



Frontispiece:

Photograph of Model of Native Township for 20,000 Inhabitants.

Model by:

J. Reekie and A. Jenks

NATIVE HOUSING

A COLLECTIVE THESIS BY

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NATIVE HOUSING 1939

PREFACE

The problem of Native Housing in South Africa has been exercising the minds of local authorities for many years but it is only comparatively recently that these authorities have tackled the question seriously, and have carried out housing schemes on a large scale.

These schemes vary considerably in the different provinces. In some cases small family houses are being erected, in others tenement buildings for single men are employed, whilst in some instances natives are permitted to erect their own homes under supervision.

The latter scheme has produced some most interesting results notably at Bloemfontein and brought about a self respect and civic pride entirely lacking in those areas where the so-called "ideal" Municipal housing, referred to in this thesis, has been carried out.

But in none of these have really satisfactory results been attained, owing to the sub-economic conditions under which they have been built. The European population of South Africa, more particularly that in urban areas, is just beginning to realise that it owes a duty to the native and that given satisfactory living conditions and a healthy environment, he becomes an efficient and law abiding citizen. The authors of this work, inspired, as they say, by an address given to the Architectural Society of the University of the Witwatersrand, by Professor R.F.A. Hoernlé, have investigated the problem of Native Housing very systematically, and have not overlooked the sociological and psychological approaches to the subject.

Influenced by the most recent developments in town planning, they have appreciated the need for open spaces to create a healthy environment, for childrens' playgrounds, for ample provision for education

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and entertainment, and provided for these in their general layout.

The type of building they have proposed is the result of the fullest investigations into the economies of building and is more conducive to the development of a civic pride and healthy and hygienic living conditions than the depressing and shoddily built structures provided by Municipal authorities in many centres in the Union.

This thesis has been submitted by the authors as part of their work for the degree of Bachelor of Architecture and I welcome this opportunity of paying a tribute to them for the earnest manner in which they have carried out their investigations in a matter of such national importance.

It is the first of its kind to be submitted jointly and follows previous collaborative work in the advanced courses in planning and design at this University.

Work of this nature might well be extended to include research being done by other departments of the University in similar fields.

I feel sure that this thesis will be recognised as a valuable contribution to the literature dealing with Municipal and Native affairs and Bantu culture in South Africa.

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JOHANNESBURG.
October, 1939.

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INTRODUCTION

The papers and drawings collected here are the result of eighteen months collective work of five architectural students of the University of the Witwatersrand.

The work was started in July 1937 as a result of a lecture by Professor Hoernle in which he drew the attention of architectural students to the need for studying Native housing conditions. It was completed in February 1939 and presented as a thesis for the degree of Bachelor of Architecture to the University of the Witwatersrand.

The present edition is, for technical reasons, an exact replica of the original thesis as submitted to the University. It has not been possible, therefore, to make such changes as the authors might have desired, nor to adapt this academic study to the somewhat different requirements of a publication designed to reach a wider audience.

The authors would offer it, not as a perfect scheme to be seized upon and adopted by every Municipality (they are only too conscious of their limitations especially in those subjects that lie outside the normal scope of an architectural education), but rather as a demonstration of a certain approach to the problem. It is only hoped that some light has been thrown on the dark problem of Native Housing and that the effect in the end will be a small yet material contribution towards the improvement of housing conditions of the Native population of the South African cities.

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JOHANNESBURG.
October, 1939.

ERRATA.

1. Page 13, second line from bottom: "sections" should read "section ..."
2. Page 24, line 4, para. 2: "behavious" should read "behaviour."
3. Page 25, line 5, para. 2: spacing error between "this" and "labour ..."
4. Page 26, lines 4 and 5: "fundimental" should read "fundamental ..."
5. Page 29, line 21: "£113,000" should read "£73,000..."
6. Page 52, line 9, para. 3: "as with an examination as to what causes their particular modes and under what circumstances these are changed."
7. Page 60, line 4, para. 4: "reserved" should read "reserves..."
8. Page 61, line 14, para. 4: "prople" should read "people ..."
9. Page 63, line 3, para. 1: "discussed this class and its effects on the tribes."
10. Page 67, line 9, para. 1: spacing error between "is" and "partly ..."
11. Page 71, line 3, para. 1: "sowewimes" should read "sometimes ..."
12. Page 74, line 16, para. 1: "ffluence" should read "affluence"
13. Page 81, line 7, para. 3: "privelege" should read "privilege..."
14. Page 85, line 6, para. 2: "our" should read "out ..."
15. Page 98, line 16, para. 1: "unhealty" should read "unhealthy..!"
16. Page 119, fourth line from bottom: "Ville Radiense" should read "Ville Radieuse ..."
17. Page 120, line 11, para. 1: "rythem" should read "rhythm ..."
18. Page 122, line 7, para. 1: "strata" should read "stratum ..."
19. Page 139, tenth line from bottom: "tarrazzo" should read "terrazzo ..."
20. Page 142, line 4, para. 1: "fuition" should read "fruition."
21. Page 142, fifth line from bottom: "structional" should read "constructional ..."
22. Page 157, line 4, para. 1: beginning of sentence, "The" should read "They ..."
23. Page 175, line 8, para. 4: "illegitimate" should read "illegal..!"
24. Page 176, line 2, para. 6: delete redundant "m" between "a" and "month."

25. Page 183, line 18: "Grahan Ballenden" should read "Graham Ballenden ..."
26. Page 184, line 3, para. 6: "Native" should read "Natives ..."
27. Page 188, third line from bottom: "being" should read "is..."
28. Page 189, line 1, para. 3: "uauslly" should read "usually..."
29. Page 195, line 7, "20/- a ton" should read "20/- a cwt."
30. Page 206, twelfth line from bottom: "£96.000.000." should read "£96,000,000."
31. Page 254, "HARLEY" should read "HAILEY."

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S O C I O L O G I C A L A P P R O A C H

INTRODUCTION

Planning a town - that is, casting a mould in which to receive the future. The lives of men and women and children will be influenced, perhaps modelled, by the form which we prepare to-day; their lives to-morrow, and ten years hence, and the lives of generations that will live in half a century.

Confronted with such responsibility, the town-planner cannot be content with taking due notice of contours; nor with solving only the problems of drainage or aesthetics.

The town-planner must be scientist and prophet, engineer and moralist, sociologist and psychologist; advocate of hygiene as well as of art.

And since he cannot hope to be master of all subjects, his becomes the task of synthesis. Yet even as he has assimilated the guiding principles of so many different disciplines, and the first vague contours of a plastic solution arise in his mind, new and more fundamental doubts beset him.

Planning a town, in the year of grace 1938. The irony of it ! To plan in chaos, from chaos, to chaos infinite. Is it not self-delusion of pathological proportions to believe, that you can plan (and build) towns, plan for generations ahead, in a world so chaotic that not even the most elementary things are planned, where the very production of our daily bread is left to chance, where wheat is burned and coffee drowned, women are bombed and children starved ?

It would indeed be self-delusion to attempt planning, if this chaos was but chaos. But it is not. For there are laws in this madness, not man-made, nor man-controlled. These laws, producing with mathematical certainty those very phenomena - crises, wars, revolutions - which appear to the untrained eye as chance results of chaotic disorder - these laws are inherent in our system of

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society, and as such can be analysed and verified. Man's freedom, it has been said, is his understanding of necessity. The understanding of the laws of movement of our society gives us the freedom to plan. And only such understanding can justify the attempt.

The science concerned with the analysis of the underlying laws in the structure and evolution of societies is known as sociology. In its particular forms it comprises economic, political, legal and cultural studies, viewing all of these as different aspects of the general field of investigation. Sociology as a science has not yet reached the precision of physics, nor is it likely ever to do so, considering the enormous complexity of the problems dealt with. However, by establishing certain fundamental laws of general or historical validity and then minutely collecting all relevant data for a particular social problem, by then ordering and interpreting these data in terms of the established social laws of development, sociology makes possible forecasts of fair accuracy and considerable probability. Thus man is enabled to form a general conception of probable future development which transforms his planning from a game of hazard into purposive social activity.

It is obvious that laws of development, laws of social movement, cannot be discovered by analysing one phenomenon, without taking into account its manifold relations, active and passive, to other phenomena with which it is connected; nor can forecasts for the future be made otherwise than by studying the past, the historical process, thus arriving at an understanding of the forces which determine the tendencies of future development.

Sociology, then, if it is not to remain purely factual, and for that very reason academic and sterile, must be a study of inter-related social processes, isolating the object neither in time nor in space, more than is necessary and permissible, so as to make any specialised study possible.

If planning presupposes an understanding of the tendencies of social development because it is an activity directed towards the

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future as well as the present, then a sociological approach to town-planning is clearly the only one that can give such an understanding. It establishes the framework of the present and deduces from the inherent forces a conception of the future. To the town-planner is left the task of finding a solution that will satisfy both sets of conditions - if that be humanly possible.

To design an urban Native location for about 20,000 inhabitants may appear, on the surface of it, a straightforward enough task. Yet it is not without its complications, because it is concerned with a social group living under particularly unfavourable conditions. So much so, that the scope of the town-planner is restricted from the beginning to a very considerable degree. If not only the present but also the future is considered - and any such scheme, for economic reasons alone (as will be shown later) must be calculated for a life somewhere between 40 and 60 years - the very justified question will immediately arise: "Is it not extremely likely that the future, within the lifetime of any housing scheme, will see such a revolutionary change in the living conditions of this group - the Bantu - that no scheme designed to meet present-day requirements can be of any value in the relatively near future? And if that is so, why should any particular effort be made trying to synthesize two evidently irreconcilable sets of conditions?"

The sociologist approaching the problem of housing this urban Native community will then have to investigate not only the present social, political and economic status of that community insofar as it is relevant to the town-planning issue, but he will also have to answer, even if only tentatively, this question about the future validity of any solution that is practicable to-day. In order to do so it will be necessary to consider this particular problem sociologically, i.e., in its context in time and space. The 20,000 urban Natives who are to be housed can only be studied as part of the urbanised Native population of South Africa, this again only as part of the whole Bantu people. But the Bantu do not live in isolation, they live in and as part of the social body and economic system of the whole of South Africa. And the problems of this particular social body cannot be understood without reference to its own history and to the economic system of the world, Capitalism, of which it is an integral part. Any attempt

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to discuss this apparently so specialised and particular problem of housing 20,000 urban Natives somewhere near Johannesburg, in 1939, without showing how the problem and the solution are determined by the general social context, could only lead to an abstract treatment of the issue, devoid alike of social reality and historical significance.

These 20,000 urban Natives are not the core of the economic system of the world, so that by a close analysis of this core we could arrive at an understanding of the more general issues. They are just one amongst innumerable particular groups determined, in fact, created, by that capitalist system. Therefore, only the reverse procedure from the general to the particular, can be of any value in this study.

It is necessary first to gain a summary idea of the social and economic system in which we live and its tendencies of development, then to discuss, very broadly, the modifications which this system has undergone in South Africa, and to investigate how far the tendencies of development are affected by these modifications. From there must follow an analysis of the particular position taken by the Bantu population as a whole, and the urbanised Bantu in particular, in South African society of to-day, again with special reference to tendencies for the future. Then only will it be possible to investigate the bearing of all these contexts on the problem of planning a town for an urban Native population, and to investigate this specialised problem, of course, in considerably more detail than is possible with regard to the general background. Finally, it will be necessary to add to the results of the sociological analysis that moral postulate - itself again socially and historically determined - which alone gives justification to the work of the town-planner: the postulate namely, to establish under all circumstances a minimum standard of what, at the present stage of social development, can be considered as reasonably decent human living conditions. For it must be quite clear that if, for economic or political reasons, such a minimum standard cannot be established, the work of the town-planner is senseless and out of place. He will be wise to hand over his function, such as it

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could be under those circumstances, to his better-equipped competitor: the slum landlord.

ANALYSIS OF THE ECONOMIC SYSTEM

South Africa is part of the world economic system known as Capitalism.

The fundamental characteristic, which differentiates this system from all others, is the relation between capital and labour, brought about by the separation of the mass of the people from the means of production.

In the capitalist system the means of production, land, factories, machinery, are owned by one small section of the population (the capitalists), whilst the great majority of the people possess nothing but their ability to work. They become proletarians, forced to sell this ability, their labour power, to the capitalist. It is in the resulting "co-operation" that the means of production assume their character as capital.

For it is the characteristic of human labour that it produces more than it consumes. Now the necessary minimum of consumption goods needed to keep alive the individual worker and make possible the reproduction of the working class as a whole, is roughly indicated by the wages. Whatever is produced in excess of this minimum goes to the capitalist as surplus value, be it in the form of profit, rent or interest.

The capitalist mode of production is, by necessity, one of commodity production (See Appendix 1.) In this system, whenever it reaches its complete form, the labourer, too, must appear on the market as a commodity owner and seller, for this is the only type of social relation possible to this system.

However, the worker could not even sell his labour power, if it did not belong to him as his free and alienable property. In order to make the exchange of commodities possible, their owners

must confront each other as free property owners. And because the worker enters into the production process of capitalism as the owner and potential seller of a commodity, he too must be a free man and property owner, even if his property is but what he always carries with him, his ability to work.

Slavery or serfdom, and capitalism are not without affinities, yet mutually exclusive. For capitalism to come into existence, two classes must have first developed, one of which is in the possession of the means of production, whilst the other has no longer access to these means of production, notably the soil, and must bring its sole possession, labour-power, on to the market of commodity exchange. Only thus can capital gain command of unpaid labour and start on its spectacular career.

This career is characterised in its creative period by what is known as the "industrial revolution".

By the end of the 18th century science had advanced sufficiently to become applicable to industry. First, by improved water and wind-mills, driving the spindles of English factories, then by steam, finally by electricity, manufacture was transformed into machinery. Capitalism had grown up. In Britain the capitalist class was rapidly gaining in political power, whilst already dominating the economic life of the country. In France political power was conquered by the Bourgeoisie in the French Revolution. In 1825 the capitalist system had sufficiently matured to produce its first general crisis - a crisis of over-production (crise pléthorique, as Fourier called it), like all other capitalist crises that were to follow. Capitalism ruled the world - and its inner contradictions ruled capitalism:

The transition from simple co-operation and manufacture to large-scale industry and machinery marks a critical point in the history of capitalism. Early capitalism had created a social system of production - co-operation - within the framework of private property. The mass of the people, ceasing to be direct producers had lost the claim to the ownership of the product of

their work, and necessarily so, because no individual could in this process of co-operative production point to any one product leaving the workshop and say: "This is the result of my work, therefore it is mine own." So production had taken on a social, instead of an individual form. But instead of becoming directly social property it is appropriated by the owners of the means of production. The social product of one class, in capitalism, becomes the private property of the other. Against this property form of an already socialised, though not yet organised, production is directed the struggles of the proletariat. Here we have the inherent social contradiction in capitalism, which determines form and object of the class struggle in the capitalist system and constitutes its specifically social law of movement: from an unorganised, chaotic social production with private ownership of the means of production, and hence of the products, towards an organised, planned social production, with directly social ownership of the means of production and therefore directly social distribution of the products.

But the same technical progress which brings these social contradictions creates at the same time contradictions of an economic nature which become insoluble except by a change of the social system. Because this technical progress, working in a competitive economic system, must necessarily subject the whole economic life to its inherent laws of a falling rate of profit, on the one hand, and on the other an ever more rapid accumulation and concentration of capital, producing blindly and anarchally. The result is that production must be expanded on an ever-increasing scale without regard to demand. Crises of over-production, the most striking single feature of modern capitalism, become inevitable (see Appendix 2.)

During the 19th century the way out of those crises was by finding new markets. India and Africa became colonies, Japan and China were "opened" to civilisation. But in the beginning of the 20th century the division of the world was complete. It was impossible for the capitalist system to find new markets. The question was now only who would control these markets. No longer division,

but only re-division of the world was possible. The inevitability of crises had taken on the form of the inevitability of war.

The law of movement of capitalism, the double-faced law of the falling rate of profit and the ever more rapid accumulation of capital has produced the highest and last stage of capitalism - imperialism - the era in which we live. But the division of the globe amongst the great capitalist nations, and imperialist wars between them, are not the only characteristics of this latest phase.

Another characteristic of equal importance in this context is that export of capital becomes more important than export of consumption goods. This export of capital is caused, not only by the fact that owing to the rapid accumulation of capital it becomes more and more difficult to apply it at home, but more still by the lower wages prevalent in colonial countries. Capital exported to colonial countries, using coloured labour and less machinery, can produce a higher rate of profit and thereby help to prevent the average rate of profit, for the whole of the capitalist system, from declining too rapidly. That is why British capitalists have invested considerable portions of their capital in South African gold mines. Here lies the explanation for the existence and rapid growth of Johannesburg, here in the last resort the reason why the housing of urban Natives should occupy the minds of white people, who by rights are at home far to the north - but cannot help finding themselves living amidst this native population in Africa - since the law of the falling rate of profit so decrees.

By 1914 the division of the globe was complete, all markets absorbed within the orbit of capitalist production. Capital export had so expedited the growth of capitalism in the colonial countries that they became serious rivals of the old countries. International monopolies and trusts had driven the concentration of capital to extreme and the velocity of capital accumulation was such that a general crisis had become inevitable. But the political storm broke before the economic cycle had reached its crisis-point. The world war ushered in the final crisis of capitalism, final because there is no general solution, not even temporary, for this crisis within the framework of the capitalist

system. All that is possible is the temporary prosperity of one part of this system at the expense of the other, a possibility which makes further wars inevitable. Thus we find ourselves in a state of "crisis in permanence", a state in which all the social and economic contradictions of the system are coming to a head, driving towards a revolutionary solution. Yet such is the power of resistance of a ruling system with all the economic weapons at its disposal against a forcible political solution of its own inherent contradictions, that this final crisis may still last for years and decades.

If it already appeared a doubtful and difficult undertaking to plan in a chaotic society, how much more so, to plan in a state of crisis with a view to a continuation of this crisis, to plan, that is, in and for chaos multiplied ? ! Yet that is the position that must be faced.

And even this analysis does not exhaust the difficulties in the way of such an attempt under special South African conditions. For these bring in still further complications, economic, social and political which must be taken into account before it becomes possible to understand the particular status of an urban Native community in the era of the final capitalist - imperialist crisis.

SOUTH AFRICAN MODIFICATIONS

The history of early European settlement in South Africa is the history of two conflicting colonial ideologies: colonies as outposts, markets and strongholds of capitalism, or colonisation as a refuge from capitalism.

The first Dutch colony in the Cape was intended as an outpost of early Dutch capitalism, as a half-way house to the East. But soon there grew up a population with a strong anti-capitalist bias, people who saw in this colony, with its moderate climate, a refuge from capitalism. Imbued with a strong feeling of

freedom, coupled with a romanticism directed (as all romanticism) towards the past, these Dutch settlers might have succeeded in the formation of a really free peasant-republic, but for the presence of a Native population. For here was a temptation too strong to be resisted. Religious contempt for the "Children of Ham", combined with lingering ideas of the blessing of a serf-population in feudalism to supply the ideological cloak to their system of exploitation of the Native population. This system was modelled on feudal rather than capitalist lines, more in keeping with the actual situation in which conquest, not economics, had forced the Native population into the role of serfs rather than free labourers. It is most important for an understanding of present-day political and social forces in South Africa to realise that the anti-capitalist attitude of the original Dutch farmer, and of his Afrikaans descendant to-day, was and is a "back to the good old days" (i.e. of feudalism) feeling, a politically and socially reactionary attitude which has nothing whatever in common with the forward urge of an anti-capitalist proletariat.

As capitalism developed and England took the lead from the Netherlands, the Cape became increasingly important to the English. Their annexation of the Cape Colony slowly but surely pressed the earlier Dutch settlers northwards, where they finally formed their two new republics, the Orange Free State and the South African Republic, in which their semi-feudal farming system found its clearest and most definite expression.

This was the position in the middle of the 19th century. The whole of the coast and fairly far inland, in the possession of the English. An outpost of British capitalism, mainly of importance because of its position on the sea route to East India, but also constituting a fairly profitable market for British goods. And since, at that time, there was no serious competitor to British commerce, there was no reason why any money or lives should be expended in order to subjugate some farmer republics or Native tribes who would buy British in any case. Moreover, since no capital was, as yet, invested in this part of the world, the only interest of the capitalist at home was to see the buying power of his African

customers increased. Hence the progressive Native policy of the Cape Parliament which gave to the Native both in the political and the economic sphere a status that looked very nearly like equality. Hence also the deeply ingrained suspicion shown by the Dutch farmers of anything approaching this British type of "liberalism" which went so strongly against their own mode of production, based on the Native in his role as human beast of burden, not as potential customer.

Thus things might have remained, but for the discovery of diamonds and gold. And once valuable raw materials are discovered, political ownership of the country is the only guarantee to the capitalist that his profit will not be pocketed by others. Moreover, the exploitation of sources of raw material, particularly in the case of mining, requires considerable capital investment on the spot. And capital always longs for the protection of that government which it governs. For therein lies the only safeguard for investment.

The history inaugurated by the discovery of diamonds and, more particularly, gold, culminating in the crisis of the Boer War, and coming to a happy end in the formation of the Union, needs no recounting. From it emerged present-day capitalist South Africa, as far removed from the semi-feudal Boer Republics as it is from Cape liberalism.

Three factors are of paramount importance in this capitalist sub-continent. Firstly, the production of gold which has concentrated the whole economic life in one small area and has given to this whole life its peculiar, parasitical character. The second factor is due to the successive colonisation of South Africa by two distinct nations of different language, different cultural and religious traditions and different ideologies evolved in and traceable to the different historical periods in which they started on their colonising careers. This second factor is the national-cultural group antagonism between the Afrikaans and the English sections of the population. The third factor, finally, is the racial problem of Black and White. The racial differences are so marked, the gap in cultural level so considerable, the psychological tension between the smaller body of conquerors and

the greater mass of subjected people so intense, that a solution by mixture is impracticable for generations to come, regardless of whether or not there are any objections of final or absolute validity against such a solution. Here the group antagonism is marked by a fear complex of the white master-population, due to its smaller number (there are about $6\frac{1}{2}$ million Bantu to 2 million white inhabitants in South Africa, and to the North looms the "Black Continent"), and by resentment of the Bantu population against an aggressive white civilisation which has taken their land and undermined their tribal life but refuses to let them partake of the fruits of this civilisation.

These last two factors of group and racial antagonisms would not, within an analysis of the social and economic forces, play the prominent role they do, if it were not for the fact that these three distinct groups have become very largely identified with the three main economic classes of the country. The English have almost a monopoly on gold and diamond production, as well as most of the other industries. They constitute the class of industrial capitalists, including the non-proletarian staff, middle-men, bankers etc., commanded by and dependent on this class. The Afrikaans constitute essentially the farmer class, producing on half-capitalist, half-feudal lines, but in any case producing by means of the exploitation of foreign labour. This farmer-class is therefore essentially different from the small peasant class of Europe. The outlook of this class is capitalist, even where its immediate interests may clash with those of the industrial capitalists, with whom he is in the end united in his relation to the working class, whether industrial or agricultural. This proletariat is constituted almost entirely by the Bantu population. An intermediate position is taken by the small European class of skilled workers, whose class-consciousness is obscured by the race-antagonism, and frequently obliterated by their relatively high standard of living. This may be due, in some extreme cases, to a participation in the profits of the capitalist allowed precisely in order to prevent working class unity. As a rule, however, it is just due to the fact that the abnormally high surplus profit derived from the cheap Native labour makes it possible

for the capitalist to reduce his rate of profit somewhat where skilled white labour is concerned, thus establishing a white against black front for the social struggle, instead of proletariat against capitalists. The state of the South African Labour movement goes to prove that the "sacrifice" was well worth while. Instead of giving a lead to the workers, the white labour aristocracy of South Africa, at best, follows the lead of the capitalists.

In the interstices between the three main groups of the economic structure of South Africa we find still a fourth one, the de-classed farmer elements, in the process of proletarianisation, drifting into the towns. This is a phenomenon found in all early capitalist societies, and the difficulties of readjustment in the transition from one class into the other constitutes a major social problem at the best of times. In South Africa the problem of this class - commonly referred to as the "poor whites" - is far more complicated.. For these people come as unskilled workers into an industrial system in which unskilled labour is paid for at "uncivilised" rates on which they cannot live. At the same time there is nothing like the rapid industrialisation of early capitalism which allowed for the training and absorption of such masses in the process of building up new industries. To raise the standard of living of all unskilled labour, without regard to colour, would appear the natural direction for a solution. But it is the tragedy of the poor white section that, coming from the most reactionary stratum of the population, they cannot even conceive of a common struggle with the Native labourer for a better life, but see in the Native only the competitor who is responsible for his present plight. A common struggle would appear possible to these colour-blinded white workers only by sinking to the level of the black worker, instead of consisting in the rise of the black worker to that of the white, and thence in a common rise until the whole class of the unskilled labourers has come into its own. (In England the ratio of wages for skilled and unskilled labour is about 1.4 : 1, in South Africa about 6 : 1). Thus, this poor white sections falls an easy prey to nationalist propaganda and government quackery, and

helps to prevent from arising those very conditions which could bring its only salvation.

It has been shown that there is a certain national-cultural antagonism between the Afrikaans and English sections of the population of South Africa. This antagonism is reinforced by the parallelism of economic group formation. At the same time the jealousy that always prevails between different sections of the capitalist class about the distribution of the spoils, can conveniently throw the cloak of national sentiment over the skeleton of unsatisfied greed. And since it is undoubtedly the English gold-mining section of the capitalist class that is working the richer field, it must be the Afrikaans farmer section that plays the nationalist trombone, pointing at the same time to the Afrikaans poor white as proof of their own poverty - due to imperialist exploitation.

And yet the antagonism is harmoniously resolved in "Fusion". This is essentially a fusion on the basis of common interest: the exploitation of cheap black labour. The discrepancy of profits is admitted and is rectified by mutual consent. About a third of the total profits of the gold-mines is taxed away, and goes by means of direct assistance and export subsidies to the other partner of fusion, the Afrikaans farmer class. The bargain was for a time satisfactory to both sides. In the meantime, however, the farming section feels that the other side is still pocketing too much, and must be fleeced a bit more. The lever of political pressure are the votes of the poor whites. Hence intensive anti-black, anti-imperialist, anti-Jewish nationalist propaganda. All that can come of this is a new fusion, with still increased power of the farmer section and correspondingly increased fleecing of the mine-owners for the benefit of the landowners. Exploitation of the Bantu proletariat is the common platform on which the two warring sections of South Africa's capitalist class must inevitably meet. And the poor white will remain in the cold - with a Labour canvasser offering him the ice-chest of a "complete segregation" policy.

Thus we see 7½ million Bantu, Coloured and Asiatics, and added to this even hundreds of thousands of Europeans, members of the glorious ruling race, live in abject poverty. And why? The "Official Year Book of the Union of South Africa" lifts the veil from the secret: because South Africa, except for minerals, is a poor country. This general statement about the poverty of South Africa may or may not be correct. The exception made for minerals certainly is correct. And this does not only apply to gold, though here alone there lies an enormous source of wealth which does not benefit the bulk of the population. (If we take the most extreme rise of profit, that between 1930 and 1934, we find an increase in profit per ounce of gold mined - the amount of gold mined increased only by about 7% - of 135%. To this corresponds a rise in the average earnings of the European mine workers and employees of 1.6%, and a drop in the average gross wages of the non-European mine-workers of 1.6%. In the same period the standard index figures (retail) fell by 8%. Yet the remaining discrepancy of 135% rise in profit to an increase in real wages of between 6% and 10% is still quite enough to illustrate the point !)

But gold is by no means the only wealth of South Africa. It has abundant deposits of coal, iron, copper, chromium, manganese, platinum, asbestos, etc. In fact, South Africa has all the prerequisites for an industrial country, except the inner market. This can only be created by either a rapid rise in the standard of living of the Native population, or by a mass-immigration of Europeans. The best way would appear to be a carefully balanced application of both methods. Only in such an industrialisation lies the chance of making of potentially rich, but actually poverty-stricken, South Africa a country in which all working people can live and partake of the fruits of their labour.

However, it has been shown in the earlier analysis of the capitalist system that its famous "wealth of nations" is identical with the poverty of the people. The same applies, with the greater intensity found in colonial countries, to

16.

South Africa. Industrialisation could solve South Africa's poverty problem at least to the extent to which this problem is capable of solution within the capitalist system, i.e., it could raise the standard of living of the Bantu and poor white proletariat to that of the better developed capitalist countries, at least to the level of England, perhaps to that of Canada or Australia. But that is a purely theoretical possibility, in striking contrast to the actual laws of movement of the South African sector of capitalism which hold no promise of any such development.

The Bantu themselves, disfranchised, under restrictive legislation which will be discussed later at greater length, deprived of all effective liberty of concerted action, uneducated and still suffering from the mentality of their own stagnant social and economic system, do not and will not count as a political force for a considerable time. Of the Europeans, the Afrikaans farmer section, wielding most of the political power, are violently opposed to any industrialisation. They see that it would quickly deprive them of their cheap black labour and give them in exchange an inner market which they do not need nor care for. After all, in their capacity as government they can subsidise from gold mine taxation the export of their products, which is an easier and more profitable way of disposing of them than a hazardous inner market. Still more opposed is this class to any mass immigration. For all immigration to South Africa is English speaking and tends therefore to weaken the political influence of the Afrikaans section, and may, if allowed on a large scale, even threaten its national-cultural identity. But in the preservation of this identity and the relative voting strength of the Afrikaans section lies their only means of striking and preserving the bargain with the mining magnates - always with the threat of a "national revolution" in the background - by which alone the farmer section can get its share of the golden eggs. Then there is the class of gold-mining capitalists. They too are opposed to raising the standard of living of the Bantu. For that would reduce their profits without giving them anything in return. For the gold industry has no use for an inner market.

The argument of the mining houses, that to raise non-European wages even a trifle, would render gold-production unprofitable, is of course so much eyewash. In 1937 the gold mines spent about £16,000,000 in wages and salaries to Europeans, and about £15,000,000 in wages, housing and feeding of Natives. In the same year the profit shown was £31,000,000 (of which about one-third went later in taxes to the government). The rate of surplus value produced by all workers, including highly-paid officials etc. was therefore just 100%. It can be safely said that the rate of exploitation of the 300,000 Natives who receive somewhat less than the 40,000 Europeans is considerably higher than that of the Europeans, i.e., that they are responsible for most of the £31,000,000 profit. To raise their wages, within certain limits, would therefore definitely not render the industry unprofitable. It might, however, beyond these limits, make a greater mechanisation of production the more profitable alternative and therefore result in the dismissal of a considerable number of Natives. But these considerations are of no practical importance as long as there are no economic, social and political forces capable of bringing about such a rise in Native wages.

Nor has this mining section any reason to press for an immigration which would do them no good, even if no harm, but would greatly antagonise the fusion partner. There remains the class of European workers. They too are opposed to immigration, even if they do not make this opposition into a major election platform. They fear competition and a threat to their carefully built-up privileged position. They would not be opposed to higher wages for unskilled labour, but violently fight against any intrusion of the black worker into the skilled trades. The fear of the black menace, if once the Native population was allowed to start rising, this fear born of a bad conscience animates them as much as the farmer and mining magnate. This common fear, against which white mass immigration would be the only psychological remedy, effectively overcomes the class differences.

There remain the famous liberal elements in the country. Their existence is not accidental. They too represent an economic class, the class of small industrialists and merchants. This class is obviously interested in a general raising of the standard of living, for the corresponding expansion of the inner market would increase the amount of their profit tenfold, and make more than good for the small drop in the rate of profit which they themselves would suffer. But this class is numerically small and politically almost as effectively paralysed as the Bantu themselves by the fact that a very considerable proportion of their members are Jews - who in these times of increasing difficulty for the Jewish people of the world, and of South Africa, cannot afford to shout their political convictions from the roof-tops. Just one more example of the fatal effect, for South Africa, of the parallelism between economic, and racial or cultural-national group foundations.

There are then, in South Africa, no internal forces at work which are sufficiently strong to bring about any radical change, politically, socially, or economically. The present state of equilibrium, unstable as it may appear, has as much stability as is possible for any political and social formation in this final crisis of capitalism. For the relative stability of the South African economic system in itself - even if we allow for the possibility of major distributive adjustments between the different sections of the capitalist class - must not blind us to the critical instability of the system as a whole, of which South Africa is only a part.

If the crisis of capitalism enters once again into an acute stage - war and revolution - (as it is likely to do in the near future), the fate of South Africa will no longer be determined by its inner forces, but will be violently modelled from without. What the results of such a final stage of the capitalist crisis will be, whether a world of socialism, or just destruction and chaos, nobody can foresee. To plan for the world, or for South Africa, as it may be after such a violent change is not possible.

Therefore, once the comparative stability of the South African social and economic system has been shown, this system as it is, with its overwhelming strength of conservative, and its weak, if valiant, opposition of liberal and revolutionary forces, must be taken as the solid foundation on which to base a plan for the future.

It remains to analyse in more detail what exactly the political, economic and social position of the Bantu, and the urbanised Bantu in particular, is within this moderately stable system.

THE POSITION OF THE BANTU IN SOUTH AFRICA

(a) Economic position

The development of capitalism in South Africa was different from the corresponding process in Europe, mainly because the conquering Europeans could not "free" the Native tribes of all their land without either forcing them to emigrate to the North, thus depriving the potential capitalist of all cheap labour, or creating a proletariat far exceeding the demand and constituting an insoluble social problem.

The policy evolved to meet this difficulty, in the economic, social and political field alike, is both cynical and ingenious. It has long acquired official recognition, by government and the non-thinking sections of the European population alike, and has been christened the "policy of segregation", which is a good word for a bad practice.

It has been described as the "policy of having it both ways", and is aptly characterised by L. P. Mair ("Native Policies in Africa") thus:

"The Native is to be 'segregated' from the European sufficiently to prevent his stealing stock, but not enough to prevent his 'coming out to work'.... The Native is to 'progress' far

enough to want to buy European goods, but not far enough to have ideas about parliamentary representation. He is to have enough land to save him from destitution, lest he should be driven to crime as a means of livelihood, but not so much that he has no need to 'work'..."

So the Natives were given "reserves" in which they could continue to lead their tribal life. In a number of Acts of Parliament they were deprived of the right to buy land from Europeans, except in a number of released areas. Again and again these released areas were restricted, so that to-day the Bantu population, constituting about 70% of the total population, occupy about 15% of the total land area of the Union.

Naturally, the Native reserves are grossly over-populated compared with the other rural districts of the Union. This, combined with the over-stocking due to the conservative, unproductive cattle economy of Bantu tradition, should have generated sufficient pressure to drive a certain percentage of male labourers out to the mines for temporary work, whilst making it necessary for a considerable number of Native families to live on European farms and supply the farmer with cheap labour. In fact, almost as many natives still live on European farms as in the reserves.

However, so strong were the tribal traditions, so great the value put on leisure, so foreign to all native conceptions the idea of going out to work, that a more forceful method had to be devised. Unfortunately, the colourful methods of early capitalism were found to be rather out-of-date in the enlightened age of universal freedom. A good alternative was found in the poll tax. The reserves gave no possibility of cash earnings. The tax had to be paid in cash. The lever with which to throw cheap labour on to the market was found.

The result of this development was to create three fairly distinct economic groups within the Bantu population. The first comprises the tribal Natives living in the reserves and supplying the mines with the bulk of the temporary workers recruited for periods of

not less than 10 - 11 months (270 shifts). The second group consists of the Native families living on European farms. The third are the urban Natives, families living permanently in the locations as well as temporary workers. From both the first and the second group there has developed during recent years a constant trend of fluctuation into the third group.

Whilst it is one of the main tenets of the segregationist gospel to preserve tribal life, the constant absence of a considerable percentage of the young male population cannot fail to undermine tribalism. At the same time the surplus of money earnings over expenses, poll tax etc., of the mine workers brings money economy back into the kraal and tends to upset the traditional cattle system. Lastly, the towns, low as the standard of living may be there, offer great attractions. Once a certain section of the Native population has become urbanised, a drift to the towns without any "encouragement" by the poll tax device becomes inevitable. To-day this is said to constitute the major problem of Native economy.

By far the worst off are the Native families living on European farms. Until recently a considerable number of them lived there only as squatters, but that system has been practically abolished and legislation passed under which the head of each Native family living on a European farm must give at least 90 days of labour per annum to the farmer. Here we have a virtual reversion to serfdom. The annual cash earnings vary between £6 - £12, with payment in kind of probably slightly higher value. "The crux of the whole problem of agriculture in South Africa.....is that the Native population is unwilling to work for the wages which the European is willing to pay. Somebody must therefore be constrained, and the principle of freedom of contract precludes putting the screw on the employer". (L. P. Mair, op. cit. P.31). No wonder there is a constant flux of Natives from the farms into urban areas and that the farming class is clamouring for restricting still further the already very limited freedom of movement of rural Natives.

The last group finally are the urban Natives, urbanised to a greater or lesser degree. A considerable number work as house boys and return periodically to the reserves. Yet with these, who have tasted town life the tendency to return to the towns is much more marked than, for instance, the tendency of the mine-Natives to return to the mines, (unless forced to do so in order to pay the poll tax).

Apart from domestic service, male Natives work in the towns as unskilled labourers in industry and public and municipal services, as office and messenger boys, as garage attendants and car drivers, as teachers, agents, artisans, etc., within their own locations. The women do charring, washing, etc., and enter, to a lesser degree, into domestic service.

All avenues to skilled work are strictly barred. Only the trader or artisan in the location can hope to rise above the level given by the current unskilled wage rate. The average weekly rate for unskilled Native workers in trade and industry was in 1936 on the Witwatersrand 18s. 8d., as against 24s. 7d. in the Cape Peninsula. For getting an idea of yearly wages, the fact that work is not always continuous, must be taken into account. An annual average will be rather nearer to £40 than to the £52 which would result by taking the weekly rates as a net basis. In industries there exists a minimum wage for unskilled, mainly Native, labour, varying from 20s. to 27s. 6d. a week. But only in Bloemfontein is there a general minimum wage for all unskilled labour (20s.) South African Railways and Harbours, on the other hand, paid 16s. 3d. a week in 1936-37.

If the urban Native population were more or less stationary, an improvement in these wage rates could be confidently anticipated. But the constant influx from reserves and farms is sufficient to keep the wages at their present low level. Moreover, the Natives of the Union are not the only reserve, otherwise the colossal demand of the mines would have led to an appreciation of wages at least during the last boom years. But a great number of Native labourers are annually imported from Portuguese East Africa

(max. 90,000). And since 1935 the ban on the import of tropical Natives was broken with a permission to introduce, as an "experiment", 3,000 Natives from Nyasaland. The number was increased to 5,000 in 1936, to 10,000 July 1937, and in November 1937 authority was given to recruit tropical Natives to an unlimited number.

Considering that a rise of the standard of living of the Native population, particularly the urban section, cannot be expected from political agencies, such a change could only result from economic forces, i.e., the law of supply and demand. Yet as long as the reservoirs of the North are open to the mines there is little chance for such an improvement. On the contrary, there still remain the social and political factors working against the Natives, restricting their freedom of movement, barring them largely from education and thus preventing them from making the best use even of the scanty opportunities which the economic system offers them.

(b) Social position

The social position of the Bantu in South Africa is best characterised by what is commonly known as the colour bar. That is the social reality behind the theory of segregation. It becomes necessary therefore to look somewhat closely at this policy of segregation. It is based on a number of assumptions:

1. Europeans and Bantu are fundamentally, i.e., biologically, different - not only living on different levels of historical development.
2. Therefore the Bantu are unassimilable to European civilisation. They can only ape it, losing their identity in the process, but not really gaining anything in exchange.
3. Miscegenation, which might be suggested as a solution, is
 - (a) an evil in itself and an abomination unto the Lord, and
 - (b) in any case repulsive to black and white alike.

The conclusions drawn from these assumptions are manifold and not

all equally logical. It is argued that the natural expression for the biological differentiation is segregation in space. Let the Bantu and the Europeans live in separate areas and as far as possible from one another. So why this should be the inevitable consequence of a biological difference remains enigmatic. Furthermore, the Bantu must develop on their own lines. The vernacular is to be used in schools, and education is to be adapted to the needs of the kraal. In government affairs "the wholly unsound principle of fiscal segregation" appears "in all its naked repulsiveness" (E. H. Brookes: *Colour Problems of South Africa*, page 9). Only so much is to be spent on the Native section of the population as they contribute to Union revenue by direct taxation.

As to miscegenation, the stipulated natural abhorrence between the two races makes it necessary to deter potential martyrs from mortifying the flesh in carnal intercourse with the repulsive other race by imposing savage penalties on such saintly behaviour.

In the towns, where the Natives actually should not be according to the zealots of segregation, they must not use trams and 'buses used by Europeans, they are segregated in locations, segregated in restaurants and shops, segregated in trains and bioscopes, in fact, segregated everywhere except in work.

It is precisely in relation to work that segregation breaks down most blatantly and shows up its whole farcical nature. For in order to make segregation effective, the segregation in work would be the first condition. Because it is essentially the processes and social relations and conditions of work, of production, which model the outlook on life and are at the bottom of every particular civilisation. The Bantu, working in European capitalist working conditions and processes, is bound to be more assimilated by that than any amount of after hours segregation can "make good" again. Yet the whole economic system of South Africa is based on native labour. According to the official Year Book of the Union of South Africa for 1938, "...it is generally admitted that the prosperity of South African trade and industry depends to a very great extent on an adequate supply of relatively cheap, unskilled, non-European labour". (Page 306). The policy of segregation,

logically pursued, would cut off that supply. As a way out, it is being pursued illogically, as the policy of having it both ways. But as such it is continually creating the conditions for its own failure. For it makes the assimilation, which it sets out to prevent, inevitable. Thus one cannot help but agree with Edgar H. Brookes, who writes: "To treat as an inassimilable minority a majority which is being subjected daily to the strongest influences of assimilation is to refuse to recognise facts" (Page 27), and then again: "Any scheme of segregation considerable enough to affect vitally South Africa's political, economic and social life is impossible" (Page 70).

The explanation for the adoption of this self-contradictory policy lies in the relation of the economic structure of South Africa to the social and political structure of the imperialist world generally. The ruling classes of South Africa want cheap black labour. For this labour to remain cheap, its bearers must remain backward, ignorant, unskilled, untrained, in a word, primitive. But they do not want to remain so. Once they have come into contact with European civilisation, they cannot stay content to help producing its fruits. They want to partake of them. The ruling classes, in their own economic interests, must prevent such an advance. But in trying to do so, they must walk warily. For modern imperialism has developed such notions as "trusteeship for the subject races", mandates, priority of Native interest, etc. These ideas were the necessary outcome of the struggles between the different imperialist powers, in which moral principles had to cloak economic interests, if the masses were to be at all interested in the defence of these interests. But the dangerous thing about ideas is, that once born, they take on life of their own and react on the economic and social factors from which they sprang. So it happened that modern imperialism erected a barrier against straightforward exploitation of the old kind. Even if these ideas did not sink too deeply into the minds of the European population of the Union, their power, both at home and in influences from abroad was sufficient to force the masquerade - not without some minor beneficial results to the Bantu population - known as segregation policy. The pursuance of purely economic aims had to be dressed up as the care for the best interests of the Bantu population.

Only when it comes to the essential test of giving land to implement segregation does the farmer class, least tainted with modern ideas, drop all pretence, and refuses point-blank to fulfil the promises made by different acts of parliament. On this fundamental issue, "all is lost", as E. H. Brookes comments bitterly, "even hypocrisy".

So it is mainly the purely negative side of segregation, the colour bar, that is actually put into practice. It acts as a social, rather than a purely economic, force. Thus there is no law forbidding Natives to practice skilled trades. There is an Apprenticeship Act which demands for every apprentice a minimum educational standard, which the lack of educational facilities makes it practically impossible for any Native to achieve. In other occupations again the Native can get everything except the certificate of competency from which he is legally debarred. The reason given in these cases is that no authority should be given to a Native over a European, because, and here we see the force of social prejudice, no European would allow such authority to be exercised, consequently the law might be broken and work hindered (Nat. Econ. Com. Rep., par. 844).

Thus we find the Native not only the economically exploited, but also the socially despised class, much in contrast to the hero-worship of the working man which has become fashionable overseas as a blind to economically repressive legislation. At the same time this social superiority is declared to be based on the natural and immutable superiority of the race, for which nothing better can be done than to allow and encourage it to develop on its own lines, thus perpetuating the social inequality with the desirable economic results.

It is in the sphere of education and social services that this policy, especially on the part of the government, and the attitude of the Natives themselves towards it, is most clearly shown.

The attitude of the government to Native education, and to social services for Natives generally, is governed by the prin-

ciple of "fiscal segregation". Friends of the Native population, in referring to this principle, point out the vicious circle: "That the Native, being unskilled, earns a very low wage. Therefore, his contribution to the national income is equally low. Therefore, as long as the principle of fiscal segregation is adhered to, he cannot get those educational facilities, which alone would raise his skill, thereby his wages, thereby his contribution to the national income". That may be good propaganda against fiscal segregation. But unfortunately the truth, revealed by the analysis of the economic system, is harsher still. Because the Native worker contributes too much, in fact, most, of the national income, his wages are so low as they are. For national income can only mean one of two things: it either means the total of values produced by a nation; then the overwhelming contribution of the working class - in South Africa of the Bantu - is immediately clear; or it refers to government income, which is made up partly of direct or indirect taxation of the workers, and partly, usually for the greater part, of taxation on high incomes. But the bulk of the latter are nothing but the profits derived from the surplus value which the workers produce. So here again, the most exploited class contributes most to the national income - true to the axiom that in a capitalist society national wealth and poverty of the people are only two aspects of the same thing. To argue that the contribution of the Natives in South Africa is given by their contribution to direct taxation is therefore completely devoid of all sense.

Nor is there any justification for the principle of spending on social services for one section of the population only as much as this section contributes to Union Revenue. However, if this unprecedented and ridiculous idea is to be made the basis for a budget, the real contribution of the Natives should be taken into account.

The budget of 1936-37 showed revenue of ca. £43,000,000. Half of the corresponding expenditure was on items from the benefit of which the Natives are definitely excluded (i.e., Pensions, Assistance to Farmers, Land and Agriculture, Export Subsidies, Child Welfare, Unemployment, etc., Subsidy to Provinces - except for sums going

to Native Education - Higher Education and Surplus). The Native population can, therefore, under the principle of fiscal segregation, not be expected to contribute to these items of expenditure. On the other hand, they ought to pay completely for "Native Affairs" and government grant to Native education, a total of £844,563, and a certain percentage, in relation to their low income, of the remaining general expenditure, say 20%. That would bring the total government expenditure that could reasonably be charged to the Native population to round about £5,000,000. As against this stand their contributions to Union revenue in the same year, 1936-37 (for details see Appendix 3).

Native taxes	min. £771,524	max. £771,524
Customs, Excise, Pass Fees, etc.	min. £1,500,000 ca.	max. £1,500,000 ca.
Contribution to Gold Mining profits, appearing as Income Tax, etc.	min. £5,000,000 ca.	max. £8,800,000 ca.
Similar contribution to other Income Tax of industries and miscellaneous.	min. £1,000,000 ca.	max. £2,000,000 ca.
TOTAL	min. £8,271,524 ca.	max. £13,071,524 ca.

It is thus shown that the contribution of the Native section of the population in 1936-37 subsidised services which were of benefit only to the European section to the extent of anything between £3,000,000 and £8,000,000. That is the true picture which would result from an analysis of fiscal segregation. But the government prefers to leave out of account all the indirect contributions from, as well as the indirect services to the Native population, and concentrate only on the direct Native taxation on the one hand, and direct "Native

Affairs" on the other. With regard to education, the most important item, this procedure leads to far from satisfactory results.

While primary education is free to European children, Natives must pay for it. And even if the sums appear very small to us, they are considerable for an already unbalanced Native budget. The state aid to Native education is kept as near as possible to the direct Native revenue made available to the provinces who are responsible for primary education. Thus in 1936-37 the expenditure of all provinces together on Native education was £737,376, whilst the contribution from the Native Development Fund to these combined budgets for purposes of Native education was £727,255. Of course, the Native Development Fund gets a fixed annual grant of £340,000 out of so-called general Union revenue, which sum is included in the above contribution to provincial revenues. But when it is remembered that the general Native tax brought to Union revenue in 1936-37 £771,524 (that is after the percentage which goes directly to the Native Development Fund has been subtracted) and that the expenditure on "Native Affairs" which is to be covered out of the Native tax amounted to only £504,563, we see that the actual contribution out of general revenue to Native education is only ca. £113,000, and that of the provinces ca. £10,000. There were ca. 360,000 Native children in state and state-aided schools in the year to which the figures apply. Mission schools continue therefore to play a considerable role in supplementing the completely inadequate government system.

The Bantu themselves, and particularly the urbanised section, are prepared to make every sacrifice to enable their children to go to school. Their belief in the value of knowledge is implicit and not riddled with doubt and scepticism as that of their European masters. But the schools rarely give more than rudiments of reading, writing and simple sums. Yet the number of Natives who work strenuously and against the heaviest odds to continue their education by reading is amazing. Almost all of them become prolific letter-writers.

As to higher education, matters are worse still. Firstly, there are no outlets to the educated Native. He can only become a teacher or a clergyman, and earn in that capacity much less than if he were a lorry-driver. There would be a considerable demand for Native doctors, but the difficulties are almost insuperable. The "Native University" of Fort Hare, the only institution of its kind, leads up to a standard where a study at one of the European Universities could start. And some of these Universities have indeed enough of that spirit of academic freedom and liberalism not to close their gates to such students. But social prejudice has so far not allowed for these medical aspirants to get their practical training in any of the hospitals, not even the Native hospitals. Thus they are effectively prevented from completing their studies in South Africa, and a study in England or America remains as the only, and for economic reasons highly theoretical, alternative. Thus the intensity of the social convention and prejudice puts obstacles in the way of Native education and advance, even where there is no directly economic motif for such an attitude.

But the repressive tendency becomes most apparent in the ever-increasing propaganda - mainly by government spokesmen - for a complete change in the type of education. The vernacular is to replace English as the medium of instruction, and the instruction itself is to be such that it furthers the development on the lines of Bantu culture (whatever that may be), and is adapted to the needs of tribal life. In fact, education is to stop the process of detribalisation, brought about by the intrusion of European economy. Truly, their left hand does not know what their right hand does !

Apart from the fact that such a policy is utterly impractical, it is, from the point of view of the Bantu, highly reactionary. English is not only the language which they need as an economic weapon, it is also the bond by which they can overcome their Babel of different languages and become a uniform political body, which is, of course, precisely the prospect which this tendency toward true "Bantu in the kraal" education wants to forestall. The Natives are therefore resolutely opposed to

any such change. They realise that they have started on a march which knows no retreat. They must go on or perish. And with a vitality which contrasts with the fatalism of many other races subjected by capitalism during the last 400 years, they are determined to go forward. Education is their weapon, and to acquire it they are prepared to starve - or steal.

(c) Political position

The economically and socially inferior position of the Bantu within the social structure of South Africa could not but find its expression in political inequality. The postulate of political and social inequality was definitely laid down by law in the two Boer Republics. In the Cape, on the other hand, the Natives enjoyed a great measure of theoretical and even some practical equality, whilst in Natal their tribes had been granted fairly far-reaching self-administration. The history of Union, as far as the political status of the Native is concerned, is one of gradually establishing a uniformity of status, and that, on the whole, on the lowest level, that of the Orange Free State and South African Republic.

