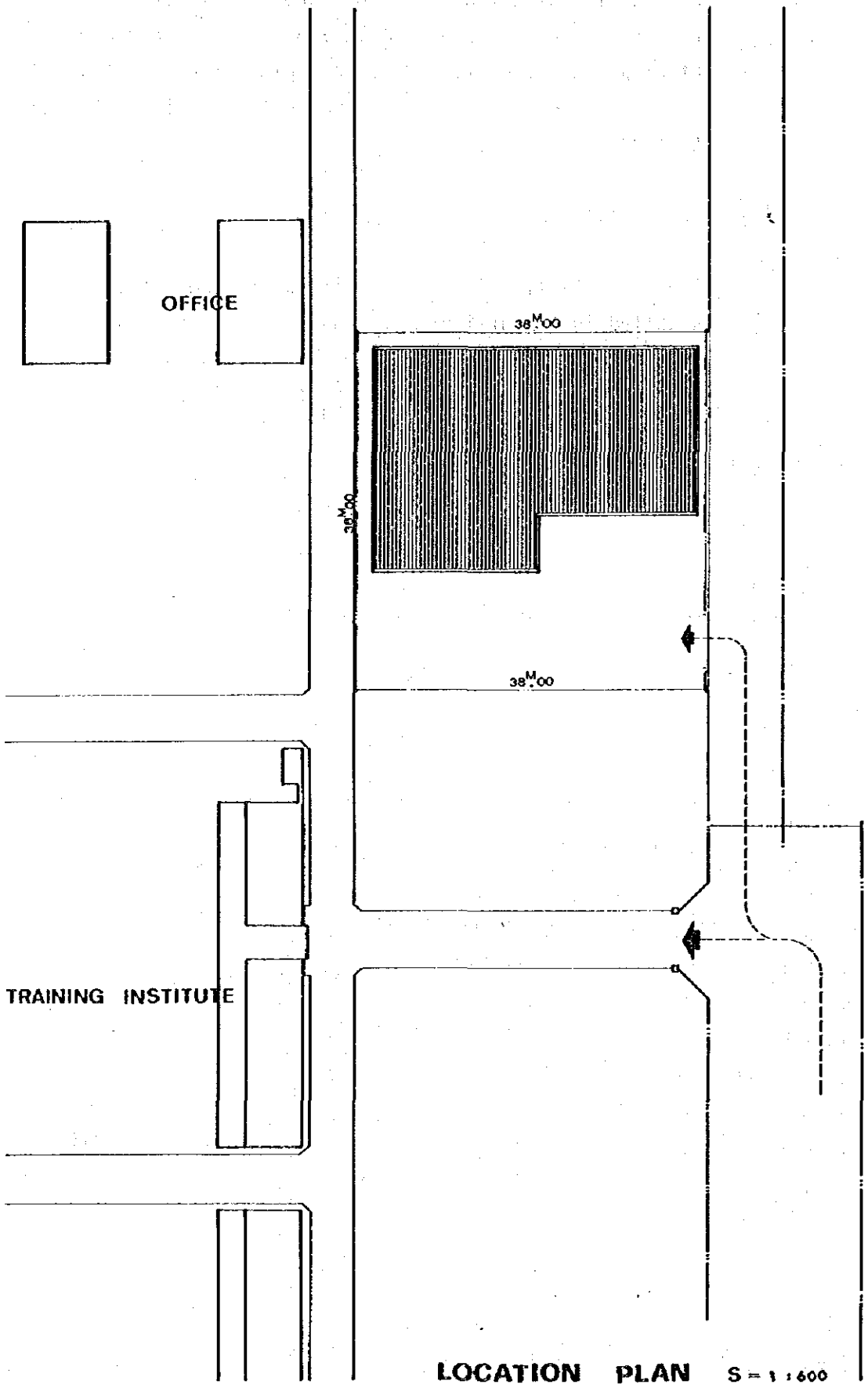
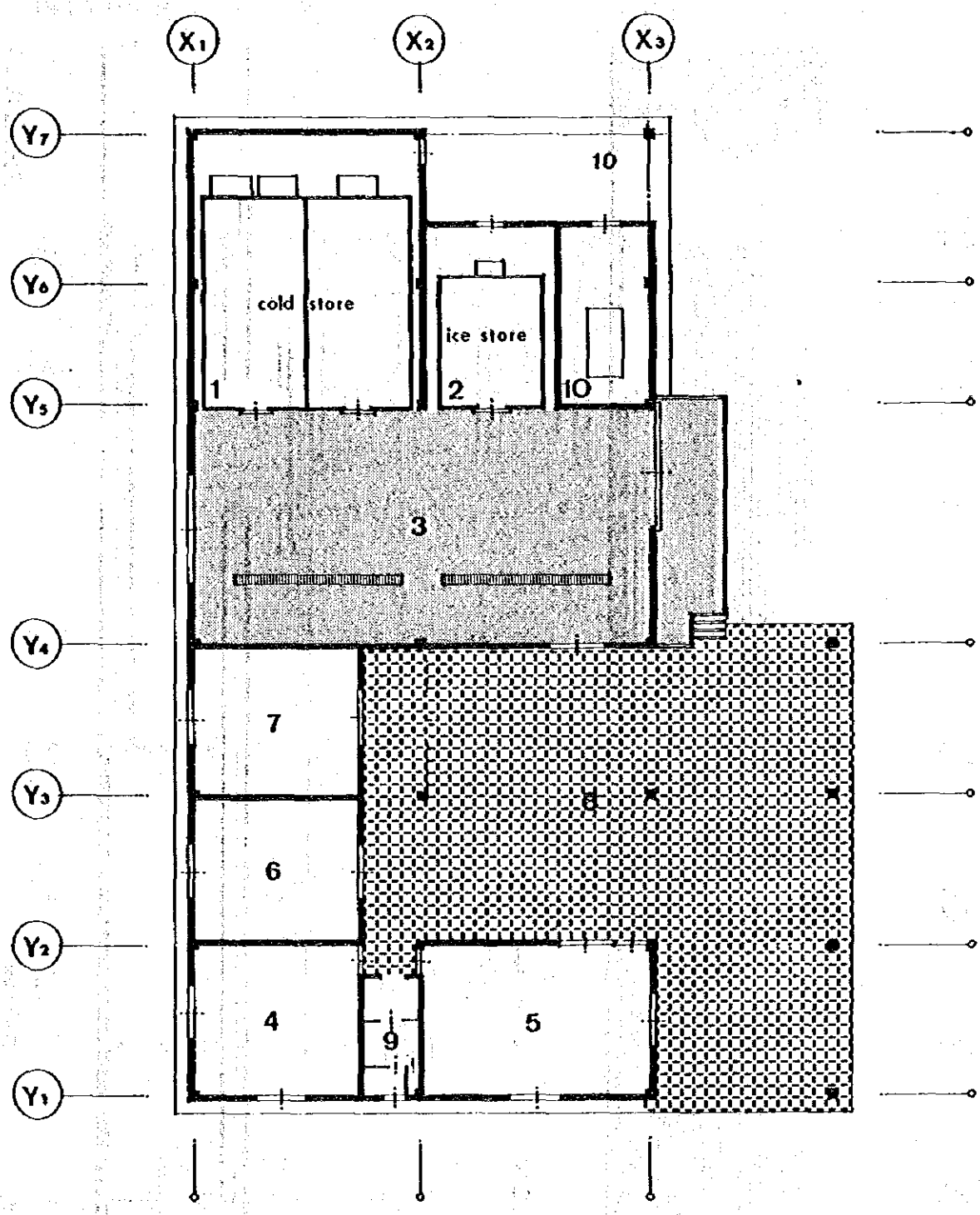
FISH PROCESS AND MARKET CENTER

