship is essential. This technique calls for great skill on the part of a teacher and makes it more necessary for the design and equipping of the building to make the task as easy and rewarding as possible.

36. In the secondary schools this break-up into smaller teaching groups can be organised more formally. Many of the practical subjects are taken in half classes; this is the usual practice in woodwork, metalwork, domestic science and needlecraft and is a frequent practice in science teaching of all kinds. A particularly successful example will usually be seen in the libraries which are now provided in all new secondary schools. Here, groups of older children, often detached from their classes, will spend periods of private study, or, with the teacher, learn about library organisation and how to use reference books.

37. These are not merely expedients to overcome the difficulties of large classes. They represent a distinct development in teaching practice and form part of the general search for flexibility and variety. The main point to establish is that the actual process of learning or teaching often can, and does, take place in groups of varying size. Sometimes the groups are much smaller than a full class—possibly two, six, ten or fifteen children to a group, and sometimes larger—perhaps two or more classes together for music, or for a lecture or demonstration in geography or science.

38. Finally it must not be forgotten that lessons are not the only things that happen in a school. The school is a social as well as an educational unit. Social gatherings, school clubs, parents' days, speech days, sports days—these are all part of school life. But they do not call for any special or additional accommodation. A well planned school will accommodate these activities in its stride. But one service offered by the schools makes a vital difference to the sort of buildings we must provide: the School Meals Service. During the war there was a rapid expansion in the provision of canteen facilities in existing schools. The necessary kitchens and dining rooms were usually added in the form of huts. After the war these facilities came to be provided as part of the permanent accommodation of nearly all new schools in the same form of construction as the main building. Today one out of every two children attending school takes a midday meal in school. This introduces two new spaces into the plan of the school, the kitchen with its

Changes in the educational background

noise, smells and complicated services, and a dining room or large open space to be used communally for meals. These facilities were not normally provided in pre-war schools and their presence alters in significant ways the size, appearance, function and cost of the modern school building. The school meals service has been regarded by all governments as an essential part of the country's social policy while at the same time offering opportunities of social training for the children. In short, it is part of the process of education.

39. Taken together, these changes in the process of education—the diversity of subject, the variety of teaching methods and materials, the variable size of the actual teaching group and the wider scope of school life—cannot but affect our idea about the sort of schools we should build. If we are to meet the needs which these changes are creating we cannot avoid the facts that:

- (1) post-war schools will need more room in total than pre-war ones;
- (2) post-war schools will need more individual spaces than pre-war ones;
- (3) these individual spaces will not be of uniform size, but of many different sizes and shapes;
- (4) some of the spaces will be for quiet and clean activities, others for noisy and dirty ones. The tools to be used may be pens, needles, chisels, lathes, pianos or vaulting horses. There is thus a need for very different physical conditions in different spaces;
- (5) these spaces must be adaptable not only to a present variety of uses, but also to the changes which the future is bound to bring, sometimes suddenly, sometimes imperceptibly;
- (6) these spaces are designed for children. A primary school is designed for people who cannot look down on or through anything that is more than about three feet six inches above ground level, or reach anything comfortably more than five feet above ground level. The *scale* of a school building should be, and today generally is, quite different from that in buildings used only by adults.

40. Is all this to ask for the moon? The answer of the post-war school building record is that all these things are essential if reasonable educational needs are to be met, and that they can be achieved with economy if skill, imagination and hard work are brought to the problem

of designing new schools. In short, these standards are justified if it can be shown that we get full value for the money spent. The rest of this document tries to show that this condition has been and is being met.

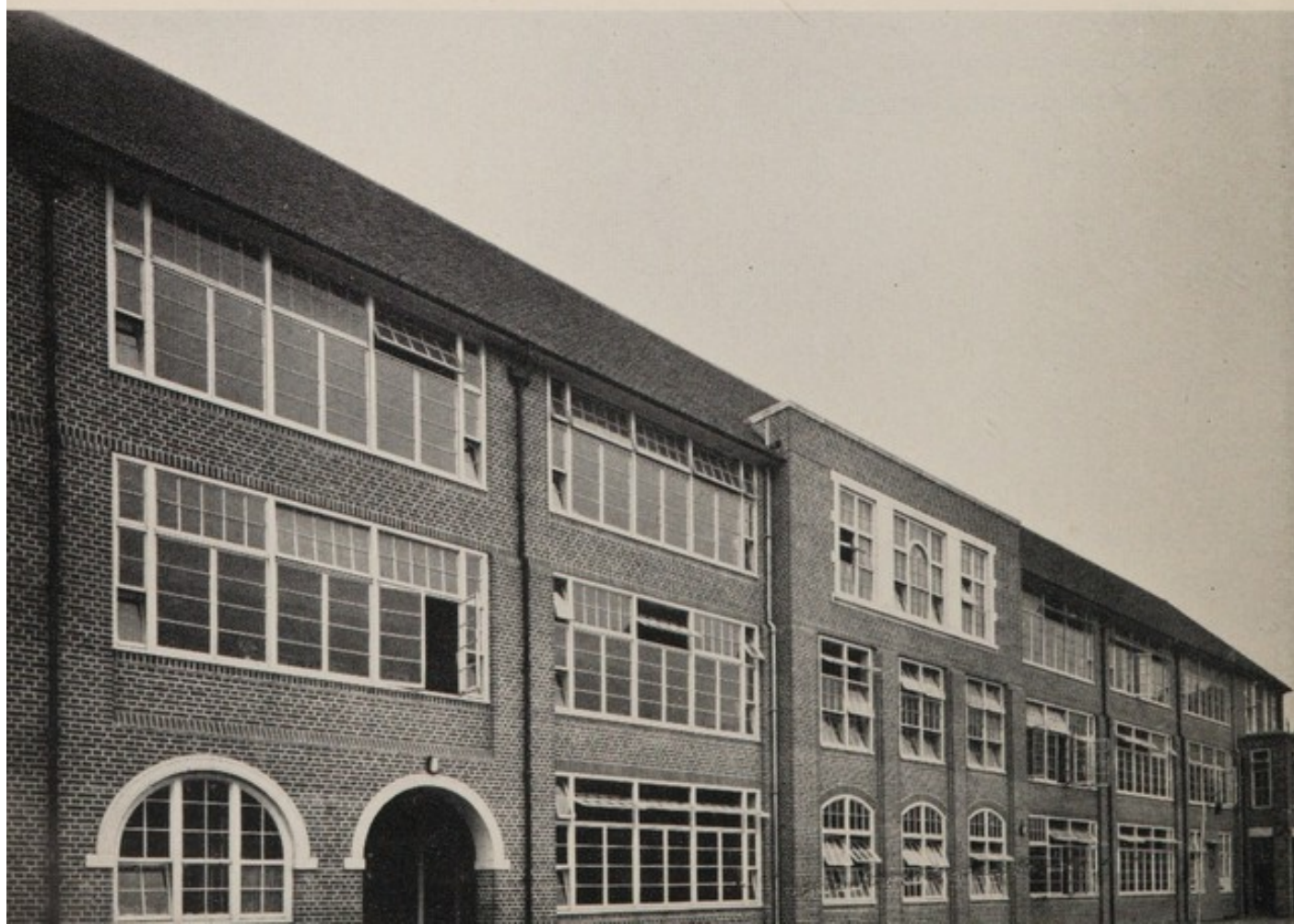
Schools for older children

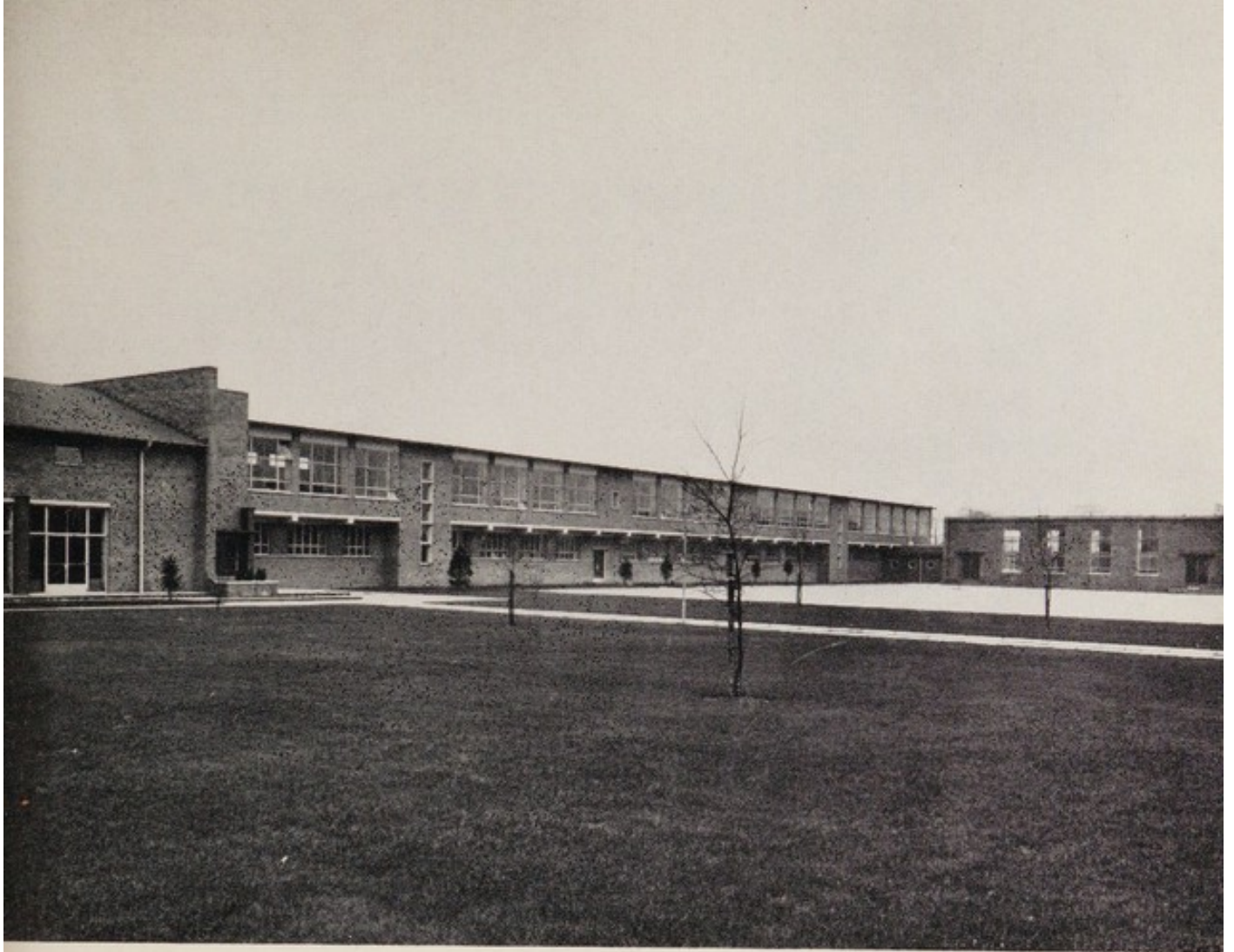
The following photographs illustrate four different periods in the development in school buildings for older children. The first is of a large urban school built about 1890 for children of all ages up to 13 years. This is a *three-decker* school, although the use of mezzanine floors gives the appearance that there are more than three storeys. The building is at present used as a primary school. The second photograph shows a senior school of the mid 1930s for children between 11 and 14 years of age. The third is of a secondary modern school of the *finger plan* type, built just after the last war. The fourth photograph shows another secondary school of more recent date designed on a campus basis and constructed of standardised prefabricated components.

1. About 1890.
2. 1936.
3. Immediate post-war.
4. A more recent example.

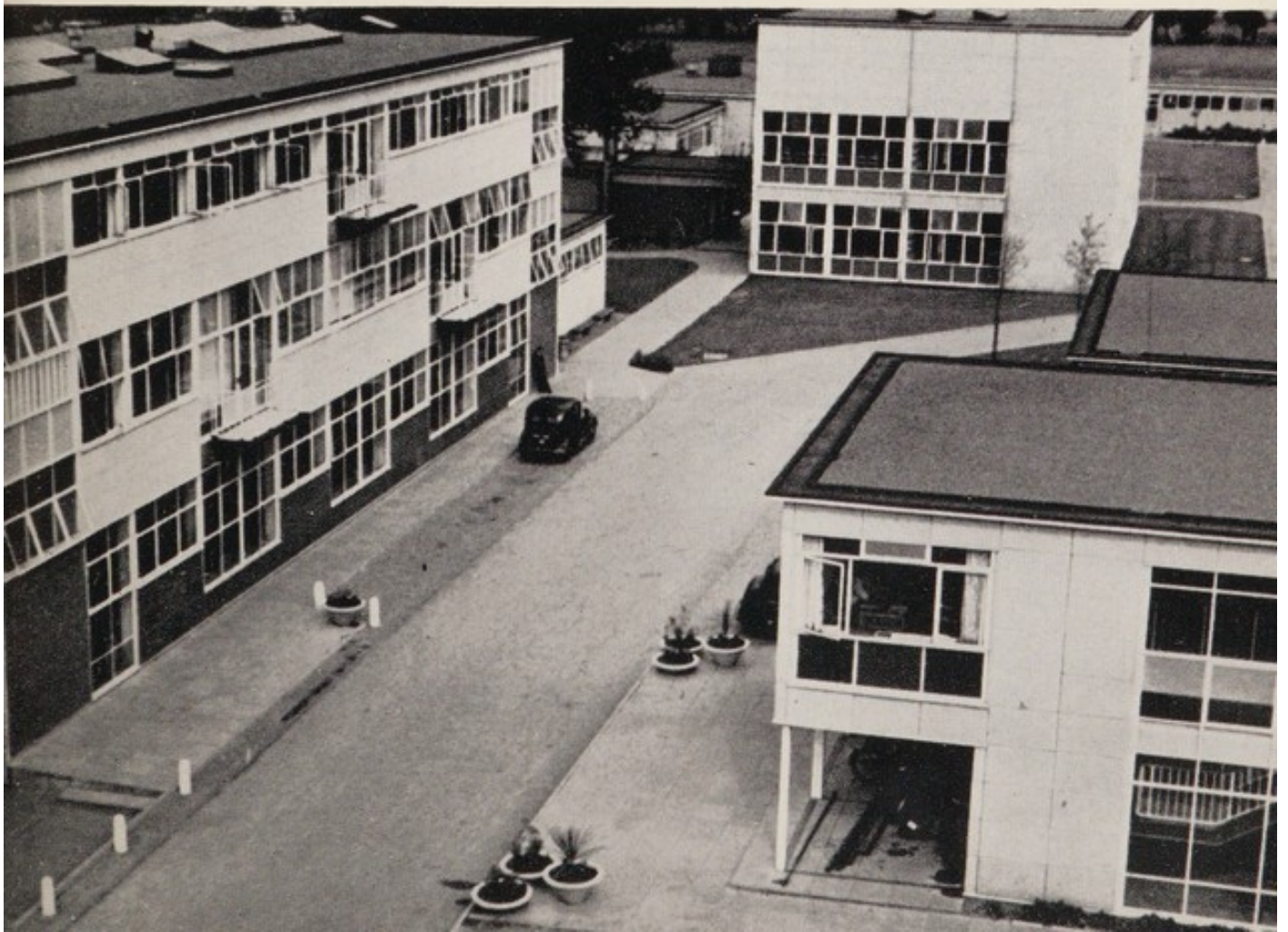


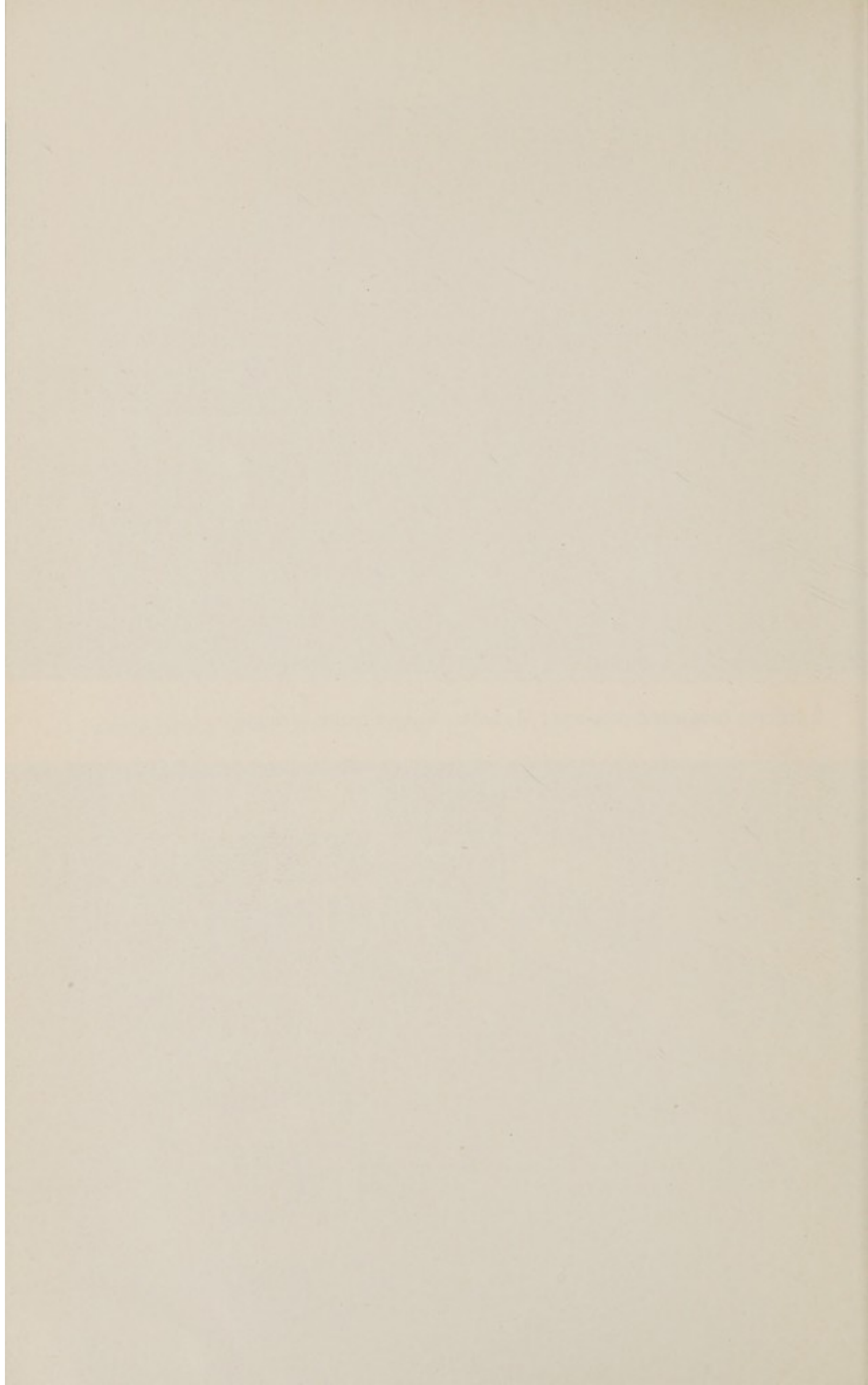
1 (*above*) About 1890; 2 (*below*) 1936





3 (*above*) Immediate post-war ; 4 (*below* a more recent example





III. Tackling the problem

Emergency needs

41. The period from the end of the war to 1949 was spent, first, in dealing with emergency needs, and secondly, in actively preparing for the full scale programme of school building in the years that followed. By the beginning of 1949 about 268,000 new school places had been provided, but only about 36,000 of these were in complete new schools or large extensions to existing schools. Nevertheless, emergency needs were largely being met by the other 232,000 places and the attack upon the main problem was under way. By about September, 1952, more than half of the 823,000 places that had by then been provided were in new schools or major extensions. By September, 1955, the proportion had increased to nearly two-thirds. At the time of writing over 1,150,000 post-war places in new schools or major extensions have been occupied.

