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SERVICE ARCHITECTURE, AND THE REQUIREMENTS OF ACCOMMODATION IN TROPICAL AND SUBTROPICAL COUNTRIES, WITH SPECIAL REFERENCE TO EGYPT AND PALESTINE.[1]

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IN the broad days of Spain, when large numbers of her people were being attracted to South America, the Spaniards were quick to adapt native habits and medicines to their own requirements. For instance, they were the first Europeans to employ ipecacuanha for dysentery, which followed their penetration of South America, where they found the drug in general use. As far back as the middle of the seventeenth century the introduction of cinchona into Europe was brought about by the Comtesse de Cinchante, who discovered it in use during her residence in Peru, where her husband was Viceroy. It will be shown presently that the modern French colonist is alert and receptive in such matters, particularly in relation to building, whereas where we have settled abroad we have too often introduced our home style of building.

The present is perhaps a suitable opportunity for attracting attention to the question of Service architecture and the requirements of accommodation in tropical and subtropical countries. The constructions erected in the past are in danger of being looked upon as traditional, and even if this

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danger is not real the scientific developments of the past fifty years invite a review of the subject.

If we were to cast our memory back and review British overseas stations, we should recall a great number of cases of siting and of laying-out which can be best described as accidental, or alien, and which have grown up in haphazard fashion through a series of annual increments. The result is a widely scattered mass of buildings which are obviously hygienically unsuitable and costly.

Political and strategical conditions abroad frequently impose the provision of entirely new, or additional accommodation, at comparatively short notice for an indefinite number of years. The question of this provision is a very difficult problem. In the majority of cases only semi-permanent or temporary structures are erected.

Semi-permanent buildings are dangerous, not because they may fall down too quickly, but because they may remain up too long. And yet I believe it is not impossible to provide hygienic and economical buildings of this kind overseas, given, first, that every aspect of the subject is thoroughly explored, and provided that the favourable results obtained from that investigation are then adhered to, without the intrusion of innovation. I think it will be admitted that the results obtained from permanent Service accommodation in general are more satisfactory than those from semi-permanent buildings.

The idea of building one's own house has occurred to us all at some stage of our lives. If attempted, the realization would too frequently prove to be a failure through lack of mature consideration, and lack of collaboration with experts. A building proposal, whatever its type, should not be embarked upon unless it is clear in the beginning what the completed scheme will be. Once it is commenced it should be carried through without interruption or amendment.

Assuming that we have only to consider permanent structures, what is the position to-day, and how have scientific discoveries and inventions during the past fifty years aided us to determine: (1) What is the ideal site? (2) What is the ideal lay-out? (3) What is the ideal ventilation? (4) What is the ideal structure? (5) What is the ideal interior?

These are very important questions which now await answers, for it is only by knowing something about the ideal that we can work out what is practicable. Before dealing with them it would be as well to put a simpler and more comprehensive question. What is the ideal dwelling anywhere? It is one conditioned by circumstances of the country, and one providing the maximum of protection against adverse climatic conditions, and affording the greatest degree of safety and comfort. Any building which fails seriously in these respects is an anachronism.

In any overseas country valuable assistance in design and construction may be obtained by studying the building traditions of the natives, particularly those of the ancient dwellers. I am afraid that in certain respects

the modern better-class native dwelling has been adversely affected by the introduction of European styles, so that the amount of guidance from that quarter may be small. When we study ancient buildings in the East we observe that the amount of exterior surface was reduced to a minimum and that the amount of light admitted was strictly limited. Great thickness of walling and roofing was regarded as being essential. In the days of the Pharaohs the roofs of the houses of well-to-do Egyptians were several feet thick, and consisted of a row of palm trunks overlaid with rushes or palm leaves covered by a thick layer of mud, the rooms being grouped within an exterior simply comprising four walls.

The Egyptian temple building is summed up in the words " thickness " and " darkness." The Romans, in Africa, went so far as to burrow underground in order to find coolness and built dwellings entirely below ground level, whither the more fortunate members of the population retired during the summer months. The same principle was followed by the Babylonians. The modern Baghdadians do much the same. India exhibits to-day many signs of the care bestowed by the ancients on the provision of vast cool interiors, as evidenced by the rock temples still existing there.