SHAJARA



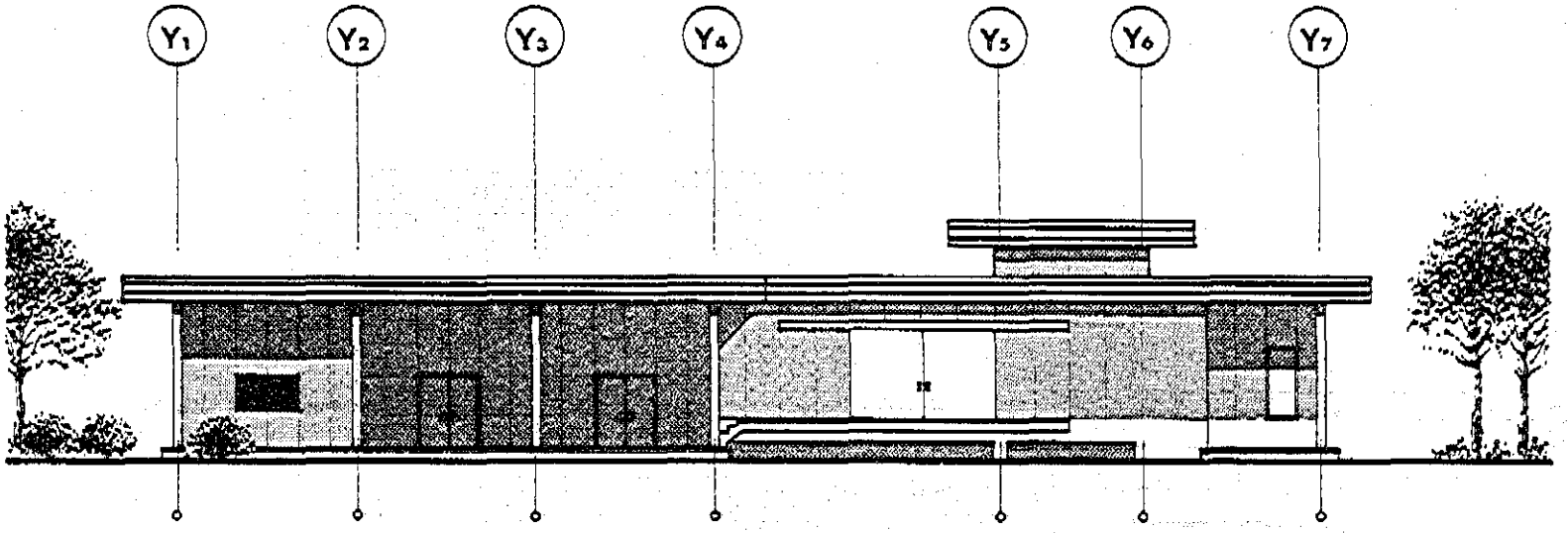
LOCATION PLAN S = 1 : 600



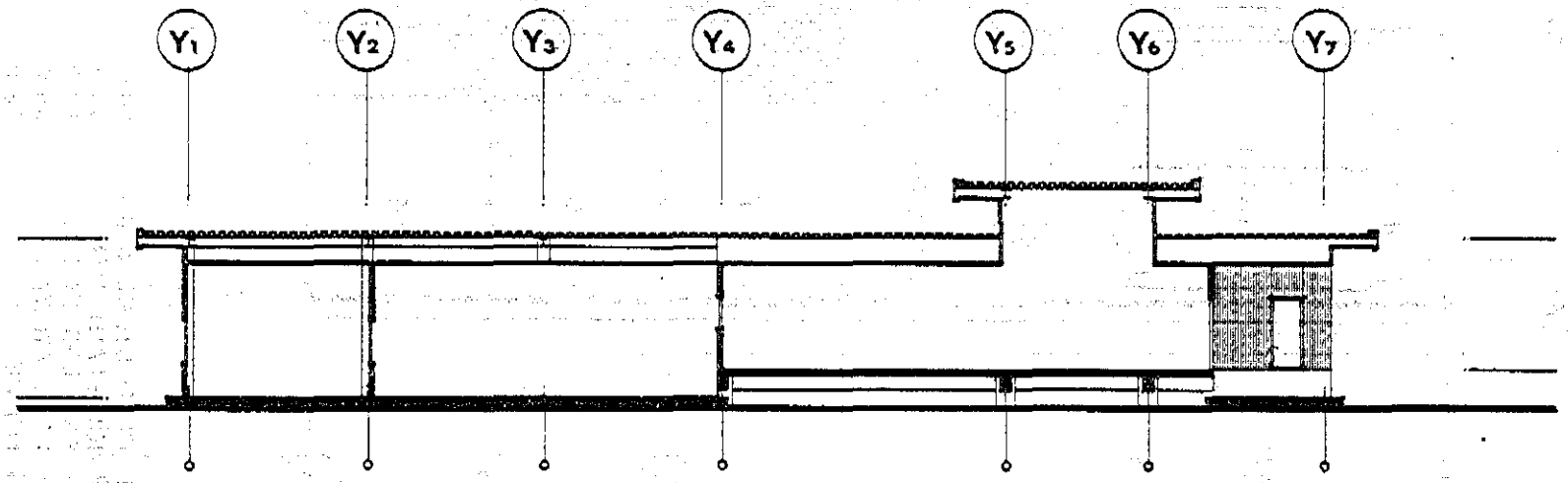
1	COLD STORE R.M	80.0
2	ICE PLANT R.M	35.0
3	PROCESSING R.M	112.0
4	LABORATORY	30.0
5	OFFICE	38.0
6	STORE R.M	30.0
7	WORK SHOP	30.0
8	UTILITY	166.0
9	TOILET	10.0
10	MACHINE R.M	39.0
	TOTAL FLOOR AREA	570.0 m²