42. We can therefore say that up to 1949, while emergency needs were being met, an organisation was being created to meet the heavy commitments ahead. This machinery was set in motion and was beginning to gain momentum. They were difficult years. Everywhere the country was reverting from a wartime to a peacetime economy. There had been no school building on any scale for about seven years. The staffs of local authorities were on a minimum basis at the end of the war. As local government officers, demobilised from the forces, returned to their desks they found a vast and difficult job awaiting them. If their ideas about school building were somewhat rusty, at least they formed a cadre of experienced men and women ready and able to make quick adjustments. But the recruitment of new officers—administrators, educationalists, architects, quantity surveyors, engineers—to enable staffs to expand, was dependent upon many people completing, and some starting, their professional training.

43. The shortage of staff and labour was, of course, common in every phase of the country's readjustment to peace-time conditions. Trans-

port, distributive trades, the manufacturing industries, the building and engineering trades, public utilities—all were short of labour and all wanted to expand.

44. If labour was short, the products of labour were scarce in consequence. Bricks, cement and timber were needed in greater quantities than they could be produced; the last two items had in fact to be rationed.

45. Briefly, they were the years of austerity—the years of ration books, clothing coupons and utility furniture. And yet they were the years in which, in education, there were emergency needs to be met. No mention is made here of emergency needs for the training of teachers, or for those of the school meals service or further education;¹ on the shortage of school places, however, a four-pronged attack was launched.

46. First, the Huttred Operation for the Raising of the School Leaving Age (HORSAs) was initiated in 1945. Its aim was to provide prefabricated huts to accommodate the extra age group which would remain in the schools after April, 1947. Huts were supplied and erected by the Ministry of Works. A common example of this operation was two class rooms and perhaps a practical room added to an existing school, often on the playground. By early 1949, about 136,000 places had been provided in this way. The full yield of places from this operation, reached by the beginning of 1952, was 167,880.

47. Secondly, local education authorities were encouraged to make small additions to existing schools, by means of minor works costing not more than £5,000 each, to tide over immediate difficulties. In the main, these additions were necessary to cope with the movement of population (especially evacuation) which had occurred during the war and the batches of new post-war houses that were already being completed. Some were needed to make good war damage. By early 1949 some 96,000 places had been provided by these means. Many of these additions were standard huts supplied by the Ministry of Works.

48. Thirdly, an Operational Programme was instituted in 1946. Its aim was to speed up the provision of new schools required by September,

¹The story of the emergency scheme for the training of teachers has already been told in a Ministry of Education pamphlet, No. 17 'Challenge and Response', 1950, Her Majesty's Stationery Office, price 4s. 0d. (by post 4s. 3d.). Although little new building was called for, the adaptation and equipping of 55 emergency colleges was successfully completed by early 1948.

Tackling the problem

1947, in connection with the raising of the school age (Part I) and by the end of 1947 to meet new housing development (Part II). Part III of the programme was added later to include further projects needed by September, 1948, for the raising of the school age. Special measures were taken to ensure that this work was put in hand as quickly as possible. The Minister's approval was given on the basis of preliminary plans and estimates of cost. Authorities were also permitted to invite tenders from selected contractors on the basis of a schedule of prices or on a fixed fee system. These were unusual relaxations; they were modified in the case of projects in Part III of the programme and were replaced by stricter controls from 1949 onwards.

49. Fourthly, a Short Term Programme was established to include projects, other than those in the operational and HORSAs programmes, which it was hoped would start to build during 1947 and 1948. Only about half this programme consisted of grant-aided primary and secondary schools. The rest was made up of projects connected with the school meals service, the training of teachers (apart from emergency training colleges), further education and special education. It also found room for some work at direct grant grammar schools and independent schools (for administrative reasons the demands of the latter had to be subjected to the same controls as were being applied to grant-aided building work).

50. The operational and the short term programmes together contained about 190,000 new places. But by the beginning of 1949 only about 36,000 of them had been completed. The reasons for the slow progress were clear—shortage of planning staff, of building labour and materials, and particularly of sufficient time to plan and organise the preparatory work. But though they were the expedients of the moment these programmes pointed the way to the kind of machinery that would be needed to tackle the large scale problems of the birthrate bulge which by 1949 were becoming of immediate concern. It became clear that, if system and momentum were to be secured, the annual programmes of building work would have to be settled and announced to local education authorities as early as possible and long before any projects were expected to start to build.

51. The first move in this direction was made in December, 1947, when authorities were asked to submit proposals for a new programme for the calendar year 1949. The details of this programme were announced in August, 1948. Although it inevitably left far too little

time for preparatory work, the 1949 programme did two other things. It absorbed all the arrears from the operational and short term programmes (many projects had not yet been started) and put them on a stricter yet simpler administrative basis, and it attempted to cover additional educational needs as far ahead as 1952. This was only possible because the necessary machinery of administration and controls was becoming more firmly established. It will be useful to turn for a moment to examine the nature of this machinery.

Development plans

52. The ability to plan ahead was greatly facilitated by the preparation of development plans. Section 11 of the Education Act, 1944, required every local education authority to estimate the immediate and prospective needs of the area as regards primary and secondary education, including arrangements for children under five years of age and for those who required special educational treatment. Each authority was also required to prepare a Development Plan, in a form determined by the Minister, saying how they proposed to meet their estimated needs.

53. In May, 1945, the Minister asked local authorities to put this work in hand. The task was immense, being nothing less than to re-examine, in the light of the Education Act, 1944, the whole structure and organisation of all the educational facilities for primary and secondary education in a local authority's area. Changes in the school population had to be estimated; consideration given to how existing schools would be affected, which schools would be discontinued, what additional new schools would be needed; proposals made about nursery schools, boarding arrangements and special educational treatment; arrangements worked out for free transport of pupils to and from school and for playing fields other than at individual schools; and finally, a time scale prepared for putting each part of the plan into effect and an estimate made of the capital expenditure involved. It was recognised that the plans would necessarily be more precise for work proposed for the first few years.

54. It is not surprising that the task took longer than was originally envisaged. In fact, by 1948, only about 20 development plans had been approved by the Minister. Nevertheless, in most authorities, including the counties, analysis and discussion of the problems were sufficiently far advanced for a clear picture at any rate of immediate priorities to be

seen. The 1949 programme could thus be launched in such a way as to ensure that first things were being tackled first and in a direction and on a scale consistent with the long term aims of an agreed development plan.

Building Regulations

55. Local authorities could not have produced their development plans without a clear idea of the standards of accommodation to be provided in the various types of schools in their area. To ensure reasonable uniformity between authorities it was necessary that the same standards should be adopted everywhere. Building Regulations for public elementary schools and for secondary schools had been issued separately in 1914. In neither case were the Regulations made under statute, nor did they purport to lay down minimum standards. They were intended as a statement of the general principles of school planning and the best current practice in applying those principles. The Regulations for public elementary schools were withdrawn in 1926, and both sets of Regulations were superseded by Handbooks of Suggestions (Educational Pamphlets Nos. 86 and 107, published in 1931 and 1936).

56. Section 10 of the Education Act, 1944, required the Minister to prescribe by regulation the standards with which the premises of primary and secondary schools should comply. In November, 1944, draft Standards were accordingly published and these came into formal operation on 1st April, 1945, as the 'Standards for School Premises Regulations 1945', commonly referred to as the Building Regulations. They apply to county and voluntary primary and secondary schools, nursery schools and classes, special schools and boarding accommodation.

57. These Regulations were novel in two respects: they had statutory force, that is, it was obligatory upon authorities to comply with them, and they prescribed minimum and not maximum standards, that is, they were intended to safeguard and not to restrict standards. Comparison between pre-war and post-war standards of accommodation can be made, but requires cautious interpretation. The table below compares the amount of teaching accommodation *suggested* in pamphlets 86 and 107 for pre-war schools with the amount *prescribed* as a minimum to be provided under post-war regulations. (The 1945 Building Regulations were amended in 1951 and 1954.)

Schools

No. of form entries (F.E.) for which school is designed (a)	Minimum area (sq. ft.) of teaching accommodation to be provided under			
	Pre-war standards	1945 Regulations	1951 Regulations	1954 Regulations
	(approx.)			
INFANTS				
1 F.E.	2,540	2,700	2,760	2,760
2 F.E.	4,980	4,760	5,300	5,200
3 F.E.	7,020	7,256	6,850	7,080
JUNIORS				
1 F.E.	3,670	4,280	3,880	3,880
2 F.E.	6,230	7,152	6,400	6,260
3 F.E.	8,500	10,428	8,800	8,640
SENIORS				
1 F.E.	4,700(b)	8,549	8,660	6,680
2 F.E.	10,500(b)	16,507	14,180	13,080
3 F.E.	12,300(b)	22,186	20,680	19,830

- (a) The size of schools is conveniently described in terms of the number of new forms (or classes) which can enter a school each year. In infant and junior schools the size of classes is taken as 40 children and in secondary schools as 30. Thus, two classes, 80 children in all, enter a 2 F.E. junior school each year, and two classes, 60 children in all, a secondary school.
- (b) These schools provided only a 3 year course for children from 11 to 14 years of age.

58. For primary (infant and junior) schools it appears as if the prescribed minimum areas in post-war schools are generally slightly higher than the pre-war figures, the more so immediately after the war. It must not be forgotten, however, that the Regulations lay down only minimum standards. The previous chapter explained that current educational practice is calling for more and more space. Have post-war schools in fact met this need? The answer, undoubtedly, is 'yes'. The chapter 'The Contribution of Design' shows how and to what extent. Broadly speaking, it has been done by ensuring that some of the space normally provided in addition to teaching accommodation—mainly circulation area—is incorporated in or can be used in conjunction with the teaching space, so as to increase the amount of useful floor space without increasing the total size of the building.

59. The figures shown for secondary (senior) schools require more careful analysis. As note (b) explains, the pre-war schools were designed for children from 11 to 14 years of age. That is, they provided a three year course. All the post-war Building Regulations, and consequently the development plans which were based upon them, allow for a school leaving age of 16, and therefore for a five year course. Although all post-war schools have been planned and built on this basis they are, while the school leaving age remains at 15, organised to provide a four year course. Thus a three form entry secondary school designed to take 15 classes on a five year course will take four form entries or 16 classes on a four year course if an extra class room is provided.¹

Relations between central and local government

60. The novel features of the Building Regulations inevitably affected the relationship between the Ministry and local education authorities. There has always been in educational matters a close and friendly partnership between central and local government. This is noticeably true in the field of educational building where it is clear that simple and harmonious working arrangements are one of the most effective ways of speeding up progress and achieving better and mutually acceptable results. Three essentials of such a partnership are:

- (1) local authorities must be given as much advance notice as possible of their annual commitments in the way of educational building, in order to organise their own staffs and their programme of work in time to complete the preparatory work before building must start. As an ideal this can rarely be achieved in full measure. But the 1949 programme had this aim in mind. In later years a complete annual building programme has usually been announced about a year, and half of it about two years, before it is due to start building so that the most that is administratively and politically possible has been done;

¹Paragraph 25 mentioned the unavoidable overcrowding of schools during the period of the 'bulge'. This has meant putting more children into schools than the latter were designed to hold. A three form entry secondary school with an additional classroom, though it will hold 16 classes on a four year course, will be designed with about 24 or 25 different teaching spaces to allow for a flexible timetable. With the addition of a second class room, it can accommodate at a 'squeeze' 20 classes. Since 1952 nearly every secondary school has had to bear a 'squeeze' of this kind in order to save our building more or bigger schools than we shall ultimately need when the school population declines in size.

- (2) local authorities must know the rules and regulations with which they are required to comply by the Minister, who must approve all projects before they start to build. Unless authorities are so informed the criteria by which the Minister judges their projects must appear arbitrary; some projects submitted for approval would obviously not comply with the Minister's requirements and would need revision; the result would be wasted time and effort. Regulations of the kind just described, published in advance, avoid this difficulty, at least in one important respect—everyone concerned knows before they start to plan a school where they stand with regard to the scale and standard of accommodation to be provided.

These two arrangements go part of the way, but not far enough, to ensure a full understanding between central and local government. In addition, therefore:

- (3) local authorities must also know where they stand with regard to the cost of school building which the Minister judges to be reasonable. From 1950 onwards the Minister has informed authorities from time to time, but always in advance of their starting to plan their projects, of the limit of cost applicable to schools of different kinds and sizes. This has taken the form of a per capita limit of cost, or, more strictly, of a limit on the money which may be spent on each school place in a school designed in accordance with the standards laid down in the Building Regulations; it is commonly referred to as *the limit of cost per place*. Cost per place has been such a dominant feature of post-war school building that it is described in greater detail in the following section.

61. Early information about future commitments, foreknowledge of the standards of accommodation to be maintained and advance publication of the limits of cost to be observed have been the three essential features of all post-war building programmes since 1950. The 1949 programme may be regarded as a transition from a period when emergency needs had to be met by every available means, to one where a long and steady attack could be launched upon the problem of the birth-rate bulge and new housing development. The 1949 programme succeeded in completing one and a half times more school places in complete new schools and major extensions than all previous pro-

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grammes put together. Momentum had been achieved. With the establishment of the procedural machinery just described and the ready cooperation of local authorities a closer control over school building was possible. The aim henceforth was to combine quantity with both quality and economy; not only sufficient schools by the right time in the right place, but the right kinds of school at the right price. The pursuit of value for money had begun.

Cost per place¹

62. Up to and including the 1949 programme authorities were not required to keep the cost of their projects within any announced limits. They submitted an estimate of cost or an actual tender cost and this was approved when it seemed reasonable in the circumstances of each case. For several years before the war the cost of building was notably stable throughout the country. After the war the position was quite different. Building costs in 1945 were about 50 per cent higher than in 1939. From 1945 to 1949 they rose steadily but in varying measure from area to area according to the local labour and materials position. The experience and efficiency of administrative and professional staff, as well as of building contractors' labour, varied substantially according to the rate at which demobilisation, resettlement and training was completed. Furthermore, there were as yet no commonly agreed ideas of how to translate educational requirements into plans for school buildings. Some plans used much more space than others to meet the same needs.

63. Three obvious things happened. The cost of school building varied widely from project to project and place to place; it was everywhere much higher than before the war; and it kept on rising. The need to arrest this trend and to secure stability of administration and uniformity of standards had already become clear by the middle of 1949. At this time the worsening of the country's economic position made

¹The following paragraphs deal with *nett* cost per place, that is, the cost per place of the school buildings proper, including built-in furniture and fittings and associated playgrounds. *Gross* cost per place is *nett* cost per place plus *additional* cost per place, the latter covering the cost of external works such as roads, paths, fences, playing fields, drainage and the supply of services up to the building. A uniform limit of cost such as is applied to *nett* cost, cannot be applied to *additional* cost because of the marked variation in site conditions. On average the *additional* costs of a school account for little more than 10 per cent of its *nett* cost, but the precise amount is settled individually for each school in the light of local circumstances.

retrenchment essential. Instead, however, of cutting down the amount of new school building, which would have checked the newly established momentum of educational building work, it was decided to continue at the same rate but at a substantially lower cost. The pursuit of value for money can be said to start from this moment. Limits of cost per place were introduced and became operative for projects in the 1950-51 programme (the programme year at this time changed from the calendar to the financial year). They were £170 per place in primary schools and £290 per place in secondary schools. This represented a reduction of about $12\frac{1}{2}$ per cent on the average cost per place at that time—about £200 and £320 per place for primary and secondary schools respectively. These reductions by themselves, however, were not sufficient and authorities were warned that a further reduction of about $12\frac{1}{2}$ per cent must be made in the following year. Accordingly, revised limits of cost of £140 and £240 per place became operative for projects in the 1951-52 programme and they remained in force until April, 1953. At this date arrangements were made to adjust the limits of cost in line with changes in prices. New limits of £146 and £250 became effective for the 1953-54 programme and they were further increased for the 1955-56 programme to £154 and £264. In April, 1956, in spite of an increase in building costs of about 6 per cent during the previous year, the Minister, because of the need to combat inflation, decided not to grant a further increase. The limits therefore remain at £154 and £264 today.

64. If the limit of cost per place has been the lever by which the cost of school building has been held down against rising prices, it has also been an effective link in the partnership between central and local government. It offered the Ministry a sure, simple and flexible means of control over the standard of school building, while giving local authorities the maximum freedom within these limits. Since 1950 the Minister has been ready to approve any project included in the Authority's programme the plans and specification of which comply with the Building Regulations and provide *not less than* the prescribed minimum amount of teaching area for that kind and size of school, and the cost of which does not exceed the appropriate limit.

65. The freedom of local authorities to work within these requirements has been substantial. Though authorities are controlled by the limit of cost per place they have every incentive to get all that they can within it. The choices open to them are real, and for one very good

reason. Cost per place is made up of two things—the amount of area planned for each child and the cost of building a unit of that area. Thus, if the cost per place is £240 it can be met by providing, for example, 80 square feet of area per child, at £3 per square foot or 60 square feet at £4 per square foot. First, therefore, there is a choice between the quantity and the quality of the accommodation provided and the authority can strike the balance it wishes.

66. In paragraph 64 it was explained that the Minister is ready to approve any school building project provided that it contains not less than the minimum amount of teaching accommodation prescribed in the Building Regulations and costs not more than the appropriate limit per place. In addition to the teaching accommodation, however, and within the limit of cost per place, the architect must also provide all the space which has come to be called the *non-teaching* space—for example, lavatories, cloakrooms, offices, kitchen, service areas and, of course, the corridors, stairs and other circulation areas. Thus authorities and their architects have not only a choice in the total amount of space per child to be provided, but also one, within this total, in the balance between teaching and non-teaching areas, provided that the prescribed minimum amount of the former is included.

67. A limit of cost per place is thus both a control and an incentive. It must therefore be fixed at a point which is not so high that everybody can hit it with ease or so low that nobody can hit it without sacrificing standards of accommodation or construction to an undesirable level. It must allow of economical but also of practicable alternatives. A limit which permitted, in a secondary school, an area per place of only 50 square feet would be impracticable since it would not be possible to contain within it the necessary amount of both teaching and non-teaching areas. 80 square feet per place, on the other hand, is generous to an unnecessary degree. Between about 65 and 75 square feet, however, there is a choice of economical and practicable alternatives.

68. The choice of a particular number of square feet per place within this range is necessarily governed by the cost of each square foot, since it is the product of these two factors which determines the cost per place. The effect of reducing the limits of cost per place or of maintaining them at a fixed point in spite of rises in wages and prices, has been to compel authorities and their architects to make economies in both area per place and cost per square foot. Chapter IV 'The Contribution of Design'

and Chapter V 'The Attack on Costs' describe how and to what extent this has been done.

69. A particular responsibility rests with the Minister of Education in determining both the minimum standards of accommodation and the limits of cost per place. Something must therefore be said about the Ministry's role in these matters.