The main aspect to be considered, in a democratic country, is, of course, political representation. Until the passing of General Hertzog's Native Bills in 1936 Natives, with certain educational qualifications, still had the right to vote in the Cape Province. The practical weight of this vote had already been greatly reduced by the introduction of women franchise, which applied to European women only. Yet it gave to the native community in the Cape at least some practical influence in a number of constituencies, and to the Natives of the whole Union it stood as the symbol of a fundamental principle which they ever hoped to see extended - one day - to the other provinces. This last vestige of political equality has now been taken from them.

The Natives on the Cape voters' roll were transferred to a special Native voters' roll and entitled to elect 3 European representatives to the House of Assembly. Native taxpayers throughout the

Union, subject to certain electoral qualifications, were divided into four electoral divisions, each of which is entitled to elect one European to the Senate. It is well known that the Senate has no political influence whatever. There remain then, as the sole representatives of 6½ million Natives, three members in a House of 150, and these three elected by something like 16,000 voters. This, of course, is not representation, but a mockery and farce.

Besides representation in Parliament, the Native population has also been granted what is sometimes referred to as the Native Parliament, namely, the Native Representative Council. This body, only partly elected, and presided over by the Secretary for Native Affairs, can act only in an advisory capacity on proposed legislation affecting Native interest. As if there could be any legislation not affecting the interest of the vast majority of the population! And seeing that the main lines of government policy were rigidly fixed in the legislation of 1936 and 1937 it is hard to see what influence the humble advice of these Native "representatives" can still have.

The Native population of South Africa is then practically disfranchised. But, as if that were not enough, it suffers under a number of legal restrictions imposed by special discriminatory legislation.

There is first of all the Masters and Servants Act, which makes breach of contract between Europeans and Natives a criminal offence. The most important aspect of this Act is that it makes every and any strike of Natives a criminal offence. It is probably the most repressive piece of social legislation extant in any parliamentary country to-day. Incidentally, as far as rural Natives, with their long-term contracts of services against mainly payment in kind, are concerned, it makes them virtually into serfs.

Then there is the Riotous Assembly (Amendment) Act of 1930, which, according to E. H. Brookes (op. cit. pp. 11/12) "gave

to the Minister of Justice powers almost unprecedented in a modern state claiming to be parliamentary and not actually at war". The provisions of this Act enable the Minister to close practically every avenue of legitimate political expression and action to the Natives, thus forcing them and their leaders into illegal action and landing them in jail.

There is lastly the position of the Governor-General as Supreme Chief, in which capacity he has the right to imprison any Native whom he considers dangerous to public peace etc. for a period of three months without trial. And naturally the process can be repeated on the expiration of the first three months. Moreover, the definition of certain offences - causing ill-feeling between the two races - is so wide and vague, that it gives almost unlimited powers to the Magistrate Courts to deal with any Native (or white agitator, for that matter) whom they may consider undesirable.

A lesser, if particularly petty and oppressive piece of legislation, are the pass laws and all that goes with them. For a Native not to carry his poll tax receipt with him is a criminal offence. Altogether the attitude of the law towards the Native is that, unless he can furnish documentary proof to the contrary he is a criminal.

To sum up: The Native proletariat in South Africa is economically exploited to a more than average degree. Socially they constitute a despised, almost pariah, class, valiantly striving to rise against persistent obstruction from those who know "what is better for them". Politically they are disfranchised and subject to discriminatory and repressive legislation of the worst kind - mitigated to some extent by the honest and quasi-paternal care which some of the less hypocritical administrators of the law show them.

It has been shown that there is little chance of any radical change from within the social and economic structure of South Africa. That holds good for the position of the Bantu within that structure. For there is, as yet, no militant organisation

of the Bantu proletariat - on a big enough scale - to bring about such a change. The process of social rise achieved by education must needs be a very slow one. A process of more than extremely gradual economic rise cannot be expected even to start as long as there are available huge reserve armies of labour, both inside and outside the Union. Political betterment can only follow when the economic and social position of the Bantu has risen sufficiently. But before we can draw our conclusions for the particular housing problem before us, it will still be necessary to analyse in somewhat greater detail the particular section of the population that is to be housed, the urbanised Natives.

THE URBAN NATIVE

The drift of the Natives from the reserves to the town is not identical with the process of urbanisation. In fact, it is important to note that the thorough urbanisation of one section of the Native population is hindered, not helped, by the constant flux of temporary workers into the towns. For these temporary workers are still rooted in the reserves where they leave their families and possessions. The agricultural work is carried on by the women, whether the menfolk are there or not. So in going to the mines or towns to work, these men only want to get such money earnings as they need to pay their taxes and for a highly-desirable augmentation of their rural budget. They are therefore able to work at wages on which an urban Native with a family could not live. Thus they act as a constant depressing force on the living standard of those Native workers who have made the town their permanent home. These urbanised Natives must provide food, clothing and shelter for a whole family on a wage only rarely above that earned by the semi-rural cousin who is a bachelor, and, more often than not, has lodging and food free, either as a mine worker, or as a house-boy,

When it comes to housing schemes it is only the permanent urban Native population that is concerned. In the following we will therefore deal with this section in particular. In Johannesburg

alone there are at present over 100,000 Natives, who undoubtedly belong to this category of permanent city dwellers.

The urbanised Native has completely severed all connections with the reserves. The number of Natives born in the towns, who never have had any contact with tribal life, is naturally growing. In dress and habits, in the way they work and in the way they spend their leisure time these Natives are very largely, if not completely Europeanised. Tribal traditions mean little to them, superstitions, tribal taboos, primitive beliefs are on the wane. To the sociologist, at least, this is a community of proletarians and some artisans and petty bourgeois, darker in skin pigment and handicapped by social prejudice and legal discrimination, yet in no way inherently different from a similarly constituted European group.

It is then only from a study of the composition of this group that any information about their housing requirements can be obtained. The vast majority of the urbanised Natives are unskilled workers in industry, others are unskilled workers in warehouses, offices, shops, municipal concerns, etc. The wage rates of these workers have already been discussed. But it may be noted that whilst money wages have remained practically constant for at least 25 years, the purchasing power of the sovereign has fallen since 1910 by not less than 17½%. (In the same period the rise in European money wages was more than the fall in the purchasing power of money, resulting in a rise of ca. 10% in real wages compared with 1910). Thus, economically, the present generation of urban Natives is absolutely and relatively worse off than the generation of their fathers.

Besides this big class of manual workers there have arisen in the urban Native community two small classes, one of educated Natives, the other of tradesmen and artisans.

The educated class supplies teachers, clergymen, clerks, agents and the few journalists of the Bantu Press. Very few of these educated Natives rise beyond the standard of living of the

average unskilled worker, and most of them remain well below the best paid of the latter class. Only the agents for building societies and wholesalers stand out. Their earnings are rarely below £10 a month, and frequently reach £20. Yet their number is so small that they do not affect the total picture.

As to the artisan class, this is restricted mainly to bootmakers, furriers, carpenters and barbers. Competition is so keen that profits are almost negligible. Few members of this class are better off than the unskilled workers. There are, however, a number of building contractors who are capitalists on a small scale and make a handsome living. The traders, mainly grocers or eating-house owners, do a good deal of business. But since most of them are without education or business experience, unable and unwilling to keep books, only a small number is economically successful.

On the whole, the discrepancy between income and expenditure is such that virtually the whole of the urban Native population is in debt. The family budgets of 48 educated Natives on the Reef, collected and quoted by R. E. Phillips in "The Bantu in the City" (P. 41) show a total indebtedness of £2,165 5s. Od., or £45 2s. 2d. per individual. Nothing could better illustrate how untenable has become the position of paying a permanent urban population wage rates sufficient only as a subsidiary income for a rural population working temporarily in the towns.

Such a state of affairs must, of course, have the most unfortunate effects on the health, morality and criminality of the population. Overcrowding in the houses, so as to supplement the budget by lodgers' rents, begging, stealing and robbery, immorality, illicit liquor selling are the inevitable results.

The state of health of the urban Native population, though probably not much worse and perhaps in some respects better than that of the rural Natives, is appalling. Infantile mortality in the various locations of the Rand is estimated at about 50%, mortality from pneumonia is enormous, venereal disease has

spread to an almost incredible extent. The prevalent immorality can probably be traced to economic causes only to a limited extent. But the crowding of whole families, plus cousins, guests and boarders into two rooms - where the kraal would have given the facility of sex segregation in special huts - must have devastating effects.

The connection between poverty and crime, especially against property, is too obvious to need elaboration. But in the case of juvenile delinquents an excess of leisure, due to the absence of a general system of education, is certainly co-responsible. In this fact lies the only hope that compulsory primary schools may be introduced in the towns, purely as a means of safeguarding the property of the Europeans from the ingenuity of the youthful Native thief and house-breaker. In the same way the only argument that has so far been of any effect in connection with Native health was that which showed that the European population could only efficiently guarantee their own health if they did not allow breeding beds of disease next door.

Besides poverty, legal disabilities do most to embitter the life of the urban Native. The daily humiliation of the pass laws is felt stronger in urban than in rural areas, and the urbanised Native, conscious of his advance towards European civilisation, has become more impatient of being treated as sub-human. The habit of the police force to hunt down Native "offenders" as a profitable game or enterprise has resulted in a state of tension between police and urban Natives, in which the roughness and brutality of many police officers is matched by undiluted hatred for the whole system on the part of the urban Natives.

A still more serious disability is founded in the Land Acts, which makes it practically impossible for the Natives to own property in the new townships. Still more repressive in character is the Urban Areas Amendment Act of 1937 which grants the Governor-General the right to remove from any urban areas Natives who are considered to be in excess of local labour

requirements. Whilst this section of the Act, coupled with the one restricting the entry of Natives into urban areas, could be used with discretion to stabilise the existing urban population and protect it from the depressing results of the fluctuating elements, it is much more likely - judging from previous experience - that it will mainly be used as a weapon against Native agitators and other political undesirables. Whatever its application, it suspends a Damocles sword of fear over the head of every urban Native, lest any temporary spell of unemployment leads to forcible removal into rural working conditions for which he has lost taste and aptitude. They feel that the locations are no longer a permanent home, but "intended to be mere temporary abiding places for Natives in employment who are.....not allowed to sleep in the European cities". (L. P. Mair, op. cit. P. 36).

A further stipulation of the segregation policy, from which all the mentioned disabilities arise, is that any Native location must be at least three miles from the European area, thus adding transport costs to the already overburdened budget of the Native worker.

As to the prospects for the future, a slight modification can perhaps be made, compared with the prospect for the Native population as a whole. It has been shown to be probable that a certain advance in the educational system of the urban Native community may be encouraged by the European population as a preventive measure against native juvenile criminality. This would give to the urban Native a measure of superiority over his rural competitor which should somewhat facilitate his fight for a stabilised urban standard of living. At the same time, a higher degree of general education would certainly help in the formation of well-organised and efficient Native trade unions. Yet the experience of, for instance, the African Laundry Workers Union (900 members), which achieved an almost 40% rise in wages, only to see soon after about 240 Native workers replaced by Europeans, shows that such an advance is only possible within fairly narrow limits. And it

may take a very long time before it will lead to any appreciable all-round improvement of the economic condition of the urban Natives.

On the other hand, there is at least no reason to expect any deterioration in the position of the urbanised section. The fact that under the Urban Areas Act municipalities are compelled to provide Native locations of an approved standard, will tend to make the municipalities very strict in their control of the entry of rural Natives into the urban areas. Thus, the competition of the temporary Native worker, which has been shown to be such a dangerous factor for urban Native development, will tend to be curbed. But unless the position of the rural and reserve Native is correspondingly improved by large-scale government action, this control would lead to a still further deterioration of the position of the rural Natives, and generate a pressure towards the towns against which all administrative control might easily prove helpless.

Summing up, the main characteristics of the urban Native population can be stated thus:

1. Complete severance of connections with the reserves. The town has become the permanent home. In no way inherently different from a European community of similar economic structure.
2. Consisting mainly of unskilled workers, with a small number of educated Natives, traders and artisans. On the whole, a proletarian group, living on wages that have remained constant for decades, whilst the cost of living has risen.
3. The discrepancy of income and expenditure results in general indebtedness, overcrowding, bad health, immorality and criminality.
4. Legal disabilities accentuate the economic plight. Pass laws and municipal regulations are a constant source of friction between the urban Natives and the officers of the law. Moreover, recent legislation makes even the permanence of their abode doubtful and tends to remove the last stabilising

factor in the life of the urban Native community, the knowledge of having a permanent home.

5. The future makes compulsory education appear probable, as a measure against juvenile delinquency. This holds a promise of a slow economic advance, within the narrow limits given by the general social and political position of the Bantu in the Union. At the least, no deterioration of the economic position of the urbanised Native population appears likely.

PLANNING A TOWNSHIP FOR THIS BANTU PROLETARIAT

The preceding chapters have attempted to place the special problem of housing an urban Native community in the South Africa of 1939 into its proper relation to the general social forces, processes and institutions of which it forms part. It remains to be shown how far the conclusions reached by way of this sociological approach directly determine or affect the course of town-planning.

The first thing to be decided on in the planning of any new township is the locality. Here the all-pervading importance of the segregation policy - not as just a government policy, but as a highly active social force - is one of the determining factors. The new township will have to be situated at least three miles from any European area, thus forcing the town-planner to disregard the economic considerations which would weigh heavily against choosing a locality which will make, for many inhabitants, rail or 'bus transport a necessity. But since this regulation is in force, a railway connection, as the by far most economical means of mass transport, becomes essential, an element that would not enter into the planning of a normal European township or suburb of similar size. Again, it has been shown that the urban Bantu population is made up for the most part of unskilled industrial workers. Therefore, it is necessary for any Native township to be as near as possible to the industrial area, and to a lesser degree to the warehouse area of the city to which it belongs. Sociological factors determine the position of the new township within very narrow limits.

The second consideration would be the optimal size of the township. Johannesburg has a permanent urban Native population - of the type discussed here - of over 100,000. It might be suggested to house all of these in one town - and, in fact, Orlando threatens to become the Native town in this sense. But there are sound sociological reasons against such a scheme, as well as against too many small townships. The urban Native proletariat cannot afford motorcars, or the running of 'buses or trams within the township. Even the bicycle is beyond the reach of most, It is essentially a pedestrian community. And taking into account the great importance that is attached in modern town-planning to the need of preserving between 80% - 90% of any residential area as green areas (even if the use of flat-blocks can make good by concentration), there is a definite limit to the size which a pedestrian township should have. The lower limit is given by the need to provide certain social services effectively and economically. As will be shown in more detail in a later section, these considerations made a township of about 20,000 inhabitants appear ideal - with the notion of simply repeating such a township in whatever number may be required for the absorption of the total Native population of the city.

In mentioning the provision of social services which are a determining factor, the policy of segregation was implied as the cause for these considerations. For whilst any new European township that may be built partakes of the general educational, recreational and amusement facilities of the city - so that it becomes essentially a residential area with perhaps an odd school or cinema - there is no such universal centre for the urban Native population. A new Native township must therefore be conceived as a social centre within itself. It must cater for all the needs of its, say, 20,000 inhabitants. The abnormal social position of the Bantu in South Africa makes it necessary to give to what would normally be a residential suburb, its own administrative and police centre, its goods station and shopping centre, its communal centre with educational and recreational facilities, its sportsgrounds and meeting places. Thus, because it is planning for urban Natives, the planning of a township must become the planning of a town.

The economic importance of education to the urban Native proletariat has been stressed repeatedly. To it must correspond a definite consideration of the primary school system as part of the town-planning. Moreover, the future must be taken into account. And since the introduction of compulsory primary education for urban Natives has been shown to be quite a probable, as well as a highly desirable development of the near future, any township designed to-day should be at least sufficiently flexible for the introduction of such a system, or better still, be definitely based on the primary school as a unit determining the size of the social organisms into which the township is to be sub-divided.

But in doing so a further social anomaly must not be forgotten. Unmarried Bantu men over 18 years of age are not allowed to live with their families, but must live in hostels, as a rule outside the actual township. In the case of Johannesburg, these hostels are actually in the city. The age grouping of an urban Native community in a township is therefore different from the normal, the percentage of children of school-going age, for instance, being higher than it would be otherwise. If, therefore, the primary school is taken as a determinant for the sub-division of the township, it will have the effect that the resulting social units, supporting one school, will be smaller than would be their European counterparts.

Lastly, a general conclusion should be drawn from the social fact of segregation. If the Bantu population must be segregated, much against their will as a rule, then at least any township provided for them must be planned in such a way that the development of real community life and of a civic consciousness, even within these restricted limits, becomes possible. Only thus can the worst effects of the artificiality of the segregation policy be mitigated to a certain extent. Here lies the major task for the town-planner.

The next aspect that comes up for consideration is the purely economic one. From figures quoted it is abundantly clear that Native wages at present are virtually below subsistence level. Obviously, therefore, rents charged in municipally, i.e., publicly owned townships must be kept as low as possible, if it is not to result in still more serious malnutrition, criminality, etc. Yet, as will be shown later,

it appears necessary to considerably raise the actual standard of housing accommodation. This must be done without raising rents beyond their present level. On the contrary, a more detailed review of Native family budget, given in the last section, reveals the urgent necessity to reduce rents.

However, the monopoly of the European Trade Unions for all skilled labour, particularly strong in the building industry, has so far resulted in the use of white labour wherever the houses were erected by the municipalities. This is what the "Native Economic Commission" Report, 1930-32 has to say about this abnormal state of affairs.

Par. 504. "Your Commission is much concerned about the danger to the permanence of the Urban Areas Act, resulting from the need to subsidise Native housing in many large urban areas. Such subsidisation is undesirable, but has to be resorted to now, because in many cases the Natives cannot pay an economic rent."

Par. 505. "It is due in part to the almost universal practice of building Native locations with European skilled labour".....

Par. 506...."Your Commission considers that it is unreasonable to expect Natives to pay rent based on capital charges, created by much higher wages than Natives in practice earn. This over-capitalises the location ab initio, and frequently there is no escape from the necessity to subsidise rent. In time this will have a harmful effect on the location itself, inasmuch that urban authorities, faced by successive losses on the Native revenue account, will be chary of undertaking further expenditure. Your Commission considers that any attempt to apply the industrial colour bar against Natives in locations should be made illegal..."

This puts the problem completely and succinctly. Only the remedy suggested in the last sentence shows that general tendency of such Commissions to over-estimate the importance of administrative measures. The fear of Trade Union and labour

opposition would, even if this suggestion were put into practice, prevent the municipalities from employing anything but European skilled labour. This assumption is borne out by the fact that the Act, recognising the anomaly of the position, empowers the Minister of Labour to make an exception with regard to the so-called colour bar laws where the erection of Native townships is concerned. But neither has the Minister ever made use of this right, nor, at least as far as printed records show, has he ever been requested by any municipality to exercise it. For the time being this labour aspect of the segregation policy must be considered as a social force practically outside the scope of administrative control, and a force, which no public body in South Africa can defy for some considerable time to come.

Yet the analysis of the Commission is of importance. First of all, because it has the courage to call the evil by its right name, but more so, because it gives the true reason for the undesirability of subsidised rents in a Native location. The normal argument against sub-economic rents is that they constitute a direct subsidy to the employer. Whatever the validity of this argument may be - and considering the identity of the capitalist classes with the governing bodies, the validity can at most be partial - in the case of Native housing it is only of minor importance. In that case the main argument against subsidised rents lies in the fact that as long as the immoral principle of fiscal segregation and the social pariahdom of the Bantu proletariat persists as social realities, so long will no municipality or public body in South Africa provide decent living conditions for the Natives if that requires subsidisation from general revenue. The harsh reality is that the ruling European population of South Africa gives presents to the Natives only by miscalculation - and that can be rectified. In the long run, the Bantu proletariat cannot expect to get better housing accommodation than it can pay for - however meagre the wages may be from which the rent has to come. Therefore, to suggest improvements on the present housing schemes resulting in sub-economic rents is to cherish Utopian illusions. Any such scheme stands or falls, in the first instance, on this fundamental issue.

We see then that, on the one hand, the rents must be as low as possible, yet economical; on the other, we see no reasonable hope of being able to use skilled Native labour at cheaper rates in preference to European skilled labour. The two sets of conditions appear to be irreconcilable. Yet perhaps they are not quite so. As far as any solution, however incomplete, is possible, the solution to this social problem must be technical. Only by evolving building methods which largely replace skilled labour by actual unskilled labour - thus rendering the use of Native labour possible - and which rely to the greatest possible extent on standardisation and pre-fabrication of building units, will it be possible so to reduce labour-cost in relation to the cost of materials that the result is economical. For this reason, the greatest importance must be attached to the seemingly technical problems of materials and construction. In the correct analysis of that aspect lies the solution, not only to the technical difficulties but also to one of the crucial social problems of Native housing.

The technical revolution must be supplemented by a complete reconsideration of the methods of public finance in relation to Native housing, so that rents should be rents, and not contributions towards administration, road up-keep and other public services which ought to be covered from general revenue. The Native, who so greatly contributes to that revenue, as was shown in the analysis of the Union Budget, has a right to these fundamental services as well as any other citizen, whether rate-payer or not. And in this field the anti-social tendency of South African municipalities goes so far beyond "normal" capitalist practice, and is financially so unsound, that it should not be impossible to bring about improvements in the direction indicated. These aspects will be dealt with at greater length in the last section.

There is one more field in which sociological factors must directly influence the planning of a Native township, the field of political and legal considerations. The main point in this connection, of course, is the inability of the Native to acquire land in the new municipal locations. This is so fundamental a difference from the

normal type of township that it must have the most profound influence on the planning. The pros and cons of houses and flats as the two main trends in residential design have been argued ad nauseam. Yet in regard to Native housing the possibility of the flat solution does not appear to have received any attention. This is surprising just because of the inability of the Native to own land. For is not the chief argument in favour of the individual house precisely that, that to own a house first of all satisfied a primary human want, and secondly is conducive to such civic virtues as cleanliness, sobriety, dignity and solidity in general? ! And that therein lies the superiority of this system over the flat system which more than balances all its technical and town-planning shortcomings? Yet it is extremely difficult to see how this argument can apply to a section of the population which cannot own but only rent these houses, under conditions, moreover, where every individual is liable to be forcefully expelled at a moment's notice, without even a claim for compensation for improvements which he may have made to the property. Obviously, there is no incentive to the exercise of any of the civic virtues in a system thus stripped of its very basis: private ownership. In fact, as a system it is a dangerous and, from the point of view of a progressive Bantu community, undesirable pretence. Out of this particular legal disability of the Bantu arises, therefore, for the town-planner with more than normal urgency, the task of closely scrutinising the alleged merits of the individual house system and compare it with the undoubted advantages, from the economic point of view, of the flat system. On the other hand, he must not forget one economic consideration which may or may not militate against the latter system, the need, namely, of giving private vegetable gardens as an almost indispensable source of supplementing the diet of the Bantu family. Nor must he overlook the fact, that owing to the extremely low income of the Native worker, women must go to work too. Some provision, therefore, must be made for babies and small children, so that they should not constitute an undue burden hindering the extremely necessary work of their mothers, which alone raises the living standard of the average Native family from sheer starvation to only malnutrition. Probably this is again a point where the flat system could score heavily.

But there is also the more particularly social-political aspect. The de-tribalised urban Native, forming now an industrial proletariat, has not yet found a new social-political form of life. The collectivism of the kraal is destroyed in the competitive struggle of metropolitan capitalist life. It lingers as a memory and a tradition, strong enough still as a social force to keep unemployed Natives supplied with food and shelter, but giving way already, in many cases, to a most extreme individualism. Here lies a great danger to the mental health of the individual Bantu, as well as to the potential strength of the whole community. The proletariat is as much in need of collectivism, unity, solidarity, as is the tribe. The one in its fight against a system of exploitation as much as the other in its fight against the forces of nature. The two collectivisms are not identical. But it is not impossible that the one could be led over into the other without going first through a destructive period of atomistic individualism. There can be no doubt that in this direction lies a fundamental need of the Bantu proletariat. And the combination of individual cells with collectivist organisation found in a well-planned flat system might prove an invaluable basis for such a development.

One last argument from the sociological angle might be added to the house versus flat controversy. Even if in the individual house system of the Native there is no ownership, but only a pretence, it will yet tend to act as a tie to the particular township to a greater extent than a flat would. Now such attachment to the house may be a civic virtue, but it is neither in the best interests of the Bantu proletariat nor of South African capitalism as a whole. Capitalism is based on free labour, on labourers free to move, following the law of supply and demand. Such free movement, of labourers as well as of commodities, is the only safeguard for an equalisation of wages, prices and profits throughout a national system of economy, and throughout the world. It is a safety valve that can only be closed with danger to capitalist and worker alike. For the underpaid Bantu worker in South Africa it is of great importance, and will certainly be of greater importance still in the near future, to be able to follow the trend of the market, to follow in the path of newly-developing industries, to make use of every chance, however small, of bettering his economic position. Any system that has a tendency, even if only a psychological tendency, to tie him down to one particular place of work more

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than he is already by legislation, is against his best interests. So it can safely be said, that, taking only the sociological factors, the flat system appears as the most adequate solution to the urban Native housing problem, provided it is planned to comply with the many sociological requirements which these last paragraphs attempted to postulate.

But as has been said in the introduction, the social, economic and political forces affecting the Bantu population cannot be taken as the only source from which to derive a housing standard. What appears economically and politically possible in conformity with the social position of one section of the population, must be compared with the relatively absolute historical standard of minimum decent living conditions as it is established by contemporary society as a whole. This standard is absolute, or very nearly so, for one particular stage in historical development. That is why it still remains only a relative standard. What appears as a social necessity to-day, a bathroom for instance, would have seemed to other periods and civilisations incredible, if not wicked luxury. What we consider luxury housing to-day may seem a slum to future generations. But for any one period and within the orbit of one fairly homogeneous civilisation a standard of practically general validity can be established, and is in fact established simply by the social average of what is actually done. It is only necessary to abstract that standard from the manifold forms in which it appears as concrete social reality, and then to test the social validity of any new scheme by comparing it with this abstract. This will actually be done in the planning section. But it is important to recall here one of the results of the sociological analysis, stating that there was no essential difference between the Bantu proletariat as we now find it in the towns of South Africa, and other proletariats all over the world, except in the fact that it is more exploited, more despised, more outlawed, than they are. But these are differences which do not affect this issue of the social standard of living and housing conditions reached by the capitalist system as a whole. There is, therefore, no sense in saying that the Bantu, because he is black, can be housed worse. To the sociologist, this difference does not exist. To say that Native houses do not need floors

because the Native huts in the reserves have no floors is like suggesting that the Native garage attendant should walk about in banana leaves. Once the Bantu has entered urban capitalist society, and our substantiated contention is that he has, he can only be treated as an integral part of that society. And the fact that he belongs to the exploited section makes him no less part of the system as a whole. Its standards must be his standards. As far as living conditions generally are concerned, it is beyond the scope of the town-planner to effect the application of the general social standard. But when it comes to housing standards, it is up to him to make a stand. Again, success does not depend on him alone. If he does not succeed in having what he knows to be a minimum standard agreed to, it only indicates that the time for the town-planner in the proper sense of the word has not yet come. It remains for him to step back, wait, and leave the job of slum-erection to those better fitted for the work. But accede to anything less than the moral standard of minimum decent housing conditions he must not.

Conclusion

These are the conclusions to which an analysis, first of the meaning of a sociological approach, then of the economic system as a whole, of its South African modifications, of the position of the Bantu in that system, and that of the urbanised Bantu in particular, has led in its application to the special problem of housing a section of this urban Bantu proletariat. But it would be impossible to translate these conclusions immediately into town-planning practice. For in all the preceding argument the workings of the social laws of movement have been treated to a large extent as if they were acting, so to speak, through abstract media, the abstract capitalist, the abstract proletariat, the abstract Bantu. But that is not how these laws really work. Men of flesh and blood, men with emotions, beliefs, superstitions, irrational traditions are the real agents of historical movement. To neglect these factors would leave open a very serious source of error. It is therefore necessary - and in this part it is possible to concentrate more exclusively on the Bantu - to show and analyse how the social, economic and political changes have affected, and are still affecting the mental make-up of the Bantu. It must be shown how

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the urbanised Native reacts psychologically to his new conditions of life. It must also be shown, as far as that is theoretically possible, how he would react to diverse town-planning and housing schemes. Only then will it be possible to judge how far the sociological conclusions are either contradicted or reinforced by the psychological analysis, and then to proceed to plan in accordance with a balanced weighing up of sociological and psychological evidence alike.

II PSYCHOLOGICAL APPROACH

The Social Development of Man

In the attempt to understand the position of the Bantu in our cities, and to solve the difficult problems with which he is confronted, it is necessary to analyse, in broad outline, the development of man as an individual and as a member of society. To appreciate his present position and the possibilities of future development, it is essential to examine the development of social customs and conventions, and to see whether these habits are inborn or whether they are the product of environment.

The reason why it is necessary to go so far back in our analysis, lies in the fact that we are considering a primitive and backward people. The natural assumption, therefore, is that in the attempt to provide these people, the Bantu, with decent housing the town-planner is confronted with a unique problem which can only be solved in a unique way; or rather in some manner which differs radically from that which would suit the European. The assumption is that, since the Native is not as civilised as the European, since he is not so "intelligent" and since his customs and conditions of life are different, his needs cannot possibly be satisfied in the same way as those of the European.

The cause of all the difficulties which beset the Bantu to-day - according to this contention - is found in the fact that he has "transgressed" the laws of nature in attempting to change himself from what he is "by nature". This, of course, is no argument. For all advancement in human institutions and modes of living is an improvement on nature. Admittedly, human knowledge has not yet advanced sufficiently to make radical alterations in the bodily structure of man possible. His mental make-up, however, is relatively easily changed, for better or worse, simply by altering his environment.

This brings us to the whole crux of the problem: is man's mind, his attitudes and his success or failure in life, predominantly due to heredity or to environment? In other words, do inherited patterns of behaviour govern his actions, or are acquired knowledge and experience the determining factors?

All the actions of the individual are the result of, or response to, stimuli from within or without. Of the stimuli from within, hunger and the sex-urge are by far the most important. A child, for instance, will make random movements and howl if its hunger is not satisfied, or, to take the example of an external stimulus, if it is shown interesting bright or coloured objects it will try to clasp them in its hands. When, however, it has no desire to eat or drink, and when there is no interesting object in its vicinity to attract its attention, it will not act - it will sleep.

As the child develops, it learns to react positively to stimuli, by a process of trial and error. That is what is generally known as experience. The older the child becomes the more its development and reactions are conditioned by past experience and environment, just as the final shape of a building is largely affected by the foundations and the lower walls. The environment is of prime importance because it really constitutes the sum of all external stimuli which condition the reactions and habit formation of the individual.

It seems, therefore, that a fully developed or matured human being is the result of the interaction between his basic urges, i.e., hunger and sex, and his environment, an interaction in which the expression taken by these basic urges is largely modified by the particular qualities of the environment.

From this point of view we must come to the conclusion - if we compare the Bantu with the European - that there is no fundamental difference between them, but that the differences which are so obvious to everyone are due to unequal environmental conditions. But this conclusion does, of course, not preclude the possibility of a developmental difference, resulting in the - historical and not necessarily permanent - superiority of one race over the other. This would affect the issue as well, because a mentally inferior man may not be able to adjust himself to the complex environment of a mentally superior individual.

As far as the city Native is concerned, in whom we are mainly interested, it is generally assumed by the average European that

he is inferior, at least in this sense, and that therefore all attempts to improve his conditions of living rapidly and radically are doomed to failure. This argument is applied in particular to the provision of decent houses, to which, it is said, the Native would not be able to adjust himself.

This whole problem actually hinges on the one question: whether human customs, superstitions and fears, tending to prevent progress, are ineradicable, or whether they are, on the contrary, much more easily discarded than is popularly supposed. Particularly since the theory of evolution has become generally accepted - without being equally generally understood - people have frequently argued that it is impossible for primitive races to advance culturally and mentally to European level in a decade or so, considering that it took other races 2,000 years or more to reach the present stage of European civilisation. This whole argument is based on a confusion of evolution and education. By a process of education - the imparting of the accumulated experience of centuries - the average European child is enabled to reach a level of civilisation in a few years which it took mankind as a whole thousands of years to reach by a process of evolution. Similarly with primitive races.

However, even if the evolutionary "argument" is a fallacy, the question as to the eradicability of traditions still remains. To answer it we have to turn to the origins of society and social groups and to investigate the forces which induce on the one hand a gradual advancement in certain groups, and on the other, a retrogression of other groups. In this analysis we will not concern ourselves so much with details of the customs and habits of primitive people, as with an examination as to what causes their particular mores and under what circumstances there are modified or changed.

Although this thesis is concerned mainly with the Bantu races in South Africa, it is not necessary to confine our research entirely to them. It would be preferable to examine the general origins and development of society and then later to apply the principles discovered to the problems of the Bantu community.

The prime circumstance which conditions a social group dwelling apart is the land on which it lives. The ease with which man is able to wrest a livelihood from the soil, either in the form of meat, fruit or cereals, and the difficulties which confront him will condition his mode of living, his habits and his customs. If he is a member of a group of human beings, such as the Kalahari Bushmen, and is driven by circumstances to seek food in an unproductive desert country, he and his like can only live in very small groups. The amount of food available dictates the size of such a group and the structure of the people as a whole. Since circumstances have made them a hunting people they have to move about continuously in search of game. The result is that they have not acquired the ability or desire to build houses, and also have no idea of private property.

This example, only one of many that could be quoted, tends to show that the structure of a society, its customs and state of civilisation are conditioned by the topography, climate and other natural properties of the country in which it lives. It was the battle against these forces of nature that showed man the advantages of co-operation and thus led to association and the growth of societies. The increased security and leisure, which this association gave to the individual, combined with the community of interests and work, led to the development of a common culture.

Thus it is shown that the more primitive a race the smaller the group-formations will be. The higher the state of civilisation, on the other hand, the bigger the groups, the greater, therefore, the security and leisure of the individual, the more rapid and intense the cultural development.

However, all these advantages of association must be paid for by certain disadvantages, even if these are relatively unimportant. The individual must sacrifice a certain amount of liberty, and finds his freedom of self-expression restricted. He is not allowed to behave in such a manner as to become a nuisance or a danger to other members of society. In times of emergency he is obliged to relinquish his daily pursuits to go to the aid of the group. These necessary limitations of freedom lead up to discipline and organisation which alone make the achievement of a

higher degree of civilisation possible.

It has been stated that hunger and sex are the primary urges underlying the actions of man as an individual. They are also the primary socialising forces. They give rise to almost every other activity, although there are some others which develop fairly independently. The fine arts can develop either because of a great deal of leisure, or from sex-frustration. Human energy is being produced at a fairly even rate. If only a small amount of it is required for satisfying the primary needs of life the surplus must be diverted into other channels. Society as a whole is the winner.

It is now necessary to trace the effects of this association of human beings in primitive societies. From close association and recurrent needs arise habits for the individual and customs for the group. Those that are unsuitable are gradually discarded and replaced by new ones. The selection is generally due to chance, and not forethought. Development in society is entirely unconscious, and improvements are only noticed and appreciated after they have come into existence.

After certain customs have been practised for hundreds of years, people become so used to them that they consider them necessary and inevitable, although they may have lost their significance. This applies to many European customs of to-day which have no rational justification. These customs, which have lost their meaning, become traditional, and take on ritualistic or even religious significance. At the same time, those modes of action which are still useful are reinforced and powerfully entrenched, thus tending to stabilise society. It would be impossible for a group to develop if each generation had to learn from its own experience only. Customs are usually nothing else but forms of reaction towards often recurring circumstances, and are in the end performed without the need for thinking of a possible alternative course of action. Modern civilisation is based on the combined experience of the whole human race of the past. Although, or rather because customs and traditions preserve what humanity

has gained, they are conservative forces - forces which are opposed to change and hence retard development.

It remains briefly to trace the historical development of culture and civilisation based on the above considerations. In his most primitive and undeveloped state man was a hunter. His needs were simple and his means of supplying them equally so. He lived alone with his wife or in association with one or two others. He was coarse, selfish and uncivilised. Life was precarious and the struggle for existence acute.

By slow degrees, and in suitable surroundings, he discovered that he could ensure a regular food supply by taming animals and securing his needs from them. He had advanced one step by becoming a wandering herdsman. Yet because he needed so much space for himself he still had to live in scattered groups.

The next stage was the greatest step towards civilisation. Man discovered the practice of sowing seed and reaping the crop. This made him remain stationary. It is in this settled state that man became rapidly civilised. His habits became regular, he lived in close association with his fellows, and tradition and public opinion, censure and praise, gained increasing importance in developing his character. The process is a slow and steady one. Left to itself, this inter-related development of primitive man and primitive society will continue in its own conservative and inherently regulated manner. But if the conditions under which a primitive society has lived for hundreds of years are suddenly changed - by a forcible clash with a superior civilisation, for instance, then the results are drastic and far-reaching.

Now customs and traditions do not only lose their meaning, they are direct hindrances to an adaption to new needs and conditions. At the same time, these new conditions bring forth new customs, and originate new traditions. Thus something new arises which can outdo the old. The inertia of social tradition can no longer rule for sheer lack of anything else to take its place. The slow, steady pace of evolution is, for a brief moment in history, superseded by the sudden leap of revolution, in fact, the position with

which we are faced in considering the particular primitive race with which we are concerned, the Bantu in South Africa.

PRIMITIVE BANTU SOCIETY

Having analysed the forces underlying the development of society, we must now consider the primitive Bantu, for he is the raw material from which the urban Native has developed.

Primitive Bantu society is based on the patriarchal system. The father holds complete sway over his wives and children, who have to submit to his authority. He and his family are under the leadership of the Headman of the group. A number of these family groups constitute a tribe, which is ruled by a chief.

Although there are different ranks in this primitive Bantu society, possessing varying amounts of cattle, the people on the whole are fairly equal in economic and social status. Their standard of living does not vary much, and no individual runs the risk of starving as long as the rest of the community has enough to eat.

In Bantu life the head of the household occupies a position of great dignity. He keeps order and maintains discipline. He holds sway over his sons even after they are married and they are expected to show him every respect, to send him presents and to support him in his old age. All this helps to conserve the close unity of the primitive Bantu group.

Kinship bonds form the basis of many social institutions such as dances, festivals and funerals. A man's nearest relatives are expected to contribute towards the "lobola" for his wife, to make him occasional gifts of cattle and other objects, to advise him in his family affairs, to offer him hospitality and to assist him economically and practically in such things as the building and thatching of huts, the clearing of ground for new gardens and the weeding of existing ones.

The life of the group is very intimate and communal. Its members have common grazing ground for their cattle, though they have separate allotments for the cultivation of crops and individual gardens. Although the land is not individual private property, cultivated plots may not be violated. However, when the land is no longer used it reverts to common use.

The main source of wealth and the mark of distinction is the number of cattle owned. In a statement made to the Native Economic Commission of 1932 by Mrs. A. F. Hoernle, she said (par. 33):

"The cattle are a trust to the present generation from the past generation; they are a medium between the people who are here and those who are no longer here, as the Natives put it.... They are heirlooms; emblems of the status of the family.... When an animal is sacrificed, for example, they say: 'Father, here are your cattle; you have asked for cattle; here they are.' That is why, when these cattle are used in marriage the ancestors must be appealed to, to accept a transfer of cattle to another kraal, because they are really the cattle of the ancestors. Therefore, always, in the original ceremony, an animal was sacrificed as part of the marriage ceremony, and through the groaning of the animal, or in some other way, the ancestors gave their assent to the marriage - accepted the woman into the kraal and allowed the cattle to go into another kraal".

This brings us to the consideration of the lobola system. It has contributed much towards preserving tribes and keeping their traditional life intact, and is continuing to do so in the stage in which these tribes are found to-day. Lobola is intimately connected with the whole social structure of the Bantu people. Through it, inter-tribal relations are established by the marriage of chiefs and of their sons and daughters with persons of the blood from other tribes. In the same community it establishes an even closer bond, between various family groups.

Lobola upholds the worthiness of woman in society, and is at the same time a spur to man to preserve and improve his status and so

to ensure his social position.

Marriage amongst primitive people is fundamentally an affair of the whole family group; among the Bantu it is particularly so. Among them it is the family who arranges the marriage and bears the cost. The contract is solemnly sealed through the medium of lobola, which constitutes a warranty on the part of the bridegroom that he is in earnest and no longer playing, and is a token of his acknowledgment of his obligations. On the part of the bride its acceptance is taken as a guarantee of proper conduct. Lobola determines the validity of marriage and the legitimacy of children.

By strengthening family ties in this way, it upholds the rights and authority and dignity of the head of the family: it is a symbol of the union and cohesion, the solidarity, of the family and tribe.

The fundamental ideas of sexual morality are to be found in almost all societies, with certain local variations. Where the conditions of life are easy, there will be a certain amount of sexual freedom (as in the South Sea Islands), but where life is more difficult, as in European society, the community is unwilling to rear children whose parents are unable to keep them. It is for this reason that early and indiscriminate sexual relations are frowned upon. It threatens the very basis of the society, i.e., the structure and solidarity of the family. For this reason boys and girls are separated after the age of puberty. It is the general custom with the Bantu tribes in South Africa to have a separate hut for the boys and girls; whereas the smaller children share the hut of the mother. Polygamy is widely practised, and when a man has a number of wives, each has her own separate hut.

Religion and magic underly most of the practices and customs of primitive peoples. They continue these practices for hundreds of years, ignorant of their original causes. Sometimes their knowledge of natural phenomena is fairly advanced but they have little or no idea of the laws of cause and effect. People can only, and have only, made the first step beyond this primitive state of

existence in regions where certain natural phenomena occur at regular intervals, and thereby make daily life dependent on some form of empirical natural science.

The wish for, and therefore the belief in, his own immortality is to be found in almost every human being. In this respect civilised European races are no more advanced than the more primitive Esquimos, the American Indians or the South African Natives. This faith naturally causes people such as the Bantu to believe that the spirits of their ancestors still hover about after their death. Since their whereabouts and their activities are just as obscure as the origin of lightning, rain and disease, they feel that the departed spirits must have some control over these natural forces. They therefore offer sacrifices to their ancestral spirits to aid them in their struggle against the elements.

Bantu society was stable and well organised as far as its inner organisation went. When, however, the Bantu began to be influenced by European culture he gradually lost his equilibrium. He could have lived a happy and contented life had it not been for the fact that the Europeans brought with them an economic system that was completely different from his own. He found it impossible to adjust the old culture to the new conditions. The result was that the structure of Bantu society collapsed and the people were unable to replace it by anything new.

It has been shown that societies are continually adapting themselves to changing or changed conditions. If the Bantu have to a large extent failed to do so this is due to the fact that they are actively prevented from doing so, as was shown in the preceding section.

The main directions in which the Bantu is influenced by the European are as follows. First of all, he is converted to Christianity by Missionaries. How far he understands this religion it is difficult to say, but it appears that it is modified to suit primitive ideas on religion. Many of the teachings have no significance to the Bantu people, and many others they learn to use for their own ends.

They are shrewd enough to see through the practices of the white man, who invariably baptises the Bantu before he exploits him economically. Missionaries, in most cases, precede traders.

The Christian religion has played a fair part in replacing and breaking up the system of ideas of the Bantu, but because of its mysticism it has not replaced it by anything concrete and useful. Before trying to teach the Natives European morals, it would be necessary to improve their material conditions, since before civilisation or culture can be developed a society must have reached a certain level of economic security.

Those Natives who leave their homes to seek employment in the towns, are the first to lose contact with and break away from the old culture. They get acquainted with new habits and new things, and because of their superior knowledge of the world they are, on their return, regarded with respect and admiration by the girls at home. This induces other youngsters to follow their example, and many of them are doomed to acquire the bad habits of the white man, because they seem to be so distinguishing and exciting. The young Native gradually forgets the customs of his people, yet understands the newly acquired habits but imperfectly.

Because of what he has seen in town he makes love in the European fashion. The practice of paying lobola no longer has its pristine significance to him, and the custom is not rigidly adhered to. Many cases are reported from the reserved where children are born before the cattle are handed over. It also happens that the youth moves into the kraal of his father-in-law, presumably to escape the control of his own father.

According to the Native Economic Commission the effects of this modified system of lobola are as follows:

1. A lowering of social status, i.e., denationalisation.
2. A spiritual decline.
3. A weakening and breaking up of family ties.

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4. Neglect of what is right and becoming in their society.
5. The adoption of European marriage rites, usually for the purpose of evading the lobola custom.
6. A forsaking of tribal moral law, leading to moral straying and collapse.

The fact that this semi-urbanised type of Bantu has been away from the influence of his tribe for a long time also makes him lose a certain amount of respect for the wisdom of the elders. This, however, is not complete because town life has not rid him of his superstition, and he therefore retains a considerable amount of awe for the witch doctors and heads. However, his various experiences have caused him to lose his pride in many of his primitive customs. His growing disregard for his tribe's moral customs strikes at the roots of the whole structure of this primitive society. The fact that he is learning to understand and use the money economy of the white man makes him change his attitude towards marriage. In the kraal his whole family helped him to get a wife, who was destined to work for him. In town things were different. Contact with white civilisation has impoverished his people, and he must now work for himself and often if he wants to get married in the normal way he has to supply his own cattle. The pressure is great and he is often forced to take the easier path. The writer has known the son of a Rhodesian headman. He had a Zulu wife, which to start with caused him endless trouble. Then, to succeed his father he would have been obliged to acquire an extra wife, as befitted the high position. The idea was unpleasant to him because he had no desire to sacrifice the few cattle he had acquired. The result was that he refused to take his father's place and remained in service in Johannesburg. The hero of Dr. Wulf Sachs' "Black Hamlet" returned to his native village after spending years in various towns in the Union. He was made chief but the conflicts that were set up in his mind by the differences between his life among Europeans and the customs of his tribe made him abandon his hut and return to civilisation. The stronger culture, and the one that has more to offer must succeed.

Contact with white civilisation is rapidly disintegrating Bantu society. The tragic part of it is, however, that the Bantu is not given a chance to advance correspondingly along European lines.

This is how the report of the Native Economic Commission (par. 383) sums up the position:

"As against the monotony of the farm they have heard from their comrades of the glitter, the movement, the excitement of town life. In the eyes of a young Native a visit to Johannesburg frequently ranks with the circumcision school as a necessary preliminary towards the attainment of manhood. The solidarity of the family having ceased to be a factor holding back the young Native, he contrasts his life on the farm, where he gets next to nothing for himself of what he earns, with the attractive picture of life in town, which is brought back by those who have been there. There he will be able to spend all he earns on himself, and as length of vision is not a strong point with primitive people, he disregards the problems which will arise when he wants to get married and settle down, and he freely and not very wisely spends the money which he earns in town. Parents complain that they have frequently to find lobolo-cattle and even money for taxes for their prodigal sons. (This is not to be wondered at because they no longer have the backing of the whole tribe). The older Natives complain bitterly throughout the country that their children are not sending back money as they used to do. A large number of incentives, from the lowest to the highest, draws the young Native to town: potent drink, amours, fine clothes, better opportunities of education, contact with civilisation".

THE URBAN NATIVE

We now come to the urban Native, with whom we are mainly concerned. there are roughly two classes.

Firstly, those who still have their roots in Native settlements in the country, and secondly, those who have completely broken with

their past and have few or no tribal connections. The first class, because it periodically returns to the land helps to perfect the disintegration of native life. We have already discussed this class in its effects on the tribes.

The permanent urban dweller is usually completely detribalised. All the same, this type of native still retains many customs and habits characteristic of the primitive but this is due to lack of proper education. His every-day activities are similar to those of Europeans except that he has but very few of the amenities of civilisation. We will not discuss this aspect here, because it belongs to the section on planning, but we must consider the implications.

There are 4 aspects to consider:

1. The new habits formed by the Native.
2. The need of unity and class consciousness.
3. Crime.
4. Education and recreation.

1. The new habits formed by the Native are merely simpler expressions of those common among Europeans. The old communal life has gone. Instead of depending on cattle and the land for food and lodging, he has to work regularly for a livelihood and he has to rent a room or a house to sleep in. He has been completely absorbed by the capitalist economic system. He rises early in the morning and arrives at home in the evening. His wife remains at home to look after the children and to prepare the food, and occasionally to do some washing. Life is rather drab and monotonous. He has not much open-air activity. He is beset with many worries for he has to clothe and feed his children, and, because of its many advantages, must try to make an education available to them. He becomes individualised. In the kraal the interest of the group was the first consideration, but now he has to look after himself and that is all that matters.

2. In spite of all this he still tenders help and hospitality to those members of his family or tribe who are temporarily in need, for, as a member of a suppressed class, he realises that he must help those who suffer from the same disabilities. If he has the time or inclination he cultivates a little garden, which is invariably rather sparse and untidy - nevertheless, it is an attempt. As to the privacy of his home, this depends entirely on his income.

The man we have been considering is the average unskilled worker who earns a salary of £3 to about £6 per month, and who supports a family. There are many, however, who are single, and who are consequently forced to live away from the townships, and are obliged to sleep in municipal or employer's barracks. They have no privacy, yet very little social life. In the kraal the Native had considerable leisure and the opportunity to hunt and dance. Now he is coupled up with no opportunity to get rid of surplus energy. On the whole his life is completely unnatural and prosaic. Only the creation of an active communal life in the townships, with common cultural, educational, sporting and recreational facilities, could to some extent mitigate these evil effects of city life.

3. This brings us to the consideration of crime, which is one of the chief problems in connection with urban Natives. Lack of means of livelihood, bad environment, the effects of disease (and to a small extent - heredity), and lack of recreation are the chief causes of crime amongst urban Natives, which go to show that there is very little right with the urban Native. As in the case of societies, so with the individual; environment has the greatest influence on mental development, and if the environmental conditions are improved the individual will improve.

The fundamental drive for nourishment will stop at nothing; it can make man an honest worker if he can obtain employment, or a thief and a murderer if he cannot. But bad example has also its effects, so that children whose parents are forced to steal will most probably also become thieves even if they could find another solution. Even if crime is due to heredity it can be overcome indirectly by

improving the social conditions under which people have to live. Venereal diseases and others that affect the brain and other organs of the children of afflicted parents, cause insanity as well as minor mental abnormalities, and it is usually the abnormal person who becomes a criminal when circumstances are not particularly propitious.

Yet crime is so widespread amongst both Bantu youths and adults that other reasons must have something to do with it. The most important of these subsidiary causes is probably the treatment meted out to tax and fee defaulters. They are frequently handled by the police with unnecessary harshness, and usually have to spend a number of days, or more, in jail. In addition to the purely degrading effect of this practice, it also brings these defaulters into direct contact with real criminals. Moreover, the whole system generates hatred for the white man generally, and thus leads to a certain amount of crime, particularly assault.

