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CHUNG HAI. WAN SHAN TIEN. THE MAIN BUILDING

CHINESE CULTURE AND ARCHITECTURE

By A. S. Konya

A PAPER READ TO THE ARCHITECTURAL STUDENTS' SOCIETY AT THE UNIVERSITY OF THE WITWATERSRAND IN AUGUST, 1943

When your chairman honoured me with the invitation to speak to you here to-night he asked me to stress the architectural aspect of the subject as that might be of primary interest to you. I immediately felt the difficulties I should have to face if I wanted to comply with that request and as I went along putting my material into shape, the difficulties increased.

It would be impossible to understand and fully appreciate any race or nation's achievement in any one sphere without knowing something about their background against which everything they create must be viewed. It would be next to useless to talk to an audience about Greek architecture if that audience were not sufficiently acquainted with Hellenic culture and civilisation. This fact applies to Chinese creative art more than to that of any other race in history; and especially architecture, the development of which was—and still is—largely governed by factors quite different from those we are accustomed to examine when studying say Greek or Roman architecture.

The development of Western architecture and its precursors was also influenced by religious and social developments, but certain practical conditions had more to do with their ultimate shaping—materials available at certain localities when transportation was a problem, climatic conditions, and the extent of the knowledge of engineering. The discovery of new building materials, new building methods and a changed mode of life gradually pushed more and more into the background such influences which were still largely prevalent in Europe up to the 15th Century.

There is no such analogy in the development of Chinese architecture. There, material considerations always played a very secondary rôle. The main influence was, rather, spiritual. I am using the word "spiritual" deliberately instead of the word religious. In Chinese architecture the student does not find such deep influences as that of the Roman Catholic Church in Western architecture. Buddhism had at one period some influence on Chinese architecture but that was gradually shaped to China's ideas until it completely disappeared. Indeed, the word "religion" is meaningless to the Chinese. Neither Buddhism nor Taoism could influence the social structure to such an extent as Christianity or Islam have done because long before their advent China possessed a set of ethical laws governing the behaviour of the individual in the family,

the social structure and the State. Confucianism, though to some extent it occupies itself with the individual's attitude to the Supreme Being, consists largely of philosophical teachings and an ethical code. So, as no single religious movement was sufficiently strong to have a definite and lasting influence on Chinese culture, especially on creative art; what were the shaping influences?

In my opinion the most profound influence may be in long established social customs and laws and also a great deal in superstitions. It may sound incongruous that superstitions can play any part in the development of such a concrete creative art as architecture, but what importance superstition has in Chinese life can best be illustrated by the fact that a French author's work on Chinese superstitions consists of 22 volumes.

As an example of the influence of superstition on Chinese architecture: in every Chinese house about three feet behind the entrance door is always a screen. The reason for this is that, according to superstitious belief, evil spirits can walk only in a straight line and therefore the screen, which forces everybody to turn to the left or right before entering the hall, keeps the evil spirits out. The same idea of confusing evil spirits causes the Chinese never to build the houses in a street on a straight boundary line as we are accustomed to do. The front of each house is either set back a couple of feet from the front of its neighbour or put forward. Roofs must also be either higher or lower than those immediately next to them.

I think by now it must be clear to all of you why it is impossible to speak of Chinese architecture without going into some discussion of those factors which had a shaping influence on it. And the subject is so vast and so interesting that I shall have to exercise great restraint if I wish to talk to-night about Chinese architecture at all. Even so I must dispense almost entirely with historical data as that in itself would require, even in outline, the whole evening.

In what follows I shall attempt to show the main tracks of the development of Chinese civilisation, the tracks beaten out by Chinese thinkers, to what extent they have influenced Chinese life, and eventually the effect they have had on the

development of Chinese architecture. One of the outstanding characteristics of Chinese civilization has been its emphasis upon social relations. Chinese philosophy has had, as a leading objective, the achievement and maintenance of an orderly society. Confucianism, so long dominant in the State and in the intellectual and moral life of the Empire, has laid great stress upon right relations among human beings. In the course of the centuries the Chinese have developed many institutions and customs to conserve and perpetuate society, to give joint protection to individuals, and to facilitate the intercourse of the many millions who have formed the population of the Empire.

During the Chou dynasty (c. 1134-247 B.C.) Chinese civilization reached a point of high achievement: rites, ceremonials, official procedure were established in orderly fashion; the human mind found a sort of social equilibrium for its background; it was a time when the seeds of great thought were germinating. As the dynasty moved toward eclipse, and rival forces rose up to tear the State into separate factions, so human thought suffered a revolution; in its main outlines it showed a reaction against existing circumstances, and a deep regret that the old orderly system of society was departing, apparently for good. Some put all their effort towards restoring the old habits of life, the old gradations of society, the old traditions of rulership. "Let us now praise famous men!" was the cry and in the misty past they found the "golden" Emperors Yao and Shün worthy figures of emulation. This is the fundamental idea of Confucius and Mencius—of what is called "Confucianism." In practice it led to positive conduct; it had some practical rules for living; society was in a bad way, certainly, but it could be saved. On the other side of the scale we find the negative beliefs—if one may so call them—of Lao Tzu and Chuang Tzu; what was subsequently termed Taoism, after the "Tao Te Ching," the Scripture of Lao Tzu. These two philosophers and their followers equally deplored the existing state of fruitless rivalry for power, with all its attendant miseries, but held that the return to a former political state was not enough; the nature of man himself must be changed. They saw the world as a ceaseless, battlefield so long as a man was under the bondage of desire; his only salvation would be through a return to his primitive state, where he learned the art of living from Nature herself in place of fallible human laws. "Quietism" is one of the keystones of this school of thought; people, it urged, should learn to hate the world, to rise above the dust of ordinary affairs, to escape from them into the quietness of the mind. Thus inwardly satisfied, desire for material possession would cease, and with it conflict. The rulers in their turn would have no need to harass their own people or to desire further conquest among the bordering races. Taoism hoped to save the world by reducing the causes of destruction; Confucianism recognised the inevitability of destruction, of wars and individual conflict, but tried to reduce their sting by binding up society in a system of mutual dependence. These two great systems of thought, with all their repercussions upon personal conduct

and endeavour, have really influenced China through the whole length of her subsequent history, they stand side by side, equally balanced; sometimes the one predominating, sometimes the other. Several different types of thought grew out of them, as developments or opposition: for example, the altruism and pacifism of Mo Tzu, and the egotism of Yang Tzu. Subsequently, Buddhism, introduced from India, exerted a powerful sway over people's minds. It was under an Empire revived and unified afresh by the Sui and the T'ang that Buddhism reached its apex. The Chinese made it largely their own and most of the sects through which it has persisted seem to have been of native origin. A wide range of Chinese life has been affected by it—Confucianism, Taoism, folklore, philosophy, popular religious beliefs and practices and art mainly. It is still a living force. Yet since about the middle of the T'ang Buddhism in China gradually lost in vitality. Beginning with the Han dynasty and especially after the Sui and the T'ang, with their revival and strengthening of the civil service examinations based upon the Confucian Classics, Confucianism was, until the twentieth century, usually the philosophy established and supported by the state. It was therefore dominant in the life of the nation.

Unsatisfactory though these brief historical notes are, they may render somewhat more intelligible religion as it was on the eve of the revolution brought by the coming of the Occident and as it exists to-day. They will, moreover, serve to make clear some of the reasons for the religious attitudes of the Chinese. Religiously the Chinese are very eclectic. In proportion to the total population the number of pure Buddhists, Confucianists, or Taoists has been and is comparatively small. The average Chinese has long been and still is an animist, a Buddhist, a Confucianist, and a Taoist with no sense of incongruity or inconsistency. Associated with this eclecticism is a great religious tolerance. The practically minded Chinese have always been eager to take advantage of every possible benefit from each of the systems which have come to their attention. It may have been because of a fundamental religious uncertainty—a lurking suspicion that all religions are at least in part false and a lack of confidence in the finality of any one of them—and yet a fear that each may possess elements of truth. It may have been, too, because of the desire to build a mankind-embracing culture, and of the concomitant talent for absorbing other cultures.

Still another characteristic of Chinese religious life has been its optimism. There is little of despair of human existence, of the pessimism about the worth of human life, and of the desire to be rid of personality which one finds in much of Indian thought. This is in spite of the fact that Buddhism, so influential in China, was originally a means of getting rid of desire, and, in the eyes of many interpreters, of the separate entities called persons. It is significant that in Chinese Buddhism nirvana, as a place where desire is at last extinguished, has largely dropped into the background and that heaven and hell, where separate personal existences are pictured as



THE PURPLE FORBIDDEN CITY, PEKING. HSI HOUA MEN FROM THE WEST

continuing, loom large in Buddhist teachings. The optimism, too, is seen in the discussions about the basic quality of human nature which have been prominent in the history of Chinese philosophy. Orthodox Confucianism declares men to be by nature good. Even those philosophers who have denied the truth of this contention have usually regarded human nature as improvable. There is, too, a certain confidence in the moral trustworthiness of the universe. Some have regarded the universe as beyond human understanding and as indifferent to the fate of men, either collectively or as individuals. Others have held that the universe moves according to unvarying law and that nothing like a personal God is at the heart of it. In the main, however, orthodox Confucianism has taught that moral law is part of the essence of things, that when men obey it prosperity ensues and that evil-doing is a cause of calamities. Closely allied with this optimistic attitude towards the universe is the strong ethical note in much of Chinese

religion. Confucianism emphasises man's duty to man and praises such virtues as sincerity, kindness, loyalty, filial piety, and not doing to another what one does not like to have done to oneself. The Emperor was supposed to rule because of his virtue. National calamities might come as a result of his misdeeds, and in imperial proclamations public confession of lack of righteousness was not unknown.