The ancients, therefore, considered a cool interior more important than a well-aired one, for many of their buildings, specimens of which remain to-day, were neither orientated nor constructed to enjoy the effects of a through current of air. They argued, no doubt, that when the sun was up a cool retiring place was the first consideration, and that when it had set, if one wanted to enjoy the breeze and to obtain some degree of freedom from winged insects, the best thing to do was to go outdoors and sleep there.

At the present, what importance is attached to the housing of personnel overseas?

The French, in Morocco, have recently grappled with the question; they found that the European types of dwellings which they had previously erected there were definitely unsuited to the climate. Under the direction of Marshal Lyautey, the erection of unsuitable types was checked, and after a period of investigation and study of old Moroccan buildings, a new type, by which the native forms were adapted to new purposes, was evolved, or in other words, a Franco-Moorish type was established. Anyone who is called upon to build in hot countries can do no better than adopt a similar system, or perhaps pay a visit of study to Morocco, and especially to the Government administrative buildings at Rabat.

I will now reply to the questions dealing with the ideal site, lay-out, ventilation, structure and interior, and discuss various points which have struck me in connexion with them during my service abroad. Some are very obvious, and others largely matters of opinion, and I shall at once explain that features which might be considered applicable to Upper Egypt might not be adaptable, for instance, in Ceylon.

Siting.

Unless dominated by strategical policy this question is comparatively simple. It is important that a site should be as exposed and as high as possible in relationship to the surrounding ground surface, which in turn should be devoid of vegetation and habitations. In this way only can the full effect of any prevailing wind be utilized, and freedom from winged insect plagues be enjoyed. No site should ever be considered without a liaison with the Civil Health Authority of the country. Failure to do so in the past has led to disaster. When at all possible a survey from the air should be made; this is frequently an aid of the highest importance. An aerial survey of ten minutes' duration will often reveal more features of importance than a ground survey lasting many days, because from a height of a few thousand feet native villages, sources of water pollution, and obscurely located water collections for miles around are usually clearly revealed.

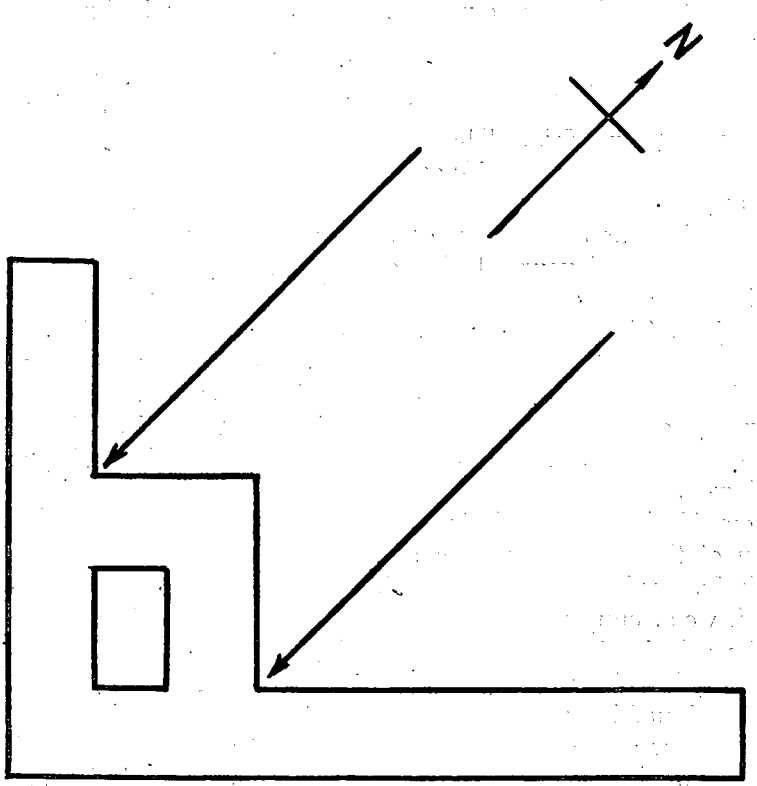
Once the site has been decided upon, a wide tract of land should be obtained in order that it may never become necessary to erect buildings near to the station or cantonment boundary immediately outside which native dwellings, markets or factories are likely to appear. Such land is usually inexpensive. If a site is required on the sea-coast the living quarters should be built as near the shore as possible in order that the effect of inshore breezes may be enjoyed. A quarter of a mile inland, or less, such air movement may be imperceptible at ground level owing to contour obstructions. One usually finds the shore site free from mosquitoes and sandflies, whilst the inland site may be infested with both. Areas over which sand is drifting should be avoided. Water accumulations must be mapped out, and the possibility of mosquito breeding areas estimated. Drainage is important and levels require to be examined. In cities there is not much freedom of choice and land is expensive, the Civil Authority is here again of great assistance. Sufficient land must be obtained to give such unobstructed orientation as will provide ample windage.