4. In connection with the last aspect - lack of recreation, the Native Economic Commission says: (par. 366)

"The Native in his Native areas had many outlets for his energy and many ways in which to get recreation. The young boy lived in the open, playing, sticking-fighting, and wrestling with his fellows, chasing birds and hunting small game, swimming, and singing and dancing. The adult Native had his hunting and dancing with the occasional excitement of tribal fights; he also filled up a considerable amount of his time in talking round the beer pot. When he entered European employment, no thought was given to the provision of substitutes for his traditional amusements and recreation and as time passed and large numbers of Natives became congregated in towns, the need for an outlet for the Natives' high spirits, in his free time, began to show itself in the establishment of Amalayita gangs and in orgies of drunkenness. A very close connection exists between the need for recreation and the prevention of drunkenness and many forms of crime".

The last, but not least important aspect to be discussed in this connection is that of education. The city Native, as we have

seen, is to a large extent detribalised. Yet he lives in a state of ignorance which makes it impossible for him to rise above his present state of poverty and squalor. This fact again leads certain people to assert that he is inferior and incapable of improvement. Others advocate the policy of allowing him to develop along his own lines (which means practically to allow him to go to the devil in his own way). That the Native is not really incapable of being properly civilised has been shown.

Since his traditions and language are different from that of the Europeans great circumspection is needed in the subjects taught and the way in which knowledge is imparted.

Professor Lestrade (par. 613. N.E.C.) tells the following story illustrating that the Native child living in the country is incapable of grasping what he is learning if he is taught in English:

"I entered a (Native) school where there happened to be a geography lesson in progress - through the English medium. They were busy with the names of rivers, and these rivers were the Steelpoort and Elands rivers. Then I asked the class in Lesuto, "Where is the Elands River?" The answer was, "No. We do not know". Then I asked, "Where is the Steelpoort River?" "No, we do not know". I asked the class, "What do you call the Steelpoort River in Lesuto?" "We do not know". Then I asked, "Have you never heard of the Tubatse?" "Yes, sir, you have just crossed it". "And have you heard of the Lepelle?" "Yes, sir, we know it well. My father lives there". Ergo, they had enjoyed the teaching, but had failed to understand and appreciate its true import".

Obviously, in this instance, the teaching method and not the intelligence of the Native pupils was at fault. Both in teaching and in judging people, terms must be used that are functionally significant to the people concerned.

Thus we see that all education must start with only such subjects that fall within the sphere of experience of the pupils. Another

matter to consider is that unless Natives know English or some cultural language well, they should, in the beginning, receive instruction in their vernacular. In par. 610, 612 of the Report of the Native Economic Commission, it is stated that the Natives are suspicious if they are taught in their own language because they feel that they are being given something inferior. Considering the greater usefulness of the English language for an urban Native, they are justified in their suspicions. But the attitude itself is partly due to a feeling of inferiority induced in them by the treatment they receive at the hands of their white "superiors".

Without education it would be impossible for the Native to adapt himself successfully to the conditions in our cities. Education is necessary with regard alike to general culture, special training and social knowledge and hygiene.

In discussing this supremely important subject of education we shall first mention what we consider the education of the urban Native population should be; then what it actually is to-day; of what benefit it is to the Native; and finally what the causes of the difficulties are which prevent the Native from developing his potentialities fully, and whether there appears to be any immediate prospect of improvement.

Certain valuable suggestions regarding Native education are made by the Native Economic Commission (par. 627 and 628) in their report. "It is necessary to point out...that for the regeneration of a primitive people there are educational needs which precede ordinary school education. European school education is based on a civilised environment: for a great proportion of the Native people this civilised environment has still to be created. It is an educational task, but it is not solely the task of ordinary school, although the school can in a measure assist in carrying it out."

"This 'social' education should embrace the following:

1. It should aim at freeing the mass of Natives from their reactionary conceptions, animisms and witchcraft.

2. It should not pursue a course which makes the Native dissatisfied with everything in his own backyard. But it should proceed from the foundation of Native society, and build up, giving the Native a pride in his own people, and a desire to develop what is good (and of this there is a good deal) in his own institutions.
3. It should aim at making the educated Native a missionary to his own people, an instrument in advancing their material progress without which they will never as a people achieve cultural progress".

There is a considerable amount of valuable material in these suggestions, but the logical sequence of processes has been reversed. Clearly, change of cultural environment and education (i.e., book-learning) must come before an attempt is made to get rid of the Native's superstitious beliefs and practices. After all, they are due to their general ignorance of scientific matters.

A fairly good general education and a certain amount of equally necessary vocational training is essential. In spite of his changed environment the urban Native cannot cope with the exigencies of daily life without some education. Unless he is tolerably conversant with English, he cannot achieve much. His Europeanised environment is incomplete and will remain so until he is provided with better surroundings, i.e., with a better type of township and a better home to live in. The most powerful factor in the environment acting on the European child is the education he receives at school. There he learns to understand the traditions and institutions of his people; he acquires the heritage of his predecessors. The Bantu child, however, is brought up in ignorance - which is only made worse by the traditions and customs of his race which are totally inadequate to cope with the new problems. It is useless to teach him along his own lines; he must assimilate European culture and education because he lives in conditions created by Europeans.

Every pedagogue knows, that to educate a child, it is necessary to build on whatever knowledge already exists. Since different races have different characteristics (which are caused by their particular language and literature, their idiom and way of thinking), it would be impossible to make the Bantu a black European, without completely destroying these characteristics. But we must enable the Native city-dwellers to live civilised lives and to fit into their new surroundings. If many people are firmly opposed to advanced Native education, the real reason for their attitude is that they fear competition. This fear they rationalise by saying that the attempt is useless, since the Natives can never become like Europeans. The latter part of their contention is correct to a certain extent, but the first part has been proved to be false by the ever-increasing number of educated Natives.

The conclusion we have come to, therefore, is that there must be no difference in the matter taught Natives and Europeans (excepting perhaps history), but only in the method used.

Besides school education, an accompanying betterment in environment is essential-hence the necessity of a decent housing scheme. As the Commissioners say in par. 613, "the white man's education without the white man's environment working on the Native must have other results than in the white community, and will be unable to make the Native an equal of the white man. If there is anything to blame this, it is not the Native". About the extent of the education required, they say (par. 624) "The education must, to have much effect, proceed much further than it does at present, with consequent further increased expenditure. If therefore school education is to make any sensible change to the outlook of the Native, it is as well to consider at this stage the soundness of its foundation".

A consideration of the second and third points of this statement brings us to the effects of present Native education. At the moment Native schooling does not proceed very far. According to the Commission, nearly 60% of those children actually attending

school, do not advance beyond the sub-standards. To say that this is entirely inadequate would still be an under-statement. Just consider what a European child is like that left school after passing standard 6. It is totally uneducated and uncultured. What must the Native be like, then, who has left school after reaching standard 2? He has only had a glance of what lies beyond him, but he has not seen enough to enable him to understand what it signifies. He passes through life hardly better off than his unenlightened brother.

Native parents have long since realised that education is the key to a better life. They make many sacrifices to enable their children to benefit from the meagre educational facilities which are within their reach. Unfortunately the educated Native can find no suitable position in the employ of Europeans. However, there is some good in this, since the effect frequently is that he turns to the teaching profession and is thus able to assist in the reconstruction of his race.

In par. 638 the Native Economic Commission says: "By making liberal provision for the complete education of the future teachers and leaders of the Native peoples.....", showing thereby that there should be a genuine plan to equip the Natives themselves with one of the principal requisites for national advance, namely, an adequate supply of well-educated men and women capable of fulfilling their natural task of leading their people on the upward march. As regards the overcoming of the inferiority complex of the Native it is useful to note "that it is essential to use the vernacular as a medium of instruction" to begin with. Proper comprehension of the fundamentals is of more importance than the learning of a single accomplishment like a European language (although this is essential in a town), owing to the short school life of a Native, he learns the accomplishment badly and the fundamentals not at all.

Before leaving the consideration of education (we shall return to it in the final section dealing with actual Native re-housing), let us briefly glance at the effect of grafting a European education on a primitive society in other parts of the world. All over the world we have examples of people who are under the influence of European

economy and culture. In India, China and Japan (although these people are by no means primitive, they have an advanced though sometimes decadent culture of their own) there are very many people who have reached the greatest heights in scholastic attainments. They have been able to acquire and make full use of European culture. (See Appendix No. 4.)

This brings us to the final consideration. What is the difference between an educated Bantu and an educated European. There are two. Firstly, there is a difference similar to that between an Englishman and a Frenchman, a Chinaman and a German - the difference which is due to the source from which the individual is drawn, i.e., a national stamp. Secondly, since the particular environment of the urban Native (locations which are equal to slums) is different he too must be different. But this second difference is temporary only. It will vanish once the standard of living (and housing) of the urban Native has been raised to that of the European.

TOWN-PLANNING

The family as we have seen was the first social group. That does not mean one man and his wife only, but their offspring with their households as well. In the Caucasus, for instance, there are many families like this isolated in the valleys among the mountains. These families are economic units who help each other with reaping and harvesting. They also combine to protect their common interests against enemies. They constitute the first village. One of their members would be the local carpenter, another a smith and so on. Amongst these people we first find group consciousness in a restricted sense. Even among the Bantu there are little groups of huts of this nature (although here, because of their greater backwardness, there are no carpenters, etc).

In village life we find the first signs of the collective life that is so characteristic of modern society. It is here that the first division of labour takes place, here that there is greater security

against caprice of nature. Co-operation increases the amount of food obtainable, so that a greater amount of leisure becomes the lot of the individual.

Yet in the primitive village (as is general in primitive society) there is very little private property, just as among the Native tribes of South Africa. The land has no value to the individual - it belongs to everybody.

One thing that characterises village life, apart from the fact that the people live close together, is that they do most things in common. They celebrate harvest festivals, weddings and births together. They dance and sing together. They have common legends, that they tell and listen to together. They have a common religion, and share common superstitions. Of course, many of these activities are common to a whole racial group, but the particular district has its particular variations. Such districts even have their own dialect. In other words, these people have a culture of their own, something to which everybody contributes, and something which leaves its mark on everybody. Because of their common customs the individual learns to be proud of them, firstly, because they are his customs, and secondly, because they are the customs of the group. The result is that when members of his village are praised he feels a glow of pride, and if they are injured he feels personally affronted.

It is only by partaking of such collective activities that man can live a full life. It is necessary because in a group there is always inter-stimulation. It is a circular reflex. If, for instance, anything stimulates an individual's indignation he is merely indignant. But if there is someone with him who is also affected in the same way, and who expresses his reactions either in words, by the expressions in his face or by his actions, his emotion is intensified, which in turn increases that of his companion. This phenomenon has been extensively observed in all walks of life. A joke or a story is appreciated more in the company of others than when alone.

We see therefore that collective work and collective pleasures, collective desires and collective prejudices constitute the very soul of a village community.

Let us now see what happens when the village develops into a town of a considerable population.

The small town is similar to the village in most respects, but the larger it becomes the more diversified its life becomes. From a merely agrarian centre it changes its character into something entirely different. The peasants are replaced by tradesmen, shop-keepers, clerks and workers. The activities of the individuals become more specialised, they are broken into groups who often form their own unions. A group of people living together like that, and continually growing in numbers, would tend to become disunited, so that as their numbers grow the central government of the town or the municipality increases in power. It undertakes the organisation of collective amenities, sees to the roads, and only recently supplied its citizens with water and sanitary conveniences. It passes by-laws which are essential for such a large community.

If we look into the past, we find that the burgomaster or Mayor of European towns was the cultural and political leader of the town, who represented its interests and organised its cultural activities. The civic centre of the town, or the town hall, was the very heart of the community. It was the seat of the town council, and also the cultural centre where concerts and festivals were held. Besides being the actual link between the various sections of the community it tended to be symbolic of its unity.

Let us consider the growth of the 20th century city and its effects on the life of the community. The development of the machine and its displacement of human labour, generally known as the industrial revolution is responsible for the present large proportions of our cities. Without the capitalist economy which developed along with it, the modern city would not be able to exist. The production of commodities has become a very impersonal affair; whereas the tradesman of 200 hundred years ago, started and completed an article on his own or got members of his family to help him, the worker of to-day performs only a small part of the operation necessary to produce the finished article. By this means the full expression of his personality is curtailed

and work has become much more monotonous and deadening to the nerves and intellect. The old struggle for existence with Nature has now been replaced by a struggle against his employers and exploiters. The result is that the city is divided into a number of sections which have very little in common with one another. The Berlin of the Kaiser or of Hitler or the capitalist class, is entirely different from that of the Siemens workmen. The former feel their unity as a class, and the latter also form themselves into a self-conscious group. Their districts, their habits, their education, their standard and mode of living are entirely different, their hopes and ambitions are widely divergent. The former class is interested in accumulating more capital and greater power, whereas the latter in improving its miserable lot. Whilst in the old village and town the standard of living was comparatively equal, in the modern city there are enormous contrasts between poverty and affluence. The only thing that gives the different sections of a community a certain amount of unity is the fact that they occupy the same city. However this does not mean very much; there is rivalry between the various suburbs, and many of these are like self-contained towns. The people living in Vrededorp have nothing in common with those living in Houghton. The modern city is in effect the conglomeration of a number of towns, but in actuality it is an economic and political unity insofar as it is controlled by one body and has one budget for the whole community, and insofar as everybody depends for his livelihood on its industries.

As the city is always controlled by the upper classes, its activities as a city are merely representative of that class. The popular concerts and lectures held, the garden parties etc. are not meant for and generally not attended by the common worker. The overt cultural life of the city is that of a section of the community only, the rest have their own activities and organisations. The city as a collection of men of various interests is a many-headed monster.

Of course, it is not rigidly divided along the lines indicated above, but is also a very highly integrated organism. This can

be seen by taking as an example the activities of one citizen. A certain Mr. Jones is a turner; he belongs to his trade union. Besides, he is interested in football; he also happens to belong to a church, and is an active member of the Labour Party. He happens to live in a particular suburb and periodically has to vote for a representative for the City Council. In each of these capacities he is a different man. As a member of the Labour Party he reacts to situations in one way, and as a sportsman in another. It often happens that his various activities are in water-tight compartments and have very little effect on one another. Thus, it is often found that a very brilliant scientist is also very religious and believes in everything taught by the churches. He does not allow his religion to interfere with his work, or his science to modify his religious ideas. It is to a large extent due to this phenomenon that the individuals of a city form a unity although their interests are so diverse. The complete integration of the individual is sacrificed, for the good of the community.

It appears necessary to look a bit deeper into the life of the individual inhabitant of a modern city. Many philosophers and psychologists have, after a great deal of thought, come to the conclusion that life means action and this is only logical. But although it is a commonplace many city-dwellers do not realise it, either in thought or practice. Let us examine why. In the morning the average citizen gets up, goes through the routine of doing his toilet, eating and catching the tram or 'bus to go to his work. Here he remains busy for the greater part of the day, and is back home again at about 6 - 6.30 p.m. In summer, in South Africa, there is about $1\frac{1}{2}$ hours daylight left. Our friend is too tired to do much, he reads the paper, or does a bit of gardening. In winter he arrives home when it is already dark. Of an evening he might read or chat a bit, sometimes go to a "show" or a dance. As we see, there is not much action in his daily life. Occupation in a workshop or writing at a desk is not action, it is merely a way of earning a living. This is a peculiar thing about our civilisation. The means become the end in the lives of most people. Work is the means to food and life, but it is almost

always made the most important part of life, in fact it occupies the greater part of the waking hours.

To get back to the idea of action. What is the result of these inhibitions and lack of a normal active life? It is that modern man does not develop habits of action and when he has a bit of leisure (which happens occasionally), he does not know what to do - or if he has anything to do, how to do it in moderation. Generally, however, he cannot afford to do much, so that he is obliged to spend the time at home. The result is either, that he gets into mischief, or else (which is by far the most common occurrence) he grumbles about the hardships of life, gets fits of depression and has a bad temper generally.

Life is called prosaic and uninteresting. There is a great deal of unspent energy, which makes for restlessness. The result is a greater or lesser degree of unrest and occasional attempts to improve matters politically.

The people who are, more than others, affected in this way are the slum dwellers. The slum is produced by and is an important part of the modern city. It consists of those parts in which people are generally indigent and have to live in squalor, parts in which the children are poorly clad, poorly fed and are obliged to play in the streets, between houses of poor quality and under miserably cramped conditions. In Johannesburg the greater part of the Native townships and about a third of the suburbs occupied by Europeans are slums in this sense, even if this fact is not officially admitted.

The effects of the slum, besides the prevention of a normal outlet to surplus energy, are many. There is very little or no culture - of that "veneer" which distinguishes a civilised man. People see too much of life in the "raw" to develop much susceptibility for refinement. Children see tottering fathers coming home from the bar, where they had attempted to forget their troubles, sometimes they see their drunken or even sober fathers beat their mothers. They hear foul language, and see many quarrels and fights. They

are so crowded together that there is not much to prevent the development of immorality. Early indulgence in sexual activities makes self-control and discipline rare virtues. To make matters worse, slum-dwellers, besides their lack of self-control, have very little knowledge of sexual matters and Eugenics. Large families and less food per mouth and more overcrowding are the results. It becomes a vicious circle. Life is a drudge and a misery and remains thus to the grave.

It is not necessary to go into the conditions obtaining in slums generally, but it may be useful to compare the city community with the country community, to see whether there is any difference, and if so, whether conditions in the cities are better or worse. Now in the country, i.e., on the farms, people live much nearer to nature than the city-dwellers do. They are occupied with manual labour in the fields; they fill their lungs with fresh air, and have all the benefits of the sun. As far as physical health is concerned they are A.l. (i.e., those who do not suffer from malnutrition, etc.), and as for longevity they head the list of the various occupations.

Their family life is simple and more intimate. Kinship bonds are stronger and parental control and public opinion more definitely felt than in the towns. Tradition is stronger and the people are more conservative. Life is more simple and direct, and since the individual has a very limited range of experiences he is fairly ignorant, superstitious and inhibited. But because of his outdoor life, he has not much unspent energy and is fairly contented even if conditions are not quite as good as they might be.

There are three things mainly in country life that can be of use in our discussion of the city-dweller. Firstly, the country-dweller has sun and fresh air. Secondly, he has plenty of outdoor activities which make him happy and contented, and lastly, there is a much closer bond and greater co-operation with his fellows. Country people are less individualistic than city-dwellers, and in many respects it is desirable that a certain amount of individuality should be sacrificed for common improvement.

In the town-planning schemes worked out by Le Corbusier, and in others actually carried out in Europe, especially in Holland, Sweden and Russia and Germany, the principles derived above have been applied, namely an optimum supply of fresh air and sunlight is ensured, more space for outdoor activities is supplied, and finally greater communal life is made possible. It is important to try to analyse what the effect of such an ideally planned township on the life of the community would be. The first necessity, for the possibility of such a scheme, is that it be carried out by a public body, or by representatives of the people who are to occupy the town. This is essential for two important reasons. The first reason is a negative one. If such a scheme were carried out by a capitalist body, profit and not the comfort of the community will be the main concern. The second reason is positive. Only if the scheme is built by a public body or by the community itself, the individual citizen would have a personal pride in it, and would be willing to give all possible assistance for the common good in which his own is included. This consideration in a housing scheme is essential, and its validity is abundantly proved by experience in the U.S.S.R.

Civilisation is characterised by the living together and co-operation of thousands and millions of people for mutual benefit. Yet at the same time civilisation stimulates the growth of individualism which is not bad in itself, but which, if left unchecked and allowed to become egoistic, can cause a great deal of harm, can even cause the collapse of civilisation and culture; it is therefore necessary to maintain active co-operation and collective living. This need is supplied by community housing.

The economic and social necessity of having people living in close association leads to the flat system. We must therefore investigate whether it is impossible for the individual to adjust himself to flat life. Does the flat system work in practice, or are people living in flats very unhappy? In Europe and America, millions of people are living in flats, in the U.S.S.R. they are re-housing millions of city-dwellers in flats. The people living in apartment houses do not suffer any inconvenience but enjoy many advantages.

It saves them transport, trouble with servants and similar worries.

Before the working classes were actually housed in flats, the objections still made by the owners or occupiers of private houses, were very common. It was believed that their individuality would be crushed, that they would become mere atoms in the larger whole - society, and that they would lose their identity. In a private house, it was and still is held, they can stamp their individuality on their home, by arranging their garden and rooms to suit them, and paint their houses according to their own fancy. In this connection it may be noted that many objections to present-day flat life are perfectly valid, but then the fault lies with the actual design of the flat blocks and not with the principle.

On the whole, however, these objections are quite without foundation, since there is very little difference in the appearance of suburban houses. Yet they must be seriously considered, because whatever a man believes in is real to him. In the same way people become emotionally attached to a private home, they are averse to change, and no amount of argument will alter their ideas.

Another objection is concerned with the alleged disintegration of family life, but this can easily be met by a short consideration of the modern family. Present-day ideas or rather conservative ideas are based on the semi-patriarchal family system of the pre-war days, when the father was a despot in his own family.

The modern family is liberal and democratic in its outlook, and loose in its structure. There is a healthy attitude towards sexual matters, and the individual has his own friends and activities, and is given the chance to develop his own individuality. There is not so much parental control and there is a greater amount of mutual regard and respect based on real merits.

There could be no harmful effect on such a family, by the flat system (since to a considerable extent it is the outcome of that system). So if a family of this kind is the general rule, flat life would be

a definite advantage. For in this system the control of the individual depends almost exclusively on the praise or censure of society. It would therefore be preferable for him to live in closer contact with his fellow men outside his own family group.

The arguments against flat life are mere rationalisations of man's fundamental fear of the suppression of his individualism. Yet experience has shown, and shows every day, that everything is to be gained by collaboration.

In flat life this atavistic tendency of extreme egoism is not given any outlet, because in our society there is enough to supply everybody with the needs of life so that there will be no necessity to exert the selfish part of individualism. People will still be able to furnish their houses as they please and to use any colour that suits them. The main difficulty, it seems, is that at first they feel that their liberty has been curtailed if they are forced or believe that they are forced into an apartment house. People like to believe that they are free agents with a free will. They feel that if they are allowed to choose their own home, whatever it may be, and to cultivate their garden, that they are acting according to their own volition. Actually, there is no free volition. To start with, if they belong to the working class (black or white) they can choose from only a certain type of house even if they desire something better. They are limited from the start. Then they can only choose from those available and finally choose one that seems to suit them. Generally it is something that strikes them or is the most convenient - there is not much of independent will in that - their choice was dictated by their needs, their purse, and by their prejudices or preferences built up from past experience. If they can be led to understand that they really have the same freedom of choice with regard to flats, their objections will be overcome.

In housing people in flats, therefore, it is quite unnecessary to make them feel that they are being forced by some private person or body. If they believe and to a great extent this is true, that the introduction of the flat system is the only and inevitable solution they will bow to fate and adjust themselves to it without much difficulty. Even if they do not like the idea at first they will soon find that their

prejudices were unfounded. In our present economic system there is normally no need to possess a private garden to procure food, so that they will not really miss it. They may, however, wish to have a couple of flowers to tend. But this is no difficulty since this wish can so easily be fulfilled. As far as greenery and open spaces are concerned there will be more of this in a flat block scheme than would ever be possible if the individual house idea were adopted.

In an ideally laid out city, the individual will live decently, cleanly and with a permanent, adequate home. There will be no overcrowding with its harmful psychological results. Therefore morals will be protected. People will be healthier, and the green trees and grass will form a more restful background, than the usual gray buildings and bustling streets. The elimination of noise and dust will make the nerves less prone to irritation, and hence will make the people less irritable and more affable. The open surroundings will give them more freedom, and more opportunities for physical exertion and recreation. Organised sport and a greater amount of communal and cultural life will be possible. The personality of the individual will be more integrated or in other words he will not develop so many abnormalities or inconsistencies in his mental make-up as are found in the inhabitant of the present type of city.

NATIVE HOUSING

The Native, generally speaking, is faced with the same problems that confront the white man who moves from the country to town, who changes his mode of life from agriculture to industrial or other city life. The process has been going on in European countries for almost one and a half centuries. Yet the case of the Native is much worse; for not only does he proceed from a more backward environment, but when he comes to town almost every human privilege is taken away from him. As we have seen, he is subject to a hundred and one restrictions, some merely due to his economically inferior position, others to a deliberate policy of suppression. His income is far too small to give a minimum supply of nourishment and shelter. He is half-starved, housed

in overcrowded surroundings, lives in filth and is unprotected from the ravages of disease.

In his natural state he drinks beer, which has been prohibited in the cities till recently when public beer halls were established. As we have already seen he loses, to a great extent, the usages and moral practices of his tribe, and all the usual outlets for his accumulated energy. Cultural and sporting activities have only replaced his old activities to a very inadequate extent.

There are however various clubs and associations in the Bantu community which will in the end save it from its present degraded state. These, however, affect only a very small section of the Natives and usually only those who have been lucky enough to enjoy a certain amount of education. In an ideal township these activities will be able to be fully developed, and adequate provision be made for a social and educational centre, and sufficient accommodation to enable every member of the community to partake of sport.

The main consideration, however, is to provide the Native family with minimum housing conditions, which will be considered in the section on planning. Because of his natural communal tendencies it would be advisable to house the Native in such a way as to enable him to live in close co-operation with his fellows. Private houses will not completely answer this need, since this, together with the capitalist economy, will tend to make him only more individualistic and selfish. Decent flats, arranged in such a way as to supply all his social needs might therefore be preferable.

But to house the raw Native or even the city Native in flats presents many difficulties and to some "authorities" some of these appear insuperable. Even the Natives themselves have objections. It is contended that flat life will deprive them of privacy, that it will lead to quarrels and immorality because the people will live in such proximity; some who feel that their people are inferior and backward fear that they would not know how to make use of these new amenities. One hears arguments against flat life, in which it is stated that the

baths will only be used for storing coal or other objects.

In answering these objections some fundamental considerations must be taken into account. The first is concerned with the possibility of an adverse effect of the flat system on Native family life. Therefore, if Natives are to be housed in flats, there must be a minimum supply of amenities, which is necessarily very much higher than the present level for Native housing (which is usually no better than slums). We have already seen the effect of city life on the social and family structure of the Native population. To prevent some of these evils there must be sufficient room in flats, to give the parents a separate room with a separate room for children of either sex above the age of 12. This arrangement would be fairly similar to the conditions obtaining in their primitive state, in fact it is what is necessary for any society whatever. Such flats would improve hygiene and moral conditions with infinite benefit to the inmates. But flats alone are no solution to the problem. Additional amenities such as large parks and sports grounds, social clubs and schools are necessary. If Natives are to be housed in tenements without these additional amenities they will be worse off than if they were housed in their individual little shanties. They would not be able to afford to live decently and to augment their income they would be obliged to take in lodgers as is the case to-day. It would, therefore, not be possible to house Natives successfully in flats if they were left at their present low economic level, unless rents can be reduced considerably. To enable them to use the amenities of modern life to their full extent it is necessary to have passed on to them the past experience and culture of the race which has created contemporary civilisation.

Unless they acquire this culture they will not feel quite at home in flats with no real fire but supplied instead with electric radiators. These will not appear so homely and all the associations connected with the old open fire will be missed. Among primitive people generally one finds ceremonies and rituals connected with fire and gods and goddesses of the hearth. Unless these old superstitions

are broken down and replaced by something new through the medium of education, adjustment might prove to be slow.

However, man has always been able to and will always succeed in adapting himself to a changing environment. It is not a matter of choice but of necessity, if he is to continue his existence. It is mainly this quality of adaptability that distinguishes man from the other animals. He is able to make a living in the arctic circle, in central African tropical climates, in desert Arabia and in almost every other part of the world. The ancestors of the modern Europeans used to wander about on the Continent and used to live partly by hunting and partly by agriculture, and yet their descendants live in huge cities to-day. There has been no change in man himself but merely in the environmental forces which act on him (and these are often of his own unconscious creation as our present economic system for instance).

If the circumstances under which the Bantu people of South Africa live are changed, these Bantu will find no difficulty in adapting themselves to flat life. In fact they have many advantages which are lacking to the European. The Bantu have not yet completely broken away from their primitive communal life so that it would be comparatively easy to make use of this tendency in allowing them to live in flats, with their additional communal amenities.

A community of this nature can run its affairs in the old democratic ways of the Bantu people. The leader or superintendent of each block of flats can be elected together with his advisory and executive council. Through these officials it would be possible to organise the laying out of public gardens, the planting of trees and the social and cultural life of the group. Their society could be re-integrated and the individuals could become prouder and more virile. It is only by this means that the rapidly disintegrating Native community can be saved; and at the same time the life of the individual could be made happier and more contented.

Moreover, the Bantu's natural appreciation of form and arrangement, will enable him to appreciate a formally laid out township. Townships like Orlando can have nothing but a depressing effect on him (and even on the European who has largely lost that appreciation of

form) by its deadening monotony. But surroundings in which there is a simple and classical contrast between buildings and nature, will have an elevating effect upon him. Order and repose, besides its many material advantages, have a very positive effect on the human mind.

To sum up, the city Natives are rapidly losing contact with their tribal traditions and discipline. They are almost completely dis-integrated as a society, with the exception of a few well-organised social clubs in various parts of South Africa. Crime and immorality are general; more than half the children born in the cities are born out of wedlock. The cause of these conditions is economic. The low wages of the Native have as a result the overcrowding of rooms by members of both sexes and the breaking up of the solidarity of the family. There is practically no social life, and no normal outlet for accumulated energy, with the result that many Natives indulge in activities which are detrimental to their fellows and to the white community.

To solve the various problems with which the Natives are confronted, they must be housed in such surroundings and with such amenities and facilities that they can recover from the many set-backs which their race has experienced. If they are housed in flats they will gain many advantages, but at the same time they will have to face certain difficulties, which, however, can be overcome by training, leadership and education.

As to the objections that the Natives are inferior to the white man and will, therefore, not be able to adapt themselves to such an advanced level of living, we have shown that there is no proof for this assumption. Hence there is no reason to believe, that there are any insuperable psychological difficulties in the way of housing an urban Native community very much in the same manner in which we would house a European community of similar economic status.

III

P L A N N I N G

INTRODUCTION

"Man walks in a straight line because he has a goal and knows where he is going; he has made up his mind to reach some particular place and he goes straight to it". - le Corbusier.

Research, and the establishing of the background out of which planning may develop, cannot end where the sociologist draws his conclusions, and the psychologist declares his analyses. Town-planning does not consist alone in integrating the, as yet, intangible requirements of the sociological and psychological fields, into some three-dimensional, "solid" existence.

The town-planner has his own principles to obey - principles of the town-planning art. To avoid confusion one ought really to specify the "town-planner" as the "modern town-planner", for it is only in comparatively recent times that town-planning from principles has been adopted as a fit procedure. What was town-planning in the past dictated by? We cannot feel that it was spontaneously evolved, with no background, no reason for its existence. Town-planning was a decorative art, much like carpet designing, for that matter. The concern of the town-planner was infinitely more with the symmetry, the star-pattern of his project as it appeared to him on his beautifully rendered plan, than with the questions of workability or even the appearance and material existence of these patterns in the eventual three-dimensional realisation.

From being once a decorative art to being (what it should after all be) a "utility" art, sums up the revolution in town-planning. In order that the design for the Native Township for 20,000 inhabitants may not be judged, evaluated solely in terms of historical town-planning practice (i.e., as a pattern, bluntly speaking), it is necessary to enumerate those positive principles in planning that guided the development of the design. These principles were evolved, collected, advanced and demonstrated by the great French architect, le Corbusier. To him must go the full credit not only for achieving this, in itself a considerable feat but mainly insofar as he has made the carrying out of a design, such as the one presented here, a possibility at all. It is necessary to give his principles

in regard to planning, even in summarised form, so that the design may be appreciated in terms of them.

GENERAL PRINCIPLES OF TOWN-PLANNING

The revolution in town-planning practice from the "star-pattern" state of affairs to the present approach to the subject, can best be epitomised by the statement that the human-being has entered the consciousness of the town-planner. Whether or not one has a regard for the plastic expression that characterises le Corbusier's projects, one is unable to deny that he plays the fundamental role of Humanist. The human-being is his concern, all the time.

It would seem axiomatic and, therefore, unnecessary to mention that any town-planning scheme should be considered in terms of the requirements of those who are to inhabit the completed town, if it were not for the fact that the requirements of the individual have for so long not been so much neglected as completely ignored as not affecting the issue.

Thus, in the exposition of the principles, let us start with the hitherto overlooked - human-being. It then is evident that the business of town-planning is foremost a practical problem with its roots in the lives of the people of the time. The demands of these people are born of their every-day existence. It is to improve the surroundings in which people work, circulate, eat, sleep, etc., etc., that the town-planner is consulted. Thus, in accordance with this very first postulate, if a town-plan does not serve people's practical requirements, however beautiful it may appear on paper, or from the air, or along certain vistas, it cannot be considered a success.

This does not now imply that a town-plan, conversely, by merely and only meeting all practical requirements without exhibiting any further formal or beautiful characteristics, achieves perfection. Or, on the other hand, that the method of approach is to solve all the practical problems first and to add the "beauty make-up" and "touches" subsequently.

The design of the scheme must advance practically and aesthetically at an equal rate. For, to return upon ourselves, the scheme is designed for human-beings - to satisfy their physical and mental needs in the broadest possible sense. These two aspects are of equal importance and it is impossible for the town-planner temporarily to lose sight of one or the other if he aims at providing the most balanced and complete background to man's earthly existence.

It can be seen that this "humanist" approach to town-planning immediately demands a certain amount of research into the lives of the people who are to be accommodated. In fact, design, in the purely architectural sense, is not possible until this whole background has been appreciated and the inevitable conclusions arrived at and decisions made.

Let us commence the research by making some observations on the daily existence of the people we design for. The community, for this purpose, can be divided up into occupational classes.

- (1) The fathers and wage-earners (or bread-winners).
- (2) The mothers (or housekeepers).
- (3) The high school and technical college children.
- (4) The primary school children, and
- (5) The kindergarten children.

The town-planning scheme must cater for each activity of every class. The occupations of these classes can be divided into the three categories:

- (1) Work.
- (2) Recreation.
- (3) Education.

This brings us to the next fundamental principle of contemporary town-planning - zoning. Zoning can best be illustrated in existing cities by its negative appearance, its non-existence. We all know the lack of arrangement in our present cities, where business is carried on in the same region as amusement is to be found, where residential regions "interpenetrate" those occupied by gaols and hospitals, where recreation is to be found adjoining railway stations. Zoning gives organisation and clarity to the numerous and assorted elements, which combined, are known as a city. In this manner the districts where the three main urban activities are carried on (work, recreation and education), will be properly related. They will be cut off from each other in some cases - (for instance, factories will be away from residential districts); they will be brought closer in others - (e.g., bioscopes and theatres will be found near the home). A proper broad working arrangement will thus be achieved; the relation between the elements thus created will dictate, to a very considerable extent, the formal balance of the scheme considered as a whole.

Our particular problem, a housing problem, will already be dealing with a "zoned" portion of the city. Here, work for the most part will not take place. Certain portions of the population, it is true, would be doing work mainly of a household type here, but the main activity will be in the business and industrial zones.

Recreation and rest are the chief concerns of the designer of housing schemes. The strain and wearing-down effect of every-day work make it essential that a home milieu in which it is possible to recuperate be provided. Against the rigours of work is set the congenial atmosphere of the home, the possibilities of recreation and cultural advancement. The latter questions fall very certainly within the sphere of operation of the home-designer. He must consider where exercise is to be obtained, where amusement is to be found, where cultural advancement can be carried on. In addition, the advisability of stimulating communal gatherings by the provision of suitable facilities for them must be considered.

Educational problems are the next in importance. The danger of modern traffic to young children is a factor that must influence the zoning of schools for the very young in relation to their homes. Kindergartens, too, should be considered in their zoning from the point of view of the utmost convenience to the mothers who have to perform household and other tasks during the day.

Larger educational institutions must be considered in the light of their connection with the general cultural life of the community.

These, then, are the general lines on which the life of the community must be studied.

We must next examine the form of the society we are to house. The question of housing in the country under a scheme of radical agrarian reform is not being discussed here - urban housing is the subject to which the interest is to be confined. The modern city, then, must be understood as a sociological phenomenon. Its growth in the last 100 years has had a great significance. There has been a great movement of people from the isolated mode of country life to the more cohesive form of city life. The character of our investigation can be best revealed in the increasing urbanisation of the people. The city is a centre, a magnetic pole towards which the people are attracted. But its vitality as a centre, its magnetism, depends upon the concentration of people about itself. Here we have the most pressing problem that a town-planner to-day has to face. It is the paradox of the simultaneous demands for concentration on the part of the city for its vital functioning, and for space on the part of the population who live and form the city. The paradox manifests itself to a very marked degree in the tackling of a housing problem. Existing housing conditions give two alternative methods by means of which people have been housed to date. The one is the squalor and over-crowding in the slum quarters - achieving the desired concentration but at the complete sacrifice of habitable conditions; the other is the opulence of the wealthy-class suburbs where space is ample but where the concentration is extremely low. Although the latter solution is ideal from the point of view of purely habitable conditions, and can be adopted

for the very limited wealthy community, it does not meet the case when applied to large-scale housing projects. Land costs are in the first place prohibitive, but with the spread-eagling of the city over square miles of area, necessary municipal services are impossible to provide, except at enormous expense.

Thus it can be seen that history offers no solution, and as the problem becomes increasingly acute with the increasing drift to the towns, it is certain that some new way out of the conflict has to be found - and that immediately.

Town-planners to-day offer two alternatives. The first solution is the individual home solution on smaller sites than those provided for the wealthy, and mentioned above. Sites of approximately 100' x 50' are named, this being a considerable decrease (75%) on the "luxury" ground provisions, but being, nevertheless, considerably more than is usually found in middle-class suburbs (75'0" x 50'0" is the normal, 50'0" x 50'0" is not unusual). It is then agreed that the concentration thus gained is sufficient, whilst the space provided is fairly ample. A close examination of this solution shows that on the whole it is anything but an adequate one. In the first place the houses and outbuildings cover usually from 50% - 60% of the ground granted to each. The result is that the space left over is meagre and provides poor possibilities for children to have their games off the streets. Further, the space between neighbouring houses would not be adequate enough to ensure reasonable privacy, particularly seeing that bedrooms would, as often as not, face the neighbouring kitchens, with but 10 feet of clear, and sound-transmitting, air separating them. Without even proceeding to discuss the formal aspects of such a solution (which would exhibit an individualism causing the whole to be a chaotic jumble), the practical deficiencies rule it out of any further consideration. The concentration is not sufficient if the space so sorely needed is granted, and vice versa.

The second solution is by adopting the flat or apartment system. This is now possible on a scale hitherto limited to a large extent by an inadequate building technique. Flats form a

means of concentration that can supply all the demands in that direction. On the other hand, flats as we know them to date are virtually no more than cages in which the "human" lives a dreary and confined existence. There is not sufficient open space about them, if any at all is provided, whereas in the flats themselves, beyond a small concrete or brick balcony, cold and utterly unattractive, the flat-owner has no means of communing with nature outside.

These defects are not, however, inherent in the flat system as such, but are the result of a vicious and uncontrolled exploitation of the system (valued for its concentration possibilities) to derive an inflated return of rental from a given area of ground.

There seems no reason why each successive floor of a flat building should not be considered as a complete building site; - as Prof. Thornton-White once put it - super-imposed building sites. The system now assumes a different appearance:- house plus gardens growing in concrete boxes) are transported to higher planes, whereas the ground plane on which they originally stood is left free for open park development. Even where economic exigencies prevent the ideal working out of the "hanging-garden", "super-imposed-site" principle, the flat system can still be adopted with a balance of many advantages over the single house system. Any desired degree of concentration can by this means be obtained, with the simultaneous saving of valuable ground space.

In Vienna, where a progressive municipality dealt with the acute housing shortage after the Great War, the following conclusions as to concentration possibilities (and resulting economies) through using the flat system were arrived at:

"We have found that if we utilise 30% of a building site for the erection of an apartment building we need only 30 sq. metres of ground for each dwelling; hence the cost of land is much lower than if we built more cottages. Moreover, there are material economies in the erection of multi-storey dwellings directly adjacent to existing dwellings. The ancillary cost consists only of the building of short streets, and moderate expenditures in con-

necting up with the existing network of sewers, water and gas pipes and electric lines." - Das Neue Wien, VOL. III, pp. 52 - 53. To save the horizontal, exploit the vertical. As far as privacy is concerned, it seems that with a proper sound-proofing wall, separating the one flat from its neighbour, a good deal more can be done in this direction than is possible when neighbours have a gap of 10 feet of air separating each other.

From a consideration, therefore, of the structure and nature of the modern city and the relation of housing to the city, one can come to the definite conclusion that for any housing project on any reasonable scale at all the flat system is the system that logically should be adopted. This, let it be stressed, does not necessarily take into account economic levels in the society to be housed - from a purely planning point of view, regarding the city as a working organism, a machine, the flat system is advisable for all sections of the community. We may even go further in conclusion - the flat system of housing outlined above is the only one that would make it possible for the city to survive and to develop.

Above, a programme of research has been outlined which has to be followed in order to tackle the problem of housing whether applied to one section of the community or another. The problem of housing in the modern city has been, so to speak, abstracted and a very general set of questions has been asked. (For instance, taking the general problem of cities as they exist to-day, how would one house the population that live there ?) The result is a set of normally absolute results, hard and fast rules emerging from these investigations.

However, the programme of research is not complete: to these investigations has to be added more particular research into the community that is actually to be housed - not so much research of a directly planning nature, but research which will throw light onto the social background of the community that we are asked to house.

Firstly, we have to study the economic and political background of the people - that is, what class in the class-structure of the general society they belong to (if there is a class-structure): what classes they have graduated from, and what are their possibilities of social advancement from an economic as well as a political point of view. This will dictate what particular form the housing solution shall take.

Next, there is the psychological background of these people to be studied. An architect or a town-planner is a person who usually postulates a change an advance in current ideas about building. It has to be decided as to how much ability to face a change, the community possesses. Whether there are certain formal prejudices (not necessarily negative) carried over from a previous mode of housing that are worth retaining and developing in the community's consciousness in the new surroundings. In the case of backward or less-civilised people, it must be decided to what degree it is psychologically possible to increase the mechanisation of the home.

Constructional possibilities have to be investigated - in what respect does modern technique make the planner more able to tackle his problems. An examination of financial resources will decide, firstly, the particular constructional methods employed, and also the very nature and possibilities of the planned scheme.

Armed with this veritable battery of knowledge, the town-planner may then, with infinite temerity, bring out his ream of grease-proof paper, sharpen his pencil and wits, and battle with the practical and aesthetic problems which are his own particular sphere of operation.

THE COMMUNITY TO BE HOUSED

We come now to the particular portion of the discussion. The problem is the design of a location for 20,000 Bantu inhabitants to be situated near a large industrial town (e.g. Johannesburg), in South Africa. In this location will be housed married men and women and their families. Bachelors over the age of 18 are not permitted in

the location but are provided for separately in special compounds. (See Sociological Approach).

Let us see who these people are and what sort of lives they lead. Their social and economic condition and position has already been fully dealt with in preceding chapters, but a brief summary might not be out of place in this section.

The Native population we are to house is one characterised by its meagre material resources. The males are employed either in the industrial concerns to the south of the city, or in the offices and shops in town. The Native, as regards housing, is segregated away from the white community. Thus, in order to arrive at his work the Native has to travel a distance of upward of three miles in each direction per day. As working hours are, in most cases, long the Native has few hours to spend at home, and usually spends them in a prostrate, thoroughly exhausted state. The fact that he has often a few miles to walk from the railway station serving the location until he reaches his home is a further tiring factor.

For his work, the Native is paid an extremely low wage (approximately £4 per month), out of which has to be found, firstly, transport charges to and from work (about 8s. 6d. per month), taxes (£1 per annum), before the question of expenditure on living requirements can be discussed.

The females usually stay at home and care for the children as best they can with the resources at their disposal. Often, however, they find it necessary to supplement the family income by taking in washing from the white community, or even by leaving their household for whole days in order to do day work in the white suburbs. Some cultivation of the small plot of ground generally provided for each abode is attempted in order to supplement the income by raising a few vegetables.

The youngest children follow their mothers (on the latter's backs) to the washtub, wherever it may be situated. Slightly older children go to a primary school if the family can afford it.

If it cannot, they find their way into some odd job in the city - paper-selling, car-cleaning, etc. Higher education than primary school is practically unknown, economic pressure usually cutting short any possibility of further mental development. The income difficulty is so intense and serious that often the Bantu family is forced to resort to extra-legal means of supplementing the income. Illicit beer-brewing, petty-thieving are two instances.

The Native is subjected to further discrimination which directly affects the living problem. He is unable to own property in the location, and must always rent his house; even should he be able to purchase his abode, he would be liable to summary eviction (as soon as it is deemed that his presence is superfluous in the particular city in which he is working) and consequently to loss in selling his property at short notice.

In all, we may say that economically, the Native's existence is hard, a constant struggle to make ends (practically polar opposites) meet. His daily work is long and arduous in addition.

We have to consider the Bantu for our purpose from another point of view. We have to take into consideration certain psychological factors. These, too, have been dealt with in another chapter, but can again bear summary here. Broadly speaking, we find the Native removed from a feudal uncivilised existence in the reserve or on the farm, and brought to the towns to provide cheap, unskilled labour. The country life, with its age-old background of religious superstition, is in a trice broken down. With it, disintegrates the whole of the Native's previous moral and ethical code. The whole mode of existence is altered: from the comparatively stable cycle of life in the country to the madcap rush and quick-silver change of the city. The result is that we find the Native psychologically unhinged, and this factor must be taken into account when the housing of the individual is considered. Prior to the removal of the Native to the cities the social life in the country was characterised by a marked community-interest or -consciousness. The kraal, with the Chief at its head, was a close-knit unity, and the

and the individual had his chief interest in serving the remaining individuals insofar as they comprised the group. It is in this thrusting of the Native from a highly-organised life into the turmoil of self-sufficiency and independence (which is the keynote of city life) that we find one of the greatest psychological menaces. The housing scheme may well provide a means of overcoming this difficulty.

This gives us some insight into the Native, for whom the housing scheme is designed. What demands are immediately forthcoming from the above? Economic difficulties insist that the cost of living should be as low as possible for the Native: rents must be reduced to match the low income. At the same time the homes must comply with a minimum standard of decent living (to be enumerated later). It is no use providing the Native with a hovel because he cannot afford to pay for anything better. Further, the location must be so arranged that the Native has a very minimum of walking to do from the railway station to his home. The home itself must provide a truly restful background so that the Native may recover from his daily exertions. Recreation facilities should be found close to the home. After a strenuous day's work it is unlikely that the worker will find sufficient energy to indulge in the recreation if it must be preceded (or succeeded) by a dreary walk of a mile or two. Cultural facilities must similarly be closely at hand. Creches and kindergartens must be provided for the very young, so that mothers can leave their children in capable hands when they have to go out to work. The housing scheme, by its zoning and informal arrangement must stimulate a revival of that community spirit existing in the kraal, but destroyed or lost in the city.

MINIMUM STANDARDS OF DECENT HUMAN LIVING CONDITIONS

From the preceding analysis of the Native's position in the urban communities of South Africa, it will be seen that their housing costs could not be possibly borne, at least initially, by the Natives. For they have not the necessary capital. Some type of governmental assistance or municipal assistance is necessary in the form of giving to or raising a housing loan for the community, and even of paying the interest to a large extent on that loan for a considerable time. Whichever way one looks at it, it is apparent that no enormous amounts of capital are, therefore, going to be sunk in Native housing. Rather will it be the

other extreme - minima will dictate the general tone of the scheme. It is imperative, therefore, that minimum standards of decent human living for our present age should be set up, so that, in the inevitable process of cutting down expenditure on Native housing, the actual conditions provided do not sink below these levels. These standards would be based on considerations of the health, decency, amenity, comfort and convenience, and safety of the given population, and lest it be felt that, after all, these considerations are not so important for the black population, let it be borne in mind that the insufficient provision of health minima can have their detrimental effect directly on other sections of the population, who may be more fortunately endowed, financially or pigmentally. The conservative estimate that venereal diseases are to be found in 25% of urban Natives, and the recent (1938) smallpox epidemic which spread like wild-fire through the Johannesburg slum locations (notably Alexandra Township) are sufficient proof of the danger of unhealthy districts of habitation to a whole urban community. The other considerations outlined have their effect less directly, but certainly, nevertheless, there are material, good reasons for adopting minimum standards. The moral obligations to provide them need not be stressed.

What standards shall be adopted? We are of the opinion that with safety minimum standards provided in European working-class housing schemes are applicable and the "minimum standards required of housing" set out by Catherine Bauer ("Modern Housing", published Houghton Mifflin Co., New York) will be quoted here as perfectly reasonable and applicable.

<u>"Requirement</u>	<u>Minimum Standards</u>
	(i) <u>Decency</u>
Shelter unit suited to population groupings.	One structurally separate dwelling for each family or other natural unit.
Sub-division of unit for carrying on ordinary functions.	Enough bedrooms so that parents, boys, girls, can sleep separately. In addition, a living room and a kitchen, or a living-kitchen.

<u>Requirement</u>	<u>Minimum Standards</u>
Possibility of privacy.	Relatively sound-proof walls. No windows looking directly into windows of other dwellings.
(ii) <u>Health</u>	
Facilities for cleanliness and sanitation.	Running water and flush toilet within each dwelling. Toilet ventilated. Baths or shower either in the dwelling or in the neighbourhood (depends as much on local habits as on absolute standards).
Adequate air and cross-ventilation.	No dwelling more than 2 rooms deep in any part, which in apartment-buildings ordinarily means no more than 2 dwellings per landing if the stair halls are also to be adequately ventilated. As large a glass area as climate and heating provisions make practical.
Purity of air.	No noxious industrial or other fumes nearby. No heavy traffic streets immediately adjacent.
Maximum light and adequate sun in all rooms and public corridors.	No small courts, definite proportions between height of buildings and open space between them.
Facilities for outdoor recreation,	Play-spaces for small and large children. Walks, parks, athletic provisions, gardens conveniently located for adults.

<u>Requirement</u>	<u>Minimum Standards</u>
(iii) <u>Amenity</u>	
Attractive outlook.	Lawn and garden visible from all windows. Preservation of natural features of site in the plan. No paved inner courts. No blighted or run-down area adjacent.
Moderately prepossessing architecture (note that these are minima).	Buildings which more or less obviously fulfil their purpose of good materials and simple and direct design grouped harmoniously. Plan clean and simple to follow, both physically and with the eye.
Quiet.	Adequately insulated walls. No major traffic streets immediately adjacent. No noise amplifying courtyards or side alleys.
(iv) <u>Comfort and Convenience</u>	
Domestic.	Rooms designed to accommodate furniture and living habits, and to facilitate circulation and cleanliness. Closets, cupboards, kitchen equipment (especially apparatus for cooking and hot water). Laundry and drying facilities, either within the dwelling, within the building, or, if with additional labour-saving devices, centralised within the community. Electricity. None too many stairs to climb, say no more than 4 stories or 3 flights. In cold climates adequate heating provisions. In hot climates high enough ceilings.

RequirementMinimum Standards

Communal.

Immediate or easy access to schools, necessary shops, cafes and social centres. Work, let us say, not more than 30 minutes away at a maximum. Some facilities for choice of dwelling and location on part of tenant and, therefore, possibility of natural population groupings.

(v) Safety

Firmness of construction.	Adequate and workable building codes.
Play-space for small children without crossing a through street.	Use of super block, dead-end street, or large open block interior.
Passably fireproof.	Regulations against predominantly wood construction, except for isolated low dwellings. Stairs and corridors wide and directly accessible to outside.
Permanent immunity from partial or total neighbourhood blight.	Communities planned, constructed and administered continuously as a functional unit".