0 5 10 m

GROUND FLOOR PLAN S = 1 : 200



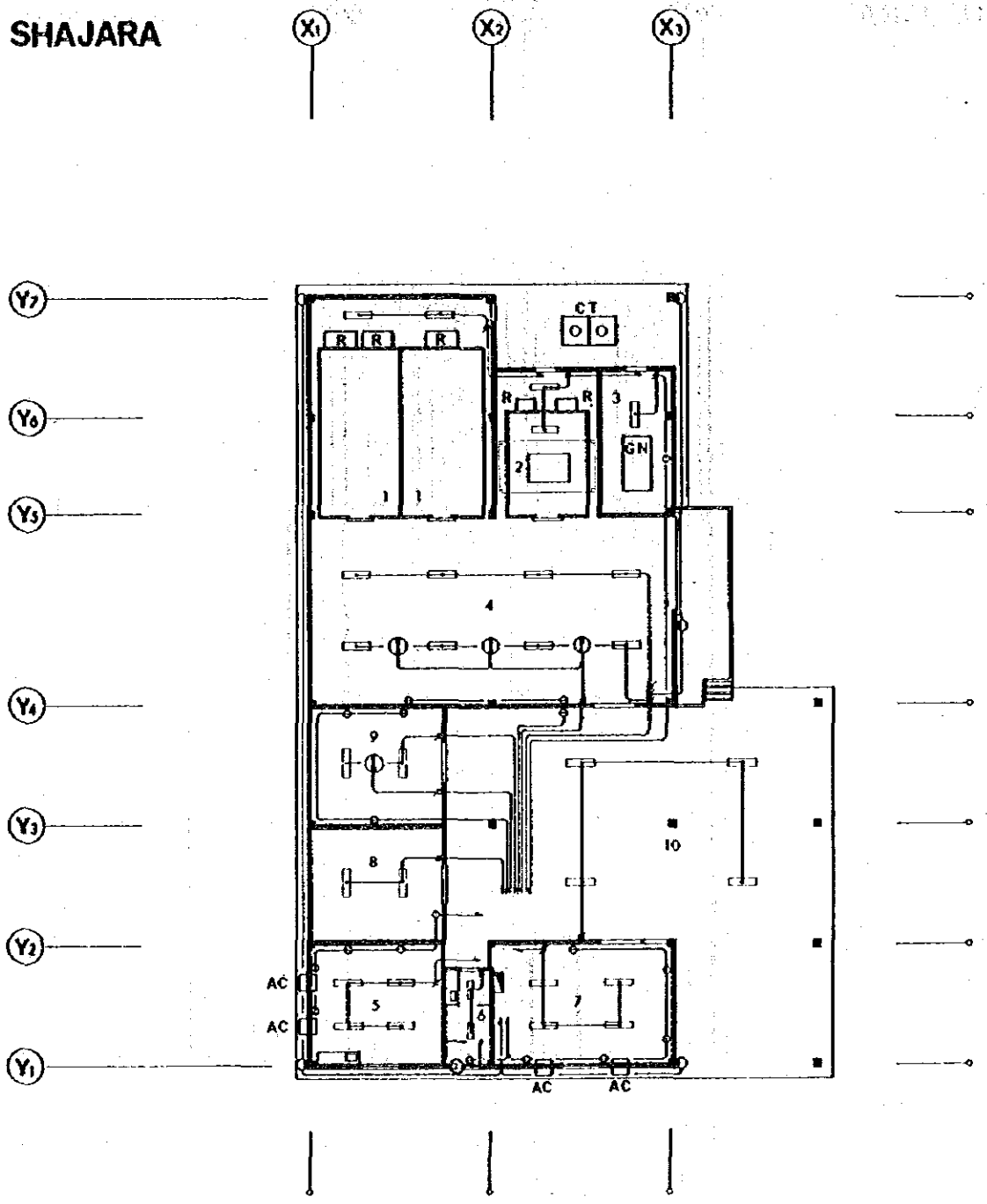
ELEVATION S = 1 : 200



SECTION S = 1 : 200

SHAJARA

SHAJARA



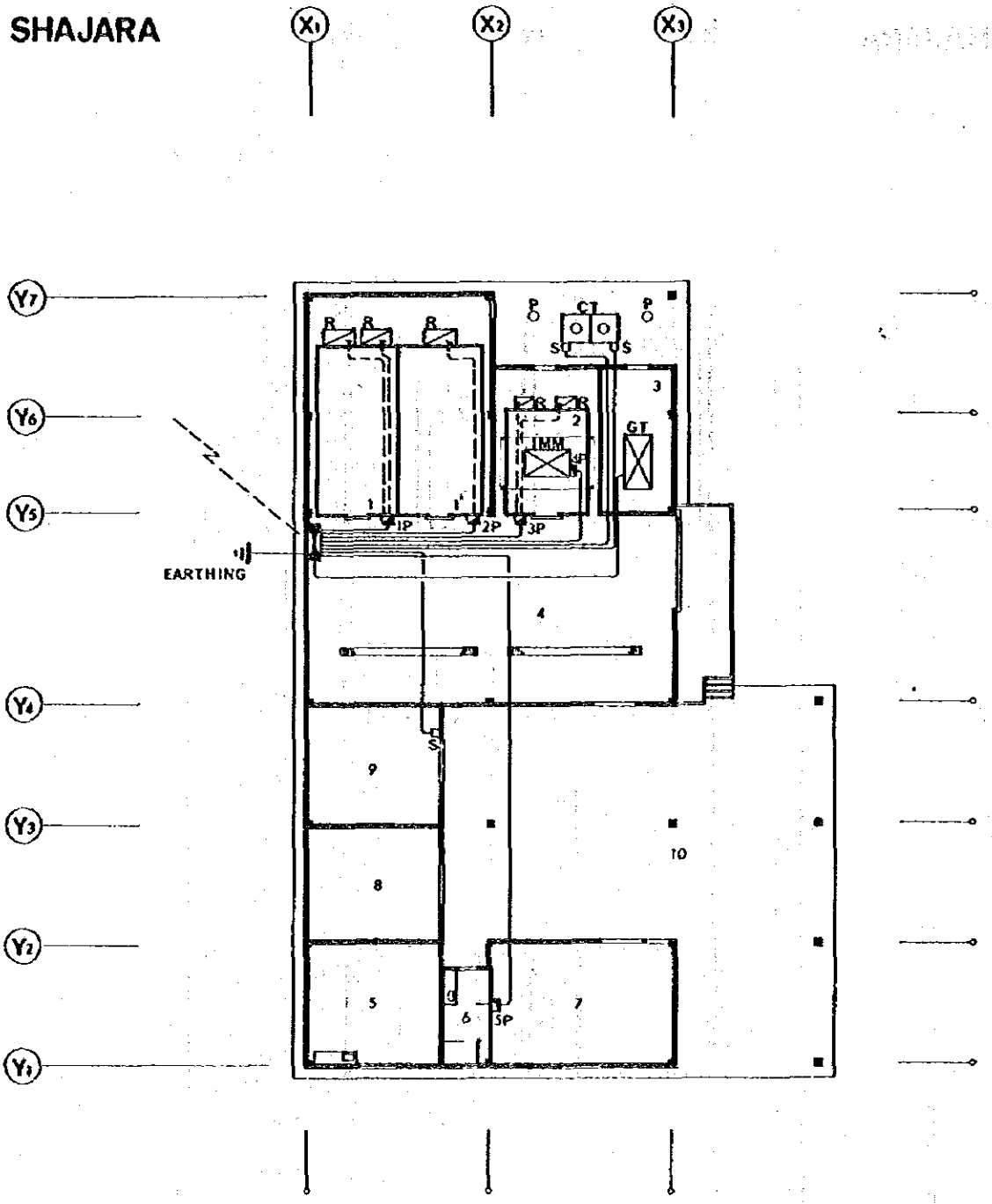
1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 MACHINE RM.
4 PROCESSING RM.
5 LABORATORY
6 TOILET
7 OFFICE
8 STORE RM.
9 WORK SHOP
10 UTILITY