Lay-out.

Wind generally determines the lay-out. When a favourable prevailing wind does not exist, or when all winds are unfavourable during hot weather, the buildings should be grouped on the smallest site conformable with adequate ventilation in order to reduce the amount of exterior surface exposed to sun heating. In those places in which the prevailing wind is favourable, as in lands in and adjacent to the Mediterranean, and in certain parts of India, the question of the entire lay-out must be subordinated to this factor. Buildings should not be spaced out in separate groups of small dimensions. The fewer separate foundations the better. Structural requirements may, of course, impose the necessity of a number of comparatively small buildings independently sited; it is possible to obtain some

degree of success with this method, but it makes accommodation uncomfortable owing to the heat, since an excessive amount of exterior surface is exposed to the sun. Unless spacing out is very carefully arranged, insufficient room is available for the wind to pick up again after striking an obstruction. I incline, therefore, to grouping the greatest amount of structure on the smallest possible foundation. It is quite practicable to employ, say, five separate blocks instead of the fifty or more buildings of various sizes such as one often sees.

In order to obtain the utmost perflation, a block should be L-shaped,



and so placed that the line of force of the prevalent wind point intersects the angle (see diagram, p. 5). Then only will the maximum effect be enjoyed. When the prevailing wind is north, the rectangular block thus orientated offers, in addition, much shelter from sunshine.

As the maximal force is in the region of the angle, at that point an additional block in the form of a square or oblong may be overlaid, in order that the utmost use may be made of the wind, instead of it being allowed to waste itself by rushing practically uninterruptedly from the front to the back.

Conjoined rectangular blocks may be laid behind one another where

good perflation is obtainable, and a certain amount of mutual shading is thereby afforded; moreover, shading can be greatly increased by additional structural features without in any way diminishing the wind force. However, planning of this kind is only required in the case of a station of exceptional size.

The back of the building might look to the south-east and the south-west, and need not be used a great deal for entrances, while the front aspect might look towards the north-east and north-west, and so only receive the sunlight in the early morning and again in the evening when the sun is setting in the western horizon. To anyone who knows the East, these are most striking advantages.

The lay-out I have described really exists. It is the nearest to the ideal I have seen. Unfortunately it is not a Service structure but an hotel at Ramleh, near Alexandria. The architect must have approached his task very carefully, for he has produced a vast building the lines of which are simple and the natural ventilation of which is perfect. So wisely is it orientated that the blazing sun of the Egyptian summer appears to treat it with exceptional favour. It is noteworthy, too, that verandahs are not a prominent feature; only a few rooms have them. So well is the wind trapped that a light breeze produces air movement which is felt even in the most unfavourably located rooms situated on the south-eastern aspect. Many of the rooms have their doors looking south, but this defect is countered by a closed-in corridor along this aspect, which entirely prevents these rooms being overheated from that source, provided simple precautions are followed.