The Chinese, like many other peoples, have had great confidence in ritual and in practice have believed it to be quite as important as an ethically good life. A further characteristic of the religious attitude of the Chinese has been this—worldliness. The earliest religion of the Chinese which we know seems to have had as its primary object the material happiness and prosperity of men here and now. It believed that the dead live on, but its concept of their state was very vague and its chief concern was the welfare of the living. By its

rites religion was believed both to help to preserve order in the relations of men to each other and to insure the friendly co-operation with men of unseen forces, spiritual or otherwise, of the universe. In popular practice this belief has taken rather crass forms. Men have given to the spirits that they may obtain benefits here and now. The boatmen may be seen offering incense to ward off danger, and the city merchant burning incense and making his kowtow at the beginning of the day to improve his business. If a god has been besought by offerings for a particular favour such as recovery from illness or success in a business undertaking, and the occasion turns out otherwise than had been hoped, the disappointed worshipper may display an outward sense of having been defrauded and curse the diety. In time of drought the image of the god may be exposed to the sun to let it feel how hot it is, and may even be fined by the magistrate for allowing the calamity, be condemned and broken in pieces. It is because of this attitude that some Chinese have accepted Christianity from a belief in its potency to give relief from such present misfortunes as the illness of one's own person or relatives or of one's pigs or oxen.

Another feature of Chinese religion has been a credulous superstition. As this feature became more and more dominating in the beliefs of the masses and to a great extent in the beliefs of the educated classes too, from our point of view it is the most significant phase in the religious development in China. The extent to which superstition rules Chinese life we shall see presently. But before entering upon its discussion I must say something about the last link between the philosophers teachings and superstition: ancestor-worship.

No other phase of Chinese religious life has been more prominent than the ceremonies for the departed. They constitute, indeed, one of the outstanding characteristics of Chinese culture and have been an integral part of that most potent of Chinese institutions, the family. No attempt to understand the Chinese can be anything but imperfect without at least a brief description of them.

In general, the dead have been supposed to be dependent upon the living for their well being. Ceremonies in honour of the ancestors, moreover, have had a decided utility in helping to tie together the family and the clan. In the hearts of some, respect and affection for the dead have doubtless been the predominant or even the only motive. Possibly a larger number have kept up the ceremonies simply from the desire to conform to the customs of civilized society and have had no confidence that through them good would accrue to the dead or that the dead would be able to bless or injure the living. Probably the majority, however, have been moved by a more or less strong belief that through the prescribed ritual the dead are benefited and are induced to aid the living.

Theories as to the location of the departed have not been uniform, but in general it has been believed that the soul of

the deceased is to be found in three places at once, or, perhaps more correctly, that each man has three souls. Each of the dead goes to the future world to be judged and is assigned either to a heaven or to a hell. Each also is to be found both in the grave and in the ancestral tablet. The popular idea has it that there are many restless spirits who either because of some ill fortune or crime while still in this life or through neglect of the living wander about doing harm to men.

The ceremonies for the dead sometimes begin even before life has departed. The dying person may be taken off the bed or k'ang on which he is lying, for fear that if this is not done his spirit will later haunt it, and the curtains of the bed may be taken down to prevent his rebirth as a fish. Sometimes a hole has been broken in the roof to facilitate the exit of the soul. The coffin has perhaps been prepared for months or years in advance. Often, indeed, it has been a mark of affection for one's parents to present them with coffins, and so give them assurance of provision for a worthy burial.

The actual burial may be delayed for months or even years, pending the selection of a fortunate site for the grave and the determination of an auspicious day. Upon these is held to depend much of the happiness of the dead, and, in consequence, of the prosperity of the living. The funeral is usually as elaborate as the means and the status of the family allow—or more so. Along the route of the cortège paper money may be scattered, presumably to keep evilly disposed spirits from snatching away the soul of the dead. At the grave some of the insignia, a paper house with paper clothes, servants, and other accessories to comfortable living may be burned, the supposition being that these are thus transferred to the spirit world, there to be at the disposal of the deceased.

Many other practices are connected with the cult of the ancestors. About New Year's time the dead may be welcomed to the homes from the ancestral temples and then, a few days later, be formally sent back to their customary abodes. At Ch'ing Ming, the great spring festival, the graves are cleaned and repaired and offerings made of food and incense.

The great majority of the Chinese, as we have seen have not been exclusively Confucian, Buddhist or Taoist. They have been influenced by all of these systems—in ethical standards, in conceptions of the universe and of divine beings, and in beliefs about the future life. But the religion of the masses has not been just a composite of these three faiths. The additional elements have had in them a great deal of animism. Such an element is, classified by some sinologists as popular religion, the fêng shui. The two words mean literally—wind and water. Fêng shui is based upon the belief that in every locality forces exist which act on graves, buildings, cities and towns, either for the welfare or the ill of the living and the dead. The object of fêng shui, this superstitious pseudo-science, therefore, is to discover the sites where the beneficent

influences predominate, or so to alter, by artificial means, the surroundings of existing sites that the same happy results may be achieved. To attain these ends advice is sought from specialists in fēng shui.

Among the factors with which fēng shui reckons are the yang and the yin, the positive and negative principles of the universe—or male and female; the ch'i (sometimes translated breath) pervading the universe and of which there may be two divisions the 't'ien ch'i, or ch'i of heaven, and the ti ch'i, or ch'i of earth; four creatures—the azure dragon, the white tiger, the black tortoise, and the red bird—associated with the four quarters of heaven; wind (bearing water or drought); and the five traditional elements (metal, earth, fire, water, and wood) especially water. When it comes to the actual choice of a site, experts in fēng shui often differ widely as to the worth of a particular locality—a lack of agreement which the sceptical hold up to derision. There appear, however, to be some general principles upon which the decision is supposed to be made. An ideal site is protected on the north (from which the yin comes), is open to the south (associated with the yang), has water flowing in such a way as partly to encircle it but not so directly away from it as to drain off the good influences, and possesses some natural feature, such as a hill or hummock, in the direction of the dragon (on the east or left) stronger than that of the tiger (on the west or right). Some natural object, such as a hill, or some building, especially a high building, in front of a site—even some distance away—may do serious damage. A straight road, such as a railway, may also work much harm by permitting the good influences to drain away. On the other hand, an otherwise unpropitious site may be improved by such devices as a pool, a hummock of earth, a pagoda, charms or the picture of a dragon. As you see now, the architects' job in China is not an easy one!

Fēng shui has been especially used in determining the locations for interments. Stories abound of families which have been ruined because the grave of an ancestor had an unfavourable fēng shui and of others which have prospered because of a fortunate location of ancestral remains. Whole cities, too, are said to have had their fortunes improved by the construction of a pagoda on expert advice, and a neighbourhood to have been badly damaged by some high building or flag-pole, such as Westerners sometimes erect.

After giving you this sketchy outline of the religious influences that have shaped Chinese thought, I must say something about the organisation of the family as it has an important bearing at least on the planning of Chinese domestic architecture.

The basic and most characteristic Chinese institution has been and is the family. It has had a leading part in economic life, in social control, in moral education, and in government. Ethical concepts have contributed to the strength of the

family. Of the five relations emphasized by traditional moral standards and re-enforced by Confucianism—those between prince and minister, father and son, older brother and younger brother, husband and wife, and friend and friend—three are in the family. In such society, the institution of marriage has been of very great importance. Sons are so indispensable in carrying on the family line and in maintaining the honours to ancestors that failure to have them has been regarded as a major offence against filial piety. Without sons the rites to parents cannot be continued and not only will the living be disgraced, but the spirits of the dead, deprived of such service, will be in misery. Since marriage has been so largely for the purpose of perpetuating the family and the ancestral rites, the mating of couples has been regarded as a concern of the elders and of the family even more than of the two most immediately involved. Betrothals are arranged by the head or other members of the family, perhaps the elder brother, and not infrequently as a result of consultation among the more influential relatives. Generally the prospective bride and groom have no voice whatever in the arrangements and have not even seen each other until the wedding day. Through marriage the bride becomes a member of her husband's family. She is taken to her husband's home for the wedding ceremony and part of the rite consists in an obeisance by the two before the groom's ancestral tablets. A man can have only one legal wife. Until recently, however, he might take as many concubines as he wished and could afford. While the new codes forbid concubines they are not yet universally enforced. Concubinage has been and is, therefore, a recognised institution in the homes of the well-to-do. One of two motives has usually been responsible for the acquisition of a concubine: a man may take one in case his wife has failed to bear him a son or in case his wife's sons have died, or, his marriage having been a matter of family convenience and having failed to result in binding love, he may acquire concubines because of their personal attractiveness.