Lest these minima sound too much like maxima Miss Bauer goes on to comment on the fact that "out of the four and a half million dwellings put up since the war with official aid and regulation in the eleven localities we have listed, I think it would be safe to say that not less than four millions, or about 90%, come quite adequately within these bounds". American conditions are quoted.

EXISTING LOCATIONS

Minimum standards they are indeed. Low enough that any man, poor as he might be, can demand them from the authorities or persons who keep him subjected to their financial betterment. Minimum standards which, translated into terms of housing animals, would render one liable to prosecution for cruelty to dumb animals.

And to what extent do present provisions conform with or "exceed" these very minima? In what respect are Natives treated as if they were more, in the white man's estimation, than "dumb animals, "beasts of burden"?

The picture of the Native locations in Johannesburg, or in any big South African city, is as gloomy as the rhetorical questions in the above paragraph might lead one to expect. It may be argued that there are locations and locations; that, taking Johannesburg as a typical South African city, the Pimville or Alexandra plague spots are the older type to be supplanted by "ideal" settlements of the "Orlando" type. We will not discuss the Pimvilles or the Alexandras - we will confine ourselves to the alleged "ideal" settlements as represented by that Town Councillor's dream, that town-planner's nightmare - Orlando Location,

Briefly, what does Orlando consist of? It is a collection of little isolated dwellings, either two or three roomed, standing on 50'0" x 69'0" stands (not usually freehold) In the "back-yard" is a little earth closet. No separate kitchen or bathroom is provided: no water or electricity or drainage is laid on. Structurally, the houses are of brick with badly-fitting steel casement windows (one can see daylight between the frame and the jamb), no floor is provided, the roof is of corrugated iron with no ceiling. These "mansions" are clustered on a south sloping site (thus exposed to the worst winds) in a star-shaped arrangement, evident with difficulty on the artificial abstraction of the City Council's layout plan, but non-existent in actuality. The location sprawls, directionless, across an enormous area, exhibiting no formal grouping around the meagre communal provisions. The result is that for the more remote inhabitants upwards of half-an-hour's walk is necessary to get to the railway station. Owing to the numerous streets, the roads are not macadamised, and are left as raw red earth. This factor, combined with the star-shaped plan and the contours on the site, results, at each downpour, in great diagonal ruts being washed out of the surface. These "donga-decorated" mud-heaps form the playgrounds for the children of the location.

This in brief is Orlands - bleak, chaotic, colourless, an agglomeration of tiny red brick shacks covered with generally unpainted tin roofs. (The Council's merits should not be overlooked, for to create individuality of treatment, to relieve the after all inevitable monotony, have not they provided - at considerable extra expense - cast concrete imitation quoins to every third or fourth house, and are not some of the houses "relieved" by an interspersion of some orange, some mauve bricks to liven up the general red brick quality ?)

Let us study Orlando in terms of Miss Bauer's minimum standards. Firstly, under decency. Separate dwelling per family. This is nominally provided, although it frequently occurs that more than one family, for the sake of economy, inhabits one abode - to say nothing of the big problem of occasional visitors.

Next, enough bedrooms so that the various members of the family may sleep separately. In addition, a living room. In this quite fundamental requirement the municipal scheme fails miserably. At best there are three bare rooms in which sleeping, eating, cooking and bathing all have to take place. Thus, this fundamental, minima law of decency, segregation, is not satisfied. The next point - the possibility of privacy is not considered as of sufficient importance to be complied with.

Now as regards Health. Running water and flush toilet within each dwelling. There is no running water, the toilets do not flush and are without, a distance in the open air in rain, hail or wind, of some fifty feet - (particularly convenient, of course, when there is illness in the home !)

Baths and showers are neither in the dwelling nor in the neighbourhood.

The next point, as regards air and ventilation, is satisfied up to the extent of the minimum laid down in the Council's byelaws - 10% window is provided. This could well be increased.

The purity of the air as far as industrial smells are concerned is excellent, but great volumes of dust arise from the earth roads in the dry weather.

The provision of facilities for outdoor recreation is so infinitesimally scanty that it can be deemed as non-existent. As has been already mentioned, the children play in the street, and the only walks for the parents are along the dusty roads.

And now Amenity ! The attractive outlook is onto a cabbage patch, watered with bath- and dish-water, and a dusty road separating a row of bleak identical houses. - "Lawn, and garden visible from all windows" - not in Orlando. "No blighted or run-down areas adjacent" - Orlando is blighted, let alone anything adjacent.

The architecture is not moderately prepossessing - it is bleak and unimaginative and pretentiously and meretriciously relieved by concrete-quasi-stone-quoins and coloured bricks. The plan is anything but pleasing to the eye, and horribly complicated to follow - it is easy to lose your way in Orlando.

As far as quiet is concerned, the streets are so numerous, the houses so close together that there is always a bedlam raging in the place. Not all of this is due to the Native's notorious convivial conversational ability.

Comfort and convenience - none of these requirements are met at all.

Communal - access to schools, shops, cafes, etc., are as difficult, long and roundabout as is conceivably possible. Work is anything up to an hour and a half from the home, sometimes three-quarters of an hour being wasted in getting to the railway station.

Safety. It is true the houses are not in imminent danger of collapsing - nor is there extreme danger of fire, but no safe play-space is provided for the small children.

Lastly, the location is a blight at the time of its construction and deteriorates still further with the passage of time.

It can be safely said that Orlando conforms with these minimum standards to a miserable extent. This criticism, perhaps, has been unduly long, but has been necessary because of the much prevalent idea that Orlando, if not exactly ideal, is still not bad at all; that the Natives should be pleased to live in Johannesburg where they are cared for so well in contradistinction to the other cities where conditions are much worse. The human imagination finds it difficult indeed to conjure up something worse than Orlando, but in fact such is the case. In all, what a savage indictment on the white man's much-vaunted civilisation. How brilliantly does he fulfil the task of "civilising the savage".

THE THESIS SCHEME

We now turn from analysis and criticism, the two aspects of Native housing treated to this point, to construction. It is now necessary to present the authors' design for the township for 20,000 Natives.

The first decision to be made is as to whether the flat system or the individual house system should be adopted. We have already seen how, from an absolute point of view, the flat system seems to be preferable and have also seen, particularly, what disastrous results were achieved with the individual house system in Orlando. However, it might be argued that the general arguments do not have validity in this extreme, particular case, and that it was not necessarily due to the system of housing adopted that Orlando did not succeed. The issue must, therefore again be raised.

Summarising from the preceding sections, from the sociological point of view the adoption of the flat system is preferred as a better communal life is possible, the homes are easy to supervise, clean and control. Also, the argument that the house can be acquired as private property, and is therefore advocable, does not apply as the liability of the Native's being summarily ejected makes it inadvisable for him to acquire fixed property.

Psychologically good effects of communal activity are the provision of stable home and community background that would assist

the re-integration of the disrupted and disorganised urban Native. The alleged psychological impossibility of Natives being able to live in flats is unfounded. The Native is found to adjust himself from kraal life to some entirely new form of living, and why flat living should be more difficult to adjust oneself to than house living is not understandable. In fact, the communal living of the flat block approximates a good deal more closely to the kraal life in its communal aspects. (see Psychological Section).

From the constructional and financial point of view, with a given amount of money available and with certain technical resources, much more can be achieved with the flat system. The density of population per given area is greater, whilst the space retained for gardens, parks, play-space and amenities is greatly increased. Roads are reduced in number and length, and all the necessary services such as light, water and sewerage, can be installed at minimum cost. Proper mass-production, standardisation and rationalisation can be achieved easily under this system.

The architectural and planning benefits have already been sufficiently stressed. It may be merely noted that with the increase in the size of the group of cells from the individual house to the flat block, a formal arrangement of the whole scheme is possible on a town-planning scale, and the chaotic jumble of Orlando is avoidable.

All considerations point then to the value of the flat system, so it is therefore adopted. The next consideration is the unit within the flat block - the individual flat.

The flats provided fall into three categories: two-roomed, three-roomed and four-roomed, each having, in addition, separate bathroom, kitchen and balcony. The flats, it will be observed, contain many more rooms than those provided in the existing locations, the idea being to conform with the minimum standards previously outlined. Thus, families would pay a flat rate of rent for each type of flat, the flats being distributed in accordance with the number of people in the family. The smallest flat, the two-roomed flat, could provide at best for husband and wife and at most two children, not more than one of the latter being over the age of 12 years. Thus

the young child might sleep in the bedroom, whilst the older in the living room. This is only the extreme case of crowding in this unit, and would really be in the transitional period before this family moves to a slightly larger abode. The conditions are not ideal as such functions as sexual intercourse should be able to be carried out in private and the added presence of even a very young child is not advisable from the parents' as well as the child's point of view. The kitchen is freely planned in relation to the entrance lobby, and it is possible that a small table could be erected in this zone for eating purposes, so that the living room might be retained purely for living purposes. The balcony provided gives additional living space, and gives a contact with the fresh outside air, however small, and a look-out over the gardens below. A separate bathroom is provided and the water closet is included. The flat is designed on one floor.

The flat next in size is the three-roomed flat. For this type, the duplex flat system has been adopted. That means that the flat is designed on two floors, a small internal staircase connecting the floors. There are many advantages to be found in this system. Firstly, it is more economical in space, as with the greater number of rooms in the larger flat, if these were all arranged on the one floor and faced the best aspect, there would be much wasted corridor space internally. The saving of the normal service corridor on every other floor would compensate for the addition of the small staircase. Secondly, a much greater degree of privacy is possible. The bedrooms are grouped on the upper floor level, so are away from the noise of the general living and circulation zones below, and thus children would be able to sleep uninterrupted at night. Lastly, it is possible to make certain units extend the double height and thus to gain a great increase in volume, spaciousness and architectural quality. (In this scheme, which is very tight, it was only possible to give the balcony the double height, but even this would add immensely to the architectural value of the design).

On the ground floor are grouped the kitchen, living room, balcony, and the staircase leading upstairs. Both the living room and the balcony are larger than in the two-roomed flat. The kitchen can again be used for eating. The under side of the staircase is used

for storage-space in the kitchen. Upstairs are the two bedrooms, the bathroom and a little balcony that looks into the big balcony volume below. Thus, this flat would provide for a family of five and giving segregation of both sexes for children over 12 years of age. It is possible that six might, at a pinch, be accommodated, but here again, only as a transitional measure.

The largest flat, the four-roomed flat, differs only from the last in that it provides extra sleeping accommodation. An extra bedroom is provided, occupying the vacant space occurring above the corridor below. In addition, the bathroom is slightly larger, whilst the water closet is kept separate, by means of a seven foot wall, from the bathroom. This flat would provide for a family of from 6 to 8 in number. Larger families would be accommodated, if such existed, by combining neighbouring flats, the construction being sufficiently flexible for this purpose.

Fittings in the flats would consist of a ventilated food cupboard in the kitchen, slatted shelves under the sink, a three-plate electric range with oven, a small electric radiator in the living room, bath, basin and water closet, electric light in each room. Each room will be adequately cross-ventilated, the kitchens particularly well in the larger flats as they have windows to the open air on two opposite sides.

The ratio of the provision of the various types of flats to each other are two-roomed to three-roomed to four-roomed 21:34:33. That, in simpler figures, means there are about the same number of three- and four-roomed flats, whilst there are 3/5ths this number of two-roomed flats. This ratio was obtained by an examination of census figures amongst the native population.

These, then, are the bare units that together, and with certain services, form the flat blocks. We have now to decide how many flats to one block, and the governing factor in this case is a sociological one. We have previously noted that young children of preparatory-school or kindergarten-going and "creche-crawling" age should not have to cross any traffic circulations on their

way to their "business activities". Kindergartens and creches should, it is felt, be contained within the limits of the actual building or at any rate close to it. Preparatory schools are more noisy things and separation by a stretch of sound dampening greenery from the flats themselves is desirable. This should be situated within the grounds allotted to one flat block. Thus the number of inhabitants to one flat block would be such that it would contain a sufficient proportion of preparatory school children to keep one school going. This, from an examination of age ratios to population in the census would be approximately 2,000 inhabitants. This is the basis of the size of the flat block. (See Appendix No. 5).

In this one flat block, we are then combining 84 two-roomed flats, 136 three-roomed flats and 132 four-roomed flats. In addition to the flats we will provide two creches, two kindergartens, one primary school, a laundry and incidental shops, all to one site. As the pleasantest aspects are northerly in South Africa, it has been our aim to face all the flats as far as possible in that direction. The service corridor would therefore be on the southern aspect, and all service rooms, bathrooms and kitchens would face in that direction. Theoretically speaking, the form of the building should, for ideal conditions, be a thin slab, facing north-east. This, however, does not lend itself to an economical site arrangement, or, if the necessary concentration of flats per given area is achieved, the space between the back and front of two succeeding flats would not be big enough to be developed as an open garden. Thus a larger site was adopted, twice as broad as it was deep, the broader aspect facing north-eastwards. The flats were grouped on three sides of this rectangular space, so that all of the main rooms look onto the large open central space. The aspects onto which the flats face are north-east predominantly, south-east and north-west to a lesser extent.

As to the arrangement of the flats, it was decided that the various types of flats should all be contained within the one group so that there would be no class-stigma or superiorities

resulting from the different sizes of flats used by different families. Thus, the three-roomed flats are superimposed over the four-roomed flats. In the case of the two-roomed flats which, not being "duplex" are different in structure, these are joined in a linked portion of the building.

As far as the height of the block was concerned, it was originally decided to keep it down to four stories as a maximum, thus saving the investment of lifts. This, however, meant that a too low concentration resulted and that actually if the buildings were constructed to twice the height there would be such savings in road costs, purchase of land costs, and so on, that the lifts would be more than paid for. Thus the portions of the building containing the three- and four-roomed flats were taken to a height of eight stories each, running at 8'6" floor to floor, the lower four stories consisting of two four-roomed flats, and the upper floor of two three-roomed flats. The two linked blocks of the two-roomed flats are only seven stories high with a flat on each level. Here, the ground floor is not used for flats, but the space is devoted to the creches and kindergartens.

Such services to the flats as electric light installation, plumbing, etc., will be discussed in detail in later sections. Here it is just necessary to mention the system of refuse disposal. This will not be by a chute as this method can often lead to an unsanitary state of affairs. Each flat will be provided with a small bin which will be cleared by a small wheeled collector each morning. The lifts will be used to transport the barrows from floor to floor.

Now as to the disposition of the building on the site, we find that the remaining free portion of the site can be used in two senses: firstly, for recreation and sport - the garden portion; secondly, to contain the incidental shops and entrances - the more formal portion. The flat block, by its shape, sub-divides the site so that the flats do not look onto the formal portions which are in two piazzas in the east and west corners. The flat block entrances are approached from the south and the view of the garden is concealed until one is actually in the flat. As was remarked, in the piazzas are grouped the small shops dealing in perishable produce, such as butter, fish and meat, and so on. The general shopping

centre is zoned elsewhere in the location.

On the roof of the main central block of the flat block is the communal laundry. Clean washing and ironing rooms are provided, so that when white people send their washing to be done in the locations, it will be cleanly attended to, not as at present. Lines for drying the clothes extend down the whole roof and run between two screen walls. Thus the unsightly aspect of fluttering washing, a rather motley display on the whole, is not visible from the ground.

Underneath the main central block four double flats are removed on the ground floor, so that access through the building is provided at that point. In addition, a medical centre is zoned, this consisting of a dispensary and two consulting rooms with waiting rooms, one for each sex. This medical centre will deal with minor medical ailments, and will provide a centre for routine inspections and visits of doctors. The hospital will be outside the actual scheme; its actual position will be discussed later.

The building is altogether served by eight large lifts, with stairs and fire-escape stairs liberally provided. The corridors, for economic reasons, are not glazed in, as the extremes of climate in South Africa are not such as to make this imperative.

In the large garden to the north is the preparatory school. The ten class rooms all face north, the closed glazed corridor running on the south. Two cloakrooms, one for each sex, are provided at the end of the classroom wing. Centrally on this wing is the access to the hall and to the foyer leading to the staff rooms. The hall is not only to be used by the school, but also by the inhabitants of the flat block in the evenings for meetings and discussions of a "block" character. It is possible that a small flat block repertory group might be formed. Whatever might occur, the closeness of the hall to the homes will stimulate evening activity. The design of the gardens is very free. Paths will ramble for the most part, with the exception of direct paths providing diagonal short cuts from block to block. (The 'pedestrian' quality of the Native population as a whole must be borne in mind). For the most part the discretion and initiative of the individuals

in the block will decide the exact form of the layout. It is hoped thus to stimulate healthy competition between one flat block and the next, thus giving the individual some community interest. Tennis courts and such sports facilities would be provided so that casual exercise can be taken "outside one's door" so to speak. The main sports club will be situated elsewhere in the location.

There will be ten of these flat blocks, each on its site of 1020 feet by 540 feet. We have now to discuss how they are all related, in fact to discuss the scheme as a whole. For this, it would be best to discuss the access to the location. The railway is taken to run on the rear side of the site, that is, to the south of the scheme. Thus, the unpleasant vista of noisy trains is not granted to the inhabitants. The train will stop at two halts for the location, approximately half a mile apart, so that excessive walking from station to home is eliminated. Each station serves five flat blocks and the station is at the end of the road that divides the blocks into two groups of 3 and 2. Since to get to the furthest block from the station involves walking only past the short end of two blocks and the long of one in the worst instance, it can be seen that the walking distances are reduced to an absolute minimum. The scheme is thus seen to be symmetrical, with five blocks either side of the line of symmetry. This is treated as the main axis of the scheme, and as the inhabitants are mainly pedestrians, no vehicular traffic will be allowed on this boulevard. All roads that run from the one side of the scheme to the other will be dipped under the boulevard. This main axis links the two centres of communal activity, the administration and shopping centre to the cultural and recreation centre. The administration and shopping centres are grouped on a broad piazza: the administration portion consists of a pass-office, post office and general administration services; opposite, the shopping centre is designed as a great open space - a roof on columns - with a large internal atrium. Freely planned stalls will be arranged in this space, and marketing and general shopping will be carried on here.

This whole piazza is to the south of the through railway line. The goods siding and general handling depots are to the north of the railway line, opposite the administration piazza. A little

bridge for pedestrians and barrows connects the shopping place with the goods depot. On the south of the railway are also the police and fire stations, which connect with the main service roads that run from the goods depot to the main body of the scheme. These roads run from the centre of the scheme outwards to each side, turn and ramp over the railway line at the two stations and connect in that way with the general road system of the scheme. Thus access to the scheme from this point of view is direct yet well zoned away from the main pedestrian circulation, the main boulevard.

Near each station will be an hotel, so that relations on a temporary visit to their friends in town need not overcrowd the flats. Two are provided so as to furnish an element of competition (there is nothing quite so bad as an hotel which enjoys a monopoly).

The boulevard falls from the shopping piazza gradually down a broad vista of flat blocks to the first portion of the recreation centre, the cultural portion. (It must be remembered that the site slopes gently to the north-east). It terminates on a broad, formally-paved area which is terminated on either side by the two lowest flat blocks, and two car parks, one on each side, which ensure that no motor-cars will come into this portion of the scheme.

On the west side of the piazza is the technical college, the centre of any higher education that the young Natives might get above preparatory school standard. This consists of two separate departments, one giving instruction of the artisan type, with lecture-rooms and workshops, the other for instruction of the clerical type, with class-rooms as the provision. Cloakrooms are at the end of each of these units. Centrally placed are the staff quarters and administration. This building is linked by a long, closed corridor to the public library, so that students can reach the reference section for research work even if it happens to be raining. The library has a general entrance from the piazza, which leads by two articulated links to the lending section, a great cylindrical hall, and to the reference section, long and rectangular. A small discussion hall is attached to this section for small congregations of a literary type.

On the other side of the piazza are the places of amusement. These are grouped together in one unit which is articulated by links into the various halls. The whole is dominated by the main theatre, a great fan-shaped hall. It is lifted on columns to first-floor level. Public access is through a great double-storeyed foyer on the ground-floor level where cloakrooms are grouped, and the approach to the upper level is by two free standing ramps.

On the first-floor level a long enclosed corridor links the other three elements to this portion of the scheme. On the one side are the two bioscopes, also on columns on the first-floor level, and on the other side the restaurant. The kitchens serving this portion are on the ground-floor, whilst the restaurant portion is on the first floor. This zone is bifurcated by the servery so that it can be sub-divided into two restaurants, one for normal public use, and the other for use in connection with the theatre or the bioscopes which have an enclosed link directly to it.

The whole building is freely articulated and will be treated in gay colours so as to achieve a light festive character.

Let us now return to the axis; we saw that it expanded into the broad formal piazza of the technical college, library and theatres. However, the direction is still maintained further down the slope by two pylons supported by steel cables (on which bunting will be hung on "state" occasions). A broad flight of steps leads down to the sports centre, which is freely planned with rambling paths, with the exception of the main avenue which continues between stately gum trees to terminate in an open forum with an acoustic concha or shell at the platform end. Here great open-air gatherings can take place to discuss general location and even broader affairs. Behind this forum is a great screen of cypresses which terminate the access and which return flank and define the whole sports area. In this way, then, the culmination of the most formal element in the scheme, the boulevard-axis, ends on a note of communal gathering; thus architectural "stage-craft" can build up a drama which can have its repercussions in the lives of the people living in the location. It is hoped that such archi-

tectural devices can be used to stimulate the return of that community consciousness, the absence of which is such a symptom of Native urban existence.

But to return to the gum-tree lined axis. Through the colonnade of bare, tall trunks vistas to elements to each side of the main line of advance are achieved. To the one side is the swimming baths, an open-air sheet of water with dressing-rooms, stands and lawns; to the other, the gymnasium, a great arched hall, also with dressing-rooms. Further down the axis we get three sets of tennis courts, each with a small tea kiosk for the players, and on the opposite side, the stadium where the home team, the "Lily-Whites" can engage in football contest with the neighbouring "Tiger-Stripes".

Free garden space with lawns, flower-beds and trees, pools and foot-paths, fills the remainder of the space, which, if the sporting demands of the community increase can easily accommodate further playing fields.

There are two more elements that have to be enumerated; the one is the position of the churches. These are placed in the free spaces in front of the last two flanking blocks. They are thus in a quiet garden zone of their own.

The last element is the space for garden plots. With the flat system, it is not possible, obviously, to provide a plot of ground to each flat in the immediate vicinity of the flats. However, in the Native's scantily made up balance, a small patch of ground, out of which a vegetable or two can be extracted, forms a very vital portion. On the lowest ground of the scheme, these plots are collected in two groups on either side of the sports area. There is a plot in size approximately 30'0" x 15'0" to each family. To each section there is a large reservoir which collects all the storm-water from the location for use on the plots. A small chief gardener's quarters is next to the reservoir so that the distribution of water can be controlled and assistance in gardening provided. The zoning apart of the plots from the general

body of the location has a practical advantage in that waste water, which normally irrigates the cabbage patch, with extreme danger to health, will be safely removed, and the plots will be irrigated with clean, uninfected water.

This ends the bare enumeration of the elements that constitute the scheme. It is now necessary to return to the minimum standards of living originally quoted, and in fairness to the Municipal Authorities to see how this scheme fares.

Firstly, as far as decency is concerned: each clause in this section is complied with. The dwellings are structurally separated, there are the correct number of bedrooms and the additional kitchen is in every case provided.

Then as regards health, once again every condition is complied with. Running water, flush toilet, separate bath, are all included. No dwelling is more than two rooms deep. The glass area is ample. There are no small courts. The space about the buildings is more than ample and provides liberally for outdoor recreation.

As regards amenity, the scheme again scores heavily. An attractive outlook is provided for the inmates of every flat. The architecture is certainly "moderately prepossessing" and the buildings fulfil their purpose and are particularly of "good materials (see section on Materials and Construction) and simple and direct design". They are "grouped harmoniously", and the plan is "clear and simple to follow"; in fact, special attention has been paid to the juxtaposition of the various elements in order to achieve lucid and satisfactory relationships between them.

As regards comfort and convenience, once again all the demands are satisfied. Cupboards, stoves, laundries, electricity, few stairs and mainly lifts, easy access to schools and social activities, and short walks to work.

The question of safety has been fully considered and the use of the "super-block" ensures ample play-space for the children without their

having to cross a street.

Thus, where Orlando fails so miserably when confronted by minimum standards of decent human living, the scheme here presented succeeds adequately. In some respects (as regards the size of rooms, for example) it just complies with these standards or provides conditions just above them; in other respects (as in the questions of amenity and safety, for example,) it provides facilities well above minima. In regard to the first, these are due to reasons of economy; the second are achieved by rational planning.

THE SCHEME CONSIDERED AS A WHOLE

It may be wondered why the scheme is for 20,000 Natives and not 40,000 or 60,000. And it may be wondered if there is to be provision made for extension by, say, the addition of an extra flat block or so. The scheme is complete as it stands, and no additions are proposed. Thus the ten flat blocks and the services and amenities attached are to serve exclusively this population. The limiting factor in the size is the pedestrian nature of the population. It is felt that with 20,000 people, the maximum distances that have to be walked to get from one part of the scheme to another are reasonably short. A larger scheme would bring in internal transportation difficulties; a smaller scheme would not warrant the provision of amenities on the scale found in this scheme. Thus, should there be a need for further housing once this unit is completely occupied, a new unit would be commenced to the right or the left of this one, as the case may be. This unit would in the end grow to be self-sufficient in regard to amenities and services. The hospital has been mentioned earlier, but not discussed. It is felt that one hospital to 20,000 Natives is rather excessive, so that a hospital would be situated between two location units, serving each and thus 40,000 inhabitants.

It must be stressed that a string of locations each of 20,000 along a length of railway line is not envisaged. The "ribbon" development, so popular in certain overseas municipalities, is not intended. The arrangement of the units and their zoning in relation to the city they serve would be very much modified

when actual sites are to be dealt with (especially amongst the capricious hills of the high-veld). The point that is striven for is a location size with a maximum of about 20,000 Natives, complete in itself. Whether the neighbouring location is to the left, right, rear or front of it will depend on circumstances; it is only likely that the continuation of the railway line will find the next unit to the left or the right.

Earlier on the conflict of concentration and space was discussed. It is apparent from the description of this scheme that there is plenty of space. Whether the concentration is high enough to make the Utopia reality has now to be investigated. Firstly, in Orlando, which is grossly overcrowded and congested, one house is built on a site 69'0" x 50'0". As this is used most probably for five persons the area allotted per individual is 690 sq. ft. The official figures given in the Minutes of the Mayor for 1934 are: Population density in Western Native, Eastern Native and Pineville - 60 persons per acre, giving 670 sq. ft. per person. For these townships circulations are most probably included.

In Orlando this does not include circulations. Long roads run at a distance of 150'0" apart, cross roads at a distance of 400'0" average, and sanitary lanes between the long roads, each of 12' width, also at 150'0" apart. A perfect maze of roads, as can be imagined.

In the scheme presented here, one block of flats occupies a site of dimensions 1020 feet by 540 feet. On this site will be 2,000 inhabitants. Thus there is 275 sq. ft. allotted per person. The concentration in this scheme is thus 2.76, roughly $2\frac{3}{4}$ times that of Orlando.

Coverage of ground makes further interesting statistics. In Orlando the coverage varies from 40% to 50% of the stand ('curtilage', in municipal jargon). In the present scheme, the coverage is just under 10%.

The economic benefits resulting from such an arrangement are fully detailed in a later section, where the saving on cost of ground,

cost of road construction and up-keep etc. etc., are all estimated. The position, broadly speaking, is that this scheme, plus all its amenities, sports grounds, recreation centres, schools, parks included, occupies about the same amount of ground that 4,000 individual shacks would occupy under the normal system of location construction.

The previous descriptions of the proposed scheme enumerated the architectural and plastic qualities of the individual units, the flats. Seeing that it is held that this quality in the architecture should be found as well in the town-planning, it would be as well to give a brief appreciation of the scheme as town-planning. The scheme is a very simple statement, formally speaking. The ten great blocks with their set-backs, are grouped symmetrically about a central axis in the one direction, and juxtaposed against the low buildings and open spaces of the recreation centre and the vegetable gardens. A textural background of greenery and earthy browns runs through the entire scheme like an under-current of episodes in a Bach fugue. The rigid network of blue-grey tar-macadam roads unites and defines all.

The buildings themselves will be anything but barracks. Great sweeps of surface, modulated with light and shade by the set back balconies, heightened in definition by the liberal use of big areas of strong colour to offset the general pure white facades. In the strong sunlight, with a deep blue bowl of sky above and the play of terra-cotta and greens below, the buildings will sparkle and glow. The polychromy will take advantage of the strong contrasts produced naturally in this country and will relegate as "foreign" the neutral greys and the dull reds of cement slabs and stock bricks, materials which might produce subtle relationships in a grey light, but which are only dirty in the harsh purity of the South African sun.

The question of scale is of considerable importance. The beat of the flat block set-backs in le Corbusier's Ville Radiense, attuned to the speed of a motor-car travelling at 60 miles per hour, - these "vast architectural perspectives" - are out of context and scale in the Native location. Locomotion there is at the rate of the pre-

industrial era- even further back - four miles an hour. The scale must be decreased so that a walk down long wings of building will not be terrifying, - the feeling of the immensity of the cold lifeless mass of building, overpowering the insignificant human, must be avoided. Thus, the set-backs in the buildings occur at more frequent intervals than those in the le Corbusier project, and they have been arranged so that along the mainly used circulations, (the short roads between blocks) a type of volumetric pulse, if it can be so described, is attempted. One proceeds in the channel of the two neighbouring blocks; this expands into the open courtyards of the entrance halls and then contracts again. This rhythm is one that can be registered by the human-being walking, and gives interest and enjoyment to the walk. In the other direction the effect is rather different.

The vertical face, on the one side, of building is opposed on the other by the horizontal expanse of garden, a simple contrast. In no case does the size of the location overwhelm the onlooker. There is always space around the individual, and when large masses of building are seen they are across an intermediate expanse of garden greenery.

In all, interest and variety provided within the framework of order and simplicity of statement has been the aim. Variety there is in Orlando, but there is no discipline that can be discerned by the eye, which suffers sadly from attempting to combine disjointed particles into a unity which they do not possess. The reverse is the case in this scheme. A pulse, a beat, a contrast, these are the weapons used to give the dynamics to the scheme.

The introductory sections on the sociological approach and psychological approach stressed the need for a reintegration, a reorganisation of communal life. They both laid down that such facilities that could promote such a reintegration should be provided. These, in the shape of schools to each block, and well laid out cultural and recreational centres are all to be found in the location. To a far lesser degree, but to a measure they are also found in Orlando. On what arguments are our hopes based when we consider that our scheme will facilitate the reconstruction of communal life to a

greater extent than in Orlando (renowned for a miserable failure in this direction) ? It is in the town-planning, in the arrangement of the elements in relation to each other that we feel the results will be achieved. For instance, the whole scheme is focussed-(all buildings directing the attention- on the very public places. The scheme forces a conscious appreciation of these places incessantly onto the inhabitants; from their flats, down through numerous vistas, the inhabitants have their common interests ever in mind. The great housing blocks embrace and acclaim the centres of activity.

There is one aspect hitherto not dwelt upon which might assist the reconstruction on a higher level of the battered remnants of tribal life. This is in the regard for the formal qualities in architecture. That the Native was peculiarly endowed with an appreciation of pure primary architectural form, with a quite advanced plastic sense, is easily recognised when one visits the old kraals built and conceived before the white man came to South Africa. Fine rondavels, pure cylinders against the rugged African landscape, are a demonstration of the architectural concepts which have moved man through the ages. That the Natives did not arrive at these forms accidentally, but were in fact conscious of their aptness and fitness, was well demonstrated when we interviewed a Native who hoped that we would in our scheme have some of the quality of the original Native architecture, and who remarked that "our buildings taper, like the landscape to the horizon".

The new industrial environment brings new demands in housing. The rondavel cannot be repeated on a town-planning scale - the fifty huts that constituted a small Native settlement in the old days and which had, in that size, a fine architectural unity, would register as a nightmare of revolving chaos when duplicated on a location scale. The cube is the form of mass-production - the right angle, the geometry of town-planning. The cube in our scheme then supplants the cylinder; the purity of the forms remain.

The task of the town-planner is then virtually complete. The background to the lives of these people has been supplied. From

the smallest smallest individual compartment to the largest manifestation of the scheme as a whole the demands of function, function in its two aspects, have been heeded, and as far as it is within our capabilities, supplied. We make no claim that this scheme is "ideal", for that would imply immediately that it would not be applicable within the framework of the present society we are living in. The Native is a poor class strata in a richly varied class-stratification. Until there is a general levelling upwards, it is folly to expect the upper classes to provide those ideal living conditions, which even they themselves have not attained, for that class that they exploit. Our starting off point was the stipulation of minima in every direction. What are the minima, we asked ourselves, from a hygienic, moral, etc. etc. point of view, that we are bound, let us say, morally to provide for this "black proletariat", ruthlessly plucked out of an age-old civilisation, to serve our needs ? This scheme in our opinion is the minimum in every respect that we can decently provide.

But, it may be argued, although considered as planning, the scheme may be very fine, what of its practical possibilities ? Would constructional difficulties rule it out of all reckoning ? Would it cost so much, minimum though it be, that it would not be even considered by the most progressive municipality ? Why is it that it has not been found possible to provide in the Orlandos even an approximation to the minimum standards laid down ?

These questions and others are to be answered in the remaining two sections, Construction and Finance. We have covered our "Research"; from that we have produced a "Thesis"; we have now to show the possibilities of "Realisation".

IV

C O N S T R U C T I O N

INTRODUCTION

The first two sections of this Thesis have outlined the sociological and psychological factors affecting the science of Town-Planning, and the Native population of South Africa, dealing at the same time with the particular aspect of Town-Planning in question, namely the problem of Native Housing in urban areas. The third section then went on to discuss the principles of modern Town-Planning and Mass Housing in detail, analysing existing housing schemes in terms of these principles, describing the design for the proposed Native Township and finally indicating how in this design established modern principles have been followed.

It is now necessary to discuss the ways and means of realising the proposed scheme as a practical possibility - of translating the conception into terms of measurable reality. In the section which follows it will be shown that the project is well capable of realisation, even with the resources at present available in South Africa. In addition it will be shown that the constructional methods indicated as indispensable for the successful erection of the Housing Scheme are in themselves merely the outcome of modern industrial practice. The first portion of the following section will deal with the development of modern industrial technique, and its effect on the building industry, and the second portion with the constructional system adopted for the proposed scheme.

THE CONSTRUCTIONAL ASPECT OF ARCHITECTURE

This aspect of architecture becomes of prime importance if the best possible results are to be obtained in any building programme. It is vitally necessary to know and understand thoroughly the true role which structure plays within a building, to appreciate the limitations and possibilities of the various structural methods and building materials to be employed. The function of building construction, broadly put, is to make a building hold together; in the sense, that is, that without some form of constructional system it is impossible to build anything at all. In the beginning, the nature of the materials

available and the poor and ineffective tools in Man's possession resulted in extreme crudity of structure and great preponderance of bulk of material over the useful volume enclosed.

The history and development of architectural technique is the history of the development and gradual refinement of constructional knowledge, coupled with development of ornamentation. For our purposes, the former aspect is of importance. Early constructional resources consisted of natural materials more or less modified and shaped to Man's use. Stone, clay, timber, reeds, grass, etc. The development of structure up to the Middle Ages is a development in the technique of handling this type of material, particularly of stone (with a notable break in Roman times, when the discovery of cement and concrete occurred). After the disintegration of the Roman Empire, the extent of human knowledge rapidly declined and a return to the exclusive use of natural materials took place. Owing to different conditions from those found in pre-Roman times, the form in which stone was used varied greatly from previous practice, and a new and untried technique came to light which was gradually perfected and established new building forms. In the 15th and 16th centuries the constructional possibilities of stone were exploited to their fullest until a decadent trend set in, the material being abused and tortured into alien forms, the masons and carvers vying with each other to produce each time a fresh and novel manifestation of this art. In other words, stone as a constructional material had reached its zenith, further development taking place only in the decorative and ornamental sense.

With the coming of the Renaissance the spirit of classicism again pervaded architecture, and while, structurally, stone was used only within defined limits, advances were made in the technique of working and handling the material. Brick began to be used in large quantities, usually in conjunction with stone and timber. Stucco came into favour, first in timber-frame houses then as a framing to more permanent structures.

At this stage the development of structure and material remained without any radical change until the 19th century. The appearance

of the industrial revolution and the growth of the practice of machine-production coupled with scientific research and the consequent growth of knowledge has given rise to new materials and methods of construction which have truly revolutionised the whole process of building. It is important to bear this last fact in mind in considering a design for any building problem, particularly a housing problem for workers, such as is the subject of this thesis.

It is obviously in the best interests of the project if every possible use is made of present-day technical knowledge and resources and of industrial organisation. Such a policy will lead to great economy, ease of construction and a minimum of subsequent maintenance, while to allow any preconception which ignores the resources available will inevitably lead to waste, expensive methods and high upkeep cost. It seems mere folly to build housing schemes, at great expense, using obsolete methods and materials of crude and "rule-of-thumb" character, requiring constant patching and repairing throughout their life, when there is an abundance of technical knowledge and organisation ready waiting to solve our housing problems for us in toto. Yet this is so often the case, with the result that in many parts of the world housing development is technically at a standstill and is likely to remain so. The right frame of mind to tackle these problems rationally does not exist. One of the tasks of the architect is to see to it that people (and particularly Public Bodies) are brought face to face with to-day's problems and persuaded into the right frame of mind for the solving of them.

It is first of all necessary to free our minds of all non-essentials and pre-conceived ideas and to reject all but the best and most direct methods to achieve the end in view. Having cleared the ground it can be stated as a first principle of modern housing that every advantage must be taken of the combined resources, intellectual and material, of our time.

THE SCIENCE OF BUILDING

One of the most important factors to be remembered is that the rise of the industrial era has been the cause of a new approach to the building problem entirely. At the beginning of the 19th century the building trade was in the hands of the Master craftsman. Following the traditions of the Middle Ages, each workman, brought up in his particular trade, was a responsible, more or less independent, craftsman. He executed his work in the manner of the artist, as an expression of his personality and skill. Although there was a growing tendency, particularly in more expensive work, to erect buildings to architects' drawings, yet in the bulk of the work done, the local builder pursued his leisurely trade quite independently of others, and due to his craftsman's outlook, usually contrived to turn out tasteful and pleasing designs. Constructional methods were traditional, the general form of the various classes of buildings exhibited a general traditional standard. Very few new departures either in technique or form occurred.

Early in the 19th century, the invention of steam-powered engines and the consequent advance of machinery saw the beginning of the industrial revolution - the great movement which gave rise to such enormous advances in human amenities and in knowledge and thought. The industrial age penetrated into every human activity. The craftsman was merged into the industrial worker and his tradition died out.

Populations began to concentrate round the centres of industrial activity. A crying need arose for the rapid erection of large numbers of workers' dwellings, even at a comparatively early stage in the world's industrial development. Comparative speed of erection and cheapness were the two main conditions laid down in the erection of these dwellings. Brick was the universal material used. The new constructional materials and methods evolved during this period were not yet applied to the housing problem, although the industrial process was invading the building trade, in the form of a degree of standardisation - the multiplication and nauseum of a single type of house. Good workmanship was often lacking in these building schemes, a fact which accelerated their decline into slums, as the buildings grew old, dilapidated, insanitary and unsafe.

Yet it was in this period, when housing schemes became so haphazard, so ugly and so lacking in forethought and planning, that the roots of the modern building industry were laid. First of all came the invention and development of new building material - cast iron, steel, reinforced concrete, glass and new synthetic materials. The swift realisation of the great significance of these materials, changing the form of buildings, freeing them from traditional limitations, led to increased use being made of them and the first step towards modern building technique - factory production - became general. Then there was continuous research being carried out into the nature and property of building materials both natural and synthetic. And finally, certain principles evolved in industry generally, which were to have extremely far-reaching effects on building technique, effects which have by no means been fully realised at the present time. The first of these principles emerged out of the very nature of the machine - the production in large numbers of standard objects - standardisation, from which it is but a short step to large-scale mass-production.

Another of these principles, one which arose out of the practice of free competition in trading, is the principle of reduction in the number of human labour-processes and of increase in the number of machine-processes necessary in the manufacture of an article, the object being to reduce overhead costs. A further increase in the number of articles produced within a given time is effected by the process of dividing the work required to be done into a number of specialised processes. In other words, each worker performs a quickly-learned repetitive task. This is one of the great changes in methods of production which the industrial age has brought about, as by adopting this system, not only is production speeded up, but it becomes far less costly to train a worker for a single operation than to train a craftsman to carry out all the processes required during the production of the article.

A further principle which evolves in the manufacture of articles is that of standardisation of units. Whenever a complex object is manufactured, the tendency is more and more towards the standardisation of similar parts. The effect of this is to reduce still more the number of independent labour-processes required.

And the final, and perhaps most important aspect of all is the principle of organised assembly of the various parts into the complete product. All these principles evolve out of the process of rationalisation.

Modern industry has brought the rational mentality to the forefront. It is the man who trains his brain to think rationally who controls industry to-day. The rational outlook is the way to the solution of most of the problems of our time, and it is in this frame of mind that we must tackle the building problem.

The effect of this rational outlook towards the building problem was seen in the work of le Corbusier and Walter Gropius, in particular, when applied to the grave problem of European housing in the years following the World War. The contribution which these men, among others, made towards the advancement of building technique is discussed in detail later on in the section dealing with the housing problem.

INDUSTRIAL PRACTICE APPLIED TO BUILDING CONSTRUCTION

The development of industry during the last century has a lesson to teach. Namely, that by thinking out carefully - planning, that is - the whole process of manufacture of an article, from raw material to the finished state, great savings in cost of production are effected, many more articles can be produced in a given time and the quality of the article is improved.

The crudity of traditional building materials is notorious. The variations in size between individual bricks, for instance, are enormous when judged by mechanical standards. The well-known filthy conditions of most buildings during erection, the large amount of building material lying about exposed to the weather, the wet nature of much of the materials used, the large number of brick-layers, the over-lapping of trades on the job, all tell their story of waste, inefficiency and lack of planned approach to the problem. The nature of every-day building practice is such that accuracy is impossible unless extra care and considerable time is taken in setting

out, and if the work is hurried, such accuracy as is thereby achieved is cancelled by inaccuracies later on in the construction-period caused by workers being asked to work faster than the nature of the material permits. It is rarely indeed, that a building goes up completely to schedule with every element in place. It is the more usual case to find that detail drawings have to be revised owing to small discrepancies between the working drawings and the building. Fittings are brought on to the site and found to be too large or too small for the positions provided for them, so that extra work is involved to make them fit. These are every-day occurrences, but they show clearly that building as is normally known to-day, is far behind industry in the technique of production and assembly., while the craftsman has died out, the old confusion of method and material persist.

These statements are not altogether true when applied to building construction as a whole, for the introduction of reinforced concrete and structural steelwork have necessitated a greater degree of accuracy than older systems required; but when the condition of housing construction is considered, they are generally speaking quite true in the majority of cases.

If the economies, coupled with the qualitative improvements found everywhere in industrial production, are to be carried through into the field of building construction, a process of rationalisation must be applied to every activity connected therewith: in the manufacture of materials, in the assembly of parts, in the design of standard units and in the organisation of labour both in the factory and on the site. Rationalisation has been achieved in many branches of building industry, particularly in the manufacture of synthetic materials and finishes, and to a certain extent in the design and manufacture of such articles as sanitary fittings, plumbing and electrical accessories, door furniture, metal windows, skirtings, picture rails, etc., and of course in structural steelwork, but in an unorganised manner, each manufacturer turning out a comparatively low number of individual designs, in conflict with those of other manufacturers, introducing variety "to suit all tastes".

To illustrate the case in point: every large maker of sanitary ware produces thirty or forty different types of w.c. pan designed to suit all "tastes" and carried out in a variety of shapes and colours, from sentimental pink or pale-green "luxury" style, via flowered-designs and fretwork church-pew types, to the common and coldly practical white glazed porcelain or vitreous china article - the same is the case with baths and lavatory basins. Think of the intolerable confusion which would result in the motor industry if Lord Nuffield were called upon by public opinion to produce a choice of thirty to forty different styles of steering wheel, in a variety of colours and textures. And so on through all the fittings of the motor car. The idea is so ridiculous as to appear to be facetious. People are accustomed to accept the standard type of steering wheel, upholstery, door handles, etc. provided in all cars of the same make and model. Standardisation is achieved. The variety available for the individual is limited to a choice of five or six colours - the form, design and detail of all the cars remains identical. Yet nobody complains that his car is unsatisfactory to him because there are 10,000 others like it on the roads.

It is quite obvious that standardised goods, when actually placed before and used by the public are not in any way irksome to the average man, despite large volumes of individualistic theory to the contrary. There is no doubt whatever - on the basis of what has actually happened with industrial products - that standardised units and elements in building, once introduced will be accepted readily by the mass of the people. Designers need have no fear that their rational, functional articles will be unacceptable to the public.

This aspect of the question of rationalising the building industry has been mentioned because the opponents of contemporary architecture and progressive policy in architecture and building construction usually agree that any move towards rationalisation will put an end to the "artistic" side of architecture and reduce all to humdrum monotony. Many architects are obsessed by this fear also, and the fear that they will lose their "individuality" and be subject to "dictation" by the builders and manufacturers. Any study of the case for rationalisation will show that this is far from the truth. There will still be room for infinite variety in design - the putting-together of the standard

units - and a great range of available materials for all purposes. These remarks refer to building as a whole. They are subject to some variation when considered in relation to workers' housing schemes, where economy is of such prime importance that standardisation has to be carried into planning as well as construction.

ANALYSIS OF BUILDING MATERIALS COMMONLY IN USE

There are no serious objections to a complete rationalising process being applied to the building industry. The public will quickly adapt themselves to the idea, the material resources, technical skill and knowledge, the required machinery and tools are all available. It is possible - to-day - to evolve a system of manufacture and assembly of building parts, rationalised to such a degree as to bring down building costs to what would seem at present an impossibly low figure. But great changes in method and material are necessary before the most complete and fully worked-out system can be put into effect. Many materials in use to-day are quite unsuitable for mechanical production and ease of assembly. Before going on to suggest types of structure and material suitable for application to modern industrial practice, it would be as well to review in a general manner the materials and methods of building commonly in use to-day, and to consider their advantages and disadvantages in the light of modern requirements and conditions.

Taking each element in turn, the first to be considered is the foundation material. Commonly, foundations are of concrete, steel and concrete, brick or stone, the former being the type most used at the present time. The problem of foundations is that of distributing the point load carried by a vertical stanchion over a wider area so that at no point do loads transmitted to the subsoil become greater than the bearing power of the soil. Brick and stone are satisfactory only for very light structures - cottages for example. For multi-floored types of building they are quite unsuitable and costly to lay. For all other work (and even for light structures themselves), mass concrete, reinforced concrete or steel grillage foundations encased in concrete are employed, according to

the load to be carried. Concrete has proved itself to be the most flexible and suitable foundation material known to date, possessing great compressive strength, being easily mixed on the site and convenient to place in position in its wet state. As for the design of foundations themselves, there are two alternatives: the traditional trench foundation and the more flexible and convenient point-load foundation. The former is still largely in use in brick buildings of single or two-storeyed type and sometimes even for larger buildings. Its disadvantages lie in the amount of excavation required and the consequent difficulties experienced in the way of keeping the trenches free from rain or surface water, and the delays and extra cost involved where ground of low bearing power, such as sand or a disused rubbish-dump is encountered over portions of the site. These difficulties are overcome when the point-load foundation system is used. The excavations required to take the foundations are small enough in size to enable them to be easily protected from rain, and are easy to keep free of surface water; further, if bad ground is encountered, the foundations effected need only be carried vertically downward in the form of shafts, until better ground is reached, where the true foundation is laid, the shaft forming a below-ground column. Such an easy solution to poor subsoil problems is not possible when the trench system is used. From the point of view of convenience in the actual construction of foundations, there can be no doubt that the use of reinforced concrete, or steel encased in concrete, in a point-load foundation system is by far the most efficient and the most economical method to use.

The next subject for consideration is the load-bearing portion of the building. Traditionally the weight of the roof and floors is carried by the walls. Modern resources have rendered this system hopelessly out of date. In the light of modern knowledge it becomes most irrational to continue to make use of this system, even in small buildings, for a load-supporting wall to begin with requires trench foundations (already shown to be at a disadvantage when compared with point-load foundations); further it limits the size and span of window and door openings, and in multi-storey buildings the necessity to thicken out at each floor level increases the bulk of the walls beyond reasonable limits, increases weight, labour required, time required for completion, and costs. In addition, the walls on each storey must

rest above one another if serious complications are to be avoided. The plan of one floor must approximate to that of the floor below it. In other words the plan is paralysed, the openings in walls are rigidly limited.

In contrast to this the system of framed-construction presents itself. The framing may be of wood, iron, steel or reinforced concrete. For buildings of any size the latter two systems are the most common, and both have considerable merits. Taking steel first, by nature it is a highly standardised product, factory-produced and of a homogeneous and consistent character. It has high compressive strength and equally high tensile strength. Herein lies its most useful characteristic. Similar - often identical - sections can be used both as columns and as beams. The material can be bolted or riveted, welded, sawn and cut at will. It is of particular interest in the light of the industrial aspect of building, for not only is it factory-produced in standardised lengths and sizes, but is capable of extremely swift assembly on the site owing to its being a "dry" material and the method of its assembly requiring no wet processes whatever. The whole frame of a building can be erected in an exceedingly short space of time, no time being lost in waiting for drying-out processes, and once the frame is up the necessity for scaffolding, so complex in traditional systems of construction, largely falls away. A further advantage lies in the fact that once a building has outlived its usefulness and is dismantled, the frame can be simply unbolted, and the stanchions and beams used again.

The other system of framed construction employed in modern building technique is the reinforced concrete frame. The degree of flexibility of plan and wall-surface obtained in the steel frame is as great in the case of the reinforced concrete frame. The latter system, however, has certain disadvantages, largely concerned with the assembly problem. Reinforced concrete requires shuttering and centering, which must be of wood. The initial cost of this item is great and the care and time taken in accurately erecting and levelling it adds further to the cost. The steel reinforcing bars are factory-produced and assembled and are simply laid in place within the shuttering. The actual concrete is mixed by machinery on the site and poured immediately. Delay is now encountered in waiting for the concrete to dry out suf-

ficiently in order to acquire its calculated strength, before the shuttering can be removed. So long as the shuttering is in place no work can be carried on by other trades, whereas in the steel system the subsequent trades can commence operations immediately the frame is erected.

Concrete has certain advantages over steel however. The first is that it is a cheaper material generally speaking, and where the time factor is not of paramount importance the saving in cost over steel justifies its use. Then portland cement, from which concrete is made, is manufactured throughout the world and shipped in small bags, convenient for transportation and handling. Suitable stone for the aggregate and sand are almost always locally available. Concrete, then, is readily obtainable in countries where structural steel is difficult to obtain and transport. It is only the fact that the laying of concrete is a wet process which weighs against this material. Once the frame has dried out the work can proceed with the same precision and speed as in the case of steel construction.

