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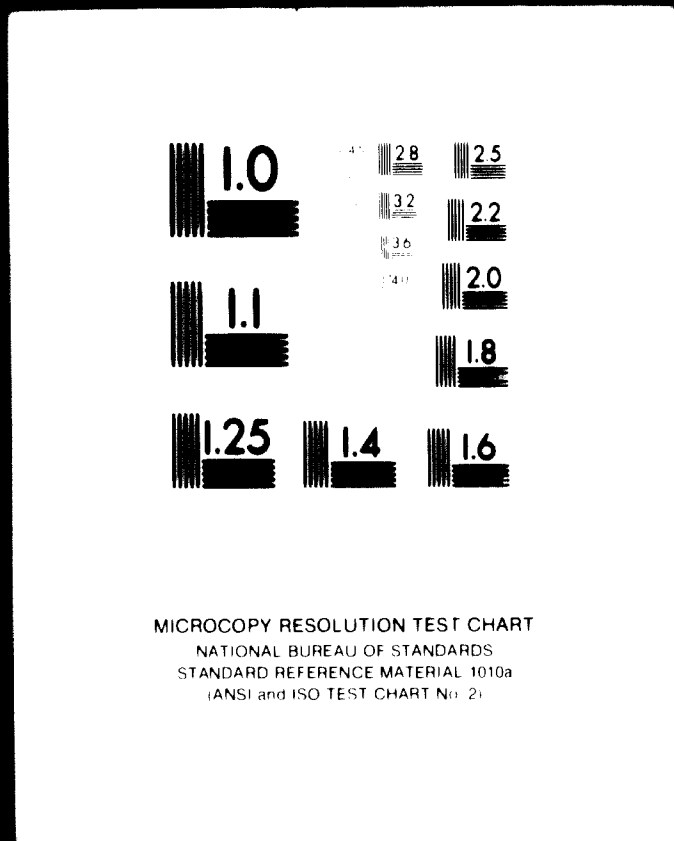
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DEVELOPMENT
OF INDUSTRIAL ESTATES
IN "NORTH-EAST" - BRAZIL



1970

FOREWORD

At the request of the Federal Government of Brazil, the United Nations Development Programme, in cooperation with the United Industrial Development Organization, agreed to provide assistance in advising on location of Industrial Estates and on the general plans for their development.

This mission was composed of one member, ARIE COHEN, Architect and Town Planner (ISRAEL) - the writer.

The present, revised, draft report meets the following advice issued by the United Nations Industrial Development Organization (x)

- (a) "A brief account of the Terms-of-Reference of the mission and the tasks he was asked to carry-out in his initial briefing in Recife.
- (b) "A summary containing advice to SUDENE:

- On policies and strategies for the development of Industrial Estates;
- On the selection of sites;
- On physical planning; and
- On organizational problems of establishing the Estates."

Terms of Reference issued at Recife.

The Terms of Reference issued verbally by SUDENE at Recife, at the initial briefing meeting with the Director of the Division for Research and Programming is the following:

"The United Nations Industrial Development Organization mission is requested:

- (a) To examine a number of Industrial Estates (xx) in course of establishment in the 'North-East' Region, analyse problems referring to location, planning and implementation, deduct conclusions and make recommendations to the Director and the staff members of the Division for Research and Programming.
- (b) "To select one (or two) of the above mentioned sites and undertake its - (or their) physical Planning."

These Terms-of-Reference were carried out by this mission during its stay in Brazil.

(x) Received in Recife on the 19th Feb. 1970.
(xx) As proposed by SUDENE.

ACKNOWLEDGEMENTS

The mission gratefully acknowledges the assistance accorded to it by His Honour

GENERAL TACITO THEOPHILO GASPAR DE OLIVEIRA, Superintende of the Superintendencia do Desenvolvimento do Nordeste;

DR. ANTONIO PEREIRA PINTO, Superintendente-Adjunto;

DR. LEONIDES ALVES CASADO, Chief of the Department for International Cooperation;

Messers GERALDO ALVES CASADO and GILDO TAVARES NUNES MACHADO, Senior Assistants to the Chief of the Department for International Cooperation

and by all the Staff Members of the Division for Research and Programming who actually assisted the mission to carry out the drawing, typing and technical details and especially by Miss Darcy the Secretary of the Division who was in charge for this assistance.

The mission wishes to extend its high appreciation of the permanent assistance and cooperation given to it by:

(a) the Senior Officials of SUDENE:

DR. HUGO ALMEIDA, Chief of the Department for Industrialization;

DR. VALFRIDO SALMITO FILHO, Deputy Chief of the Department for Industrialization;

DR. LUIZ FERNANDO CORREIA DE ARAUJU, Chief of the Division for Research and Programmings;

DR. GLAUCO ANTONIO MADEIRA MELIBEU, Deputy Chief of the Department for Transportation;

(b) DR. LAYETTE LAMARTINE AZEVEDO, Civil Engineer, the Deputy Chief of the Public Works Department - D.E.R.

The mission wishes also to extend its appreciation for the assistance given to it by the following members of the United Nations Development Programme Office at Rio de Janeiro:

MR. EDUARDO ALBERTAL, the Resident Representative;

MR. MARCEL LANDEY, the Deputy Resident Representative;

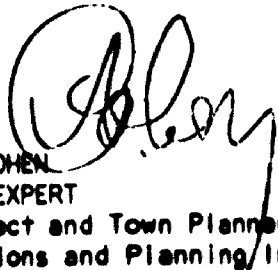
MR. ROMEO BONINI, Senior Field Adviser, Industrial Development UNIDO;

MR. D. T. RICHARDS, Senior Administration and Personnel Officer.

Last but not least the mission wishes in particular to extend its highest appreciation and gratitude to:

MR. J. DULA NAVARRETE, Project Manager F.A.O., for his permanent friendly assistance, as well as to his administrative staff.

To all the above mentioned persons the mission's thanks and gratitude are again extended.


ARIE COHEN
UNIDO EXPERT
Architect and Town Planner
(Locations and Planning/Industrial Estates)

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(x) Inspected by this mission at SUDENE's request.

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1. POLICIES AND STRATEGIES FOR
DEVELOPMENT OF INDUSTRIAL ESTATES
IN
"NORTH - EAST"

1.1. THE PROBLEM

The "North East" region of Brazil is characterized by low levels of industrial development and technical productivity, low rates of average income per capita, resulting in migration of population and private resources to the dynamic & developed South.

This process may be mainly related to disparities prevailing within the region itself, between its lagging and poor "Interior" and its relatively developed "Coastal Area".

The "Interior", which is featured by redundant labour-force from agriculture, on one hand, and absence of any other occupational opportunities on the other, is being continuously deserted for the "Coastal Area".

The "Coastal Area", due to the limitations in its employment and housing markets, fails to meet the demand.

Migration, thus, proceeds southwards.

The vicious circle created in the interior by three factors: Unemployment, Migration and Economic decline, aggravates, further-on, Intra - regional as well as inter - regional disparities. ("Interior" versus "Coastal Area" and "North East" versus "South".)

Moreover, such disparities exert detrimental effects on the country as a whole, by leading to overall imbalance in the economic structure and by weakening the defence system.

Hence, reluctant "Interior" constitutes not only the major problem of "North East" but also a National issue.

It is, therefore, presumed that enhancement of the "Interior's" productivity, while meeting its employment demand, would have positive repercussions on the entire North East region, as well as on the country as a whole.

The difficulty and importance lying in this objective calls for coordinated efforts and actions of the State and the North-East regional Authorities.

1.2 THE INDUSTRIAL ESTATE - A STIMULANT FOR INDUSTRIAL DEVELOPMENT

1.2.1 General.

Planning a system of Industrial Estates in the North-East might provide an efficient device, both to reverse trends of economic decline and depopulation of the "Interior", and to serve as stimulant for further industrial development of the "Coastal Area".

1.2.2 Main Advantages.

The ability of the Industrial Estate to initiate industrialization in a lagging region may be related to its characteristics:

- (a) The Industrial Estate, often, includes Small Scale Industries of various branches which may provide occupation for any kind of unemployed labour force - a major problem in an underdeveloped region.
- (b) The Industrial Estate has attractive features from the industrialists' view point, such as:

- Pre built factories for rent; subsidies provided by public funds which alleviate financing problems, location within a wider range of utilities and services which reduce investments on implementation.

- (c) The Industrial Estate (due to the above features) has the ability to oppose individual trends - to concentrate in developed areas - and contribute, in a way, to implement regional goals of industrial decentralization.

1.2.3

Size.

Industrial Estates differ in size according to the characteristics of the region in which they are located.

S m a l l^{x)} Industrial Estates would generally suit agricultural areas. They may contribute in developing agriculture industries such as: food processing plants, food packing plants, primary processing of agricultural raw material, creameries and workshops for agricultural machinery. They may as well be combined with supply depots for agricultural fertilizers, fuel and equipment. Such estates may be appropriate for the "Interior". They may be tied in to small existing towns or big villages, provide occupation to unemployed labour force, on one hand and use housing, existing facilities, community services and infra-structure they might possess on the other. Thus, problems of accommodation, at the initial stage, might be spared. In the course of time the estates might become Nuclei of "Growth Poles". (Diseconomies of scale, resulting from small enterprises, would be offset by regional, social and economic benefits achieved).

B i g g e r^{xx)} Industrial Estates would suit for Small Scale or Medium Scale Manufacturing enterprises. They would be appropriate for the "Coastal Area" where they might be located at proximity of bigger manufacturing enterprises and stimulate "subcontracting".

1.3 LOCATION OF INDUSTRIAL ESTATES IN "NORTH-EAST"

1.3.1

Planning Approach.

Location of Industrial Estates should be governed by a comprehensive approach combining economic considerations pertaining to industrial development policy with those regarding physical planning.

Thus, a regional pattern of industrial estates should form a coordinated system contributing to implement regional goals such as: Industrial employment and production targets; Desired population distribution patterns; Desired land use pattern; Rational timing in allocation of capital resources for provision of infra-structure and other services.

Location of Industrial Estates should be studied at two subsequent levels, regional and local:

- (a) The study at the regional level should elaborate a general concept, based on cooperation between physical planning and industrial development in translating economic goals and objectives to space requirements.

Under this concept alternative plans, for regional spatial distribution of Industrial Estates, should be designed.

x) Size of Estate: 20 to 60 acres. (8 to 24 hectares).
xx) Size of Estate: 60 to 120 acres. (24 to 48 hectares).

Alternates should be evaluated and ranked according to their ability to meet the pre-determined objectives. The chosen alternate should be the one supposed to maximize regional welfare through optimal use of human and physical resources available in its context.

- (b) The study at the local level should test the adequacy of proposed sites, mainly from physical view-point. Objectives influencing decision making would be: optimum of favourable conditions for implementation, minimization of complications, procedure, time and cost.

Objectives at both levels should be translated into a criteria set-up to serve a tool for analysis and choice between alternates using various techniques, such as: cost-benefit-analysis, scoring etc.

In case of the North-East, data surveys and forecasts available in the four year plan "IV PLANO DIRETOR De Desenvolvimento Economico E Social Do Nordeste - 1969-1973"^{x)} should be deepened and refined to a pre-investment study covering the whole region. This pre-investment study would serve as basis and guidance for a distribution of Industrial Estates at the regional level.

It is worth remarking that a comprehensive regional plan would provide the soundest basis for location of industrial activities at the regional level.

Still, as it often occurs, lack of: time, budget and availability of the whole wide range of statistical data required compels the planner to adapt a more pragmatic, but practical approach.

1.3.2

Planning Objectives.

The ultimate objective of planning a system of Industrial Estates for the whole of the North-East would be to reduce disparities between the "Interior" and the "Coastal Area".

The aim of the plan at the regional level would be not a mere coordinated distribution of estates, throughout the North-East, but rather stimulation of "Growth Poles", which are centres, including, along with the estates, residential areas, community services and amenities. (According to this concept the Industrial Estate becomes a component part of the region within which it is located and on which it would depend for scale and character.)

1.3.3

Location Criteria at the Regional Level.

1.3.3.1

General.

The "Interior" and the "Coastal Area", by virtue of their characteristics and their problems, should be assigned different regional development programmes. Subsequently, criteria for analysing adequacy of location of Industrial Estates in their context, should be different.

1.3.3.2

Criteria for the "Interior".

- (a) Location in areas characterized by redundant agricultural labour force, unemployment and migration.
- (b) Integration in small existing towns, possessing partly housing facilities and community services, or at their vicinity, while promoting them to become "Growth Poles"; or, in a group of villages, one of which might be selected for promotion as a "Growth-Pole".

^{x)} Ministry of Interior - SUDENE, IV PLANO DIRETOR De Desenvolvimento Economico E Social Do Nordeste, 1969-1973, Recife, 1968.

- (c) Accessibility to marketing centres.
- (d) Accessibility to supplies and services.
- (e) Convenient access to existing, or prospective national communication system.
- (f) Proximity to main supply systems of Utilities: electric power stations and/or power lines; sea, large rivers or adequate land areas or features for disposal of sewerage after being treated.
- (g) Location in plains where relatively convenient climate conditions prevail.

1.3.3.3

Criteria for the Coastal Area.

- (a) Proximity to an existing growth-nucleus, including Industries of scale: electrical power stations etc. enabling Industrial Estates to profit from the infra-structure and general development, introduced by these, at their vicinity.
- (b) Proximity to an existing city or town enabling Industrial Estate to profit from various urban services as well as skilled manpower etc.
- (c) Integration in regional development programmes of broad scope, enabling Industrial Estates to reduce development costs on one hand and to contribute to their successful materialization, on the other.

1.3.4

Siting Criteria at the Local Level.

After a regional pattern of Industrial Estates is established, alternative sites should be evaluated from local view-point according to the following criteria:

- (a) Topography: flat land with slope not to exceed an average of 2.5% (acceptable "cut and fill" for levelling large buildings) and not inferior to 1% (required for storm-water drainage).
- (b) Soil: Soil load-bearing rate not to be under 1 kilogram per square centimetre; not sagging; free of flood or subsidence, and not of rocky nature, (to minimize cost of trenches and eventual slight levelling, "cut" especially).
- (c) Size: (Including 30% to 50% reserve). Tracts of land 30-60 acres (12 to 24 hectares) for small estates - suitable generally for the "Interior", or 100-150 acres (40-60 hectares) for large estates - suitable generally for the "Coastal Area".
- (d) Form: Rectangular, or near to, to achieve functional layout.
- (e) Infra-Structure: Easiest links to transportation systems and utilities;
- (f) Land Value: Relative low prices;
- (g) Land Ownership: Uncomplicated, to avoid delays in initiation of Implementation. (Single ownership or LAND-BANK (x) ownership would be the best).
- (h) Competing Uses: Land free from competing claims such as residential, commercial or of nature exclusively suitable for agriculture.
- (i) Adjoining Areas: Prevent undesirable neighbourhood in relationship with adjoining areas (existing or proposed).

(x) See LAND-BANK in Section: "Organizational Problems" Para No.1.5.2

1.3.5

Phasing Policy.

Phases of development should include the "Interior" and the "Coastal Area" simultaneously. A determined policy regarding allocation of public investments and subsidies should prevent the relatively more attractive "Coastal Area" from being a competing handicap to the "Interior". At the initial stage, a few industrial estates situated at "key locations", both in the "Interior" and the "Coastal Area", should be selected as "key-growth poles". The first industrial estate implemented at the initial stage would be looked upon as an experimental one. Its achievements would strongly affect public opinion as well as the future prospects of the whole programme. Hence, its additional importance for demonstration purposes.

1.4 PLANNING THE INDUSTRIAL ESTATE

1.4.1

Programme.

Planning of an Industrial Estate should be preceded by a programme.