In considering lay-out it is as well at the same time to go into the question of the surroundings of a building. At the present day we see flower-beds, shrubs, and trees in the immediate vicinity of quarters. People protest if we attempt to remove them. No plant obtaining its sustenance from the soil should be allowed to flourish within a distance of about sixty yards of any building where people work and dwell, and even at this distance vegetation should be relegated to an area situated to leeward of all buildings. Native quarters and latrines must be outside this distance.

A good substitute for a garden in a tropical or subtropical country is an enclosed quadrilateral of oblong form, where æsthetic tastes may be satisfied by providing a frieze of coloured tiles easily procurable in the East, which will cost less than the labour required for the repeated irrigation of flower-beds. In architecture the æsthetic must claim equal rights with the purely utilitarian. Successful architecture not only provides shelter for men but also satisfies closely studied environmental needs, not the least of which is a sense of the beautiful; at its best it is an embodiment of spirit rather than of material.

Before discussing structure we will inquire as to how scientific research during the past fifty years has helped us to site and to build our houses overseas.

Mosquitoes and Sandflies.

First come the disease-carrying mosquitoes. It is an extremely tedious and difficult operation to rid an area of mosquitoes, and the prime object should be to select the district as carefully as possible. There is no excuse for the selection of a thoroughly bad site nowadays, although such a misfortune has happened within the decade, and will happen again if those responsible for the choice do not exercise ordinary care and inquiry. Then comes next in order, but of more recent discovery as regards its life habits—the sandfly. The sandfly interdicts flower-beds, gardens, and all vegetal life and moisture, however little, in the region of dwellings. The sandfly's radius of action is probably not more than fifty yards at the utmost. The insect is more of a hopper than a flier; air movements, even gentle ones, provide an effective barrier to its progress in any direction and cause it to seek refuge immediately.

Ventilation.

Everyone is familiar with the important researches made in recent years in connexion with ventilation, which, from an adverse physical and mental standpoint, are summed up in the word "humidity." In what may be conveniently called "low temperature humidity," the individual merely experiences a sensation of great cold and can usually escape from it at will, but in "high temperature humidity," so general abroad at certain places and times, man is continuously distressed and working efficiency is lowered. We know now that air movement, yet not necessarily that of freshly supplied air, is the remedy. It warrants our keeping buildings closed during the daytime, a principle which would not have been endorsed a quarter of a century ago when frequent changes of air were considered vital. The electric fan enables us to use the same air over and over again for many hours without any adverse effects being felt. When the atmosphere of a well-fanned room becomes stale it is due usually to the odour produced by tobacco smoking, and not to transpired air alone. The Greenwich air purifier, owing to its powerful dehydrating action, should be a valuable apparatus for cooling purposes, provided the cost of the compound employed could be substantially reduced.

What means have we at hand for preventing outer heat being conducted into an interior? Walls several feet thick; but this is a most expensive proposition.

A wall may be doubled by having an intervening air space; that system has not been successful in hot countries, and is mainly due to the very marked radiation inwards from the outer division of the wall. The radiation raises the temperature of the air in the middle section, which may conceivably rise many degrees above that of the outer air shade temperature. The intended function of the air space is, in consequence, negatived. With the strong present-day tendency to innovation in wall and roof construction, careful research under actual tropical conditions is essential, because even

after various methods have been tried no definite solution has been forthcoming. Recently, in England, a firm has produced a combination of materials consisting of layers, from within outwards, of coke-breeze, cork and cement, possessing remarkable insulating properties along with the advantages of cheapness. In the tropics, with a core of adequate thickness, this type of wall may provide an inexpensive solution to this problem.

Wall construction is the very acme of building success in the East. A builder must aim at providing a wall (and roof) which will prevent the temperature wave from the exterior reaching the interior between the morning and the afternoon, and during a maximal period, therefore, of about nine hours.

