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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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GUIDELINES AND SPECIFICATIONS FOR THE CONSTRUCTION OF SMALL-SCALE INDUSTRIAL ESTATES IN DEVELOPING COUNTRIES*

by

the UNIDO Secretariat

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1. Introduction

Small-scale industrial estates in developing countries are generally considered an appropriate instrument, among others, through which entrepreneurship and skills can be developed if the activities of these estates are sponsored and organized within a context of promotion and development programme nation-wide.

This paper gives a general view of different steps that should be taken in connection with the construction of estates for small industries based mainly on recent UNIDO field experience in Kenya.

Emphasis is put on small sheds with a working space ranging from 40 m^2 to 150 m^2 which were found quite suitable for the size of enterprise to be offered accommodation on a low-rent basis.

Due to the fact that conditions may vary from country to country, the proposed specifications may be subject to modification for better compliance to local exigencies and building regulations. It is believed, however, that the low-cost type of buildings and materials to be used, as indicated, is more likely to be found in many countries in Africa. In addition, the construction technique for such projects does not require special knowledge from the local contractor.

Finally, examples of typical workshops and the general layout of estates where they were built in the rural areas are shown to indicate what is strictly required in terms of facilities for the small-scale sector.

This exercise may provide a reasonable basis for comprehensive discussion and understanding between sponsors, donor agencies and consultants concerned with construction programmes of industrial estates for small industries.

2. Objectives in establishing an industrial estate

The concept of industrial estates for small-scale industries in developing countries is not new. While efforts are being made to promote the sector, particular attempts to provide the small entrepreneurs with basic industrial accommodation have been limited.

Due to limited resources, the great majority of entrepreneurs, whether in urban or rural areas, cannot face the initial financial obligations which would be required to build industrial sheds equipped with proper working space, adequate lighting, ventilation and security.

This lack of basic facilities may be due to inadequate promotional policy or a lack of more direct assistance to the sector or a combination of both. Indeed, few are the countries in Africa where Governments have sponsored, built and managed industrial estates for promoting small-scale industries.

The promotion of this sector should not be contemplated as an isolated case in itself but should be encompassed in a general plan in which the industrial estate as an instrument is to be conceived within the framework of a general policy of industrialization at the national level.

Consequently, the objectives of an industrial estates programme cannot be divorced from national economic development and industrialization aims. The

estate is but one tool of the many needed to further these aims and, like a tool, it has to be used to do the job for which it is best suited.1/

The scope for establishing the estates should be seen with the view to increasing economic activities, generating employment opportunities, promoting and developing entrepreneurial capabilities.

Other objectives necessary to sustain industrialization through industrial estates shall consist of encouraging the development of human resources, up-grading know-how and quality of products, and improving appropriate use of local resources and technology.

Coherent policies and willingness of governments to deliver continuous assistance to small entrepreneurs must be the corner stone upon which these objectives can be achieved in the long term.

3. Sponsors of industrial estates2/

Industrial estates in developing countries are generally sponsored by governmental organizations. In a bid to promote industrialization, the governments initiate, plan, organize, establish and manage industrial estate programmes. This is certainly justified in the case of developing countries where private capital and initiative for starting such projects is usually not sufficiently available.

The private sector is rather reluctant to initiate and start such projects in view of the promotional and developmental nature of the venture. However, if the success of the industrial estate is demonstrated satisfactorily by the public sector, the private sector will become interested and gain confidence to invest in such projects.

A central government agency as a support institution is necessary to sponsor the estates programme. It should organize the much needed assistance so that the entrepreneur is more able to run his business and make it profitable.

4. Feasibility study

The first step in the process of establishing an industrial estate starts with a pre-project survey and a feasibility study covering economic, technical and social aspects of the project.

The viability of the project should be assessed before starting the construction phase.

Population, distribution of income groups, existing communication and transport systems, as well as social infrastructure must be looked into. Particular emphasis should be placed on the following areas:

4.1 Market survey and analysis;
4.2 Demand for goods and products;

1/ The effectiveness of industrial estates in developing countries, United Nations, New York 1978, page 25, ID/216.

2/ Source: Industrial estates, an instrument for industrial development and promotion, by P.H. Gloeckner, Ferozons Ltd., Lahore, 1966, p.49.

4.3 Raw materials' availability, supply and consumption;
4.4 Availability of human resources and their qualifications;
4.5 Existing industries and their impact on employment, products manufactured, and distribution of these products on local or external markets.

Based on the social and economic background and the findings of the study, the possibilities for an operational "niche" for the small-scale sector can be analysed. Projects that can be accommodated together on the estate could be selected and proposed for implementation.

Availability of a site for construction and alternative plots should be carefully looked into, giving due consideration to existing services and infrastructure in view of an overall assessment of the project in terms of final cost.

Based on the findings of the study, the construction programme can be delineated according to the number of workshops to be built with a foreseeable working population and the nature of the different enterprises to be accommodated.

The decision to construct the project in urban or rural areas shall be consistent with government policy and objectives designed for the promotion of the small-scale sector.

5. Types of industrial accommodation

Five different types of accommodation can be provided depending on what the sponsor intends to achieve. These are as follows:1/

5.1. Custom-built factories, usually provided for a selected range of industries based on locally-available materials;

5.2. Standard factories of various sizes; this is the usual pattern adopted in estates intending to stimulate small-scale industry;

5.3. Standard and custom-built factories; for a few special industries a country wishes to encourage;

5.4. Fully developed plots; the lessee of a plot builds his own premises in accordance with the estate building regulations. This has the advantage of minimizing the sponsor's investment and allowing the development to be most accurately phased to meet the demand for accommodation;

5.5. Fully developed plots and a number of standard factories; estates intended to accommodate large- and small-scale establishments are of this type.

In this paper emphasis is given to the type of accommodation illustrated under 5.2 due to the workshop areas required and the related low-cost implications. This pattern is considered more appropriate to the promotional character and the objectives of the industrial estates programme.

1/ Source: Guidelines for the establishment of industrial estates in developing countries, United Nations, New York, 1978, p.9, ID/220.

6. Types of small enterprise

Enterprises to be contemplated for accommodation on the estates should primarily be the small manufacturing-oriented kind.

Demand for energy should be commensurate with this type of manufacturing where pollution should not be an issue.

If the feasibility study indicates market potential and viability, the following list, which is not exhaustive, could give an indication as to which sort of project might be considered during the selection process:

- Garments
- Furniture
- Leather or sisal bags
- Electronics assembly
- Handicraft products
- Embroidery
- Window- and door-frames
- Zip fasteners
- Wire nails, washers, rivets
- Toys
- Paper clips
- Woodcrafts
- Printing, stationary
- Plastic torches
- Animal feed
- Rubber shoes
- Wheel-barrows
- Agricultural implements
- Water-tanks
- Pottery
- Metalworks
- Pins, buttons
- Paper cups
- Cutlery
- Kitchen sinks
- Cosmetics
- Spectacle frames
- Metal containers
- Egg trays
- Bakery
- Food processing
- Plastic bags/containers

7. Examples of estates for small-scale industries

As already mentioned, these examples are only meant to put into perspective a type of facility deemed appropriate for this sectoral industry.

During the last 20 years, 28 estates were built in the urban and rural areas in Kenya. About 400 sheds totalling 71,000 m^2 were provided and equipped with a view to promoting small-scale industries mainly in the rural areas across the country.

Small estates were built with a basic production unit of around 50 m^2. On the same estate other units occupied an area of 150 m^2 or more, depending on the requirements of the construction programme (see examples in annexes 1 to 9).