The programme would require basic estimates on:

- (a) Size and branches of production, to meet market's demand;
- (b) Number of jobs, to meet the employment demand;
- (c) Rate of subsidy;
- (d) Average standard floor-space per worker;
- (e) Standard parking space for the various functions;
- (f) Number, size and type of factories for rent, lease and sale.

The programme would specify:

- (a) Distribution of subsidies among the various functions of the estate;
- (b) Total floor-space and land area for industrial use;
- (c) Total floor-space and land area for common services buildings and amenities;
- (d) Number of enterprises by groups;
- (e) Number of prebuilt standard factories;
- (f) Number of standard factories;
- (g) Number of developed lots for miscellaneous factories.

Such programme would serve as basis for the land use plan.

1.4.2

Size.

Size of the estate would derive, generally, from its location and nature of activity.

Industrial Estates tied in to villages and small towns in the "Interior", handling mainly agricultural products and some manufacturing in the frame of Small Scale Industry, would be small in size. In such cases areas of estates would vary between 20 and 60 acres (8-24 hectares).

Industrial Estates tied in to cities in the "Coastal Area", handling mainly manufacturing industry in the frame of Small Scale Industry and sometimes Medium Scale Industry, would require, as a rule, bigger factories and larger land areas. In such cases areas of estates would vary between 60 and 120 acres (24-48 hectares).

1.4.3.

Form.

The optimal form for the site of an Industrial Estate would be the rectangular with acceptable proportions:

For Small Estates covering 20.60 acres, the optimum width would be - 130-200 m.

For Big Estates covering 60-120 acres the optimum width would be - 300-400 m.

As irregular sites occur quite often in reality, the above dimensions may serve only for guidance, leading to a specific solution in each case.

It is, however, recommended for any site to apply rectangular design to the industrial uses and let irregularities be overcome by having them landscaped or used for common services buildings, when it is appropriate, or, failure of other alternative, allow blocks with growing depths of lots (trapez form).

1.4.4

Layout.

1.4.4.1

Land Use.

Optimal main distribution land use within and Industrial Estate would be as follows:

Industrial		65% - 70%
Lots for prebuilt standard factories	10%	
Lots for standard factories	15%	
Lots for miscellaneous factories	40%	
Administration and commonservices		6% - 5%
Roads and pedestrian ways		16% - 14%
Parking		7% - 6%
Open spaces		6% - 5%
	Totals	100% 100%

1.4.4.2

Zoning.

Zoning would serve a useful tool for establishing a functional land use pattern within the Industrial Estate. It would help in reducing intrusion and in safeguarding an over-all attractive visual appearance. Zoning would call for separation of industrial areas from common services buildings' areas, as well as for internal subdivision of industrial areas according to types and sizes of factories erected on them, as follows:

- Areas for terraced standard factories of small size; (types A1, A2, see below para No.1.4.5.2.2)
- Areas for standard factories of bigger size; (type A3, see below para No.1.4.5.2.2)
- Areas for standard detached factories; (types B and B2; see below para No.1.4.5.2.2)
- Areas for Custom factories;
- Areas segregated for factories causing nuisance;(x)

Separation of standard and pre-built standard factories, having uniform facades, (due to their modular design) from custom factories, having diversified facades, would contribute to an orderly attractive architectural appearance.

(x) Admittance of such factories to estates of small size should be prohibited. Admittance to bigger estates should be conditioned by location on an isolated site surrounded by a green belt.

4.4.3

Site Planning.

Site planning of an Industrial Estate may be based on two alternative principles:

- (a) Road pattern providing front and rear vehicular access to lots, separating vehicular access to offices from vehicular service to back service yards. (See Drawings No.1 & 2).
- (b) Road pattern providing only front vehicular access to lots (used, both for entrance to offices and penetration along the lot's side to rear-service-yard).

In fact, both principles should be adopted in the same estate according to factory type of building.

Lots built up with small terraced factories (Types A1 A2) would do with vehicular access at the front side only.

Lots built up with standard factories of bigger size, which might become terraced after expansion, (types B1 and B2) would require front and rear vehicular access (as vehicular access to back yards would be essential for their operation).

Lots built up with detached factories would do with front entrance only.

According to this concept, terraced factories should be located at the central area of the estate and detached factories at the periphery. (See Drawings No.1 & 2).

1.4.4.4

Lots of Modular Frontage.

Recommended frontage dimension for modular lot would be 30 meters (100 feet). This dimension is double of the proposed optimal frontage for a factory building - 15 meters. (See Drawings No.3 & No.4.)

Thus, gap between buildings would equal their width.

Such a design would enable economic and convenient expansion, while keeping an attractive appearance of a modular facade. (See Drawings No.3 & No.4).

The initial setbacks under such a design would be: Front - 10 m; Side I - 3,5 m; Side II - 11,5 m; and Rear - 20 m. Thus, the recommended initial location of the building in the lot would be assymetric. The 11,50 m space obtained on Side II might be used in the pre-annexation phase, for auxilliary and storage purposes and for a limited parking area for the management personnel. (See Drawing No.4).

1.4.5

Factory Buildings.

1.4.5.1

Main Categories.

Types of factory buildings would be classified into two categories:

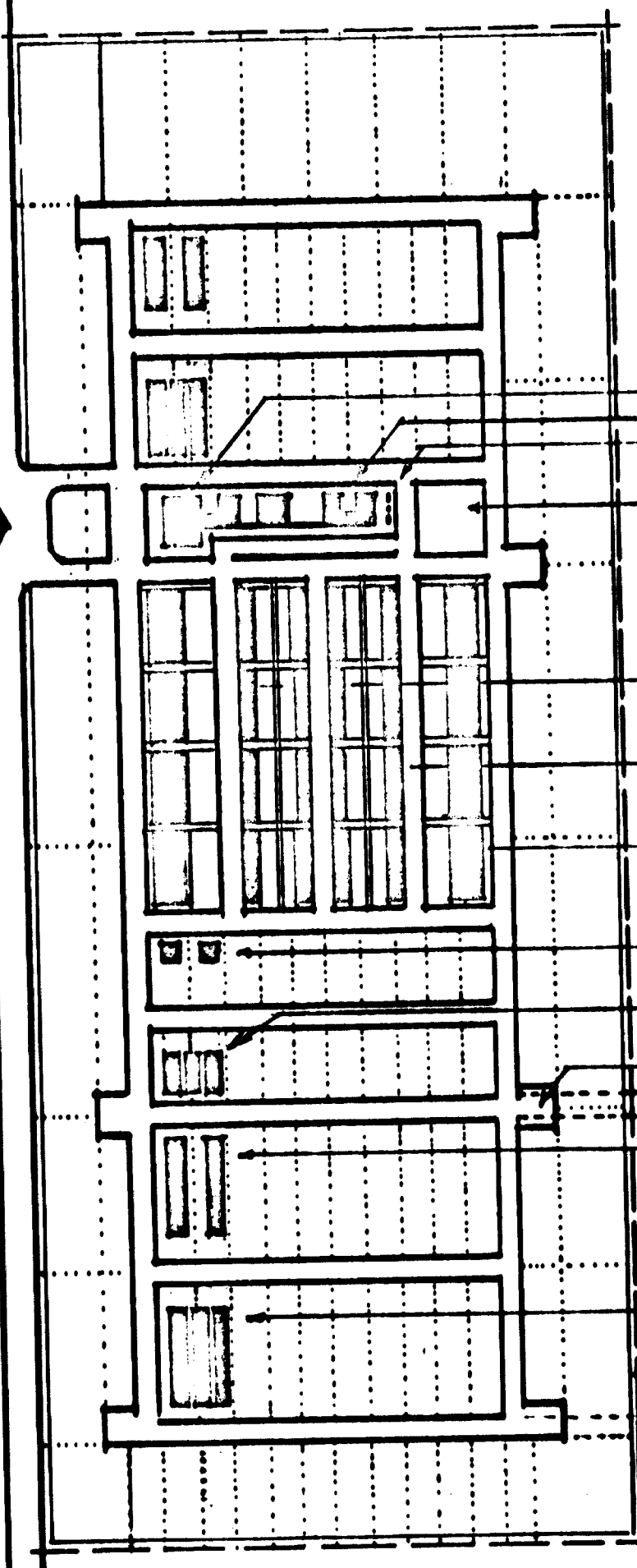
- (a) Standard factories erected by the promoting agency;
- (b) Miscellaneous custom factories erected by individual industrialists.

1.4.5.2

Standard Factories.

These are based on type plans consisting of standard components adapted for repetition.

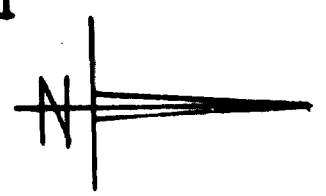
1.4.5.2.1. Advantages. Advantages of standard factories are the following:



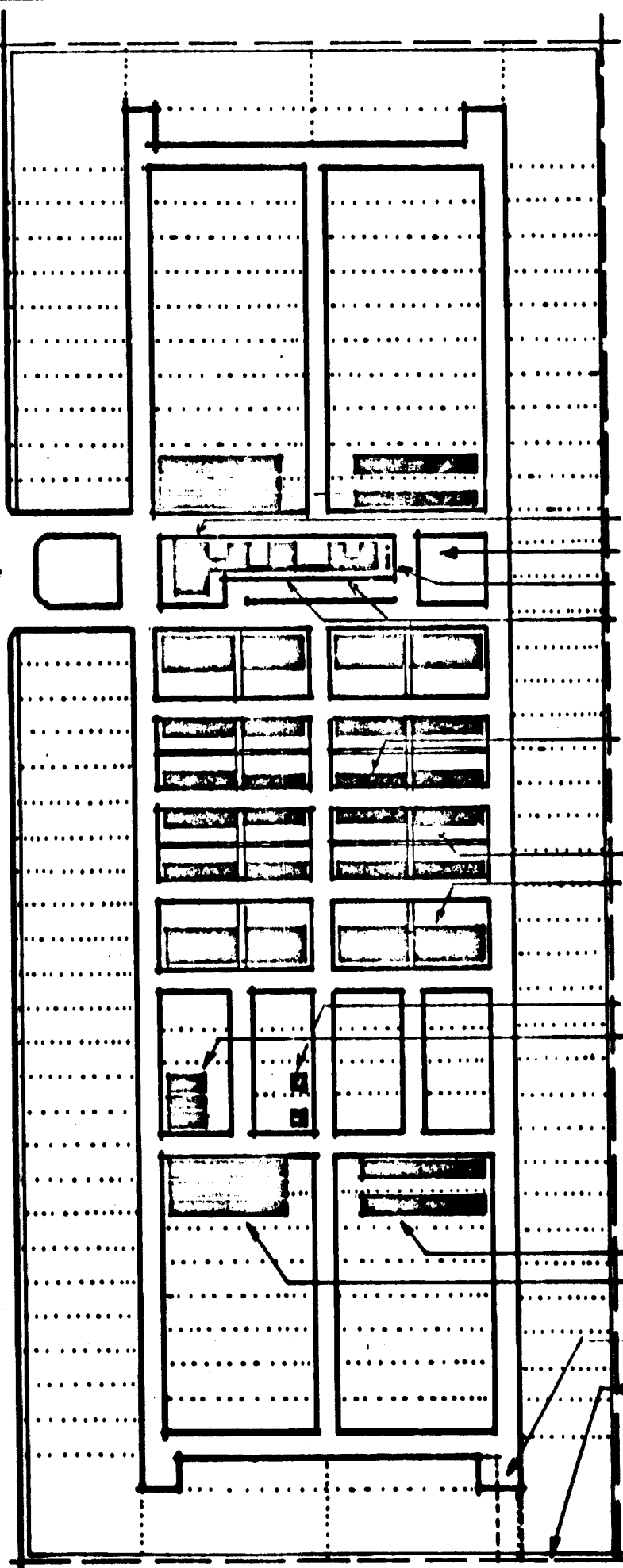
- ADMINISTRATION
- COMMON SERVICES
- WEIGHBRIDGE
- DUB TERMINAL
- STANDARD TYPE A.1
- STANDARD TYPE A.2
- STANDARD TYPE A.3
- STANDARD TYPE B.1
- STANDARD TYPE B.2 AFTER EXPANSION
- EVENTUAL EXIT ROAD
- STANDARD TYPE B.3
- STANDARD TYPE B.4 AFTER EXPANSION
- LANDSCAPING

SITE PLAN AND ORIENTATION
 ALTERNATE A
 SCHEMATIC SKETCH

SCALE: 1/5000



DRAWING No 1



ADMINISTRATION
 BUS TERMINAL
 WEIGHBRIDGE
 COMMON SERVICES

STANDARD TYPE A.1

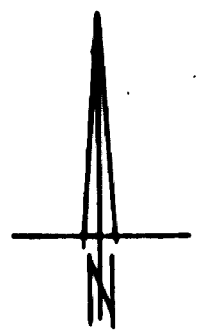
STANDARD TYPE A.2
 STANDARD TYPE A.3

STANDARD TYPE B.1
 STANDARD TYPE B.2
 AFTER EXPANSION

STANDARD TYPE B.2
 STANDARD TYPE B.2
 AFTER EXPANSION

EVENTUAL EXIT ROAD

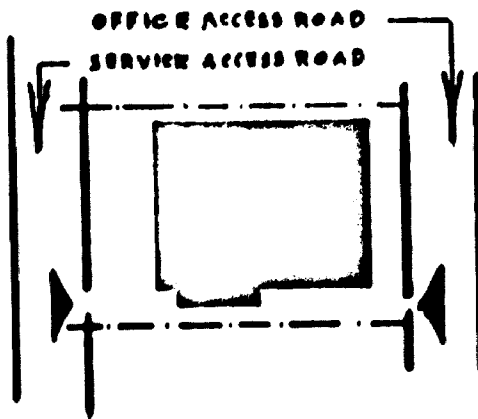
LANDSCAPING.