The frame having been erected, the flooring is laid in position. Flooring may be of wood, reinforced concrete, precast concrete or metal. The cheapest type, and the most simple to construct is the traditional wooden floor construction consisting of joists laid across the shortest span to be covered, on to which flooring boards are fixed, running along the length of the room or building. For individual private houses this system is generally satisfactory, if carefully laid and well ventilated beneath the flooring boards. The material is cheap and convenient to use, as standard size sections of joists and boards are machine-cut at the timber yard and only need to be cut into the required lengths on the job. The nature of wood enables the latter task to be performed by hand tools with ease. In time, however, the material deteriorates and the floor has to be renovated or relaid. The material is not fireproof, which is a severe disadvantage, and is also liable to damage by dry-rot, damp and the action of insects. For large buildings a floor constructed entirely of wood is unsuitable.

Reinforced concrete floor slabs are most commonly used nowadays in large buildings, and also in private houses of the more expensive type.

The advantages accruing to the use of reinforced concrete in the beams and columns of the frame, as enumerated above, apply also to floor slabs. The only serious disadvantage in terms of contemporary building technique is the fact that reinforced concrete floor slabs involve a wet process of erection and considerable labour and expense in shuttering. In recent times experimentation has been taking place on a large scale into the problems of design of reinforced concrete floors and a considerable range of types is now in general use, the most common being the slab-and-beam type of monolithic structure. Lightness or heaviness in form of the structure is obtained by using different systems of reinforcement in the slab. Other systems use a combination of small beams and thin slabs between the main beam system. Such a method is the "Truscon" type floor, so designed that standardised shuttering can be used throughout - a great saving in cost. In concrete construction, particularly referring to large buildings, the problem of sound insulation is a serious one, and from the simple single-slab floor, on which is placed the floor finish, the underside being plastered and forming the ceiling of the rooms below, a large number of complex flooring systems has been evolved, in which insulating material, such as synthetic boarding, glass wool, wool packing, or hollow tiles are incorporated in the structure. Provision can also be made for the building-in of heating, service and cable pipes within the flooring system. Apart from the high cost of laying the slab, monolithic reinforced concrete floor slabs are eminently suitable for modern buildings, the material being homogeneous and consistent if properly mixed and laid, fireproof, resistant to vermin, flexible and practically everlasting.

A development of reinforced concrete slab construction is precast beam or slab floors. These have the advantage of being capable of manufacture in moulds, adjacent to the concrete mixer. They are then allowed to dry out and are fixed complete to the framed structure, either by a dry or semi-wet process. Thus the necessity for shuttering is obviated, and the flooring can actually be manufactured while the frame is being cast. Saving in time, labour and material is thereby effected. This system is adaptable also to steel frame construction, and is therefore an extremely useful type of flooring

construction in cases where speed of through-put and economy are important. Precast floors can consist either of small beams or "slabs" laid side by side, or hollow concrete beams, or panel-slabs laid on rolled steel joists. The flexibility of this system is one of its chief characteristics - one which recommends it strongly in modern building technique.

A step further towards completely industrialised building is the pressed steel floor, consisting of sections of thin metal, cut in long lengths and convenient widths, which are pressed by machinery into interlocking shapes. These floor sections are bolted or welded to the steel frame of the building and locked together, forming a completely impervious surface on which the floor finish and insulating material is laid, and to which the ceiling is attached.

The next element for consideration is the walling. The introduction of framed construction has changed completely the meaning and function of the wall as understood in traditional building. Before the invention of the framed system the walls of the building, besides serving in a protective capacity, transmitted the weight of the roof and upper floors to the foundations. Since the introduction of framed buildings, however, the supporting function of the wall is no longer called for. The wall simply becomes a screen, protecting the interior from the elements and dividing the floor-space into different activity zones. The wall, then, can be constructed of the lightest materials, so long as they are capable of protection from the elements, and are strong enough to remain rigidly in place.

The most common material used in walling is brick. It is cheap, readily obtainable and reasonably weatherproof. Brick, however, has many disadvantages. The small size of the unit, added to the fact that it has to be soaked and laid wet with wet mortar makes assembly a costly and lengthy process. Further, the laying of a brick wall is a highly skilled operation, and has to be paid for accordingly. Bricks are also very heavy and inevitably increase the cost of the supporting frame. In addition, a brick wall has very little tensile strength, necessitating extensive use of lintels, and of bracing where exposed to high winds. The great advantage of brickwork, however, is

that it provides a comparatively cheap walling material which requires no special external finish and no special weatherproofing measures. It is one of the few walling materials which possess these characteristics, and despite its generally unpleasing colour it is a handy facing material for use at the present time in view of the fact that most of the more attractive materials are usually expensive.

Stone as a walling material is no longer used except in public buildings or in buildings which are in imitation of bygone styles, and even then is used more often as a veneer than as a structural material. Special stones, such as marbles of various types, slates, etc. are also used in veneer form as wall finishes. They are, however, expensive to work and transport, and are therefore used only in luxury building.

Concrete cast in situ - reinforced or mass-concrete - is used considerably to-day as a walling material, in conjunction with framed systems of construction, and occasionally as supporting-walls. It has been found, however, that unless specially rendered waterproof, cast concrete when used in external walls rapidly becomes waterlogged. Even in cavity walls the rainwater penetrates through the concrete, pouring down the inner surface of the outer skin, and fills up the bottom of the cavity, soaking through the inner skin into the building.

Concrete can be rendered waterproof, either by mixing with a waterproofing compound, or by rendering externally with plaster. Both systems are perfectly satisfactory until the concrete cracks, due to settlement, uneven expansion and contraction, etc. Once the surface is cracked the wall is no longer waterproof.

A development of the concrete wall is the built-up wall of precast concrete blocks. These have the advantage of being easily mass-produced in the factory, whereas walls cast in situ must be erected at the site. Further the relatively small area of the concrete block minimises cracking. If waterproofed with plaster or special waterproofing medium, and if the mortar joints are properly pointed, a precast block wall is as weatherproof as a brick wall, and superior to it from the point of view both of manufacture and assembly.

Shaped concrete blocks, keyed together with weatherproof joints, eliminating mortar joints are being used in housing schemes where speed of erection and economy are of importance, a modification of this system being the employment of sheet walling. The sheet is in the form of a super-large block which covers completely the external face of a unit-cell. These sheets are usually of lightweight breeze or pumice concrete, or asbestos cement.

The final development of sheet-walling technique is in the use of composite walls. Sections of walling are made up, consisting of an impervious outer skin, an air cavity and an inner skin of the heat-and-sound insulating material. The outer impervious skin can be of wood, asbestos-cement sheet, corrugated asbestos, a number of synthetic materials, or of metal sheet. The use of metal sheet composite walling, in a surround of steel angles, is of immense practical significance in the rapid erection of cheap small houses, as it enables the designer to eliminate frame members entirely, the metal surround acting as the structural frame; dry construction is possible throughout, and with a very few standard types and sizes of wall sheet, extremely flexible design and great speed of assembly is possible.

Internal partitions make use of the same materials as are found in walling generally, but of a lighter nature and of necessity of more flexible dimensions

Next comes the question of roofing. The first requirement of a roof is that it must be waterproof, must possess adequate insulating properties, must have reasonably long life and must not require frequent repairs. A further requirement, particularly these days, is that the roof will have to bear traffic - at least people walking or playing games on it - and the weight of furniture, flower-boxes, etc. etc. If no traffic is to be carried, the traditional types of roof, pitched or lean-to are quite satisfactory provided their workmanship is good. Materials such as corrugated iron or asbestos, copper, tiles, etc., are all reasonably weatherproof. Generally speaking, those materials which can be manufactured in large sheets in order to minimise the number of joints in the roof are more suited to modern building re-

quirements than are those in which the unit is small. Adequate insulation is obtained provided a ventilated air-space is arranged between the roofing material and the ceiling below. When the roof is to carry traffic, however, the case becomes more difficult. To begin with the final roof surface must be practically flat. The available slope for falls towards rainwater heads is extremely limited when compared with the sloping pitched or lean-to roof, and the period required to throw off a given quantity of water is longer. Special measures are therefore taken to ensure the thorough waterproofing of flat roofs. The biggest problem is that of expansion cracks in the concrete. This is overcome by using plastic materials such as bitumen, bituminous felt, asphalt, etc. Various proprietary systems are in use, all of which are theoretically reliable, though the actual watertightness of the job depends as much on correct fixing and laying as on the material itself. All roof waterproofing must obviously be laid on at the site; only a limited amount of factory-production is possible. Owing to the extreme care which has to be taken over this important process, it is doubtful whether this operation can be speeded up much above its present rate.

From roof finishes we come to internal floor finishes. The requirements of these are: comfort, suitability to purpose (according to the function of the room), pleasant appearance and long life. Floor finishes may be divided into two main categories - impervious and non-impervious finishes. Impervious finishes comprise a wide range of materials, varying according to cost and quality. The cheapest impervious finishes are cement screeding, granolithic cement, quarry tiles, flagstones and precast concrete paving blocks. Better and more expensive types are various proprietary makes of floor tiling, encaustic tiles, tarrazzo, tile mosaic, slate, marble, etc. Non-impervious floors are usually of wood - either wood-block, parquet or stripwood, of late years rubber, rubber tiles, cork linoleum, and synthetic floors of this type have been used increasingly as they combine the functions of an impervious finish with the good appearance usually associated with non-impervious floors. The suitability or otherwise of the various finishes indicated, in terms of modern building technique can be assessed in terms of their degree of usefulness, long life, etc., coupled with the degree of ease of manufacture and laying in position.

The question of wall finishes has more or less been covered in the section dealing with "walling", so far as external finishes are concerned. Internal wall finishes, however, are dependent on the system of internal partitioning adopted. For partitions of brick or concrete block, or of metal lathing and metal or wood framing there is little to equal a good plaster finish, both from the point of view of lasting qualities and good appearance. However, the fact that a plastered wall involves manual labour in a wet medium mitigates against this method, and recently plaster-board or small sections of boarding with the plaster applied prior to delivery on the site may be used effectively as a finish for internal walls which combine the advantages of a plastered surface with increased speed and facility of building. Large numbers of cane fibre and compressed wood boards are available as wall surfaces, varying in texture from extremely hard, impervious finishes to more open-textured surfaces, which combine acoustical properties with their structural capabilities. Very rough-textured structural boards are marketed with a view to subsequent plastering. One of the latest developments is the introduction of metal wall-tiling. Produced in excellent hard gloss colours, these standardised units form a completely impervious hard-wearing surface, and in addition individual tiles can be detached and replaced with no trouble at all in case of damage.

In all other elements used in building, the tendency towards rationalisation and modern industrial technique is discernible. In the case of windows and doors, for instance, there is a considerable movement towards standardisation of type and pre-fabrication in large quantities. Metal is being used increasingly for those elements which are gradually replacing older types in most building activity.

The question of plumbing and electric wiring has to be considered. The degree of rationalisation seen in these elements varies according to local conditions. The greatest degree of rationalisation occurs in the most highly-industrialised regions. But standardisation could be carried considerably further than is the case at present, with attendant saving in cost and labour.

BUILDING TECHNIQUE FOR MODERN REQUIREMENTS

Consideration of present-day building materials as enumerated above in the light of modern requirements points to the conclusion that a building technique which will radically reduce costs and be capable of rapid production and assembly in large quantities is called for if the urgent problems of re-planning, improvement and mass housing which face the world at the present time are to be tackled satisfactorily. Such a technique requires, first of all, that as much work as possible on the various elements should be carried on in the factory. This involves a complete standardisation of parts. The elements must be of such a nature that rapid, dry assembly is possible with a minimum of skilled manual work involved. Only in this manner can the cost of building be brought sufficiently low to enable large-scale operations to be carried on.

A suggested type of constructional system which fulfils all requirements is as follows:

1. Point-load foundations.
2. Framed structure, of a dry-assembly nature, constructed of standard sections and couplings. (In individual-house types of dwelling, the framed structure can be dispensed with, if metal-framed sheet walling is used).
3. Composite metal-faced sheet walling for external walls. Internal partitions of standard built-up sections which can be bolted to the frame and each other without involving wet construction.
4. Dry-assembly pre-fabricated insulated flooring and roofing.
5. All accessory elements: windows, doors, door frames, built-in fittings, wiring and plumbing etc. to be of standard parts which can be fixed together on the site with the minimum of labour and time, using normal transportable tools.

Such a system is comprehensible and feasible at the present time and with the industrial resources now available. Considerable ground will have to be broken, however, before the system could come to fruition. Co-ordination of standards between the industries at present supplying the building market with materials and equipment, and further rationalisation of standard types of all elements will have to take place before the full value of such a system could be felt. The most serious objection standing in the way of the adoption of rationalised building technique is the reluctance of industrialists to lay down expensive plant and develop factories capable of supplying the type of material required. The reason for this reluctance is given in the unreliability of demand. But the demand is assured in the enormous number of re-housing and slum-clearance projects throughout the world which are only held up due to the high cost of building and the difficulty of raising money to meet this cost. The great reduction in cost which would occur if the system were adopted would enable existing re-housing needs to be met, and would quite certainly create further demands by reason of its inexpensiveness. It only requires men of foresight to organise capital to float a large factory for the production of standardised building elements in any industrialised area to bring the whole technique of building into line with proved modern industrial practice.

THE HOUSING PROBLEM

This concludes the generalised consideration of building construction and materials and it is now time to pass on to a review of the housing problem in its relation to building technique. The role played by the housing problem in the field of construction is important. It was largely the need for enormous re-housing schemes in Europe following the World War which initiated research into the nature and suitability of building materials, and the characteristics of various constructional methods. This research was headed by a group of progressive architects, who, incidentally, were the great pioneers of the modern movement in architecture. It is highly significant that the instigators of this architecture, suited to man's needs in the 20th century, were in every case the leaders in constructional research.

By brilliant insight into the capabilities and possibilities of new constructional media and by bold experiment in the laboratory and in actual housing schemes, the principles of modern building technique were tested and proved.

Following the war - four years of frightful destruction - a new spirit arose in Europe - the spirit of construction, a progressive and vital spirit. A belief that the Peace marked the dawn of a new age - an age of machine-civilisation - of industry, of constructive work, of comfort and leisure and beauty - pervaded the European scene. Thinkers and leaders in all cultural and practical spheres were at work - fashioning a new world, a world that would be fit to live in.....

In this atmosphere the first housing schemes were started. From the beginning a new approach is discernible - a modern line of approach, born of our civilisation and time. This factor was of great assistance in breaking down the resistance to change normally encountered when new ideas are evolving, and helped materially towards the establishment of large town-planning schemes where new and improved building methods and materials were utilised. During this progressive phase it was, naturally, the most urgent problem of providing adequate housing for workers which was tackled first and foremost. As the working-class section of a population is by far the largest numerically, and the most needy section, the solution to the problem required the building of very large numbers of dwellings. It is fortunate for architecture, as for building technique, that this was the case; for had the progressive spirit been lacking, or had any other smaller section of the population received consideration, the amount of research carried on during this post-war period would not have been so great or so far-reaching, and the science of building construction could not have advanced as far as it has done.

It would be of value to consider briefly the more important advances which were made in Europe at this period and to assess the position as it exists to-day, before considering the position in South Africa, with which we are more intimately concerned.

EUROPE

For many years before the actual start of large-scale re-housing in the European countries, engineers had been perfecting the structural materials which were later to have such a revolutionary influence on architectural history. At the same time, the new spirit - "l'Esprit Nouveau" - was manifesting itself here and there, and although the volume of its voice was at first small, yet it asserted itself with almost uncanny persistence and vigour. The realisation that industry had, already, shaped the tools whereby Man might build a new world for himself, had laid hold on certain men with unshakeable conviction, and these early pioneers, John Paxton, Adolf Loos, the Perret Brothers, Adolf Meyer, Tony Garnier, Peter Behrens, directed all their energies to the cause of bringing architecture - and, of course, construction with it - into line with the contemporary standard of industrial development and scientific knowledge, with the end in view, that by this means vast and radical improvements could be effected in all classes of building.

In America, Frank Lloyd Wright, who first conceived the home and garden together as one living unit, designed houses which were specifically and consciously designed to enrich the lives of their occupiers, at the same time carrying out numerous experiments in constructional methods and technique, supplementing the work of the European pioneers.

These men trained large numbers of young architects and engineers, and each one carried away something of the new spirit. One or two pupils, however, were of outstanding intelligence and breadth of vision, and two in particular, Le Corbusier and Walter Gropius, were later to rationalise the many parallel theories and schools of thought and to integrate them into an architectural philosophy for our time. In the more "practical" field, it was these two men, above all others, who evolved constructional systems and building methods suited to the machine-production of our civilisation and to our way of living, and laid the foundations to the solution of the housing problem throughout the whole world, irrespective of local conditions and prejudices.

Le Corbusier's contribution to the problems of housing and housing construction cannot be overstressed. His work in this field, was the outcome of an intensely practical mind applying itself to extremely urgent human needs, and though few of his housing schemes have actually been put into practice, and but few of his constructional methods adopted in a widespread manner by the building industry, the fruits of his research are being seen to-day in the work of modern architects the world over who are applying his principles of design and construction to the problems with which they have to deal.

Le Corbusier started his architectural career with the right approach - the rational approach. He was a structural engineer, trained in the possibilities, constructional and aesthetic, of reinforced concrete by the Perret Brothers, for whom he worked. He started with the engineer's mentality - with a mind trained to state and solve problems directly, trained in accuracy, economy and the elimination of the unnecessary and the wasteful. These characteristics of his mind are apparent in his designs. Self-control and discipline are the keynote. Le Corbusier experimented with a number of housing types, both of the single-type house and the apartment type, always with a view to reducing costs and enabling quantity production to be carried out. His most significant contribution to modern building technique was the development of the "Dom-ino" type of "standard skeleton" (ossature standard) of reinforced concrete beams, columns and floor slabs. A structure of standard dimensions completely independent of the plan of the unit which it supports. This principle of separation of the structural and non-structural elements in a building is generally accepted in Mass Housing work to-day. Le Corbusier also developed several alternate systems for rapid and cheap housing-construction, nearly always using concrete or cement as the basic material. Schemes were published using walling of mass concrete, compressed straw and guncrete, composite hollow walls of concrete or expanded metal, precast concrete blocks, etc. The development of the "Citrohan" type of house went far to demonstrate to the Public the advantages and economies which result from rationalised construction and planning. Again the "Monol" system, conceived and worked out in 1919 was one of the very first instances in which complete

prefabrication of dwelling houses, together with all their fittings, was envisaged. Standard sheets of asbestos cement were used as the basic material, together with reinforced concrete.

Attention is drawn to the housing scheme at Pessac-Bordeaux, built in 1925, in which many of le Corbusier's theories were carefully demonstrated in practice. The great reductions in cost which occurred even in a localised case such as this are an indication of how much more could be saved by a constructional organisation covering a whole region or nation. (Ref: le Corbusier et P. Jeanneret, *Oeuvre Complete* de 1910-29 pp. 78-86).

These housing-types, indicated as basic material on which to start, are of great importance to the question of housing and slum clearance, by reason of their rational character and extreme economy. For the principles demonstrated in these individual houses apply to exactly the same extent when the small units are grouped together in the form of flats. In 1925 le Corbusier turned his attention to the problem of flat-design, at the same time demonstrating the necessity, in urban housing schemes, for concentration of population and decongestion of land. From this point onward le Corbusier became the Town Planner. But his concentration in late years on the ultimate goal of all modern building development - town and regional planning, must not be allowed to obscure the immense practical value of le Corbusier's original research in the field of mass-produced houses and rationalised construction.

The other outstanding figure in European Housing research was Walter Gropius - a pupil, with Adolf Meyer, constructor of the first prefabricated steel house, of Peter Behrens, the "grand old man" of the early days of Modern Architecture in Germany. In 1919 Gropius was appointed head of the Weimar School of Arts and Crafts. He set himself the task of combining, in his students, imaginative design with technical proficiency. This policy tended towards an ever-increasing emphasis on building technique, and experimentation into suitable standard forms of all elements in building. Gropius' keen appreciation of the crux of the housing problem - the solution of the constructional and material problems in terms of modern industrial

resources - had such a powerful effect on the Weimar School that when it became the Bauhaus, Dessau, and was given the opportunity to erect its own quarters, staff houses, a labour-exchange and a housing colony at Dessau-Toerten, its organisation was such that in these extensive works complete rationalisation of method was possible, effecting enormous saving in cost and increase in speed of building.

From the housing point of view, the Dessau-Toerten scheme is of great interest, both for the extreme care and forethought which was put into the organisation of work during manufacture and erection, and for the structural system used.

This system was a carefully planned method of solving the problem of low-cost housing. In this case, the colony was an isolated example, similar in size and scope to le Corbusier's Pessac, but erected under severer economic handicaps and for a less advanced type of inhabitant. The constructional system evolved, therefore, was especially suitable for small-scale quantity production. Advantage was taken of industrial organisation and efficiency in such products as windows, glass bricks, sanitary and plumbing appliances, and fittings of various types, but the main structural elements were such as could be manufactured in quantity on the site, and placed into position in the buildings with a minimum of transportation and other incidental labour. The scheme consisted of rows of two-storey dwellings, separated by insulating transverse walls, resting on trench foundations at even distances along the length of each row. These transverse walls carried the vertical loads of the structure to the foundations. The walls consisted of breeze concrete blocks, approximately $8\frac{1}{2}$ " x 10" x 1'8", a size calculated to be convenient for a single workman to lift with ease, yet large enough to eliminate much of the time spent in laying smaller units such as bricks. The wall blocks were set in cement mortar. Thus a semi-wet process was used. At right angles to the transverse walls, precast reinforced concrete beams were strung, and the flooring and roof placed into position in a dry state. The flooring beams were of precast hollow concrete construction. Waterproofing and finishes followed in sequence. The extreme simplicity of the system; its adaptability to rationalisation of construction, and to mass-production of standardised units, commends this scheme very

highly, as one of the most important practical contributions made to the science of building construction as applied to the housing problem. (Ref: Bauhausbücher 12 - Bauhausbauten-Dessau).

Another important field of research which Gropius and the Bauhaus have exploited is that of prefabrication. Complete schemes were worked out, and actual houses erected for inclusive factory production of all the elements in the building, so that transportation to the site of the whole house, on a lorry and trailer, and erection and completion within a few days became an established and demonstrable fact.

Mention must be made also of the more recent advances in building technique, particularly steel construction, as applied to housing. One of the most interesting systems evolved is the "Mopin" system employed in the re-housing scheme at Drancy (France) by Beaudouin, and Lodz, and more recently in Leeds. In this system, the erection is proceeded with by bays. The foundations of a bay having set, the structural grid of beams and stanchions is first assembled complete on the ground and is then lifted into place on the foundations and bolted up to the adjacent sides. Precast floor slabs and wall units are then fixed in place in a dry state. Building by this method is extremely swift. Steel has been also used with effect in a slum-clearance scheme in Rotterdam in which the steel frame of a nine-storey block of flats (75 flats) was erected complete in 3½ weeks, on a similar system to the Mopin system.

Tribute must also be paid to the work carried out in England by the Council for Research on Housing Construction, appointed to investigate methods of organising construction systems of the low-cost, speedy output type suitable for use in slum-clearance and re-housing schemes. The Council published in 1934 a First Report, entitled "Slum Clearance and Re-housing", (Published P.S. King & Son Ltd., London). This report gives the preliminary findings arising out of the Council's research into re-housing methods from the town-planning, constructional and financial aspects. The conclusions reached in the constructional field are identical with the general conclusions outlined above, and are complementary to the conclusions reached by the contemporary Continental workers. The Council's work indicates that the right approach to the problem - the

scientific approach - exists and is operating in England. (See Appendix No.7).

AMERICA

In America too, research is being carried on at high pressure into synthetic and machine-produced building materials, and into the question of prefabrication, the latter in a more thorough and comprehensive manner than in any other centre. Extended research into the use of raw materials in building is progressing rapidly, the movement having been led in recent years by Richard Neutra, and by the followers of Frank Lloyd Wright. But it is due largely to the Building and Estate Companies that prefabrication has advanced so far in America during the last few years. It is probable that America will take the lead in prefabrication methods and organisation, whereas England appears at the moment to be occupied with the problem of slum clearance and re-housing under concentrated conditions. The research and experimentation into the two aspects of the building problem should do a great deal in the next decade or so, towards the complete industrialisation of building, particularly since Gropius, the leader of the Bauhaus, who was forced to leave Germany when the Nazis came into power, has settled in America and become head of the Harvard University School of Architecture, and at the same time his colleague at Dessau - L. Moholy-Nagy, has started a school in Boston similar in character to the original Bauhaus. With the traditional policy of progressive building in America, plus the experienced direction of Gropius and Moholy-Nagy, we shall probably see considerable development in housing construction in the U.S.A. within the near future.

CONDITIONS IN SOUTH AFRICA

It has been seen then, that the bulk of the pioneer work in the industrialisation of building dictated by the need for rapid mass-housing, has been carried on in Europe. This is to be expected as it was in Europe that the most acute housing problem existed, and in Europe, industry reached its maximum concentration.

In South Africa, the housing problem, though on a smaller scale is no less urgent, and needs to be taken in hand immediately. But any project for large (or small) scale housing to be carried out in the Union is from the very beginning seriously hampered by the lack of industrial enterprise concerning itself with the building trade. For reasons pointed out in the first section of this thesis, South Africa is not an industrial country, nor, for political reasons, is it likely to see much industrial growth for some time. It is, by the same token, extremely difficult to persuade manufacturers to import costly plant and factory equipment when the steady return of their profits is by no means sure. Consequently, as external forces tend to prevent to a large extent any big expansion of industry and consequent growth of proletarian population in South Africa, it cannot be assumed, for the purposes of considering industrialised building methods for housing schemes, that any far-reaching improvement in building methods generally is to be expected in the near future.

Construction, as generally known and understood in South Africa, is traditional in character - to an extreme degree. Brick (and bad brick at that) is the universal building material for dwellings, and is still holding its paramount position even for reinforced-concrete framed multiple-storey buildings, where it is most unsuitable owing to its weight and comparatively low insulating qualities. Yet such is the power of inertia that antiquated municipal building bye-laws usually prevent any improvement over brick as a curtain-wall filling being even attempted for experimental purposes. Hence, with experiment (in the form of actual building) at a standstill, building technique has not improved or advanced in any way whatsoever, despite the recent unprecedented building boom lasting a period of five years. Stone is still used to a large extent in Public Buildings, perpetuating a hybrid state of building and decoration conceived in the least artistic period of the 19th century. This artificially-fostered tradition efficiently prevents any new methods being employed in Government or Municipal buildings, in which, though nowadays usually assisted by a reinforced concrete frame (a bit on the heavy side, perhaps) the 18" brick wall still reigns supreme!

In all repetitive domestic work, the jerry-builder's methods and materials are universally used, invariably of the cheapest type and shoddily finished. As this state of affairs exists even in houses for middle-class owners, it is the more so in the case of working-class and Bantu housing. The constructional systems adopted, particularly in the latter case, are primitive in the extreme, to the extent that the buildings are not even weatherproof. The reason, or excuse, given is that the need for rock-bottom economy prevents proper workmanship and the provision of household equipment to give decent living conditions. It has been demonstrated above, however, that the road to economy, coupled with the provision of minimum conditions, does not lie through cost-cutting on materials and quality of labour, but on the other hand, lies through rationalisation of the constructional system, manufacture of parts and methods of assembly. If the responsible authorities who promote working-class housing schemes in South Africa could once be brought to a realisation that the meagre results of their work were only due to wrong methods, to misunderstanding of the ways and means of attacking the problem, it could be demonstrated how much more could be provided for approximately the same expenditure, and there is no doubt that the lesson would be taken to heart. The obstacles lie in the initial overcoming of the resistance to novel ideas and outside advice so frequently encountered in official circles. This breaking-down of official aloofness is a major portion of the task which confronts those who wish to see an improvement in the standards of life of the poor sections of the community. For once official enthusiasm is raised and co-operation gained, the other obstacles will fall away, and not only housing will benefit, but the state of the building trade as well. For it will be demonstrated that modern methods decrease cost, increase quantity of production, increase speed of building, etc. Thus a start can be made by the solution of the housing problem by Public Bodies in the modernisation and improvement of the building industry, a process which will bring far-reaching advantages within the grasp of all sections of the community. The subject of this thesis, a Native Township for 20,000 inhabitants, is intended as a demonstration of the improvement in conditions which can be brought about by a rational programme, and this section indicates the methods by which rationalisation may be brought into the building process.

CONSTRUCTION APPLIED TO BANTU HOUSING SCHEMES

A number of peculiar factors enter into the question of housing for the Bantu which do not always affect the planning of housing schemes for white workers. The first and most obstructive difficulty to be met with is the traditional attitude to the Native, both in "official" and "unofficial" minds. This attitude looks upon the urban Native as a rather unrespectable "hanger-on", a necessary evil, to the European community. For 50 years he has had to fend for himself, dressed in rags and living in rude and insanitary dwellings made of old paraffin tins and rusty scraps of corrugated iron. During this time the European gave little or no thought to his conditions. With such a state of affairs in the background it is no wonder that any improvement, even of the slightest nature, which the European has brought to pass for the Native, is treated to self-congratulatory praise. As a result, the authorities, having constructed an Orlando, are apt to rest on their laurels. And in congratulating themselves on their enterprise the authorities fail to recognise that their "improvements" are very small, amounting to not much more than the substitution of brick walls where paraffin tins or half-drums were previously used.

Further, the fact that Bantu housing schemes are designed for an extremely poverty-stricken stratum of the population, and are therefore not likely to be an economic proposition, has led to a policy of economising to such a degree that building methods are used which create most unsatisfactory conditions; no proper amenities are provided, and no attempt is made to design such dwellings as will present an attractive appearance and create some esprit de corps among the future inhabitants. In short, due to the background of neglect of the Native housing problem, that problem when tackled to-day, is carried out in a wholly slipshod and inefficient manner.

But by applying the principles of modern building technique, as outlined above in the general introduction to the subject of construction, the problem can be attacked in a thoroughly efficient manner, with far superior results.

In planning the method of construction to be adopted for a Bantu housing scheme in South Africa, certain essential conditions have to be borne in mind. The first is the ever-stressed need for economical building. To this end, every cost-reducing device possible must be employed. Since no organised building industry in the modern sense is in existence in the Union, the methods of building have to be such that prefabrication of units, except in the case of factory-made windows, doors, etc., can be carried out actually on the site, the raw materials for this prefabrication being readily obtainable from South African sources.

In addition, certain materials commonly used overseas are not available at economic rates in the Union, and therefore have to be disregarded in connection with Bantu housing schemes. Structural steel is a case in point. The local steelworks do not produce any but the smaller sizes of rolled sections, which are of little use in large buildings, and imported steel is extremely costly. The unreliability of local supply, and the high cost of the overseas product offset the speed of erection enabled by steel construction, and make the substitution of reinforced concrete construction a more practical method of building at the present moment.

Then, in order further to reduce costs it is absolutely essential to employ as much unskilled labour in the erection of the works as is possible, particularly as the difference between the wage-rates of skilled white labour and those of unskilled Native labour is so enormous. And, since Bantu housing schemes are presumably an attempt on the part of the authorities to better the conditions, both material and moral, of the urban Natives, it would assist in improving still further their material welfare if large numbers of unskilled men were recruited for such work. This policy would also tend to give the Bantu urban populations some direct interest in the growth and development of their own townships if they were largely erected by their own people.

Expenses are still further reduced by the combination of different processes in the factory, and thus the elimination of overlapping work by several trades on the job.

In the scheme proposed by the authors, these principles have been adopted, and rationalisation carried as far as local conditions will permit.

CONSTRUCTION OF NATIVE TOWNSHIP FOR 20,000 INHABITANTS

It has been shown in the preceding sections that the most suitable system for modern housing development from the sociological and town-planning point of view is the apartment or flat system. By planning on this system it is possible to provide the minimum requirements for decent living conditions without undue increase in cost. It will probably be thought that the expense of erecting a multi-storey framed structure will considerably increase the cost per dwelling unit over and above that of a corresponding cottage type dwelling unit. Actually it has been found that, by adopting rationalised methods of construction and labour-organisation, the cost per unit (the cost, that is, of the actual rooms, without sanitary and kitchen fittings) is very little more than the cost of the existing type of municipal location cottage as seen in Orlando, despite the fact that in the scheme submitted the dwellings contain more rooms than do those in Orlando. With the fittings included the cost per unit is 2 to 3 times that of the Orlando type of dwelling. But were the amenities provided in the proposed scheme to be included in the individual-house type of township (water-borne sewerage, water laid on in each house, electric light, etc.), the cost in the latter case would be very high, due to the large number of branch connections required between main services and dwellings, and to the extra length of piping, cabling, sewers, etc., which would be required. The existing type of cottages would become actually more expensive than the proposed apartment dwellings if similar services were provided.

The general principles of modern building practice and the nature of modern building materials have been analysed, and the peculiar conditions in South Africa affecting the realisation of these principles within the Building Industry in this country have been outlined. The constructional method adopted in the proposed scheme will now be described in detail, showing how far it is thought practicably possible

to incorporate modern principles of building construction in such a housing scheme at the present time in South Africa. This analysis will be treated under three headings: structure, fabrication of material, organisation of construction.

A. Structure

1. Foundations

The system of point-load foundations has been adopted, as this allows of maximum flexibility, and a minimum of delay and disturbance where patches of bad ground may be encountered. The foundations are of the grillage type, square on plan, and the foundation excavations under normal circumstances are dug out to a sufficient depth to allow a cover of 2'6" above the top of foundations.

2. Frame

It was originally intended to reduce as far as possible all concrete work cast in situ, in order to save the expense of wooden shuttering. The system the authors had in mind was similar to that employed in the Dessau-Toerten housing scheme by Walter Gropius. That is, the vertical loads were to be carried down to the foundations on solid transverse walls which would separate the flats. The reason for considering such a system is that it would enable precast reinforced concrete beams to span across between the main walls, and would eliminate columns entirely. When the stage of detailed planning was reached, however, it was found that the longitudinal precast beams would have to span 20'0", which would require beams of considerable depth. Further, it is necessary to allow a certain degree of flexibility so that two adjacent flats might, in particular cases, be combined into one large flat. The presence of supporting walls between flats makes such flexibility impossible, as no door-openings could be placed therein, particularly on the lower floors. It was decided, therefore, to adopt a monolithic reinforced concrete skeleton of beams and columns, all of standard dimensions, which reduced the maximum span of beams to 10'0". This enables beams of small and convenient size to be employed. In addition, standardised

shuttering can be utilised throughout the work. Wood has to be used for this purpose, but if the shuttering is made on the site to standardised dimensions and hoisted complete into place by crane, and propped up and levelled in the usual way, instead of being erected in situ from boarding, great savings in cost and time are possible. And if the shuttering is stoutly constructed of a durable wood, it can be re-used without difficulty. It is proposed that shuttering to cover approximately six bays of one floor height should be constructed for each flat block, which should suffice, except for minor maintenance, for the casting of the whole skeleton of the block. Special shuttering would be required for the main vertical circulations, and two or three sets of such shuttering would probably suffice for the ten blocks.

The collaborators realise that the speed of erection will be slower than would be the case if steel were used. On a scheme of this magnitude steel would certainly be a more economic proposition than in the case of a single building, but other considerations besides that of cost weigh against this material for our purpose. For instance, it has been found that a steel frame is a remarkably efficient conductor of sound. In office or factory buildings this is not a serious matter, but in highly-concentrated domestic apartments the problem of sound-insulation is of paramount importance, and the cost of insulating the members of framed structure from one another in order to break the continuity of vibrations, etc., is prohibitive in a scheme such as the proposed township. In addition, the question of speed in erection is not of such great importance in a Native housing scheme on new land in a more or less segregated area, than would be the case where the rapid clearance and rebuilding of slum areas had to be carried out.

The blocks are eight storeys in height, except where the 2-roomed flats occur, where the height is seven storeys. The sizes of the columns and the respective beams are identical on all floors, the reinforcement only being altered according to the various loading conditions. The casting of the monolithic frame and foundations is the only wet process occurring in the whole of the structural system.

3. Flooring

The floor decks consist of small precast reinforced concrete slabs, 1'0" wide and of two standard lengths: 10'7" and 6'7". The slabs are of T-section and grooved along the edges to interlock with each other and their ends rest on the monolithic beams. They are fabricated in moulds on the site, transported after drying to the working face, and laid in position in a dry state. The accuracy ensured by prefabrication reduces time taken in making good. The joints are then treated on the upper face with a bituminous substance in order to render the floors impervious and vermin-proof. On the underside the joints are pointed with cement plaster prior to whitewashing.

4. Roofing

The roof decks are identical with the floor decks, but are covered with a cement screed floated on the upper face, graded to falls and the whole is asphalted and covered with a layer of gravel. This work will be one of the processes which will have to be carried out by skilled workers, though the laying of the deck is unskilled work.

5. Walling

The choice of a suitable walling material which should combine light weight, good insulation properties and an impervious and long-lasting surface in a poorly industrialised country presents a considerable problem. In the first place the usual, inexpensive material, brick, is unsuited to a Bantu housing scheme, in that, by law, skilled white labour must be used for the laying of the walls. Bricklayers' wages are too expensive an item to be allowed in such a scheme. Some form of walling had to be devised, which could be prefabricated cheaply and in large quantities and erected by unskilled workers. Various forms of concrete block were under discussion when an aerated concrete block known as "Spongecrete" came on the market. At the moment a large factory is being erected on the Reef for the local manufacture of this material. "Spongecrete" is made of pure cement and sand. It is claimed to be vermin proof, impervious to moisture, perfectly inert, hygienic and everlasting. It is a perfect insulator against sound

and heat, aphonic and a good acoustic material. Its texture forms a good key for plaster. It can be nailed, screwed, chased, drilled or sawn, using carpenter's tools. The specific gravity varies from 0.3 to 1. Its weight is approximately 1/5 that of brick. If used throughout it reduces the weight of a building by 60% over a similar brick building. The overall sizes of beams and columns are correspondingly reduced. "Spongecrete" is also produced reinforced with wire mesh. The material is made by mixing the sand and cement carefully and then introducing and well mixing an aluminium salt. The powder is then laid out in large trays. Water is added and a chemical action sets up due to the presence of the aluminium salt which causes the cement to become aerated. After drying the sheets are cut up into blocks of the requisite sizes.

It is proposed to effect considerable saving in the Bantu housing scheme by manufacturing special "Spongecrete" walling blocks having a hard cement impervious surface. The surface would be cast in metal moulds, the "Spongecrete" core laid on to this hard surface, and when partially dry a further surface of hard cement cast on top. The metal faces of the moulds would produce almost a glazed surface to the block. It is proposed also to introduce a few standard colours into the cement surfaces. In this way the trades of waller, plasterer and painter, so far as the walling is concerned, are combined into one machine process in the factory. The walling blocks are 1'0" x 1'0" x 3" size, with a smaller number of size 1'0" x 4" x 3". They will be laid by Native labourers, according to a standardised system. After laying, a plasterer is brought in, who goes round pointing the joints in a rapid-hardening plaster, thus rendering the walling completely impervious. A certain number of blocks for use in external walling are to be impregnated with "Sika" waterproofing compound. Internal cills are to be granolithic cement. External metal cills affixed to windows.

6. Floor finishes

The problem of choosing a suitable floor finish in the living rooms and bedrooms presented some difficulty. After considerable research into various proprietary makes of floor finishes, it was decided that

by far the most durable material, having regard to the price, was Rhodesian teak wood block, which in addition gives more pleasant appearance than do the cheaper types of synthetic flooring materials. It is proposed that the wood block floors should be 9" x 9" in size. The use of a wood block floor indicates that wooden skirtings should be used. These would be of Oregon pine, 3" x 1", mitred at corners. The impervious floors in corridors, bathrooms, kitchens and balconies are of granolithic cement. In the corridors and balconies the screeding is rolled by a figured roller when wet, giving a non-skid textured surface.

7. Doors

The number of doors per unit is greatly in excess of those found in most Bantu housing schemes, but it is felt that the fundamental demands of privacy and decency require the provision of an adequate number of doors. It is intended to provide for frameless pivot-hung internal doors, made up of styles and rails of 4½" x 1½" and faced with sheet metal, or corrugated metal. The external doors to be the same, but set in 4½" x 3" teak frames.

Recently, however, a local firm have placed on the market an excellent door faced with pressed-steel, being in a pressed-steel door frame. The price compares favourably with that of normal good quality wood doors and frames and it is thought that the large quantity required for the proposed housing scheme will reduce their price considerably further. It is suggested therefore, that as an alternative to manufacturing special metal-faced doors as outlined above, use might be made of the plant already in existence for the production of these items. The doors would be mounted as indicated above, but with pressed steel frames for the external doors.

8. Windows

Windows are of prefabricated steel type, which are purpose-made according to the requirements of the flats. The large number required will nullify the usual slight extra cost over the standard types. Metal external cills are to be incorporated in the window design. Further

details of steel windows - glazing to be 18 ozs. clear sheet glass or arctic glass according to position.

9. Fittings

The fittings provided in each flat consist of: one sink and draining-board unit, in sheet metal, 4'4" x 1'9", the sink being 12" x 24" x 6" in size. Contract by tender. One 3-plate electric cooker with oven. Contract by tender. One shelf and cupboard fitting 4'6" x 2'0" x 3'0" high for food storage. To be constructed of clear pine and manufactured on the site in quantity. One cast iron porcelain enamelled lavatory basin 15" x 24". Contract by tender. One cast iron porcelain enamelled bath 5'6" x 2'6". Contract by tender. One w.c. pan equipped with hardwood polished seat and flushing cistern. Contract by tender. Two or three cold water taps per unit (according to the design). Plumbing contract by tender. One electric radiator to each flat unit. One electric light ceiling point to each room and the staircase. Electrical contract by tender. One electric meter and fuse board per dwelling. One galvanised iron refuse bin per unit. An optional fitting will be an electric water-heater, to be hired by the householder at a small extra rental, and to be fixed by the Township maintenance officials.

So far as the structure, materials and fittings are concerned, these are used in identical form in other buildings in the township, such as schools, hotels, creches and kindergartens, clinics, laundries, sports clubs, etc., and are also incorporated in the civic buildings and the Technical College. These other buildings are designed to conform with the standard dimensions of the building units.

B. Fabrication of Materials

South Africa being poorly equipped industrially, there are not sufficient factories available to prefabricate all the materials required for a modern building project. Certain elements and materials, such as metal doors and windows, wood block floors, etc., are already in production locally, and the existing factories for such products may

be made use of in the case of a scheme of this nature. But the proposed township being strictly and deliberately limited to 20,000 inhabitants, the scope of a single township is not of sufficient magnitude to warrant the construction of a large, independent factory for the production and distribution of these materials. But if expenses are to be saved, prefabrication, carried as far as possible, must be employed. It is reasonable then to adopt the policy of calling for tenders on all outside fabricated materials, and that all work to be cast in moulds prior to being dried out before assembly, should be fabricated actually within the confines of the site. In this way transportation costs are considerably reduced and breakages after manufacture minimised.

Outside-fabricated materials include the manufacture of reinforcing rods, portland cement, stone crushing, timber, windows, glazing, doors, door frames and door furniture, lettering and numerals, sinks, wash-hand basins, baths, w.c. pans and cisterns, piping and drains, electric wiring, transformers and switchgear, lift machinery and electric light fittings. These materials are brought on to the site by railway or road and prepared for building in at special fabrication sites within the township. It is proposed, therefore, that the railway goods warehouse and the market centre be built first. These buildings will be of the usual factory building type, constructed of light steel roof trusses and stanchions, this type of steelwork being obtainable from local sources. As the work is proceeding the roads will be surveyed and laid down by graders. Light railway tracks will be laid along the roads from the fabrication sites to the building sites. Cocopans, flat trucks, light diesel locomotives will be used for transportation within the site. This will avoid to a large extent the danger of the roads being cut about by lorries before the tarmac surface is laid on them.

The first materials to be manufactured will be the precast floor slabs and stair treads. These will be fabricated while the monolithic frame is being cast. At the same time the reinforcing rods will be bent to shape (by Native labour under supervision) and the reinforcement for the monolithic frame will be made up.

The precast slabs will be cast by Natives in wooden moulds, the reinforcement being placed in the mould first of all and the concrete then worked in. A large number of moulds will be made so that the work turned out per day will be in sufficient quantity to keep pace with the work on the buildings.

It is proposed to establish a "Spongecrete" manufacturing plant in one bay of the market centre. Special machinery will have to be devised for the construction of the hard-faced coloured blocks, and in order to reduce breakages, it would be economical to erect this machinery on the site itself.

Concrete paving slabs are also required in large numbers. These would preferably be manufactured on the site, but if found more economical the existing plant of the Knap paving slab works might be made use of.

Concrete surface water channels for the carrying off of rainwater from the foundations, will be manufactured in hand presses in a manner similar to that already in use in the Orlando location.

Other fabricated work carried out on the site will be the cutting and dressing of timber for shuttering and joinery work and the assembly of kitchen fittings, garden seats, schoolroom furniture, etc. In addition the water service piping, electric tubing, fire mains, etc. will be cut into standard lengths and threaded at ends to take standard prefabricated bends and junctions. It is proposed that as little as possible of soldered or other hand work of this nature be used in the assembly of piping. Cast iron soil and vent pipes, bends and junctions will be prefabricated to standard dimensions prior to delivery on the Township site. Galvanised iron rainwater heads, guttering, flashing, etc., will be manufactured on the site from the sheet metal, but the down-pipes will be factory-produced and delivered ready for fixing.

It is proposed that the railway goods sheds be used for the storage of raw materials arriving on the site, and that the market centre be used as the fabrication plant.

Besides these elements, a painter's shop and store are required, also a mechanic's workshop attached to the fabrication plant. The offices of the architects, Municipal officials, clerk of works and foreman and a drawing office will be accommodated in the administration building, which will be the first building to be erected after the fabrication unit. Portable corrugated-iron and wood watchmen's huts and temporary lavatory accommodation for overseers and workmen will also be required. Earth closets will be used until the sewers are connected up with the disposal works, after which water closets will be provided.

C. Organisation of Construction

The sequence of processes will be as follows: Arrangements will be made with the Administration for the railway tracks to be laid down, at any rate from the existing system to the goods yard. Failing this, a good hard-surfaced road must be constructed from the town to the site. If the railway is constructed first, however, it will not be immediately necessary to put down a finished road surface, and a graded earth road will be sufficient. Next, work is proceeded with for the erection of the goods sheds and the shopping centre, and the installation of fabrication plant. The roads will at the same time be laid out and graded, and the light railway tracks laid down. In addition, work will be immediately started by large gangs of labourers on the trenching necessary for water mains, electric mains, sewers and sewer connections to buildings, and storm water drainage. The work on sewer excavation will be continued out beyond the township site, to connect with a disposal works. If there is no such plant in the vicinity, a special private plant will have to be installed, at some distance away from the township. The administration building is then to be erected, and work started on the frame of the first housing block.

The frame will be cast laterally, that is, the whole of the ground floor system, starting at one end, will be completed before work is started on the first floor. Then the whole of the first floor, and so on.

The horizontal method of development enables the floor decks to follow the beams and columns very rapidly, and forms the maximum possible working-face for further trades.

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After the floors are laid, the piping, sanitary fittings, electric tubing, switch-gear and meters are fixed. They are, by this stage, adequately protected from the elements. The flats are not at first developed on part of the ground floor, which will be used as a storage space, together with the small shops attached to each flat block.

Once the fittings are built in, the walls, first internal and then external, are built in, together with windows, doors, etc. Following the walling, the plasterers come on the job and point all joints in walls and undersides of ceilings. Whitewashing of ceilings is then carried out. Floor finishes and skirtings follow and lastly the kitchen fittings. Painting of woodwork, doors and windows, sweeping clean and washing down floors and corridors are the final operations before the building is ready for occupation. This rational sequence allows for building in each unit without demolishing and making good after previous trades, and with a minimum of interference with the hoisting and transport of material from the store to the working face. Great savings in time and unnecessary costs are the result. Following the completion of the housing units, the roads are surfaced with tarmac and pavements with asphalt. Concrete paving is laid down at the entrances and terraces to the flats. The other buildings, schools, public buildings, etc., are then proceeded with.

The organisation of labour follows the principles laid down above. practically all fabrication on the site is carried out by unskilled Native workers under the supervision of skilled foremen. The erection of all but machinery, wiring, plumbing, drain-laying and sanitary fittings is the work of Native workmen. The principle adopted is to divide the labour force so that each unskilled worker carries out a repetitive task. In this manner it has been found that the progress of the work is speeded up as the building proceeds.

Conclusion

By using methods of rationalisation in choice and manufacture of materials, by a clear-cut organisation of the processes of assembly and by the adherence to a strict working time-table, sufficient saving in cost is effected to render the erection of the housing scheme in

the form of flats a practical proposition. The next section deals with the actual costing of the work and indicates the methods in which the necessary funds are obtained and used for the erection of the scheme.

NOTE: See Appendix No. 6 for schedule of materials.

See Appendix No. 7 for extract from the Report of the Council for Research on Housing Construction, dealing with mass-production, standardisation and organised assembly in modern building practice as applied to slum clearance in England.

See Appendix No. 8 for Structural Design of Monolithic Frame.

V.

F I N A N C E.

A. ECONOMIC STATUS OF THE NATIVE

The economic system of the Native in South Africa before the arrival of the white man was one of primitive subsistence. Such a system, although necessarily very limited seemed at least to function in harmony with the mode of living of the time, and families were able to live according to their moral and social beliefs and standards. Life amongst them was not competitive, and their most important possessions - cattle - were handed on from generation to generation with sacred simplicity.

With the arrival of the white man with a diametrically opposed economic system, an inevitable clash took place, and still continues.

Under such circumstances only one of two results is possible - either the one or other system must be exterminated, or it must be absorbed. The latter alternative is taking place to-day, accompanied by all the inevitable stresses and strains.

The Native Reserves

One of the first results of the absorption was the herding together of the Natives into reserves. Unable to adapt themselves to this changed condition the Natives now find themselves a poorer people, more exposed to food shortages and failing crops, due to the resulting overcrowding and overstocking. The inevitable effect is that individual Natives are in ever-increasing numbers turning towards the towns for relief, and thereby causing ever-increasing problems of urban housing and administration.

The position in the reserves is in no way improved by this steady exodus to the towns. Due to lack of knowledge of more advanced systems of agriculture and animal husbandry the lands are becoming steadily poorer until such a state of barrenness will occur that it will be impossible to support man or beast on the land.

Education in better farming methods seems to be the only possible hope of maintaining the standards of production in these areas, and conserving the fertility of the soil.

The Natives resident in these areas are entirely dependent for their existence on the land. They grow crops enough for their own food consumption, and they keep cattle and sheep, which are their sole possessions.

Should there be any surplus by way of crops or wool they are sold for cash. It has been estimated that the annual cash income of a family of five by this means is £2 12s. 6d., obtained from the sale of maize and wool. (Native Economic Commission 1930-32). This sum has to account for taxes (£1. 0s. 0d. per head for each male over 18 years of age, and 10/- per hut - total £1. 10s. 0d.) Then additional food has to be purchased such as sugar, tea, meal, coffee, condensed milk, besides other articles such as paraffin or candles, soap, blankets, clothing and tobacco.