The dissensions and jealousies which frequently accompany concubines have been familiar features of Chinese households, even though the first and legal wife is recognised as mistress. However, a man may maintain entirely separate establishments in different places for his wife and each concubine, and if all are housed within one enclosure each woman usually has her distinct apartment and, perhaps, a somewhat separate household.

The factor in family life which had the greatest influence on Chinese domestic architecture is the separation of the sexes, the relations between men and women and the position of women. A rigid etiquette regulates all intercourse between men and women. It is written that "they should not sit together in the same room. They should not use the same clothes-rack," and again "in giving or receiving anything they should not allow their hands to touch." After early childhood, boys and girls do not play together or have an opportunity to meet

in any recognised proper way. As a result courtesans were the only women with whom men could have easy and free social intercourse. Girls have been generally regarded as much less valuable than boys and sayings in common circulation appraise sons as infinitely preferable to daughters. One such proverb states in effect that the most beautiful and gifted girl is not so desirable as a deformed boy. Boys, as children, have sometimes been given girls' names to protect them from evil spirits, who, thereby supposedly deceived into believing that the child is actually a girl, and less valuable, will pass him by. By bearing a son a woman acquires a greater importance and as, in the normal course of events, she becomes a mother-in-law and a grandmother, she is regarded as being of more and more consequence and is treated with increasing respect. A woman without a son, however, is a reproach among her neighbours and to her husband, and often without honour or provision for support in her old age.

It is evident that in communities where the sexes' position is so clearly defined, and that of the women particularly, and also where rites and ceremonies play such an important part even in family life—the home must be planned and constructed to suit that particular mode of life.

China, being mainly an agricultural country, consists overwhelmingly of small villages. Some of these villages are built of stone obtained locally, others of mud and sand moulded into bricks; while the poorest dwellings of all are merely huts of palm leaf, board, tin and any other available material. The average size of a village house is 40 ft. by 12 ft. They are one storey in height, with a small cock-loft above. A wooden partition divides the one long room into two sections of which the inner is used as a sleeping compartment. The doors are of wood, held together by home-made hinges and lock, and the floor is the earth beaten flat. Cooking is done on clay stoves with wood or charcoal. If the occupants own any pigs or poultry there may be a small shed for them behind the building, but more often than not they are kept in the back of the house itself. Bathrooms are non-existent; most of the villagers wash in the morning in front of their houses.

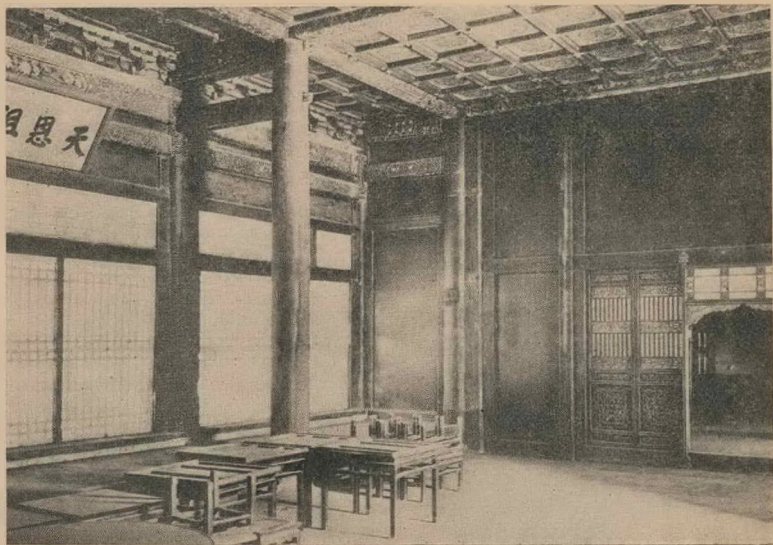
An old ceremony in South China which takes place during the building of a house is called "Blessing the beam." After the lucky spot has been picked by the feng shui expert and the site is cleared, a bamboo scaffolding about six feet high is erected immediately in front of the site, and upon this is placed the main or centre beam of the house. It is painted a brilliant red and various joss papers are stuck upon it to ward off evil spirits. The beam remains upon the scaffolding until the new building has reached a sufficient height to enable it to receive its proper position. On the day when it is to be raised there is usually a feast, the pole is blessed by the priests, and the last blessing is arranged. This takes the form of a red paper banner bearing in gold the Chinese characters "Sheung Leung Tai Kat" (May great happiness follow the raising of the beam) which is affixed to the beam and remains

there. The beam is then pulled into position to the accompaniment of a discharge of fire-crackers.

The most conspicuous building in a Chinese village is the pawnshop which stands out above all the rest of the houses. It is built in the form of a tower, and with its narrow windows and massive doors looks very much like a fortress. On the roof, which is flat, there is placed a collection of large boulders which can be hurled down on the head of anyone who attacks the place. Just inside the door of the shop stands a screen—which serves here a twofold purpose—guards against evil spirits and at the same time prevents passers-by from seeing the transactions that are taking place within. The owner sits behind a counter, some five or six feet high. The pawnbroker himself holds a very respectable position in the village. No Chinese sees anything discreditable in doing business at a pawn-shop. In the summer all his winter things are stored there for safekeeping and in the winter he deposits his summer clothing. For a small charge everything is kept clean, pressed, and free from destructive insects, and what more can anyone ask?

The houses of the well-to-do are much more elaborate. But whether they are moderate in size or very large, whether they are simple or richly decorated they all have one thing in common. They all have to conform to a plan which will enable their inhabitants to carry on their lives according to the established customs. And as these customs are in most cases many centuries old consequently the plan of a Chinese house has not changed for centuries. In fact there is only one plan. The number of rooms or apartments may vary but the principle is always the same. Here I must make it clear that up-to-now I have only referred to traditional Chinese house. Naturally, with the coming of the Occident many changes have been wrought, especially in the coastal towns where the influence of Western civilisation is most marked. The houses are usually made up of buildings whose number and dimensions may vary, but whose plan and orientation remain the same. At the end, facing south, is the main building, with the reception room and rooms at the side. Usually it has an upper story where the women live, below which the roof of a verandah comes out, held up by pillars along the edge of a terrace. To the right and left there are buildings with the men's quarters. The servants' quarters, kitchens, and outhouses shut in the courtyard from the north side.

Although for more than two thousand years the Chinese have been erecting buildings and walls, some of them of gigantic proportions, a surprisingly small proportion of the structures are very old. In their present form comparatively few go back as far as the T'ang or the Sung or even to the Yüan. Most of those which boast of more than a century of age were put up, at least substantially as they are now, only in the Ming or in the prosperous first century and a half of the Ch'ing. To be sure, some walls of the Han are extant—largely because they have been preserved in the desert air of the



CH'ENG WANG FU. INTERIOR VIEW OF THE ANCESTRAL HALL

Western frontiers. There are many tombs of the Han and even earlier. A few rockhewn temples have come down from T'ang and even pre-T'ang times, and a number of pagodas built under Sung and T'ang still can be seen. Here and there are a very few temples which were probably erected before the T'ang. So, too, there are ancient stone bridges. Compared with the extent and richness of Chinese culture, however, the student interested in architecture has available much less surviving material than in such sites of old civilisations as Mesopotamia, the Nile Valley and the shores of the Mediterranean.

This lack of structures of pre-Ming times is not due to the absence of building in these centuries. From books and paintings we know that then as now the land had palaces and temples, some of them as huge as could be found in the world of their time. The great wall built on the northern

marches of Ch'in Shih Huang Ti must have dwarfed the seven wonders of the Mediterranean world, and the imperial residence which he erected at his capital was enormous. So, too, the palaces of Han and the T'ang must have been very extensive. At the height of these dynasties Ch'angan could probably have stood comparison with the other metropolises of those eras in the number of its dwellings and in the spaciousness and dignity of its walls and palaces. Marco Polo, who had been in many of the great cities of his day, saw Hangchow only a few years after it had ceased to be the capital of the Sung and described it as pre-eminent "to all others in the world, in point of grandeur and beauty." From the extent of its walls, which can even now be traced, from the accounts of contemporary travellers, and from such surviving monuments as the Drum Tower, we can form some conception of the extent and architectural magnificence of Cambaluc under the Mongols.

The lack of buildings and walls from ancient times is due largely to the perishable nature of the materials. Wood has been extensively employed. As a rule, indeed, it has been chiefly relied upon for the framework not only of private houses but of places and temples. Bricks have been utilised to fill in walls or for supporting platforms, and not to hold up roofs. Stone appears chiefly in ornamental trimmings. Since, moreover, the great frontier ramparts and the walls of cities have usually been of rubble lined with brick, and sometimes even of tamped unbaked earth, they have not stood up as well as if they had been of stone.

In spite of the scarcity of ancient monuments, it is possible to learn a good deal of the architecture of pre-Ming centuries and to know something of the main stages of its development. Japan possesses very old wooden buildings which have escaped the ravages of fire and war and since some of these caught their inspiration from Chinese models we can form an idea of what the latter were like. Wall sculptures from the Han and later dynasties not infrequently portray buildings, and paintings of the T'ang and Sung of which we have either the originals or copies often include pictures of buildings, from simple huts to palaces and temples. The great wealth of Chinese literature which has come down to us from previous centuries contains useful information. There is at least one detailed treatise on architecture from as early as the Sung.