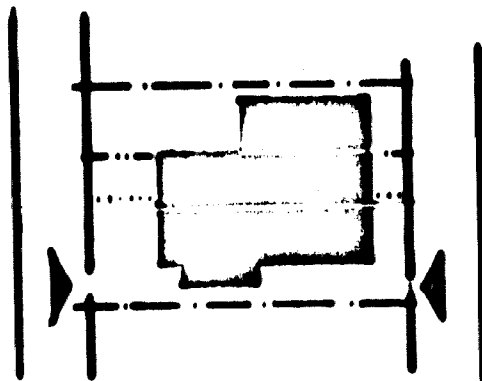
SITE PLAN AND ORIENTATION
 ALTERNATE B
 SCHEMATIC SKETCH

SCALE: 1:5000

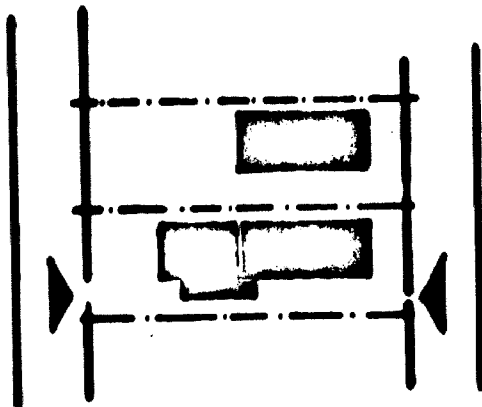
DRAWING No 2



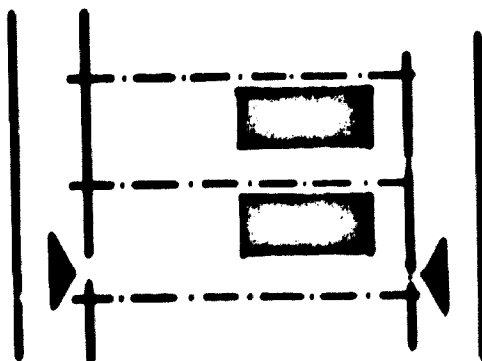
PHASE - 4



PHASE - 3



PHASE - 2

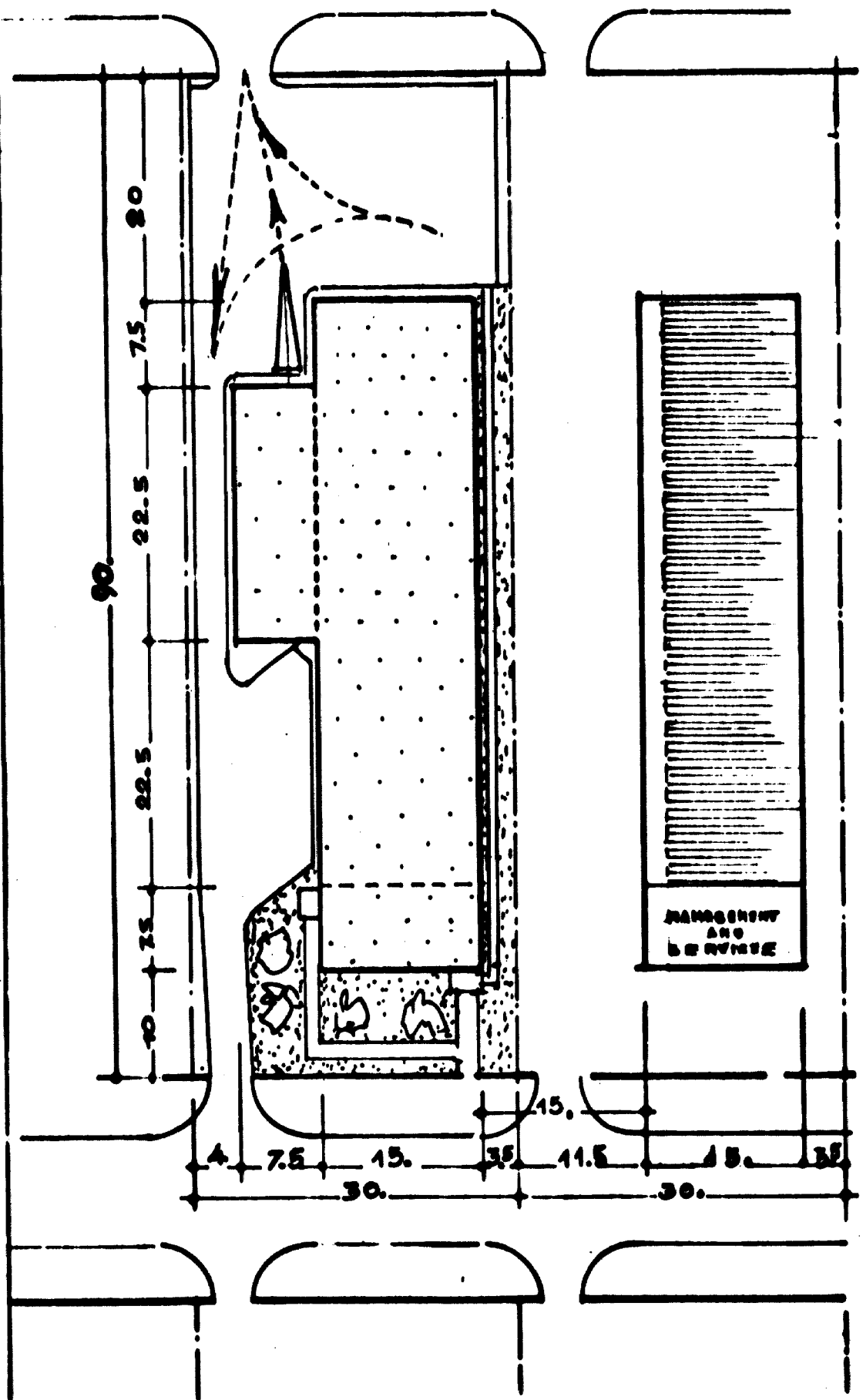


PHASE - 1

EXPANSION
OF STANDARD FACTORIES
IN PHASES

SCALE: 1/2000

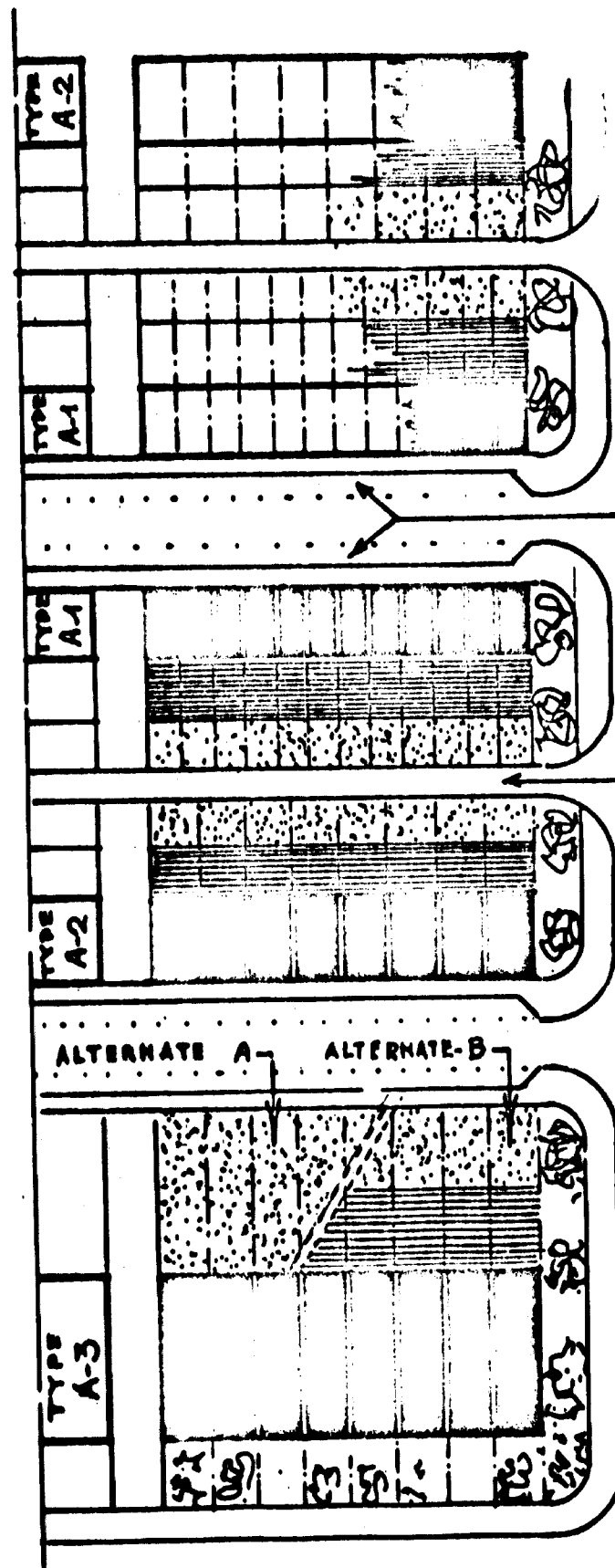
DRAWING NO 3



STANDARD FACTORY PLOT AND BUILDING TYPE B-2

SCALE 1/500





DRAWING No 4



LOADING AND UNLOADING

SERVICE ROAD INCLUDING
REMOVAL OF INDUSTRIAL
WASTE AND REFUSE
AND FIRE-FIGHTING

LEGEND

-  INITIAL
-  EXPANSION
-  SERVICE-YARD
-  LANDSCAPING

PRE-BUILT STANDARD TERRACED
 FACTORIES TYPES: A₁, A₂, A₃.

SCALE: 1 : 1000

DRAWING No 5

(a) Advantages from construction view-point:

Flexibility in expansion; elaboration of their standard components; economy deriving from repeated production and mounting of identical elements.

(b) Advantages from operational view-point:

Possibility to accommodate efficiently a variety of industrial operations; improving standards of working conditions and enhance productivity.

(c) Advantages from public-benefit view-point:

Possibility of encouraging particular industrial development according to a pre-determined promotion policy, by adjustment of rentals; Possibility of controlling the visual architectural appearance of the estate as a whole.

(d) Advantages at the establishment stage:

Saving industrialists capital expenditure at developmental stage, which makes great demand on his capital; Saving the industrialist problems and efforts in a field he is unlikely to be experienced - that of construction and arranging for services; Reduction of construction cost and time by using standard components and sophisticated building methods; Enabling production to start quickly (often a requirement for new industrial projects).

1.4.5.2.2. Types. Standard factories would include five types:

A1 A2 A3 - in terraced buildings (See Drawing No.5)

B1 B2 - in detached buildings, which may become terraced after expansion. (See drawing No.3)

Sizes and dimensions of the above types are presented in the following table.

Sizes and Dimensions of Units in Modular Standard Buildings

Types	Sizes and dimensions of modular units			
	Size		Dimensions	
	sq.meters	sq.feet	meters	feet
Terraced				
A1	50	550	5 x 10	16 x 32
A2	93	1000	7.5x 12.5	25 x 41
A3	183	2000	7.5x 25	25 x 82
Detached (x)				
B1	225	2500	15 x 15	50 x 50
B2	450-1125	1480-3700	15 x 30+15x ^(xx) x7,5	50x100+50xnx25

Types A1 and A2 - Small terraced standard factories (or workshops) would be generally provided with one vehicular access, at the front, while back yards would be accessible only to workers, by walking through the building.

(x) Detached initially and terraced after expansion

(xx)'n' - A variable multiplying the modular-unit for depth - 7.5 m (25 f.)

Type A3 - bigger terraced standard factories and
Types B1 and B2 - detached standard factories (which may
become terraced after expansion), would be generally provided with
vehicular access both at front and at rear sides. (See Drawings
No.1, No.2, No.3).

1.4.5.2.3. Expansion. The following would discuss expansion of
standard factories only and would refer to type B2.
The first phase of expansion would take place over the
depth of the lot - a land reserve pre-allocated for this purpose.

The second phase of expansion would take place over the
side, joining the neighbouring unit by covering the 15 meters gap
between them. This process, would turn gradually detached factories
into terraced blocks.

The third and final phase of expansion would include
either moving to a bigger factory elsewhere in the same estate or
complete annexation of the neighbour's factory and his entire lot.
(Obviously, after adequate compensation of its owner). (See Drawing
No.3). Operations required for such expansion would be confined to:

- Casting of standard ground floor;
- Construction of a standard roof; and
- Removal of side walls, (initially concieved as non load-bearing walls).

It is therefore highly recommended that standard factories
preplanned for expansion (according to the method described above)
have, non-load bearing back and side walls (for convenient removal
when necessary). The expansion described above requires: Consent of
the neighbouring unit; its compensation by the expanding factory;
approval of the management.

1.4.5.3 Miscellaneous Factories.

This category consists of detached factories with
diversified design. They would be generally provided one vehicular
access at the front leading also to the backyard. (See Drawings
No.1 and 2).

1.4.5.4 Adaptation to Climatic Conditions.

Orientation, building materials, adequate architectural
design and details would adapt buildings to climatic conditions.

In the North-East, where hot or hot and dry climate pre-
vail, climatic considerations should plan an important role in the
planning process of buildings.

Buildings should be oriented to reduce exposure of walls
and windows to sun-rays (x). Hence the recommended orientation would
be: exposed walls facing North-South, while Northern walls are
provided with wide overhanging eaves to create shade (x).

(x) See Drawings No.1 and No.2 which demonstrate the correlation
between Estate's layout and design on one hand and orientation
on the other. In Drawing No.1 the length of the Estate faces
North-South. In Drawing No.2 the width of the Estate faces
North-South.

1.4.5.5

Factories for Foreign Industries.

In the "Coastal Area" industrial estates, of big size, may include a limited number of foreign industrial enterprises, within the frames of Small Scale Industry and Medium Scale Industry. Efficient means to attract foreign industry would be: improvement of construction, finish works and pleasant architectural appearance of the factory buildings. Additional public investment required for above improvements would be compensated by the contribution of Foreign Industries to local industrial development by introducing modern machinery and sophisticated techniques.

1.4.5.6

Building Restrictions.

Building restrictions are indicated by three inter-related factors: lot-ratio, set-backs and number of storeys.

Lot ratio constitutes the factor determining the built-up area, whereas set-backs only allow for flexibility of design.

When these do not reconcile the higher restriction of both (in each case) counts.

Building Restrictions Table

Type	Lot		Building		Lot Ratio %	Set-backs				
	Dimensions	Area	Dimensions	Area		Front	Side I	Side II	Rear	
<u>Terraced</u>										
A-1	71x 27.5	1952	60 x 20	1200	61	0	4	7	7.5	
A-2	71x 27.5	1952	60 x 17.5	1050	54	0	4	7	10.-	
A-3 alt.a	76x 60	4260	60 x 25	1500	35	10	4	7	25	
A-3 alt.b	76x 60	4260	60 x 37.5	2250	53	10	4	7	12.5	
<u>Terraced-after expansion</u>										
B-1	30x 60	1800	22.5x 30	675	38	10	4	3.5	30	
B-1 double	60x 60	3600	52.5x 30	1575	45	10	4	3.5	30	
B-2-(90)	30x 90	2700	15 x 60 + 7.5x 22.5	1070	40	10	4	3.5	30	
d ^o - double	60x 90	5400	45 x 60 + 7.5x 22.5	1870	53	10	4	3.5	30	
B-2-(115)	30x115	3450	15 x 80 + 7.5x 22.5	1370	40	10	4	3.5	35	
d ^o - double	60x115	6900	45 x 80 + 7.5x 22.5	3770	50	10	4	3.5	35	
B-2-(140)	30x140	4200	15 x115 + 7.5x 22.5	1725	40	10	4	3.5	35	
d ^o - double	60x140	8400	45 x115 + 7.5x 22.5	5175	55	10	4	3.5	35	
<u>Miscellaneous</u>					50	10	4 (11.5*)	3.5	30	

Remarks: 1) Dimensions and areas above are given in the metric system
 2) Buildings' dimensions refer to permitted expansions
 x) (11.5) refers to lots having only one entry for offices and service-yard.

1.4.6

Administration, Services and Amenities.

1.4.6.1

Elements.

The main services and amenities to be supplied in an Industrial Estate are the following:

(a) Amenities

- Canteen with outdoor recreation grounds

(b) Social and Commercial Services.

- Meeting rooms
- Club rooms
- Show rooms

(c) Offices

- Post office and Telephone - telex exchange
- Bank agencies
- Transportation and shipping agencies
- Advisory services (recruitment, selection, wage determination, industrial relations)
- Translating, typing, duplicating and printing services
- Customs and excise office

(d) Technical Services

- Communal repair and maintenance workshop
- Central garage for vehicles maintenance and repair
- Woodworkshop

(e) Storage

- Supply depots for industrial hardware and general
- Warehouse with rentable space
- Common leasing shop to lease-out portable tools and other machinery with skilled operators to guide in use

(f) Centres

- Building and maintenance centre
- Training centre (in reduced scale)

(g) Miscellaneous

- Children crèche
- Bus terminal for commuter traffic
- Weighbridge
- Removal and disposal of industrial waste combined with salvage

1.4.6.2

Phasing

The above elements encompass the whole range of services to be provided in the Industrial Estate.

Yet, this list should be adjusted according to size, location and character of each Industrial Estate.

Implementation of the above services and amenities should proceed in phases so as to alleviate financial problems.

At the first phase most essential elements should be selected for implementation. The remaining should be gradually added in course of the Estate's development.

1.4.7

Subsidies.

Subsidies should serve two main objectives:

Encouragement of desired manufacturing branches;
Assistance to Industrialists.

Subsidies should be granted on: rentals, service-charges, lease, sale and option payments.