The Ministry's role

70. From paragraphs 60 and 61 which touched on the relationship between central and local government, it will be seen that the Ministry's role has been primarily to establish the right conditions for the effective control and execution of large scale building programmes. A thousand building projects a year (about three quarters of them primary and secondary schools) cannot be run from the Ministry. It is the responsibility of the local authorities to design, erect and operate these buildings, and, within the policies laid down by the Minister, they must be left to get on with the job in their own way. By making policy well known in advance and by simplifying procedures for obtaining approval, the Ministry has sought to interfere as little as possible in the direct execution of authorities' programmes¹.

71. Broadly speaking, there have been two ways in which the Ministry has played its main role in establishing the right conditions and standards for the effective control and execution of large scale building programmes.

72. First, being placed at the centre, the Ministry has an opportunity of seeing and studying the design and cost of every new school built. This information is analysed and collated. Comparison can be made between projects from different authorities. But it is not enough simply to study statistics and plans. Every effort is made by the Ministry's staff to leave their desks and visit schools when they have been built and are in use, and thus try to evaluate what has been obtained for the money spent. By a combination of analytical and eye witness evidence it is possible to see with reasonable accuracy what, at any one time, a

¹The formal procedures are few and well known. Informal consultation between the authorities' and the Ministry's staffs at an early stage in the planning of the project is sought and welcomed by both sides. An hour's discussion round a table with the people concerned will usually confirm that a sketch plan is on the right lines. Sometimes the matter can be settled by post. By pooling experience in this way in the very early stages both sides ensure that the formal stages of final approval will be as simple and swift as possible.

comparative abstraction such as a limit of cost of £264 per place actually means in terms of bricks and mortar. Thus, it is possible to recognise the school of average standard and to distinguish it from the very good one and from the indifferent one. In these ways the Ministry can ensure that the targets it sets are reasonable ones, and, by disseminating the information it obtains, it can help to make sure that good and economical ways of design and construction drive out bad and extravagant ones.

73. The principal means of disseminating this information has been through the publication of the Ministry's Building Bulletins. Their aim has been to discuss the main problems facing those responsible for the design and construction of new schools, to collect and evaluate as much relevant information on the subject as possible and to suggest and illustrate a variety of solutions to each problem. A list of the titles of the Bulletins published to date is given on the cover of this document. Altogether about 120,000 copies of these bulletins have been sold, including many abroad. They have helped to create one of the distinctive features of British school building—a common body of ideas, data and terms which not only permits but also encourages a continuous debate as to ends and means in the minds of all concerned.

74. The second way in which the Ministry has tried to see that the standards and limits it sets are reasonable and economical is to ensure that they are fixed jointly by all the interested parties to their utmost common advantage and not only by one party for its own interests and at the expense of that of the others. This calls for much more than mere lip service to the principle of 'team work' or 'close consultation'. It means an active and informed understanding by each party of the needs and interests of the other parties and a readiness to compromise for the common good. The architect must have a detailed understanding of and a genuine sympathy for current educational ideas and ideals. He must design not merely a building, but a school building. The educationalist must occasionally temper his demands to ease his architectural colleagues' technical problems. The administrator must steer a middle course between economising in the expenditure of public money and meeting the legitimate needs of educational building. Such a system of checks and balances has produced a sensible compromise between the ideal and the practicable, between quality and economy, between discipline and incentive. The Government of the day which must vote the necessary money and the taxpayer and the ratepayer who must

provide it are entitled to an assurance that the best compromise has been found and will continue to be found as circumstances change.

75. The precise instrument which the Ministry has used to carry out this joint investigation of standards is its Development Group. This group consists of administrators, architects, quantity surveyors and H.M. Inspectors. The group is divided into teams, each team carrying out a development project. A project consists of a complete educational building, such as a secondary modern school, chosen from the programme of a particular local education authority. The team acts rather in the role of private architects to the local authority and must follow the usual procedures and comply with the normal regulations. Perhaps the chief difference between a development project and the other hundreds of projects in an annual programme is that much more time and effort can be put into the former than can ever be found by a hard pressed local authority. Every point in a development project can be fully investigated. Educational needs, constructional requirements, new materials and the design of every constituent item from the boiler-house to an individual light fitting can be the subject of detailed study, comparison and test.

76. The schools which are designed and built in this way are not intended to be model schools. Their primary function is to serve as vehicles for ideas which, after careful examination, it seems worthwhile to carry into the field of practical application. Some of these ideas, when put to the ultimate test, have been found wanting, but many have proved themselves and passed into the common pool of experience and practice. The failures in a development project are therefore almost as useful as the successes. The purpose of development work is to see that no idea that promises to help in the search for value for money goes untested. By giving every potentially useful idea an opportunity to 'develop' we are helping to ensure that even good ideas are driven out by better ones, while bad ones fail to survive in a highly competitive activity.

77. Some notes about individual projects carried out by the Ministry's Development Group are given in Appendix II.

Summary

78. This chapter is called 'Tackling the Problem'. From the end of the war until 1949 the task was to create and set in motion the machinery of administration and control, from 1949 to 1952 to drive this machine

Tackling the problem

in pursuit of value for money, and from 1953, having gained this objective, till today to defend it in the face of rising costs. If its price is a little higher now than in 1952, the fact remains that a school is one of the few things that costs less today than 10 years ago—at least 20 per cent less in terms of the prices actually incurred, and less still when increases in building costs are taken into account and their cost expressed in terms of constant prices.

IV. The contribution of design

The pre-war legacy

79. The design and construction of most buildings are a reaction against the architectural ideas that have gone before. This does not imply a search for novelty for its own sake; it is a natural and healthy process. Changes from one style to another are always taking place; but it is usually a long time before it is commonly recognised that a complete transition has been made. But in the short space of about six years the design and often the construction of most schools have changed to an extent that attracts immediate notice. Laymen will pick out a post-war school and say 'There is one of those modern schools: no roof, all glass, funny colours everywhere—just a series of boxes.' In short, contemporary architecture has made an impression on him. But, from the road, he is seeing only the surface of things. Inside the changes are greater and more fundamental. The design, the construction and the appearance of schools have changed in this way for two main reasons—one educational and the other economic.

80. First, we *want* to use our building differently from a few years ago. Our changing and developing educational ideas demand a different kind of building. Secondly, our economic circumstances *force* us to use our buildings differently. The same is true of post-war housing. Very few people want large, formally planned houses which are costly to build, run and maintain. We need to live more compactly and we prefer to join spaces together to make the most of them rather than keep them small and separate. We want every square foot of floor to count. School building has followed exactly the same process, though on a larger and more complicated scale. The need to economise and the desire to use our school buildings differently have combined to replace what we may call the pre-war legacy with a new kind of school. What was the pre-war legacy?

81. From the end of the war to about 1949, when every effort was bent on meeting emergency needs, little happened to call in question

Assembly Halls

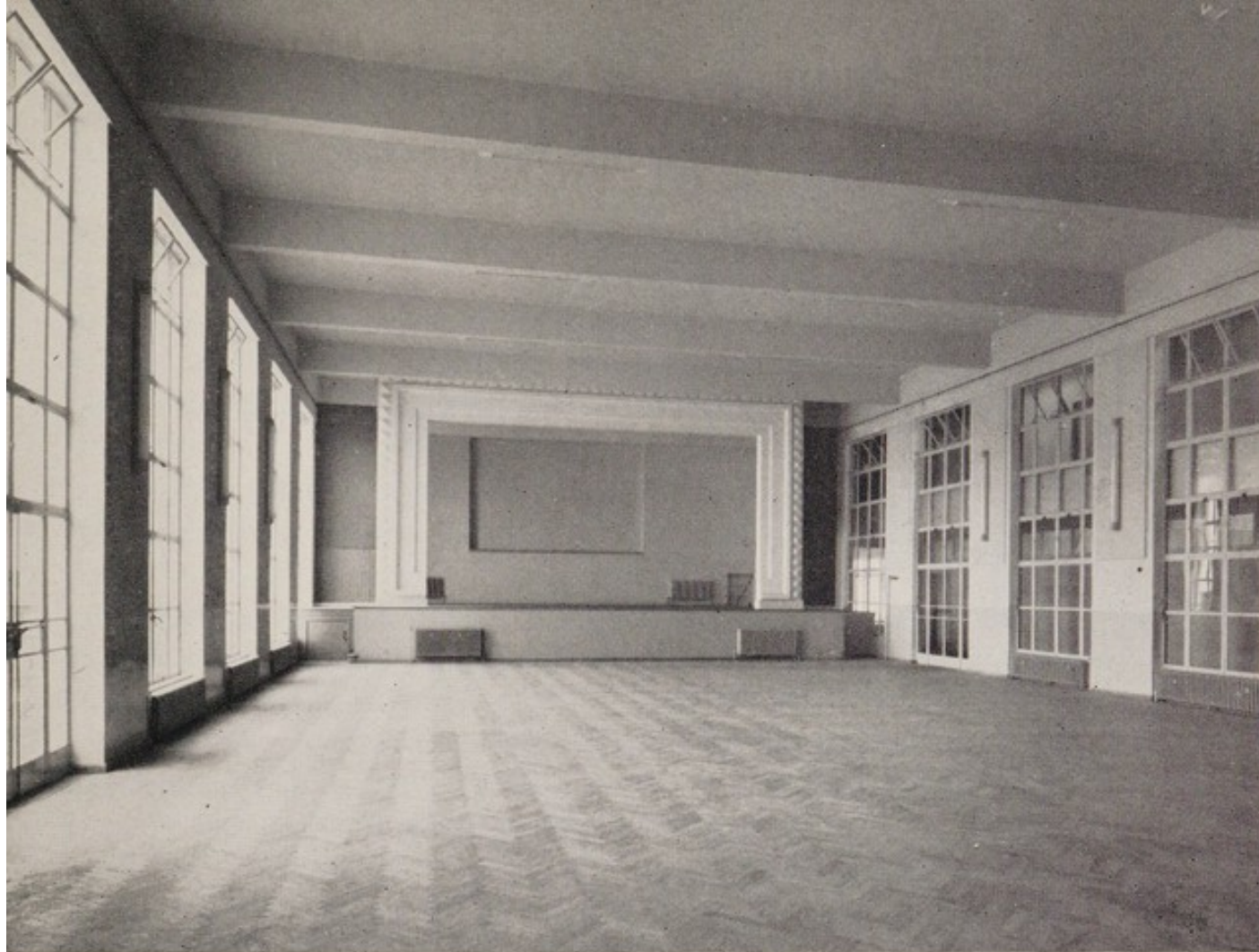
The first of the four photographs overleaf shows a typical assembly hall in an all-age school of the late 19th century. Class rooms on the ground floor open directly off the hall and those on the first floor on to an open balcony corridor overlooking the hall. The second photograph catches many of the characteristic features of the elementary school hall of the late 1920s and early 1930s. The third—of a secondary modern school hall—shows the grand and undoubtedly extravagant ideas of the immediate post war years. The fourth illustrates the more informal and economical approach of more recent years. The floor space seen beyond the right-hand side of the hall is the dining area. The “corridor” linking this area with that part of the school to the left of the picture runs immediately behind the hall curtains, and serves, when the need arises, as a stage to the hall. This is a good example of the dual use of space.

1. About 1880.
2. 1932.
3. Early post-war.
4. 1952.



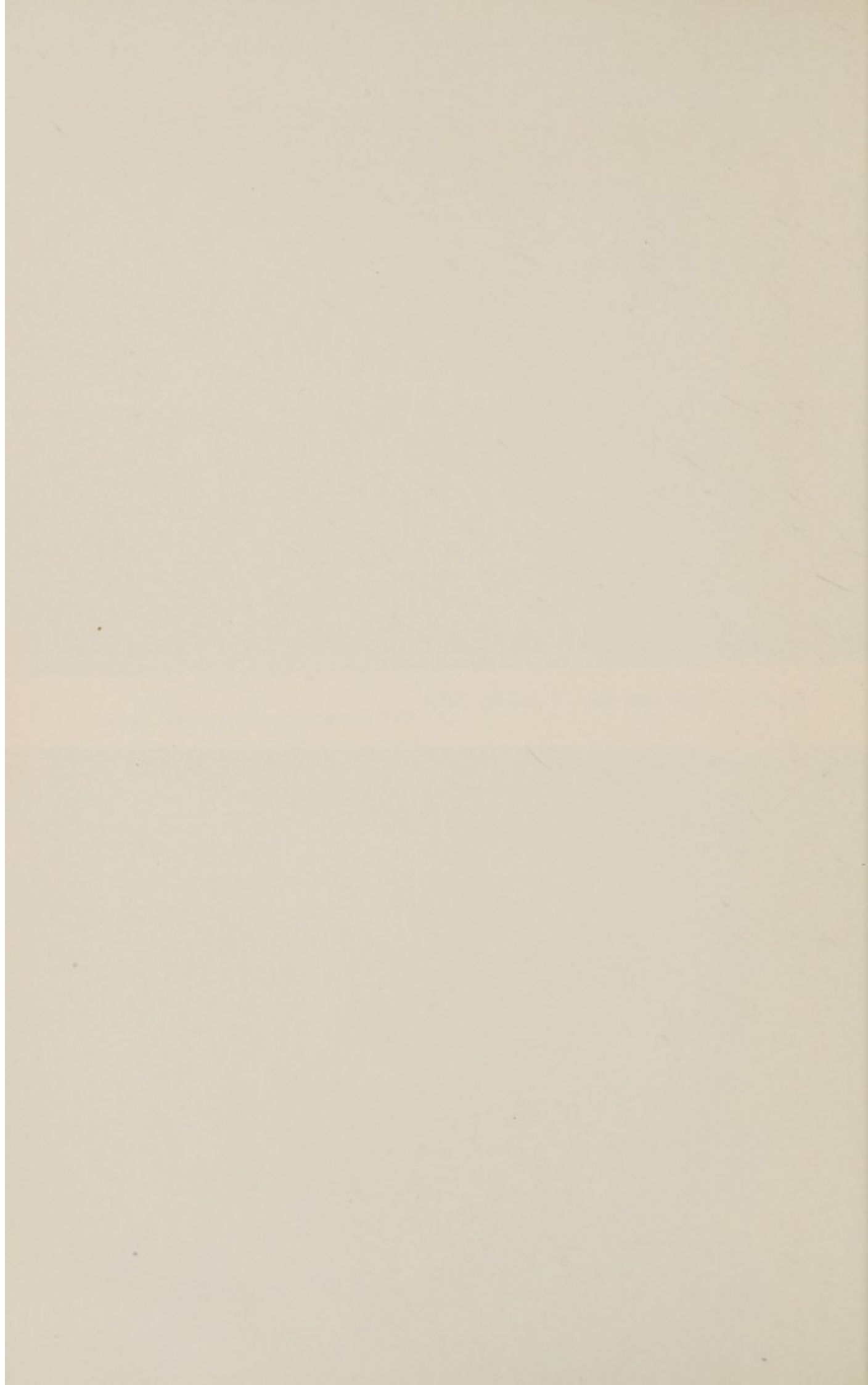
1 (above) About 1880 ; 2 (below) 1932





3 (above) Early post-war ; 4 (below) 1952





the ideas about design of schools that were current before the war. Looking back upon the 1930s we can see that little fresh attention was paid to educational trends in deciding the size, shape or function of teaching spaces. But a great deal of attention was given to physical standards, particularly to the improvement of lighting and ventilation and to the reduction of sound. The architects of this time were reacting against the type of plan which in varying degrees had held sway from Victorian times and which was not entirely obsolete in the 1920s. The typical school designed to this plan had an assembly hall in the centre, surrounded probably on three sides by class rooms which opened directly off it. In built-up urban areas there were often two or more upper floors. The famous *three decker* schools which still dominate the townscape of many London boroughs and other large cities are early examples of this type of plan. In terms of physical standards they were defective in three respects. Because most of the rooms had only one external wall to contain windows, cross ventilation was impossible; because their layout followed a rigid formula, many rooms had a poor aspect and some received no share of westerly or southerly sunlight; because they were cheek by jowl with each other and the assembly hall, noise travelled easily from space to space.

82. Some architects of the 1930s set out deliberately to correct these defects. They produced a type of plan which is now aptly described as a *finger plan*. Class rooms and practical rooms were disposed in rows with a corridor on one side. Usually several rows were planned parallel with each other and set, like fingers, at right-angles to the *palm* which embodied the hall, administration offices, cloak rooms and lavatories. Every teaching room could thus be made to face south, and, by having a clerestory light over the corridor, obtain cross ventilation. By keeping the rows widely apart and placing storage space between rooms in each row, sound transmission between rooms could be kept to a minimum.

83. These were the ideas that most post-war architects inherited and followed up to about 1949. It soon became apparent that this approach did not solve every problem; it had its own major defects:

- (1) it led to extravagant use of floor space. A corridor had to run along the length of the palm and up each finger of the plan. As much space, and often more, had to be devoted to circulation areas as was provided for teaching purposes;
- (2) it made the building sprawl over a large area, using up valuable land and making administration and supervision difficult;

- (3) it lost most of its advantages if, in an attempt to make the plan more compact, class rooms were designed on both sides of the finger corridor or above each other on more than one floor;
- (4) it paid little or no attention to the size or shape of individual rooms according to the way they were to be used or to placing different kinds of rooms in the right relationship to each other. Rooms were strung together in rows according to a geometrical pattern and not on any organic or functional basis;
- (5) it required this pattern to be set on a site irrespective of the land's natural contours or amenities such as views and convenient access: it was usually costly on this account;
- (6) it resulted in buildings that were highly formal, even institutional in character, out of scale with a child's world and out of keeping with the growing need for teaching spaces adaptable to many and various activities.

Primary schools

84. The problem which next posed itself was to design a building which, without surrendering the physical standards achieved by the finger plan, was more economical in total area but more generous and adaptable in the amount of space used for teaching. The way this problem has been tackled is best illustrated by the three diagrammatic plans in Diagram 1¹. The plans are of actual schools. For the purpose of comparison 8 class junior schools for 320 children have been chosen. They are all drawn to the same scale, and accommodation which serves the same purpose is coloured in the same way in all cases; for example, the class rooms in all three cases are white. The following points will be noted:

- (1) Example A illustrates a school designed on the finger plan. It is typical of many schools built between the end of the war and about 1949. Six of the class rooms are 520 square feet in area (the minimum size permitted by the Building Regulations) and the other two are each about 720 square feet. A separate dining space is provided in addition to an assembly hall;
- (2) Example B shows a school typical of those designed between about 1950 and 1953. Class rooms are each about 700 square feet in area. A separate dining space is still provided. There is a small two storey section in the building;

¹Pages 36 and 37.

(3) Example C illustrates a school typical of the best designed from about 1954 until the present. Class rooms are nearly 900 square feet in area. Only one large communal space is provided (the hall). Three of the 8 classrooms are on the first floor.

85. The chart in Diagram 1 and the table below show what has been achieved. The total floor area has been reduced by about 40 per cent without reducing in any way the amount of teaching accommodation. It will be useful to look more closely at some of the changes which have been made.

Area per place (a) in square feet
(b) as percentage of total area

Example	Teaching accommodation (1)		Non-teaching accommodation				Total	
	(a)	(b)	Circulation		Other (2)		(a)	(b)
A	27	39.1	16	23.2	26	37.7	69	100
B	25	46.3	11	20.4	18	33.3	54	100
C	29	67.4	3	7.0	11	25.6	43	200

Notes: (1) includes class rooms and assembly hall, and all teaching storage.

(2) includes dining space (where separate) and kitchen, administrative offices, cloakrooms, lavatories and non-teaching stores.