LEGEND

R : REFRIGERATOR
C T : COOLING TOWER
A C : AIR CONDITIONER
G N : GENERATOR
: DISTRIBUTION BOARD
: FLUORESCENT LIGHT
: INCANDESCENT LIGHT
: OUTLET
: SWITCH
: CEILING FAN
: VENTILATING FAN

ELECTRICAL PLAN (LIGHTING)

SHAJARA



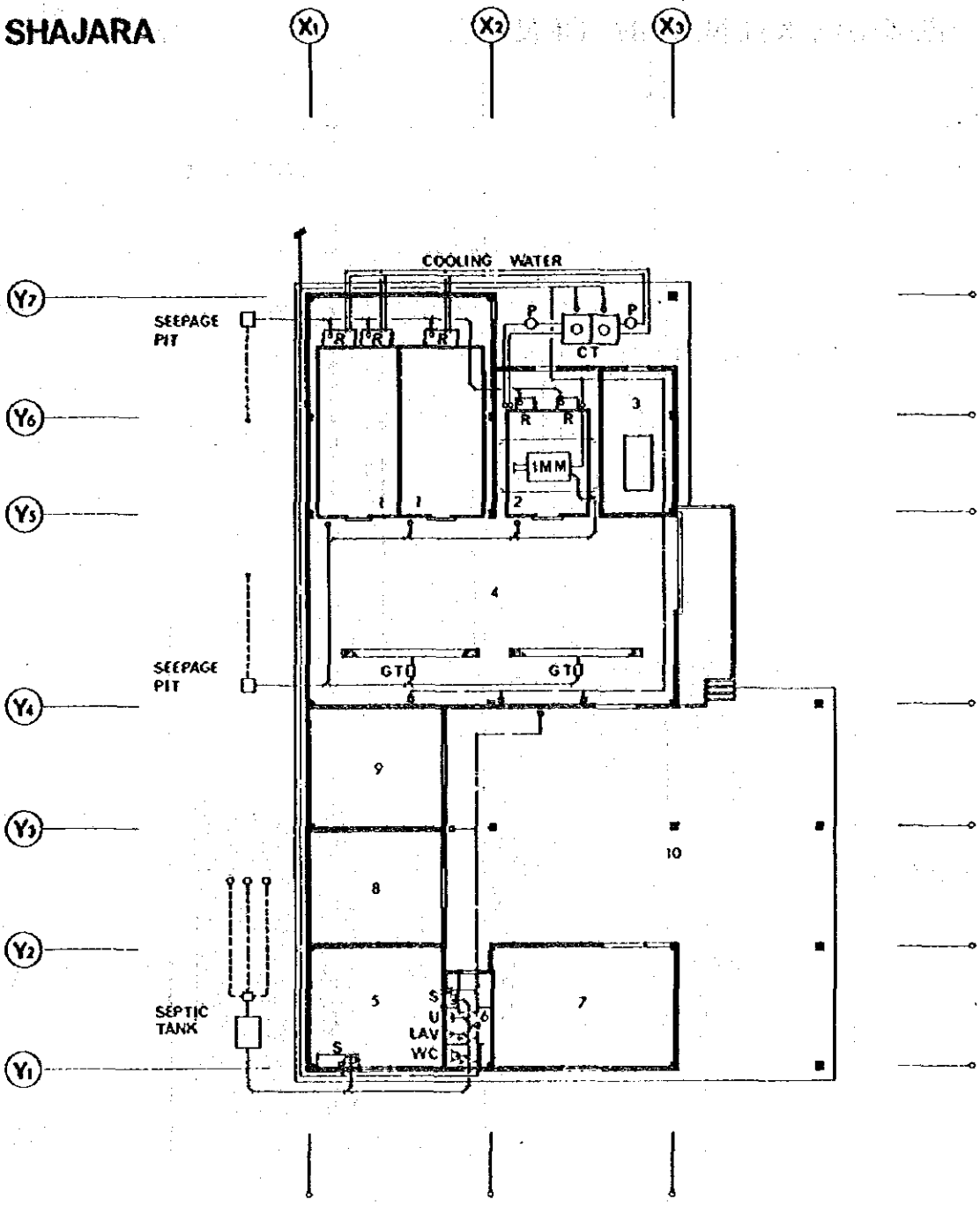
1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 MACHINE RM.
4 PROCESSING RM.
5 LABORATORY
6 TOILET
7 OFFICE
8 STORE RM.
9 WORK SHOP
10 UTILITY

LEGEND

IMM	: ICE MAKING MACHINE
R	: REFRIGERATOR
CT	: COOLING TOWER
GN	: GENERATOR
1P	: PANELBOARD FOR RM. 1
2P	: " FOR RM. 1'
3P	: " FOR RM. 2
4P	: " FOR IMM
5P	: " FOR LIGHT
S	: SAFETY SWITCH
P	: CIRCULATING PUMP
MDB	: MAIN DISTRIBUTION BOARD

ELECTRICAL PLAN (POWER)

SHAJARA



1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 MACHINE RM.
4 PROCESSING RM.
5 LABORATORY
6 TOILET
7 OFFICE
8 STORE RM.
9 WORK SHOP
10 UTILITY