I cannot go into history, but I want to mention, however, that non-Chinese influences entered, with marked results, Buddhism particularly brought new forms, some of them Indian others Tibetan or of other provenance. Yet, although factors from abroad were often potent, architecture remained distinctly Chinese. In time even alien patterns were altered to fit the national tradition.

Without attempting to arrange them in any logical order, the main characteristics which run through most of Chinese architecture may be enumerated generally as follows. First of all may be mentioned the desire to make the works of man accord with the universe. From early times it has been felt that if man is to prosper he must not antagonise or even strive to master the world about him but must seek to put himself in harmony with it. This conviction has expressed itself in part in *feng shui*. As we have seen, the latter often determines the location of houses and especially of tombs and the arrangement of the units of these structures.

Walls are prominent. Every city has had one, and many survive. Although the passion to conform to Western example has torn down a few of them, others have recently been repaired. Their primary purpose has been defence, and this they have fulfilled most usefully. Even villages may be surrounded by mud ramparts as a protection against robbers. The city walls are often imposing. They are usually, as has just been said, of clay or earth faced with brick and in some instances are trimmed with stone. Many average twenty-five or thirty feet in height and at the top are twenty feet or more in

breadth. A circumference of five or six miles is not unusual. In some of the chief cities, such as Peiping, the walls are higher and enclose a larger area. City walls are pierced by gates. Over the gates rise towers, many of them several stories in height, and in front are sometimes secondary, curtaining walls, with a gate or gates entering obliquely. The wall is often surrounded by a moat, and its top is crenelated.

The Great Wall, called by the Chinese the *Wan-li-ch'ang-ch'eng*, "the Ten Thousand Li Long Wall," along the northern frontier of China proper, has a long history. Sections of it were in existence before Ch'in Shih Huang Ti, and that great monarch completed the barrier. It was repaired and rebuilt again, sometimes not on the original course of the old. As it exists now it dates from several periods and is of more than one type of construction. The latest thorough-going repairs seem to have been given it under the Ming, and two hundred miles or more were added under that dynasty. The Ch'ing being masters of Manchuria and Mongolia, against inroads from which it was a protection presumably did not have as much need for it as did the Ming. The wall stretches from Shanhaikuan into Kansu, a distance of about twelve hundred and fifty miles in a straight line, and with all its windings probably over fifteen hundred miles. In several places it is double and even triple, thus affording more than one line of defence. Sometimes the successive barriers are many miles apart. Built with an eye for strategic positions, the Great Wall follows mountain crests and takes advantage of narrow gorges. In height it ranges from fifteen to fifty feet, with towers rising at intervals above it. At its base its width is from fifteen to thirty feet and at its top twelve feet or more. On its outer side, for much of the distance, is a moat.

Walls have been used not only for cities and for imperial defence, but to enclose temples, palaces, and private homes. From the outside, nearly every such Chinese structure presents the aspect of a blank screen, at proper places pierced by gates which in turn are often shielded by curtaining walls.

Another feature of Chinese architecture is the enclosed court. In temples, palaces, and dwellings of any size the individual units are as a rule grouped about quadrangles, sometimes square sometimes elongated. Most buildings are one or two stories in height, and more space is usually obtained, not by adding stories but courts. The best of the Chinese buildings preserve a proportion between the width of courts and the heights and forms of the buildings which is both impressive and restful.

A characteristic already mentioned is the extensive use of wood. A few buildings have stone pillars, but in the vast majority of the buildings the framework is timber. Wooden pillars are used to support the roof and the entire structure is tied together by beams of the same material. The walls—of brick or wood or sometimes of plastered wattle or tamped earth—are simply for purposes of enclosure.

A TYPICAL CHINESE PAGODA, SHANGHAI



Many of the beams are left exposed. The walls may be built around the inner row of pillars and the outer row be left unenclosed. The supporting pillars may be painted or coated with lacquer and the beams carved or painted in conventional designs of various colours. In this manner the exposed wooden framework becomes an ornamental feature and the view upward, toward the beams and rafters which support the roof, can be made very attractive. Chinese pillars are without capitals in the Western sense of the word. Often wooden brackets at the top give the appearance of helping to support the beam above and so prevent the transition from seeming abrupt. Usually, too, there are pedestals, some of them small, but many of them large and highly ornamented.

As a rule important buildings are placed on platforms faced with brick or stone. Some of the platforms are low, requiring only one or two steps to mount them. Many, however, are quite high. The platforms and the stairways are often set off by balustrades of stone, brick or wood, in numerous instances elaborately carved. The stairways themselves may be broad, and frequently two rows of steps are separated by an inclined face displaying an elaborately carved dragon. There may be three sets of steps mounting the platform, especially if, as is so often the case, the surmounting building has three doorways.

One of the most prominent features of a Chinese building is the roof. It is possible that the platform is designed to pre-

serve the balance and to prevent the roof appearing out of proportion. Sometimes roofs are double or even triple, the eaves of the second and the third being set back from the one below, and each upper one being raised above the one underneath by a wall or a kind of clerestory with supporting pillars. They are usually tiled, although thatch may be employed in poorer houses. In many instances, especially in such structures as temples and palaces, the tiles are covered with a coloured glaze. No one who has seen them can forget the yellow roofs of the Imperial Palaces of Peiping or the blue of the Temple of Heaven. Often the main lines of the roof are emphasized by tiles shaped in conventional pattern or in the forms of dragons or of other animals mythical or real. Sometimes the decorations are in bronze or iron. Often the crown of the roof is mounted by especially elaborate decorations of designs of varying history and origin. The eaves are usually prominent and terminated by ornate tiles. The curved eaves are familiar to all who know anything about Chinese buildings. The origin of the curve is uncertain. The surviving representations of Han buildings do not have it, and it seems not to have entered until the first millenium of our era. It may have been adopted to afford relief from the severely straight lines which the heavy projecting roof would otherwise present, or it may have been devised to let in more light.

Not much is made of the gable ends, although these are often decorated. Most Chinese buildings are elongated rectangles and are intended to be viewed from the side rather than the end. It is the broad facade in which the door or doors are placed and from which the sweep of the roof can be seen to best advantage.

Much colour is employed, and generally, even to the uninitiated Westerner, with pleasing effect. Many buildings have a great deal of lattice-work, some of it elaborately carved. To this Chinese construction lends itself, for since the weight of the roof is carried by pillars the walls need not be substantial but can be perforated as much as the architect desires. Still, Chinese buildings display more variety than the traditional rectilinear plans lead one to believe. The Chinese have often employed the octagonal pavilion, generally for decorative purposes. The architecture of much of the Yangtze Valley and the South differs in part from that of the North. The former shows a great tendency to flamboyance, and to exaggerated curves in the roof.

The pagoda has been prominent. As we now see it, it is a Chinese development. It came, however, from Buddhism. It appears to have taken its inspiration, at least in part from the stupa, a structure which seems originally to have been for the housing of relics of Buddhist saints, and is of Indian origin. Pagodas were first built in China not long after the introduction of Buddhism. At least one is extant which dates from early in the sixth century and several can be seen which were built during the T'ang and the Sung. Pagodas seldom

have more than fifteen stories. The total is always uneven, for popular Buddhism sets more value by odd than by even numbers. Pagodas may be very high. One is known which towers to three hundred and sixty feet. The material varies. In some instances it has been wood, but naturally, the structures which survive are mostly of brick or stone. Often they are octagonal and frequently they are square, but the shape and the size vary greatly.

Bridges are another characteristic work of the Chinese builder. A large proportion are of stone. Many have a single arch, some of them, perhaps, for the purpose of allowing boats to pass, made high and ascended by steps. Others have several arches. Many are constructed of huge stones laid longitudinally and supported by piers. There are some suspension bridges, but these are usually over the mountain torrents in the West.

A familiar feature of Chinese cities is the memorial arch. Under the Ching dynasty these could be erected only by Imperial permission. They are either in honour of distinguished officials or distinguished local citizens noted for their virtue or learning, or in honour of centenarians, of families who have lived together for several generations, of widows who committed suicide on the death of their husbands, of women who died in defence of their chastity, or in memory of others who had performed meritorious actions. They are not always commemorative, and as a rule they consist of four pillars supporting transverse stones and presenting three passages, the central one wider than the others. Often, however, they have only one passage and a good many have five. Graves are an important feature of a Chinese landscape, some are quite elaborate. Imperial tombs generally cover a fairly large area and with their great courts, their avenues, their numerous buildings and their sense of dignified repose are very impressive even in decay.

Without adequate illustration, it would be of little use to discuss some of the individual buildings which are standing to-day. Unfortunately Chinese architecture, for some unexplained reason, has very little literature, and most books on China, if they discuss architecture at all, usually do so only from the traveller's point of view. As I explained earlier, most of the existing buildings, temples or palaces, originated in the 17th-18th Century, a few in 13th-17th, so it would be just as well to say something about the style of that period. Curiously enough, the buildings at that period show a similar tendency for exaggeration and flamboyance as the corresponding period in Europe. The upper roof has less and less importance and allows a greater brick triangle to be seen at the sides. The lower roof is, therefore, more horizontal at the sides; the angles have a more decided curve; the decoration of glazed pottery on the points of the roof and on each angle become more and more numerous. The most interesting examples of this style are; the main temple and halls of the T'ai-ling (at the Si-ling) the tomb of Yung Cheng. The two-

storied building containing the 23-metre Buddha in the Yung-ho Kung, at Peking. The Ta-chung Si, "Western Yellow Monastery," near the north-west angle of Peking. Chung Lou, "the Bell Tower," at Peking (north of the Drum Tower), built in 1746. The stupa of the Western Yellow Monastery, Si-huang Si, built in 1783 for a Dalai Lama who died at Peking.