Reduction in circulation areas

86. First, the amount of corridor space has been greatly reduced. In many parts of many schools it has been abolished altogether. Since primary school classes tend to stay in the same room for most of the day, there is no real need for permanent traffic routes round the whole building. The only large scale movement is that of a class to the assembly hall for music, drama, or physical education or that of the whole school for morning assembly and school dinner. As these two activities nearly always take place in the assembly hall or in an area immediately adjacent to it, the only vital circulation area is that between class rooms and the hall, and this can be kept short in the type of plan which disposes the class rooms in a perimeter round the hall.

87. But even where corridors are necessary it is often possible to design them so that they can be used as part of the teaching space by,

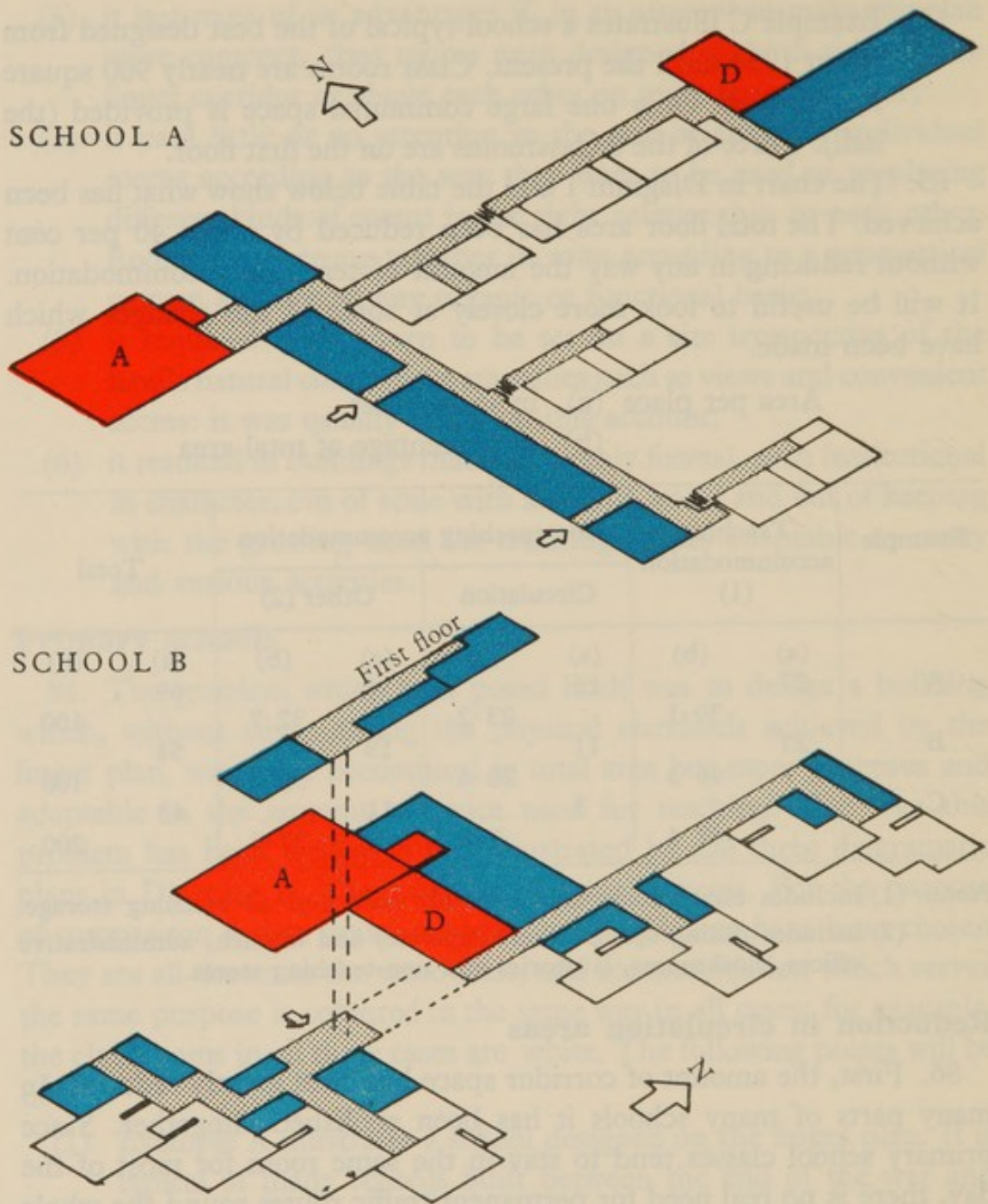
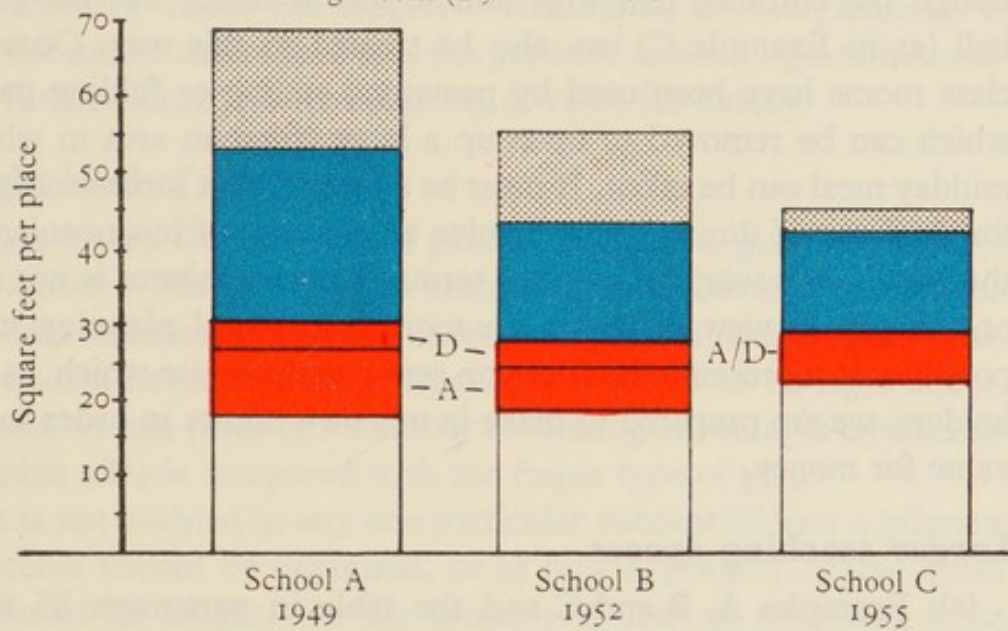
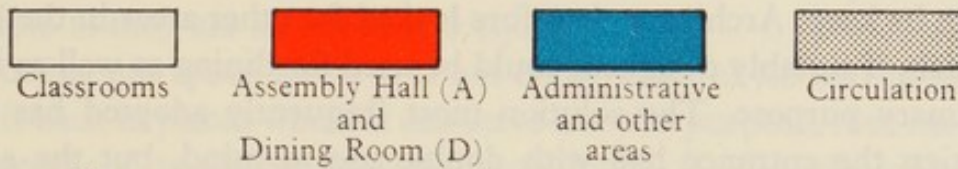
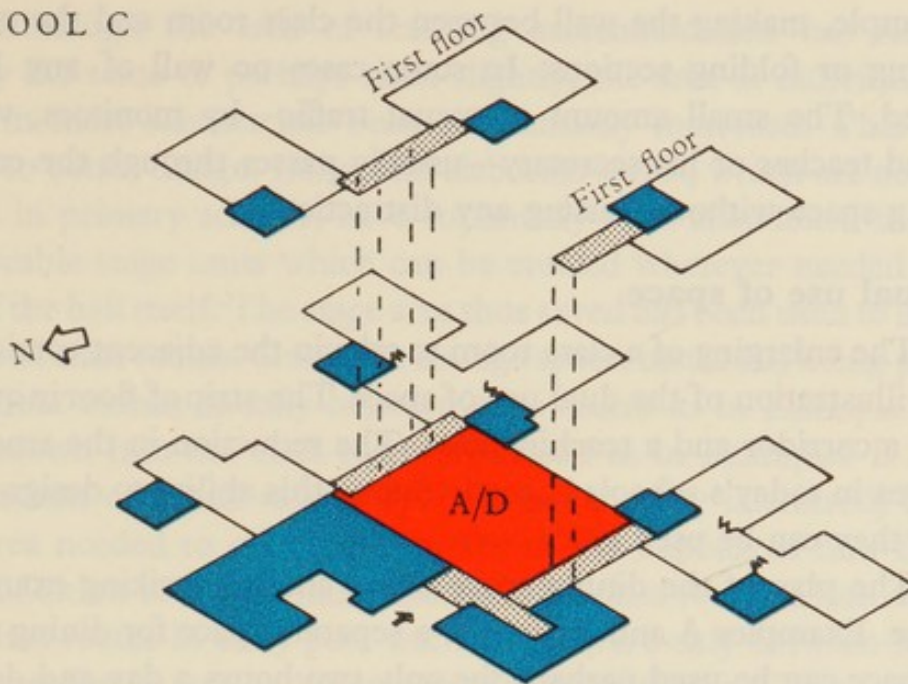


Diagram 1. TRENDS IN THE DESIGN OF PRIMARY SCHOOLS

SCHOOL C



for example, making the wall between the class room and the corridor of sliding or folding sections. In some cases no wall of any kind is provided. The small amount of casual traffic—by monitors, visitors, the head teacher or his secretary—usually passes through the enlarged teaching space without causing any distraction.

The dual use of space

88. The enlarging of a class room to take in the adjacent corridor is a simple illustration of the dual use of space. The strip of floor in question is both a corridor and a teaching area. The reduction in the amount of floor area in today's schools is partly due to this ability to design spaces so that they can be used twice over.

89. The plan of the dining space offers another striking example of dual use. Examples A and B provide a separate space for dining rooms. This space can be used perhaps for only two hours a day and does not earn its keep. Architects therefore looked for other areas in the building which, if suitably designed, could be used for dining as well as for their primary purpose. The solution most frequently adopted has been to design the entrance hall with double use in mind, but the assembly hall (as in Example C) can also be treated in this way. Occasionally class rooms have been used by providing sliding or folding partitions which can be removed to open up a large common area in which the midday meal can be taken. It must be admitted that some arrangements for dual use of dining space involve an element of inconvenience. On the whole, however, the price in terms of inconvenience is not a heavy one to pay in view of the much more economical planning it makes possible. It represents the common sense compromise which, as householders, we are prepared to make in our own homes in order to ensure value for money.

Larger teaching spaces

90. Examples A, B and C and the table in paragraph 85 together clearly illustrate, in the case of primary schools, the most significant achievement of post-war school building, namely, that the total area has been reduced on average by nearly 40 per cent while the area of useful teaching accommodation has remained practically the same. In relative terms useful teaching space occupies between 60 and 70 per cent of the total area, compared with only about 40 per cent in the early post-war schools.

91. Although the area of teaching accommodation has remained roughly the same or perhaps risen slightly, the area of individual class rooms in most schools has been substantially increased. This is due largely to better design. Large and elaborate stages, which are not really needed in primary schools, have commonly been abandoned in favour of moveable stage units which can be erected wherever needed on the floor of the hall itself. The stage area thus saved has been used to increase the size of class rooms. Similarly, storage space, instead of being planned in separate rooms, usually between class rooms as in Example A, has been thrown into the class room area itself as in Examples B and C. The amount of actual storage space is not thereby decreased, but the floor area needed to get at the shelves of the cupboards now forms a useful addition to the working space in the class room. Thus, whereas most class rooms in early post-war schools were only between 520 and 600 square feet in area, today many are between 600 and 700 square feet; in Example C they are all about 900 square feet.

92. Cutting out space where it is not doing a useful job and putting some of it back in places where it can serve a useful purpose, thus meeting the teachers' needs for adaptable conditions, is wise planning. It reduces the total area but increases the productive teaching accommodation. It further illustrates the meaning of value for money.

The right kind of school?

93. Can we say that the type of plan in Example C gives us the right kind of school? There can be no absolute answer because it has been shown that educational ideas and needs are bound to change with time, so that we can never be certain what it is we want to be right about. But at least we can point to a number of striking advantages which this type of plan affords compared with the finger type of plan:

- (1) it is not wedded to any one particular concept of how a primary school should be organised, or of how a primary school child should be taught. On the contrary it aims at providing large simple spaces, which can be adapted by the teacher to his particular needs, rather than a number of small specialised ones which will prove inflexible;
- (2) it is, as has been shown, very economical in area;
- (3) it is compact and therefore uses the minimum of land and makes for convenient administration and supervision and for lower maintenance costs;

- (4) it preserves the physical standards of the finger plan without having to conform to a rigid pattern. It can be varied to suit the natural contours and amenities of each site while still ensuring that every teaching room gets a share of southerly sunlight, adequate cross ventilation and tolerable sound conditions;
- (5) it results in buildings that are informal in character and lends the school a domestic rather than an institutional atmosphere.

Secondary schools

94. Secondary schools are altogether more complicated to design than primary schools. In the first place they are much bigger. A primary school is usually of such a size that it can be treated as a single unit, the various constituent parts being related quite simply to an obvious centre or focus—the assembly hall. But a secondary school, because of its size alone, tends to fall into two or three different major parts, each perhaps with its own centre or focus. It is clear that there will be economical and uneconomical ways of relating these various parts of the building.

95. But there is a factor other than size which distinguishes the primary school from the secondary school. A primary school class spends most of its day in its class room base; it therefore needs a large general adaptable space. The secondary school class wants to follow at least as many different activities as the primary school class, but in a more specialised manner. A single all-purpose room is no longer sufficient. In addition to classrooms it is necessary to provide specialist rooms for subjects such as science, art, handicrafts and physical recreation. This means that there are many more different kinds of individual rooms to be related in the plan. Not only will there be an economical and an uneconomical way of joining these spaces together, but there will also be a good and a bad way of relating them from an educational point of view. Just as in designing our own home we are greatly concerned about how the kitchen relates to the dining room, or a bathroom to the bedrooms, so those designing schools must consider carefully how the hall should be related to the gymnasium, or the class rooms to the practical rooms, and where best to place the administrative offices, library, the kitchen or the boiler house. It will be appreciated how important it is that decisions on these matters should be taken jointly by the people concerned and not by the architect alone, or the administrator or the educationalist.

96. How differently these component parts can be put together to

form either an economical or an extravagant pattern or an educationally satisfactory or unsatisfactory one can be seen from the two examples in Diagram 2¹. Both are diagrammatic representations of actual post-war schools of similar size—three form entry secondary modern schools. They are drawn to the same scale and analysed on the same basis.

97. School D is typical of the period up to 1949. It is the finger plan applied direct to secondary schools and many of the defects of that approach described in paragraph 83 remain apparent. It is an uneconomical and sprawling plan with extensive corridors. It is inconvenient to administer and supervise. It is not greatly bothered about the inter-relationship of different kinds of space. All the class rooms are in one two storey *finger* and all the practical rooms in another. Three of the big communal spaces, the gymnasium, the dining space and the library, are tacked on to the three outermost corners of the plan and the central focus is the entrance between two large blocks of cloakrooms and lavatories, boys on the left and girls on the right.

98. School E represents the type of secondary school plan common today. It will be seen to be both compact and complex in layout. Class rooms and practical rooms are very carefully inter-related. The big communal spaces are brought into the centre of the building. The assembly hall and the dining space overlap and are really one space. Other examples of dual use of space, which result in a reduction in total floor area, occur wherever the plans are marked with diagonal hatching.

99. The chart in Diagram 2 and the table below show how the area per place is divided between different uses.

Area per place (a) in square feet
(b) as percentage of total area

School	Teaching accommodation		Non-teaching accommodation				Total	
	(1)		Circulation		Other (2)			
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
D	44		28		30		102	
		43		27.4		29.6		100
E	45		9		16		70	
		64		12.8		23.2		100

Notes: (1) includes class rooms and assembly hall, and all teaching storage.
(2) includes dining space (where separate) and kitchen, administrative offices, cloakrooms, lavatories and non-teaching stores.

¹Pages 42 and 43.

The story of post-war school building

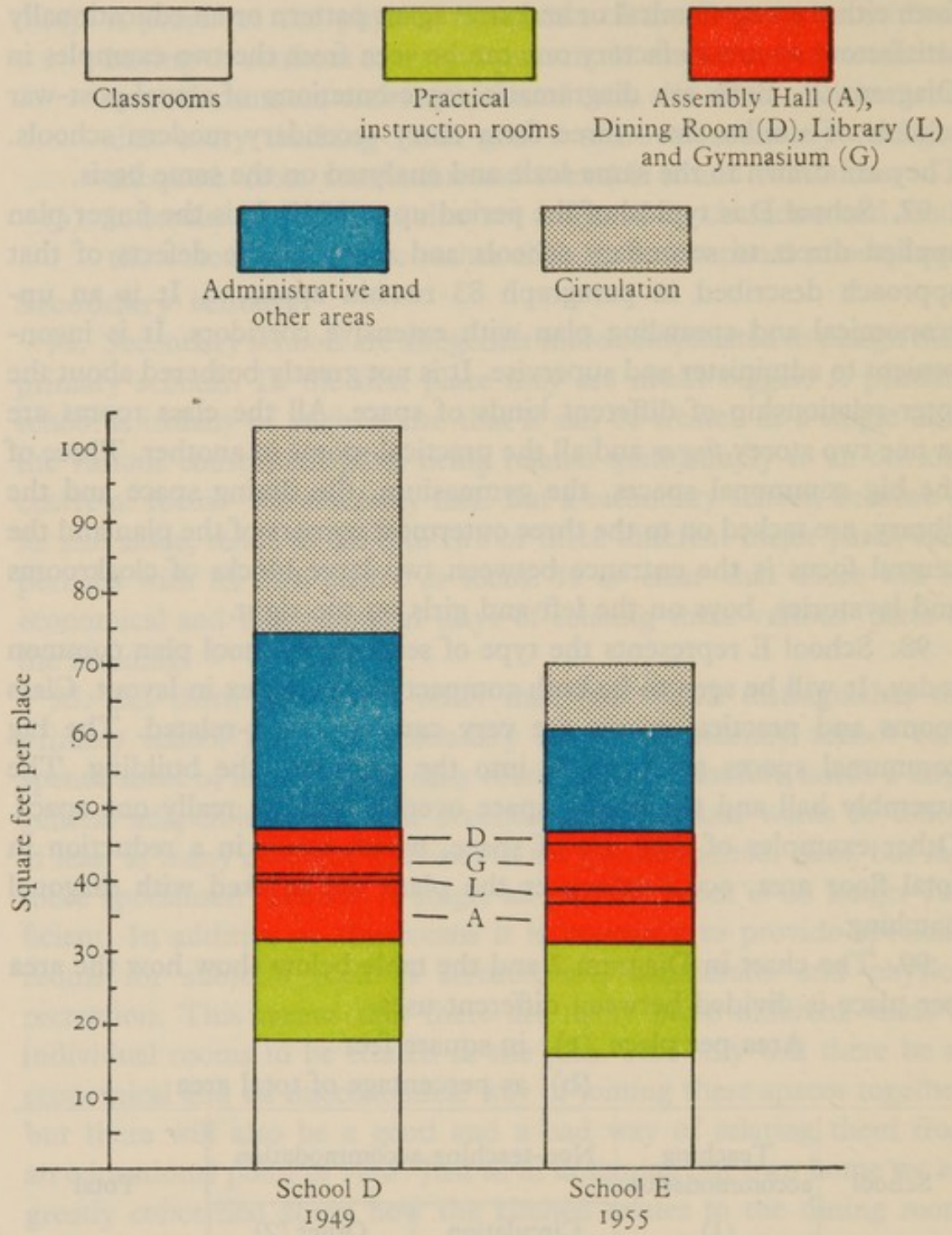
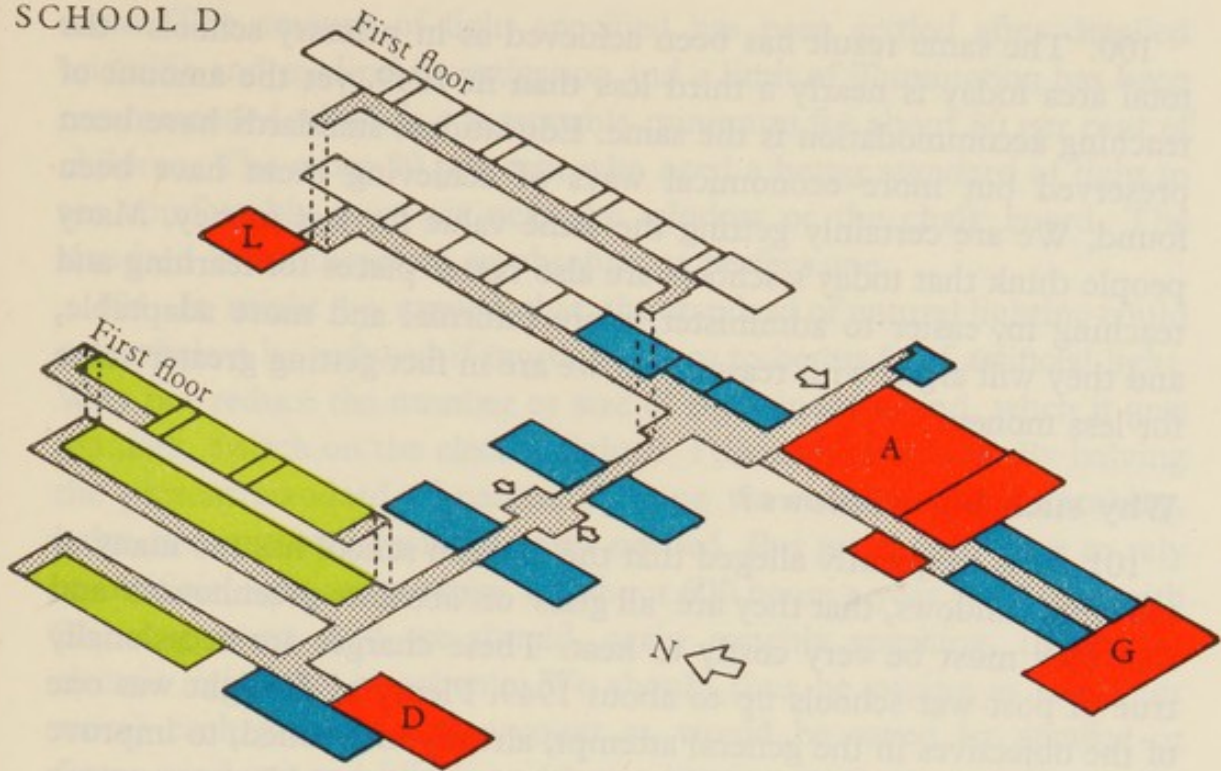