Double windows, which are employed on the Continent to keep out the cold, could be used with great success in hot countries to keep out the heat. The single window does not do so in any marked degree, because of its great size and the manner in which the interior air is driven against it through movements caused by occupants or by the electric fans which are employed. Those who live in hot countries can readily verify this fact by comparing the temperature of the window glass on its inner surface with that of the adjacent wall interior when the exterior shade temperature has reached 100° F. The amount of wall space given up to glazing in Egypt is extraordinary, and can only be justified if the windows are double. In my opinion, glazing is grossly overdone in the East, and often renders buildings suitable only for winter residence. In addition, such windows admit too much light. By doubling them and reducing their surface area sufficient illumination is available during the daytime, and ample perflation is assured during the night hours, when streaming air can be employed with advantage.

Compressed or refrigerated air is an agent which in a hot country can alter the whole aspect of indoor life from one of distress and fatigue to one resembling life in a northern latitude. Leonard Hill refers to this in his important work on ventilation, in which he says that "for cooling tropical houses compressed air douches could be used, as air escaping from compression is both cool and dry." I feel certain that one day his suggestion will be adopted. Initially, the provision of the various parts of such ventilating system is expensive, though once the installation has been completed the running cost is negligible. It means a particular method of insulation of floor, wall, and roof with cork sets, and therefore implies new construction of a deliberate kind. Everything is at hand to enable such a system to be employed. It is the old question—finance. If cheaper materials could be substituted, such a method would no longer be impracticable from a Service point of view, and probably would be first introduced in order to provide accommodation in a special hospital ward for treating cases of serious illness. Great relief would be provided for the patient if the room temperature registered 70° F., the exterior shade temperature being 115° F.; there would be no mosquitoes, consequently no mosquito nets, and no sandflies.

The cost for an eight-bedded ward with a refrigerating air douching plant would exceed that of an ordinary ward of the same number of beds by about £3,000; there is not a correlative rise in cost as the number of beds allotted is increased.

I look forward to the day when refrigerated air will be laid on to quarters abroad; the cubic contents of such quarters need not be large. When one considers the amount of space taken up by a ship's company of 500 men in a cruiser, it will be seen that the space required is very small. In the tropics it is better to sleep in a room eight feet square by six feet high, the temperature of which is about 65° F., than to attempt to do so in a large hall with a temperature almost double that figure. Under such a régime sickness ratios would reflect a marked reduction in insect-borne diseases, and possibly in general diseases.

If we place on the debit side the expense of erecting buildings with vast interiors fitted with numerous electric fans, involving heavy and continuous charges for mosquito nets, together with losses through ineffectiveness, hospitalization, and other items—and on the credit side a few air-cooled buildings—I think the latter method would prove to be the less costly of the two.

Structure.

The vital part of the problem of accommodation is structure, so full of detail; so fruitful of failure. It is a very large subject, and I have already touched upon it. Anyone who has lived in a hot country will agree that the smaller the houses and the greater their exterior surface, in proportion to that of the general interior, the more costly will they be in comparison to massed structure, and the more difficult to keep cool during the daytime. A station consisting of numerous small buildings or pavilions is therefore only justifiable on a temporary basis, for the design carries in its train scarcely a single redeeming feature.

Before designing the structures required on a general lay-out, the needs of every department represented must be considered, and a place given to each. This means grouping. It should be possible to group the various sections on about half a dozen separate areas. Generally speaking, everything relating to the daily life of the man, whether he be a soldier or an airman, should be carried on upon the one foundation, with a few exceptions. You may not build men's quarters on the top of hangars, engine testing shops, or stables; but you can group all noiseless departments such as certain workshops, schools, cinemas, canteens, &c., on the ground floor. Above these you can place men's and serjeants' quarters, ablution and sick quarters. That leaves a group of noisy and objectionable trades, and transport quarters, two groups of married quarters and officers' quarters, each to be given their separate sites.

I know there is a tendency at the present day to build quarters on the widely scattered pavilion system so as to minimize the results of possible air attacks. That may apply at home, but it should not do so abroad where

the question of housing must accommodate itself to the particular climatic condition. It need not be a great disaster for any complement of personnel in a hot country suddenly to find itself homeless, provided tentage is in reserve and rapidly available. But to oblige people in the tropics to dwell permanently in what might be called emergency-of-warfare buildings is both unwise and unfair.