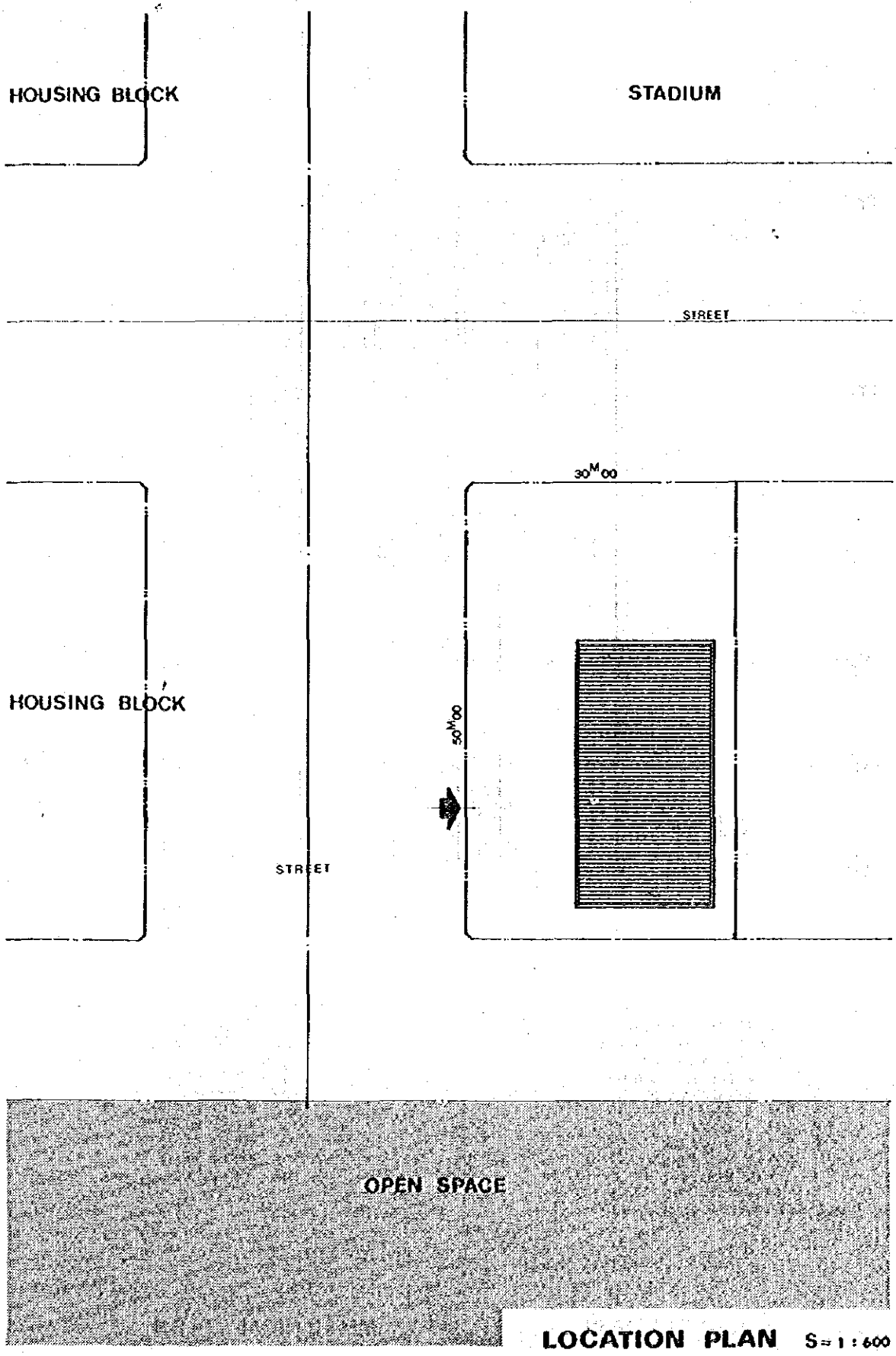
LEGEND

R : REFRIGERATOR
C T : COOLING TOWER
P : CIRCULATING PUMP
S : SINK
LAV : LAVATORY
WC : WATER CLOSET
• : FLOOR DRAIN
∞ : FAUCET
G T : GREASE TRAP
IMM : ICE MAKING MACHINE