Rates of subsidies should be flexible - high at the initial phase, decreasing gradually through the following phases:

Subsidies should have, as main guideline, acceptable average returns on non-profit basis, over a defined period.

Subsidies granted in the "interior" should be higher than those granted in the "Coastal Area".

1.5 ORGANIZATIONAL PROBLEMS RELATED TO DEVELOPMENT OF INDUSTRIAL ESTATES.

1.5.1

General.

Organizational problems connected with development of Industrial Estates in the North-East might be classified into two main categories:

- (a) Organizational Problems at the regional level connected with preliminary operations serving as basis for the establishment of Industrial estates.
- (b) Organizational problems connected with the establishment and operation of Industrial estates proper.

1.5.2

Organizational Problems at the Regional Level.

These consist mainly of initiatives to be undertaken by SUDENE:

- (a) Initiation of a campaign through which authorities concerned: central and local government, public and private agencies, would become acquainted with the specific elements included in the industrial estate which have not been yet practiced in Brazil, such as: standard or pre-built standard factories and common services buildings and amenities.
- (b) Initiation of pre-investment regional comprehensive studies according to which a preliminary distribution of estates, throughout the North-East would be established;
- (c) Nomination of steering committees for guidance and assistance in decision-making at the planning stages;

- (d) Convincing public financial bodies on the necessity and advantages of a "LAND-BANK", its contribution to public benefit.
- (e) Recruitment of capitals for the establishment of a "LAND-BANK".

1.5.3 Organizational Problems related to the
Establishment of Industrial Estates Proper.

1.5.3.1 General.

Organizational problems related to the establishment and operation of Industrial Estates should mainly be the concern of promoting agencies cooperating with SUDENE. Activities to be undertaken by the above mentioned agencies would include:

(a) At the pre-establishment stage:

- Determination of programmes for the Estates;
- Design of plans (layouts, types of standard factories, common services buildings, infra-structure);

(b) At the establishment stage:

- Development and construction of the Estates;
- Surveys on available industrialists and labour force;
- Recruitment of industrialists;
- Preparation of construction rules and restrictions;
- Preparations of agreements and covenants.
- Preparation of contracts with maintenance contractors.

(c) At the operational stage:

- Various assistance to industrialists;
- Inspection on adherence to restrictions;
- Collection of rentals, leases, options and other charges; and
- Preparation of accounts for control.

1.5.3.2 Organizational Actions to be undertaken
at the Pre-Establishment Stage .

The following actions should serve as basis for the establishment of Industrial estates in the North-East.

(a) Appointment of promoting agencies:

SUDENE should appoint promoting agencies either existing or newly set-up to be in charge of development of Industrial Estates. Each promoting agency would be in charge of one relatively big estate, as might generally occur in the "Coastal Area", or would handle a group of relative small Industrial Estates, as might generally occur in the "Interior".

(b) Drawing-up a programme:

The promoting agencies should cooperate with SUDENE on drawing-up programmes for the industrial estates. The programmes should be based on guidelines issued by the pre-investment study and in accordance with the allocated subsidies. (See contents of the programme para No.1.4.1).

(c) Appointment of planning consultants:

The promoting agencies should appoint planning consultants for preparation of all plans required. A steering committee representing SUDENE and the promoting agency should follow-up the planning process as an advisory authority.

Organizational Actions to be undertaken
at the Establishment Stage .

The following actions - under SUDENE's supervision - would be essential for the establishment of Industrial Estates:

(a) Implementation:

The promoting agency should select contracting firms (through a bid) for implementation of Industrial estates. Implementation would include: construction of buildings and roads; installation of utilities and landscapings.

(b) Appointment of a local Management Team:

In parallel with the selection of contracting firms the promoting agencies should appoint, out of their own personnel (or alternatively by contracting private specialized firms), to handle organizational problems during the establishment period. Their task would be: Supervision on implementation and setting forth of preliminary actions for the forthcoming operations of the Estates.

(c) Survey and Recruitment of Industrialists:

The management team should initiate detailed surveys (based on preliminary) on available local Industrialists, manpower and suitable industrial branches. Particular interest should be paid to industrialists willing to be housed in pre-built standard factories.

(d) Restrictions:

The management team should issue the rules-restrictions in form of covenants, as follows:

- I Avoidance of industries causing nuisances to other factories in the estate (smoke, dust, odours);
- II Avoidance of fire and explosion hazards;
- III Avoidance of unauthorized building (including fences and walls) as well as uncontrolled or non-approved sign-boards or advertisements, dumping of waste causing disorder, damage or harm to landscaped and/or other public domain so as to maintain a pleasant and attractive appearance of the estate;
- IV Avoidance of dumping material within the lots by limiting the uncovered area which may be used for storage, and by limiting the distance of inflammable material from the fence, for fire security, (3.5 meters - 11 feet approximately);
- V Adherence to defined set-backs;
- VI Adherence to defined floor space ratio;
- VII Avoidance of disposal of harmful effluents into drainage systems;
- VIII Avoidance waste of water, for non manufacturing or sanitary uses;
- IX Avoidance of unauthorized interference with building structures;
- X Avoidance of use of buildings for other purposes than those specified and agreed upon in the signed agreements;
- XI Avoidance of unauthorized sub-leasing;

- XII Avoidance of putting leased factories in bad conditions;
- XIII Avoidance of admittance of big factories beyond a defined size (i.e. 10-15 times the average lot area - incompatibility between factories);
- XIV Avoidance of many factories producing the same products - (30-50%)

(e) Contracts:

The management teams should prepare all required contracts with maintenance-contractors and agencies for external services (transportation etc.)

(f) Agreements with Industrialists:

Preparation of agreements for: rent, leases, sales and options. (Sales should be encouraged for the benefit of both sides: Industrialists and promoting agencies).

1.5.3.4

Organizational Actions to be undertaken at the Operational Stage.

As soon as the stage of implementation and agreements with Industrialists etc. is over, the promoting agencies should appoint management teams as permanent bodies for running of the Estates. These management teams should provide the following services:

(a) Assistance to Industrialists:

The management teams should advise Industrialists on the use of various common services and amenities provided in the Estates; supply technical information concerning existing buildings and infra-structure which might be needed in case of alterations or expansions, etc.

(b) Inspection:

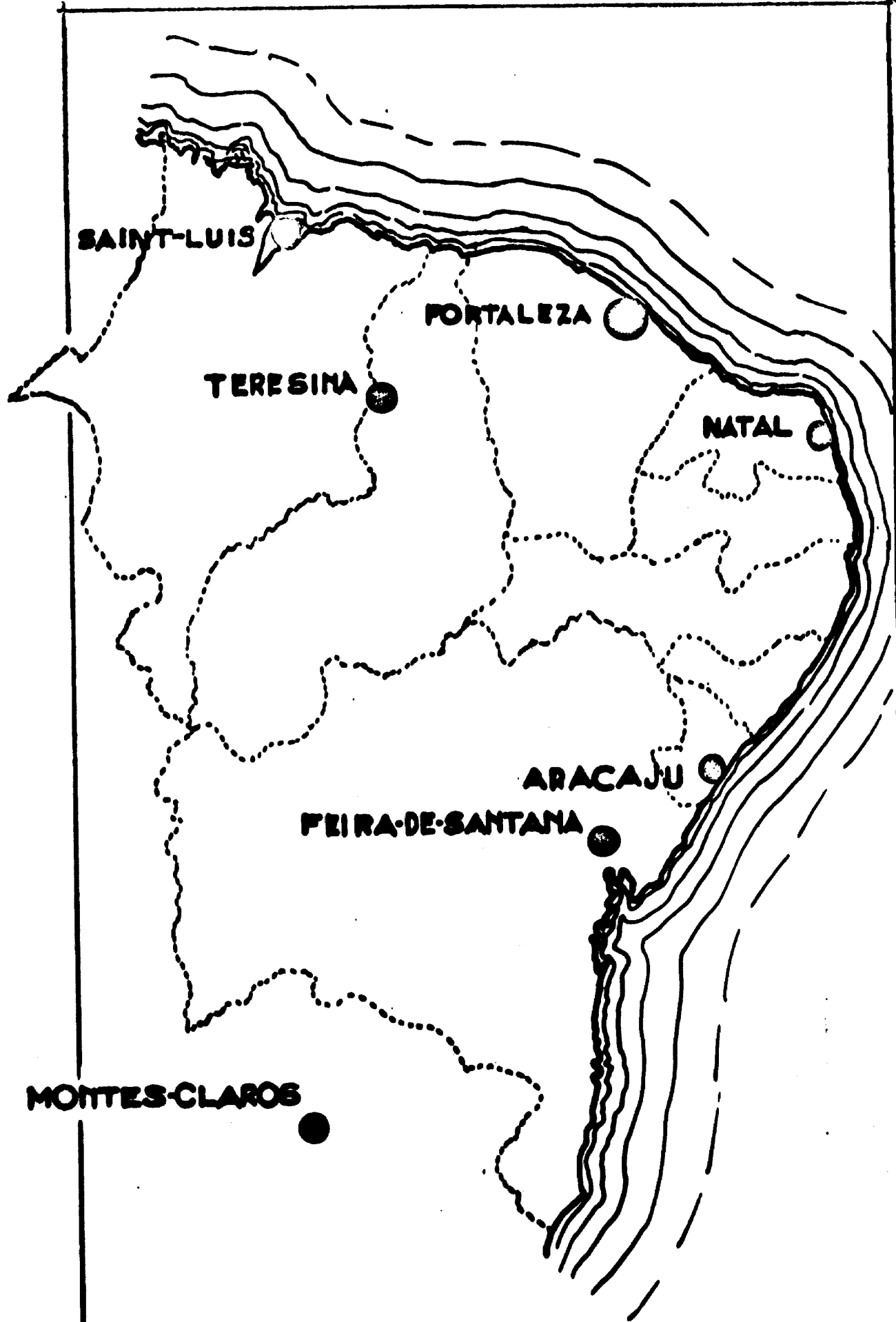
The management team should inspect on adherence to restrictions accepted by Industrialists through the signed covenants.

(c) Financial Management:

The management team should collect rentals, leases and miscellaneous charges and prepare accounts for control.

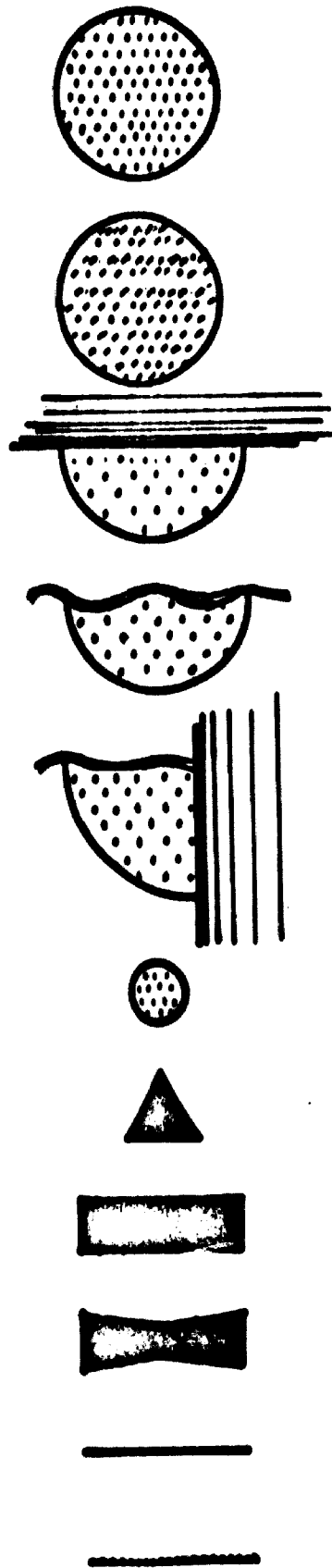
(x) Agreements include covenants. Covenants include all the restrictions; among other, the Building Restrictions.

2. DEVELOPING INDUSTRIAL ESTATES
IN
"NORTH-EAST"



INSPECTED INDUSTRIAL ESTATES
IN CITIES OF — NORTH-EAST

DRAWING N° 6



EXISTING CITY

CITY WITH EFFECTIVE WATER PLAN

CITY BORDERED BY THE SEA

CITY BORDERED BY A RIVER

CITY BORDERED BY SEA AND RIVER.

VILLAGE

INDUSTRIAL ESTATE

INDUSTRIAL ZONE

INDUSTRIAL CENTRE

ROAD

RAILWAY

SYMBOLS USED IN THE
SCHEMATIC SKETCHES OF CITIES

DRAWING No 7

2.1 GENERAL

Following SUDENE's request, this mission has examined a series of Industrial Estates in the North-East, being at different stages of development: location, planning or implementation.

Analysis has referred to physical planning aspects (location, layout) and to the effect of these on their feasibility.

Economic aspects were not covered, as data and surveys needed as background material, were not available.

2.1.1

Classification of Industrial Estates.

Examined Industrial Estates were classified into three categories:

- (a) Estates having no particular problems, as those tied-in to: Teresina, Montes-Cleros and St. Luis;
- (b) Estates encountering difficulties, as those tied-in to: Natal, Fortaleza and Fetre-de-Santana;
- (c) Estate selected for physical planning, tied-in to Arocaju.

The above classification is presented in the table below:

Classification by	Tere- sina	Mon- tes Cla- ros	St. Luis	Na- tal	For- tal- eza	F.de Sant- ana	Ara- caju
Categories							
Estates having no particular problems	x	x	x				
Estates encountering difficulties				x	x	x	
Estate selected for planning							x
Phase of Development							
Revision of location						x	
Before final location				x			
Between location and planning			x				
Partial implementation (infra-structure)	x	x					
Partial implementation (infra-structure and erection of factories)					x		
Planning (by this mission) (x)							x

(x) Plans approved, in principle, by:
 The Chief of the Department for Industrialization:
 DR. HUGO DE ALMEIDA
 The Chief of the Division for Research and Programming:
 DR. LUIZ FERNANDO CORREIA DE ARAUJU

2.2 INDUSTRIAL ESTATES HAVING
NO PARTICULAR PROBLEMS

2.2.1 THE INDUSTRIAL ESTATE OF T E R E S I N A

2.2.1.1 General.

TERESINA is the capital of the state of PIAUI. Size of population is of about 220,000 inhabitants (1970). The Estate of TERESINA is developed by the FOMINPI promoting agency.

2.2.1.2 Location and Size.

The Estate is located at the southern periphery of the planned urban area and covers about 80 acres (32 Hectares).

2.2.1.3 Accessibility.

Accessibility is adequate. The Estate is well linked to the city center and to other urban centres of activity.

2.2.1.4 Planning.

A master-plan for TERESINA including a plan for an Industrial Estate was initiated by the promoting agency FOMINPI. The planned urban area has a linear form partly bordered by two joining rivers. The estate is located at the periphery of the planned urban area opposite the rivers' joining point. The Estate has a parabolic form, after its topographical configuration.

2.2.1.5 Topography.

60% to 70% of the area is of slopy nature. Slopes vary between 2% to 10% approximately.

2.2.1.6 Soil.

Soil quality is acceptable.

2.2.1.7 Infra-Structure.

The Estate is bordered on one side by a paved road.

2.2.1.8 Utilities.

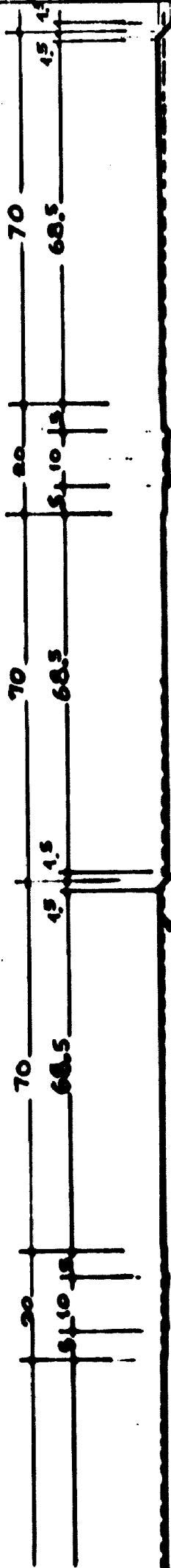
Utilities are supplied from the urban networks.