The bridges vary greatly in design. Some are meant for ornament and take the most curious forms, such as the "Camel Bridge," Lo-t'o K'iao, on the lake of the Summer Palace ;

others reach great dimensions, like the "Bridge of Fifty-three Arches," south of Soochow. Bridges hung on chains are often found in the south-western provinces ; such a one is the Po-si bridge in Yunnan.

During the 19th Century European architecture showed its influence in China to the extent that heavier brick structures were built, especially in Peking. The Six-sided Tower, of three stories, built by the Empress Chi-hi at the Summer Palace reaches imposing dimensions.

ACKNOWLEDGMENTS FOR ILLUSTRATIONS.

The illustrations appearing on the Frontispiece and on pages 273 and 277 are taken from Parts II, I and III respectively, of "THE IMPERIAL PALACES OF PEKING," by Osvald Sirén ; G. van Oest, publisher, Paris, 1926. The illustration on page 279 is from "A HISTORY OF ARCHITECTURE," by Professor Banister Fletcher and Banister Fletcher, Fifth Edition: B. T. Batsford, publisher, London. 1925.

THE SOUTH AFRICAN ACADEMY

A REVIEW IN RETROSPECT

The shortage of artists' materials in the Union and the withdrawal of the usual transport concession for exhibition were the factors which faced the organising committee when they were considering the advisability of holding an Academy Exhibition this year. It was felt that art exhibitions in times like these, are more than ever necessary when we are faced with the danger of ultimate values being obscured by the temporary measures through which we are passing. It came as a surprise, however, when the attendance figures were increased out of all proportion to previous years. Although the same number of catalogues were ordered from the printers as last year these were all sold within the first four days and while awaiting further supplies catalogues were hired out. It is estimated that the attendance figure was three times that of any previous year for the S.A. Academy held in the Duncan Hall, Johannesburg during August 00th 000. The total from sales of exhibits exceeded £4,000 which was an excellent result and contributed handsomely towards the donation of £100 which the Academy presented to the Navy War Fund.

MARITIME EXHIBIT.

A happy innovation was the section given over to old Maritime Prints. The exhibition of this feature was the outcome of the desire expressed by the Transvaal Art Society to show their appreciation for the work being done by the Navy in this war. The organisation of the Maritime Section was undertaken by Mr. T. Schultz, the Acting Consul for Denmark, who, in approaching private individuals, managed to produce a most interesting collection of prints both from an artistic and historical standpoint. This section proved popular with the public and Mr. Schultz, who is an expert on prints, gave two lectures which aroused considerable interest. Lectures were given to the public during lunch hours by well-known authorities on Art, and these were most popular.

THE PICTURES.

There were 420 entries submitted to this year's Academy, of which only 113 were accepted. This low figure is somewhat explained by the fact that only the best of a particular class of work was hung. The standard, however, was fairly even and maintained the high level set last year. Kottler's "Mother and Child," carved out of stinkwood, and the oil painting, "A Coloured Girl," by Anton P. Hendricks, were probably the most outstanding exhibits, while several artists, from whom one expects work of high quality, came up to

expectations. Landscapes were in the majority with a goodly sprinkling of Still-life, while the Craft Section and Black and White Section were hardly representative. A glance through the catalogue reveals that many well-known artists were not represented and this is probably due to the War. However, this seems to have presented an opportunity to a number of the younger artists, for one observes many names not seen before. Among the exhibitors that have featured at previous Academy Exhibitions were: Walter Battis, Joyce Leonard, Emily Fern, Phyllis Gardner, Mary Packer, Maud Sumner, Benjamin, Brodie, Terence McCaw, Robert Broadley, Marilyn Evans, Frank Spears, Mary Vaughan-Williams, Mary Davis, Eric Byrd, Erica Berry, Leon Levson, Anton Hendricks, Edith Azgour, Erich Meyer, W. L. Grossett, Phyllis E. Sullivan, Maurice Van Esche, while other names included Nina Arbuckle and May Arlington, Marguerite Brown, Josephine Back, Isa Cameron, Pierre Du Plessis, James Eddie, H. Ebenstein, Germaine Foury, Antoine Gianelli, Benny Gruzin, W. M. Hunt, Harvey Russel, Buller Kyle, Nancy Lister, Freida Lock, Norah Massey, Margaret Metcalf, Douglas Portway, Ernest Renfield, Karan Scholberg, Annie Sproat, H. Gertrude Smith, Wim Swaan, Donald Turgel, Reginald Turvey, Charles Wedgwood, Kathleen M. Wright, Louise Young, J. Mohl. Some twelve works were shown in the sculpture section by the following: Moses Kottler, Florence Cuairan, Gerard De Leeuw, Elsa Dziomba, Lippy Lipschitz, Wim Marschall, Hermann Wald. The craft section consisted of five exhibitors while Theophile Schaerer was the only representative of the Architects to take advantage of the Architectural Section.

NATAL EXHIBITORS.

There was also a "Natal Exhibit," consisting of work which had previously been judged in Durban by the Natal Society of artists and therefore did not come before the Academy jury. The artists represented in this section included: Natalie Field, John Williams, John Ferguson, Rosa Hope, Kathleen Anderson, Jack Pieters, Nils Andersen, Ethel Hall, Van Nooit, Peggy Bafoure, John Wilson, Venus Graham-Whitely, Perla Siedle Gibson, Edith Ward, Bertha Froome.

The success of the Twenty-fourth South African Academy was most gratifying and says much for the co-operation between the Transvaal Institute of S.A. Architects and the Transvaal Art Society in its organisation. Especially is their "act of faith" in holding an exhibition this year a matter for congratulation.

HERBERT E. PERRING.

WARTIME BUILDING

4

This supplement is the fourth of a series published by courtesy of the Building Control Investigation Section, with the object of keeping Members informed of the developments of constructional methods, new and substitute materials, and tests, which have come about as a result of war conditions.

BUILDING CONTROL INVESTIGATION SECTION: SECOND REPORT

INTRODUCTION.

This report deals with the construction and the new materials used in the Building Control Experimental House which has been erected at Cottesloe, Johannesburg. The construction of this house was undertaken for the following purposes:

1. To experiment under actual conditions of a building site with the new types of construction which had been evolved by Building Control Investigation Section during the previous five months, in an attempt to overcome the shortage of timber and other materials, and, further, to test under general conditions of wear and tear new building materials developed by local manufacturers in a similar endeavour to keep the building industry alive despite the present import difficulties.

2. To induce—by means of example—the local manufacturers, contractors and members of the professions in the building industry to revise standard practice with a view to increasing the range of locally manufactured building units and to incorporating them into the design of structures.

3. To show and prove to the general public that substantial houses can be built under present conditions despite the curtailed supplies of certain imported materials.

The house was built entirely of South African materials with the exception of the following items for which imported materials only were available: glass, wood-screws, linseed oil, turpentine, rim-locks, stopcocks, taps over $\frac{1}{2}$ in. bore, and electrical accessories. Samples of the structural members used had previously been subjected to load tests, and preliminary indications of the suitability of the other materials had been obtained in tests carried out at the laboratories of the Civil Engineering Department of the University of the Witwatersrand.

In many of these tests accelerated methods had to be used in which the damaging agencies of wear and tear were reproduced in a concentrated form for a short period of time. No standards of testing exist for such building materials as floors and windows, and it was necessary, therefore, to devise new methods for this work, without the possibility of linking the test results of the local materials with the experience gained in similar work done in overseas countries.

A series of test results was published in the First Report which appeared in the August issue of the "South African Architectural Record" and the July issue of the "S.A. Builder."

In designing alternatives for established building methods, two entirely different lines can be followed. To obtain safe

results within a short period of time, it appears advisable to employ known materials for new uses. On the other hand, while the investigation of new materials may require more extensive experimental work it may lead to more far reaching developments than are possible by the first method. Both forms of research were employed in this work; the former, however, had to be given preference in view of the urgency of the housing question.

The plan, although it is economic in the use of space and the layout of the services, was designed as a basis for carrying out the structural work, and not as a model. The possibility of future extension is a desirable feature in present-day houses which of necessity have to be smaller than the future requirements of a growing family may demand.

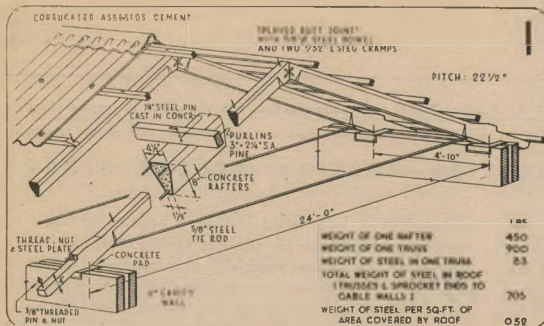
The house was constructed by the National Federation of Building Trade Employers in South Africa on a non-profit basis. Many manufacturers assisted the scheme in supplying new materials, partly to their own design and specification and partly worked out in collaboration with the Building Control Investigation Section.