In general, in rural areas an estate could comprise of 8 to 10 workshops distributed over a covered area of approximately 600 m^2 to 1,200 m^2, inclusive of offices and other amenities. The number of enterprises accommodated was determined by the market demand resulting from a pre-feasibility survey.

In urban areas the estate was provided with a technical service centre and a number of production units with larger covered areas.

The parcel of land for these estates was sufficient for possible future extension.

The construction programme was sponsored and administered by the Kenya Industrial Estates (KIE), a parastatal institution entrusted by the Government to promote and assist the small- and medium-scale industrial sector nationwide.

Technical assistance was provided by UNDP/UNIDO and other bilateral agencies. It should be mentioned that such an extensive construction of industrial facilities was made possible primarily with government funding. Bilateral agencies from the Federal Republic of Germany, Sweden, Denmark, Finland and other international agencies such as the EEC and IBRD also assisted the small-scale industries through KIE.

This example shows to what extent a programme of construction can be implemented when such an undertaking is part of a long-term development plan.

8. Advantages of the estates

The small entrepreneurs are faced with serious difficulties in obtaining enough capital to invest in building and equipment to start their businesses. In addition, where proper regulations do not exist to facilitate easy access to credit institutions, the prospect for developing a business is not promising.

One of the advantages of the estate is to offer the entrepreneurs basic facilities at low rental, thus easing their initial financial obligations.

The sponsor of the estate is able to offer more economic facilities to the small industrialists in view of the fact that the construction cost and the completion time can both be reduced by adopting a typical building design that can be built with standard components throughout.

All the occupants will have the benefits of basic services and safety provided on the estate. In view of the concentration of activities, the estate is convenient for on-site advisory services as well as demonstration workshops.

The industrial estate may become a focal point within the community for training and human resources development.

Regional development and decentralization through a balanced industrial estates implementation programme can also be regarded in the long term as an additional advantage to the economy as a whole.

9. Extension services and technical service centre

Considering the estates as a means for implementing industrial promotion and institution-building, measures should be taken to strengthen and widen their functions with the view to achieving the basic objectives for which they are primarily built.

Emphasis should be put on a dual programme of extension services and training.

Through extension services, the estates management should be able to give training and assistance to the entrepreneurs in different subjects related to their businesses, i.e. management (administration, accounting, production planning, costing of finished products, how to run a small business, marketing). Depending on the level of technology and entrepreneurship in the region these services should be extended to other entrepreneurs in the entire geographical area within the jurisdiction of the estates.

In addition to extension services, the need for a TSC will be determined by the market demand for services which cannot be performed by the entrepreneurs on the estate or elsewhere in the area.

Repair, maintenance and manufacture of parts for machinery and equipment can be ensured by the service centre, thus avoiding production stoppages and losses.

The technical service centre, if properly equipped, will also provide technical training that will reinforce the complementarity to the programme set for the estates.

10. Incentives to entrepreneurs

Allocation of workshop premises at low rental costs, inclusive of basic services and safety, does not offer a guarantee to success for the small-scale entrepreneurs on the estates.

A package of complementary measures should be integrated within the framework of assistance with the view to:

10.1. Reducing taxes on imports of equipment and materials for the sector;
10.2. Easing administrative procurement procedure;
10.3. Creating commercial outlets and marketing for the products manufactured on the estates;
10.4. Providing access to credit and financing institutions that could offer acceptable terms and conditions to be tailored for the sector as a whole.

This target group is usually neglected by formal institutions of finance and industry promotion. The small entrepreneur is too often faced with a framework of concepts, procedures and policies which have proven useful for the medium and the large-scale undertakings.1/

This programme of incentives could considerably enhance the motivation of the entrepreneurs.

11. International assistance

The establishment of industrial estates in developing countries creates the need for assistance and close co-operation between Government and international organizations or bilateral agencies.

Proper assessment of the construction programme prior to its design and further development can be covered by international assistance to the interested government. Assistance should also be contemplated in the following main areas:

11.1. Feasibility studies

International assistance is helpful for assessing the estate project as a whole; in addition the assistance can be extended to identifying viable entrepreneurs through proper market survey and appraisal of each potential enterprise.

1/ Sources: Small-scale industry promotion in developing countries, editors: N. Molenar, M.S.S. El-Namaki, M.P. Van Dijk, Research Institute for Management Service; readings from a conference on small-scale industry problems and prospects in developing countries, Delft, 19-20 September 1983; Policies for financing of small industries, by J. de la Rive Box, chapter 12, p. 134.

11-2. Financing for construction and machinery

The cost implications related to construction and equipment should be spelled out objectively in the recommendations of the main feasibility study.

One possibility for financing may consist of a government commitment to assume the expenses if the project is considered a priority target of the overall industrialization programme.

Another possibility may consist of a government commitment to share the costs on a percentage basis with the international or bilateral agency involved in the project.

In some instances, a bilateral agency may agree to finance the construction phase only. The same agency may, however, consider machinery and equipment as a grant.

11.3. Training and extension services

Training and extension services are two areas where international assistance can bring much support to the activities of the estates.

Independently from on-the-job training and extension services, seminars can be arranged periodically for the benefit of entrepreneurs, managers and the technical workforce.

11.4. Selection of machinery and equipment

Based on the identification and appraisal of eligible projects, professional advisory services could be sought by the government concerned for the selection of appropriate machinery and equipment for each individual project.

12. Location of the estate

The location of the estate - whether in a rural or urban area - shall depend primarily on the policy and objectives designed for the promotion of the small-scale industrial sector.

The nature and level of enterprises already operating in the locality should be surveyed as should the availability of workers, level of skills, resources, social infrastructure and services.

Existing electricity and water supply shall be considered indispensable services without which a township could not be eligible for consideration.

The area reserved for industries is generally within the municipal development plan of a township. However, if no master plan is available, as might be the case in some rural areas, efforts should be made to find a suitable location not conflicting with i.e. residential areas, schools, hospitals, sporting grounds.

13. The site evaluation

A complete evaluation of the site should be conducted. Alternative plots must be considered in order for the sponsor to select the best option.

Industrial areas subject to development are usually earmarked in the outskirts of a township where the cost of land is much lower and poorly serviced as compared to lands reserved for housing projects.

Both the topography and the soil consistency should be analysed. The extent of levelling works on the one hand, and the type of substructure that may be needed on the other hand, shall provide enough elements for assessing the cost implications for site improvement and related works.

The evaluation shall be complemented with a proper survey of the services available in the vicinity. Electricity and water supply, sewerage system, communications, transportation and access roads shall be looked into.

In the example illustrated in annexes 3 and 4 (Karatina estate) the allocated parcel of land has a surface of approximately 1.3 ha out of which 6,000 m^2 is occupied by the current phase 1, the other part being held in reserve for a second phase.

The percentage of area covered by the main features on the estate with respect to the surface for phase 1 is the following: workshops, inclusive of own backyards, 40 per cent; roads and parking areas, 15 per cent; administration and external common toilet facilities, 2 per cent; open space, 43 per cent. The working population is around 80.

Each workshop is given the possibility for 50 per cent expansion of the existing floor area. The extension works can only take place within the backyard.

This example does not reflect a typical condition with regard to land usage, but suggests the scale of different elements to be considered in the evaluation process in anticipation of the site's development.

The extent of property necessary for construction shall depend on the programme intended for the estate and its possible extension. In the case of a government project, it might well be that the plot is allocated free of charge to the sponsor. In cases where this is not applicable, the expenses for the acquisition of a track of land should become an important element to be taken into account in the analysis of site evaluation and final selection.

The service of a consultant would be useful in view of the expertise needed, particularly at this early stage of the project.

14. Construction programme

Basically, the feasibility study should provide the necessary guidance and be the main source of information for the construction programme which could be executed in different phases depending on the extent of the project.