2.2.1.9 Implementation.

About 10% to 15% of the area is in course of development.

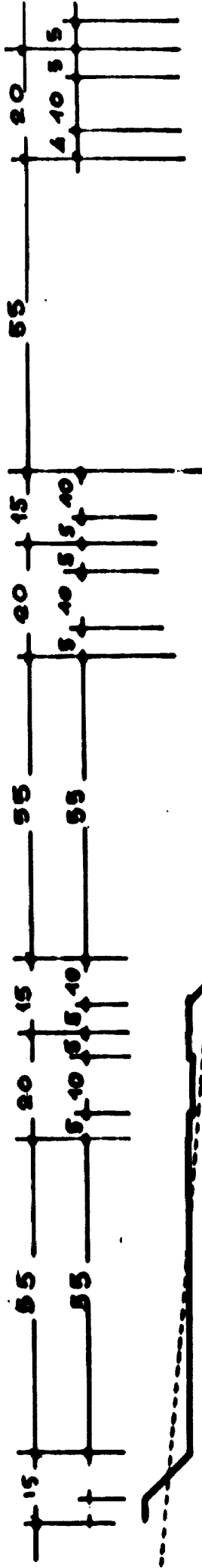
2.2.1.10 Problems.

- (a) Levelling works would be required in the major part of the Estate and even then, there would be limitation regarding types of factories (factories accepting hanging ground-floor, only, would be suitable).
- (b) About 25 lots, out of about one hundred, would face an inter-urban, non-access road;
- (c) Feasibility of the Estate would be seriously affected by problems related to topography and internal accessibility.



SUCH SECTION PERMITS SLOPE UP TO 2"

ACCESS ROAD SERVING LOTS ON BOTH SIDES



SUCH SECTION PERMITS SLOPE UP TO 1.50%

REMARK: OVER THE ABOVE LIMITED SLOPES
THE GROUND FLOOR SLAB MUST RAMP OVER CURBS.

ACCESS ROAD SERVING LOTS ON ONE SIDE ONLY.

CROSS SECTION OF ACCESS ROAD AND LOT
SCALE : 1 : 4000

DRAWING No 9

2.2.1.11

Recommendations.

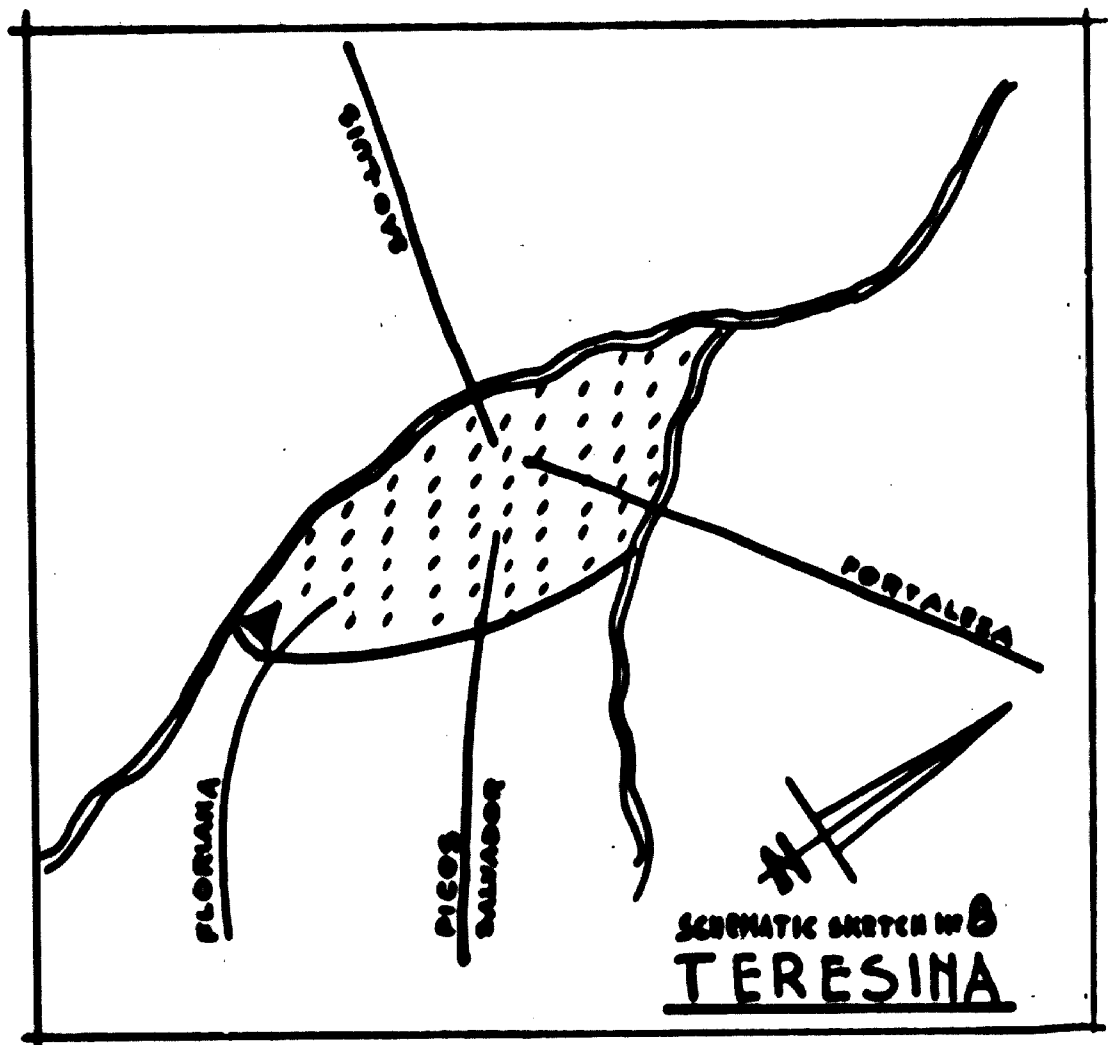
In view of the above described problems a revision of layout is recommended according to the following guidelines:

(a) Design should adapt layout to topography in the following manner:

Road network should serve two rows of lots, where topography is moderate, and only one row of lots, where topography is with greater slope (See below, Drawing No.9).

Any solution, should adapt to a limitation indicating not to exceed 1.25 meter of filling (4 feet approx.) in the lot's area.

(b) Design should isolate the Estate from the external road by means of a green belt and an internal servicing road.



2.2.2

THE INDUSTRIAL ESTATE OF
MONTES - CLAROS

2.2.2.1

General.

MONTES-CLAROS is a city in the State of MINAS-GERAIS, about 1 h. flight from BELO-HORIZONTE - the capital. Size of population is of about 200,000 inhabitants (1970).

The Industrial Estate of MONTES-CLAROS is developed by the promoting agency: CONSELHO ESTADUAL DE DESENVOLVIMENTO, Departamento de Industrializacao.

2.2.2.2

Location and Size.

The Estate is located at the periphery of the city. It covers about 150 acres (60 Hectares). In fact, the Estate's boundaries are not defined precisely due to lack of economic surveys. The promoters have, therefore, concluded to allocate a land reserve, to prepare a general layout and develop the Estate in phases, according to requirements.

2.2.2.3

Accessibility.

The location favours the Estate with adequate accessibility. It is conveniently linked to urban centres of activity and transportation.

2.2.2.4

Planning.

The Industrial Estate of MONTES-CLAROS was planned by the above mentioned Departamento de Industrializacao. Originally, the layout included an industrial area, a residential area and a green belt between them. A revision initiated by the promoting agency, expanded the industrial area over a part of the green belt, whose topography reached a slope up to 10%, and therefore, unsuitable for industrial use, except under specific planning, generally non-economic.

2.2.2.5

Topography.

Topography varies, generally, between 3% to 7% slope approximately and reaches 10% at specific sites, as mentioned above.

2.2.2.6

Soil.

The soil is generally acceptable for erection of factories.

2.2.2.7

Infra-Structure.

Roads bordering the Estate are under construction.

2.2.2.8

Utilities.

Non-existent at present, but they are available in the vicinity. Their supply by the promoting agency will encounter no problems.

2.2.2.9

Implementation.

Certain parts of the Estate are being levelled and a few roads are under construction.

2.2.2.10

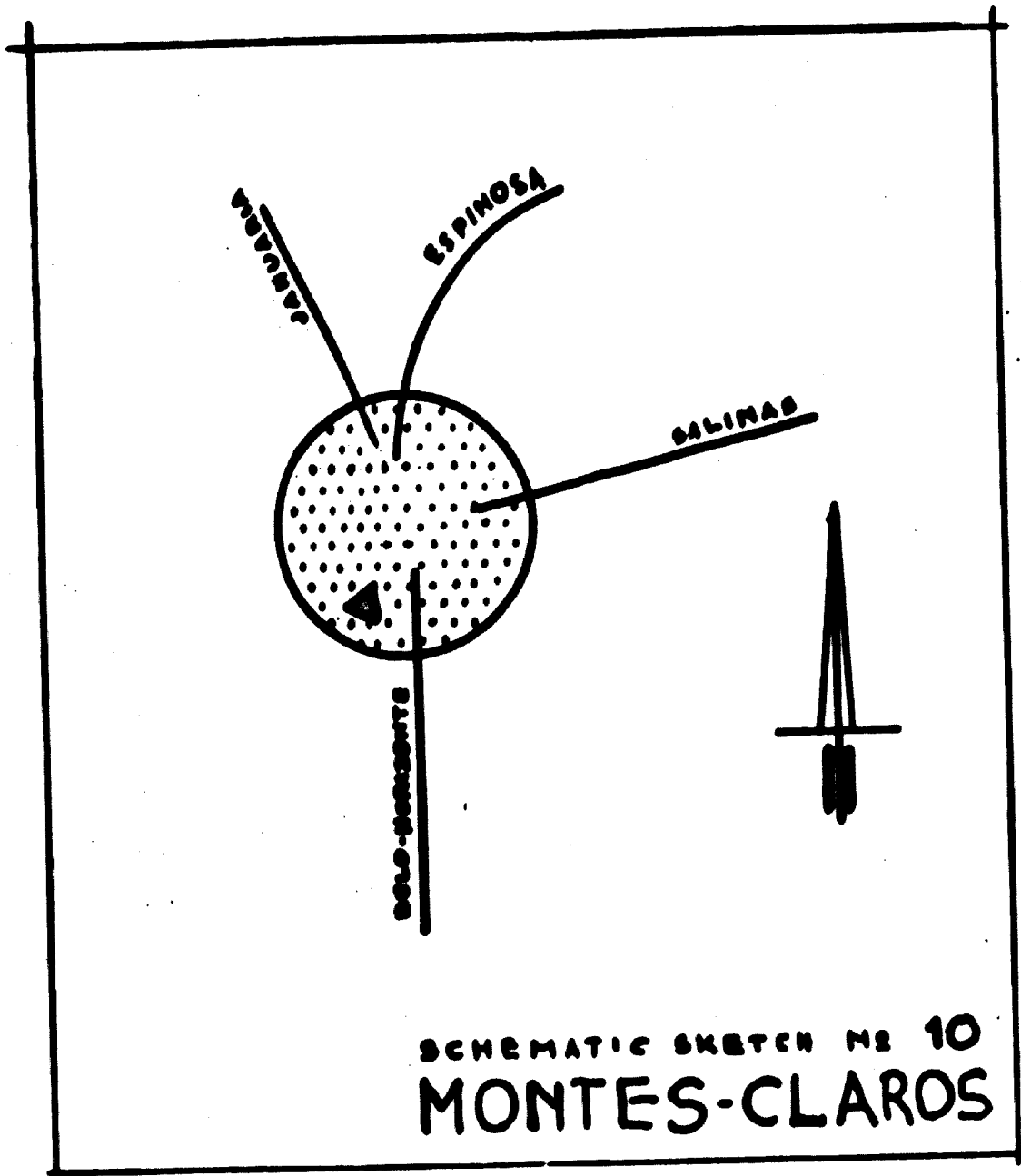
Problems.

The main problem of this Estate lies with the non-adaptability of its layout, in certain parts, to topography. Required levelling works (filling in) would be excessive and cause problems at the phase of factories erection. In addition, drainage of storm water would encounter problems unless treated under specific technical devices.

2.2.2.11

Recommendations.

In view of the above problems a revision of the layout is recommended to meet more adequately topographical constraints. It would be advisable either to abandon expansion of the industrial area over the green belt or to revise the design in the following way: Road pattern should be traced to service only one row of lots with access to their low side. This would enable erection of factories over an excavated site (very advantageous).



2.2.3

THE INDUSTRIAL CENTRE OF
SAINT - LUIS

2.2.3.1

General.

SAINT-LUIS is the capital of the state of Maranhao. Size of population is of about 240,000 inhabitants (1970).

SAINT-LUIS has a master plan at early stages of preparation. The Industrial Centre was initiated by the promoting agency SUDAM.

2.2.3.2

Location and Size.

According to the preliminary land use plan a vast industrial centre is located outside the present city at the South-West direction beyond the Parnaiba river. The size of the Industrial Centre is not yet finally defined.

2.2.3.3

Accessibility.

There is no possibility to comment on accessibility as preliminary city plans designating networks, are not yet available.

2.2.3.4

Planning.

The preliminary plans for the Industrial Centre show in general lines: an industrial zone, a port, a commercial and administrative centre, a residential zone and areas for recreation. The Industrial Centre of SAINT-LUIS is designed after the example of ARATU (Industrial Centre at SALVADOR in BAHIA).

2.2.3.5

Topography.

Inspection onsite reveals that large parts of the proposed area are not flat.

2.2.3.6

Soil.

Soil on the surface and at certain depth is of sandy texture and in some parts with sandy gravel.

2.2.3.7

Infra-Structure.

The only existing road not yet completed but in use already is the one linking the dam over the Parnaiba river to the port. This road is under construction (hard-stand is ready).

2.2.3.8

Utilities.

Water and power are abundant in the port area. Their supply to the industrial centre, in due time, would present no problem.

2.2.3.9

Implementation.

The dam (crossing the Parnaiba river) and the port, as mentioned above, are under construction.