Stations built on the group method have much to recommend them. The maintenance charges never become abnormal. They suit climatic conditions. They are easily guarded against invasion by thieves and ground enemies, and if they are no longer required for military purposes, the likelihood of obtaining a reasonable price for them is fair compared with the possibility of getting a good price for a pavilion station, which has only a breaking-up value. The only possible disadvantage is the one I have mentioned—relative vulnerability—in itself a debatable point.

In dealing with the question of structure certain broad lines should be followed. (Discussion of advantages and disadvantages, which would take an interminable time, is omitted.)

(1) Buildings should be two or three stories high.

(2) Framework of steel.

(3) Constituents of walls should be of insulating material.

(4) Windows should extend down to floor level.

(5) The amount of wall section allotted to windows should be sparingly regulated in living quarters.

(6) Windows need not be more than a foot wide all the way up, and should be doubled.

(7) Both sections of the window should open inwards, and external shading should be provided. In workshops double windows should also be provided. Greater glazing space may have to be allotted on account of lighting, but the amount of area given to glazing should be strictly controlled.

(8) Floors should consist of material other than wood.

(9) Doors should be thick and all main entrants should be doubled.

(10) The exteriors of buildings should be white or cream.

(11) Roofs should, wherever possible, be flat and entirely insulated from the underlying ceiling. If pitched roofs are employed, considerable care is needed to provide against heating of the interior through failure of insulation or through faulty design. Large (triangular) openings should be provided at each end of the ridge to allow the heated air in the garret to escape freely. White uralite sets are perhaps the best for this type of roof; they can be more readily transported than the Marseilles tile. I do not consider that corrugated iron sheeting, even galvanized, is a suitable material for roofings.

Before taking up the subject of the interior of buildings the question of verandahs should be discussed. The verandah is in a sense half interior, half exterior. In most hot countries it performs a double function, namely:

(1) as a shelter from sunshine; (2) as a protection from dewfall. It is not, however, a building essential, but rather a luxury or an expedient, the existence of which can never wholly compensate for what is an otherwise faultily constructed dwelling.

We generally find a verandah at ground level, and it is to be regretted that we do not go a step further and add to it in stone or brick so as to convert it, at least on the southern aspect of the building, into an enclosed corridor with windows and shutters capable of being thrown open freely at night time. The effect of this provision often makes all the difference between a stifling interior and a cool one, no matter at what time of day. Such a scheme can go a long way towards redeeming a faultily constructed building, and at the same time it adds a very considerable quantity of what may be called air storage, which is secured each day by closing a building during the early forenoon. This structural provision has another advantage in that the outer wall, as it now becomes, fulfils the additional function of keeping out reptiles, a service which would otherwise devolve on the more internal entrants and therefore interfere with air perflation through rooms at floor level.

In a new construction the place for a verandah is at the topmost storey and not the ground floor. By causing the roof to project several feet beyond the wall and constructing a balcony all round the top floor, a most admirable construction is achieved, which will also act as a sunshade for the entire exterior of the floor immediately below it.

Interior.

When the demands of site, lay-out and structure have been wisely met, those of the interior will have been in a large measure solved. Where these demands have been ignored, only extensive and costly re-conditioning will prevent the full disadvantages of a hot season being experienced.

The amount of interior cubic space per head is definitely laid down for the Services and varies in amount according to whether the climate is tropical or subtropical. The amount is sufficient for living quarters. In many workshops, however, in the Air Force, it is greatly in excess of requirements and is incidental to the needs of air-craft construction, which implies vast and lofty interiors that can be kept cool during working hours as long as certain rules as to the construction and occupation are obeyed. The rule frequently followed in temperate climates, namely, the fact that an interior height above twelve feet is unnecessary—does not apply in hot countries where the air is kept in motion by mechanical means, and where lofty interiors are of the greatest value. At home stations interiors as much as seventeen feet in height are observed, while abroad they may be only eleven feet high. One wonders, therefore, how the air in the former can ever be made warm in the winter and in the latter kept tolerably cool in summer. Abroad, every foot added to an interior height is of the greatest importance. This is a point which is rarely neglected by builders