The necessity for a large number of the males having to seek employment in urban areas to supplement this cash income is therefore obvious, and the fact that most Natives are in debt in respect of supplies obtained from stores is not surprising.

It is estimated that the average man remits to his family £10. 0s. 0d. as a result of a six months term of employment on the mines which then brings the total annual income to £12. 12s. 6d.

The Urban Areas

The steady flow of Natives from the reserves to the towns, brought about by financial pressure, was responsible for the introduction of the Urban Areas Act which lays down two important principles.

1. The elimination of existing Native slums and the prevention of the formation of future slums.
2. The residential segregation of Natives.

The effect of this Act is to throw the responsibility of housing Natives in urban areas in an adequate manner, on the local authorities. This responsibility may in some cases be a very great one,

and the solution more often than not imposes a heavy burden on the local ratepayers.

The Director of Native Labour on the Witwatersrand declared in 1933 that there was in the Union of South Africa a Native labour force of one million of a working age. Nearly all of these were working, in normal times, as shown in the following:-

In mining proper	261,000
In alluvial diggings	28,000
In commerce and industry	97,000
In domestic service	111,000
In municipal service	27,000
In government service	27,000
On farms	65,000
In agriculture	<u>375,000</u>
	991,000

The above figures go to show that very nearly all the Natives of working age are working. It is to be noted, however, that the highest number still remain on the land, but the effect of the need for earning hard cash is also very obvious.

From the same source it was reported that in 1937 of a total of 481,540 Natives at work on the Witwatersrand, 195,839 were employed other than in mining. Thus some 200,000 natives are housed (1) on their employers' premises, and (2) in locations provided by the Municipal Authorities.

By June 1937 Johannesburg had spent over £1,000,000 on housing for Natives, and had thereby provided accommodation for 50,000 people.

In February 1938 the Native population was:-

Western Native Township	15,000
Eastern Native Township	4,500
Pimville Township	15,000
Orlando Township	26,000
	60,500
In other areas	29,000
Total under Municipal control	89,500

It is only to be expected that the standard of living of the Native will undergo a change on coming into contact with urban conditions. Their expenditure is inevitably raised, as new requirements such as dress, housing, furniture, amusements, education, and church fees have to be met. In these respects European customs and standards are being assimilated, and the extent to which this is effected is governed directly by the income.

Obviously the limit of his standard of living, and of his progress, is that allowed by his wage. These aspects apply particularly to the truly urbanised Natives, and are not so applicable to the temporary visitors.

The permanent town dweller has to compete, however, with the temporary visitors from the reserves, who come to the urban areas for short term employment to augment their cash balance. As the number of such visitors is substantial their effect upon the labour market, and therefore on the wage scale is a very marked one.

After having been forced by financial pressure to leave the reserves and seek relief in the towns, the Native finds himself in a still more embarrassing position on arriving within the control of the Urban Authorities. His position as regards accommodation is a difficult one, he is forced to take up residence in a location and to pay a rent which imposes a further strain on the family income.

The system of housing is, however, also a severe strain on the local authorities, who are bound to consider each additional Native to be housed as an additional burden.

The Cost of Living in Relation to the Income of the Urban Native

In the first instance the introduction of the Poll Tax was apparently designed to bring pressure to bear on the Natives so that they would be forced to go to urban areas and farms to work for a cash wage. In this it seems to have been fully effective, but would appear by now to have exceeded its useful period, when one considers the serious position in the reserves. The continued drift of Natives from reserves to urban areas is giving rise to an acute housing problem which has to be solved by the local authorities.

The direct taxation of the Natives consists of a General, or Poll Tax of £1. 0s. 0d. per head per annum for all males over 18 years of age, and a Local Tax of 10/- per hut or dwelling, in a Native reserve. These taxes must all be paid to the Receiver of Revenue in cash.

Besides providing the cash with which to pay taxes, the wages also have to provide a living for the Native and his family in the urban area. There are, generally speaking, three classes of wage earners living in locations in Johannesburg.

- (1) Independent.
- (2) Weekly paid workers.
- (3) Monthly paid workers.

The occupations of the first group are confined largely to agencies, shop-keeping, selling of herbs, etc., and taxi-driving.

The result of investigations seems to indicate that the weekly paid workers are slightly better off than those paid by the month. The former consist largely of shop and office workers, factory workers, and those employed in the building trades. The average wage for this class is about 20/- a week or slightly over £4. 0s. 0d. a month.

The monthly paid workers consist largely of Natives employed by the Municipalities and Government, and private servants, whose average monthly wage appears to be slightly less than £4 0s. 0d.

Average weekly wages of Natives in urban areas throughout the country for 1936 were:-

Cape Peninsula	24/7d.
Durban	18/1d.
Bloemfontein	21/3d.
Witwatersrand	18/8d.

(Figures from the Year Book 1938).

Thus the general average wage of the Native in the Witwatersrand area, considering all rates of pay, is in the neighbourhood of £4.0s. 0d. a month.

In 1929 the Master Builders' Association in Port Elizabeth agreed with other employees of Native labour to a rate of 3/6d. per day, increasing to 4/- per day after June 1930. This was not thoroughly effective, and is probably to-day non-existent.

In 1925 the Capetown Master Builders' Association agreed to 27/6d. per week of 44 hours, while according to figures given in the 1938 Year Book, the Native wages in the building trade for 1936 were 9d. an hour in the Cape and 5½d. in the Witwatersrand.

The average wages earned by Natives on the mines in 1937 was £2 18s. 4d. per month which amount did not have to provide for food, board or medical services. These services can be considered as approximately worth £2. 0s. 0d. per month, to the Native were he to provide them, but only cost the mines 23/- per month. (Year Book 1938).

The Native's nett income after eleven months service on the mines, when train fares, mine boots, etc. have been deducted is probably in the neighbourhood of little over £2. 0s. 0d. per month, or about £25. 0s. 0d. at the end of his term of employment for one year.

In general, wages are very low indeed and there seems to be little indication of any likely improvement.

The position of the urban Native as a result is aptly summed up in the words of the Economic Commission 1930-32 as follows:-

"Even allowing for a fall in prices which has occurred, and its effect upon the real wages of the urban Natives, the present level of their wages is in our opinion too low to provide for a decent standard of living for a Native with a family. A common wage in Johannesburg at present is £3. 10s. 0d. a month with nothing found. Out of that sum the Native living at the Western Native Township, where there is a population of nearly 15,000, must pay 25/- a month for rent, 10/- a month for transport, and 1/8d. a month for his poll tax. That leaves him for food, clothing, education for his children, and any other necessary expenditure a sum of £1. 13s. 4d." The resultant embarrassment of the urban Native will be seen in more detail when the cost of living is considered.

Probably one of the greatest difficulties that the Native experiences in adapting himself to urban conditions and to the economic system of the European is the realisation of relative values in terms of the constant value and power of a money currency.

It is a characteristic of the primitive subsistence that only enough food is prepared or grown to meet the immediate demand, and people accustomed to such a system inevitably find difficulty in adjusting their outlook to that of a money economy.

Hence the Native still works for a few months of the year, and, not having saved money or in any way provided for the future, feels inclined to have a holiday, and immediately finds difficulty in providing for himself and his family.

Great difficulty is of course experienced in attempting to balance the inadequate income against the requirements of the family, and the position is not improved by the constant fluctuation in the urban labour market, and the resultant effect on wages, due to the constant influence from the reserves.

Only an improved position in the reserves will result in a more stable wage rate in the urban areas, and until this state of affairs is reached no improvement in the income of Native urban families can be expected.

Before dealing with the cost of living of the urban Native it will be as well to recall that it has already been concluded, that the average wage earned by the Natives working in Johannesburg, and living in one of the Municipal locations is £4. 0s. Od. This figure must be closely borne in mind when dealing with the cost of living of a Native family.

The Joint Council of Europeans and Africans have prepared a minimum monthly budget for an average family of five members, which is given below.

Rent of a three-roomed cottage	£1	5	-
Transport (train or tram)		10	-
Poll Tax		1	8
Burial Society		2	6
Wood (3d. a day)		7	6
Coal (one bag per week)		10	-
Sugar (one pound a day)		10	-
Tea		2	6
Meat (3 times a week)		12	-
Vegetables (4 times a week)		4	-
Bread (3 loaves a week)		6	-
Mealie meal		10	-
Lunch in town (6d. per day)		13	-
Candles		3	-
School fees		1	-
Church fees		3	-
	£6	1	2

Thus sum already exceeds the income by £2. 0s. Od., and no allowance has been made for clothing, furniture, recreation, newspapers, or the possibility of having to support "aged" dependents, and the need for medical services.

Of these items noted above the first four rent, tax, fares and burial society are constant (the last item being rendered constant by the great importance attached to burial by the Native).

The result is that the needs of the other items are controlled directly within the limits of the somewhat inadequate balance of about £2. 0s. Od., after the former items have been accounted for.

Of the remaining items, food is undoubtedly the most important, and in this connection Dr. A. J. Orenstein, Medical Director of Rand Mines Ltd., is quoted, as being especially competent to speak on the subject.

"On the Rand £3. 0s. Od. (per month) is necessary for a man, his wife, and two children, for food alone, as a minimum to provide a diet consistent with the reasonable maintenance of health".

In this connection it should be borne in mind that the Native pays the same prices for his food in an urban area as the European does, and in fact a slightly higher price, due to his inability to buy in large quantities, and thus to benefit from a reduced rate.

From the experience of Mr. J. W. Lawrence of Crown Mines, the cost of feeding families of four to five is about £4. 0s. Od. per month. Assuming this figure for a family living in a location the total monthly expenditure would then be:-

Rent	£1	5	-
Tax		1	8
Fares		10	-
Burial Society		2	6
Food	£4	-	-
		£5	19 2

the
or £6. 0s. Od. in agreement with/estimates of numerous other authorities. Again it should be noted that this figure does not allow for numerous

very essential items for the well-being and happiness of the family.

Dr. C. C. P. Anning of Benoni considers that a satisfactory food budget for a family of four should amount to £1. 12s. 0d. per week or £6. 10s. 8d. per month.

However, taking the value of the minimum requirements of the family to be about £6. 0s. 0d. it becomes obvious that a serious short-coming of about £2. 0s. 0d. has to be accounted for each month.

In the income, only the effects of the male representative of the family have been taken into account. Under the circumstances it is essential for the wife of the family to work. This brings about very unfortunate circumstances for the children of the family, as they are very liable to be neglected. Even after the wife's honest efforts at washing, etc., the deficit is only decreased by another 10/-, and the still outstanding £1. 10s. 0d. is either taken off the food allowance or is made up by illegitimate means. Either of these methods is obviously to the decided detriment of the family.

From the foregoing it would be surprising if the logical result was not debt in nearly every family. Debt is in fact very common, being estimated by some at 90% of the Native population.

Instances of the hire purchase system are also very frequent, as the Native with his low income, and inability to save his money, if he had any, is an easy prey to the type of person who makes a living by this system of selling goods. The result is further debt and unhappiness amongst these unfortunate people.

B. HOUSING THE NATIVE IN URBAN AREAS

Bloemfontein

The Native families are housed by the Municipality of Bloemfontein in two methods:-

1. A system whereby the Native erect their own houses.
2. A system whereby the authorities erect houses utilising Native or coloured labour.

In the first system a site 75'0" x 50'0" is allocated to the Native upon which he has to erect the walls of the house at his own expense, and in accordance with the building regulations. The municipality then issues further building material, usually to the value of about £35. 0s. 0d., consisting of galvanised iron and timber for the roof, doors and windows.

The amount of approximately £35. 0s. 0d. which is granted in the form of material is paid for out of a loan raised from the Government at 5%. The Native owner has to pay this back at the rate of 10/- per month, which covers interest on the loan. The walls of the house built before the issue of the material standing as security for the municipality. The materials are bought by the municipality in bulk, and supplied to the Native at cost.

On completion of the house the Native is required to pay 7/- per month to cover rates for sanitary services, water, and ground rent.

The total charge is thus 17/- a month until the amount of material plus interest is paid off, when it reduces to 7/- a month. Only the monthly instalments of 10/- are used for paying off the Government loan, and the 7/- is confined to local expenses.

In the case of the second scheme the cottages are built of burnt brick by Native or coloured labour, and consist of four rooms (12'0" x 12'0") at a cost of £115. 0s. 0d. Each stand has an earth closet, and shower baths are provided. The rent charged for such buildings, which are usually let as rooms, is 10/- for one room and 17/- for two rooms.

The Native Revenue Account receives its income from:-

Hut fees	Dog Licences
Lodgers fees	Market fees
Rents	Hire of Communal Hall
Service Contracts	Transfer fees
Grazing fees	Court fines
Hire of brick fields	Instalments on loan.

All income, except instalments on loans, which have already been mentioned, is used for location services. An amount of £2,000. 0s. Od. is allowed for the maintenance of 30 miles of road.

Water is supplied by stand pipes at intervals in the streets, and the Native Revenue Account is charged at the rate of 2/6d. per 1,000 gallons, for water, the total cost for this service for 1936 being £3,153. 18s. 6d. Night soil service is carried out twice a week, slop water service once a week, and ash and refuse once a week. The Engineer's Department's charge for these services in 1934 was £4,415. 4s. 5d. According to the Superintendent of the Native Affairs Department approximately £15,000 is paid annually for services rendered by other municipal departments. In 1936 the amount collected for materials issued was £36,230, and the income from the other services mentioned above was £27,355, while expenditure was £25,671.

The usual municipal policy of making each department balance its own accounts, is apparently adopted.

Advantages claimed for the Bloemfontein system are:-

1. The system gives the Native owner some personal interest in the house, and allows him to express his individuality.
2. By confining the grant to the fabricated materials the authorities are not involved in huge financial sums, with the result that the Native resident is not burdened with a high rent in order to pay off huge loans, and after a very few years only has to pay for service.

3. The Native resident also benefits immensely by having utilised his own, or very cheap coloured labour, thereby reducing the capital outlay to a minimum. It is estimated that a 40% saving is effected by the elimination of white skilled labour.
4. In comparison it is asserted that houses with greater accommodation are possible at a reasonable rent. A four-roomed house can be erected under this system costing about £57. 0s. Od., which could not be built under the municipally built system for less than £200. 0s. Od.
5. The European rate-payer is not burdened by heavy financial commitments, maintenance, and supervision costs.

The desirability or otherwise of the first advantage claimed is dealt with in the first section of this thesis, and it would appear that this aspect might prove a disadvantage when considered in relation to the legal status of the Native under the Urban Areas (Amended) Act.

The second point claimed is an undoubted advantage, particularly the aspect which allows of a decreasing monthly payment, which must be encouraging to the tenants.

The third advantage claimed is again a valid one, as it is quite obvious that the lower the capital outlay, the less the strain on both tenant and housing authority. There is also the possibility of securing greater accommodation with the present resources of the Native.

It should not, however, be overlooked that the Bloemfontein system is dependent to a great extent upon the existence in the vicinity of the location, of suitable brick fields, from which the Native may draw his materials.

Again, there does not seem to have been the great urgency for houses that exists in Johannesburg. This is no doubt to the credit of the

authorities, who appear to have studied their problem thoroughly, and with understanding and sympathy for the Native, and have thereby achieved quite a satisfactory solution from a financial point of view, although one would like to see a lower charge made for services.

The services provided may not be all that is desirable, but further reference to this aspect of the problem will be made later.

Some interesting assertions are made by J. R. Cooper, Superintendent of Native Affairs Department, Bloemfontein, in "The Urban Native Problem", September 1930. "As an instance of the system of leasing lots to Natives on which to erect their own houses, a reference may again be made to Bloemfontein which at present is housing 25,000 Natives at little or no cost to the local authority or ratepayer. As an example of the municipal housing system we may mention Johannesburg, housing some 25,000 - 26,000 Natives at a cost of some £600,000 to the local authority or ratepayer. The monthly rental in most Municipal Housing Schemes is from 17/6d. for a two-roomed house of limited dimensions and 25/- for a three-roomed property, amounts in most cases beyond the capacity of the Native to pay and insufficient to meet the interest and redemption charges on the capital sum involved".

"In Bloemfontein the total monthly charge is 6/6d. (now increased to 7/-), and if a Native has purchased from the council the necessary material to complete the building, which averages £35. 0s. 0d. for a four-roomed house (dimensions of rooms 12' x 12') this amount is payable in monthly instalments of not less than 10/-, including interest and redemption charges".

Although the number of Native families housed is very much less than in other centres, the system adopted in Durban and the services given are worthy of mention.

By far the greater portion of the housing is for single Native men. Accommodation is provided for 7,785 people in four hostels. The rent charged is 5/- per head per month for which electric light is also provided.

There are 120 cottages for married Natives, and a rental of 20/- per month is charged for which the following services are provided, electric light, water borne sewerage, individual water supply, and a shower bath. The provision of such a high standard of housing at a fairly moderate rate is apparently possible owing to the municipality's monopoly of Native beer houses, markets and eating houses, the profits from such services offsetting any loss on the housing.

It should be noted that only a very small number of Native families are as yet housed, and very bad slum areas still exist in the Durban Area.

Johannesburg

One of the first records in the history of Native housing in Johannesburg is the establishment of a location at Klipspruit. This was brought about by an outbreak of plague in 1904 amongst the Native people living within the municipal area. Klipspruit is situated adjoining a sewerage farm, 12 miles from the centre of Johannesburg, and was laid out as a location, the Natives being allowed to rent sites on which they could construct their own houses. Owing to the situation of the location and lack of transport facilities, it was not popular, and the Natives soon filtered back into the municipal area. This was not in the interests of the health of themselves or the European population.

The next record shows the establishment in 1914 of two compounds, Salisbury and Jubilee, for the housing of single men.

During the years 1904 to 1921 the following Commissions of Inquiry all reported on the unsatisfactory state of Native housing and public health in Johannesburg.

Native Affairs Commission	1903-05.
Indigency Commission	1908
Municipal Commission	1909
"Assaults on Women" Commission	1913
Tuberculosis Inquiry	1914
Health Committee Report	1919

As a result of these findings coupled with a serious influenza epidemic in 1918 the council established the Western Native Township in 1921.

With the passing of the Urban Areas Act in 1923 further developments took place. The Wemmer Hostel was built to house 1,000 persons, and soon after completion was enlarged. The Western Native Township was considerably extended, and the Eastern Native Township was established.

With the establishment of these two townships the council embarked upon a policy from which it has since not materially departed. This policy has been to employ skilled European labour in the construction of the houses in the Native locations. The effect of such a policy will be studied more closely at a later stage.

Up to 1927 no Native Affairs Department existed, but only an Official who was responsible to the Parks and Estates Committee which supervised Native Affairs, the Zoological Gardens and any land owned by the council.

In 1927 a Manager of Native Affairs was, however, appointed, and in the following year a separate committee was formed to deal with Native Affairs.

From this time onward the department has been very active, and in ten years has developed four Native Townships, besides having provided numerous hostels for single persons.

The most recent, and what promises to be the largest, township, is that of Orlando, started in 1931-32 when the Eastern and Western Native Townships had reached their maximum of 620 houses (accommodating 4,000 people) and 2,325 houses (accommodating 13,000 people) respectively. The Klipspruit location at that time was accommodating 10,000 people. Although condemned in 1920 this location, now known as Pimville, is to-day still housing some 12,500 Natives.

Since its inception Orlando has grown at a startling rate and to-day houses an estimated population of 35,000 (Vade Mecum '38).

It is apparently the Native Affairs Committee's programme to complete the housing first and leave the other elements and services of the location until a later date, for in 1936 with 18,000 inhabitants already accommodated there were no showers or baths and only four gas lamps in the whole location by way of street lighting. In 1933 a small hall and a cottage hospital were donated to the location, and in 1936, 25 miles of new streets were laid out, 100 culverts, and 10 miles of stormwater drains were constructed. Three sports grounds were prepared, and 8,000 trees planted.

A service seldom associated with Natives is that of transport. In this direction Johannesburg seems to have done very little.

When the Klipspruit location was established in 1904 no transport was available other than a fairly intermittent rail service with no guarantee as to reasonable fares.

In 1921, when Western Native Township was established, again no transport facilities were provided and according to John Maud: "by 1934 the council had only reached the stage of providing one regular service of trams over 4.6 route miles, for the use of the Native population of the city, apart from an occasional 'bus to one suburb, Rosebank, on Sundays and Public Holidays. The one regular service which was run for the most part over a single track line, between the Western Native Township and the centre of the city, had to serve a population in the north-western suburbs of some 51,000 Natives; and, as only ten single-decker trams were provided for the purpose, it was perhaps hardly surprising to find that, although the municipal tram fare was only twopence, so many Natives were prepared, if necessary, to pay a threepenny 'bus fare for the same distance that forty-one private buses could operate over the route at considerable profit to their European owners".

The 1934 Commission of Inquiry concluded on the same subject, "That for the Native population of Johannesburg the existing transport facilities were quite inadequate" and remarked "that it knew no city in the world where so large a part of the working population was so badly served in that respect".

The position to-day is probably slightly improved. Orlando Township is on the same railway line as Pimville, and according to the Manager of the Native Affairs Department (Minute of the Mayor 1937) a monthly season ticket which allows 60 journeys costs 8/6d.

While the tram service to the Western Native Township has improved it is still not adequate in itself, and many private 'buses are still serving the area.

Advantages claimed for the Johannesburg System of Housing are:-

1. The houses built under the Johannesburg System with skilled European labour are superior in construction, and therefore have greater durability than those constructed by the Natives under the Bloemfontein System.
2. The housing scheme can be carried out at a greater speed than the Bloemfontein System, which is an important aspect when considered in relation to the Council's slum clearance policy.

The above advantages are very largely identified with the policy of utilising skilled European labour. This policy was defended in October 1933 by Graham Ballenden, Manager of the Native Affairs Department of Johannesburg at a National Conference of Managers and Superintendents of Native Affairs, for the following reasons:-

1. "There is an absence of Native contractors and skilled Native workers who could undertake large contracts".
2. "No white contractor would undertake the work with purely Native labour".
3. "Native labour would not mean a large reduction in building costs in view of the additional time taken by them".
4. The Municipalities are under pressure to complete their building projects in a short time".

It may be true to say that the houses are superior in construction, but since so much is lacking in the way of floors, ceilings and finishes, it is doubtful whether the inhabitants benefit at all from such superiority.

The superior durability is probably undoubted, but there seem to be far more urgent needs requiring a satisfactory solution.

With regard to the question of speed in relation to slum clearance it would appear that this contingency is a self-inflicted one, brought about through the apathy on the part of the council to the problem of Native housing during the period 1904 to 1924 as described earlier.

So far as Mr. Ballenden's contentions are concerned they are all closely related to the aspect of speed, and therefore the limitations of the Native as an efficient contractor or builder's labourer. This aspect, it is true, may have an important bearing on the present position, and is closely related to the policy of building houses for the Native to live in.

It seems then, that the case for skilled labour is largely a particular one, but not necessarily applicable in all cases, and certainly an expensive method of providing labour.

There can be little doubt as to the extra expense of skilled European labour, and it is ironical that on this question of cheapness of labour the Native should suffer, insofar as having to pay a higher rent for their houses than they would do if they were able to assist to a greater extent in the construction.

It is worth repeating here the words of the Native Economic Commission:

"Your Commission considers that it is unreasonable to expect Natives to pay rent based on capital charges, created by much higher wages than Natives in practice earn. This over-capitalises the location ab initio, and frequently there is no escape from the necessity to subsidise rent. In time this will have a harmful effect on the location itself, inasmuch that the urban authorities, faced by successive losses on the Native revenue account, will be chary of undertaking further expenditure".

Financial Aspects of Existing Housing Schemes

The capital expenditure involved in most municipal housing schemes is usually very high, the sum of £1,190,655 between 1927 and 1937 for Johannesburg is an example.

This aspect is the root cause of high rents which have to be charged in order to have some semblance of a return on the money invested. It is in this aspect of housing the Native, that the system adopted appears to fall short of complete solution. Any housing scheme which, by virtue of its position and the rent charged, makes its tenants pay half their total income on transport and rent, cannot claim to have achieved very much for the people housed.

This state of over-capitalisation seems in the main to be the result of the system of housing adopted, namely that of individual houses on individual sites. Such a system necessarily involves a large amount of land, a great length of streets, excessive street lighting, and stormwater drainage, a large amount of fencing to each plot, and a system of building which is not the most economic. The provision of a location of houses with each plot fenced, reasonable streets, street lighting and drainage is only reached at enormous expense to the municipal authority, accompanied by an apparent deficit, as in the case of Johannesburg, up to 1937, of £189,513. This deficit is, however, to a large extent made good by profits shown in other departments.

The nature of the layout, accompanied by such a deficit is therefore sufficient barrier to prevent any municipality's attempting to provide the houses with the essential services of water borne sewerage, electricity and water laid on.

It is apparent that the system adopted in one which entails a large outlay. This combined with the nature of the layout renders future development, after the bare housing is accomplished, an economic impossibility. It is inevitable also that all such schemes are sub-economic, and that a heavy burden has to be carried by both the Native tenant and the urban housing authority.

Statistics showing the Development of the Native Affairs

Department, Johannesburg, over the period 1937 - 1937.

from Minutes of the Mayor for that period.

Year	Estimated Native Population of Johannesburg.	Total Population of Population Housed	Population of Families Housed in Locations	Capital Expenditure
1927		13,910	12,917	£398,842
1928	136,000	17,634	17,400	£447,746
1929	140,000	21,244	21,000	£493,850
1930	144,000	24,871	24,534	£524,373
1931	150,000	27,413	25,000	£586,611
1932	150,000	28,944	27,000	£610,174
1933	153,000	31,767	30,946	£752,803
1934	187,917	40,639	-	£870,821
1935	200,000	49,000	42,000	£940,746
1936	219,893	54,000	-	£1,006,252
1937	220,000	60,000	48,249	£1,190,655
TOTAL.	220,000	60,000	48,249	£1,190,555

Interest on Capital	Redemption Fund	Income	Expendi- ture	Loss	Approximate Loss on Zoo
£18,665	£7,807	£38,064	£53,552	£15,488	£15,000
£21,883	£7,849	£40,715	£57,525	£16,810	£17,500
£23,572	£8,274	£44,060	£64,838	£20,778	£18,000
£25,779	£8,834	£55,512	£73,098	£17,577	£19,000
£30,809	£7,694	£61,821	£82,484	£20,663	£19,500
£32,334	£9,354	£63,116	£86,889	£23,773	£18,700
£34,704	£10,212	£67,134	£92,641	£25,507	£15,000
£39,494	£12,035	£92,852	£111,185	£18,333	£19,000
£38,502	£13,992	£111,549	£114,742	£3,243	£21,000
£41,348	£15,469	£125,955	£132,599	£6,644	£22,500
£42,954	£17,119	£133,672	£154,369	£20,697	£23,000
£350,044	£118,639	£834,450	£1,023,913	£189,513	£213,200

Table showing cost of land bought up to 1934.

Location	Area (acres)	Total Cost	Cost per acre
Pimville	507.78 (203 used)	£17,263	£34
Wemmer	10.7	£13,775	£1,283
Salisbury	.047	£600	£12,777
Jubilee	3.96	£1,096	£276
Western Native Township	256.7	£23,480	£91
Eastern Native Township	37.928	£2,585	£68
	33.738	£3,044	£90
Native Women's Hostel	3.979	£163	£41
Wolmutter Mens Hostel	6.6	£4,071	£616
Orlando	2,442.5	£20,791	£8.10s.
City Deep Sports Ground	10.625	£1,150	£108

"The average population per acre in the Western and Eastern Native Townships and Pimville is approximately 60 persons".

"On a basis of 640 acres to the square mile the Native population in the Eastern Native Township is 39,680 persons per square mile".

The statistics given are taken from Minute of the Mayor 1927-37.

As will be seen from the table of land costs, the cost per acre of land at Orlando was £8. 10s. Od.

Considering only the areas allotted to houses, about eight stands, including roads and sanitary lanes, go to an acre, which results in a cost of approximately £1. 5s. Od. per stand.

From the contracts entered into (Minute of the Mayor 1932) the cost of a two-roomed house was £76. 15s. Od., and the cost of a three-roomed house was £92. 14s. Od., while E.C's. cost £17.10s. Od. per pair. The cost of fencing per stand being approximately £7. 0s. Od.

On the basis of these figures the cost of a three-roomed house, including land and fencing to the stand would be £108. 9s. Od.

However, according to the report of the Manager of the Native Affairs Department (Minute of the Mayor 1934) the average cost of a three-roomed house was £99. 0s. Od., and if the cost of land, fencing, and a portion of the water reticulation were included the cost would be £113. 0s. Od.

These prices are considerably lower than prices for similar houses in Western and Eastern Native Townships which were £157 and £149 respectively for three-roomed houses.

It is to be noted that the above costs do not include the making or maintenance of roads, sanitary lanes, stormwater drainage, street lighting, but only for water. This service being limited to stand pipes at intervals in the streets.

The rent charged for a three-roomed house is £1. 5s. Od. per month.

The Native in Relation to Existing Housing Schemes

To summarise briefly it has been shown that under the Urban Areas Act the urban authorities are bound to house their Native population. This is done in locations in which the Native and his family are bound to take up residence.

The houses provided are usually built by the authorities, and usually reach only a fairly limited state of finish, with little or no equipment. (See section devoted to Planning). The services provided are also of a limited nature, and in all probability will, due to the nature of the layout of the scheme, never reach the standard desired by the minimum requirements of living.

The usual municipal principles apparently apply as far as the running of the Native Affairs Department is concerned; namely, that it should, as far as possible, be self-sufficient. This, however, according to the Native Revenue Account, has proved impossible, and deficits have to be made up from general revenue.

The deficit on the Native Revenue Account is, however, not the total deficit to the council, as services such as soil and refuse clearance, water, and to a small extent electricity, are supplied to the Native Affairs Department at the same rates as to the European population, and at a profit to the departments concerned.

The Native Economic Commission 1930-32 states that:-

"Local authorities are allowed by law to charge the Native Revenue Account the same price for services as is charged to Europeans. The rendering of these services is often much more expensive to Europeans than to Natives. The Manager of the Native Affairs Department, Johannesburg, considered that if only the actual cost of sanitary services were charged to the Eastern and Western Native Townships of that city there would probably be a saving to the Native Revenue Account of £5,000 per annum".

And the Superintendent of Native Affairs, Bloemfontein, in a Report

on Locations 1936 stated that "approximately £15,662 is paid annually for services over which this department exercises little or no control".

For the purpose of discussion, the figures quoted by the Manager of the Native Affairs Department, Johannesburg, are interesting. It is stated that £5,000 profit is made annually on sanitary services to Eastern and Western Native Townships.

Taking the population of these two townships as 4,000 and 13,000 respectively, the total is 17,000. The number of Natives housed in locations in Johannesburg to-day is over 50,000 which, on the above standard, would render a profit for sanitary services of £15,000 per annum.

It would seem quite probable that if a similar principle is adopted in supplying water and electricity to the locations, that the profits from these services together with the £15,000 already mentioned would be quite adequate in covering the annual deficit of about £20,000 shown in the Native Revenue Account each year. It would then appear that no real balance is made up from general revenue as far as Native housing is concerned.

The Native family whose monthly income is on an average £4. 0s. 0d. to £4. 10s. 0d., moves into the house in the location to find that a floor has to be laid down in the house; a stove has to be provided, a bath has to be provided, water for cooking and washing can only be procured by walking along the street to the nearest stand pipe, candles or paraffin lamps have to be provided, and finally there is insufficient accommodation in the house for the decent segregation of the family.

The rent for these privileges and the cost of transport to reach them, accounts for half the income, leaving the remainder (average £2. 0s. 0d.) to account for the provision of the amenities outlined above and in the section dealing with the cost of living.

Further, there is no indication of the rent being reduced, and little or no chance of services such as water laid on, water borne sewerage,

electric light, adequate roads, stormwater drainage, or street lighting being provided.

A further illustration of the financial strain existing amongst inhabitants in the Johannesburg locations is given in the following figures quoted from a report of the Acting Manager of the Native Affairs Department for September 1937.

	Cash Collected.			Arrears		
Western Native Township	£2,408	18	1	£1,398	18	10
Eastern Native Township	832	9	-	538	10	-
Orlando	3,709	14	3	3,535	10	11
<u>Pimville</u>	<u>762</u>	<u>15</u>	<u>2</u>	<u>505</u>	<u>19</u>	<u>6</u>
<u>TOTAL</u>	<u>£7,713</u>	<u>16</u>	<u>6</u>	<u>££5,978</u>	<u>19</u>	<u>3</u>
Native Women's Hostel	£51	11	3	£12	1	9
Salisbury Jubilee Hostel	208	8	3	1	-	-
Wemmer Native Men's Hostel	1,381	9	8	1	12	-
<u>Wolhuten Native Men's Hostel</u>	<u>1,736</u>	<u>17</u>	<u>10</u>	<u>66</u>	<u>-</u>	<u>-</u>
<u>TOTAL</u>	<u>£3,378</u>	<u>7</u>	<u>-</u>	<u>£80</u>	<u>13</u>	<u>9</u>

Further figures from the Minute of the Mayor 1935-36 show that the bad debts written off by the Native Affairs Department were £2,389 for 1935 and £1,030 for 1936.

The above figures illustrate clearly the extent to which inhabitants are in debt in respect of rent alone. It is, however, interesting to compare the arrears of the families in the locations, with those of the

single Natives in the hostels, who have no family to support, but earn the same wage.

No further conclusion need be drawn as to the strain, embarrassment, and despair of the urban Native family.

C. A PROPOSED SCHEME OF HOUSING NATIVES

Economy of the Scheme

The present system of housing Natives adopted by all municipalities, namely that of individual houses, each on its own plot of ground, is one which requires very large areas of land.

This involves the urban authority in a large expenditure on land, Johannesburg having spent £67,163 for Pimville, the Eastern and Western Native Townships, and Orlando.

The layout adopted is again one which entails a large expenditure as the length of roads and sanitary lanes is at a maximum and were these to be properly made and maintained, and adequate street lighting and stormwater drainage provided, the expenditure involved would probably be beyond most municipalities. Since there is not a large amount of traffic in the locations it would be to a large extent unwarranted.

The scheme presented in this thesis has the decided advantage of requiring much less land for the population housed, and the layout is such that the length of roads is reduced to a minimum in proportion to the requirements (See Appendix No. 9 on roads). They are only used for services to the individual flat blocks, and are at the same time adequate for the limited amount of motor transport that exists.

At present the annual grant of £5,000 (Minute of the Mayor 1934-36) for road development and maintenance is quite inadequate and largely ineffective, but would be more than sufficient in the case of the proposed scheme. Proper stormwater drainage and street lighting would be economically possible.

As has already been shown, the inherent limitations of the existing schemes render it financially impossible to complete the houses in the first instance, and secondly to supply them with adequate services even after the houses have been standing for 10 to 15 years. Eastern and Western Native Township houses still have no ceilings or floors, no water or electric light laid on, or water borne sewerage, and no individual facilities for washing.

In the proposed scheme it is claimed that all these amenities would be economically possible by virtue of the layout and method of planning and construction adopted.

In the first instance the layout of the township has reduced distances to a minimum which means minimum lengths of electric cables, water and sewerage mains, therefore bringing the cost of providing such services within economic limits.

Probably less material would be used and therefore less expenditure involved in supplying a cold water lead to each flat than is necessary in the present system of stand pipes in the streets of Orlando.

Assuming the proposed scheme to be situated near Orlando, and therefore close to the existing sewage farm, and the proposed electric power station, now under construction, the installation of water borne sewerage and electricity could be effected at a minimum cost and the compensation derived from the saving on soil clearance, and the improved hygienic conditions would fully justify such a procedure.

The economy of the system of construction, the use of a maximum amount of unskilled labour, and the use of prefabricated materials with the amount of skilled labour reduced to a minimum, have been fully discussed in the section devoted to construction.

The provision of such amenities as an electric stove, a bath, basin and sink, is considered essential to satisfy the minimum requirements of hygiene and reasonable living conditions.

By comparison then it will be seen that the proposed system satisfies every requirement at the outset, while the present systems all fall far short of this standard, and the possibility of their ever attaining the required standard is remote.

ESTIMATE OF THE COST OF THE PROPOSED SCHEME

Taking a three-roomed flat as average, an estimate as to the cost has been arrived at by taking off rough quantities. The prices allow for reductions which are anticipated due to the method outlined in the section devoted to construction.

Concrete

Columns, 2.2 cub. yds.	27/6d.	£3. 0s. 0d.
Casing to ditto, 2.4 sq. yds.	25/-	£3. 2s. 0d.
Beams, 5.9 cub. yds.	27/6d.	£8. 2s. 0d.
Casing to ditto, 6.3 sq. yds.	25/-	£7.16s. 0d.
Beam to stair, 1.2 cub. yds.	27/6d.	£1.10s. 0d.
Casing to ditto, .73 sq. yds.	25/-	19s. 0d.
3" Balustrade, 1 cub. yd.	27/6d.	£1. 7s. 6d.
Casing to ditto, .5 sq. yds.	25/-	12s. 6d.
Add $\frac{1}{8}$ to beams for extra floor, .7 cub. yds.	27/6d.	£1. 0s. 0d.
Casing to ditto, .75 sq. yds.	25/-	19s. 0d.

Precast

Treads, .3 cub. yds.	27/6d.	9s. 0d.
Floor slabs, 6.9 cub. yds.	27/6d.	£9.10s. 0d.
Add $\frac{1}{8}$ for extra floor, 1 cub. yd.	27/6d.	£1. 7s. 6d.

195.

Steel Reinforcement

$\frac{7}{8}$ " rods	68'0"	2.044	lbs./ff
$\frac{5}{8}$ " "	365'0"	1.043	" "
$\frac{5}{16}$ " "	300'0"	.261	" "
$\frac{3}{8}$ " "	1975'0"	.376	" "
$\frac{1}{2}$ " "	578'0"	.668	" "

1727 lbs. 20/- a ton £17. 0s. 0d.

Spongecrete

7" walls, 44 sup.yds.	7/6d	£16. 2s. 0d.
ditto 46.5 sup.yds.	7/6d.	£16. 4s. 0d.
3" walls, 9'0" sup. yds.	6/-	£2.14s. 0d.
ditto 9'0" " "	6/-	£2.14s. 0d.
ditto 38.5 " "	6/-	£11. 5s. 0d.

Floors

Finish and screed	42.5 sq. yds.	10/-	£21. 5s. 0d.
Skirting	141.2 ft.	3d.	£1.15s. 0d.
Frame	38.5 sq. yds.	3/6d.	£6.14s. 0d.
Skirtings	254.8 ft.	6d.	£6. 6s. 0d.
Closing cavities extra,	61 ft.	1/-	£3. 1s. 0d.
Cills extra,	32 ft.	1/6d.	£2. 8s. 0d.

£152. 2s. 6d.

Plumber
Electrician
Doors
Windows
Circulations and Fire Appliances

£34. 0s. 0d.
£22. 0s. 0d.
£10. 0s. 0d.
£12.10s. 0d..
£24. 7s. 6d.

£255. 0s. 0d.

196.

By comparison the cost of the four-roomed flat is estimated at £285, and that of the two-roomed flat at £190. These prices include the corridors to each flat, and allowance has been made for the lifts and staircases.

The total cost of one block would then be:

84 two-roomed flats at £190	=	£16,000
136 three-roomed flats at £255	=	£34,600
130 four-roomed flats at £285	=	£37,000

Total say £88,000

This brings the total cost of housing 20,000 people in the ten blocks to £880,000.

FINANCIAL ASPECTS OF THE PROPOSED SCHEME

Owing to the very low wage rate of the urban Native, and considering that little change can be expected it would seem that capital for such schemes should be raised under the most favourable conditions possible in order not to over-burden the Native tenants with a high rent.

It is, however, felt in agreement with the Manager of the Native Affairs Department, Johannesburg (quoted in "The Bantu in the City" - Ray Phillips), that it is wrong to charge a Native rental on the basis of the cost of the buildings whether built by Native or European labour. Still more undesirable is it to include in the capital outlay, and therefore charge on, the cost of the land and the layout. Such an arrangement is, however, provided for under the Urban Areas Act, and is adopted in most cases. It is to be noted that even if the Natives should pay off the total loan by means of rent, the title of the estate still remains with the urban authority.

If a housing scheme is to be of any benefit to the Native, and that, after all, should be a fundamental aim, then the following aspects should be taken into account in assessing the rents to be paid.

1. The income of the Natives concerned.
2. The cost of living of the Natives concerned.
3. The relationship of the rent to the first two aspects.

It seems to be both illogical, and paradoxical, to provide accommodation for a section of the population which it is bound to use, and then place such a heavy financial strain on it by way of a high rent. This inevitably produces malnutrition, and a generally degenerate and criminal standard of living.

It is a widely accepted rule that one should not pay more than a quarter to a third of income on rent. Owing to the position of the Native locations the inevitable cost of transport should be included in this amount.

Assuming the average case throughout, the income would be £4.0s. 0d. per month, and the proportion allocated to rent and transport would be in the neighbourhood of £1. 2s. 6d. The cost of transport being 8/6d., the rent then becomes 15/-.

As the income of the Native does not vary with the size of his family a constant rent of 15/- per month for all sizes of flat is suggested. This figure does not include any services. In this connection it is felt that owing to the very limited incomes of the section of the population housed, a different system of charging for essential services is warranted.

The various services will be treated individually, commencing with the roads and parks. It is felt that the construction of roads, storm-water drains, and their maintenance, together with the maintenance of pavements and parks should be paid for out of general revenue, and not charged direct to the Native Revenue Account. These are Public Services, and the poorer sections of the population cannot be expected to share an equal burden in this respect. Electricity and water, it is considered, should be supplied in bulk direct to the Native Affairs

Department at the vastly reduced rates for such large quantities. The department could then be responsible for the subsequent distribution to each unit. Such an arrangement is still an economic one, and the rates would be similar to those charged at present to large consumers, such as industries. (½d. per unit for electricity - Year Book 1938, and 8d. per 1,000 gallons for water - Minute of the Mayor 1937).

Sanitary services should most certainly be provided at cost, and no profit (such as £15,000 a year as mentioned) should be made on the same basis of supplying these services to Europeans.

As already shown, for the housing above it would be necessary to raise a loan of £880,000. It is suggested that a loan for the total sum be raised either from the Government, or in the open market, at a rate of 3½% and for a period of 30 years. (The Council has in the past been able to raise loans on these terms in the open market).

The return from 3,500 flats at 15/- per month would be £31,500 per annum. Assuming an upkeep of £1,500 a year for the first 20 years, and then an increase to £2,000 for the next 10 years. If the whole amount received from rents, less the upkeep, were utilised in paying off the capital, the whole loan would be paid off during the 31st year. It is suggested that the cost to the Council each year should be the interest on the capital outstanding, which would amount to £30,800 in the first year, and decrease to nothing during the 31st year, when the scheme becomes self-supporting, and from then onwards would yield in each ensuing year £28,000 profit, assuming that the upkeep was now £3,000 a year (the total interest payable would be £467,237). This profit could then be utilised in repaying the Council in respect of the interest paid out, which would take about 17 years, or it could be utilised as a rebuilding fund.

It thus appears possible to finance such a scheme, and establish it on an economic basis within a reasonable number of years, without imposing a financial strain on the Native tenant or the European ratepayer.

THE NATIVE IN RELATION TO THE PROPOSED HOUSING SCHEME

On taking up residence in the housing scheme presented in this thesis, the Native has a well-built, completely finished and equipped home at the outset. He does not have to spend time or money in completing the building before it is fit for habitation, or in supplying cooking and washing facilities. All the amenities essential to minimum living requirements such as electricity and water laid on, water borne sewerage, and facilities for washing and cooking are provided.

For adequate accommodation, and all these added amenities he has to pay a rental which is 10/- less than that charged in existing locations, where none of the above requirements are satisfied. Further saving to the Native is effected by the supply of electricity which would cost, assuming approximately 200 units at $\frac{1}{2}$ d. a unit, 8/4d. a month as against the cost of wood, coal, and candles, amounting to 20/6d. per month. The cost of the water, assuming 3,000 gallons at 8d. per 1,000 gallons, would be 2/- a month.

In all a happier, healthier, and better life is offered, together with less financial burden. The complete solution of this latter aspect - higher wages - is outside the sphere of the housing authority, and still further beyond the scope of this thesis.

APPENDICES

APPENDIX I

Commodity production

Wherever there is that segregation of the producer from the means of production, which we find at the bottom of the capitalist system of social relations, the form taken on by the process of production must be that of commodity production. For obviously, since the small class of capital-owners cannot apply their capital profitably for the production of such things only as will directly satisfy their personal wants, they must needs produce things primarily for purposes of exchange, i.e., with the intention of selling these products. And these products can, of course, only be sold if there exists a social demand for them, based on a social need. Now commodity production is nothing else than the production of things or objects which satisfy a social want and which are not only readily exchangeable against one another, but are, in fact, from the point of view of the individual capitalist, only produced for purposes of exchange.

To people living in the capitalist era this system may appear as the only and natural one. In reality, it is an historical phenomenon, as vastly different from the feudal system, from which it sprang, as it is from the socialist type of production towards which it leads.

The very fact that products of labour are exchangeable shows that behind all their material, physical differences they must have a quality in common which alone makes them into commensurable magnitudes. This common quality is nothing else than the abstract social labour contained in every commodity, stripped of all individual and concrete differences. The value of a commodity is nothing else than this abstract human labour which has gone into the making of it, and its magnitude is measured by the amount of labour which the commodity embodies. The measurement for this amount of labour is the time, the number of hours or days, during which human labour power (of course, again in the abstract social sense) has been expended.

In order to make commodity exchange on a general scale possible, ways and means must be found of expressing the value of all commodities in terms of one of them, which thereby serves as the incarnation of abstract social labour as such, and does not only express the qualitative commensurability of the different commodities, but also allows quantitative comparison. This selected commodity is money, and throughout history the most diverse commodities have served in that capacity, shells, salt, cattle, even slaves.

Yet it is inevitable that the precious metals should finally usurp that role. They alone combine all requisite qualities: consistent physical properties, durability, easy divisibility, natural measure (weight), etc. And since it is in the long run impossible for a number of metals to act as measures of value side by side (this would result in a number of prices for every commodity), gold has acquired a monopoly as the money commodity.

Hence gold production, instead of being a luxury branch of industry, akin perhaps to pearl-fishing, becomes a vital part of all commodity producing systems. And whilst the role of gold within one national system of economy can be largely taken over by state guaranteed symbols like banknotes, this is not the case with international trade. Therefore, as capitalism spreads over the whole world, so increases the importance of gold production, the production of the universal money commodity.

So lengthy an excursion into the field of economic theory may appear quite out of place in the present context. The fault, however, lies with the social system under discussion. For whilst, of course, social relations only are of interest to anybody but the professional economist, it is one of the most puzzling and confusing traits of the capitalist system of production that its fundamental social relations appear under the guise of a relation between things, not persons, namely under the guise of exchange processes between commodities. This is true not only of the relations between one capitalist and the other, but also and particularly of the relation between the capitalist class and the proletariat - the rock-bottom reality of capitalism.

Therefore, whilst "straight-forward" social systems like feudalism or slave-economy can be understood without much reference to economic theory concerned with the nature of their production and products, capitalism cannot.

When the worker sells his labour-power to the capitalist, this is actually an exchange of commodities like any other. The commodity "labour-power" is exchanged against a corresponding amount of the universal commodity "money" which represents all the other commodities, food, fuel, shelter, which the worker may acquire with it. And as in every other exchange of commodities, the act is characterised by its two-fold content, determined by the double-character of every commodity as use-value and value. The capitalist buys the labour-power as he would a motor-car - for the use he can put it to, not for its value. And he pays - within certain limits of fluctuation - for the value of the labour power. Now the value of this is measured by the amount of labour necessary to produce it, in other words, by the socially determined minimum required for the maintenance and reproduction of this labour-power. And the use-value of the labour-power is that which it produces when used, namely labour. The capitalist, then, by buying the labour-power of a worker, pays for its value and acquires the right to its use-value: labour, for a certain period, say 8 - 10 hours a day.

Now, as was indicated in the text, this human labour-power has one particular quality which differentiates it from all other commodities. In use, it produces more value than is required for its own reproduction. This fact is proved by the enormous increase of the material wealth of mankind, which is only explicable if man produces more than he consumes. The difference will vary immensely with the variations of the productivity of labour; but it will never, under normal working conditions, be nil. And in the capitalist system with its enormously increased productivity of labour, brought about by division of labour, co-operation and mechanisation, the difference will be very considerable. If then the capitalist buys the use of labour-power for 8 hours a day, only, say, 4 or 6 of these hours will be required to produce so much value as is necessary to reproduce

the labour-power. The rest of the time labour-power is expended to produce value over and above that required for its own reproduction. This is known as surplus-value, and from it derives the profit of the capitalist. Capital is therefore shown to be nothing else but "the command of unpaid labour" (Marx, Capital I, Page 580), made possible by a social relation in which one class possesses all the means of production, whilst the other has nothing but its labour-power, which it cannot apply except by selling it as a commodity.

APPENDIX II

The Inevitability of Crises in the Capitalist System

The inevitability of crises in the capitalist system is frequently disputed. The evidence of contemporary history is countered by the assertion that the crises that have occurred were accidental, due to bad management, etc., and that, provided proper care was taken, no crises need ever occur again. The point appears to be of sufficient importance in the general argument to deserve elucidation, showing the reasoning behind the "dogma" of the inevitability of crises in the capitalist system. The reasoning is as follows:-

The capitalist applies his capital to production in order to make a profit. And the magnitude of this profit is not a matter of indifference to him. He wants to make the maximum profit possible. It has been shown that profit derives from the surplus value produced by the worker. Broadly speaking, the rate of profit will first of all depend on the ratio of surplus value to wages. The first way to increase profit, then, will be to increase this ratio by lengthening the working day or by depressing wages. However, the organised resistance of the working class must close this avenue sooner or later. The other way is to increase the amount of profit without altering the rate of profit, by producing and selling more goods. In a system of free competition, as capitalism still is at the stage under discussion, it is only possible to sell more goods if you are cheaper than your competitor-capitalist. Now the capitalist can undercut prices by selling his goods under

their value. But then he will obviously lose by a decreasing rate of profit exactly what he gains by increasing the amount of goods sold. The capitalist must therefore try to produce his goods cheaper, and that he can only do by increasing the productivity of labour. He must introduce more and better machinery. But in doing so, he increases that portion of his capital which is fixed and does not produce any surplus value. And since the rate of profit is determined by the ratio of surplus-value to the whole capital invested, machinery and wages, this rate of profit must fall if the proportion of the fixed capital rises. The history of capitalism has shown that this fall in the rate of profit is always greater than the corresponding increase in the productivity of labour. Therefore, it is justified to speak of a "law of the falling rate of profit", a law which is an inevitable corollary to technical progress in capitalism. This law is the fundamental law of motion in capitalism. But its true importance can only be gauged by considering its complementary aspect. For this is a two-faced law. To the falling rate of profit must correspond a rising amount of profit, otherwise the whole system would collapse.