Working population to be accommodated in the estate, number of workshops, products to be manufactured, potential for expansion and land requirement should be analysed by the appointed architect and engineering consultants.

The consultants must have a clear background of the project as a whole in order to translate the programme into its final phase for design and construction, taking into account the cost implications and the sponsor's requirements.

It is important that a good balance between needs and means be maintained from the inception of the project. The dimensions of the sheds should reflect economy in size, with possibility for expansion, and should be in proportion to the needs of the entrepreneurs. The construction of oversized workshops would incur higher building costs, thus increasing rents which might cause financial difficulties to the small industrialists.

15. Typical workshops

No regulations exist indicating specific dimensions of workshops for small-scale industries.

Due to the types of facility to be found in urban and rural areas, one can assume that an area of 8 m^2 to 10 m^2 per worker would be adequate which would result in a floor area of 40 or 50 m^2 for a workshop unit as a basic module. Larger units can be obtained by increasing the basic module, as shown in annexes 1, 2 and 8.

The construction of workshops with less than 30 m^2 should be avoided due to the restricted working area as well as the problems which could arise with regard to rental and acceptable costs to entrepreneurs.

An estate conceived primarily for promotional purposes could conveniently comprise 500 m^2 to 1,000 m^2 of floor area of workshops. Additional areas for offices, common sanitary facilities, technical service centres or common facility workshops could also be provided.

The technical service centre already mentioned occupies a minimum surface of 200 m^2 and provides technical and general maintenance services for the entrepreneurs on the estate and for the community. A floor area of less than 150 m^2 is not advisable (see general layout in annex 2).

Regarding the common facility workshop, a covered area between 80 m^2 and 100 m^2 would be sufficient to accommodate particular tools and equipment for use by entrepreneurs with skills for special production.

16. Consultancy services

The design and the construction phase shall require the commissioning of a team of consultants, i.e. architect, engineer, quantity surveyor. The architect shall have the overall responsibility for co-ordination and execution of the work.

The primary task of the consultants shall consist of preparing a comprehensive preliminary design proposal and cost estimation for discussion with the sponsor.

Upon approval of the scheme showing a general layout of the estate with its typical workshops, the consultants shall produce the following documents:

16.1 Architectural and structural construction details;
16.2 Civil works: sewerage, drainage, water storage and distribution, roads and parking areas;
16.3 Electrical installation;
16.4 Landscaping and fencing;
16.5 Specifications of materials and bills of quantities.

The preparation of these construction documents must be carried out in co-ordination with all the consultants having overall responsibilities. After completion of the documents, the project is ready for tender. The consultancy services shall also include the following follow-up activities:

16.6 Tendering procedure;
16.7 Evaluation of tenders;
16.8 Selection of contractor;
16.9 Award of contract;
16.10 Supervision of the construction works;
16.11 Construction management.

17. Time-table for implementation

The cycle for the implementation process is estimated to take approximately 24 months from the feasibility study to the commissioning of production before the centre can be operational.

The activities are summarized as follows:

		Tentative timing (months)
17.1	Feasibility study	2
17.2	Assessment of the study and securing funds for the project	2
17.3	Commissioning of consultants	1
17.4	Preliminary design and cost estimate	1
17.5	Design development and preparation of construction documents	4
17.6	Submission of project to municipal authorities for approval	1
17.7	Tendering, evaluation of tenders and award of contract	2
17.8	Construction works	8
	Subtotal	21
17.9	Installation of machines and equipment	1
17.10	Allocation of sheds to entrepreneurs	2
	Total months	24

18. Cost considerations

Referring as an indication only to the construction projects in Kenya, the scale of expenses per square metre of floor area for a typical shed in 1983 was of the order of US$ 200 to US$ 300, inclusive of infrastructure. The figures did not include costs for property which was given free of charge by the Government.

Construction costs may vary considerably from country to country. In addition, within a country itself, projects typical to particular regions will most likely reflect cost discrepancies due to the different conditions under which they are to be implemented.

Other areas for cost consideration are in the infrastructural work for which soil conditions, topography of the plot, services and access roads play an important part in the final cost of a project.

To minimize expenditure, the sheds in the Kenya projects were identical in shape and dimension and the components specified were standard throughout. The use of local materials also helped to reduce costs.

As a rule of thumb, for these kinds of project the cost for the building alone represents roughly 50 per cent of the total amount of the project, the other half being spent on infrastructure, roads and services. This proportion will be different if particular work is necessary for infrastructure.

Finally, the quality of the work in general has implications on the cost of a project. Poor quality work would necessitate costly repairs at an earlier date. The construction work should be executed within acceptable standards of safety, with good workmanship and frequent supervision by qualified professionals. By so doing, unforeseen maintenance problems and cost implications could be significantly minimized.

19. Management and maintenance

The management of the estate shall not be confined to rent collection and road maintenance only.

A manager with satisfactory technical and managerial skills shall be appointed and provided with the necessary assistance so that relevant activities can be implemented with a view to achieving the objectives for which the estate was constructed.

Besides the daily administrative matters, the management shall develop activities in connection with training for entrepreneurs and skilled workers, quality control of production and extension services.

Assistance to the tenants shall also be considered in matters relating to procurement of raw material or other goods, administrative bottlenecks and delivery of products manufactured on the estate.

As for maintenance, a programme of periodical activities would be highly desirable. Poor maintenance due to lack of guidance and funds should be avoided.

Machinery, roads, buildings and services shall be subject to periodical inspection if deterioration is to be prevented. Appropriate preventive measures in the long term will be to the advantage of both sponsor and entrepreneur. During these inspections the tenants shall also be briefed as regards safety measures on their premises.

20. Construction specifications

These guidelines apply to both the buildings and the infrastructure. The materials specified for the different workshops are identical, mainly to standardize the construction process and reduce costs.

The specifications for the infrastructure (which may be subject to amendment for compliance to building codes and site conditions) are given in more general terms due to the fact that the conditions may vary from site to site within a country and from country to country.

20.A. Workshops

20.A.1 Substructure

The soil tests shall provide the necessary data regarding its nature, consistency and load-bearing capacity. The findings of such tests shall give the necessary data for the most appropriate and economical type of foundation, i.e. conventional strip foundations, isolated concrete footing, footing with tie-beams.

20.A.2 Floor

The concrete floor shall be at least 100 mm thick, 1x2x4 concrete mix with wire mesh reinforcement, 150 x 150 mm grid from 3 mm to 6 mm diametre bars. The thickness in the order of 150 mm can be considered depending on the consistency of the soil and/or the machinery to be installed.

The floor shall be built on hardcore filler, minimum 300 mm deep, on firm compacted soil.

A more economical way of floor construction would consist of providing a 150 mm deep concrete floor slab under the area occupied by heavy machines. This part of the floor would be isolated by an expansion joint from the adjacent floor all around.

To protect the floor from soil humidity, a waterproof membrane should be laid on top of the compacted hardstone filler before casting the slab.

A concrete hardener shall be added in the mix at all workshops floor.

20.A.3 Walling

The exterior walls shall be built with hollow concrete blocks measuring: 200 x 200 x 400 mm (HxWxL).

The interior partition can be of hollow concrete blocks 150 x 150 x 400 mm. A much cheaper partition can be provided with a wooden frame 50 x 100 mm on which is nailed a light gauge galvanized metal cladding. This solution is more practical in case of extension should a workshop be made available. For safety reasons, however, a permanent type of partitioning is advised.

Damp-proof membranes must be provided at the base of all external walls.

20.A.4 Main structure

Columns and beams shall be in reinforced concrete using 1x2x4 concrete mix as for the floor slab. The reinforcement bars shall be in accordance with the engineering details and regulations.