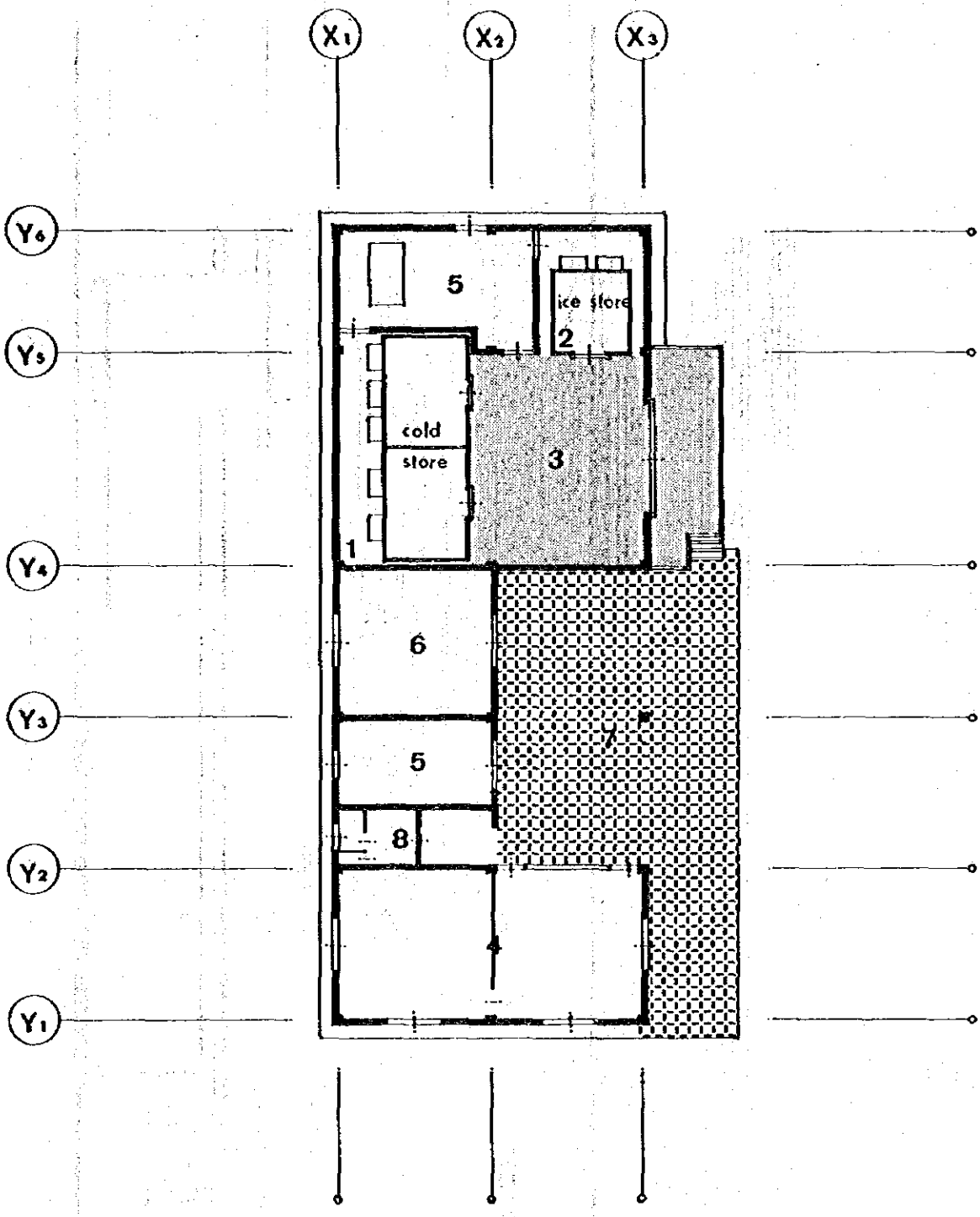
MECHANICAL PLAN

FISHERES EXTENSION CENTER

AD DUWEM



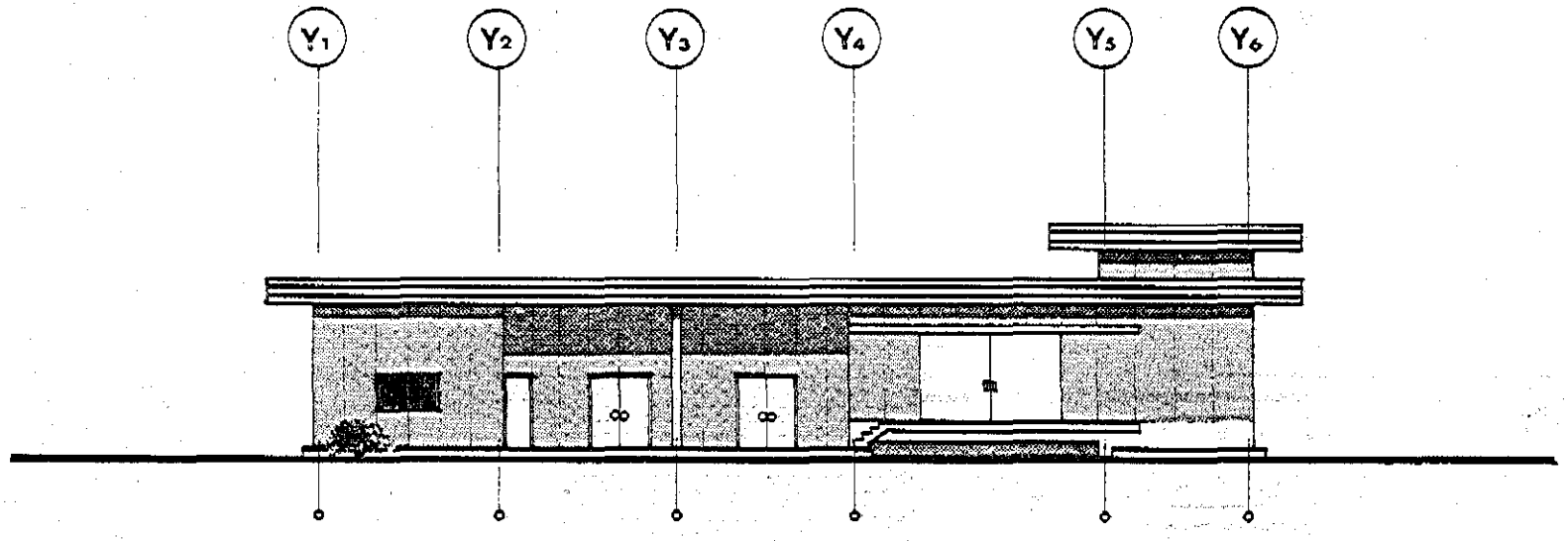
LOCATION PLAN S = 1 : 600



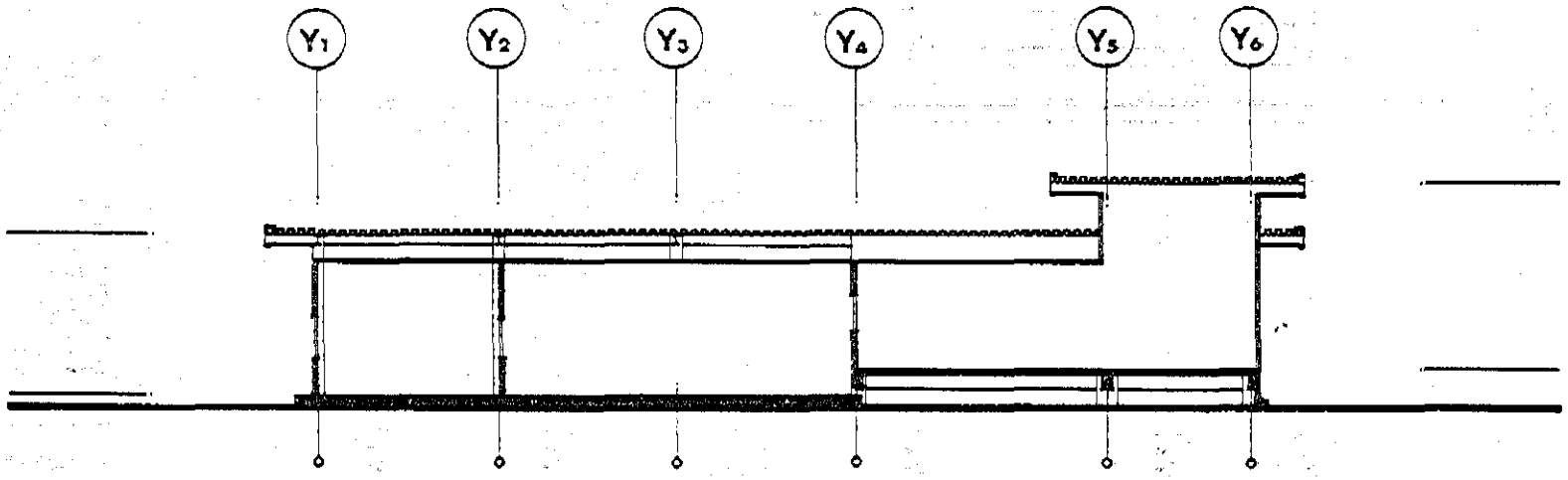
1	COLD STORE R.M	31.0
2	ICE PLANT R.M	16.0
3	HANDLING AREA	39.0
4	OFFICE	50.0
5	STORE R.M	38.0
6	WORK SHOP	25.0
7	UTILITY	51.0
8	TOILET	10.0
	TOTAL FLOOR AREA	260.0 m²