of good-class private dwellings for natives and Europeans. Domestic interiors should generally not be less than sixteen feet high, except where cooled air douching is employed, in which case it is possible to build as low as even eight feet, and thereby effect a marked economy in the cost of the actual structure so far as the building itself is concerned. A great fault of home-trained designers, in their planning of tropical buildings, is that they cannot free themselves from the rules governing house construction in temperate latitudes. More light, more air, more sun-rays are not required within dwellings in the tropics. What is required in the day-time out there is little light, trapped cool air and no sunshine, no fanlights, no air bricks, &c.

We are accustomed at home to whitewash interiors, and that is almost the rule abroad, although, for obvious reasons various shades of green are indicated; blue reflects less light than green, but it should not be employed on account of its depressant action.

The necessity for fireplaces is frequently overlooked. There are few stations abroad where they are not required in day-rooms, at least, and at some they are an absolute necessity during the greater part of the cold weather. It is extremely important, in India and Egypt, to ensure that no interior dormitory or bedroom fittings, such as shelves and wardrobes, are fixed. They must invariably be detachable, otherwise it will be well-nigh impossible to rid such quarters of bed-bugs once they become infested. The amount of wood-work in sleeping quarters should, for the same reason, be kept at a minimum, and wood should never be employed in the construction of ceilings. Floors should be paved.

The use of electric fans is now almost general at all stations abroad in the Air Force; no bedroom or dormitory is without them. Their installation has cost thousands of pounds, but the outlay has been justified because, following their introduction, the incidence of sandfly fever has fallen rapidly; it has been reduced to negligible proportions in Egypt and Palestine, where, in 1925, a total of only fifty-five cases, or 20·1 per 1,000, was notified, compared with several hundred, or 105·6 per 1,000, in 1922. For dormitories ceiling-fans are better. For smaller rooms oscillating desk-fans should be employed. As oscillating desk-fans are costly and easily damaged, they should be fitted on brackets, in convenient places, such as corners, and protected by a large mesh rabbit-wire in order to prevent the men interfering with them. In that way much money, otherwise wasted, would be saved.

Is it possible to render quarters abroad fly-proof? It is most difficult to do so with the existing types of buildings, because the entrants are so many and the space given to windows so extensive that the barriers are generally permeable. If a building is constructed with the intention of fly-proofing it, the proposition becomes a simple one.

Refrigeration apart, if buildings are constructed on the lines now described, it should mean a reduction of the mean interior day temperature

by about 5° F. This is of vital importance in its effect on human comfort.

Lastly, the insistence of standardization should not be forgotten. Standardization means consolidation of the results of research and careful investigation in Service architecture, and prevents the re-entry of that philistinism for which Service builders are unfortunately so notorious. Standardized plans cannot be applied universally in the tropics and sub-tropics. However, with limitations, they can be widely and successfully adopted. Standardization should not be rigid, but should be susceptible to new influences.

Building abroad is not really attended by profound difficulties. The questions arising from it are, however, more intricate and diverse than at home. Before a higher standard of accommodation overseas can be achieved, a break-away will have to be made from the position of regarding the question of housing in hot countries as being merely one of additional cubic air space per head. It is a more exacting problem than that, as I have endeavoured to show. Not only must the architect enlist the assistance of the sanitarian and the entomologist, but he should more and more claim the help of the physicist. As we move towards perfecting our overseas accommodation, I feel confident that our task will be greatly simplified by the aid of the physicist, and it is from that source that the most surprising improvements in housing in the tropics are likely to ensue. Everyone is aware of the magnificent work being done by Sir Edwin Lutyens in building the new Delhi, and one may ask that the Services may be given the benefit of labours in the same direction and the same spirit. Indeed, that is the dominating motive of my address, namely, to plead that investigation and research may invade the whole field of building in hot countries, in order to estimate accurately habitative needs, to interpret them, and in so doing to make a vital contribution to a problem that has long awaited elucidation.

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