Steel could also be used for the main structure, in which case its availability and the cost implication shall be considered. The steel offers the great advantage of easy erection and reduced completion time as compared with a concrete structure.

20.A.5 Roof structure

Wood trusses are recommended in view of the span of only 7 m between exterior walls of the workshops. For longer span, steel would be more appropriate.

The height between the finished floor level and the under-side of the truss shall not be less than 3 m.

20.A.6 Roof covering

Corrugated galvanized iron sheets are quite common in developing countries. However, due to their poor insulation properties, cross ventilation under the roof should be provided. Asbestos roofing offers better insulation, but it is considered more expensive.

20.A.7 Openings

Doors: Sliding doors at the main entrance shall be provided at all workshops. Workshops having 50 m^2 or more of floor area are usually built with a main entrance of 2.40 m. In workshops where the basic unit of 40 m^2 of floor area is used, the main door shall have an opening of 1.80 m provided with two single pivoted panels of 90 cm each. The height should be at least 2.40 m. All other doors at the workshops shall be pivoted type unless otherwise required.

For security reasons steel doors are recommended.

Windows: The total surface of the openings shall be not less than 10 per cent of the floor area of the workshop. This percentage may be increased according to climatic conditions and greater needs for cross ventilation.

Clear louvered glass mounted on a metal frame fixed to a wooden frame is a common practice and easy to install.

Security bars with a minimum of 12 mm diametre shall be provided at all windows.

20.A.8 Finishes

Walls: Interior and exterior face of concrete block walls shall not be plastered unless required by local building regulations. No painting is necessary unless required.

Floors: The workshop floor surface shall have a smooth concrete finish.

Ceilings: A ceiling is not needed in the workshops.

20.B. External works

20.B.1 Roads

Asphalt for roads and parking areas is advisable. The road base shall be according to established standards and approved engineering details. The width of the road from kerb to kerb shall depend on the expected traffic and the size of estate. A minimum width of 6.50 m

shall be considered appropriate. Whenever possible, adequate parking areas shall be provided near the sheds for easy access to and from the working place.

A cheaper solution for road surfacing shall consist of building the top surface with a layer of compacted red clay on approved hardcore base compacted also according to engineering specifications.

20.B.2 Drainage

Standard details for surface drainage are usually designed in accordance with specifications made available by the division of public works. Special care must be given to the protection of buildings, roads and the property itself.

20.B.3 Sewerage

The system shall be designed to provide suitable capacity for the estate and its forseeable extension. If no municipal sewerage is available, a septic tank shall be provided. Provision for increased working population shall be made and the system built according to proper engineering design and established regulations.

20.B.4 Water supply

Each workshop shall be provided with at least one water pipe connection and proper meter.

In the event of supply cuts from the water mains, an elevated water tank shall be provided with enough storage capacity. A 3,000 litre tank should be the minimum appropriate for a small industrial centre of about 600 m^2 to 800 m^2 of covered area. Provision should be made at the design stage to increase the capacity if need be in case of expansion of the centre.

Pressed-steel tanks with prefabricated components should be utilized whenever possible in view of their greater flexibility in assembly as opposed to concrete which requires a more elaborate construction technique.

20.B.5 Electrical installation

The main source of power supply should be as close as possible to the plot. A transformer is necessary to scale down the voltage supplied by the main. Two types of power supply are needed on the estate: a single phase for illumination of workshops, offices, and other facilities and a three-phase for machinery.

The power shall be distributed from a wall-mounted meter box and switchboard installed for each workshop.

For safety reasons the entire installation must be in accordance with approved regulations and specifications.

20.B.6 Fire protection

Wall-mounted fire extinguisher units must be installed at all workshops. The type of extinguisher to be provided shall be in compliance with safety regulations and the nature of the production units on the estate.

On large estates, fire hydrants shall be provided on the service roads. This will necessitate additional water storage capacity in the water supply system.

20.B.7 Fencing and landscaping

Fencing shall be provided within the perimeter of the plot as per certified topographical survey.

Chain-link and barbed wire are the most common systems for fencing industrial plots, the latter being less costly. The landscaping is necessary to improve the general outlook of the complex, create a pleasant working environment, and protect the soil.

21. Summary and conclusion

The establishment of industrial estates for small-scale industries in developing countries shall be seen as the result of a policy whose objective consists of creating an instrument for assisting and promoting the sector within a framework of institution building.

This policy must be encompassed in a wider context of industrial promotion and development in which the small-scale entrepreneurs are given better opportunities to participate in a more coherent way in economic activities at national level.

The industrial estate relieves the entrepreneurs from the financial obligations that would arise from purchasing land and equipment. Besides the low rental cost of premises, other forms of incentive shall be provided mainly in the form of low interest loans. Training shall be considered an important component of the incentive package to be designed for this sector.

Assistance from governments and the international community will be necessary to activate the participation of the small industrial sector in the economic development process. Bringing the estates to the rural areas should also enlarge this participation in the programme of promotion at grass-root level.

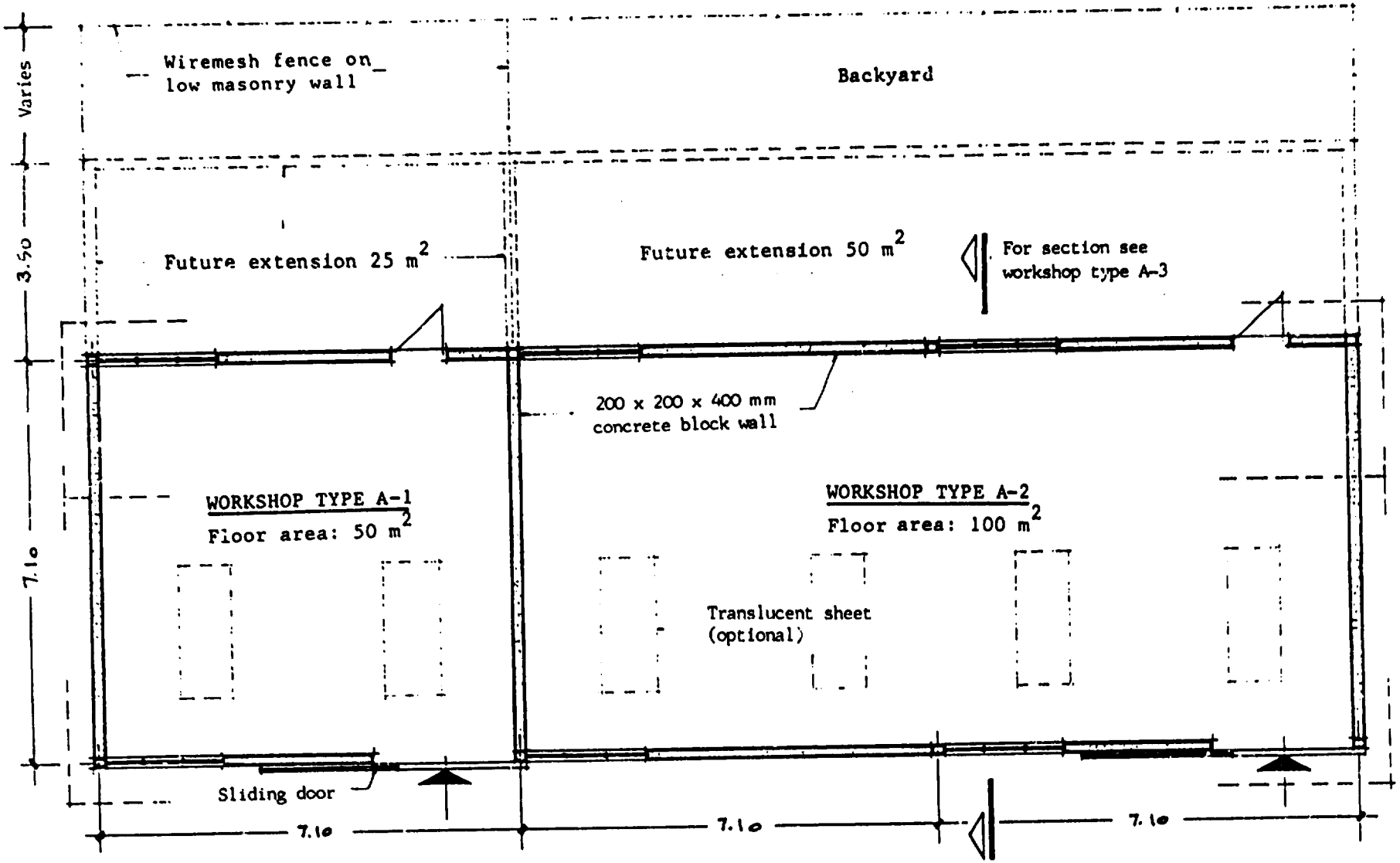
The operational base of the estate should not be confined to the community where the facilities are provided. Extension services at regional level within the country shall contribute to achieving the promotional objectives designed for the estate.