0 5 10 m

GROUND FLOOR PLAN S = 1 : 200



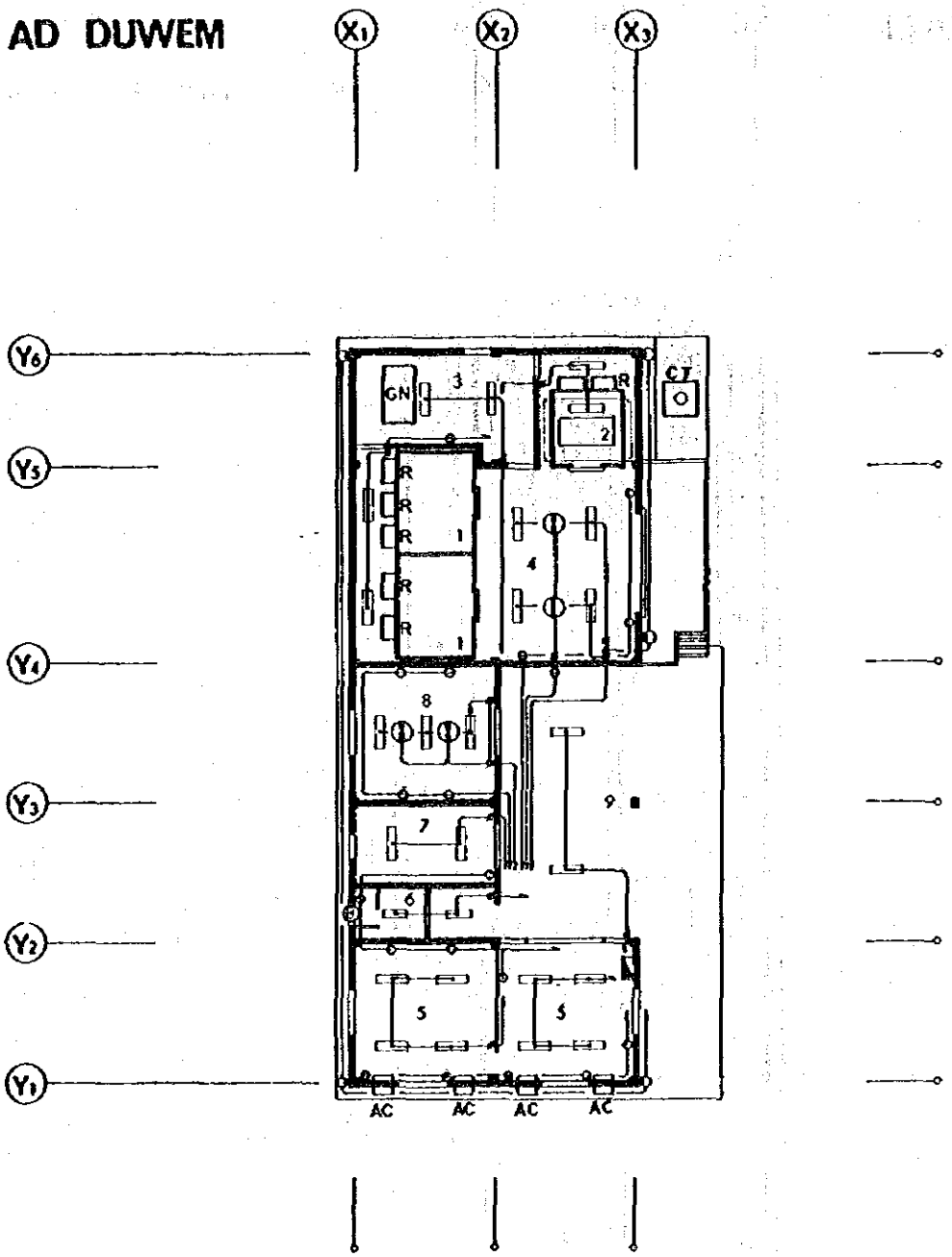
ELEVATION S = 1:200



SECTION S = 1:200

AD DUWEM

AD DUWEM



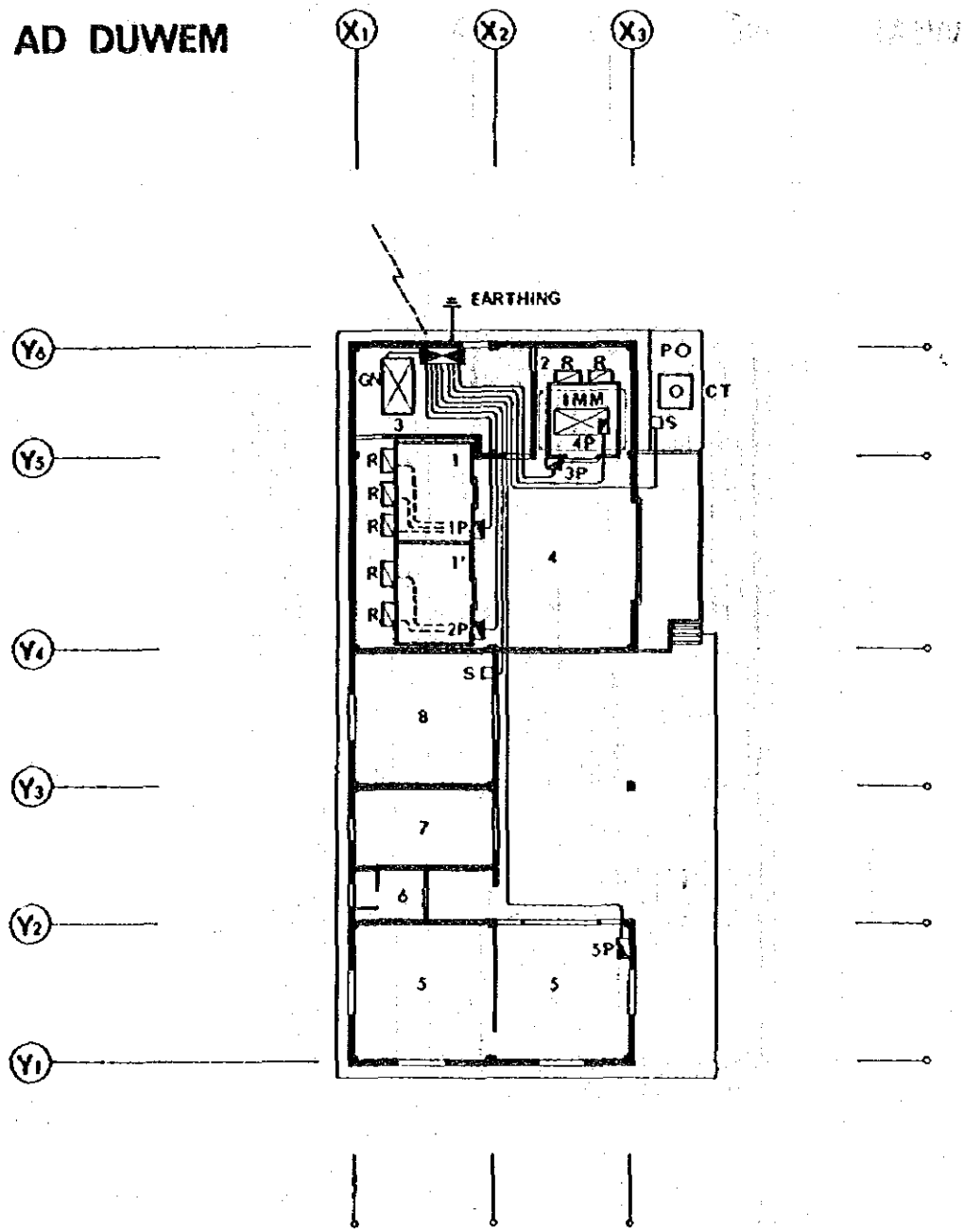
1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 MACHING RM.
4 PROCESSING RM.
5 OFFICE
6 TOILET
7 STORE RM.
8 WORK SHOP
9 LITILITY

LEGEND

R : REFRIGERATOR
CT : COOLING TOWER
AC : AIR CONDITIONER
GN : GENERATOR
: DISTRIBUTION BOARD
: FLUORESCENT LIGHT
: INCANDESCENT LIGHT
: OUTLET
: SWITCH
: CEILING FAN
: VENTILATING FAN

ELECTRICAL PLAN (LIGHTING)