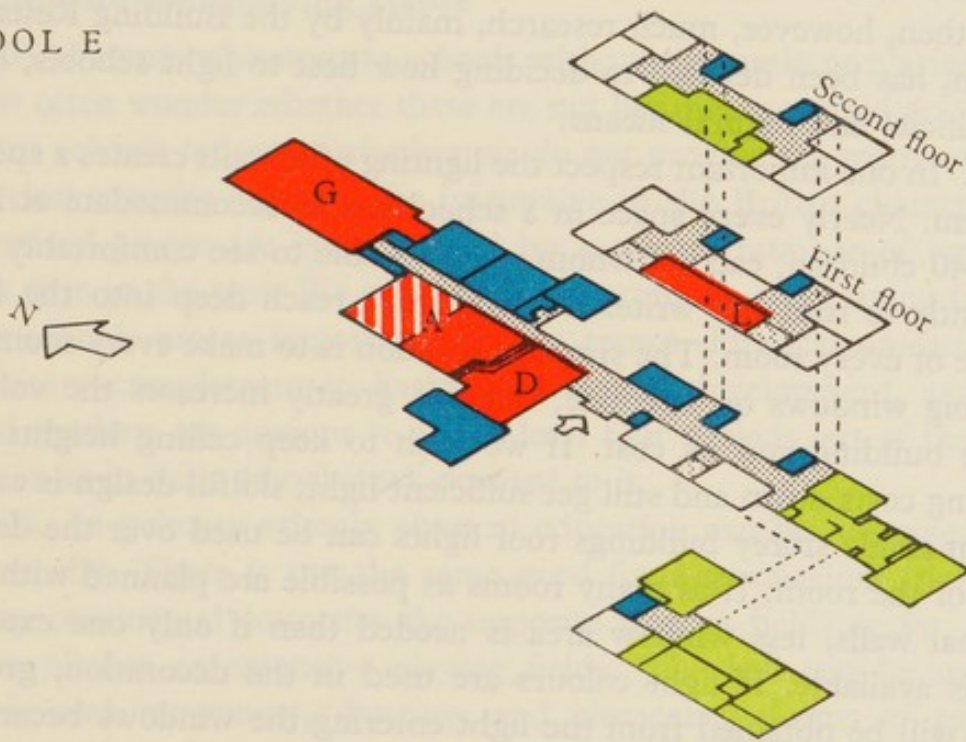
Diagram 2. TRENDS IN THE DESIGN OF SECONDARY SCHOOLS

The contribution of design

SCHOOL D



SCHOOL E



100. The same result has been achieved as in primary schools—the total area today is nearly a third less than in 1949, yet the amount of teaching accommodation is the same. Educational standards have been preserved but more economical ways of achieving them have been found. We are certainly getting the same value for less money. Many people think that today's schools are also better places for learning and teaching in, easier to administer, more informal and more adaptable, and they will argue with reason that we are in fact getting greater value for less money.

Why such big windows?

101. It is frequently alleged that the modern school has too many or too large windows, that they are 'all glass' or 'absolute greenhouses' and that they must be very costly to heat. These charges are occasionally true of post-war schools up to about 1949. Plenty of daylight was one of the objectives in the general attempt, already mentioned, to improve physical standards and there is no doubt that some architects went too far in this direction in the absence of knowledge which is now available. Since then, however, much research, mainly by the Building Research Station, has been devoted to deciding how best to light schools, both by artificial and natural means.

102. In one important respect the lighting of schools creates a special problem. Nearly every space in a school has to accommodate at least 30 to 40 children, each of whom must be able to see comfortably and efficiently to read and write. Daylight must reach deep into the back or side of every room. The simplest solution is to make every room tall with big windows on one side, but this greatly increases the volume of the building and its cost. If we wish to keep ceiling heights and building costs down and still get sufficient light, skilful design is essential. In single storey buildings roof lights can be used over the darker parts of the room. If as many rooms as possible are planned with two external walls, less window area is needed than if only one external wall is available. If light colours are used in the decoration, greater value will be obtained from the light entering the windows because it will be reflected internally round the room.

103. All these devices are now widely used, and it is generally true that schools today contain only sufficient window area to provide the necessary standard of lighting. This standard requires that a specified amount of natural daylight reaches the worst lit part of each teaching

room. The amount of light specified has been settled after detailed scientific and medical investigation and a limit of illumination has been recommended which is a reasonable minimum for about 80 per cent of children. The other 20 per cent who need a better standard of light to see comfortably must sit near the window or the chalk board. The standard is not therefore an absolute or perfect one.

104. It might be argued that the standard of natural lighting could nevertheless be reduced if more use were to be made of artificial light. Why not reduce the number or size of the windows, and, when it gets too dark, switch on the electric lights? This could be done. By halving the present standard of natural lighting we could, roughly speaking, halve the amount of window area needed. But we should have to rely on artificial light, on average, for about 600 hours a year compared with 200 at present, and we should, again roughly speaking, treble our electric light bills in schools. We should thus be paying as much (or more) each year on this account as would be saved by smaller or fewer windows and blinds and lower heating costs.

Gymnasia and playing fields

105. Parents who went to schools without gymnasia or playing fields must often wonder whether these are not luxuries we could do without in our schools today, or whether we do not provide too many of them. Physical exercise seems to be instinctive in the British character and organised games are being played by a greater number of boys and girls than in the past. We recognise that gymnasia and playing fields in new schools are as important as class rooms. Physical *education* is a necessary complement to health and mental development, and most head teachers are anxious to see at least four periods out of the thirty five or so in each school week devoted to it.

106. In primary schools physical education can be organised quite informally. There is not the same need for a gymnasium (though in many continental countries the opposite view is held) or for formal grass pitches or extensive playing fields. The hall can be used for music and movement, dancing, and elementary forms of running, skipping, jumping etc. A small grass area will allow for the playing of simple ball games. The playground need not be a dull, unbroken expanse of tarmac. It can play an important part if it is designed with imagination and provided with a variety of play equipment. This is all that is at present provided in our primary schools.

107. In secondary schools a more formal approach is necessary. Two indoor periods of physical education, taken in a gymnasium, are normally provided each week and two outdoor periods taken on the playing field. A gymnasium, however, is a very expensive area to provide and it is only justified if full-time use can be made of it throughout the week. Gymnasiums are not therefore provided in one and two form entry secondary schools (for about 150 and 300 children respectively). Physical education must then be taken in the assembly hall. Larger schools, too, usually have to take some of their physical education periods in the assembly hall. For this reason most halls have to be planned for dual use and must be skilfully designed.

108. Outdoor physical education involves the playing of team games. Football, hockey, lacrosse, rugby and cricket all need a lot of land. There is an obvious duty not to use more land—especially valuable agricultural land—than is absolutely necessary. If we are to save land and still provide a grass pitch for two games periods per week per child, school sites must be chosen with care, so that they are neither too big for the pitches needed nor too small to accommodate them without expensive earth moving, levelling and draining. The various pitches and courts must be fitted into the site as economically as possible, tucking the tennis court or the high jump pit into the awkward corners and playing football over the cricket area except for the square itself. The maximum use must be made of each pitch, thus reducing the number. This involves careful establishment of the grass and its scientific maintenance.¹ As we have learned more about these problems, so we have progressively reduced the amount of playing fields provided at new secondary schools. The table opposite shows the areas specified in the 1945, 1951 and 1954 Building Regulations. For convenience the figures quoted are those for mixed schools for boys and girls.

Swimming baths

109. In certain circumstances, particularly in built up areas, it may be possible to acquire sufficient land for playing fields only at a considerable distance from the school. This involves transporting children to outlying playing fields and providing changing and washing accommodation near the pitches. The school site, however, may be big enough

¹Building Bulletin No. 10 'New School Playing Fields', Her Majesty's Stationery Office, price 4s. 0d. (by post 4s. 3d.), deals in detail with the establishment of playing fields.

No. of form entries	No. of pupils	No. of acres prescribed in			
		1945 Regulations	1951 Regulations	1954(b) Regulations	
1	150	5	4½	4½	
2	300	9	7½	7	
3	450	14	10½	10	
4	600	}	13½	10	
5	750		16½	13	
6	900		19½	13	
7	1,050		(a)	22½	16
8	1,200		25½	16	
9	1,356		28½	19	
10	1,500		31½	19	

(a) Areas were not prescribed for schools larger in size than 3 form entry.

(b) A hard porous pitch allows of more intensive use than a grass pitch. If provided it is deemed to count three times its own area. The actual total playing field area can thus be further reduced below the undermentioned figures.

to contain an indoor swimming bath. A number of local authorities have preferred, and been allowed, to provide facilities for physical education in this way where it is clear that the cost will be less than that of providing playing fields and changing and washing accommodation, and of transporting children to them. Indeed, the heavy and continuous use which can be made of the swimming bath in all weathers has led some authorities to build one instead of a gymnasium. They have been allowed to do so, provided that its cost is still within the limit of *nett* cost for the building as a whole.

Furniture and equipment

110. The pursuit of value for money has been extended into the field of furniture and equipment. Here, as in the design of school buildings, local education authorities were on uncharted ground after the war. Although from 1949 onwards it was generally thought that the total cost of furniture and equipment ought not to exceed 10 per cent of the nett cost of the building, there were no formal limits of cost. Standards thus varied not only in terms of total expenditure but also in respect of the distribution of expenditure between different spaces in the school. For example, some authorities would think it reasonable to provide, in addition to chairs in the teaching rooms, enough chairs in the

assembly hall to seat the whole school, while others were prepared to move chairs from teaching rooms into the assembly hall as the occasion demanded. Again, there were different ideas about the amount and kind of specialist equipment needed in practical rooms. One woodwork or metal work room, for example, would be equipped with a very full range of machines, but another with only a few basic items.

111. As we learned more about the needs of particular kinds of school for furniture and equipment it was possible to calculate fairly accurately a reasonable total cost for furnishing and equipping at least the commoner types of school, and thus to set, as for building, a limit of cost per place. In fixing this limit a scale of provision was assumed which reflected good, average, but economical practice, and the prices assumed were those sufficient to buy well-designed articles of serviceable quality. The limits, which were introduced in June 1956, are £14 per place for primary schools, £24-£32 for secondary modern schools, and £28-£33 for secondary grammar schools (the last two limits varying according to the size of the school). Furniture and equipment schedules for secondary technical, bi-lateral, multi-lateral and comprehensive schools have to be settled individually in order to take account of their particular courses and types of organisation.

112. Not only has a limit been set on total expenditure but guidance has also been given on the furnishing and equipping of some of the more expensive individual parts of the school, with the object of ensuring that excessive expenditure in some spaces (for example, over-elaborate stage lighting in a hall or too much or too elaborate equipment in a practical room) does not lead to skimping standards elsewhere (for example, poor quality tables and chairs in classrooms and inadequate benching and tables in practical rooms).

113. While, therefore, the limits of cost aim to restrict total expenditure and, at the same time, to secure that this expenditure is distributed in a basically sound and balanced way, they also leave local authorities substantial freedom to choose for themselves the precise number, kind and quality of articles they think will best suit their particular needs.

Class rooms

Developments in the design of class rooms are illustrated in the four following photographs. The first is typical of the Board school of about 1900, with its tiered pitch pine desks, high window sills and glazed partitions. The second classroom was designed in the late 1920s, though the furniture is older. The third photograph shows a typical classroom of about 1949 in a *finger plan* school (a parallel finger can be seen through the windows). The improved standards of lighting, heating and ventilation should be noted. The fourth picture typifies the more recent approach towards a larger and more informal teaching space, with a self-contained toilet unit and child-sized furniture easily moved to allow small groups of children to work at separate tasks.

1. About 1900.
2. 1928.
3. Immediate post-war.
4. A recent example.



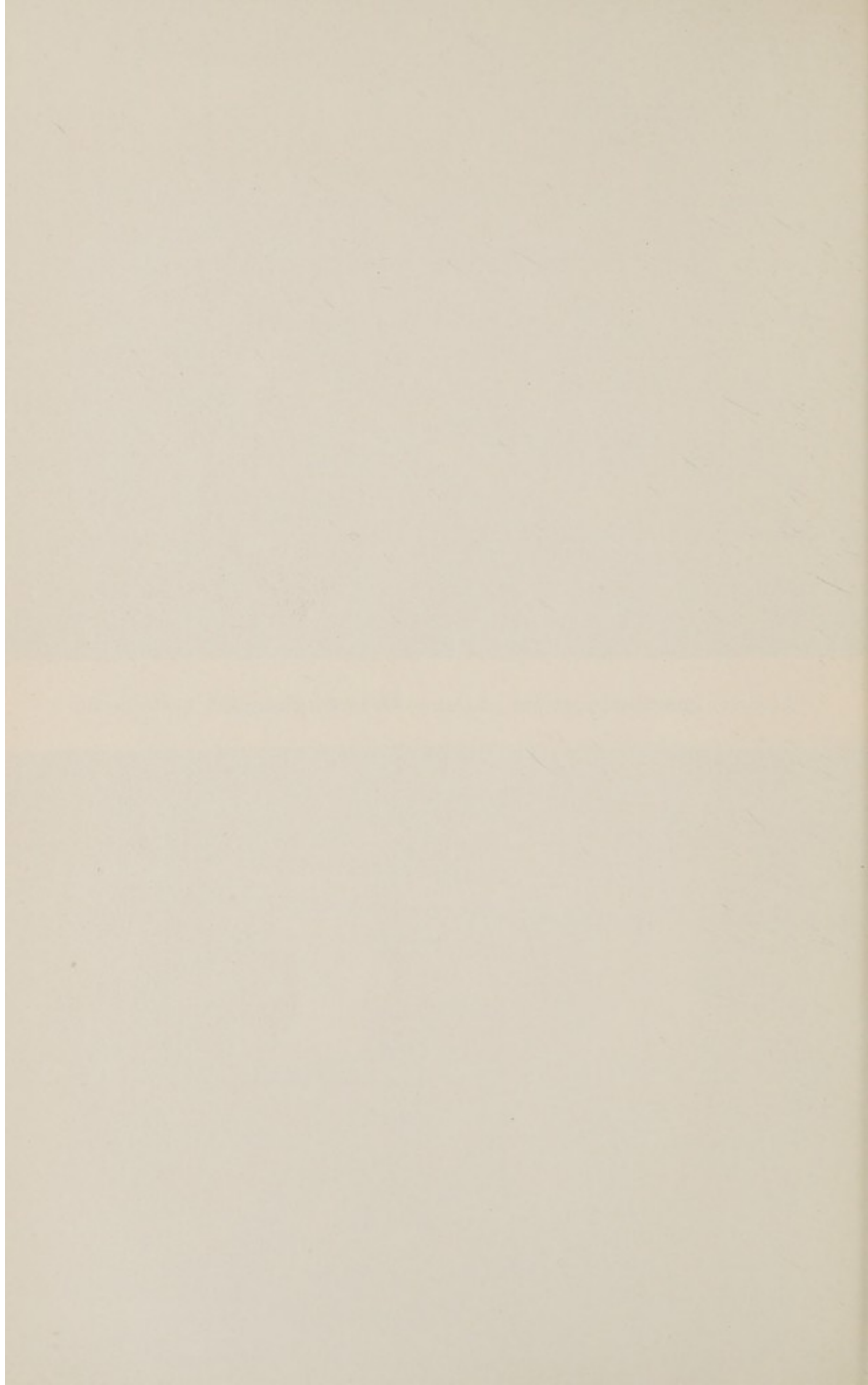
1 (*above*) About 1900 ; 2 (*below*) 1928





3 (above) Immediate post-war ; 4 (below) A recent example





V. The attack on costs

The question of quality

114. Cost per place has been brought down because the area per place has been greatly reduced in the way just described and because the cost of building each unit of that area has been held in check. This chapter discusses how the latter has been done and how it has affected building standards.

115. As has already been stated, a limit of cost per place must be fixed at a point at which it is possible for the average architect working in average conditions to provide at least the minimum area of teaching accommodation in a building of good quality. What do we mean by 'a building of good quality'?

116. The schools we build will be used not only by our children but by our grandchildren also. They are part of the environment which each generation creates and by which it expresses its standards and will subsequently be judged by public opinion at home and abroad. We are thus helping to establish the physical, social, and cultural landscape of the future. At the same time, we are investing in each new school part of our common wealth. It must be a sound investment. The buildings must be durable and not make unreasonable demands for maintenance. It would be bad business if they were poor in design and shoddy in construction and finishes. We need buildings fitted to their purpose, made of good materials, honestly designed and conscientiously constructed. The cost limits are set so that these standards can be attained.