The models of workshops illustrated in the annexes are meant to indicate a solution regarding the minimum working space necessary, the most appropriate type of industrial sheds, and the materials best suited for their construction.

The basic module can be enlarged without having to change the standardized components, thus keeping costs low.

As previously noted, the promotion of the small-scale industry shall not be limited to only providing industrial facilities to the sector. Assistance from the international community and long-term commitments from Governments will be necessary to create the appropriate environment for the small entrepreneurs so that more entrepreneurial capabilities can be developed, better products can be manufactured, and more employment opportunities can be generated at national level.

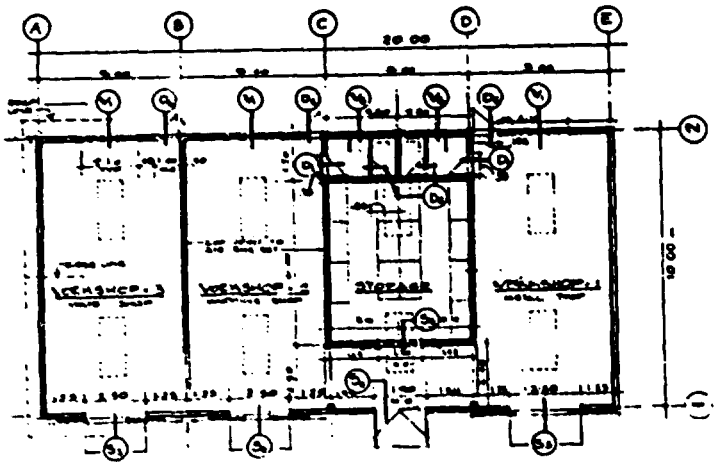
Finally the estate management shall not be limited to administrative duties or service operations. Estate managers, properly qualified and trained, shall participate effectively in the promotional activities, the industrial estate being the focal point of such activities.