If the capitalist is first forced onto the path of technical progress by the relentless law of competition, he must, once he has invested new capital in machinery, make it pay. It is not enough to increase production sufficiently to offset the falling rate of profit by increasing its amount correspondingly. The amount of profit must rise faster than the rate of profit declines, otherwise there would be no justification for the increased layout of capital, hence no incentive at the next stage, with the result of a general decline and eventual collapse of production - and with it of all profit. In order to keep the system going an extremely rapid accumulation of capital is necessary. Production on an ever-increasing scale, without regard to demand, becomes inevitable. Over-production and crises are the natural consequence. This essentially is the law of movement of capitalism.

It is interesting to note how this is inter-related with its social law of movement which was discussed earlier. The social-

isation of production in itself is not yet enough to make social ownership and distribution possible. Before such a system of direct social ownership becomes possible under modern conditions, the productivity of human labour must have increased beyond all recognition, compared with pre-capitalist or even early capitalist conditions. To bring about this increase is precisely the historical function of capitalism in the era of large scale industry. But in an atomistic system the realisation of his historical role can hardly be expected to induce the individual capitalist to work in that direction. The understanding of why capitalism can and must fulfil this historic function derives from an understanding of the economic law of motion of the capitalist mode of production, which must by necessity result in the rapid increase of the productivity of labour, thereby creating the conditions for a change in the social system.

APPENDIX III

Native Contribution to Union Revenue

It is of course quite impossible to assess the indirect contribution of any section of the population to government revenue with any degree of accuracy, unless statistics of that particular sort are available - frequently in itself an impossible stipulation. No such statistics were, in any case, available to the writer. Moreover, the attempt even to analyse revenue in this manner, is only of doubtful value. But the principle of fiscal segregation makes it necessary, for argument's sake, to indulge in this rather discreditable practice.

First of all, in assessing the contribution which the Native population should make to general expenditure (really general expenditure) it was assumed that the income of the Native population in South Africa was about 20% of the total national income. There is no guarantee that this figure is actually anywhere near the truth. But if it should really be 10% or 30% the argument would not be fundamentally affected, especially since the

part of the revenue contribution which is arrived at by assuming this very same income, amounts to almost 30% of the stipulated contribution to general expenditure, so that there is, to that extent, an equalising factor in the calculation.

In trying to calculate the percentage of the national income going to the Native population the following method was used. A family of five was taken as the economic unit. Probably European families depending on one breadwinner are as a rule smaller, so that the source of error inherent herein would tend to let the Native share appear bigger than it really is. Throughout, the writer has attempted to allow this source of error rather than the opposite one, so as not to strengthen his arguments artificially by figures erring in a way favourably to the trend of his argument.

Taking this economic unit, we have 400,000 European and 1,300,000 native bread-winners (for the sake of simplicity, coloured people and Asiatics are left out of consideration altogether).

Now the average annual income, in cash and kind, of a Native family can be fairly safely assumed as being round about £40. It may be less. It certainly is not more. The annual income of the Native population can therefore be assessed at, very roughly, £52,000,000.

It is much more difficult to assess European incomes. The total assessed for income tax in 1935 - 36 was ca. £96,000,000. To this must be added the untaxed incomes, for which a yearly average per European bread-winner of £270 (or £22 10s. 0d. per month) was assumed, which is almost certainly an under-estimate. However, that would account for another £108,000,000, bringing the total to £256,000,000, of which the Native income of £52,000,000 would constitute just about 20%. This established, we can proceed to a consideration of the indirect contribution of the Native population to Union revenue. There is first of all Customs revenue. Here the contribution was assessed as 20%, but three items, accounting between them for over 40% of the total Customs revenue, were completely neglected because Native consumption of

these particular goods is almost, if not quite, negligible. These items are (1) Ales, Spirits, etc. (2) Motor vehicles, etc., and (3) Motor Spirit. On the other hand, in the case of one item, accounting for not quite 2% of the total Customs revenue, the Native share was assessed as 80% because these articles - namely, blankets, rugs, etc. - are imported almost exclusively for Native consumption. On this basis which is certainly not optimistic, Native contribution under Customs was estimated for 1936 - 37 as being ca. £1,000,000 or under 10% of the total.

Next comes Excise Duty. Here spirits and beer, as well as miscellaneous were neglected. On the other items, i.e., cigarettes, tobacco, sugar and matches the usual 20% were taken, giving a contribution of ca. £280,000. The remaining £220,000 are made up of contributions to the item prison labour (90% or ca. £63,000 were assumed), pass fees, of which the Natives themselves pay certainly at least half, or ca. £25,000, and contributions to the remaining amount to postal revenue (about 5% or £100,000) and miscellaneous. On the whole, the resulting estimate of an indirect Native contribution under these headings of £1,500,000 is in all probability erring on the low side.

We next come to the far more important indirect Native contribution to Union revenue, hidden under the heading "Mining Taxation". In 1937 taxes on the gold-mining industry netted ca. £10,000,000. In other words, the government appropriated about one-third of the mining profits. Now we have seen that profits are nothing else then surplus value created by the workers. These £10,000,000 do therefore not constitute a contribution of the mining magnates to Union revenue, but one of the mine workers. The only question, in this particular connection is, how much of it comes from the European and how much from the Native workers. It is quite impossible, in this instance, to arrive at a trustworthy estimate. Therefore, a minimum and a maximum figure are given, which are based on the following considerations:-

There are 300,000 Native workers and 40,000 European workers. The total wage sums are just about equal. Then the one assumption, giving minimum credit to the Native workers, is that the

rate of exploitation of European and Native workers is equal, that the higher pay of the European worker is in exact proportion to his higher productivity of labour, so that the 40,000 European workers create exactly as much surplus value as the 300,000 Native workers. This is the one extreme. For if, to go one step further, the extra productivity of labour of the European workers would be greater in proportion than is expressed in their higher wages, there would be an incentive to employ European workers in preference to Native workers. But the opposite tendency is actually manifest, so that we can safely take the assumption of an equal rate of exploitation as the minimum. In that case, the hidden contribution of the Native workers would be half of the profits taxed away by the government, or £5,000,000.

The other extreme would be to assume that there is no difference at all in the productivity of labour of the Native and of the European worker, that, therefore, the amount of surplus value produced by every individual - of either race - is, on the average, the same. In that case the share of the Natives in the production of surplus value would be in relation to numbers, not to wages. That would mean, since they constitute ca. 88% of the mine-workers, a maximum Native contribution of £8,800,000. The truth probably lies somewhere between these two extremes, though where, it would be extremely difficult to determine.

As to other income tax, a similar argument applies, only that the contributions of professional men, officials, civil servants, etc., were subtracted before subjecting these figures to a similar, if for lack of detailed statistics less definite, analysis.

APPENDIX NO.4.

In "Comrades and Citizens", Seema Rynin Allan describes the progress of certain sections of the Ossetians, a race living in the Caucasus. After a dozen years of economic and educational pressure from the Soviet Government the once primitive villages and their inhabitants were completely transformed. The women were liberated and enlightened, the children were educated, superstition was "liquidated", and the people were made conscious of their own traditions and cultural existence. Besides learning to read and write their own language, they learned Russian, which was the medium through which a more advanced knowledge of the sciences and history etc. was obtainable.

In describing the life of one of the women of this tribe, S. R. Allan says page 346: "Like other women of the village, Liza as a young girl had been sold into marriage for so many oxen. She had cried and thought of killing herself with her brother's dagger. But in the end she had submitted.

Both her children had been born in the stable. Women were considered unclean during child-birth, not fit to be under the same roof with men". Liza's daughter, as was the case with many others of the district, grew up free. She dropped the veil, was educated and took part in public life.

In the same way it would be possible for our Natives to drop their superstitions and to develop along European lines (the stronger culture must inevitably overcome the weaker) if they were only given the opportunity.

APPENDIX NO.5.

DETERMINATION OF THE SIZE OF UNIT FLAT BLOCK

As has been stated in the text, the natural optimal size of one "block", surrounded by streets, is determined by the need to have one primary school within the block. It is therefore necessary to determine the ratio of children of school-going age to the population as a whole.

In the case of an urban Native population this determination is not without difficulties, resulting from the scarcity of statistical information. The census figures for Natives are only given in four "natural age groups", under one year, 1 - 14 years, 15 - 50 years, and over 50 years of age. Moreover, the figures for urban areas do not show the Native townships separately, so that the total figures show an enormous surplus of adult males.

It was therefore necessary, in order to arrive at more accurate figures, to be guided by the details given with regard to the European population of the Union. It is not likely that this resulted in any appreciable error, since the same method is used wherever such details are given in the Union census. And in the "Summary of the Census, 1921" (Page 227) it is expressly stated that European and Bantu age-distribution coincide to a sufficient degree to allow for such a procedure.

The first point to be considered is the abnormality of the age-grouping in an urban Native township due to the absence of unmarried males over 18 years of age. According to the census of 1921, out of a total Bantu population of 4,700,000 (all figures given here are "simplified"), males over 18 years of age accounted for 1,358,000. This figure, incidentally, is arrived at by taking the corresponding European figures as a basis. The number of married or widowed males is given as 757,000. Since the number of married males under 18 years of age is very small, we can take this figure as a basis. This would leave us with, say, 600,000 unmarried males over 18 years of age, a very high figure, explicable only by the not infrequent occurrence of polygamy amongst the tribal Natives. These 600,000 unmarried males constitute roughly 12½% of the total Bantu population.

Therefore, if we want to arrive at the number of school-going children, calculated as a percentage of the total population, we must amend our figure of 20,000 inhabitants accordingly, and base our calculations on a total number of ca. 22,850.

We assume, as the maximum that can be expected for some considerable time, a 6-year course of primary schooling, attended by all children between 7 and 13 years of age. Each of the years concerned constitutes, in the European population, just about 2.3% of the total. That would give us 13.8% of the total number of inhabitants of the township as children of school-going age. As a check we might take the figures for Native children, which give 36.6% for children 1 - 14 years of age, or an average of 2.6% for every year. But since the younger years constitute of course a slightly higher percentage than the average, we would come to more or less the same result. 13½% - 14% can safely be assumed as the percentage of school-going children, based, however, on a total of 22,850, not 20,000 inhabitants.

On this basis, the approximate number of school-going children in an urban Native township of 20,000 inhabitants, under present conditions, would be between 3,000 and 3,200. Now 300 - 350 (maximum) is considered an optimal number of pupils for a primary school. It is big enough to be economical in running cost, yet not so big as to become unmanageable. In the case of a six-year course, it allows for two parallel classes, with 25 - 30 pupils each, to be instituted if means permit.

The conclusion reached is that the township will require an absolute minimum of 9 primary schools, with 10 schools as the far better and safer alternative. Accordingly, the sub-division of the township into 10 blocks, housing 2,000 people each, and having a primary school with 300 - 320 pupils, was decided on.

It might still be added that babies up to 2 years of age will number about 180 per flat block, whilst there will be about 250 children of kindergarten-going age. However, not all these babies and children need be accommodated in the corresponding creches and kindergartens belonging to each block, since in a considerable number of cases the mothers themselves will be able to take care of their children.

APPENDIX NO. 6.

SCHEDULE OF MATERIALS FOR THE FLAT BLOCKS

Element	Description	Fabrication
Foundations	Point-load, reinforced-concrete grillage type.	On site.
Frame	Reinforced concrete Monolithic frame of columns and beams.	On site.
Shuttering	Wood, standardised sizes.	On site.
Floors and Roofs	Precast reinforced concrete floor slabs pointed with bitumen on upper surface, cement plaster on underside.	On site.
Walling	Prefabricated special "Spongecrete" blocks with hard cement impervious surfaces. External blocks water-proofed with "Sika".	On site.
Floor finishes	Living Rooms and Bedrooms: 9" x 9" Rhodesian teak wood blocks.	By contract.
	Bathrooms, Kitchens, Balconies, and Corridors: Granolithic	On site.
Skirtings	Living Rooms and Bedrooms: 3" x 1" Oregon.	On site.
	Bathrooms, Kitchens, Balconies and Corridors: Granolithic	On site.
Roof finish	Cement screed. Asphalt.	On site. By contract.
Paving	2'0" x 2'0" concrete paving slabs	On site or by tender.

213.

Element	Description	Fabrication
Surface water Channels	Concrete.	On site.
Doors	Wood construction, faced both sides with sheet metal.	On site or by contract.
Door frames	External doors only. $4\frac{1}{2}$ " x 3" teak frames, or pressed steel frames	On site. By contract.
Door numerals	Cast or bent metal.	By contract.
Windows	Standard steel sections.	By contract.
Cills	External: Metal Internal: Granolithic	With windows. On site.
Glazing	18 ozs. clear sheet glass Arctic glass	By contract.
Shelf and cupboard fitting	Clear pine 4'6" x 2'0" x 3'0" high	On site.
Sinks and Draining Boards	4'4" x 1'9" sheet metal, sink size 12" x 24" x 6"	By contract.
Bath	Cast-iron, porcelain enamelled	By contract.
Lavatory basin	Cast-iron, porcelain enamelled	By contract.
W.C. pan and cistern	Glazed fireclay type with polished hardwood seat. Cistern cast-iron high level type	By contract.

214.

Element	Description	Fabrication
Electric stove	3-plate with oven	By contract.
Electric radiator	-	By contract.
Electric lights, switches, wiring meter and switch-board	-	(By contract. (Fixing by contract.
Refuse bin	Galvanised iron	By contract.
Steel reinforcement	As specified, see Appendix No. 8.	By contract. Bending and making up on site.
Water service pipes, bends and junctions	Cast iron	By contract. Threading and cutting to standard lengths on site.
Bib taps	Brass	By contract.
Soil, waste and vent pipes	4" soil pipes 2" vent pipes 3" waste pipes 4" cast iron	} cast iron By contract.
Fire main		
Rainwater pipes, gutters and flashing	Galvanised iron	On site. Downpipes only by contract.
Lifts	To specification	By contract.

Element	Description	Fabrication
Painting		By contract.
Drains		By contract. Drain-laying on site by builders.
Sewers, storm water drains, water and electric mains, street lighting, etc.		Municipal Departments.

APPENDIX NO. 7.

Synopsis of the findings of the Council for Research on Housing
Construction. London 1934.

Principles to be observed in consideration of designs for working-class
housing:-

Standardisation.
Mass Production.
Large-scale operation.
Organised assembly to strict time-schedules.
A maximum working-face.
A maximum speed of through-put.

These principles are the basis of progress and cost-reduction in
industry.

Standardisation is the root of the matter. Unless the final product
or many of its parts can be subjected to a large measure of standard-
isation most of the other cost-reducing principles cannot be adequately
applied. For some building units - the brick, the steel casement
window, etc. - standard dimensions have already long been accepted.
There is no reason why the process should not be extended to every other
unit part - doors, skirtings, dressers, baths, sinks, w.c.'s, coal and
gas fires, flue and partition blocks, etc. - of which tenement dwell-
ings are composed. There is everything to gain and nothing to lose
from reducing these and many other parts to a limited range of stan-
dard types and sizes; some could with advantage be reduced to a single
type and size of almost universal application.

Closely allied with standardisation of parts should be a complementary
elimination of unnecessary elements, and a minimising of the number of
separate units by the combination of parts with each other in the pro-
cess of manufacture. The higher the proportion of work done at the
centre of specialised manufacture instead of on the site, the greater
the economy and speed of production, and, in general, the higher the

quality of the product. Further savings in the costs of repairs and stock-holding inevitably follow.

Standardisation is the most fundamental of our principles. Framed construction is the essential means by which all the principles can be expressed in building technique. Framed construction is applicable in varying degree to several different materials - steelwork, timber, various types of steel-reinforced concrete, or a combination of these. It was assumed, in formulating designs for tenement blocks in slum clearance schemes, that framed construction involved a framework of light rolled steel sections; but this does not imply that many of the advantages inherent in the use of framework as such, may not be obtained by other systems using steel in combination with concrete, though it is doubtful whether such systems will so completely satisfy the requirements of the dry, accurate, speedy and uncongested building-assembly, which we regard as essential to efficient tenement construction.

Mass-production in factory and workshop, and organised assembly on the site are the sequel of effective standardisation. The savings in cost that result from mass-production need no demonstration; the improvement in quality and especially in accuracy and consistency of the product that equally result are perhaps less widely appreciated but just as certain. These advantages apply as much to the component parts and equipment of buildings as to any other class of product - to the motor-car for instance.....

Highly organised assembly to strict time-schedule offers prospects of cost-reduction as great as, perhaps greater than, those of mass-production. In terms of traditional building technique, elaborate organisation on the site has rarely lived up to its theoretical merits. Weather risks and other uncertainties have constantly thrown all calculations of time and sequence out of gear. It is perhaps the most valuable of all the qualities of the steel-framed system that it makes organised assembly an assumed success.

The extent to which framed construction has altered the logical sequence of building operations is often under-estimated. In the old system the walls rise first, and afterwards the floors, stairs and roof. The walls

hedge in all operations from the start. Construction can only proceed at one level at a time and till a late stage when the roof is covered in, every operation is exposed to the weather. In the new way the skeleton frame rises to its full height in rapidly succeeding stages. The stairs follow the frame as it rises. Floor and roof slabs are added in the next operation, after which weather delays become a negligible factor. The enclosing walls are not inserted until after the sanitary fittings and other major equipment have been positioned on the open floor platforms. Note that the steelwork provides not only the structural skeleton, the main scaffold and the crane-base for all subsequent operations, but also an exact gauge or register for all other components as they are added. Accuracy and uniformity are assured. Precise sizes for every unit part can safely be fixed beforehand, and orders based on them put out well in advance.

This revolutionary change in the sequence of operations results in a vast increase in available "working-face" and therefore in the speed of through-put. Once the frame is up, all parts of the building on every floor are simultaneously available for the further stages of construction and equipment. In addition to giving the largest possible working-face, this system allows of the ground floor being used as storage space until a late stage. The disorganised clutter of materials awaiting erection.....is a feature of nearly all building work as persistent as it is out of date. In this branch of building assembly - storage and distribution - rationalisation based on careful study is needed most of all. In the orderly and even flow of materials to a maximum number of points of simultaneous erection is the key to speed without loss of efficiency.

There remain important limits to the speed at which buildings can soundly be erected and made ready for occupation. Next to limitations in the supply of materials and in the available working-face, the drying-out of wet or semi-wet processes such as concreting, plastering and bricklaying is the most important cause of delay at all stages..... It is not at present practicable to recommend the suspension of many wet processes, but a great deal can be done to

reduce their extent and the time required for their drying-out.
(The "Mopin" system is an example).

It is vital to the improvement of speed and organisation that thorough time schedules should be prepared and strictly adhered to. The time schedule is essentially the working-out in advance of the sequence and interlocking of the different trades and processes. Skilfully applied to a building technique rationalised on the principles here outlined, the time schedule provides an assured programme, guiding operations and checking efficiency at every stage.

Not only the time schedule, but also the fullest possible provision of general and detail drawings, specifications and instructions should be ready in advance for handing over with the initial order to begin operations. The closest consultation between all parties at the start and throughout the job is an essential reinforcement to the predetermined time schedule. Early placing of orders and delivery of orders well up to time are essential to avoid delays.

The importance of increased speed, without loss of quality, in slum clearance programmes, cannot be over-emphasised. As in other work the contractor stands to gain by reduced overhead costs, and the building owner by an earlier return on capital through rents. But in slum re-housing there is a further gain in the more rapid abolition of slum conditions and for the slum dwellers themselves the advantage of an earlier release from their intolerable surroundings.

From "Slum Clearance and Re-housing" - First Report of the Council for Research on Housing Construction. London 1934.

APPENDIX 8

Structural Design of a Typical Flat Unit

Note

The calculations which follow are those required for a four-roomed flat on the ground and first floors of the flat block. In other words, the worst loading conditions are assumed, so that the steel reinforcement sizes are maxima, and decrease on the higher floors. It will be seen that no foundation calculations are given, as the nature of the sub-soil is not known. The two most important departures from usual practice are the proposed use of vibrated concrete in all beams and columns of the monolithic frame. This process brings the comparative strength of concrete up from 600 to 900 lbs. per sq. inch.

In addition, for all walling, external and internal, "Spongecrete" is used, the weight of this material being 1/5th that of corresponding brickwork.

Calculations

$$c = 900 \text{ lbs./sq. in.} \quad t = 18000 \text{ lbs./sq. in.} \quad m = 15.$$

$$\frac{mc}{t} = \frac{n_1}{1-n_1}$$

$$\frac{15 \times 900}{18000} = \frac{n_1}{1-n_1}$$

$$3 - 3n_1 = 4n_1$$

$$7n_1 = 3$$

$$n_1 = 3/7$$

$$= .429$$

221.

$$n_1 c = 2rt$$

$$.429 \times 900 = 2r \times 18000$$

$$r = \frac{.429}{40}$$

$$= .010725 \text{ say, } .0107$$

$$\begin{aligned} RM &= \frac{1}{2}cbd^2 n_1 (1 - \frac{n_1}{3}) \\ &= \frac{1}{2} \times 900 \times bd^2 \times .429 (.857) \\ &= 166 bd^2 \end{aligned}$$

Design of Precast Floor Slabs

A. Slabs in 12" widths.

$$\text{Span} = 10'7" = 10.583 \text{ ft.}$$

Superimposed Loads:-

Live loads	50 lbs./sq.ft.
Ceiling & Floor finishes ..	10 lbs./sq.ft.
Partitions	<u>20 lbs./sq.ft.</u>

Total superimposed loads... 80 lbs./sq.ft.

$$\begin{aligned} \text{B.M.} &= \frac{1}{8} wl^2 \\ &= \frac{1}{8} \times 80 \times 10.583^2 \times 12 \\ &= 13430 \text{ lbs. ins.} \end{aligned}$$

$$\begin{aligned} \text{R.M.} &= 166 bd^2 \\ &= 166 \times 12 \times d^2 \end{aligned}$$

222.

$$d^2 = \frac{13430}{166 \times 12}$$

$$= 6.74$$

$$d = 2.595$$

say 4" slab

$$\text{Weight of slab} = 32 \text{ lbs./ft. run.}$$

$$\therefore \text{Total load on slab} = 112 \text{ lbs./ft. run.}$$

$$\begin{aligned} \text{B.M.} &= \frac{1}{8} wl^2 \\ &= \frac{1}{8} \times 112 \times 10.583^2 \times 12 \\ &= 18820 \text{ lbs. ins.} \end{aligned}$$

$$\begin{aligned} \text{R.M.} &= 166 bd^2 \\ &= 166 \times 12 \times 3.25^2 \\ &= 21050 \text{ lbs. ins.} \end{aligned} \quad \text{slab satisfactory.}$$

Steel Reinforcement

$$\begin{aligned} A_t &= rbd \\ &= .0107 \times 12 \times 3.25 \\ &= .4175 \text{ sq. ins.} \end{aligned}$$

$$\therefore \text{Use two } \frac{5}{8} \text{ diam. rods. (Area} = .614 \text{ sq. ins.)}$$

223.

Shear.

$$SF = 60ba$$

$$SF = \frac{112 \times 10.583}{2} = 593 \text{ lbs.}$$

$$60ba = 60 \times 12 \times d \left(1 - \frac{n_1}{3}\right)$$

$$= 60 \times 12 \times 3.25 \times .857$$

$$= 2050 \text{ lbs.} \quad \text{No Shear reinforcement required.}$$

B. Slabs in 12" widths.

$$\text{Span} = 6'7" = 6.583 \text{ ft.}$$

$$At = \frac{BM}{18000 \times a}$$

$$BM = \frac{1}{8} w l^2$$

$$= \frac{1}{8} \times 112 \times 6.583^2 \times 12$$

$$= 7290 \text{ lbs. ins.}$$

$$At = \frac{7290}{18000 \times 3.25 \times .857}$$

$$= .1454 \text{ sq. ins.}$$

$\therefore$ Use two 5/16" diam. rods. (Area = .154 sq. ins.)

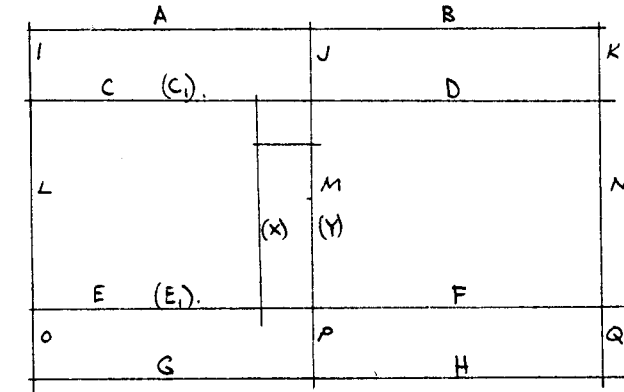
END OF PRECAST FLOOR SLABS

224.

Design of Monolithic Frame

A. Beams

Schedule of Beams.



Design of Beams A.B.G.H.

$$\text{Load due to floor slabs} = 112 \times 3.291$$

$$= 368 \text{ lbs./ft. run.}$$

$$\text{Load due to walling} = 8 \times \frac{1}{2} \times 35$$

$$= 140 \text{ lbs./ft. run.}$$

$$\text{Total load} = \underline{508 \text{ lbs./ft. run.}}$$

226.

$$\begin{aligned}
 BM &= 1/12 WL \\
 &= 1/12 \times 10.583 \times 508 \times 10.583 \times 12 \\
 &= 57000 \text{ lbs. ins.}
 \end{aligned}$$

$$\begin{aligned}
 RM &= 166 bd^2 \\
 &= 166 \times 7 \times d^2 \\
 d^2 &= \frac{57000}{166 \times 7} \\
 &= 49.1 \\
 d &= 7"
 \end{aligned}$$

Assume total depth = 9"

Weight of beam 63 lbs./ft. run.

Total load = 571 lbs./ft. run.

$$\begin{aligned}
 BM &= 10.583^2 \times 571 \\
 &= 63900 \text{ lbs. ins.}
 \end{aligned}$$

$$\begin{aligned}
 RM &= 166 bd^2 \\
 &= 166 \times 7 \times 7.5^2 \\
 &= 65400 \text{ lbs. ins.}
 \end{aligned}$$

Beam satisfactory.

227.

Steel Reinforcement

$$\begin{aligned}
 At &= rbd \\
 &= .0107 \times 7 \times 7.5 \\
 &= .562 \text{ sq. ins.}
 \end{aligned}$$

$\therefore$ Use three $\frac{1}{2}$ " diam. rods. (Area = .589 sq. ins.)

Shear

$$\begin{aligned}
 \text{Max S.F.} &= \frac{1}{2}W \\
 &= \frac{571 \times 10.583}{2} \\
 &= 3200 \text{ lbs.}
 \end{aligned}$$

Shear resistance of concrete = 60 ba.

$$\begin{aligned}
 &= 60 \times 7 \times 7.5 \times .857 \\
 &= 2700 \text{ lbs.}
 \end{aligned}$$

Therefore shear reinforcement is required.

$$SF = \frac{A_s S_s a}{p}$$

$$3200 = \frac{.22 \times 18000 \times 7.5 \times .857}{p}$$

$$p = \frac{.22 \times 18000 \times 7.5 \times .857}{3200}$$

$$= 7.95"$$

Use $\frac{3}{8}$ " diam. stirrups at 8" centres over the end quarters and at 16" centres over the centre half of the span.

END OF BEAMS A.B.G.H.

228.

Design of StaircaseLoading:-

Live load		100 lbs./sq.ft.
Weight of concrete		<u>10 lbs./sq.ft.</u>
Total load		110 lbs./sq.ft.
i.e.		82.5 lbs./ft. run.

$$\text{Max. BM} = \frac{1}{8} w l^2$$

$$= \frac{1}{8} \times 82.5 \times 9 \times 12$$

$$= 1113 \text{ lbs. ins.}$$

Design step $1\frac{1}{2}$ " deep reinforced with a layer of "Hyrib" expanded metal lathing on underside of treads. No risers.

Design of landing slab

$$\text{Span} = 3'3"$$

$$\text{Superimposed load} \quad \dots\dots\dots 100 \text{ lbs./sq. ft.}$$

Assume 3" slab

$$\text{Load per ft. run} \quad \dots\dots\dots \underline{36 \text{ lbs.}}$$

$$\underline{\text{Total load}} \quad \dots\dots\dots 136 \text{ lbs./ft. run.}$$

$$\text{BM} = \frac{1}{8} w l^2$$

$$= \frac{1}{8} \times 136 \times 3.25^2$$

$$= 1795 \text{ lbs. ins.}$$

229.

$$\text{RM} = 166 \text{ db}^2$$

$$= 166 \times 12 \times d^2$$

$$d^2 = \frac{1795}{166 \times 12} = .91$$

$$d = .954"$$

Say 3" slab. (Effective depth = $2\frac{1}{4}$ ").

Steel reinforcement

$$\text{At} = \frac{\text{BM}}{18000 \times a}$$

$$= \frac{1795}{18000 \times 2.25 \times .857}$$

$$= .0517 \text{ sq. ins.}$$

$\therefore$ Use $\frac{1}{4}$ " diam. rods at 10" centres. (Area = .059 sq. ins).
in both directions.

Shear

$$\text{SF} = \frac{136 \times 3.25}{2}$$

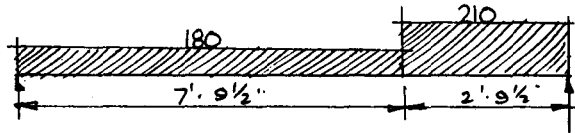
$$= 221 \text{ lbs.}$$

$$60 \text{ ba} = 60 \times 12 \times 2.25 \times .857$$

$$= 1388 \text{ lbs.}$$

No shear reinforcement is required.

Design of Cranked Beams X and Y



Weight of landing slab on cranked beam.

$$= 1\frac{1}{2} \times 3/12 \times 1 \times 144$$

$$= 54 \text{ lbs./ft. run.}$$

Say 60 lbs./ft. run. to include floor finish to slab.

$$\text{Weight of treads} = \frac{1\frac{1}{2} \times 1\frac{1}{2} \times 1 \times 144}{12}$$

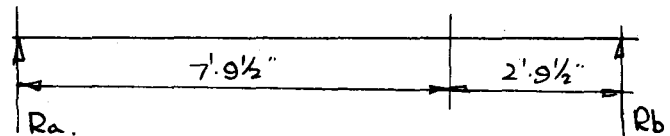
$$= 27 \text{ lbs./ft. run.}$$

Say 30 lbs./ft. run. to include finishes to treads.

$$\text{Add for live loads} = 150 \text{ lbs./ft. run.}$$

$$\text{Total load} = 210 \text{ and } 180 \text{ lbs./ft. run. respectively.}$$

$$\text{Assume width } b = 7''$$



$$\begin{aligned} R_a + R_b &= 180 \times 7.791 + 210 \times 2.791 \\ &= 1400 + 586 \\ &= 1986 \end{aligned}$$

Taking Moments about R_a

$$\begin{aligned} R_b \times 10.583 &= 180 \times 7.791 \times 3.895 \\ &+ 210 \times 2.791 \times 9.305 \\ &= 1400 \times 3.895 + 586 \times 9.305 \\ &= 5450 + 5450 \\ &= 10,900 \end{aligned}$$

$$R_b = \frac{10,900}{10.583}$$

$$= 1032$$

$$R_a = 1986 - 1032$$

$$= 954$$

$$\frac{954}{180} = 5.3 \text{ ft.}$$

Max. BM is 5.3 ft. from the left hand reaction.

$$\begin{aligned} \text{Max. BM} &= 954 \times 5.3 - 180 \times 5.3 \times 2.7 \\ &= 5050 - 2575 \\ &= 2475 \times 12 \text{ lbs. ins.} \\ &= 29300 \text{ lbs. ins.} \end{aligned}$$

232.

$$\begin{aligned}
 RM &= 166 bd^2 \\
 &= 166 \times 7 \times d^2 \\
 d^2 &= \frac{29300}{166 \times 7} \\
 &= 25.2
 \end{aligned}$$

$$d = 5.1$$

Assume 9" beam (Effective depth = $7\frac{1}{2}$ ")

Weight of beam = 63 lbs./ft. run. on the level portion
and 95 lbs./ft. run. on the raking portion.

Assuming this loading throughout:

$$\begin{aligned}
 \text{Max BM due to beam} &= \frac{1}{8} wl^2 \\
 &= \frac{1}{8} \times 95 \times 10.583^2 \times 12 \\
 &= 15900 \text{ lbs. ins.}
 \end{aligned}$$

$$\begin{aligned}
 \text{Total BM on beam} &= 29300 + 15900 \\
 &= 45200 \text{ lbs. ins.}
 \end{aligned}$$

$$\begin{aligned}
 RM &= 166 bd^2 \\
 &= 166 \times 7 \times 7.5^2 \\
 &= 65400 \text{ lbs. ins.} \quad \text{Beam satisfactory.}
 \end{aligned}$$

233.

$$\begin{aligned}
 \text{Steel reinforcement: } At &= rbd \\
 &= .0107 \times 7 \times 7.5 (.857) \\
 &= .562 \text{ sq. ins.}
 \end{aligned}$$

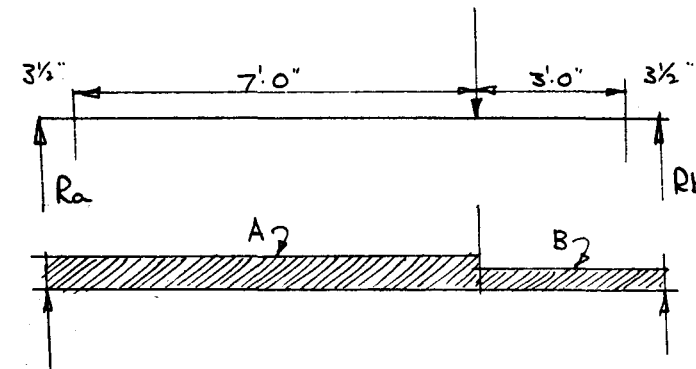
Use three $\frac{1}{2}$ " diam. rods (Area = .589 sq. ins.)

$$\begin{aligned}
 \text{Shear. } Rb &= 1032 + 475 \\
 &= 1507 \text{ lbs.} \\
 60 ba &= 60 \times 7 \times 7.5 \times .857 \\
 &= 2700 \text{ lbs.}
 \end{aligned}$$

No shear reinforcement is required.

END OF STAIRCASE.

DESIGN OF BEAMS C_1 and E_1 (Carrying Stair)



234.

$$\begin{aligned}\text{Superimposed load on Bay A} &= 112 \times 8 \\ &= 896 \text{ lbs./ft. run.}\end{aligned}$$

$$\begin{aligned}\text{Load due to wall} &= \frac{140}{1} \text{ lbs./ft. run} \\ \text{Total super. load} &= 1036\end{aligned}$$

$$\text{Point load} = 1500 \text{ lbs.}$$

$$\begin{aligned}\text{Superimposed load on bay B} &= 112 \times 3 \\ &= 336 \text{ lbs./ft. run.}\end{aligned}$$

$$\text{Load due to wall} = 140 \text{ lbs./ft. run.}$$

$$\text{Total load} = 476 \text{ lbs./ft. run.}$$

$$\begin{aligned}R_a + R_b &= (1036 \times 7.291) + (476 \times 3.291) + 1500 \\ &= 7560 + 1566 + 1500 \\ &= 10626 \text{ lbs.}\end{aligned}$$

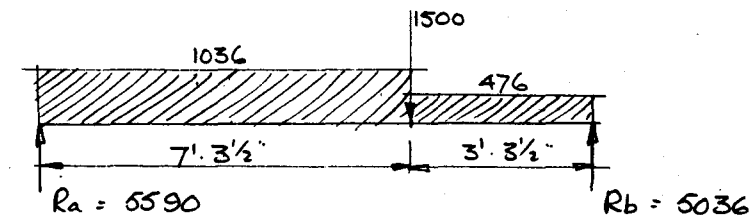
taking Moments about R_b :

$$\begin{aligned}R_a \times 10.583 &= 1036 \times 7.291 \times 6.838 \\ &+ 1500 \times 3.291 \\ &+ 476 \times 3.291 \times 1.645 \\ &= (7560 \times 6.838) + (1500 \times 3.291) + (1566 \times 1.645) \\ &= 51700 + 4940 + 2575 \\ &= 59215\end{aligned}$$

235.

$$R_a = \frac{59215}{10.583} = 5590 \text{ lbs.}$$

$$\therefore R_b = 10626 - 5590 = 5036 \text{ lbs.}$$



$$\frac{5590}{1036} = 5.4$$

$$SF = \text{zero at } 5.4 \text{ ft. from } R_a.$$

$$\begin{aligned}\therefore \text{Max BM} &= (5590 \times 5.4) - (1036 \times 5.4 \times 2.7) \\ &= 30200 - 15100 \\ &= 15100 \text{ lbs. ft.} \\ &= 181200 \text{ lbs. ins.}\end{aligned}$$

Since the beam is a continuous beam:

$$\begin{aligned}BM &= 181200 \times \frac{2}{3} \\ &= \frac{362400}{3} = 120800 \text{ lbs. ins.}\end{aligned}$$

Assume 12" beam:

$$\begin{aligned}RM &= 166 \times 7 \times 10.5^2 \\ &= 128000 \text{ lbs. ins.}\end{aligned}$$

236.

$$\text{Weight of beam} = 12 \times 7 = 84 \text{ lbs./ft. run.}$$

$$\begin{aligned}\text{Extra BM} &= 1/10 Wl \\ &= 1/10 \times 84 \times 10.583^2 \times 12 \\ &= 11300 \text{ lbs. ins.}\end{aligned}$$

$$\therefore \text{Total BM} = 132100 \text{ lbs. ins.}$$

Assume 13" beam.

$$\text{Weight of beam} = 91 \text{ lbs./ft. run.}$$

$$\begin{aligned}\text{Extra BM} &= 1/10 Wl \\ &= 1/10 \times 91 \times 10.583^2 \times 12 \\ &= 12200 \text{ lbs. ins.}\end{aligned}$$

$$\begin{aligned}\therefore \text{Total BM} &= 12200 + 120800 \\ &= 133000 \text{ lbs. ins.}\end{aligned}$$

$$\begin{aligned}\text{BM} &= 166bd^2 \\ &= 166 \times 7 \times 11.5^2 \\ &= 153500 \text{ lbs, ins.} \quad \text{Beam satisfactory.}\end{aligned}$$

Steel Reinforcement:

$$\begin{aligned}A_t &= rbd \\ &= .0107 \times 7 \times 11.5 \\ &= .862 \text{ sq. ins.}\end{aligned}$$

$\therefore$ Use three $\frac{5}{8}$ " diam. rods. (Area = .921 sq. ins.)

237.

Shear

$$\begin{aligned}60 \text{ ba} &= 60 \times 7 \times 11.5 \times .857 \\ &= 4240 \text{ lbs.}\end{aligned}$$

$$\begin{aligned}\text{Max SF} &= 5590 + \frac{91 \times 10.583}{2} \\ &= 5590 + 483 = 6073 \text{ lbs.}\end{aligned}$$

$$\frac{A_s S_{sa}}{p} = S.F.$$

$$\begin{aligned}p &= \frac{.22 \times 18000 \times .857 \times 11.5}{6073} \\ &= 6\frac{1}{2}"\end{aligned}$$

$\therefore$ Use $\frac{3}{8}$ " diam. stirrups at $6\frac{1}{2}$ " centres over the end quarters and up to the point load, and at 13" centres of the remainder of the span.

END OF BEAMS C_1 and E_1 .

DESIGN OF BEAMS C.D.E.F.

$$\text{Span} = 10.583 \text{ ft.}$$

Loading on beams:

$$\text{Load due to floors} = 8 \times 112 = 896 \text{ lbs./ft. run.}$$

$$\text{Load due to walling} = 140 \text{ lbs./ft. run.}$$

$$\text{Load due to beam} = 91 \text{ lbs./ft. run.}$$

$$\text{Total load} = 1127 \text{ lbs./ft. run.}$$

238.

$$\begin{aligned}
 BM &= \frac{1}{10} w l^2 \\
 &= \frac{1}{10} \times 1127 \times 10.583^2 \times 12 \\
 &= 152000 \text{ lbs. ins.} \\
 RM &= 166 b d^2 \\
 &= 166 \times 7 \times 11.5^2 \\
 &= 153500 \text{ lbs. ins.} \quad \underline{\text{Beam satisfactory.}}
 \end{aligned}$$

Steel Reinforcement:As for beams C_1 and E_1 i.e. three $\frac{5}{8}$ " diam. rods (Area = .921 sq. ins.)Shear Reinforcement.

$$\text{Max. S.F.} = \frac{1127 \times 10.583}{2} = 5960 \text{ lbs.}$$

$$\begin{aligned}
 60 \text{ ba} &= 60 \times 7 \times 11.5 (.857) \\
 &= 4140 \text{ lbs.}
 \end{aligned}$$

$$\frac{A_s S_{sa}}{p} = \text{S.F.}$$

$$p = \frac{.22 \times 18000 \times 11.5 \times .857}{5960}$$

$$= 6.54"$$

$\therefore$ Use $\frac{3}{8}$ " diam. stirrups at $6\frac{1}{2}$ " centres over end quarters and at 13" centres over the centre half of the span.

END OF BEAMS C.D.E.F.

239.

DESIGN OF BEAMS L.M.N.

$$\text{Span} = 10.583 \text{ ft.}$$

Loading on beams:

$$\text{Load due to walling} = 140 \text{ lbs./ft. run.}$$

$$\text{Load due to beam} = \underline{91 \text{ lbs./ft. run.}}$$

$$\text{Total load} = 231 \text{ lbs./ft. run.}$$

Assume 7" x 13" beam.

$$\begin{aligned}
 \text{Max. BM} &= \frac{1}{10} w l^2 \\
 &= \frac{1}{10} \times 231 \times 10.583^2 \times 12 \\
 &= 31000 \text{ lbs. ins.}
 \end{aligned}$$

$$\begin{aligned}
 RM &= 166 b d^2 \\
 &= 166 \times 7 \times 11.5^2 \\
 &= 153500 \text{ lbs. ins.} \quad \underline{\text{Beam uneconomical.}}
 \end{aligned}$$

 $\therefore$ Assume 7" x 9" beam.

$$\text{weight of beam} = 63 \text{ lbs./ft. run.}$$

$$\therefore \text{Total load} = 203 \text{ lbs./ft. run.}$$

$$\begin{aligned}
 \text{Max. BM} &= \frac{1}{10} \times 203 \times 10.583^2 \times 12 \\
 &= 27200 \text{ lbs. ins.}
 \end{aligned}$$

$$\begin{aligned}
 RM &= 156 \times 7 \times 7.5^2 \\
 &= 65400 \text{ lbs. ins.} \quad \underline{\text{Beam satisfactory.}}
 \end{aligned}$$

240.

Steel reinforcement:

$$\begin{aligned}
 A_t &= \frac{BM}{18000 \times a} \\
 &= \frac{27200}{18000 \times 7.5 \times .857} \\
 &= .235 \text{ sq. ins.}
 \end{aligned}$$

$\therefore$ Use two $\frac{1}{2}$ " diam. rods. (Area = .391 sq. ins.).

Shear:

No shear reinforcement required.

END OF BEAMS L.M.N.

DESIGN OF BEAMS I.J.K.O.P.Q.

Span = 6.583 ft.

Dimensions as L.M.N: 7" x 9"

$$\begin{aligned}
 BM &= \frac{1}{8} \times 203 \times 6.583^2 \times 12 \\
 &= 13200 \text{ lbs. ins.}
 \end{aligned}$$

Steel reinforcement.

$$\begin{aligned}
 A_t &= \frac{13200}{18000 \times 7.5 \times .857} \\
 &= .1075
 \end{aligned}$$

$\therefore$ Use two $\frac{1}{2}$ " diam rods (Area = .391 sq. ins.)

Shear.

No shear reinforcement required.

END OF BEAMS I.J.K.O.P.Q.

MONOLITHIC FRAME

SCHEDULE OF BEAMS

BEAM NO.	SIZE	REINFORCEMENT	SHEAR REINFORCEMENT
A	9" x 7"	3 - $\frac{1}{2}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at 8" & 16" c/c
B	9" x 7"	3 - $\frac{1}{2}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at 8" & 16" c/c
C	13" x 7"	3 - $\frac{5}{8}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at $6\frac{1}{2}$ " & 13" c/c
D	13" x 7"	3 - $\frac{5}{8}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at $6\frac{1}{2}$ " & 13" c/c
E	13" x 7"	3 - $\frac{5}{8}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at $6\frac{1}{2}$ " & 13" c/c
F	13" x 7"	3 - $\frac{5}{8}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at $6\frac{1}{2}$ " & 13" c/c
G	9" x 7"	3 - $\frac{1}{2}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at 8" & 16" c/c
H	9" x 7"	3 - $\frac{1}{2}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at 8" & 16" c/c
I	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
J	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
K	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
L	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
M	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
N	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
O	9" x 7"	2 - $\frac{1}{2}$ " diam rods.	-
P	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-

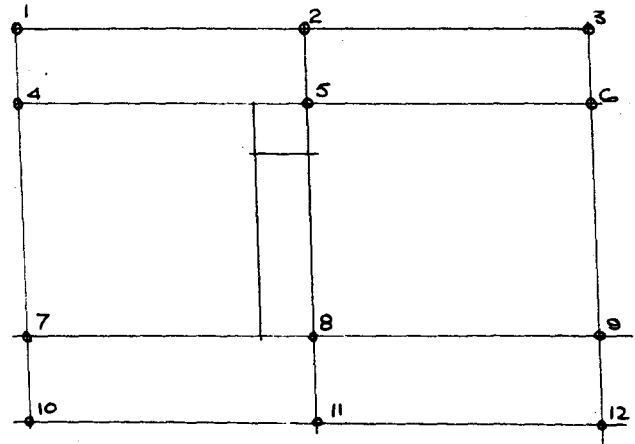
242.

BEAM NO.	SIZE	REINFORCEMENT	SHEAR REINFORCEMENT
Q	9" x 7"	2 - $\frac{1}{2}$ " diam. rods.	-
X	9" x 7" cranked	3 - $\frac{1}{2}$ " diam rods.	-
Y	9" x 7" cranked	3 - $\frac{1}{2}$ " diam. rods.	-
* { C ₁	13" x 7"	3 - $\frac{5}{8}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at 6 $\frac{1}{2}$ " & 13" c/c
* { E ₁	13" x 7"	3 - $\frac{5}{8}$ " diam. rods.	$\frac{3}{8}$ " diam. stirrups at 6 $\frac{1}{2}$ " x 13" c/c

* Carrying stair.

B. COLUMNS.

Schedule of Columns:



DESIGN OF COLUMNS 1.2.3.10.11.12.

Superimposed load:

$$\text{Load due to Floors} = 7 \times 112 \times 3 \times 10 = 23520 \text{ lbs.}$$

$$\begin{aligned} \text{Load due to Beams} &= 7 \times 10 \times 63 \\ &+ 7 \times 3 \times 63 = 3733 \text{ lbs.} \end{aligned}$$

$$\text{Load due to walls} = 7 \times 140 \times 13 = 12740 \text{ lbs.}$$

+ the weight of the columns.

Assume 7" x 15" columns, length = 7'9".

$$\text{Weight of columns} = 7 \times 7 \times 15 \times 7.75 = 5695 \text{ lbs.}$$

$$\therefore \text{Total load} = 47688 \text{ lbs.}$$

$$\text{say } 47700 \text{ lbs.}$$

$$c = .8 \times 900$$

$$= 720 \text{ lbs./sq. in.}$$

Approximate area of concrete required

$$= \frac{47688}{720}$$

$$= 66.2 \text{ sq. ins.}$$

Assume 2% steel:

$$A_t = \frac{2}{100} \times 66.2 = 1.324 \text{ sq. ins.}$$

$$\therefore \text{Use four } \frac{3}{4}" \text{ diam. rods. (Area} = 1.767 \text{ sq. ins.)}$$

$$\begin{aligned}\text{Load taken by steel} &= 1.767 \times 13500 \\ &= 23800 \text{ lbs.}\end{aligned}$$

$$\therefore \text{Remainder of load to be taken by concrete} = 23900 \text{ lbs.}$$

$$\therefore \text{Area of concrete required} = \frac{23900}{720} = 33.2 \text{ sq. ins.}$$

$$\therefore \text{Use column } 7'' \times 7''. \quad (\text{Area} = 49 \text{ sq. ins.})$$

Ratio of length to lateral dimension:

$$\begin{aligned}&= \frac{7.75 \times 12}{7} \\ &= 13.3 \quad \text{Satisfactory.}\end{aligned}$$

Try four $\frac{5}{8}''$ diam. rods.

$$\begin{aligned}P &= cAc + tAt \\ &= 720 (49 - 1.227) + (13500 \times 1.227) \\ &= 720 (47.773) + 13500 \times 1.227 \\ &= 34400 + 16550 \\ &= 50950 \text{ lbs.} \quad \text{Satisfactory.}\end{aligned}$$

Ratio of longitudinal reinforcement to area of column:

$$\frac{1.227}{7} = 1.75\% \quad \text{Satisfactory.}$$

Lateral ties:

$$\text{Minimum diameter} = \frac{1}{4} \times \frac{5}{8}'' = 5/32''$$

$$\text{Minimum allowable diameter} = \frac{1}{4}''$$

Assuming 0.4% of volume, then

$$\frac{.049 \times 4 \times 4\frac{7}{8}}{7 \times 7 \times p} = \frac{4}{1000}$$

$$\begin{aligned}\text{Maximum pitch} = p &= \frac{.049 \times 4 \times 4\frac{7}{8} \times 1000}{4 \times 7 \times 7} \\ &= 4\frac{7}{8}''\end{aligned}$$

Try $\frac{3}{8}''$ diam. ties:

$$\begin{aligned}\text{Maximum pitch} &= \frac{4.875 \times .11}{.049} \\ &= 10.94'' \quad \text{Unsatisfactory.}\end{aligned}$$

Try $5/16''$ ties:

$$\begin{aligned}\text{Maximum pitch} &= \frac{4.875 \times .077}{.049} \\ &= 7.66'' \quad \text{Satisfactory.}\end{aligned}$$

Use $5/16''$ diam. lateral ties at $7\frac{1}{2}''$ centres.

END OF COLUMNS 1.2.3.10.11.12.

DETAILS OF COLUMNS 1.2.3.10.11.12.

$7'' \times 7''$

Four $\frac{5}{8}''$ diam. reinforcing rods at $4\frac{7}{8}''$ centres.

$5/16''$ diam. lateral ties at $7\frac{1}{2}''$ centres.

246.

DESIGN OF COLUMNS 4. 5. 6. 7. 8. 9.

Assume 7" x 15" columns.

Superimposed load:

$$\text{Load due to Floors} = 112 \times 10 \times 8 \times 7 = 62720$$

$$\begin{aligned} \text{Load due to Beams} &= 91 \times 10 \times 7 \\ &+ 63 \times 8 \times 7 = 9898 \end{aligned}$$

$$\text{Load due to walls} = 18 \times 140 \times 7 = 17640$$

$$\text{Weight of Columns} = 7 \times 7 \times 15 \times 7.75 = \underline{5695}$$

$$\text{Total load} = 95953 \text{ lbs.}$$

Approximate area of concrete required

$$= \frac{95953}{720} = 133.2 \text{ sq. ins.}$$

Assume 2% steel

$$A_t = \frac{2}{100} \times 133.2 = 2.664 \text{ sq. ins.}$$

Try four $\frac{7}{8}$ " diam. rods. (Area = 2.405 sq. ins.)