ROOF OF HOUSE. See diagram 1 and photographs 4 and 5.

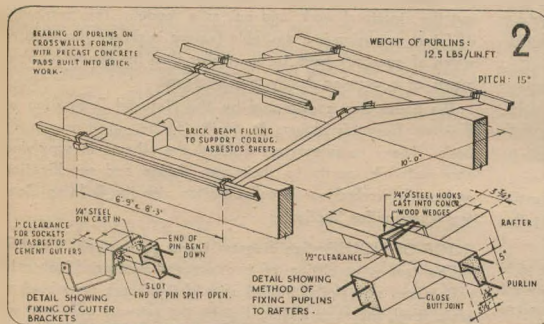
The trusses consisting of two precast reinforced concrete rafters and a threaded tie-rod of mild steel were assembled at plate level, the rafters lying flat on the external walls and on a temporary stage of timber boards laid across the internal walls parallel with the ridge. The assembled trusses were then lifted up plumb by four labourers without the use of any tackle. The purlins of 3 in. by $2\frac{1}{2}$ in. South African pine were drilled at the correct centres on the ground and dropped over $\frac{1}{4}$ in. dia. mild steel pins cast into the rafters. The ends of the pins which projected 2 in. beyond the top edge of the purlins were then hammered down; this formed a very firm connection of purlins and rafters. The first purlin at the eaves was fixed with threaded pins and nuts to avoid hammering near the ends of the concrete rafters. In order to afford a sound bracing of the trusses the purlins were tied down with hoop-iron anchors at the gable walls, and the joints in the purlins were staggered. A wooden template was used for building the purlins into the gable walls. The roof covering was formed of corrugated asbestos cement sheets coloured by the manufacturer before delivery on the site.

The design of the truss has been kept as simple as possible to facilitate the manufacture on a large scale. It is hoped that precast reinforced concrete trusses for a limited number of standardized spans will be made and marketed by exper-

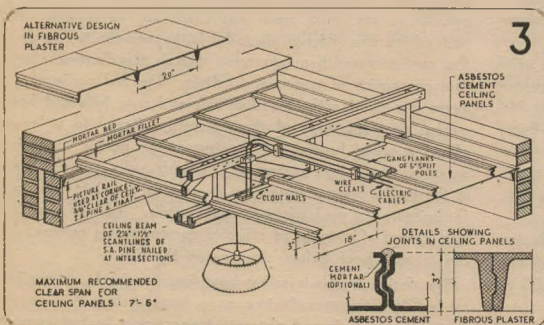
ROOF OF HOUSE



ROOF OF OUTBUILDINGS



CEILING OF HOUSE



enced concrete firms. The proposed standardization of spans need not interfere with the layout of the plans of houses as the internal walls are unaffected by the roof construction and different spans of trusses would leave a wide scope for combinations.

As it is considered advisable that a standardized truss be constructed strong enough to carry the maximum span of purlins likely to be used, the trusses on the Experimental House were designed to carry a greater span of purlin than actually adopted. The spacing of the trusses at 4 ft. 10 ins. was determined in this case by the strength of the purlins. As heavier timber purlins cannot well be considered at the present time, precast reinforced concrete purlins should be used for spans longer than 5 feet, as adopted for the roof of the outbuildings. The quantity of timber used in the roof of the house amounted to 26 cubic feet.

ROOF OF OUTBUILDINGS. See diagram 2 and photograph 6.

The precast reinforced concrete purlins were supported on two precast reinforced concrete trusses spanning the width of the garage and on precast concrete pads built into the cross walls. The purlins were fixed to the trusses by means of a dry connection which is rigid in all directions, as shown in the diagram. On the walls the purlins were tied down with wires cast into the concrete pads. Precast reinforced concrete sprocket pieces were built into the cross walls to support the eaves purlins. The built-in ends of these sprocket pieces were tied down with hoop-iron anchors. In order to brace the trusses the checked ends of the concrete purlins were butted tight against the faces of the concrete pads and the trusses. The quantity of steel used in the roof construction to the outbuilding was 280 lbs., equal to 0.51 lbs. per sq. ft. of the area covered by the roof.

The corrugated asbestos cement roofing sheets were fixed to the purlins with galvanised iron hook bolts which reached round the bottom edge of the vertical flange of the purlins.

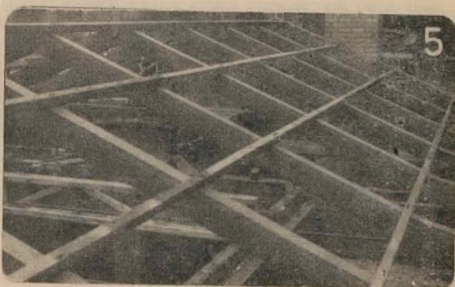
CEILINGS. See diagram 3.

Two types of trough-shaped self-supporting ceiling panels were used in order to dispense with the customary timber brandering. The panels which were made of asbestos cement and, in the case of the principal bedroom, of gypsum-fibre composition, were designed with interlocking joints to exclude dust and draught and to maintain an even soffit.

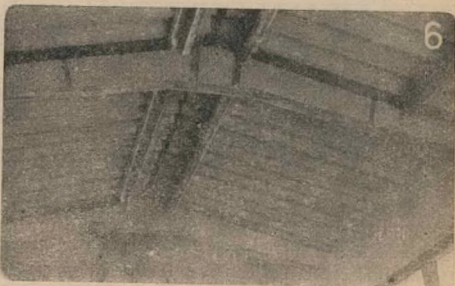
The panels were supported on mortar beds on the walls and on the bottom flanges of lattice beams made of light sections of South African pine. As it was anticipated that the nailed connections would "give" slightly due to the softness of the timber, these beams were assembled with a camber of about $\frac{1}{2}$ in. in 12 ft. which subsequently straightened itself out under the load of the ceiling and the men working in the roof. The quantity of timber used in these beams was somewhat less than half of what would have been required for brandering. Precast flanged reinforced concrete beams could be used as an alternative, or very light timber beams could be supported on hangers suspended from trusses and purlins.



GENERAL VIEW OF HOUSE DURING CONSTRUCTION SHOWING ROOF TRUSSES



DETAILED VIEW OF ROOF TRUSSES AND PURLINS



INTERIOR OF GARAGE SHOWING THE CONSTRUCTION OF THE ROOF

The asbestos cement panels showed a certain amount of expansion and contraction due to changes in temperature; it is advisable therefore not to work the wall plaster tight up against the ceiling but to separate it with a trowel cut.

In the habitable rooms the cornices were formed of picture rails of Kiaat and selected South African pine. They were kept $\frac{3}{4}$ in. clear of the ceiling and were spiked to nailable bricks built into the walls at about 1 ft. 10 in. centres. In the secondary rooms a 1 in. diameter half round plaster bead was run along the top of the walls $\frac{1}{4}$ in. clear of the ceiling.

Since the ceiling panels were not designed to carry any load, gang boards of 5 in. diameter split poles were laid across walls and ceiling beams. One of these split poles was fixed on edge with the flat face outwards for fixing electric wires clear of the gangway.

The tank stand was formed of a triangular concrete slab supported by brickwork which was carried above plate level at the intersection of two internal walls.

To provide access to the roof space a concrete slab was built over the Scullery with a square opening which was covered with a flat sheet of asbestos cement resting in a rebate in the concrete.

OPENINGS IN BRICKWORK. See diagram 7.

Long spans in the lintols over ranges of windows were avoided with the introduction of mullions of concrete and brickwork. The reinforcing steel used in beams, lintols and slabs in the house weighed only 110 lbs. The lintols over the internal doors were formed of hollow bricks filled with concrete and reinforced. Together with the precasting of the short lintols over the windows this served to reduce the quantity of timber required for shuttering.

WINDOWS.

The windows used were made of five different materials:—

1. "Green-Barb" composition.
2. "Gypwood" composition.
3. Concrete frames and wood sashes.
4. Concrete frames and pressed steel sashes.
5. Kiaat.

The windows made of the two compositions (Marks 1 and 2) had shown no deformation in accelerated weathering tests and during the period of construction of the house. They withstood the handling on the building site and are now being subjected to the wear and tear a window gets in a building. Both compositions hold screws without the use of plugs. In the case of "Gypwood" the screws and butt hinges were zinc sprayed prior to fixing to avoid the possibility of a chemical reaction between the steel and the binder used in the composition.

In the case of the concrete frames pivots were used in lieu of butt hinges for hanging the sashes, while the striking plates for the fasteners and the pins for the peg stays were part of the frame having been cast in at the factory. Through the adoption of these new methods the use of plugs was avoided

altogether.

Cover beads could be omitted except in the case of the Kiaat windows. The concrete and composition frames were built in and backed with cement mortar as the brickwork proceeded and the plaster was carried on to the face of the frames.

The Kiaat window was made up of very light sections by means of which the glass area was subdivided to avoid waste in cutting and through breakage. Fixed glazing was used to save furniture and screws.

LOUVRES.

Louvers made of asbestos cement according to the detail shown in diagram 8 were used in the Coal Shed, and a smaller type in the gable ends.

DOOR FRAMES. See diagram 9.

The door frames were made of Kiaat, asbestos cement, concrete and "Gypwood." Frames were omitted to the Garage and Yard doors.