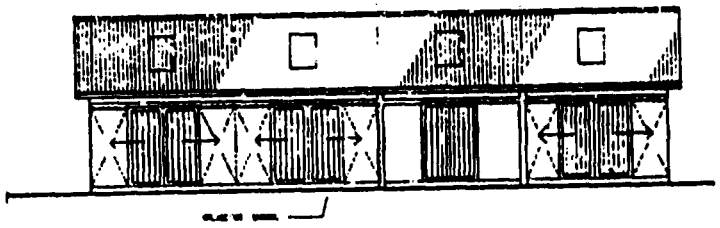
WORKSHOPS TYPE A1 and A2

Scale 1/100

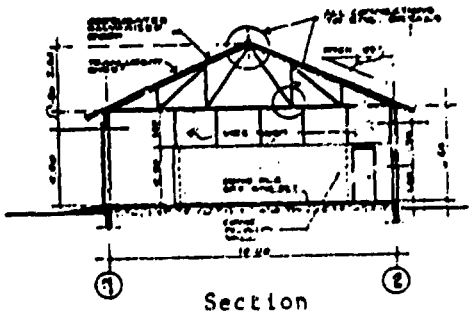
Annex 1



Plan



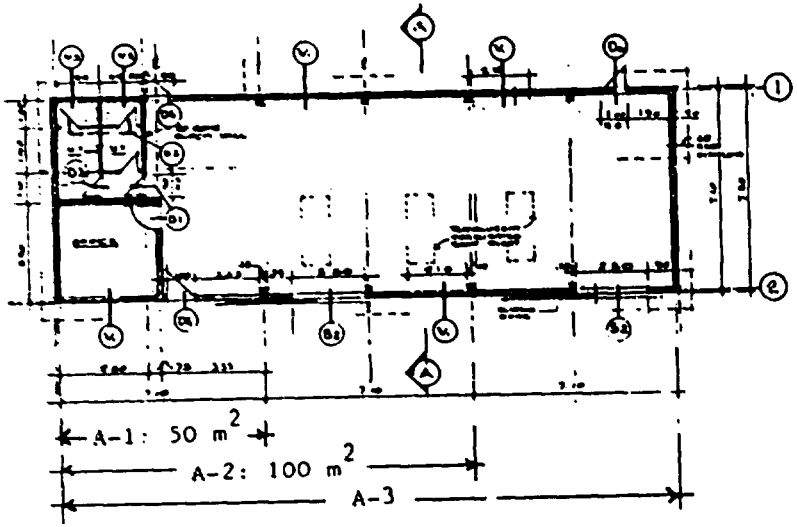
Front Elevation



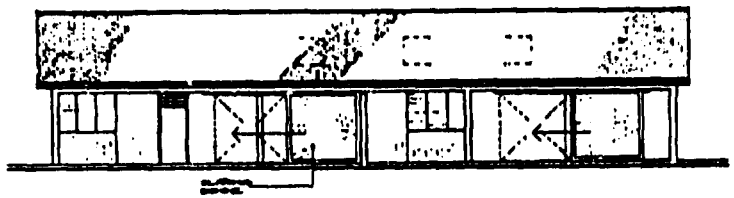
Section

TECHNICAL SERVICE CENTER

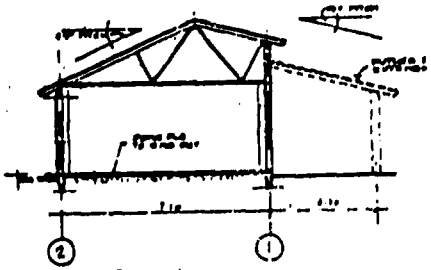
Floor area: 200 m^2



Plan



Front Elevation

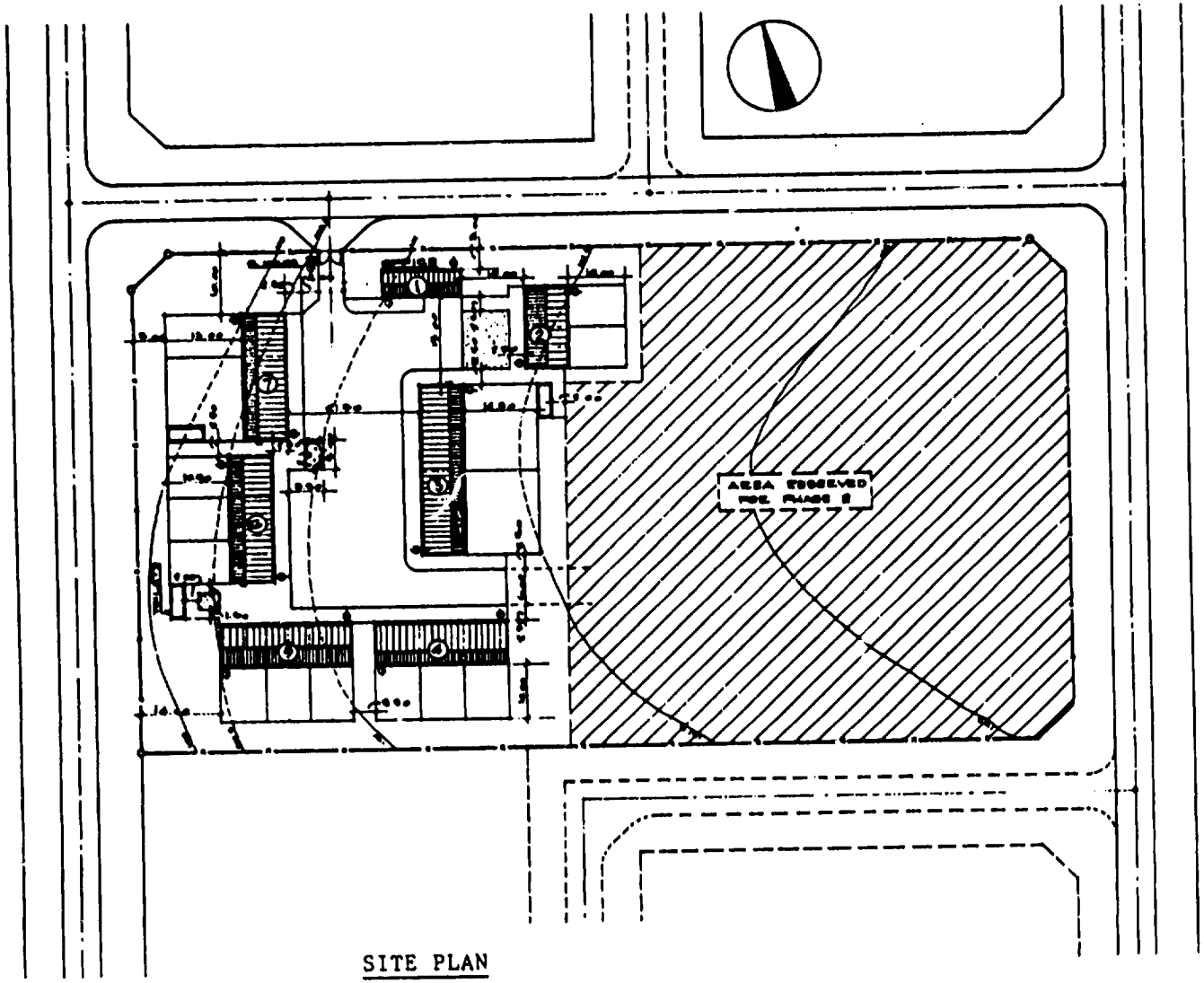


Section