Load taken by steel

$$= 2.405 \times 13500$$

$$= 32500$$

247.

$$\therefore \text{Remainder of load to be taken by concrete} = 63453 \text{ lbs.}$$

$$\therefore \text{Area of concrete required} = \frac{63453}{720} = 88.2 \text{ sq. ins.}$$

$$\therefore \text{Use } 7" \times 13" \text{ columns. (Area} = 91 \text{ sq. ins.)}$$

$$p = cAc + tAt$$

$$= 720 \times (91 - 2.405) + (13500 \times 2.405)$$

$$= 720 \times 88.6 + 32500$$

$$= 63800 + 32500$$

$$= 96300 \text{ lbs.} \quad \underline{\text{Satisfactory.}}$$

Lateral ties:

$$\text{Minimum diameter} = \frac{1}{4} \times \frac{7}{8} = 7/32"$$

Try 5/16" diam. ties.

Assuming 0.4% of volume, then

$$\text{Maximum pitch } p = \frac{.077 \times 30 \times 1000}{4 \times 7 \times 13}$$

$$= 6.34"$$

$$\therefore \text{Use } 5/16" \text{ lateral ties at } 6" \text{ centres.}$$

DETAILS OF COLUMNS 4. 5. 6. 7. 8. 9.

7" x 13"

Four $\frac{7}{8}$ " diam. reinforcing rods.

5/16" diam. lateral ties at 6" centres.

END OF COLUMNS.

MONOLITHIC FRAME

SCHEDULE OF COLUMNS

COLUMN SIZE NO.	REINFORCEMENT	LATERAL TIES
1 7" x 7"	4 - $\frac{5}{8}$ " diam. rods at $4\frac{7}{8}$ " c/c	5/16" diam. at $7\frac{1}{2}$ " c/c
2 7" x 7"	4 - $\frac{5}{8}$ " diam. rods at $4\frac{7}{8}$ " c/c	5/16" diam. at $7\frac{1}{2}$ " c/c
3 7" x 7"	4 - $\frac{5}{8}$ " diam. rods at $4\frac{7}{8}$ " c/c	5/16" diam. at $7\frac{1}{2}$ " c/c
4 7" x 13"	4 - $\frac{7}{8}$ " diam. rods at	5/16" diam. at 6" c/c
5 7" x 13"	4 - $\frac{7}{8}$ " diam. rods at	5/16" diam. at 6" c/c
6 7" x 13"	4 - $\frac{7}{8}$ " diam. rods at	5/16" diam. at 6" c/c
7 7" x 13"	4 - $\frac{7}{8}$ " diam. rods at	5/16" diam. at 6" c/c
8 7" x 13"	4 - $\frac{7}{8}$ " diam. rods at	5/16" diam. at 6" c/c
9 7" x 13"	4 - $\frac{7}{8}$ " diam. rods at	5/16" diam. at 6" c/c
10 7" x 7"	4 - $\frac{7}{8}$ " diam. rods at $4\frac{7}{8}$ " c/c	5/16" diam. at $7\frac{1}{2}$ " c/c
11 7" x 7"	4 - $\frac{7}{8}$ " diam. rods at $4\frac{7}{8}$ " c/c	5/16" diam. at $7\frac{1}{2}$ " c/c
12 7" x 7"	4 - $\frac{7}{8}$ " diam. rods at $4\frac{7}{8}$ " c/c	5/16" diam. at $7\frac{1}{2}$ " c/c

APPENDIX NO. 9.

In planning townships on the system of housing by flats, a great reduction in the length of roads required is obtained over the cottage system. The result of this reduction can mean either a corresponding reduction in road costs, or, alternatively, better and more permanent road surfaces can be provided for a given expenditure.

In the proposed scheme, the authors felt that the latter alternative should be aimed at in view of the fact that the roads in existing Native housing schemes have had insufficient consideration, being in most cases graded earth roads which are quagmires in wet weather and give rise to dusty and unhealthy conditions in dry weather. It is intended therefore, to surface the roads in the proposed scheme with a tarmacadam surface. The figures which follow give a statement of costs of the roads in the proposed township, compared with those in Orlando for an area sufficient to house an identical number of families.

Orlando.

In Orlando the size of a block is 900ft x 150ft., surrounded by roads 50ft. wide on all sides, and having a 12ft. wide sanitary lane, 900ft. in length, along the centre. Roads 100ft. wide occur every sixth road, and run along the 900ft. side of the blocks. Each block contains 36 dwellings. Thus for 3500 dwellings (the number of flats in the proposed scheme), 97 blocks would be required. The road lengths given below are calculated on this basis. It is assumed that the width of graded surface will be 30ft. in the case of the 100ft. roads, 20ft. in the case of the 50ft. roads and 10ft. in the sanitary lanes.

The cost of making graded roads is 2/- per yard super.

Block = 900'0" x 150'0". 36 dwellings per block.

3500 dwellings = 97 blocks.

250.

Length of 100ft. roads = 4,800 yds. = $2\frac{3}{4}$ miles.

" " 50ft. " = 31,033 yds. = $17\frac{1}{2}$ miles.

Total length = 35,833 yds. = $20\frac{1}{4}$ miles.

Length of sanitary lanes = 29,100 yds. = $16\frac{1}{2}$ miles.

Cost

$2\frac{3}{4}$ miles of 100ft. road = $4800 \times \frac{30}{3}$ = 48,000 sq. yds
 @ 2/- per yard super: = £4,800

$17\frac{1}{2}$ miles of 50ft. road = $31033 \times \frac{20}{3}$ = 206,890 sq. yds
 @ 2/- per yard super: = £20,689

$16\frac{1}{2}$ miles of 12ft sanitary lane = $29100 \times \frac{10}{3}$ = 97,000 sq yds.
 97,000 sq. yds. @ 2/- per yard super: = £9,700

TOTAL COST = £35,189

The Proposed Scheme

In this case the blocks are 1020ft x 540ft. and each block contains 350 dwellings. 10 blocks will therefore house 3500 families. The roads are all 50ft. clear width, having a portion 27ft wide (including kerb and gutters), surfaced with tarmacadam. The cost of laying this surface is £1 per foot run.

Length of roads serving flat blocks = 24995 ft.

" " service roads (to station, allotments, etc.) = 11220 ft.

TOTAL = 36215 ft.

Cost = 7 miles.

36215 ft. @ £1. per foot run. = £36,215

251.

It can be seen then, that with no increase over current expenditure, properly constructed tarred roads can be provided throughout the location. In considering the above figures, moreover, it must be borne in mind that the road lengths given for Orlando are limited to those roads actually adjacent to housing blocks, and take no account of the large number of other roads which exist, such as station approaches, squares, recreation grounds, etc., whereas the figures given for the proposed scheme include all roads in the township. It must not be forgotten, in addition, that the reduction from a total of $36\frac{3}{4}$ miles to 7 miles in the road length means a corresponding reduction in the costs of laying main services, such as water mains, electric cables, sewers, etc.

An interesting fact comes to light as a result of this reduction in road length. In Orlando Township, the distance from the railway station to the farthest possible house is 3,166 yards, or nearly 2 miles. In the proposed scheme the corresponding greatest distance is $\frac{3}{5}$ mile by road, and $\frac{1}{2}$ mile if the pathways through the parks are used.

252.

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NT₁

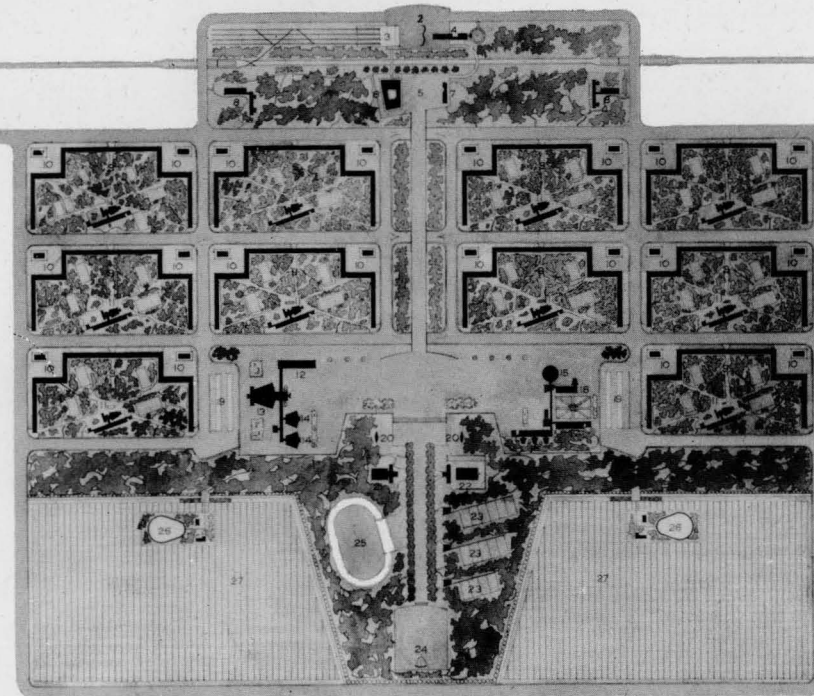
GENERAL

SITE

LAYOUT



- 1 RAILWAY STATION
- 2 GOODS YARD
- 3 GOODS STATION
- 4 POLICE & FIRE STATION
- 5 PIAZZA
- 6 MARKET CENTRE
- 7 PASS, POST & ADMINISTRATION OFFICES
- 8 HOTEL
- 9 COMMUNAL GARDEN
- 10 SHOPS
- 11 PRIMARY SCHOOL
- 12 RESTAURANT
- 13 CIVIC HALL
- 14 CINEMA



- 14 CINEMA
- 15 LENDING LIBRARY
- 16 REFERENCE LIBRARY
- 17 TRADES SCHOOL
- 18 TECHNICAL COLLEGE
- 19 PARKING
- 20 PYLON
- 21 GYMNASIUM
- 22 SWIMMING BATH
- 23 TENNIS COURTS
- 24 PUBLIC CONCOURSE
- 25 STADIUM
- 26 STORMWATER STORAGE TANK
- 27 ALLOTMENTS

NT₂ • LAYOUT OF FLAT BLOCK

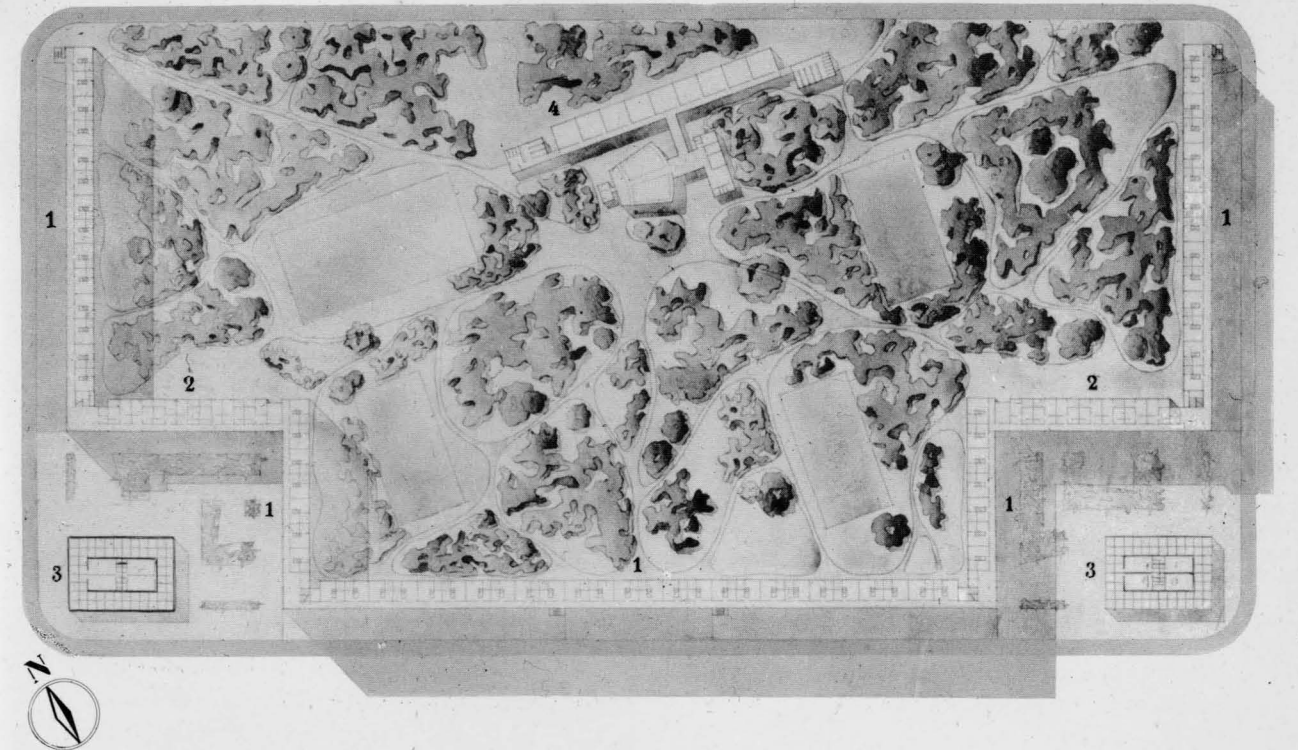
1 - THREE- AND FOUR-ROOM FLATS

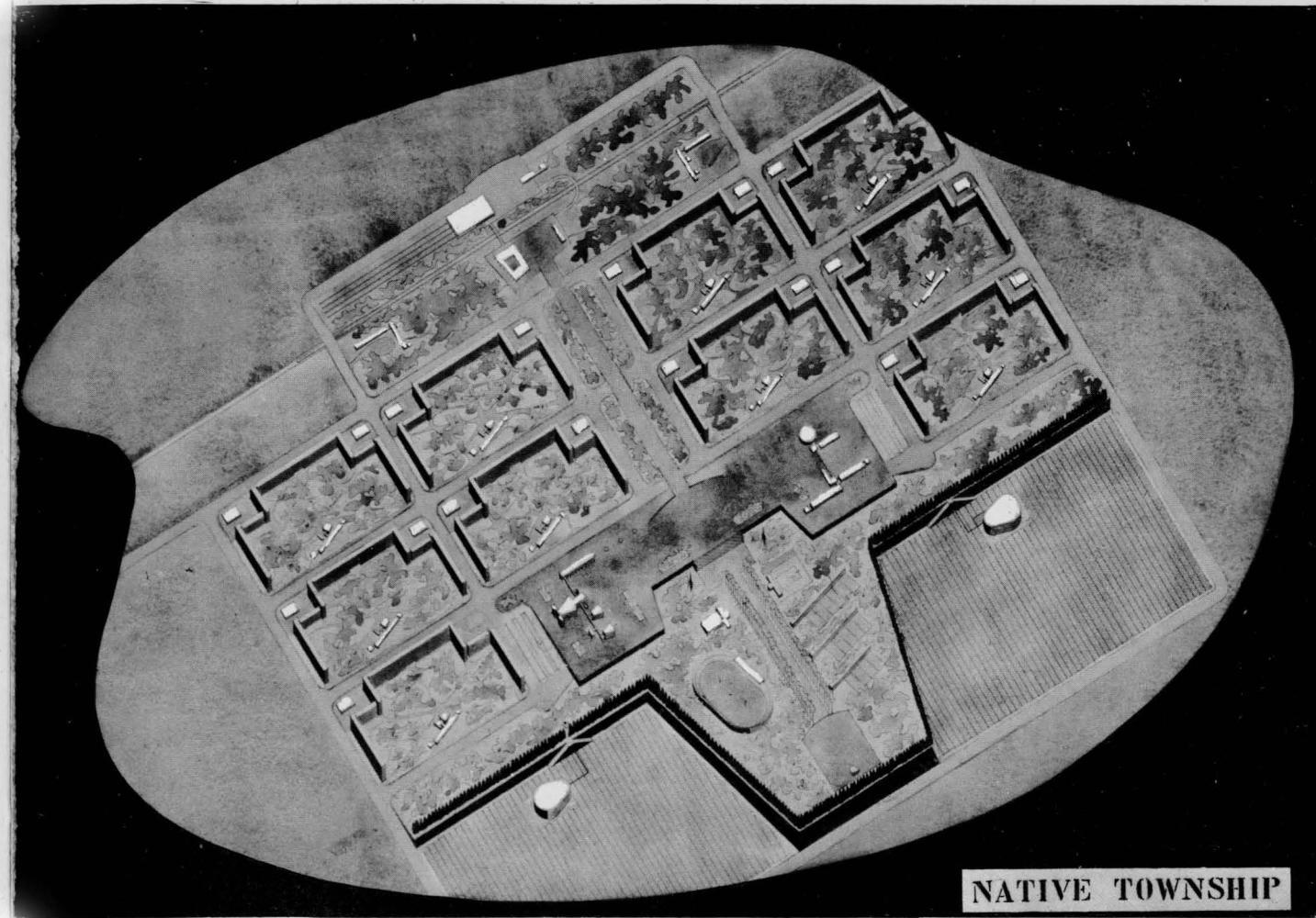
3 - RETAIL SHOPS

2 - TWO-ROOM FLATS

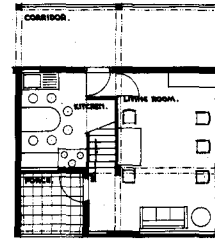
4 - PRIMARY SCHOOL

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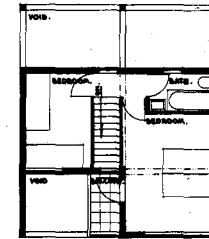




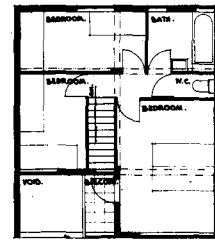
NATIVE TOWNSHIP



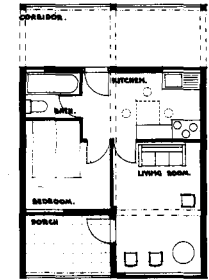
3 OR 4 ROOMED FLAT, DOWNSTAIRS.



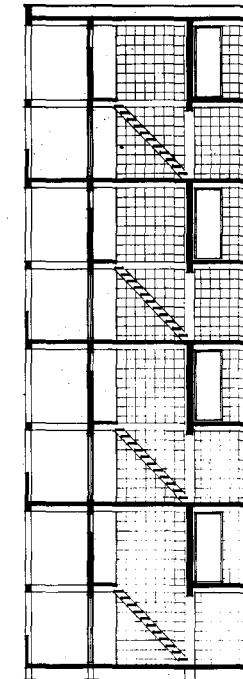
THREE ROOMED FLAT, UPSTAIRS.



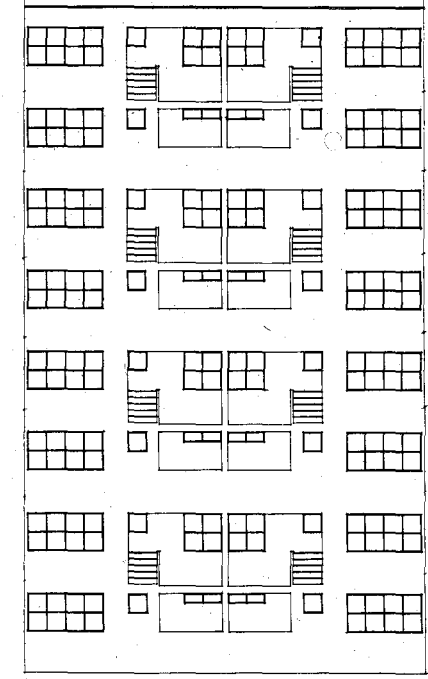
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TWO ROOMED FLAT.

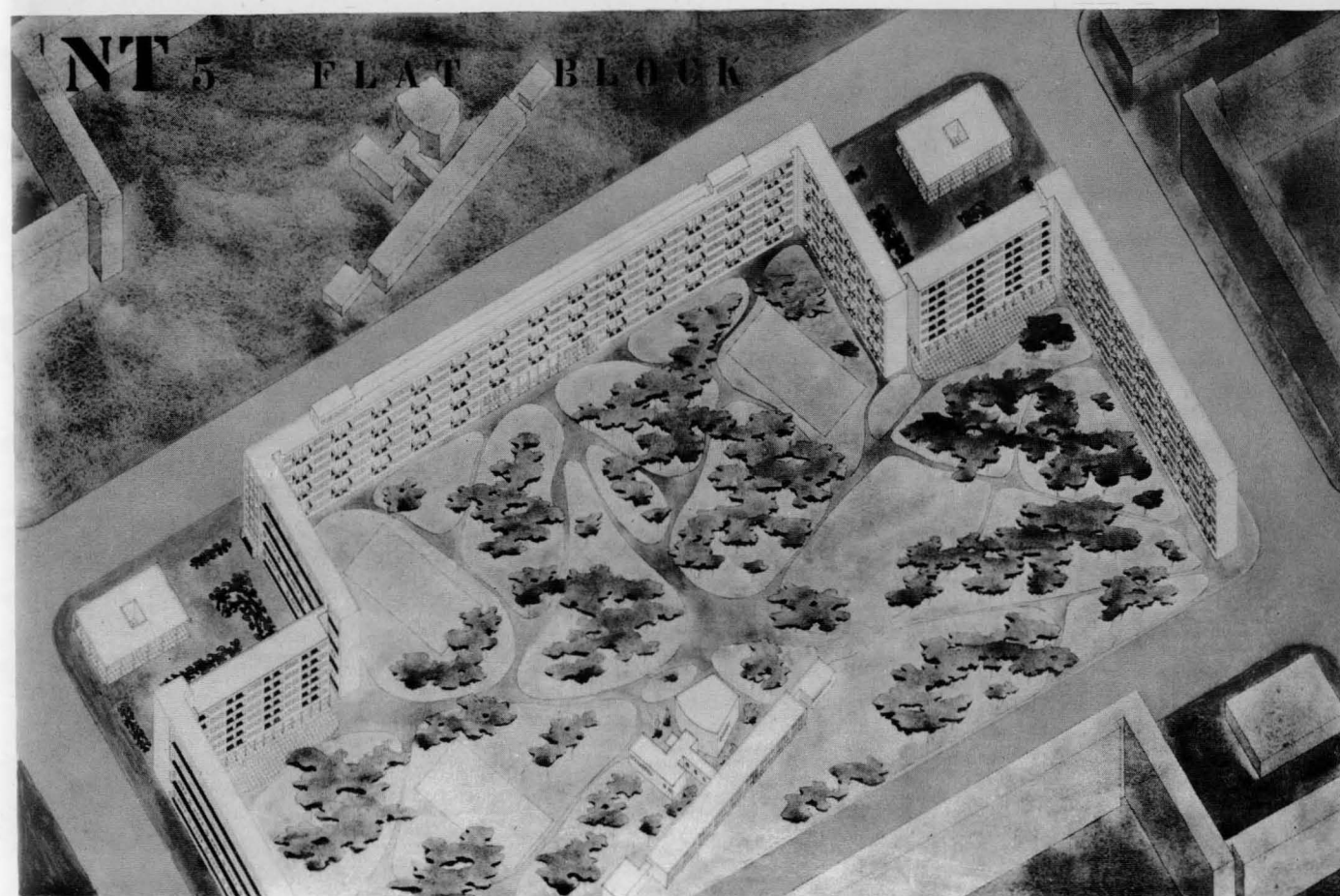


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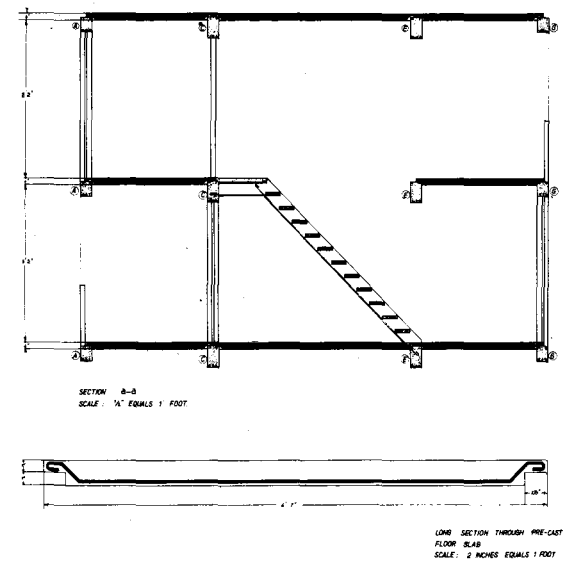
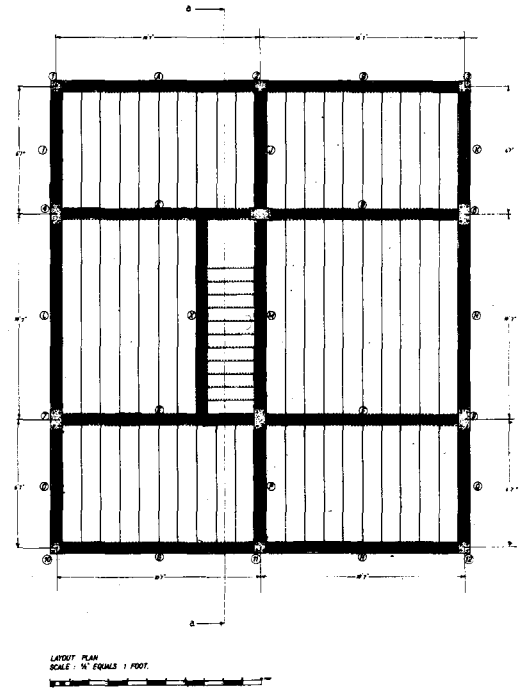


ELEVATION.

PLANS SECTION & ELEVATION OF FLAT BLOCKS **NT** 4

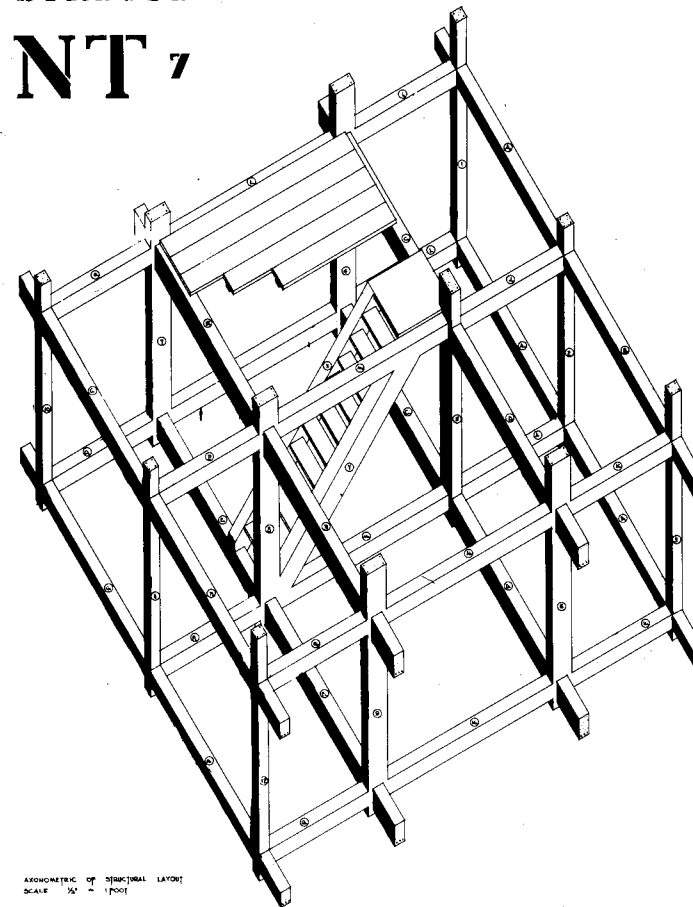


STRUCTURAL DETAILS OF FOUR ROOMED FLAT NT₆

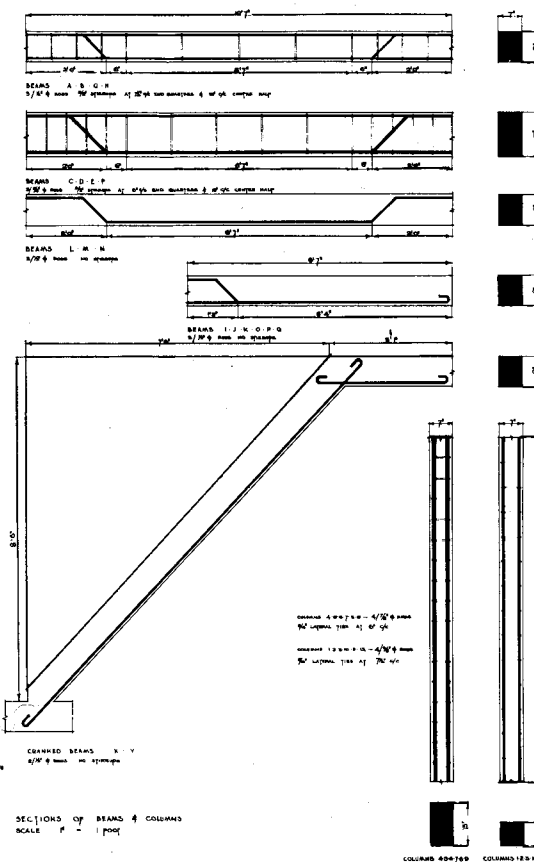


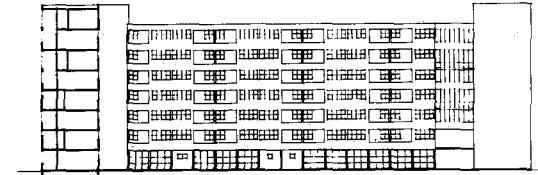
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NT 7

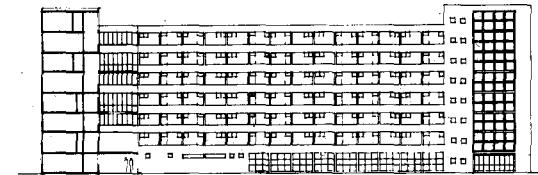


AXONOMETRIC OF STRUCTURAL LAYOUT
SCALE 1/2" = 1'-0"

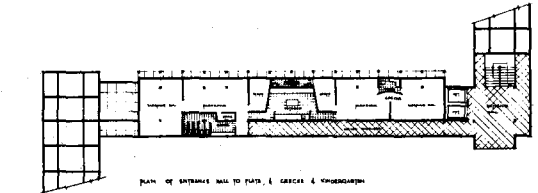




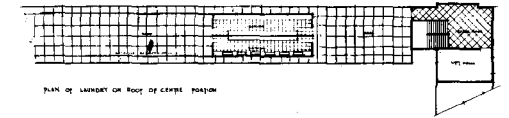
ELEVATION TO GARDEN OF 2-BEDDING FLATS, WITH CRECHE & UNDERCLOSET BELOW



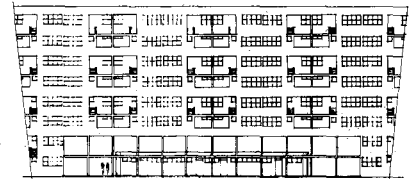
ELEVATION TO PAVILION OF 2-BEDDING FLATS



PLAN OF ENTRANCE HALL TO FLATS, & CRECHE & UNDERCLOSET



PLAN OF LAUNDRY ON ROOF OF CRECHE PORTION



ELEVATION OF CENTRE PORTION OF BLOCK INCLUDING NEW THEATRE & MEDICAL CENTRE



PLAN OF MEDICAL CENTRE AND DISPENSARY

FLAT BLOCK ACCESSORIES CRECHES ETC



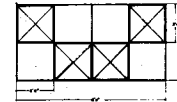
SCALE OF FEET.

WINDOW SCHEDULE OF FLAT BLOCKS

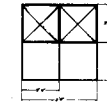
SCALE: HALF INCH EQUALS ONE FOOT.



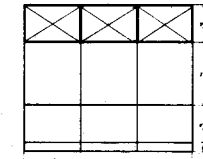
NT₉



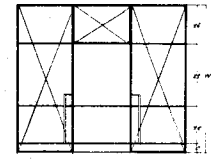
TO LIVING ROOMS.
TO BED ROOMS.
IN NO. 880C.



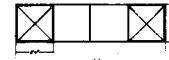
TO BED ROOMS.
IN NO. 880C.



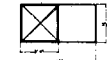
TO CORRIDORS.
TO CRECHES.
TO KINDERGARTENS.
IN NO. 800.



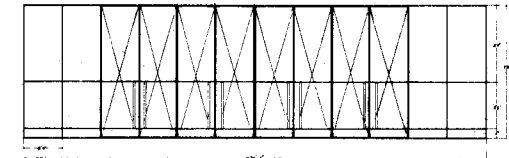
TO CRECHES.
TO KINDERGARTENS.
IN NO. 80.



TO KINDERGARTEN CLOSETS.
TO CONSULTING ROOMS.
IN NO. 88.



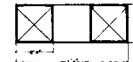
TO KITCHENS.
TO CONSULTING ROOMS.
IN NO. 288.



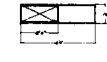
TO MAIN ENTRANCE HALLS.
IN NO. 20.



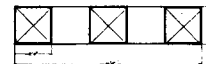
TO STAIRCASE LANDINGS.
IN NO. 880.



TO SUPERGATE.
TO WAITING ROOMS.
IN NO. 20.



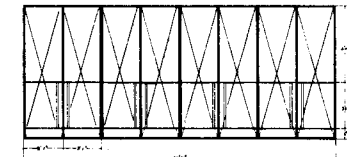
TO KITCHENS.
IN NO. 288.



TO CONSULTING ROOMS.
TO LAUNDRIES.
IN NO. 180.



TO LAVATORIES.
TO CLOAKROOMS.
TO STAFF ROOMS.
IN NO. 12 880.

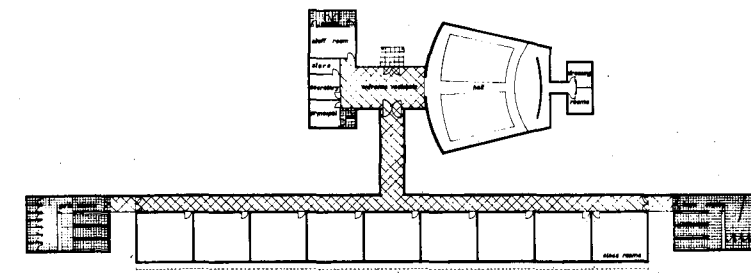
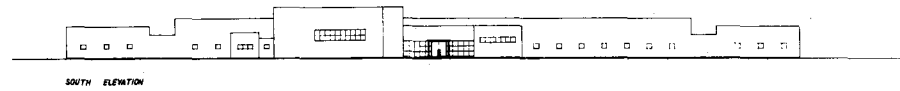
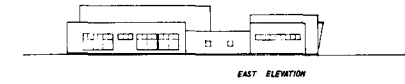
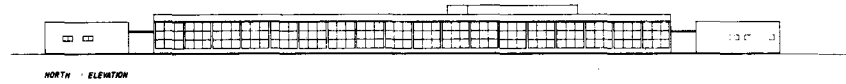


TO MAIN ENTRANCE HALLS.
IN NO. 20.

THE PRIMARY SCHOOLS

SCALE: SIXTEENTH OF AN INCH EQUALS ONE FOOT.

NT¹⁰

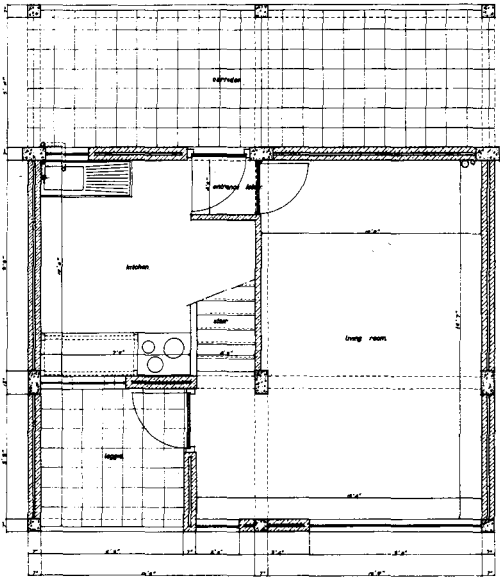


PLAN

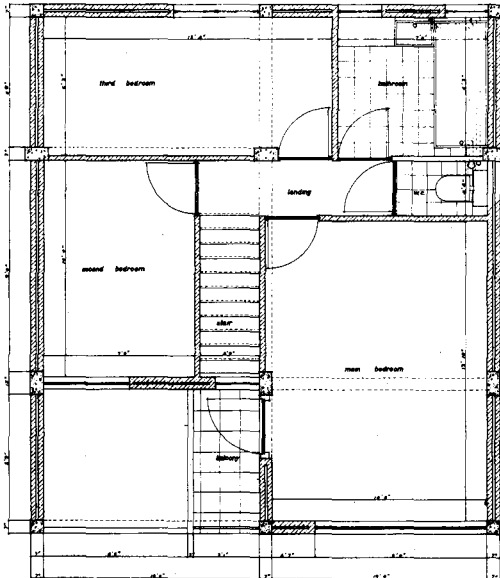
DETAILS OF FLAT UNIT

NT II

SCALE: HALF INCH EQUALS ONE FOOT.



PLAN
LOWER FLOOR OF THREE ROOM FLAT
LOWER FLOOR OF FOUR ROOM FLAT

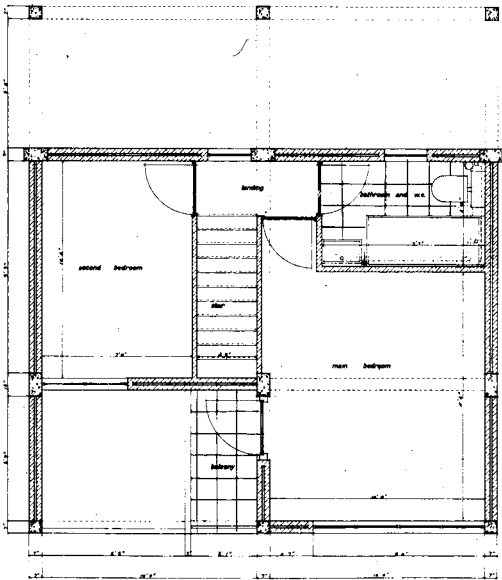


PLAN
UPPER FLOOR OF FOUR ROOM FLAT

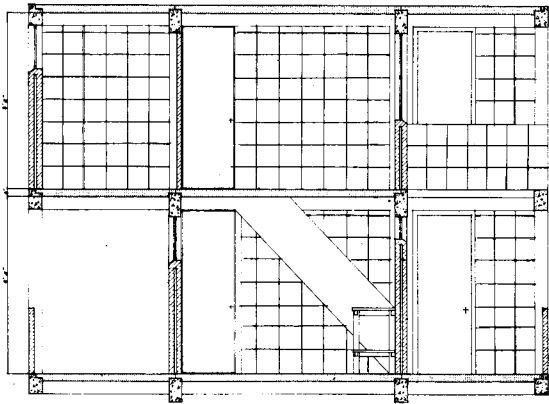
DETAILS OF FLAT UNIT

NT₁₂

SCALE : HALF INCH EQUALS ONE FOOT.



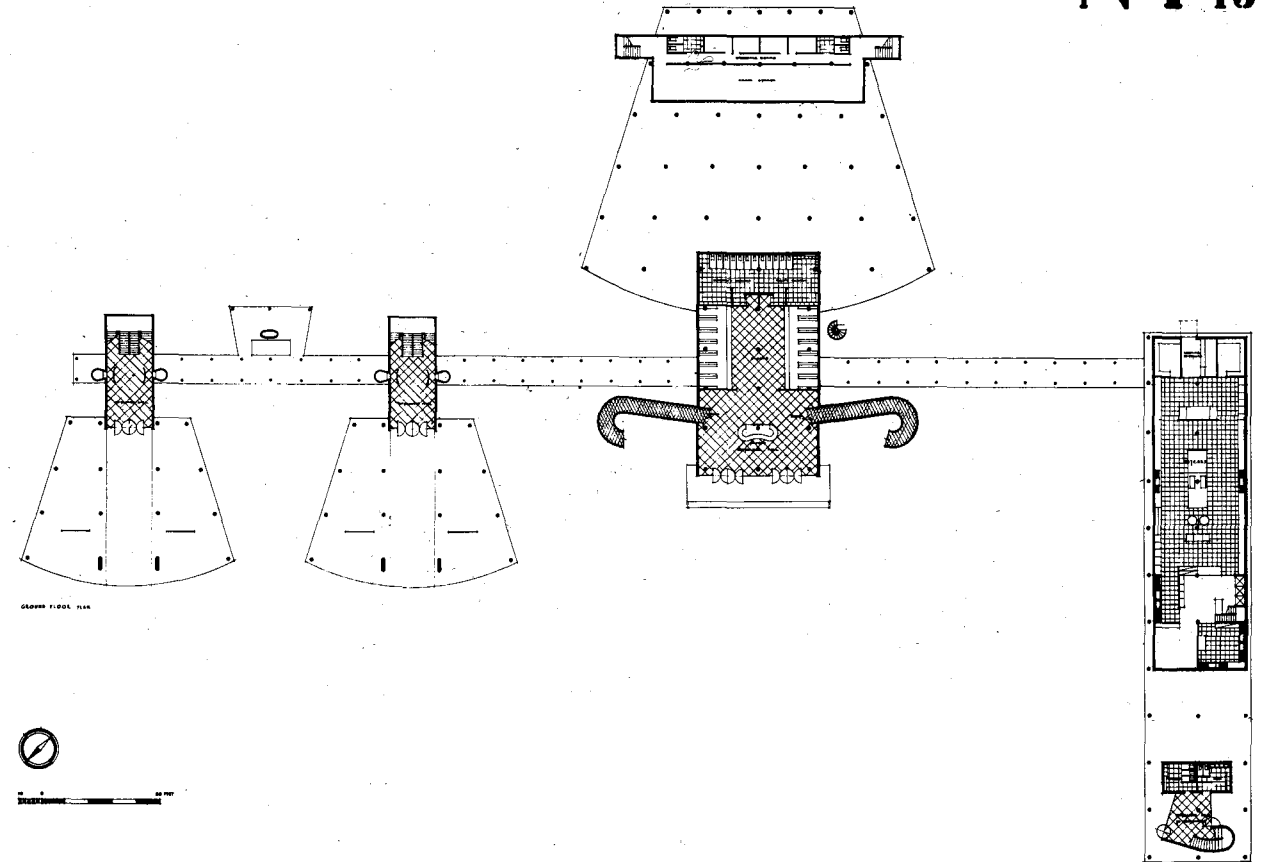
PLAN
UPPER FLOOR OF THREE ROOM FLAT



SECTION
FOUR ROOM FLAT

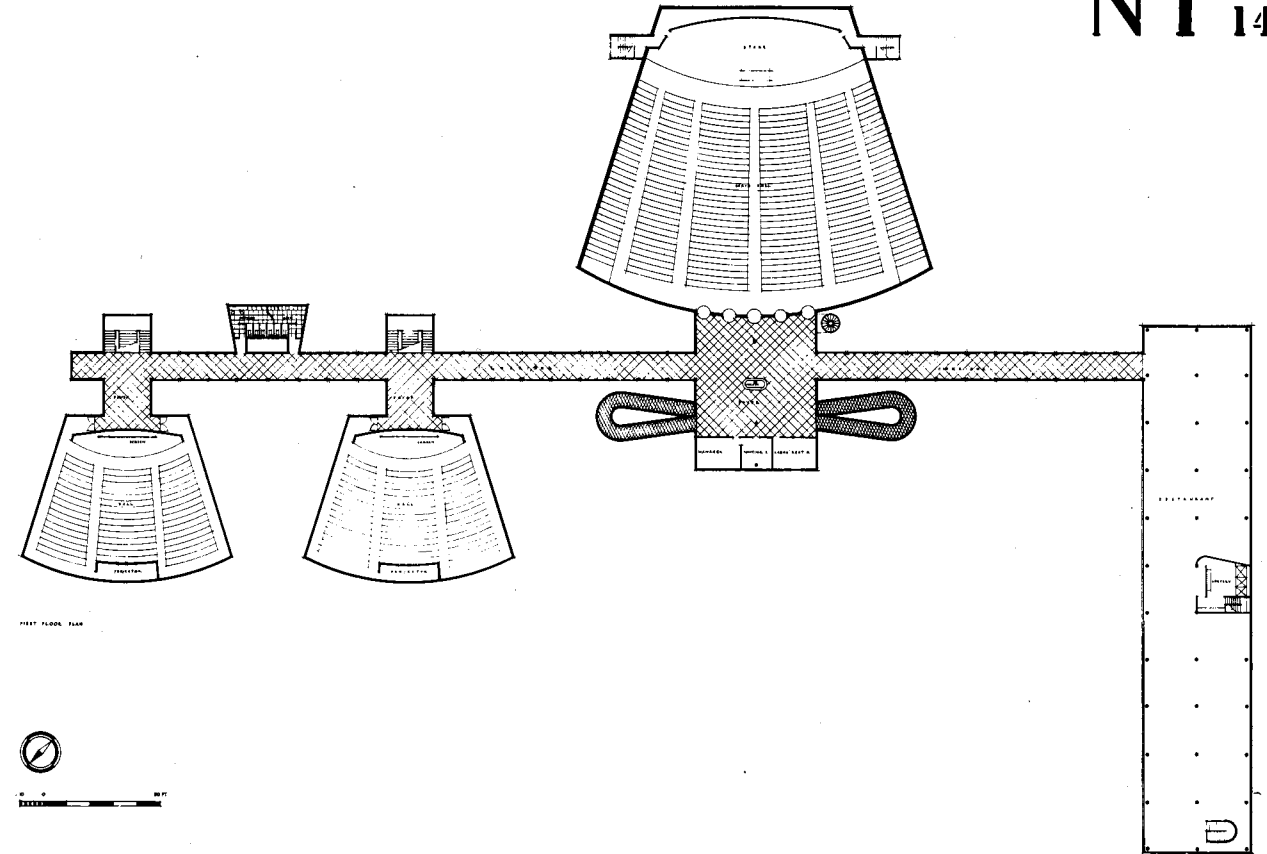
CULTURAL CENTRE

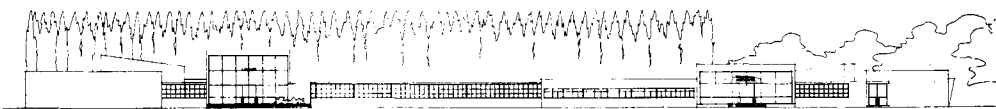
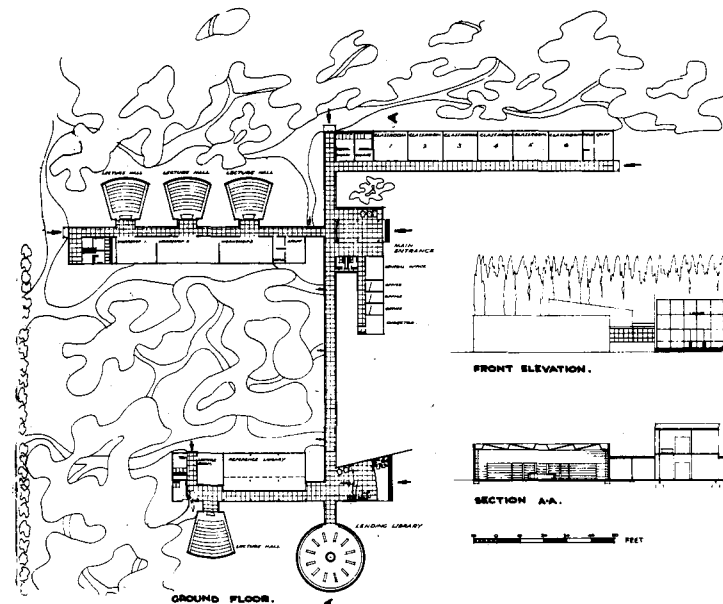
NT₁₃



CULTURAL CENTRE

NT 14





FRONT ELEVATION.



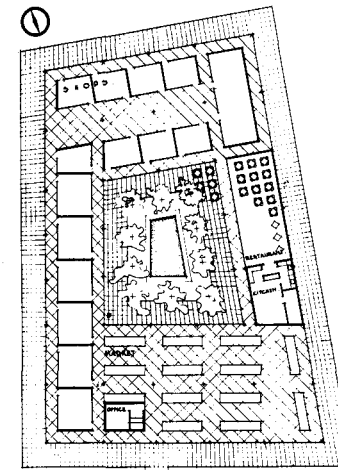
SECTION A-A.



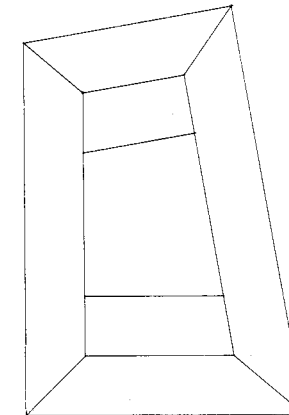
FIRST FLOOR.



TECHNICAL COLLEGE & LIBRARY



PLAN.



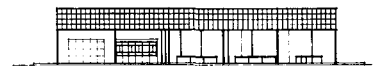
ROOF PLAN.



LONGITUDINAL SECTION.

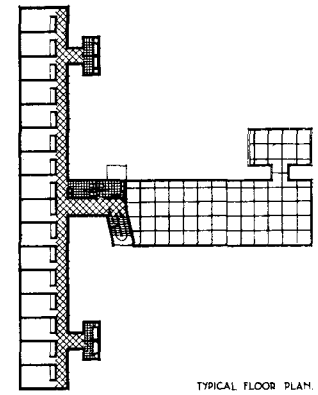


WEST ELEVATION.

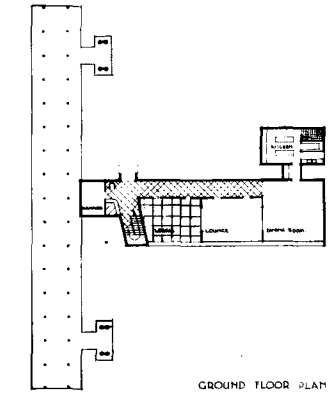


SOUTH ELEVATION.

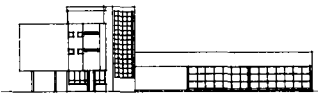
SHOPPING AND MARKET CENTRE



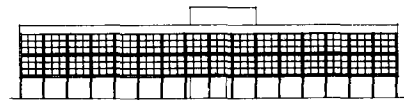
TYPICAL FLOOR PLAN.



GROUND FLOOR PLAN.



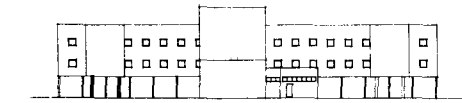
NORTH ELEVATION.



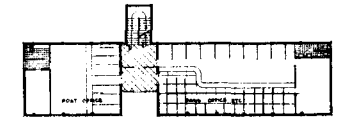
EAST ELEVATION.



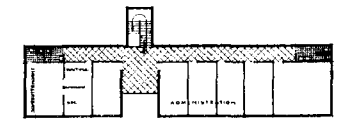
SCALE OF FEET.



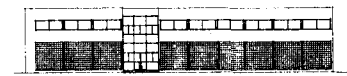
WEST ELEVATION.



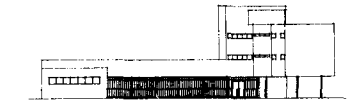
GROUND FLOOR PLAN.



FIRST FLOOR PLAN.



EAST ELEVATION.
ADMINISTRATION BLOCK.



SOUTH ELEVATION.

TYPICAL HOTEL & ADMINISTRATION BLOCK