2.2.3.10

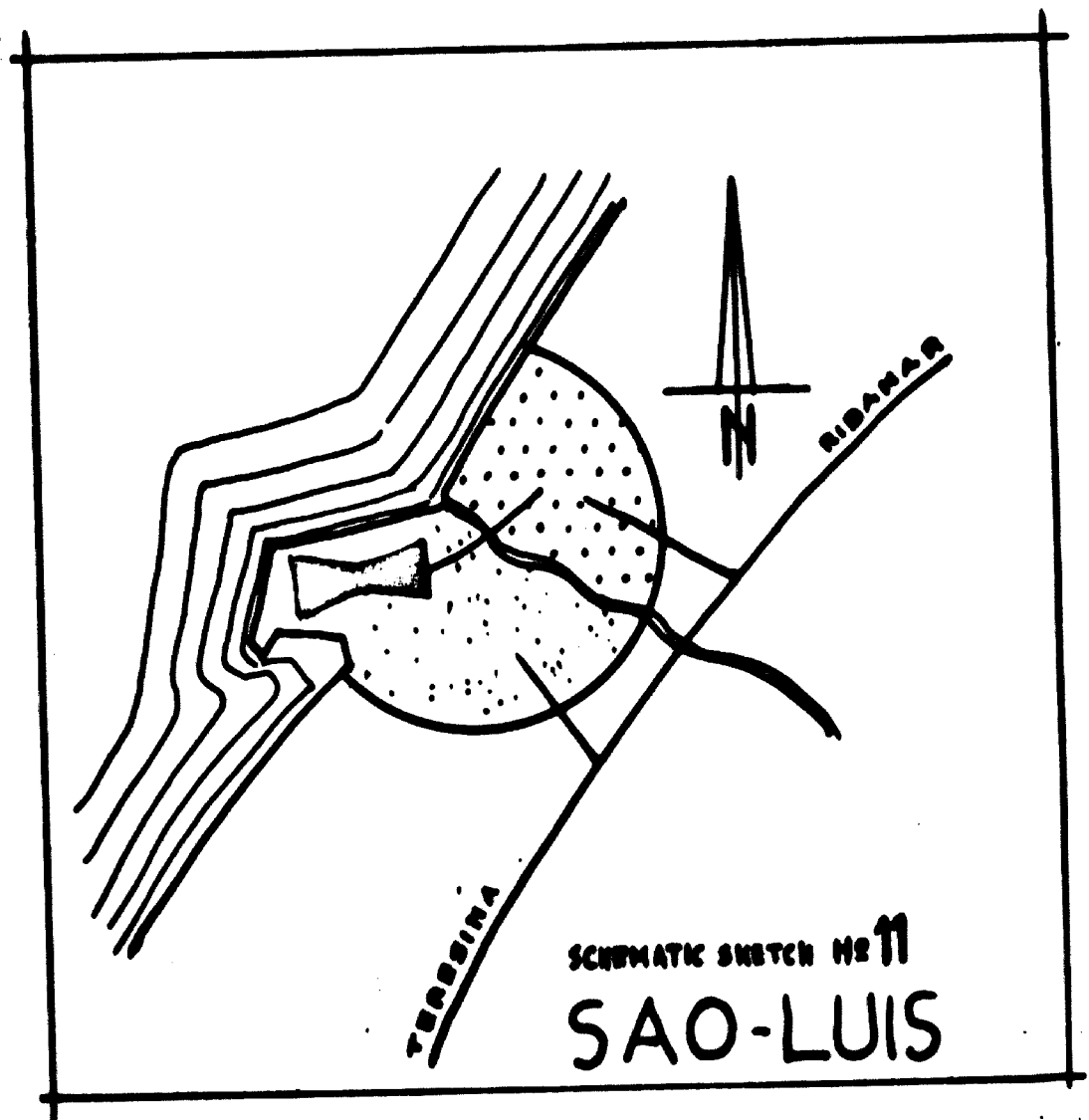
Problems.

No problems are apparent for the moment.

2.2.3.11

Recommendations.

A part of the industrial centre should be allocated as a specific area for an Industrial Estate.



2.3. INDUSTRIAL ESTATES ENCOUNTERING DIFFICULTIES

2.3.1 THE INDUSTRIAL ESTATE OF N A T A L

2.3.1.1 General.

NATAL is the capital of the State RIO GRANDE DO NORTE. Size of population is of about 240,000 inhabitants (1970). The Industrial Estate of NATAL is initiated by the promoting agency COFERN.

2.3.1.2 Location and Size.

The proposed location for the Industrial Estate of NATAL is at about 2 kilometers off a bridge overcrossing the river bordering the city built up area. The location was recommended by this mission after an examination of three alternative sites proposed by the promoting agency (see below, para 2.3.1.4 - planning). The estate covers an area of about 100 acres (40 hectares). A paved road bordering the Estate connects NATAL with its vast North-Western hinterland.

2.3.1.3 Accessibility.

The proposed estate's location of NATAL is bordered by the above mentioned road providing a convenient link between the Estate, the city centres of activity and the residential quarters.

2.3.1.4 Planning.

NATAL has at present no master plan, still it is assumed that it would not be long before its initiation takes place. (The Ministry of Interior is convincing each city or town to prepare a master-plan).

2.3.1.5 Topography.

The proposed site of the estate is almost flat and suitable for storm water drainage.

2.3.1.6 Soil.

Soil-sandy for the most part with small percentage of clay; favourable for erection of factories.

2.3.1.7 Infra-Structure.

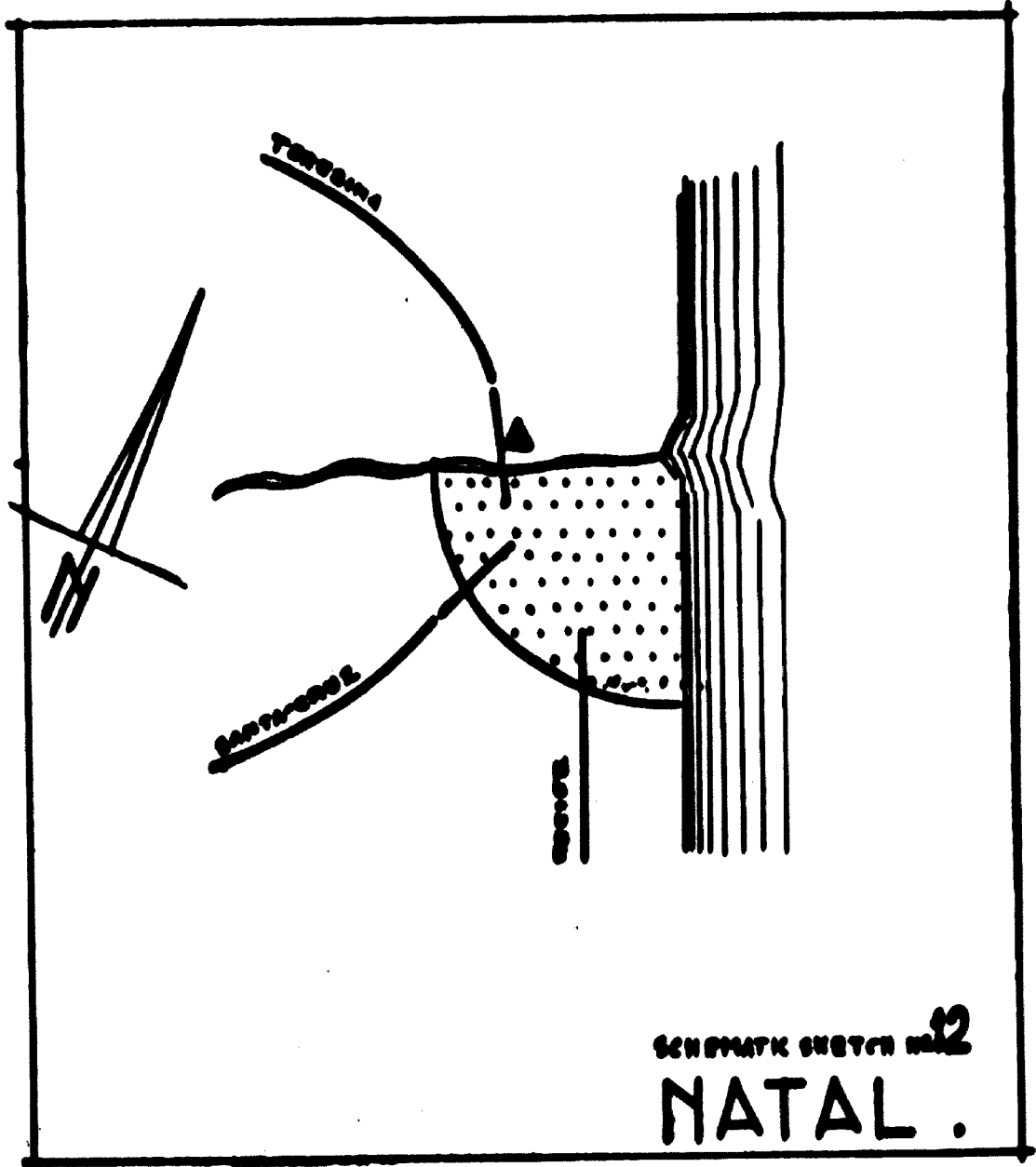
There are no other paved roads at present except one mentioned above which borders the site.

2.3.1.8 Utilities.

Power-lines are stretched over the adjoining area. NATAL water supply pipes reticulation does not reach the proposed estate's site, but subsoil sweet water is available at small depth. Alternatively water could be supplied from the nearby river, after treatment, in a temporary plant. Both possibilities are feasible. Sewage water could after adequate treatment be disposed of either as a fertilizer for agricultural fields nearby or at a convenient place into the river.

2.3.1.9 Implementation.

Has not started yet.



2.3.1.10

Problems.

Handicaps impeding the development of the Estate of NATAL may be referred to the following:

- (a) The local authority's policy by which industrialists are encouraged to purchase the best tracts of land in the central area. (These are naturally far more appealing to industrialists by being provided with all services and utilities required and by being ready for the building phase).
- (b) The policy of subsidies (Article 34/18) by which the amounts allowed constitute a percentage of the total investment required including land.
- (c) The lack of an effective outline plan indicating zoning and restrictions.

2.3.1.11

Recommendations.

In view of the above described difficulties the following actions might help solving the problem:

- (a) SUDENE should undertake adequate measures to bring about a ministerial decree by which encroachment of industrial uses in the city's central area and residential zones should be discontinued.

Local decision-makers should be convinced about the beneficial effect of this act, for the city as a whole, by which central area would be left to its normal functions (commerce business, administration, public institutions etc.), residential zones - to residences, and industry would develop at its optimal location (in the Industrial Estate), in the most efficient manner (in Clusters).

- (b) Subsequently SUDENE should assign, in cooperation with COFERN, a planning consulting office for the preparation of programme and plans required; Nominate a two member steering committee of its own to follow-up the planning process, assign contracting firm, for implementation; supervise the implementation; and recruit industrialists.
- (c) COFERN should nominate a management team for preparation of agreements and covenants with industrialists and preparation of contracts with maintenance contractors; and finally, for management of the Estate in operation.

2.3.2 THE INDUSTRIAL ESTATE OF FORTALEZA

2.3.2.1 General.

FORTALEZA is the capital of the State of CEARA. Size of population is of about 700,000 inhabitants (1970). The Estate is developed by the promoting agency CODEC which has initiated its location and planning.

2.3.2.2 Location and Size.

The Estate is located out of FORTALEZA new municipal boundaries, at about 18 km from FORTALEZA city centre in the South, South-East direction and covers about 100 acres (40 hectares).

2.3.2.3 Accessibility.

The present two lane road linking the Estate to the city does not provide a direct link as it runs through various localities. Yet, there are plans for a new wide road to provide direct link to the city centre.

2.3.2.4 Planning.

FORTALEZA has an approved master plan in the frame of which different sites of various sizes have been allocated for industrial use (partly as a legalization act for existing premises). (The Estate mentioned above has not been included in the city boundaries as determined by the master-plan.

2.3.2.5 Topography.

The topographical configuration is almost flat - appropriate for industry and for storm water drainage.

2.3.2.6 Soil.

Soil is sandy with some mixture of clay, having an acceptable rate of load-bearing capacity.

2.3.2.7 Infra-Structure.

An existing two lane paved road, running North-South direction, borders the Estate on its eastern side. Another wide road under construction, arriving from the West, bends eastwards, near the Estate, crosses it and divides it into two parts - North and South (the northern part being reserved as residential area for workers). The Estate is bordered on its western side by a railway line from which two sidings penetrate it for servicing.

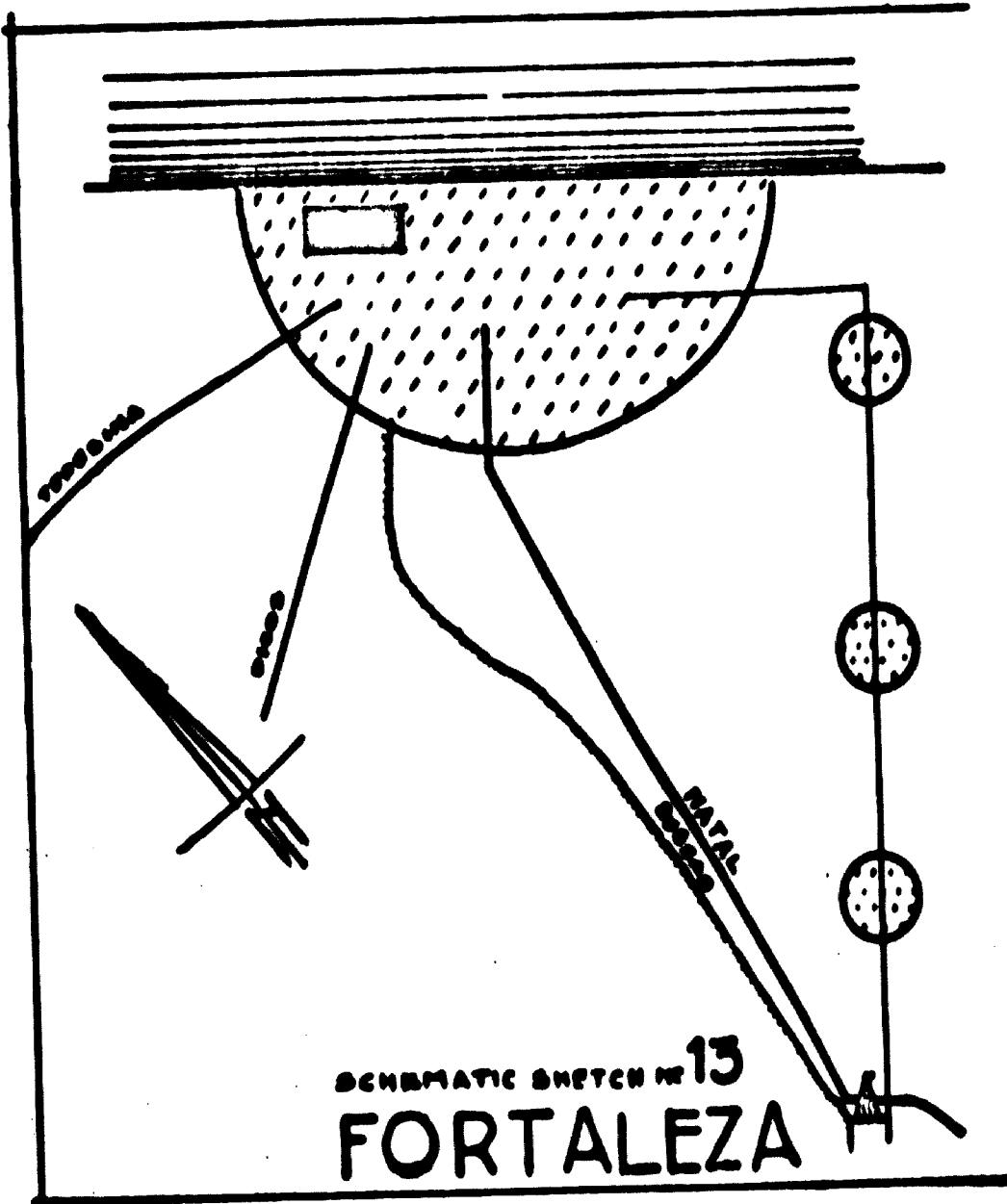
2.3.2.8 Utilities.

A high-voltage power line stretching over the neighbouring area supplies power at present and would be sufficient for the future when the whole Estate is implemented.

Water is scarce. Quantity supplied to the developed part of the Estate hardly meets the present demand.

2.3.2.9 Implementations.

About 10% of the total area of the Estate is implemented as first phase. This area includes eight factories in operation, four under construction and about 12-15 additional lots developed, ready for the erection phase.



SCHEMATIC SKETCH #13
FORTALEZA

2.3.2.10

Problems.

Development of the Estate is slow. Its main handicaps derive from its distance from FORTALEZA as centre of services, place of residence for workers, and particularly from scarcity of water (water, for its further use might be fully supplied only by another source, located at about 22 km away, the utilization of which would require very large investments).