Holding the cost down

117. The cost per square foot of a school building is bound to be relatively high—much higher than, for instance, that of a council house or a light industrial building. Comparison between the costs of different kinds of building is difficult to make because of their varying requirements, but an analysis of such information as is available indicates that many commercial buildings, office blocks and a large proportion of

multi-storey blocks of flats cost substantially more per unit of space than schools. This is perhaps the more surprising when it is remembered that school building raises problems affecting costs which are not all raised by every type of building. For example:

- (1) nearly every working space in a school is required to accommodate 30 to 40 children, relatively closely seated. This raises problems of lighting, ventilation and sound reduction not usually found together and to such a degree in any other type of non-industrial building;
- (2) schools contain anything from one to four (in larger schools, more) very large spaces—halls, gymnasias and dining spaces—which are not usually present in other types of buildings. These spaces have large spans and high ceilings and cost much more per square foot than ordinary accommodation;
- (3) the number of people in schools and the frequency of their movement impose a very heavy traffic load not found elsewhere (except possibly in large shops or stores). Durable finishes and protection against excessive noise are essential; they cost money;
- (4) schools are handed over finished to the last light fitting, with floor covering provided throughout and all fittings and equipment fixed. Apart from the capital cost of the equipment and of furniture all these items are included in the cost per square foot of the school. In many other types of building the final finishes are often left to the building owner or occupier. A further item included in the cost per square foot of schools is the provision of playgrounds and paved areas. These account for about 2s. 6d. per square foot or about 4 per cent. This requirement is quite peculiar to schools and must be borne in mind when trying to compare their costs with those of other buildings;
- (5) plans which are compact in layout and therefore economical in area and easily organised educationally, are also likely to be complicated. They thus offer little scope within any one building for repetition work which is found to be a measurable factor in keeping building costs down. The paradox that, if schools were planned less compactly, building costs might be lower has an element of truth in it, but no one will claim that the very substantial savings in floor area which have been made could be secured merely by providing enough repetition work.

Repetition work cannot be exploited to the full in educational building.

118. In 1949 the average cost per square foot of floor area in new schools was about 58s. Since then building costs have risen by over 50 per cent. To build to exactly the same specification as in 1949 would therefore cost over 90s. per square foot today. But in fact the present average cost does not exceed 71s. per square foot. This could mean either that standards of school building have been lowered or that cheaper and more efficient ways have been found of building to the same standards. The evidence shows that the latter has been by far the major factor. How has this been done?

Cost analysis

119. Principally because, as architects' experience in the building of schools has increased—and since the end of the war they have designed some 5,000 of them, so has their knowledge of how the money available is best spent. It is not enough to say that a given school must not cost more than, for example, £130,000, or to limit its cost per place to £264, or even to aim at a cost per square foot of, say, 70s. We must go further. If we are going to get value for money, we must know where each penny goes in the building. This means that the costs of previous buildings must be analysed in detail and a systematic method found of comparing the results. Comparison reveals what is economical and what is extravagant, what can be afforded within the cost limits and what cannot be afforded. Techniques for measuring costs to a fraction of a penny per square foot have been devised and an increasing use is being made of them by architects, quantity surveyors and builders¹. Wise economies can be made only if they are based upon a knowledge of costs and of their distribution in a building. Extensive practical experience and the use of the new techniques of cost analysis and cost planning have provided this knowledge and the result has been to prevent the cost per square foot of school buildings from rising anything like as fast as building costs generally.

120. A typical analysis of the cost of a 3 form entry secondary modern school is given overleaf, showing the distribution of costs between the various constituent elements in the building.

¹The Ministry's Building Bulletin No. 4 'Cost Study', second edition, Her Majesty's Stationery Office, price 5s. 6d., describes some of these techniques.

Typical cost analysis of a 3 form entry secondary modern school

(AREA—37,000 sq. ft.)

Element	Total cost per element			Cost per square foot (shillings and pence)		Percentage of total cost	
				per element	per group of elements	per element	per group of elements
	£	s.	d.				
Preliminaries and insurances	6,475	-	-	3/6		5.0	
Contingencies	2,775	-	-	1/6	5/-	2.1	7.1
Work below ground floor level	9,250	-	-	5/-	5/-	7.1	7.1
External walls and facings	8,325	-	-	4/6		6.4	
Frame	18,500	-	-	10/-		14.3	
Upper floor construction	1,850	-	-	1/-		1.4	
Staircases	2,775	-	-	1/6		2.1	
Roof construction	6,166	13	4	3/4		4.8	
Roof lights	1,850	-	-	1/-		1.4	
Metal windows	7,400	-	-	4/-		5.7	
External doors	1,387	10	-	0/9	26/1	1.1	37.2
Glazier							
Internal partitions	5,087	10	-	2/9		3.9	
Screens							
W.C. doors and partitions	308	6	8	0/2		0.2	
Internal doors	925	-	-	0/6		0.7	
Ironmongery	925	-	-	0/6	3/11	0.7	5.5
Floor finishes	8,325	-	-	4/6		6.4	
Wall finishes	925	-	-	0/6		0.7	
Ceiling finishes	6,012	10	-	3/3		4.7	
Decorations	3,700	-	-	2/-	10/3	3.0	14.8
Cloakroom fittings							
Fittings							
Gym. kit lockers and changing room benches	6,475	-	-	3/6	3/6	5.0	5.0
Kitchen equipment							
Plumbing (external)	154	3	4	0/1		0.1	
Plumbing (internal)	2,620	16	8	1/5		2.0	
Plumbing (sanitary fittings)	1,387	10	-	0/9		1.1	
Gas installation	462	10	-	0/3		0.4	
Electrical installation	5,550	-	-	3/-		4.3	
Heating installation	11,562	10	-	6/3		8.9	
Drainage	3,700	-	-	2/-	13/9	2.9	19.7
Playgrounds and paved areas	4,625	-	-	2/6	2/6	3.6	3.6
NETT COST	129,500	0	0	70/-	70/-	100.0	100.0

Smaller cubic content

121. A second important means by which cost per square foot has been held in check has been by reducing the cubic content, as well as the superficial area, of post-war schools. Ceilings in class rooms in Victorian and Edwardian schools were usually at least 14 feet above floor level. In 1949 they were still between 11 and 12 feet high. Today the average ceiling in a class room is less than 10 feet high and in some as little as 8 feet 6 inches. The ceiling heights of corridors and other areas have been correspondingly reduced. These reductions in the cubic content of schools have meant not only much lower building costs but also lower annual costs for heating, painting and cleaning. But they could only be made as our knowledge of natural lighting grew with experience. The complicated outlines and asymmetrical plans of today's schools are partly due to the desire to give as many rooms as possible windows on two external walls, so that ceiling heights can be reduced. Those who argue that symmetrical rectangular blocks are cheaper to build tend to forget that ceiling heights, and therefore the volume of the building, are thereby increased or that, if they are not increased, the standard of natural daylighting, quite apart from that of ventilation and sound transmission, must suffer.

Scientific and industrial development

122. Thirdly, our increased knowledge of natural lighting and of the use of colour which has enabled ceiling heights to be reduced is a good illustration of the part which scientific and industrial research has played in checking the cost per square foot of school building. It is not possible or necessary to list all the instances of collaboration of this kind. It is sufficient to say that there is hardly an aspect of school construction where science and industry have not been brought into partnership with the architect and the builder to seek and achieve new ways of solving old problems. A few examples may be quoted:

- (1) in association with industrial and manufacturing firms a number of systems of construction relying entirely upon prefabricated components have been developed and widely used. It is not claimed that in normal circumstances they are necessarily cheaper than traditional forms of construction, but, being capable of quick erection, they have undoubtedly saved time and money in those areas where traditional types of building labour such as bricklayers, plasterers and carpenters are scarce.

- (2) Scientific examination of the problem of protecting school children and school buildings from the hazards of fire has led to substantial economies. This involves not merely the question of fire fighting appliances, but also the more economically important matter of the design of escape routes and the physical protection of the structure. Broadly speaking, ways have been found of designing and constructing schools that do not require specialised and expensive precautions such as additional staircases, external fire escapes and costly standards of fire resistance in the structural members. Economies resulting from increased knowledge of this kind have played no small part in offsetting the effects of rising prices.
- (3) Research and development by the Ministry's Development Group, the Building Research Station and industry has led to the production of light fittings (lamp shades) which are both more efficient and cheaper than the types traditionally used. A standard size of this recently developed type of fitting costs about 25s. compared with about 45s. for a stock globe type fitting. When it is realised that a four form entry secondary school for about 600 children may contain over 800 light points of which some 500 or so require a standard fitting, the saving will be seen to be substantial. It is in fact a little less than one quarter of one per cent of the total capital cost of the school, but that is sufficient to offset a rise of $\frac{1}{4}$ d. an hour in building wages.
- (4) Although much work remains to be done in developing cheaper and more efficient ways of providing heating and electrical services, rewarding economies have already been made. Lengthy and voluminous underground ducts which were a common and costly feature of most early post-war schools have either been abandoned or reduced to a minimum and the heating and service pipes which they were intended to house are now usually run through the structure of the building; for example, between ceilings and floors or ceilings and roofs. This is an example of dual use in the technical field—making one component (the structural frame) do two jobs (hold up the building and carry the services). Similar use of the structure is increasingly being made to accommodate electric wiring. Flexible cables such as we use in our homes can be used in schools if suitably designed

and installed and the cost of steel conduit tubes screwed to the surface of the building can thus be saved.

These are a few selected examples of how scientific and industrial development has helped to reduce cost.

Building for children

123. Fourthly, money has been saved by turning to account the fact that schools are used by children and not adults. For example, a whole range of wash hand basins, water closets and urinal stalls, specially designed for children, has been developed. The articles, being child-sized, are much smaller; they contain less material and are therefore substantially cheaper than the full-sized articles which were often unthinkingly installed in most pre-war and many early post-war schools. In addition a child-sized wash hand basin holds less water; wastage is therefore less, storage capacity can be reduced and less water needs to be heated. There are thus important savings in annual running costs. The same advantages in capital costs have been obtained by designing smaller cloakroom fittings, benches, cupboards, tables and chairs.

A simple architecture

124. These are four positive lines of action to reduce cost by wise spending. But money can be saved by not spending on unnecessary additions to a school building. This is more controversial because it concerns architectural style and personal taste. Whether from choice or because the cost limits have coerced them, architects have eschewed in their school buildings what we may call traditional ornament. The design and construction of most new schools are almost entirely functional. Every piece of the building is intended first and foremost to do its job—the frame or the walls to hold the building up, the windows to let air and light in, the roof to keep wind and rain out. A skilful architect will, of course, achieve both utility and grace; his elevations will both secure the correct amount of daylight in the rooms behind the facade and yet be of pleasing proportions. The important point, however, is that there is hardly a school today which is designed primarily for its outward show. There can be no classical facades, ornamental cornices, gothic windows, stone dressing, rubbed brickwork or wrought ironwork. These were the stock in trade of the builders of our public schools and public buildings in the eighteenth and nineteenth centuries. It is surprising to see how widely they were still used even in many of

the Victorian board schools. In restrained form they still characterised many of the council schools of the 1920s and 1930s. Even some post-war schools found room for manners of this kind—ornamental water towers, stone dressings over windows, grandiose entrance halls. Today it is perhaps only commercial offices, banks and *prestige* buildings which can afford to appear in these habits. Certainly, so far as schools are concerned, they belong to another world. Some will regret this, others will rejoice at it. The truth is, however, that a very great sum of public money has been saved because of it, and some will maintain that we have gained thereby a simpler, more honest and more pleasing architecture.

125. Summarising, therefore, five ways have been shown by which the cost per square foot of school building has been restrained from rising as fast or as steeply as building costs generally; by greater knowledge and control of the constituent items of cost; by substantial reduction in the cubic content of each school building; by harnessing scientific and industrial to architectural skill in search of better and more economical methods of solving old problems; by reducing the scale of school buildings and their fittings from that of an adult's to that of a child's world; and by not indulging in costly architectural styles and devices.

126. This chapter has been called 'The Attack on Costs' because school architects have not sat passively allowing themselves to be carried along by rising costs but have sought aggressively how to defeat them without sacrificing essential standards. In the last analysis it is a question of where the initiative is to lie—with the architect or with the index of building costs. Each to a large extent can master the other. This story of school building has been told in the belief that it shows that school architects and the other members of the school building team have mastered their subject. We may now turn to answering a few remaining questions.

127. To those who say that economies of the kind just described cannot in the aggregate amount to very much, we must reply that they, and others based on the same principles, have prevented the cost per square foot of school building from rising in line with building costs generally from about 58s. in 1949 to over 90s. today and have checked it at a present average of about 71s.

128. To those who say that all these economies are such as should occur automatically in the minds of every competent architect, we must reply that each one has called for long and patient investigation and

Washing facilities

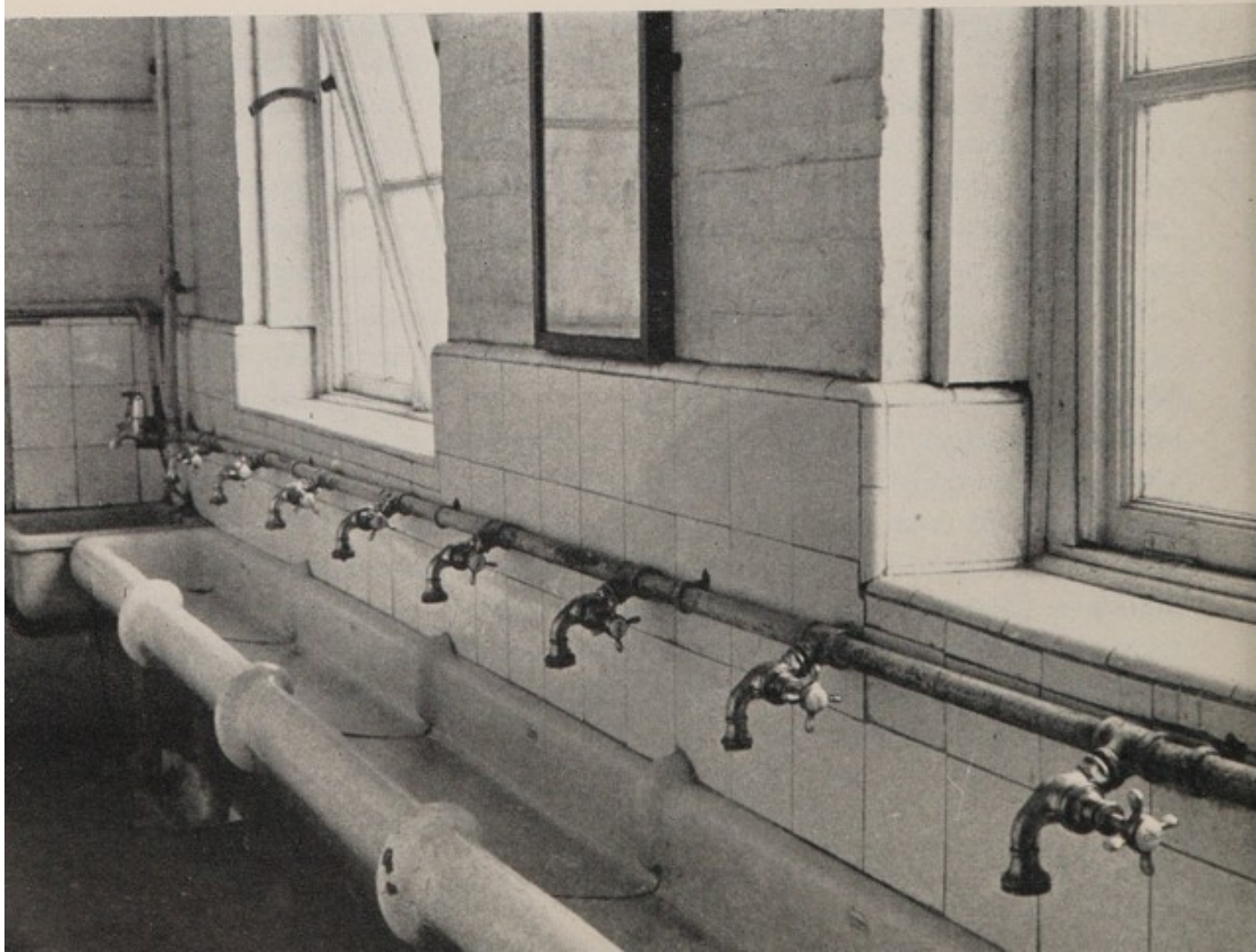
The photographs overleaf tell their own story, not only of the general advance in standards of sanitation and cleanliness, but also of more efficient and economical use of space. For example, although the general standard of fittings improved over the years, the washing and other sanitary facilities were still being concentrated in separate, specially designed, spaces. These, in turn, needed sufficient circulation area to cope with the comparatively large numbers of children using the accommodation.

The recent example, (No. 4) provides a complete unit of basins, toilets and coat pegs within the area of each classroom (an infants classroom is shown) so that separate cloakrooms and lavatories requiring their own circulation are not necessary.