WORKSHOP TYPE A-3

Floor area: 150 m^2

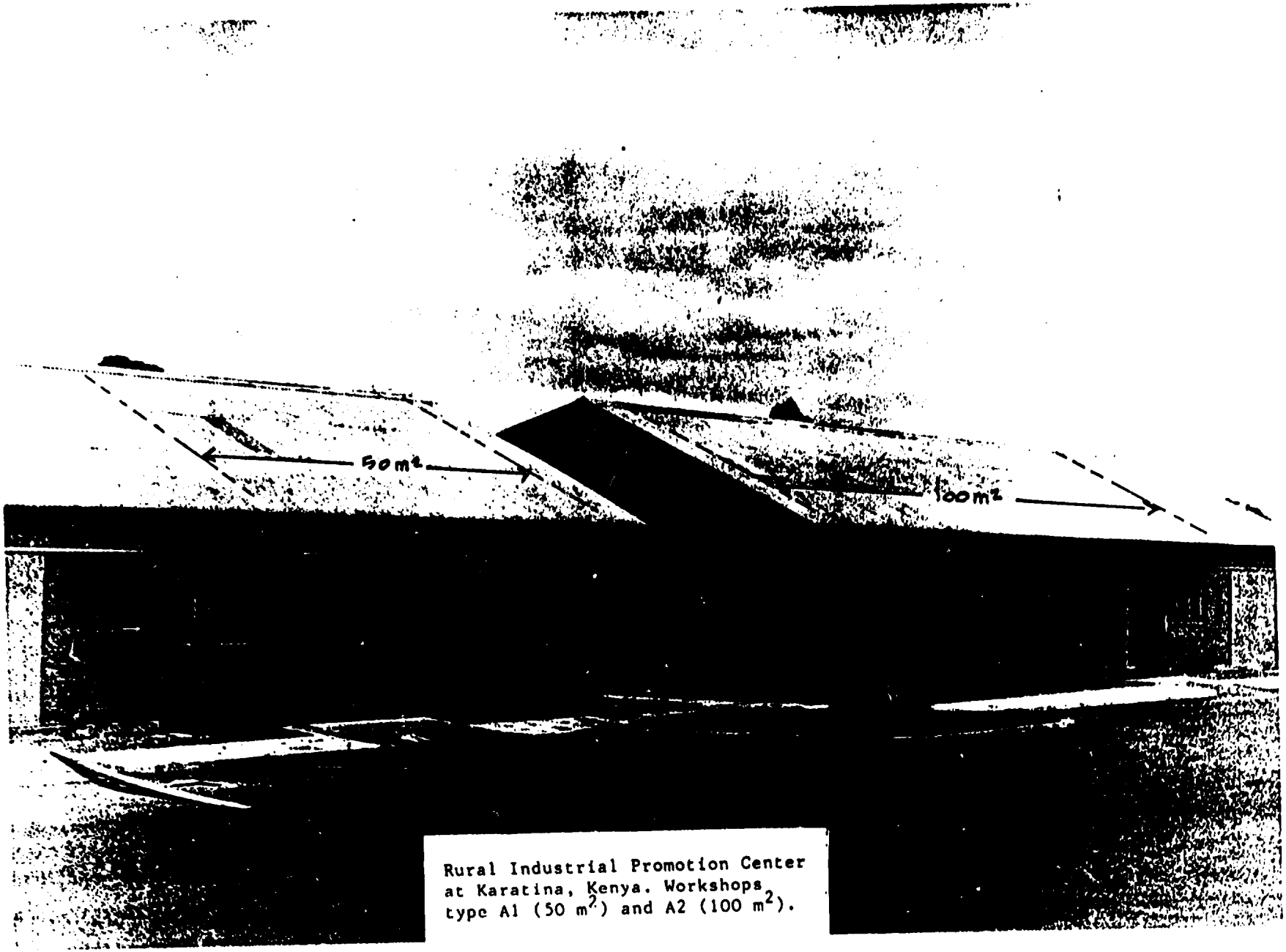
Annex 2



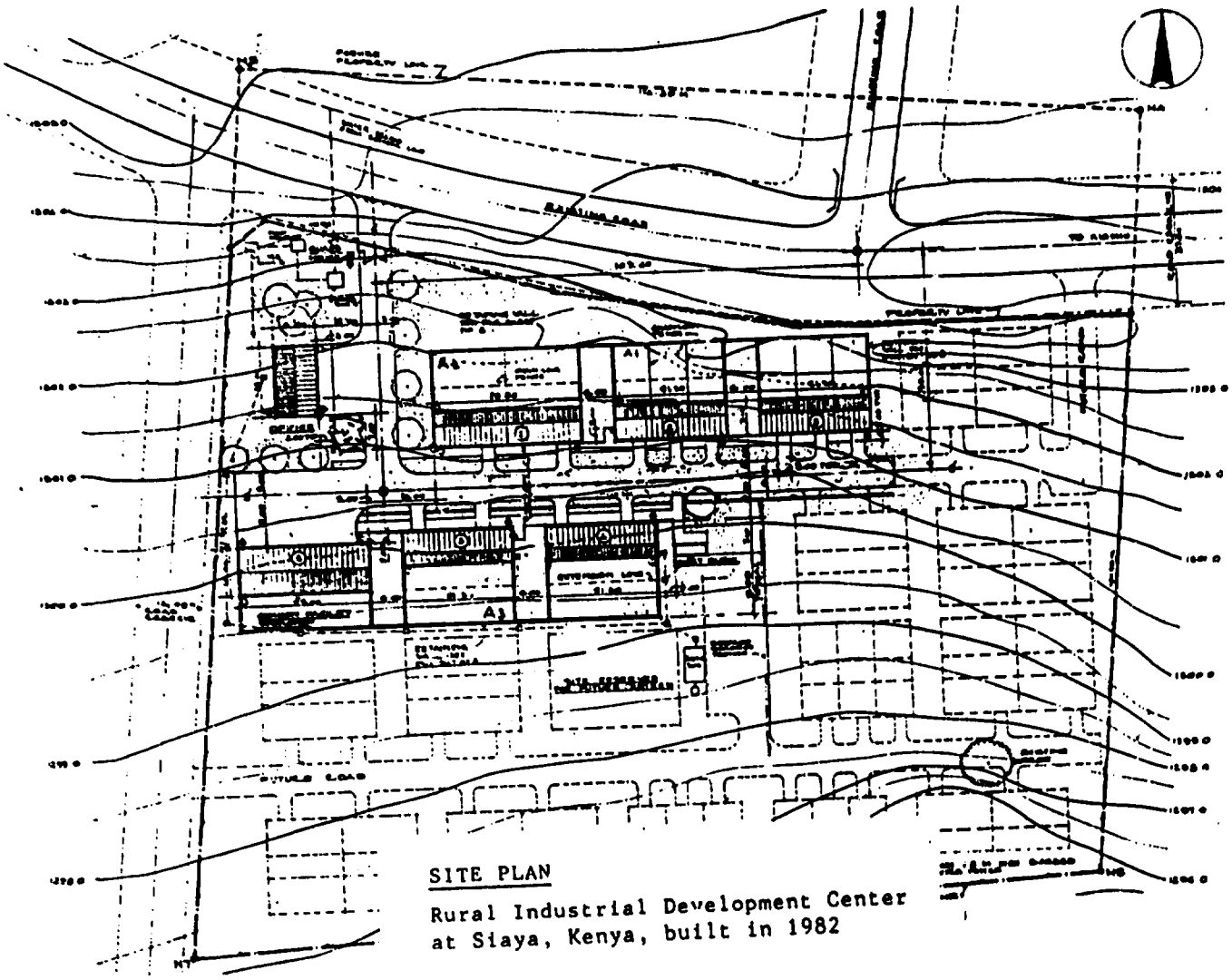
SITE PLAN

Rural Industrial Promotion Center
at Karatina, Kenya, built in 1980

Basic Workshop Unit: 50 m^2
Covered Area of Estate: 1000 m^2



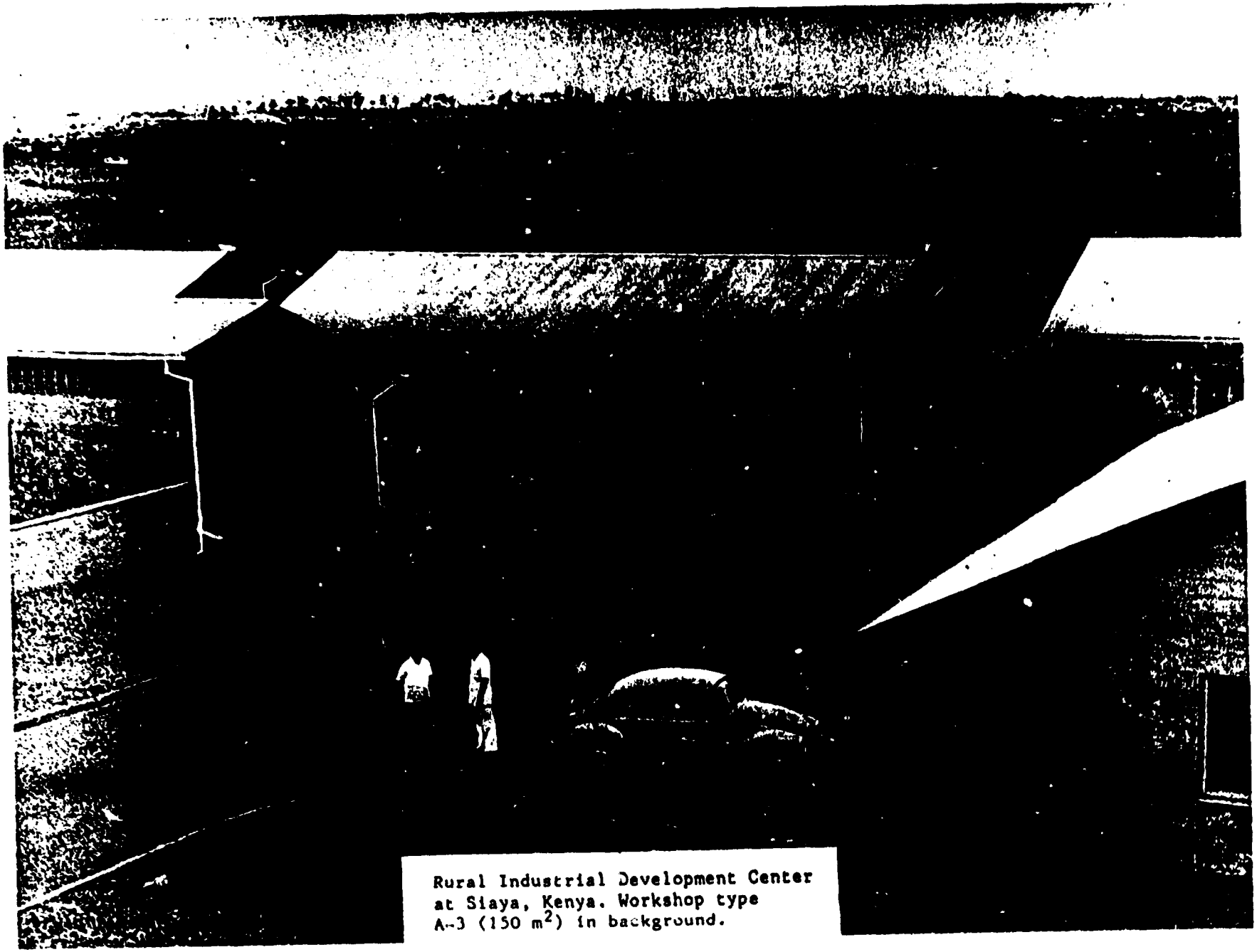
Rural Industrial Promotion Center at Karatina, Kenya. Workshops type A1 (50 m^2) and A2 (100 m^2).