Following these problems, the Estate has been unattractive to industrialists who obviously preferred to establish their factories in the industrial areas allocated within the city proper.

In view of these difficulties, the prospective growth of the Estate is most questionable.

2.3.2.11

Recommendations.

This mission wishes to state that, in spite of the shortcomings typifying the Industrial Estate in question, it considers unlogical to recommend its abandonment, having in mind commitments and capitals invested to this day.

However, the mission considers the Industrial Estate of FORTALEZA rather a regional than a local issue, requiring analysis with sophisticated regional techniques before any recommendation is pronounced.

It is suggested, therefore, to SUDENE, to initiate, in cooperation with CODEC a cost-benefit-analysis as a means to weight and compare different alternatives and achieve finally an optimal solution.

The following two possibilities seem worth examination:

- (a) Annexation of the Estate to the local authority of FORTALEZA. In this case it would appear interesting to examine implications of this act on FORTALEZA in terms of future land use development, expenditure for supply of utilities, particularly water and transportation for workers, versus benefits deriving from the Estate development to the region as a whole. Findings would indicate, as well, whether FORTALEZA is entitled to certain compensation from the State Government funds.
- (b) Promotion of the locality, in the boundaries of which the Estate is located, to become a self contained suburb from which the Estate would obtain utilities, manpower and daily services. As to water, it would be supplied from the distant source at 22 km. distance.

Here, cost of promotion of locality and water supply versus regional benefits achieved should be weighted.

Finally, costs and benefits of the two above proposals should be compared.

Findings would lead decision-makers to choose optimal solution.

2.3.3

THE INDUSTRIAL ZONE OF
FEIRA DE SANTANA

2.3.3.1

General.

FEIRA DA SANTANA is located in the interior of the State of BAHIA, at 120 km of SALVADOR, the capital. Size of population is of about 200,000 inhabitants (1970).

FEIRA DE SANTANA has two industrial zones: One - growing spontaneously as a ribbon development along the inter-urban link, Salvador- Feira de Santana.

The second - a planned industrial zone in frame of a comprehensive master plan for the city.

2.3.3.2

Location and Size.

The planned industrial zone is located at the periphery of the town in continuity of the planned residential zones. It covers about 1500 acres (600 hectares).

2.3.3.3

Accessibility.

The existing planned urban road network would provide the industrial zone with adequate accessibility and with convenient links to urban centres of activity and to residential zones.

2.3.3.4

Planning.

The industrial zone forms a part of a sector. According to the detailed layout a road pattern would divide the area into eleven sectorial modular blocks, each one subdivided into 32 lots. Average area of lots 3/4 of an acre (0.3 hectares) approximately.

2.3.3.5

Topography.

The site is hilly over its major part. Data available does not enable to figure out proportions between the hilly and the adjoining flat land.

2.3.3.6

Soil.

The soil of the hilly part is rocky. The flat part has a sufficient load-bearing capacity and is adequate for factories having their ground-floor cast on soil.

2.3.3.7

Infra-Structure.

The town major ring road runs along the northern side of the industrial zone. The planned internal road network of the industrial zone does not exist yet.

2.3.3.8

Utilities.

No utilities exist at the moment.

2.3.3.9

Implementation.

Has not started yet.

2.3.3.10

Problems.

Problems pertaining to the industrial development of FEIRA DE SANTANA may be categorized as follows:

- (a) Problems of economic aspect at the regional context.
- (b) Problems of physical aspect at the local context.

R e g i o n a l problems relate to the competition prevailing between FEIRA DE SANTANA and Salvador on industrial promotion and development grounds, having detrimental effects particularly on FEIRA DE SANTANA.

L o c a l problems relate to the physical drawbacks of both industrial zones:

The **e x i s t i n g** zone stretching as a ribbon development along the inter-urban road would achieve low functionality mainly due to inadequate form of intrusion of through traffic;

The **p l a n n e d** zone would not be feasible in its major part, due to rough topography and rocky soil.

2.3.3.11 Recommendations.

- (a) SUDENE should appoint an economists consultants office to carry out a study on industrial development problems pertaining to both cities.

The objectives of the study would be to recommend means and devices for reducing competition between the two cities (x) and bringing about a balanced pattern of production; For instance, induce both cities to specialize in production according to the principle of comparative advantage.

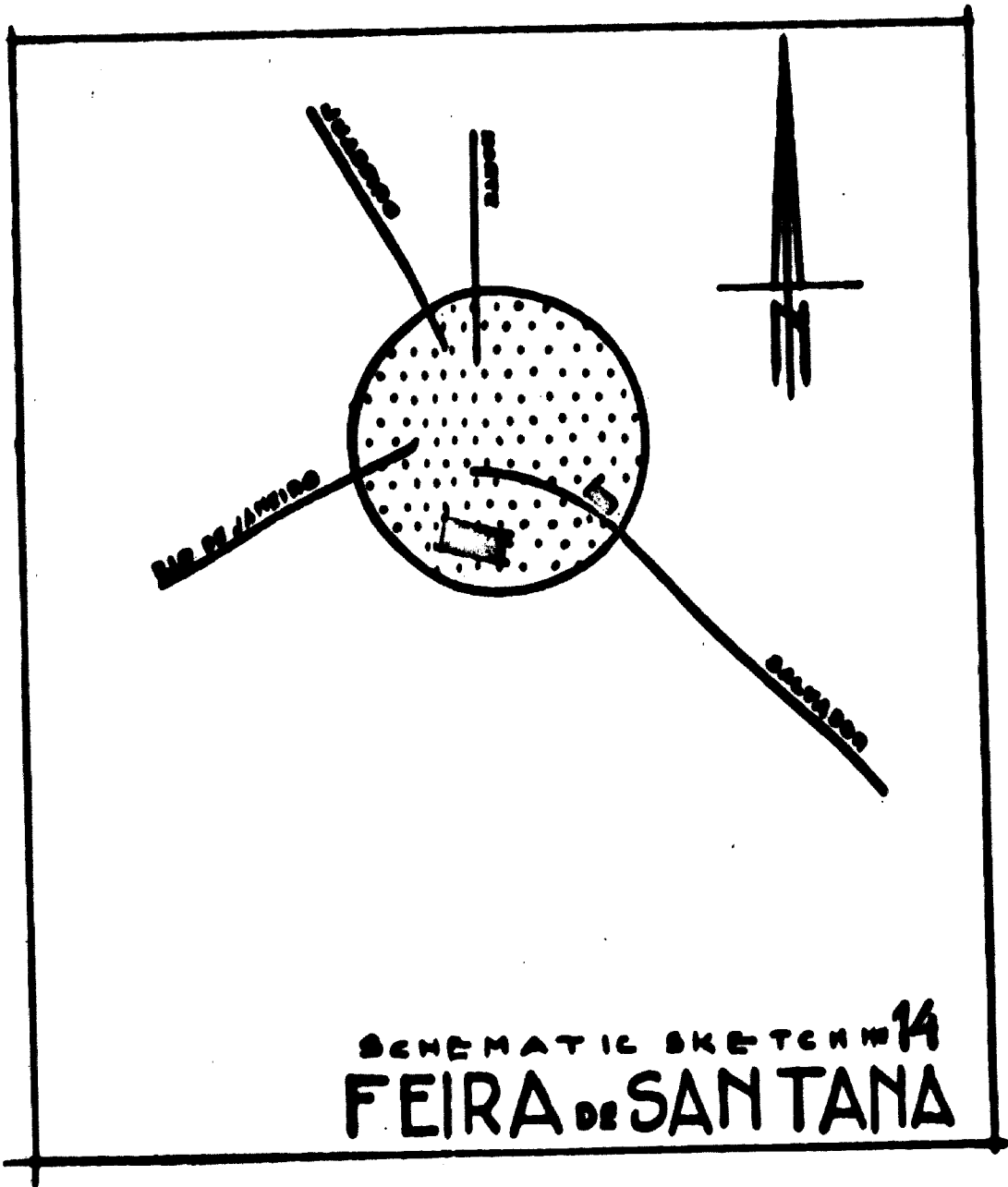
Subsequently SUDENE should nominate an ad-hoc committee representing the ministries of Interior and Industry and SUDENE (as chairman), whose task would be:

- To follow up the study
- To convince both local authorities (Salvador and Feira de Santana) to follow, for their own benefit, the programme suggested.
- To legalize agreement by a Ministerial Decree.

- (b) The planning team for FEIRA DE SANTANA comprehensive plan, should integrate **e x i s t i n g** **i n d u s t r i a l** **z o n e** in the town plan; cancel direct access to lots of the existing industrial zone from the main link Salvador Feira de Santana; and design a more adequate structure for the zone as a whole.

- (c) The above planning team should revise the location of the **p l a n n e d** **i n d u s t r i a l** **z o n e** so as to reduce topographical and geological draw-backs.

Subsequently an area for an Industrial Estate including: standard, pre-built standard factories and common services buildings should be allocated within its confines.



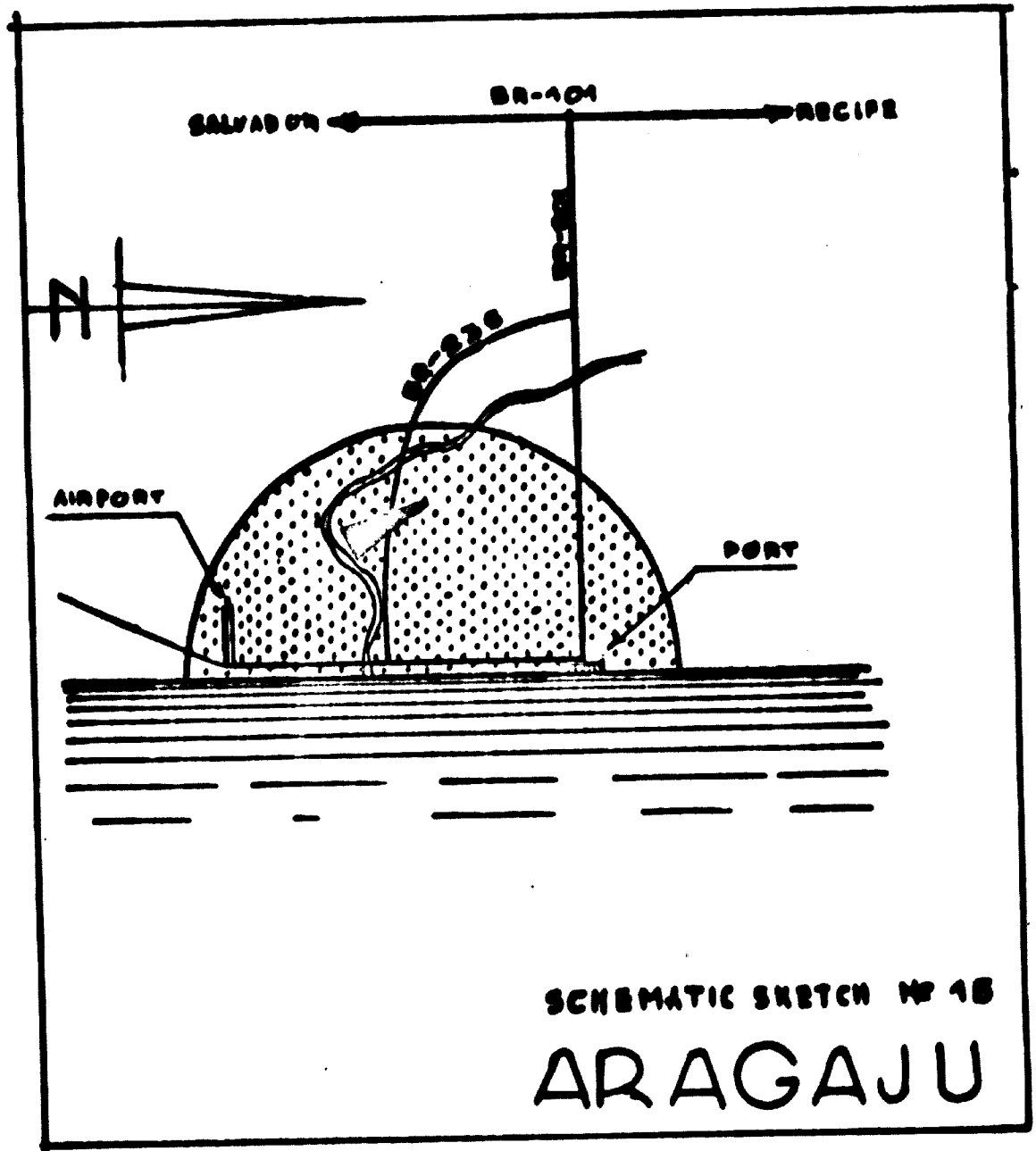
ANNEX

PLANNING THE INDUSTRIAL ESTATE OF
ARACAJU

PLANNING THE INDUSTRIAL ESTATE OF ARACAJU

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SCHEMATIC SKETCH Nº 18

ARAGAJU

1. GENERAL

Of all sites inspected by this mission, at SUDENE's request, The Industrial Estate of ARACAJU was the only one suitable for planning.

Location and size had been already defined by an ad-hoc committee nominated by the promoting agency CONDESE, in cooperation with the state of SERGIPE and SUDENE.

However, there was no commitment on planning. This mission was, therefore, expected to carry out the physical planning of the Industrial Estate of Aracaju.

This mission treated the planning of the Industrial Estate of Aracaju as a case-study, having the following objectives:

- (a) Introduction of the "Industrial Estate" including new components, not yet practiced in Brazil, such as:
 - (1) Standard, and pre-built standard factories; and
 - (2) Common Services buildings and amenities.
- (b) Development of a methodology for weighting of alternative layouts, as a tool to assist in regional decision-making that may be applied to any Industrial Estate project.

A short description of main physical characteristics of the city of Aracaju is hereby presented as background.

2. THE CITY

2.1 The Regional Setting

2.1.1 General.

Aracaju is the capital of the State of Sergipe. Sergipe is the smallest state in the North-East. Its population counts about 850,000 inhabitants, 25% of which - 200,000 inhabitants approximately - are concentrated in Aracaju.

Aracaju is situated on the Atlantic Coast, on midway between SALVADOR - the capital of BAHIA - and RECIFE - the capital of PERNAMBUCO.

The economic spheres of influence of Salvador and Recife tend to overlap and thus deprive Aracaju from a sphere of influence of its own. (x)

This phenomenon may be related to the relative big size and economic dynamism of Salvador and Recife reinforced even more by the recently completed North-South Highway, on one hand and to the Stagnation of Aracaju, since the decline of the Sugar Industry, on the other.

Under such circumstances, industrial development appears to be a major tool to restore Aracaju's declining economy. This concept is further supported by a closer examination of potential dynamic factors existing in Aracaju's vicinity: The port, the airport and the natural resources.

(x) Recursos e Necessidades do Nordeste - by: Banco do Nordeste do Brazil - Recife 1969

2.1.2

The Port.

The port is located at the northern part of the city. Up to fifty years ago, it played an important role in the economy of Sergipe by marketing sugar, servicing Sergipe's consumption and fishing.

But, since external markets for sugar were closed up, the port's activity was reduced to fishing only and thus went into a state of gradual obsolescence.

Recent studies on water-borne transportation revealed that the port could be restored to fulfill a central regional function, as an outlet for water-borne transportation arriving by rivers from deep interior of Sergipe and continuing by ocean Northwards, to Recife and Southwards to Salvador. Aracaju might, thus, become a regional centre of distribution. Furthermore, the restoration of the port might play a major part in promoting Aracaju's own manufacturing for export, by providing cheap rapid and convenient accessibility to markets.

2.1.3

The Airport.