1. About 1875.
2. 1927.
3. 1948.
4. 1952.

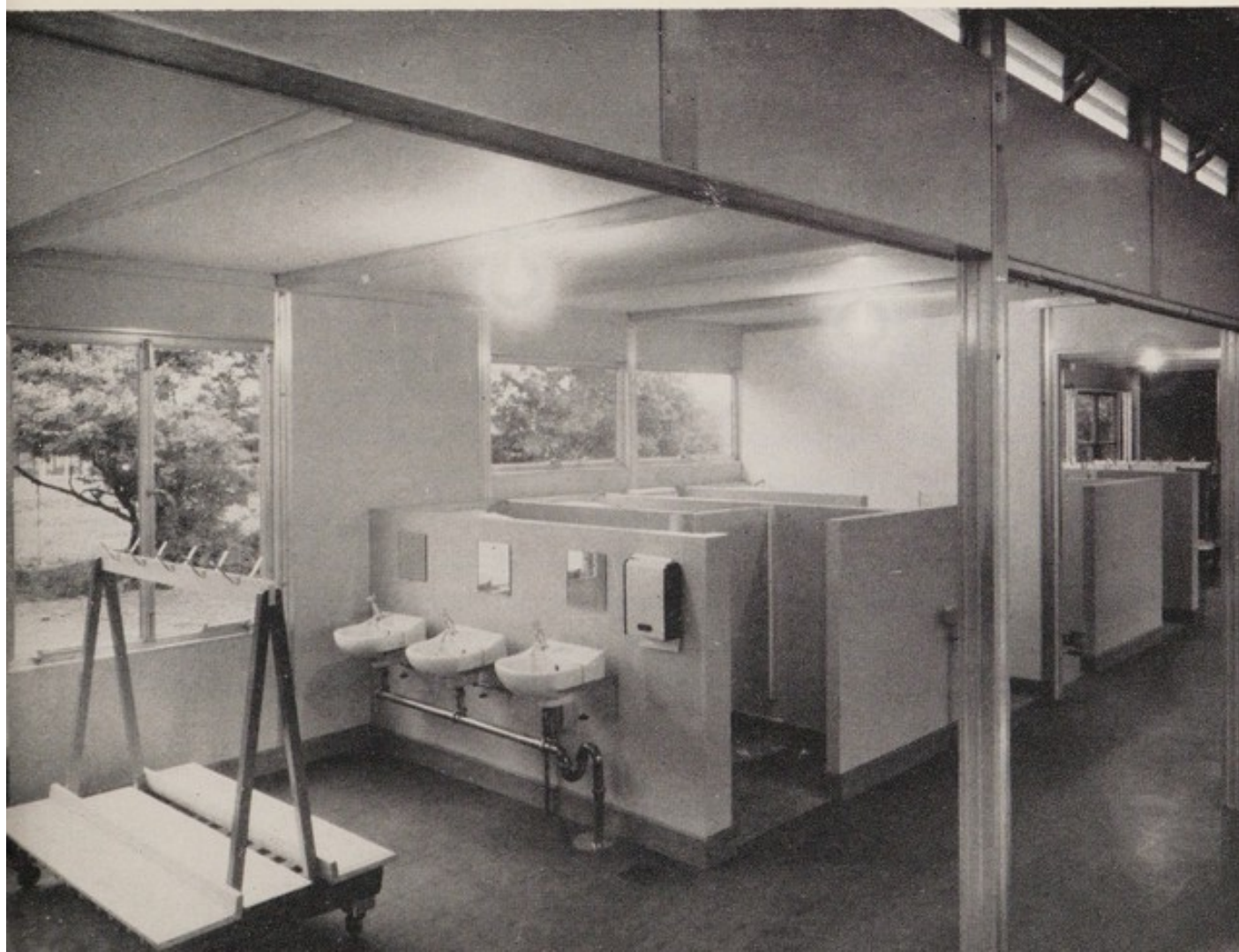


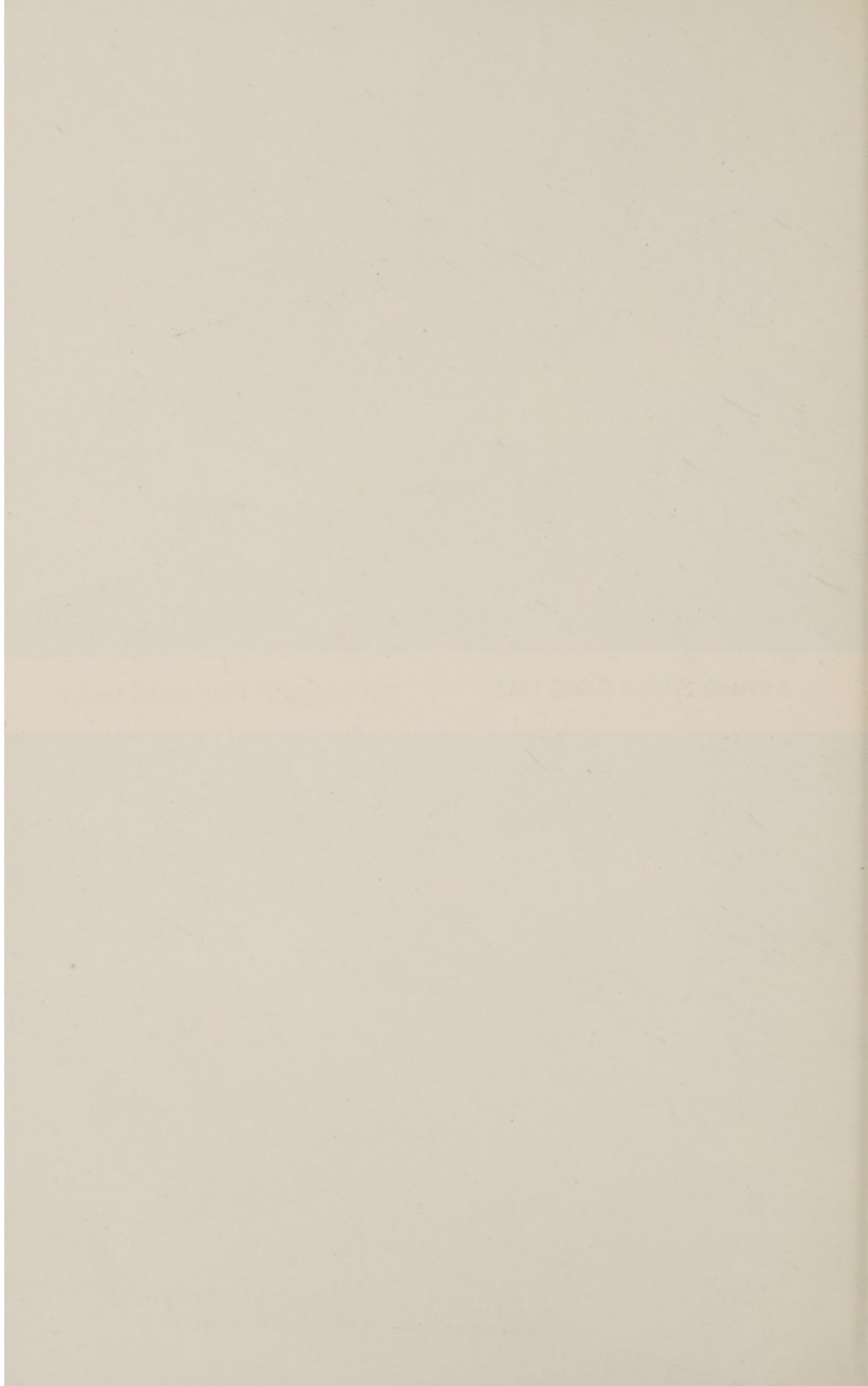
1 (*above*) About 1875 ; 2 (*below*) 1927





3 (above) 1948 ; 4 (below) 1952





trial. It is not possible to alter a way of building overnight. It is remarkable that so fundamentally different an approach to the problem has been made over such a wide field in so short a period as about six years.

129. To those who say that these are not really economies producing better value for money but are cuts in expenditure which mean the sacrificing of standards, we must reply that the amount of money spent has rarely been a true indication of the value obtained. Many of the best schools built since the war have been the cheapest. The discipline of the cost limits has been a challenge which has forced local authorities and their architects to put first things first. What needed to be improved has been improved—the size of class rooms, the variety of facilities or the physical standards of lighting, heating and sound reduction. What needed to be dispensed with has been dispensed with—superfluous circulation area or unnecessary ornamentation. When adjustments of this kind have been made it is possible to secure, out of a given limit of cost, higher standards for what is judged to be essential. To assume that every step in this direction inevitably leads to ‘shoddy buildings’ or ‘cheap and nasty schools’ is to refuse to accept that skill and efficiency can reduce costs.

130. Finally, at the other extreme, there may be some who say that the economies that have been made are not sufficient and that new schools are still too ‘lavish’. Two points need to be made in reply. First, it is often a conspicuous, individual item in a school which calls forth this charge—a sand pit, a piece of statuary, a mural or an eye-catching central light fitting in an assembly hall. If schools were full of frills of this kind they would undoubtedly be lavish. But, turning back to paragraph 116, we must see that schools are part of the physical, social and cultural background of the community. They provide an environment by which children’s tastes and sensibilities are moulded. One of the striking features of post-war schools is that they do provide quite a different environment from all earlier schools. They are gay, light, imaginative and informal. We must see the occasional frill as contributing to this environment. And, secondly, it must be remembered that there is a limit of cost for every school. Some schools built within the limit are dull, pedestrian workshops; the critic is silent because he sees no evidence of extravagance. Other schools built at no greater cost within the same limit are buildings of striking character, lively inventiveness and high quality; the critic terms them ‘lavish’. He is, in

fact, complaining that, in spending public money, the architect has obtained more value for his money than seems reasonable!

131. The crux of the problem of standards is that, while certain things such as the amount of teaching space, or the number of wash basins, or the amount of light to be admitted can be determined quantitatively, the standard of building as a whole can never be absolute or uniform. Nor is it desirable that this should be so. Variety is an advantage; there must be freedom to accommodate local needs and preferences; architects will always differ in their abilities; and critics will always hold different views as to what is necessary or desirable or practicable. There will thus always be a debate in the public mind as to ends and means. Throughout this account of post-war school building the concept of value for money has been constantly used as a criterion in making judgments as to what is necessary or desirable or economical. The following and last chapter examines this concept in more detail.

VI. Value for money

132. The capital value of the new schools to be started this year will be about £55,000,000. To furnish and equip them will cost about another £5,000,000, and professional fees for architects and quantity surveyors will amount to some £2,500,000. Are we satisfied with what we shall be getting for this expenditure? Chapter II of this pamphlet shows that if we are to give expression to current educational ideas and meet current educational needs, the basic educational standards of teaching space in the schools we build must be of the kind we are at present providing. Chapters IV and V have tried to describe how, by better design and by perpetually waging war against rising building costs, we have succeeded in providing more educational productive space in each school for substantially less money. Before summarising the details of this achievement it is perhaps worth noting that the reputation of British post-war schools stands high in international opinion on three counts, the kind of educational environment they provide, the combination of quality with economy in their construction and the speed and quantity of their production. This is high praise from countries most of which are faced with the same problems as we ourselves—a growing number of school children, extensive new housing development, shortage of professional, technical and building man-power and a background of rising costs. At home, apart from some who maintain that our new schools are inadequate in quality and others that they are too lavish, the broad body of opinion seems to be that the new school in the village or in the new housing estate, or in the old part of the town, is something to be proud of. What facts justify this sense of pride?

133. First, we can turn to the substantial economies in the area of new schools. Diagram 3¹ shows how the area per place of primary and secondary schools has been progressively reduced since 1949. It must be remembered, at the same time, that the total area of productive teaching accommodation has not diminished, while the area of individual class rooms and teaching spaces has actually been increased.

¹Page 60.

Diagram 3. AREA PER PLACE

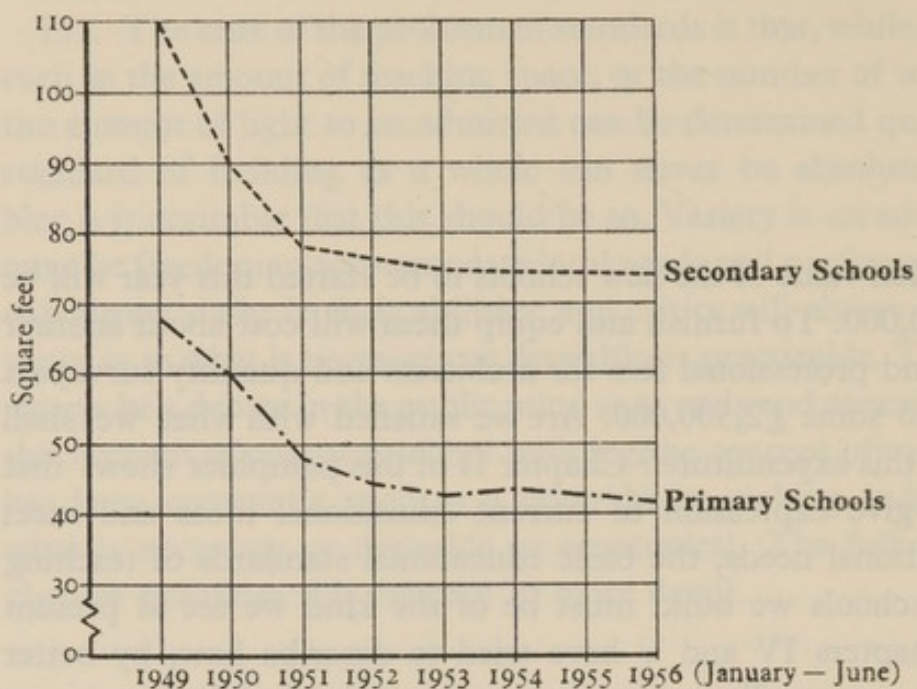
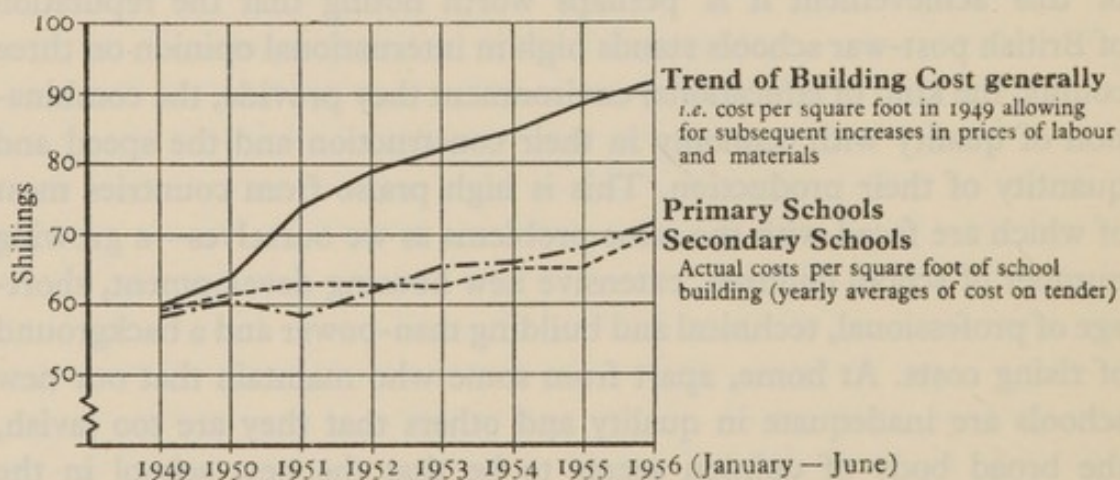
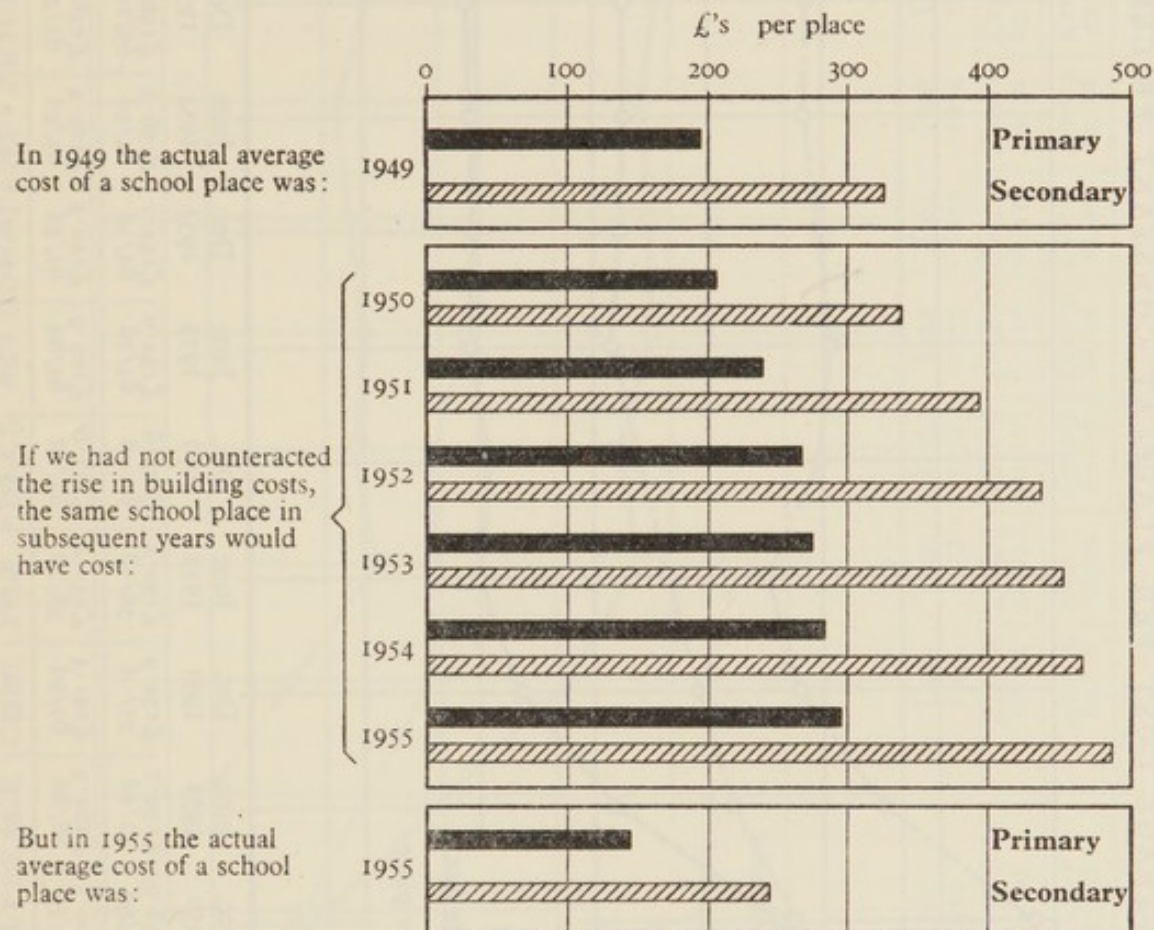


Diagram 4. COST PER SQUARE FOOT



134. Secondly, we can point to the ways in which the cost per square foot of school building has been held in check. Diagram 4 shows the actual costs per square foot today of primary and secondary schools (about 72s. and 70s. respectively) compared with what they might have been had they followed the general trend of building costs (over 90s.).

Diagram 5. AVERAGE COST PER PLACE AT ACTUAL PRICES



Thus the Ratepayer and Taxpayer today are actually paying about 20 per cent less for each school place than in 1949;

Whereas if nothing had been done to reduce areas and check rising costs they would be paying 100 per cent more today than they are actually paying.

135. Thirdly, the reductions in area per place and the economies in cost per square foot have made it possible first to reduce and then to maintain cost per place at figures below those of 1949. Diagram 5 shows that the average cost per place in 1949 was £195 and £320 for primary and secondary schools respectively. Had no economies in area and cost per square foot been made these figures would have risen in line with building costs generally to about £296 and £490. But, as the diagram shows, the actual costs per place today are still below the current limits of £154 and £264. They are thus actually less than in 1949.