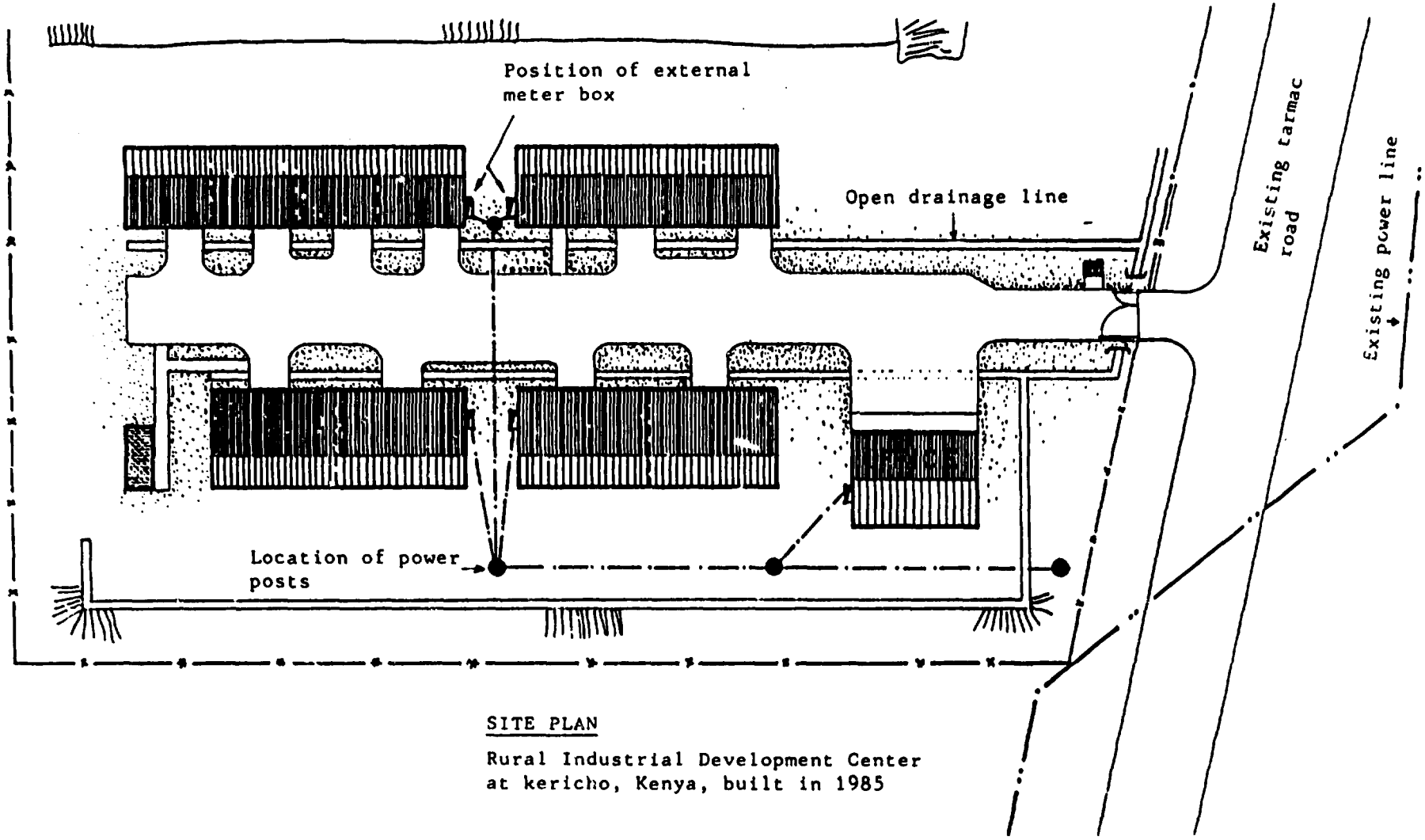
SITE PLAN

Rural Industrial Development Center
at Siaya, Kenya, built in 1982

Basic Workshop Unit: 50 m^2
Covered Area of Estate: 1200 m^2



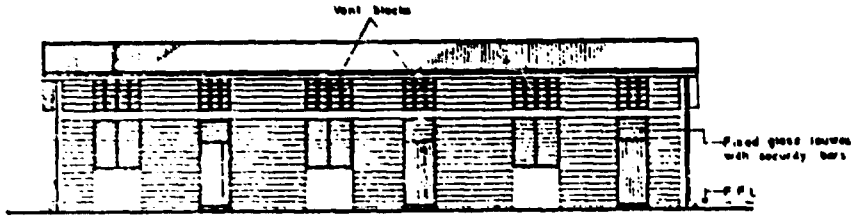
Rural Industrial Development Center at Siaya, Kenya. Workshop type A-3 (150 m^2) in background.



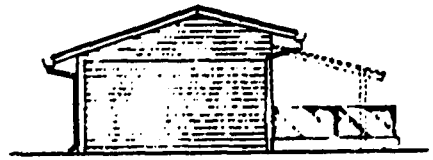
SITE PLAN

Rural Industrial Development Center
at kericho, Kenya, built in 1985

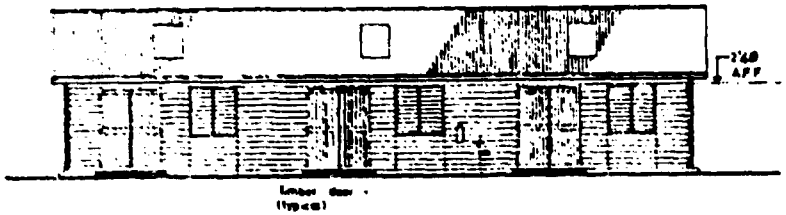
Basic Workshop Unit: 50 m^2
Covered Area of Estate: 875 m^2



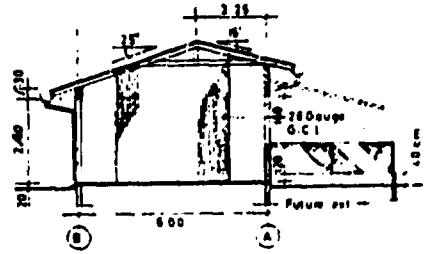
Rear Elevation



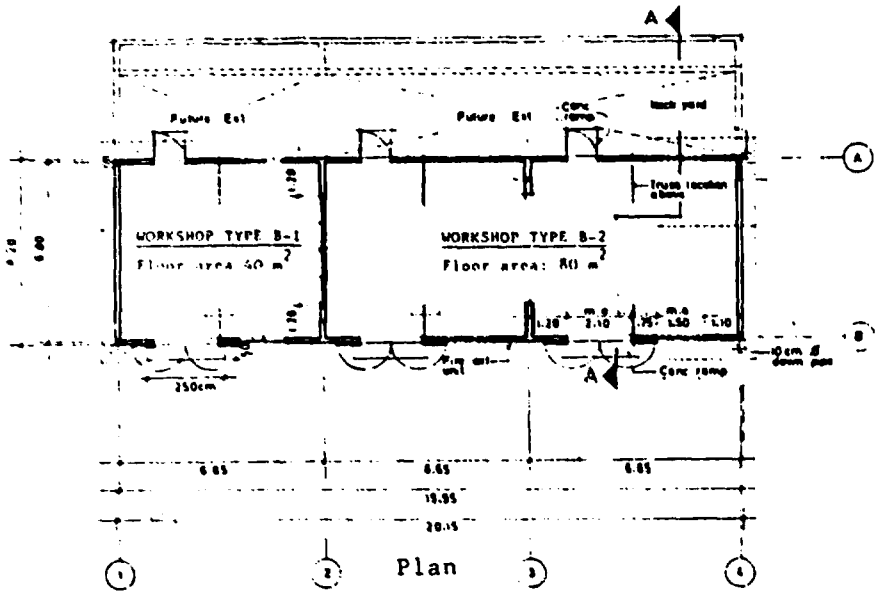
Side Elevation



Front Elevation



Section



Plan

WORKSHOPS TYPE B-1 and B-2

Annex 8

Rural Industrial Promotion Center

at Kibwezi, Kenya, built in 1983

Basic Workshop Unit: 40 m^2
Covered Area of Estate: 520 m^2