The screws for fixing butts and striking plates were driven direct into the asbestos cement and "Gypwood" frames. These materials lend themselves to drilling and hold screws well, provided the diameter of the holes corresponds with the root diameter of the thread of the screws. The use of cylindrical sheet metal screws is recommended in preference to the tapering wood screws, as it is easier to drill a hole with parallel sides than a tapering hole or one of staggered diameters. The holes should be $\frac{1}{8}$ in. longer than the screws.

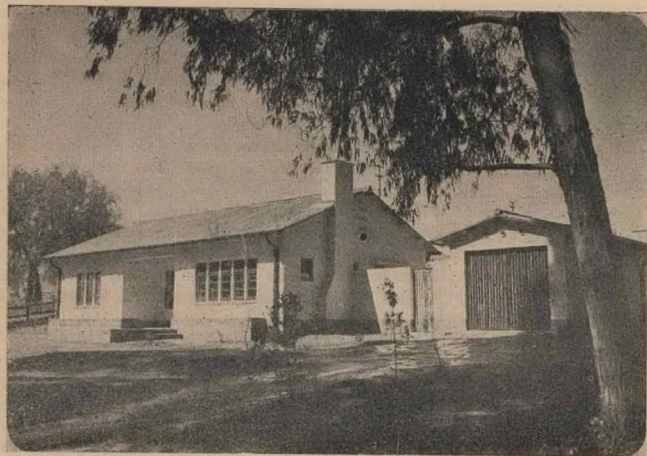
In the concrete frames hardwood plugs were provided for fixing the screws.

For the Kiaat frames 3 in. by 2 in. sections were used. These frames are strong enough if built into the walls with hoop iron in a workmanlike manner; they require only half the quantity of timber as compared with the customary sections of 4½ in. by 3 in. and 6 in. by 2 in. Architraves were replaced by fillets.

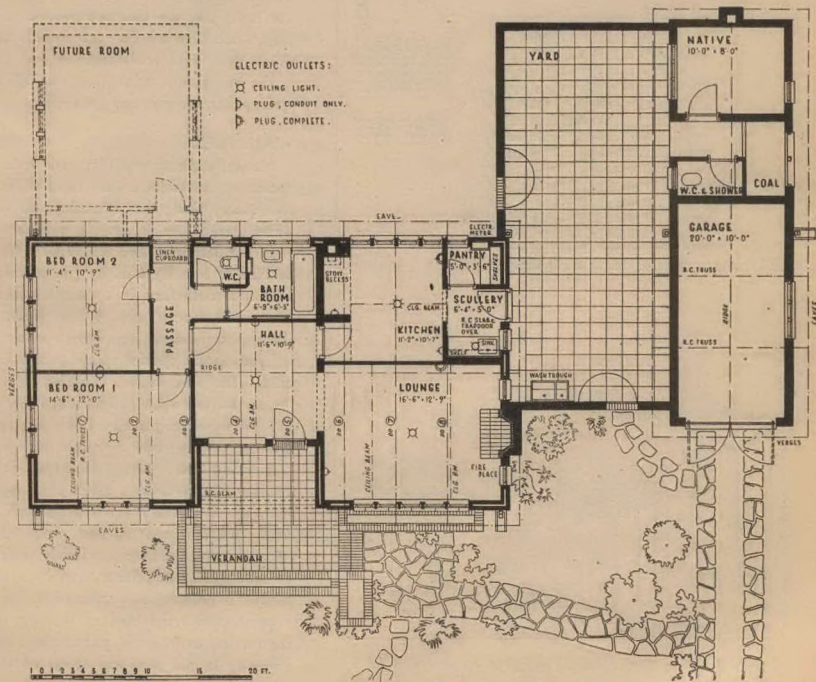
DOORS.

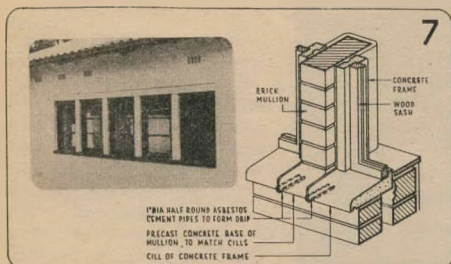
Single panel Kiaat doors were used to the rooms of the house and a batten door of Kiaat to the main entrance; an all asbestos cement door was hung in the Pantry. This door was made up of a $\frac{3}{4}$ in. thick panel of the full size of the door which was stiffened by $\frac{3}{4}$ in. and 6 in. styles and rails pressed on to the panel on both sides when still wet. Further, to secure the bond between the framing and the panel, a number of asbestos cement "rivets" were formed in the following manner: holes, about 1 in. in diameter, were drilled through framing and panel, the edges were reamed and the holes then filled with damp asbestos cement pulp reinforced with wire and rammed in. The "rivets" were rubbed off flush with the framing. This door was hung on three tee-hinges fixed to the door with gutter bolts.

The back door and the doors to the outbuildings were formed of hardwood framing and three $\frac{3}{4}$ in. asbestos-cement panels.

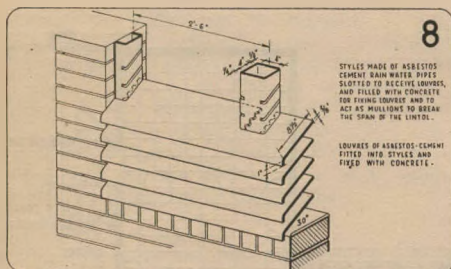


GENERAL VIEW

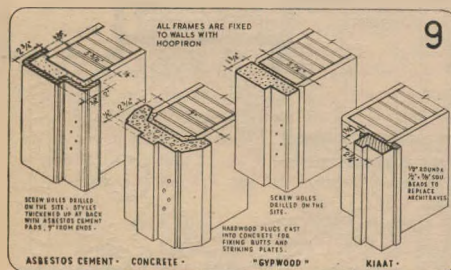




DETAIL OF CONCRETE WINDOWS AS AN EXAMPLE OF THE TREATMENT OF A RANGE OF WINDOWS



DETAIL OF ASBESTOS CEMENT LOUVRES



DETAIL SHOWING THE VARIOUS TYPES OF DOOR FRAMES USED IN THE HOUSE

The doors to the Garage and the Yard were made of split poles or "slabs" (the rounded cuttings obtained in squaring logs), selected for straightness and even bulge. See photograph 10. In the manner of a batten door the split poles were nailed to ledges and braces of selected sawn South African pine. A 3 in. by 1 in. hardwood strip was nailed all round the doors in order to give a neat finish to the edges and also to stiffen the doors against slight warping which was to be expected with the kind of timber used. The Garage doors were hung on pivots because the rounded faces of the split poles would have necessitated unsightly checking if strap-hinges had been used. The pivots are easy to fix, they take the load of the door straight down to the floor and do not require any more mild steel than ordinary hinges.

The cupboard under the sink was enclosed with a pair of asbestos cement doors as detailed in diagram 12.

FLOORS.

Two new types of floors were laid: "Woodcrete" tiles and asbestos cement tiles. These tiles were bedded in cement mortar on a 3 in. surface bed of concrete, with close butt joints in the case of the former and with $\frac{1}{4}$ in. ruled joints of cement mortar in the latter. In the accelerated tests carried out previously the tiles had proved satisfactory in comparison with wood floors. For test results see the First Report in which these tiles are marked 4 and 7 respectively.

The remaining floor area was finished with Kiaat blocks, quarry tiles, terrazzo and granolithic.

WALL TILES.

No white glazed wall tiles were used. The walls of the stove recess in the kitchen were lined with 9 in. by 3 in. by $\frac{1}{2}$ in. red quarry tiles; the remaining wall surfaces were plastered; white glazed tiles, if desired, can be fixed after the war.

In the Bathroom and the W.C. 3 ft. 6 in. high dadoes were formed of 6 in. by 6 in. by $\frac{3}{4}$ in. asbestos cement tiles, finished with a smooth face in a marble polishing machine and fixed in cement mortar with $\frac{3}{8}$ in. joints pointed with gypsum. The exposed edges were aris rounded in polishing. At one splayed corner special splay-cut and aris rounded tiles were used. The tiles show a pleasing grey colouring and a slight fibrous texture when polished, and the white joints which stand out on the background of the tiles prevent any feeling of drabness which might be expected with grey wall tiling.

In fixing these tiles it was found that they have a slight tendency to move as a result of changes in the moisture content, which caused a few tiles to work loose from the cement bed. In order to avoid bad effects of this general characteristic of cement-bound materials it is recommended that a cement mortar not richer than 6 to 1 be used, and that the joints be pointed only after the tiles have dried out. It is suggested that the back of the tiles should be roughened to form a key as in white glazed tiles; this can be done without difficulty in the semi-wet stage of the manufacture of the asbestos cement flat sheets.

The walls behind and at the ends of the sink were lined with 1 in. thick terrazzo slabs of the length and width of the drain board and 12 ins. high.

SHELVES. See diagram 11.

The wall bearers formed of rebated bricks and quarry tiles show a marked advantage over the customary wooden slats nailed into the wall since they avoid all crevices to harbour dirt and vermin. It is necessary, of course, to determine the position of the shelves at the time the walls are built.

HARDWARE.