Diagram 6. AVERAGE COST PER PLACE AT CONSTANT PRICES (Dec. 1952)

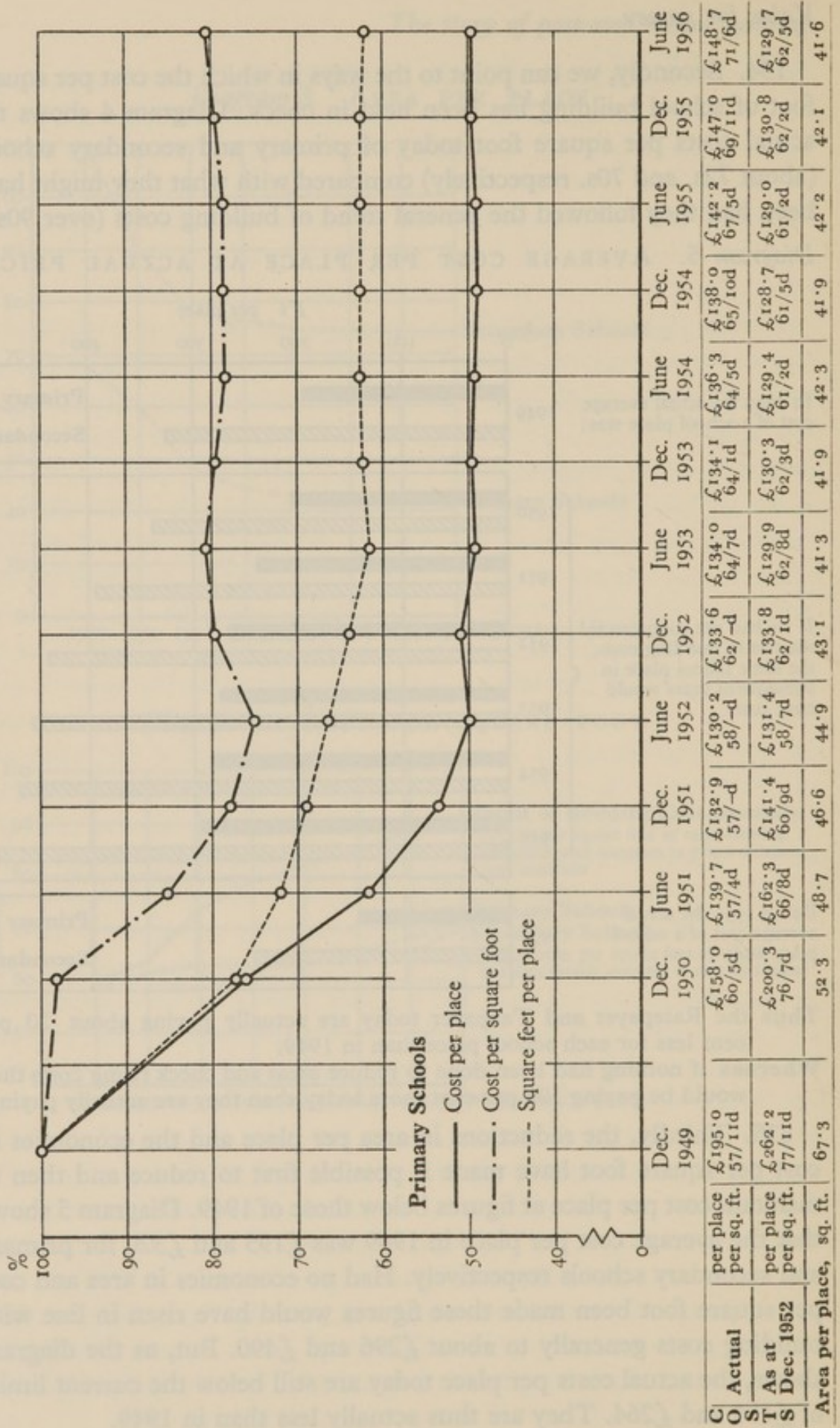
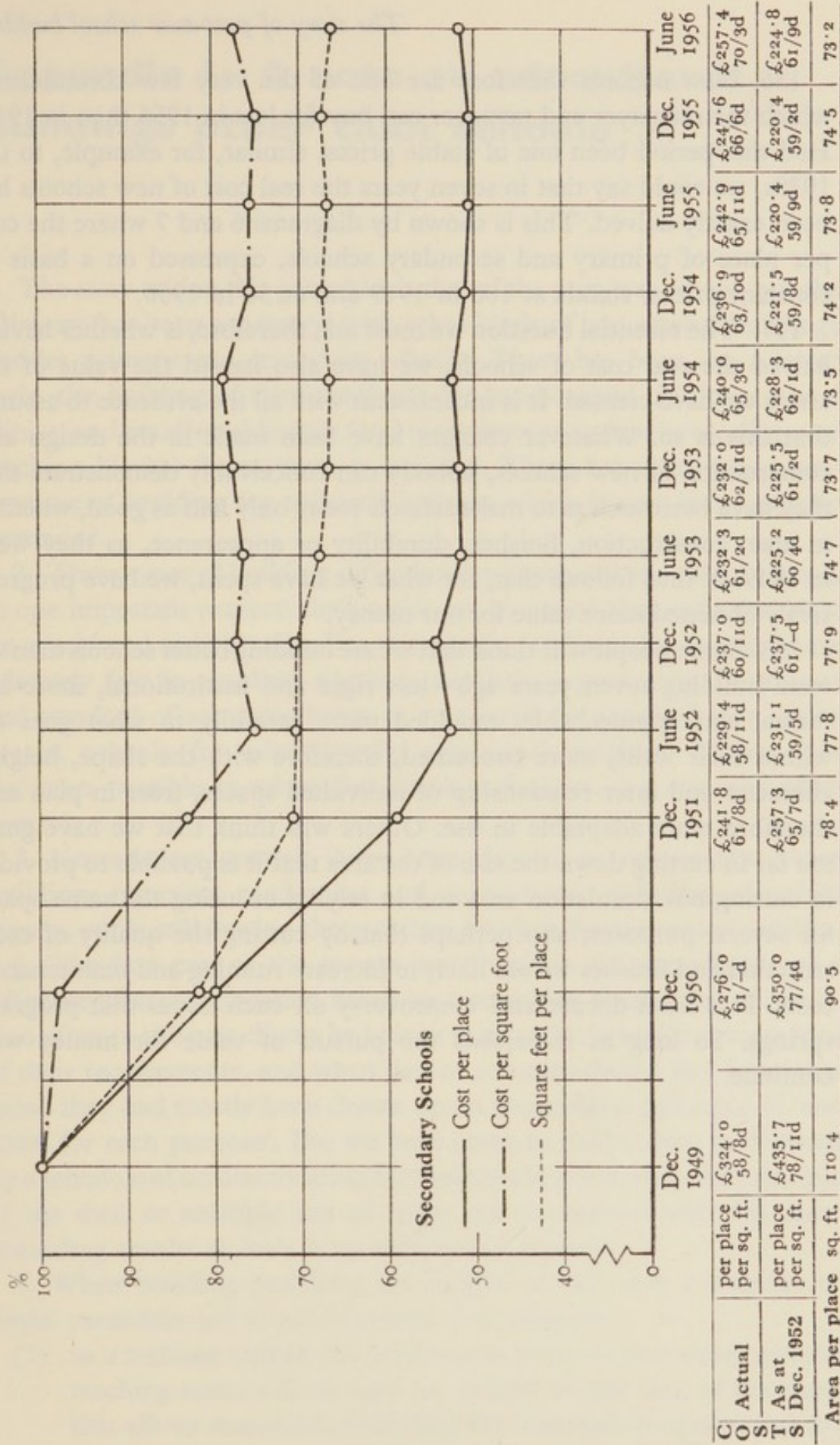


Diagram 7. AVERAGE COST PER PLACE AT CONSTANT PRICES (Dec. 1952)



136. New schools therefore are one of the very few commodities which the ratepayer and taxpayer can buy for less in 1956 than in 1949. Had this period been one of stable prices, similar, for example, to the 1930s, we could say that in seven years the real cost of new schools has been exactly halved. This is shown by diagrams 6 and 7 where the cost per place of primary and secondary schools, expressed on a basis of constant prices, stands at 100 in 1949 and at 50 in 1956.

137. The essential question we must ask, therefore, is whether having halved the real cost of schools, we have also halved the value of the assets we have created. It is inconsistent with all the evidence to assume that this is so. Whatever changes have been made in the design and construction of new schools, nobody can conceivably demonstrate that they have been such as to make schools today only half as good, whether in area, construction, finishes, durability or appearance, as they were in 1949. It thus follows that, for what we have spent, we have progressively obtained more value for our money.

138. Some people will think that we are building better schools than we were building seven years ago—less rigid and institutional, more informal and approachable, moulded more carefully to what goes on within their walls, more concerned, therefore with the shape, height, character and inter-relationship of individual spaces, freer in plan and therefore more adaptable in use. Others will think that we have gone too far in cutting down the size of the area that it is possible to provide, in cutting out circulation area and in relying on using the same space for several purposes; also perhaps that by cutting the quality of construction and finishes we are likely to increase running and maintenance costs. It is from debate and controversy on such issues that progress springs. So long as it persists the pursuit of value for money will continue.

Appendix I: A note on educational buildings other than schools

1. The story told in this pamphlet is that of the post-war school, but the Ministry has been concerned with other kinds of educational buildings besides primary and secondary schools. There has been, on a lesser scale, the building of special schools for handicapped children, school clinics, and residential hostels (and sometimes complete new colleges or teaching blocks) for teachers in training. There has also been a programme of building for technical colleges which is now being rapidly expanded.

2. These types of building differ from primary and secondary schools in one important respect: their needs are so varied that each one must be considered individually. For this reason (and also because they are relatively few in number) statutory regulations governing the amount and standard of accommodation to be provided are applied only to day special schools for educationally subnormal children. It has thus not been possible to adopt the simple technique of a cost per place control.

3. Nevertheless controls have been devised to ensure that these buildings represent good value and an economic spending of public money, while still leaving the architect freedom for his creative ability.

4. The first part of the answer was found in the compilation of a schedule of accommodation based on a searching assessment of needs. Too often in the past clients had given their architects only a vague idea of their requirements, and when lists of accommodation had been provided they had mostly been drawn up on the additive principle of 'one room for each purpose'. But we have come to realise that, in drawing up a schedule of accommodation for these kinds of building, the principle of the dual or multiple use of space can be applied with the same rewarding results as have been achieved in schools.

5. When building problems are tackled in this way a number of useful yardsticks are soon discovered. For example:

- (1) in a training college the present aim is to see that every general teaching room will be used for at least 75 per cent of the time; this allows reasonable flexibility for timetable purposes and for

changes in the nature of the courses but ensures that rooms are not provided wastefully and left empty for long periods in the day;

- (2) experience of the last few years has shown that most students of eighteen to twenty years of age are well served for personal comfort, private study and the entertainment of a few friends, by a study-bedroom of 140 square feet;
- (3) in scheduling rooms for a technical college, where the sizes of teaching groups are not likely to be constant, it has been found useful to take the greatest number of students likely to use a particular room at any one time, and multiply this maximum student capacity figure by the number of square feet per student appropriate to the use of the room. For example, a general classroom with a maximum student capacity of 30 would have a scheduled area of 30 times 20, or 600 square feet; a drawing office for 30 students would need 30 times 30 square feet—900 square feet; and a workshop for 20 students studying engineering with heavy machinery would need 20 times 90, or 1,800 square feet. A percentage addition is made to the total of the teaching areas to allow for necessary storage.

6. Once the main areas have been scheduled, it is necessary to add an allowance for circulation, internal partitions and miscellaneous ancillary accommodation such as cloakrooms, lavatories, cleaners' store cupboards, etc. An economic design does not depend only on the schedule of the main rooms. One architect may produce a plan in which the circulation space equals fifteen per cent of the scheduled area and another may require for the same scheduled area twice as much circulation space. In the Ministry's experience an allowance of one-third of the total scheduled areas, that is, one quarter of the whole superficial area within the outer walls, is enough to enable the average architect to produce an economic plan while permitting a margin of space which a good architect, who is sparing in his use of circulation space, can 'win back' to increase the scheduled areas. (Occasionally, however, the allowance must be increased when there are circulation problems as in special schools for the physically handicapped and the blind).

7. It will be noted that the Ministry is concerned with the superficial area of any educational building and not with its cubic content. This is partly because it considers the height of rooms to be relatively unimportant so long as proper standards of comfort, light and ventilation are

met, but chiefly because the costs of using various forms of construction to provide a given area cannot be properly compared on a cube foot basis. It may cost more to provide a wing of three classrooms if the building has a pitched roof rather than a flat one. The cost per square foot will reveal this fact, but the cost per cubic foot, because of the different number of cubic feet in the two types of building, may obscure it.

8. The total area arrived at by the method of scheduling described above is then multiplied by an appropriate cost per square foot to obtain a limit of nett cost. This limit compares with the nett cost for primary and secondary schools reached by multiplying the nett cost per place by the number of cost places. An allowance is made for the additional costs of roads, paths, fences, site layout and the cost of bringing services up to the building, etc. The nett cost per square foot to be applied to any type of building is decided upon after an examination of what such buildings have cost in the past and what similar buildings are costing now. Sometimes two rates are applied to one building. There is, for instance, one rate for workshop accommodation in a technical college and another for the remainder of the building. There are two rates for residential hostels, depending on the type of construction. One bears a relation to the cost of ordinary domestic housing (which is usually of unframed construction); the other derives mainly from the cost of multi-storeyed buildings such as blocks of flats (which are normally of framed construction). A cost per square foot for an unfamiliar type of building must, of course, be tested against experience, but after the first few projects an economical and fair limit can usually be determined and applied at a given point or for a given period of time.

9. Once the limit of nett cost has been reached on the basis of a cost per square foot and an assumed total superficial area, the architect is free to vary the relation of the two component parts, either to work to a lower cost per square foot if his client prefers, or his design involves, a greater total area, or to work to a higher cost per square foot if he can plan to a smaller total area (provided, of course, that in the latter case he provides at least the minimum areas of individual scheduled rooms).

10. Thus, although different means have been adopted, the same end has been achieved as in primary and secondary schools. First, the total superficial area is determined by careful analytical methods. Secondly, a fair and reasonable cost per square foot is settled for the particular type of building. Thus, thirdly, the total limit of cost is established

before the architect has to start work. These arrangements act both as a *control* on the standard and cost of a project (since the Minister's final approval will not be given where the limit is exceeded, except in extraordinary circumstances) and as an *incentive* (since they challenge the architect to get the most he can out of the sum of resources put at his disposal). One example will illustrate what can be gained. Immediately after the war it was common to find, in an individual hostel project for training college students, that the area per student was about 220 square feet, of which only 110 square feet were for the study-bedroom itself. Thus 50 per cent of the accommodation was circulation area, washing or toilet accommodation, and storage or service rooms. We now set ourselves a minimum target of providing, out of the same total area of 220 square feet, a study-bedroom of at least 140 square feet, representing 63 per cent of the total. In practice it is often possible, in the case of some of the rooms, to pool the allowance for two or three students and to provide a common study room and two or three small bed-rooms off it. In this way part of the circulation area is absorbed into the living space and the area per student can be enlarged to about 160 square feet or about 73 per cent of the same total of 220 square feet. Where this can be done in a domestic type of construction on two floors, the total area can be reduced to 200 square feet and the area per student of study-bedroom accommodation still maintained at about 160 square feet. The amount of *personal* accommodation can thus be as much as 80 per cent of the whole.

Appendix II: A note on the Ministry of Education Development Group

1. The Development Group is a part of the Architects and Building Branch of the Ministry of Education. It has collaborated with several local education authorities in the design, building and equipping of a small number of schools. The objects of these projects are three; to try out new forms of design for schools based on changes in the educational requirements and in teaching techniques; to develop, in collaboration with the manufacturers and others, building methods, components and techniques which promise to make a valuable contribution to school building; and to study the application to school building of knowledge resulting from research into buildings and materials. The form which these projects take and the ways in which they are carried out has already been described in paragraphs 74-77 so that it is only necessary here to mention the schools which have been built in this way.

2. At Wokingham, a secondary modern school for 600 boys and girls has been built for the Berkshire Education Authority. The design of this school was used to develop and test some of the ideas tentatively put forward in Building Bulletin No. 2—New Secondary Schools. The school is in an area in which there is much employment in horticulture and agriculture, and consequently the school has a bias towards these subjects. The construction was based on a light steel frame of welded hot-rolled sections, developed from an earlier system which had already been extensively used for primary schools. Whereas in the latter the size of components had been coordinated on a dimension of 8 feet 3 inches, at Wokingham the opportunity was taken of experimenting with a smaller dimension, 3 feet 4 inches, so as to achieve more flexible planning for the more complex requirements of secondary schools. The nett cost per place on tender in March, 1951, was £215·3; the limit of nett cost per place at this time was £290.

3. At Coventry, one primary school (Limbrick Wood for mixed infants and juniors) and two comprehensive schools (Woodlands School for boys and Lyng Hall School for girls) have been built in collaboration with the City Architect. In designing the primary school

the aim was to reduce the total floor area while both maintaining or increasing the amounts of teaching accommodation and enlarging the size of individual teaching space. The nett cost per place on tender in July, 1951, was £137·5, when the limit of nett cost per place was £140. The construction was designed round factory-made wall panels faced with aluminium which could be used, however, only for single-storey buildings.

4. The two comprehensive schools, being very large in size, raised problems of educational social organisation and in both these projects experiments were made in the sub-division of the school into a number of *houses* which consist of a cross section of the pupils and contain boys or girls of different ages, abilities and outlook. At the Lyng Hall School the aluminium system of construction used at Limbrick Wood was developed for use in multi-storey building. A hot-rolled steel frame was, however, introduced. The construction at the Woodlands School was a development of that used at Wokingham, modified to lower the cost. The cost per place on tender in July, 1952, of the Woodlands School was £234·8 when the limit of nett cost per place was £240. The corresponding figures for Lyng Hall in August, 1953, were £229·4 and £250.

5. In collaboration with the Derbyshire Authority a secondary modern school for 450 boys and girls was designed and built at Belper. This size of mixed school is an awkward one to plan economically and the school at Belper was used for the study of this problem. The construction was based on cold-rolled steel, the frame and other parts being coordinated dimensionally on the basis of 3 feet 4 inches and largely factory-made. Some of the ideas tried out at Wokingham were carried further, but in different form, in this school. The cost per place on tender in March, 1953, was £230·3 with the limit of nett cost per place at £250.

6. At Worthing, a secondary technical school for 600 boys and girls was built for the Worthing Borough Council and the West Sussex Education Authority in consultation with the County Architect and the Borough Engineer. The general aim in the design was, of course, to study the needs of secondary technical education, but particular emphasis was placed upon the relationship of practical spaces to each other and to the rest of the school. The construction was of pre-stressed, pre-cast concrete components made in the factory on the basis of a common dimension of 3 feet 4 inches. The nett cost per place on tender

in May, 1953, was £267·0 when the appropriate limit of nett cost per place for this school was £276.

7. At Amersham a junior school for 320 children is at present being built in collaboration with the Buckinghamshire Education Authority. The object in the design of the school has been to take account of development in teaching in primary schools over the five years or so since Limbrick Wood was designed, and to examine, in particular, the special needs of junior children (aged 8 to 11 years) as distinct from infant children (aged 5 to 7 years). The building is in a rationalised form of brick and timber construction. The nett cost per place on tender in January, 1956, was £140·5 when the limit of nett cost per place was £154.

8. The range of types of school which has been covered is a wide one. The types of construction used have also varied considerably, though these have, largely, been concerned with the problems found in those parts of the country where normal building methods or available building labour have not been able to meet the demand for schools speedily enough. This explains the bias towards prefabrication, by which is meant in this context the transference to a factory of all the work which can be done off the building site, thus minimising the demand for site labour. This raises many problems, especially if factory production is not to lead to standardised buildings unrelated to the needs of particular schools and particular localities. The systems mentioned have all been based on the factory production of relatively small components which can be assembled to produce a wide variety of building forms.

9. The opportunity has also been taken of exploring different forms of relationship between building owners, their architects and quantity surveyors, and builders. Changes in building technique may well affect the form of contract which is most appropriate. The traditional method of selecting a builder by competitive tender is valid when architects and builders are familiar with the building technique and the builders are keen to get the job; on the other hand, if new techniques are involved and there is more work to be done than the industry can comfortably handle, alternative arrangements, such as the nomination of a contractor, may result in the owner obtaining better value for money and a more satisfactory job. The relationship between the parties and the form of contract have varied on the buildings which have been mentioned from normal competitive tendering by selected builders to the negotiation of a contract with a single nominated contractor.



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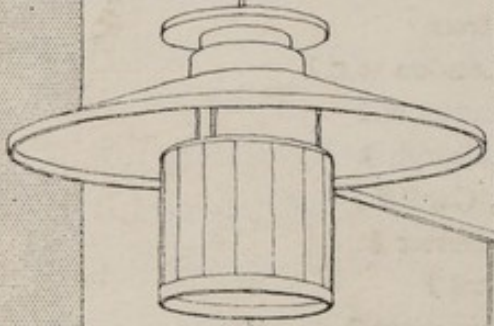
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