The airport located at the southern fringes of Aracaju (9 km of the city centre) with its adequate links to North-South Highways to Aracaju hinterland could in parallel with the port, and sometimes in coordination with it, further develop Aracaju as a centre of distribution and export of manufactured goods and agricultural products.

2.1.4

Natural Resources.

Natural resources available in Aracaju's hinterland^(x), at the initial stage of exploitation, appear to be an additional potential element that might affect manufacturing by increasing the average income level per capita resulting in increase of average rate of consumption and demand for manufactured goods.

These growth factors might help a great deal the future industrial development of Aracaju.

2.2.

Physical Characteristics.

2.2.1

Climate.

The climate of Aracaju is mild. Temperatures vary between 29° (max.) in summer to 22° (min.) in winter. Prevailing breeze from the Atlantic Coast East - North-East direction reaches a maximum velocity of 25 miles/h. (43 km/h approximately). Average rainfall (in winter only) reaches the rate of 1110 m/m. Relative humidity (annual average) is 50%. Dryness, characteristic to the summer season is weakened in Aracaju - located on the Atlantic Coast.

2.2.2

Topography.

Land is relatively flat with easy slopes over the whole site of the city except for low hills which project slightly over the average. Topography rises gradually from the coast Westwards up to 15-20 meters above sea level at a distance of 3-5 km.

(x) Petrol, Potassium and Salt.

2.2.3 Water Resources.

The main water resource is the Poxim river running within the city boundaries of Aracaju.

2.2.4 The Present Town Plan.

Aracaju has no master-plan. The existing city structure is that of a grid. The orthogonal road pattern divides the site into regular blocks of about 100-120 m. In the northern part of the city are concentrated: the port, the warehouses, stores, various manufacturing industries, factories, workshops and the railway station. The city centre includes commercial business and residences. Further South, beyond the Poxim river, a new exclusive residential quarter is under development. A main Avenue - Beira-Mar, runs along the coast, crosses the river and continues to the airport. This artery has at present two contradictory functions: servicing slow traffic whose destination is in the recreation resort along the beaches and the exclusive residential quarter, on one hand and the rapid traffic to the airport, on the other.

3. PLANNING THE INDUSTRIAL ESTATE OF ARACAJU

3.1 Physical Characteristics of the Site.

3.1.1 Location and Size.

The Industrial Estate is located at the West-South fringes of the built-up area inside the bend of the Poxim river. Its size (initial) 294 acres. Its average dimensions: length: 1800 meters (5900 feet); width: 650 meters (2150 feet).

3.1.2 Accessibility.

The access-road, which divides the Estate into two parts, happens to be a major artery connecting the regional network with the airport and the port.

The quality of accessibility it provides to the Estate is questionable. Obviously the loads of through traffic introduced would seriously interfere with the functioning of the future Estate. Links to the city centre and residential quarters are acceptable.

3.1.3 Topography.

The site includes two distinct, almost flat plateaux: the first about 5 meters above sea level and the second - 9 meters. Between those two plateaux stretches a narrow area of about 80 m wide.

3.1.4 Soil.

The major part of the Estate is of sandy soil at reasonable depth.

3.1.5 Infra-Structure.

The above mentioned access road (BR-235) is completed down to its junction with the coastal Avenue Beira Mar.

An existing railway line borders the Estate on its western side.

3.1.6 Schemes in the Vicinity.

Areas allocated for residential schemes, one of which is under construction, border the Estate from North and East.

3.2.

The Industrial Estate Plan.

3.2.1

General.

The basic concept of the plan was to design an Industrial Estate including residential zone for workers. A pre-planning analysis of physical features of the site and the surrounding area brought the mission to a conclusion to allocate the eastern part of the Estate (at low topographic level - 5 m average) for a residential zone and join it to the two other neighbouring areas allocated for housing schemes. By this, a large continuous residential area for workers would border the Estate on the East. Subsequently it was recommended to include the whole residential area, mentioned above, into the Estate by enlarging its boundaries.

This was done after it was ascertained with the promoting agency that eventual acquisition of the above areas was feasible.

3.2.2

The Problem.

The main problem encountered in the physical planning of the Estate derived from the route of the access-road BR-235, crossing the Estate and dividing it into two severed parts. The assumption is that this road would fail to fulfill its two contradictory functions:

- A regional link between the airport and North-South Interurban Highway.
- An internal road within the Estate.

From the Estate's view-point, through traffic introduced by this artery would cause serious disturbances and interfere with its orderly and efficient daily operation. An endeavour to solve the problem by introduction of a by-pass brought about the design of three alternatives.

3.2.3

Alternative Layouts. (x)

3.2.3.1 General.

Three alternative layouts have been prepared.

Their common denominator referred to: size, form, dimensions, zoning and land use distribution.

Their differing element was the road pattern which entailed alternative accesses to the Estate.

(x) A set of drawings (16 sheets under separate cover) have been annexed to the initial draft report, mailed from Recife on the 25 February 1970, in seven copies (5 - to the Resident Representative in Rio and 2 - to UNIDO - Vienna.) The originals were handed over to the Division of Research and Programming - SUDENE.

3.2.3.2 Common Denominator.

Size	244 acres (98 hectares)		
Form	Almost rectangular		
Dimensions	1620x600 meters (5300x1970 feet) averages		
Land-use Distribution	Area for common services(1)	8.8 acres (3.5 h)	3.6%
	Area for small factories(2)	55.5 acres (22.2 h)	22.6%
	Area for big factories (3)	179.7 acres (72.3 h)	73.8%
	Total	244 acres (98 h)	100 %
Zoning	Common services buildings & Small factories	- at the central area	
	Big factories	- at the periphery (4)	

3.2.3.3 Different Road Patterns.

Alternate L-A:

Alternate L-A represents existing conditions. The main element of the road pattern - the airport-link (BR-A), crosses the Estate; the access is at its South-West part.

Alternate L-B:

Alternate L-B - the main element of this road pattern, airport-link BR-B - is deviated to by-pass the Estate and borders its South-Western side, thus integrating the Estate in the city area.

Alternate L-C:

Alternate L-C - the main element of this road pattern - the airport-link BR-C, is deviated to by-pass the Estate and encircle its northern part and rejoin the initial airport-link BR-A. Thus severing the entire Estate from the city area.

-
- (1) For Common Services Building and Amenities, see Section "Planning of Industrial Estates" Para 1441, related foot note and Annex No.1).
 - (2) Factories housed in pre-built terraced and detached standard buildings (see Section "Planning" 14522).
 - (3) Factories either individually built by industrialists or pre-built by the promoting agency, according to demand (see Section "Planning" Para 14522).
 - (4) Areas located northwards and southwards of the central area of the Estate.

3.2.4

Weighting of Alternates.

3.2.4.1 Criteria Set-Up.

Alternates have been analysed under a criteria set-up classified in groups as follows:

- Accessibility;
- Effects on regional and urban traffic flow;
- Functioning;
- Integration in urban pattern;
- Investments.

Each group was assigned a weight (in terms of points, out of one hundred as total), reflecting its relative importance in the set-up.

The adherence rate of each alternate to each criterion was determined by coefficients ranging from 0.0-1.0.

Achievements of alternates have been represented by a series of scores, each one resulting from the following multiplication:

$$\text{Weight of Criterion} \times \text{adherence coefficient} = \text{SCORE}$$

Scores of each alternate were summed-up to total scores, reflecting the achievement of each alternate in relation to the others and in relation to the optimal objective represented by a score of a hundred points.

The weighting chart is hereby presented.

3.2.4.2

WEIGHTING CHART

Item.	CRITERIA	Weight of Criteria	SCORING OF ALTERNATES		
			L-A	L-B	L-C
A.	<u>Accessibility</u>	36	4.7	32.8	3.6
	1. Rapid link from airport to estate	15	0.1 1.5	1.- 15.-	0.1 1.5
	2. Short link from airport to estate	10	0.1 1.-	0.8 8.-	0.1 1.-
	3. Adequate link from workers' residential district to estate	4	0.2 0.8	0.7 2.8	0.1 0.4
	4. Adequate link from urban centres of activity to estate	7	0.2 1.4	1.- 7.-	0.1 0.7
B.	<u>Effects on Regional & Urban Traffic Flow</u>	16	1.9	16.-	1.6
	5. Unimpeded traffic flow from North-South Highway & Natural Resources sites to airport	13	0.1 1.3	1.- 13.-	0.1 1.3
	6. Unimpeded Intra-city traffic flow	3	0.2 0.6	1.- 3.-	0.1 0.3
C.	<u>Functioning</u>	10	0.-	10.-	10.-
	7. Efficient internal functioning of the Estate by deviation of through traffic	10	0.- 0.-	1.- 10.-	1.- 10.-
D.	<u>Integration in Urban Pattern</u>	8	3.4	5.6	2.4
	8. Non-severance between urban uses	5	0.2 1.-	1.- 5.-	0.- 0.-
	9. Adequate integration of adjoining factory "Santa Cruz"	3	0.8 2.4	0.2 0.6	0.8 2.4
E.	<u>Investments</u>	30			
	10. Minimization of investment on acquisition of land for right of way of roads	12	1.- 12.-	0.2 2.4	0.3 3.6
	11. Minimization of investment on civil-engineering works	18	1.- 18.-	0.3 5.4	0.8 14.4
Totals		100	40.-	72.2	35.6

3.2.4.3 Comments.

- (a) The above scoring reflects that achievements of alternate L - A would be relatively poor in terms of accessibility, functioning and integration in urban pattern and subsequently would have detrimental effects on regional and urban traffic flow to airport. But it is worth remarking that alternate L-A would entail no further additional investments to those which have already taken place.
- (b) On the other hand, alternate L - B would represent remarkable improvement in terms of accessibility, functioning and integration in urban pattern, while devising an optimal link to airport from regional and urban view-points.

This would necessitate investments on:

- Construction of proposed By-Pass BR-B;
- Civil-engineering works such as: a bridge over the Poxim river, two additional small bridges and acquisition of land for right-of-way for the By-Pass.

- (c) Alternate L - C might be looked at as a compromise between L-A and L-B.

Its achievements in terms of accessibility and integration in urban pattern would be rather limited. While creating optimal conditions for traffic flow inside the Estate it would sever it from other city uses. Links between them would be inconvenient and inefficient. Furthermore, traffic to airport would continue to use the Coastal Avenue Belra Mar.

The above advantages and disadvantages would be correctly considered in view of the relatively small investments it would require in comparison with alternate L-B.

- (d) In conclusion, Alternate L - A is liable to appear attractive for the following reasons:

- On one hand it might seem most advantageous in terms of savings (the road BR-A would require no further expenditures for a certain period).
- On the other hand its shortcomings would not appear at early stages in full scale (low accessibility, deficient functioning and impeded regional and urban traffic flow).

This mission considers, therefore, essential to stress that "advantages" of alternate L-A are just misleading.

Not before long, in view of the Estate's future operation and the foreseen increase in motorization level and in air transportation, considerable investments would be imposed, in order to adjust this alternate to adequate accessibility and orderly functioning (bridges and other civil engineering works within the Estate) (x)

In addition to the above, specific efforts would have to be made (in terms of interchanges, new carriageway on Belra Mar Ave. and land for its right of way, etc. (xx) to prevent rapid traffic to airport from encroaching on the urban network.

A rough estimate has proved that sums involved in all the above civil engineering works would exceed, by far, expenditures on by-pass BR-B, as proposed in Alternate L-B, besides causing complicated solution.

(x) Layout plan L-A, Drawing No.4 & 5

(xx) BR-235 Drawing No.1

Finally, this alternate would cope neither with the benefit of the city as a whole nor with that of the Estate.

3.2.5

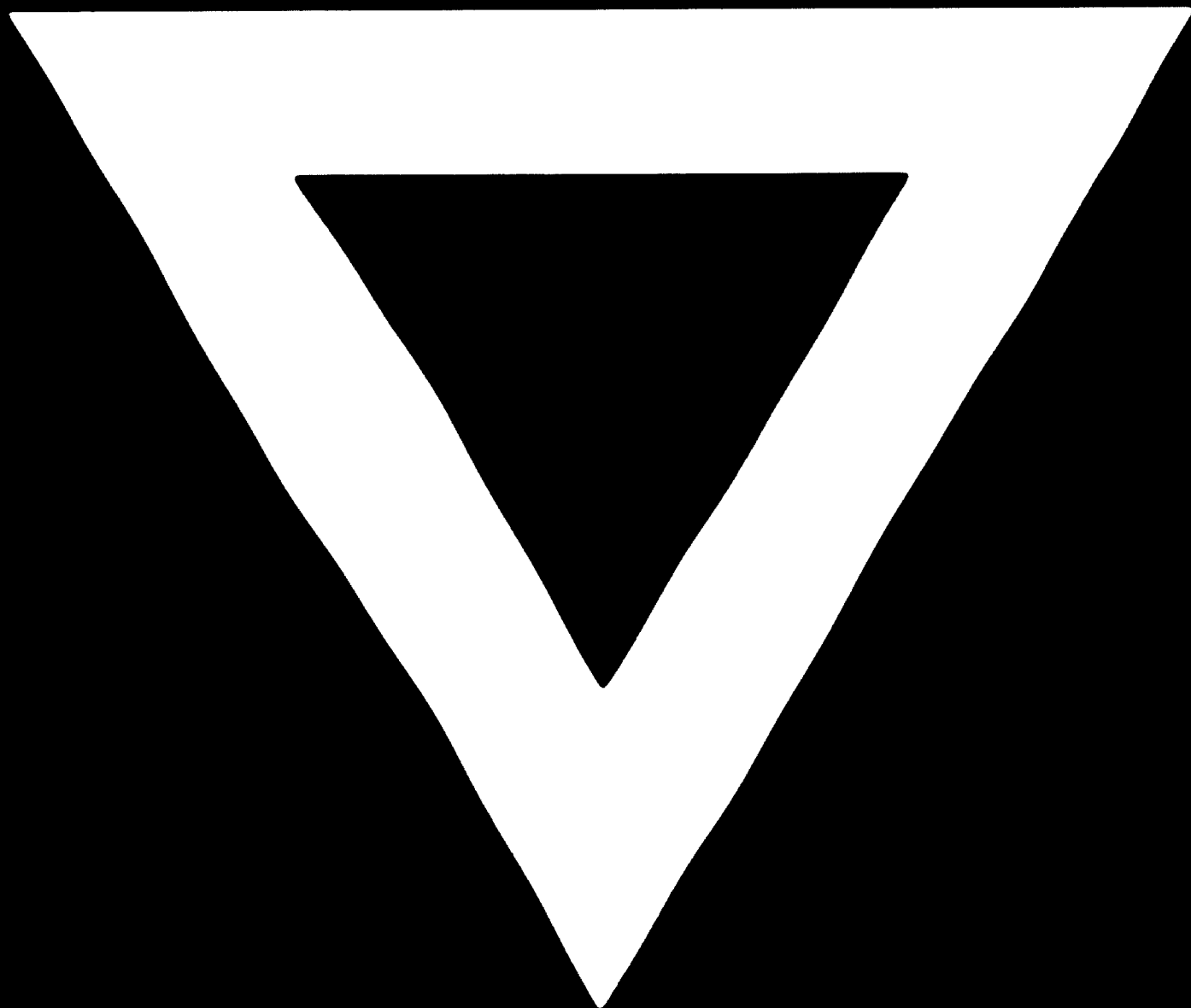
Conclusion and Recommendations.

The above scoring and considerations stress the advantages of Alternate L-B over L-A and L-C from the view-point of benefit, both for the Estate and for the city as a whole.

This mission supposes therefore, that alternate L-B presents an optimal solution and recommends it for implementation.

Remark: The two other alternates (L-A and L-C), have been worked out to serve as comparative mediums. They are presented here to prevent under-estimation of shortcomings typifying such solutions.

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