The locks used were four lever reversible upright mortice locks of two different local makes. One rim-lock was imported as this type of lock is not yet made in the country. In the Bathroom and the W.C. a specially designed latch was successfully tried out. See diagram 12. It consists of a turnbuckle of coppered mild steel which rotates inside a mortice in the door, cut out as for a lock; the spindle of the turnbuckle is worked by a wooden knob handle fixed on the room-side of the door. For locking the end of the turnbuckle is dropped into a striking plate on the door frame. In case of emergency the spindle can be turned from the outside after a wooden cap fixed with two screws is removed.

The casement fasteners and stays, butt hinges, tee hinges and tower bolts were of blackened or coppered mild steel and of local manufacture.

SANITARY FITTINGS.

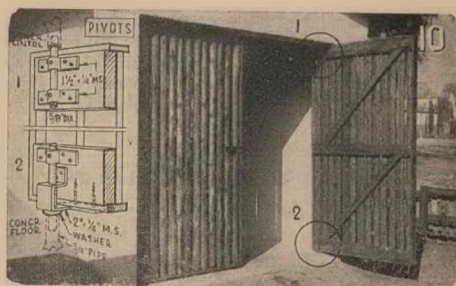
All fittings installed were of South African manufacture and consisted of a cast iron enamelled bath, a similar basin, glazed earthenware closet and squat pans, a low-level flushing cistern of asbestos cement, a high-level flushing cistern of cast iron, an acid-resisting terrazzo sink and drain board and a wash trough of concrete.

The medicine chest and the towel rails were made of Kiaat.

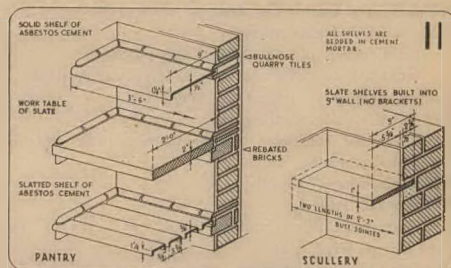
ELECTRICAL INSTALLATION.

The solid drawn screwed steel tubing and the solid single conductor insulated wires were of local manufacture, as well as the distribution fuse-board and main switch neatly enclosed in a box of pressed sheet steel. For the switches, plugs and lampholders imported articles had to be used. See layout on plan.

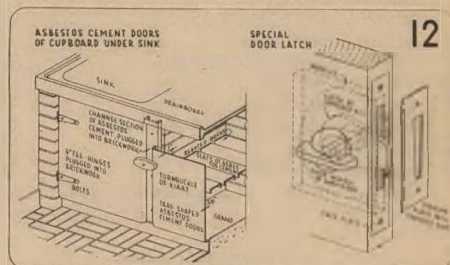
The light fittings were designed for one light point per room. All the fittings were of the ceiling type for the above reason and, further, because no lampholders of non-conducting material, suitable for wall brackets in bathrooms and sculleries, are available at present. Fittings of wrought iron and parchment were used in the living rooms and plain parchment shades in the bedrooms. In the Kitchen, Bathroom, etc., a small fitting was used consisting of a spun metal cone designed to hide the lampholder and the neck of the lamp whilst the round portion of the lamp was left exposed. All fittings were of local manufacture.



10
GARAGE DOORS OF SPLIT POLES AND
DETAIL OF PIVOTS



11
DETAILS OF ASBESTOS CEMENT SHELVES



12
ASBESTOS CEMENT DOORS AND DETAIL
OF LATCH USED IN BATHROOM & W.C.

FENCING.

The fencing was made of split pole palings, 2 ft. 6 in. high, nailed to frames of split pole rails and round pole posts. Along the street front rails of round poles were built into brick piers 8 ft. 6 in. apart. All round timber had been treated with creosote or a solution of metallic salts prior to use.

LIST OF MANUFACTURERS WHO COLLABORATED AND MATERIALS THEY SUPPLIED.

Alloy Diecast Co. (Pty.), Ltd.,
P.O. Box 8494, Johannesburg.
Casement fasteners and peg stays, blackened mild steel.
Sliding stays, blackened mild steel and brass.
James Barwell (S.A.) (Pty.), Ltd.,
"Fiddian Works," Alberton.
Bib cocks, $\frac{1}{2}$ in. brass, for hot and cold water.
Brick and Potteries Co., Ltd.,
P.O. Box 155, Johannesburg.
Pressed bricks.
British General Electric Co., Ltd.,
P.O. Box 2406, Johannesburg.
Light fittings of wrought iron and parchment.
Cone-shaped covers to lampholders of spun steel.
Central Agencies & Import Co. (Pty.), Ltd.,
P.O. Box 2260, Johannesburg.
Reversible four-lever upright mortice locks and white metal furniture.
City Engineering Works (Pty.), Ltd.,
P.O. Box 210, Pretoria.
Enamelled cast iron bath and basin.
Dana Electric (Pty.), Ltd.,
P.O. Box 4386, Johannesburg.
Light fittings of wrought iron and parchment.
Everite (Pty.), Ltd.,
P.O. Box 8613, Johannesburg.
Corrugated asbestos cement sheets, coloured.
Asbestos cement trough-shaped interlocking ceiling panels.
Asbestos cement shelves.
Asbestos cement cupboard doors.
Asbestos cement louvres.
Asbestos cement polished floor tiles.
Gratus & Gratus (Pty.), Ltd.,
P.O. Box 4888, Johannesburg.
Butt hinges and tee hinges of mild steel.
F. Gwilliam (Pty.), Ltd.,
P.O. Box 5659, Johannesburg.
Casement fasteners and peg stays, mild steel coppered.
Gypsum Industries, Ltd.,
P.O. Box 80, Germiston.
"Gypwood" windows and door frames.

Hardware Industries (Pty.), Ltd.,
P.O. Box 8700, Johannesburg.
Butt hinges of mild steel, for cupboard doors.
The Hume Pipe Co. (S.A.), Ltd.,
P.O. Box 204, Germiston.
Asbestos cement door.
Concrete wash trough.
Hunt, Leuchars & Hepburn, Ltd.,
P.O. Box 47, Johannesburg.
"Green-Barb" windows.
R. Leggat (Pty.), Ltd.,
P.O. Box 116, Pretoria.
Concrete window frames and wood or pressed steel sashes.
Concrete door frames.
Mazista Slate Quarries, Ltd.,
Sprinz Avenue, Johannesburg.
Cills and shelves of polished slate.
Plastering Industries (Pty.), Ltd.,
P.O. Box 4637, Johannesburg.
"Woodcrete" floor tiles.
"Gypwite" interlocking ceiling panels.
Fredk, Sage & Co. (S.A.), Ltd.,
P.O. Box 777, Johannesburg.
Door latches of turnbuckle type.
Sand & Co., Ltd.,
P.O. Box 1377, Johannesburg.
Terrazzo sink, drainboard and splashback.
Superconcrete Pipes (S.A.), Ltd.,
P.O. Box 92, Roodepoort.
Asbestos cement eaves gutters and rain water pipes.
Asbestos cement trough-shaped interlocking ceiling panels and cover strips.
Asbestos cement door frames.
Asbestos cement polished wall tiles.
The Switchgear & Erection Co. (Pty.), Ltd.,
P.O. Box 770, Johannesburg.
Switch and fuse.
Transvaal Brickmakers' Association (Pty.), Ltd.,
P.O. Box 2800, Johannesburg.
Rebated bricks and quarry tiles used for shelf bearers.
Unilock (Pty.), Ltd.,
P.O. Box 1931, Johannesburg.
Reversible four-lever upright mortice locks and white metal furniture.
Universal Manufacturing Engineers (Pty.), Ltd.,
33, Frere Road, Bertrams, Johannesburg.
Cupboard locks.
Tower bolts.
Vereeniging Brick & Tile Co.,
P.O. Box 49, Vereeniging.
Glazed earthenware W.C. pan.

Empire Buildings, Johannesburg,
October, 1943.

For one year now we have missed these initials in the pages of the Record.

Reflection upon them must recall to many a friend, an acquaintance or even a teacher, but to some it is that of an unknown Editor.

An Editor, who, through a highly developed love of Profession and general disinterestedness infused into the Record—which reaches all corners of the Profession—a vital spirit of awareness, making it a forum for the contemporary, and hence a source of exploration and inspiration to those youthful and isolated pupils, to whom the monthly arrival of the Record offered new standards and ideals and a new and living truth in their profession, and who might otherwise have been left unaware of and unprepared for the impending great future.

In sincere gratitude the memory of Dr. Martienssen will live long as a criterion for every student of architecture.

OLIVER J. G. WILLS.

P R O F E S S I O N A L N O T E S A N D N E W S

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Perry, T. D. Modern Plywood. R672.

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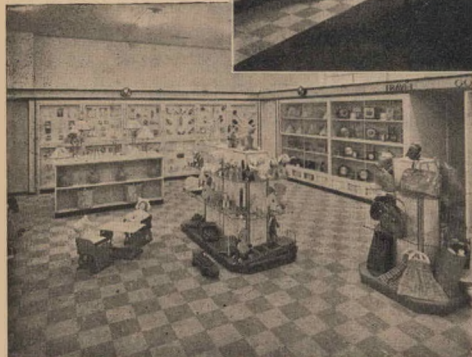
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