AD DUWEM



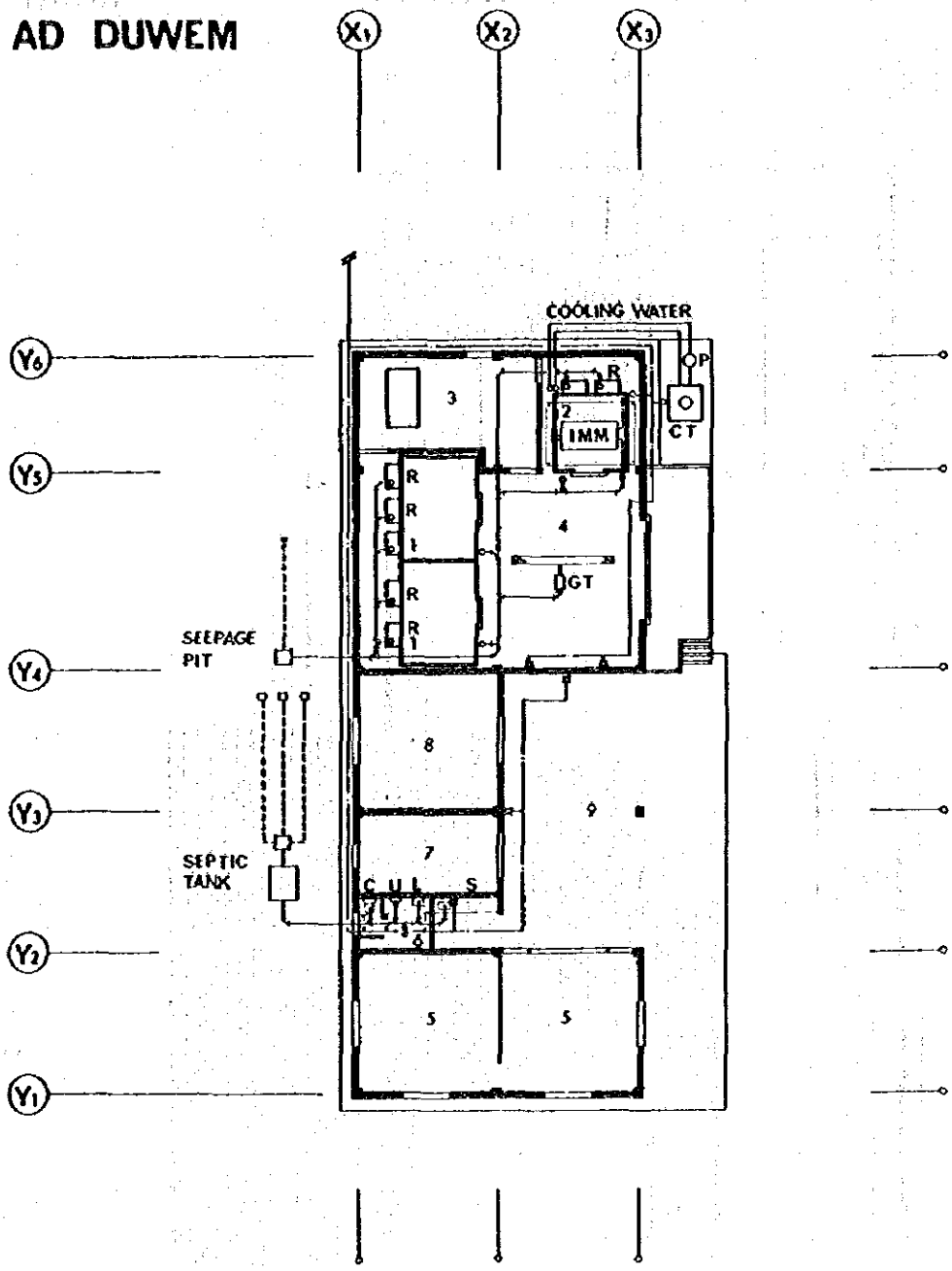
1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 MACHING RM.
4 PROCESSING RM.
5 OFFICE
6 TOILET
7 STORE RM.
8 WORK SHOP
9 LITILITY

LEGEND

1MM : ICE MAKING MACHINE
R : REFRIGERATOR
C T : COOLING TOWER
G N : GENERATOR
1 P : PANELBOARD FOR RM 1
2 P : " FOR RM 1'
3 P : " FOR RM 2
4 P : " FOR 1MM
5 P : " FOR LIGHT
S : SAFETY SWITCH
P : CIRCULATING PUMP
MDB : MAIN DISTRIBUTION BOARD

ELECTRICAL PLAN (POWER)

AD DUWEM



1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 MACHING RM.
4 PROCESSING RM.
5 OFFICE
6 TOILET
7 STORE RM.
8 WORK SHOP
9 UTILITY

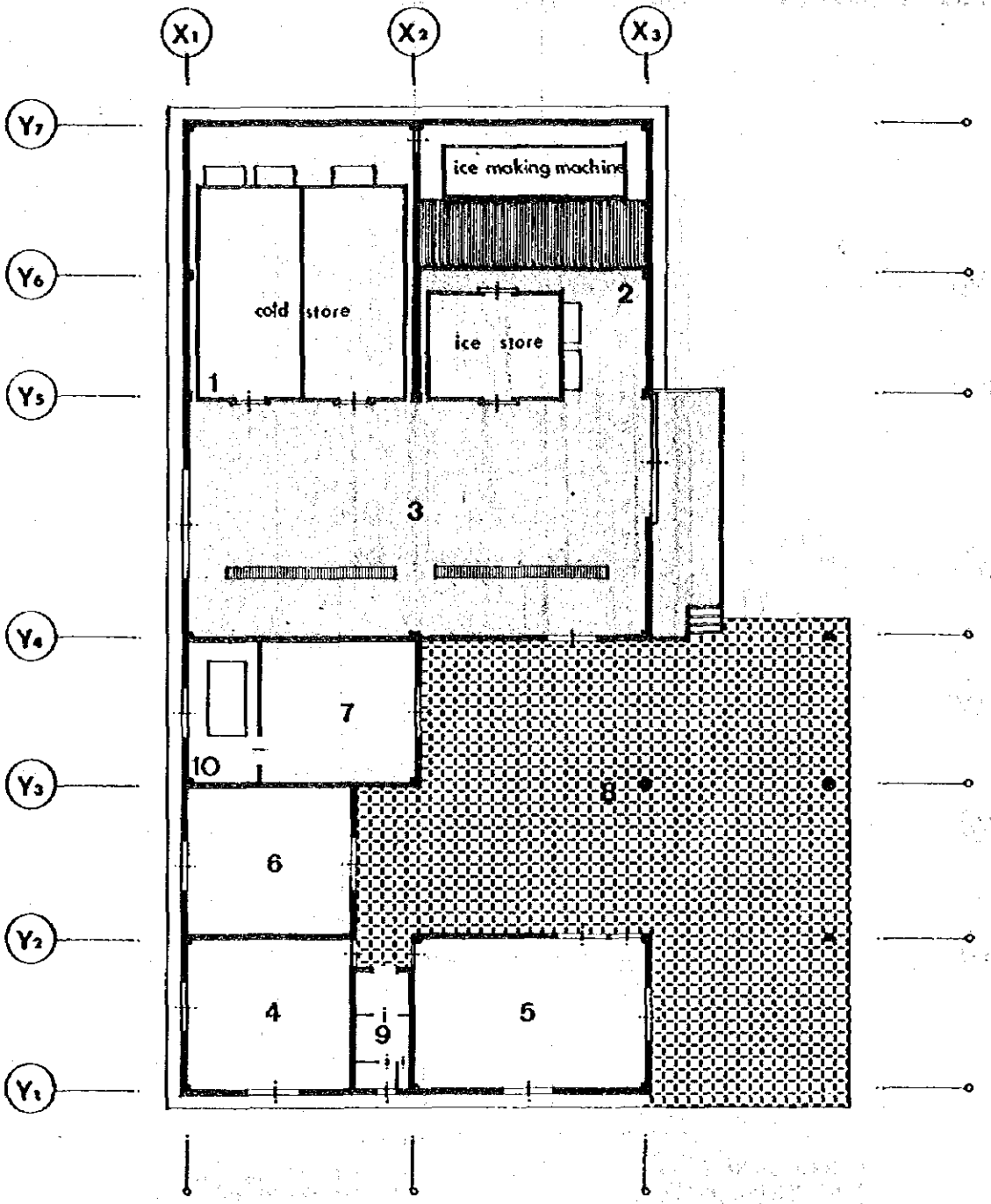
LEGEND

R	: REFRIGERATOR
C T	: COOLING TOWER
P	: CIRCULATING PUMP
S	: SINK
L	: LAVATORY
U	: URINAL
C	: WATER CLOSET
∘	: FLOOR DRAIN
⊔	: FAUCET
G T	: GREASE TRAP
IMM	: ICE MAKING MACHINE

MECHANICAL PLAN

FISH PROCESS AND MARKET CENTER

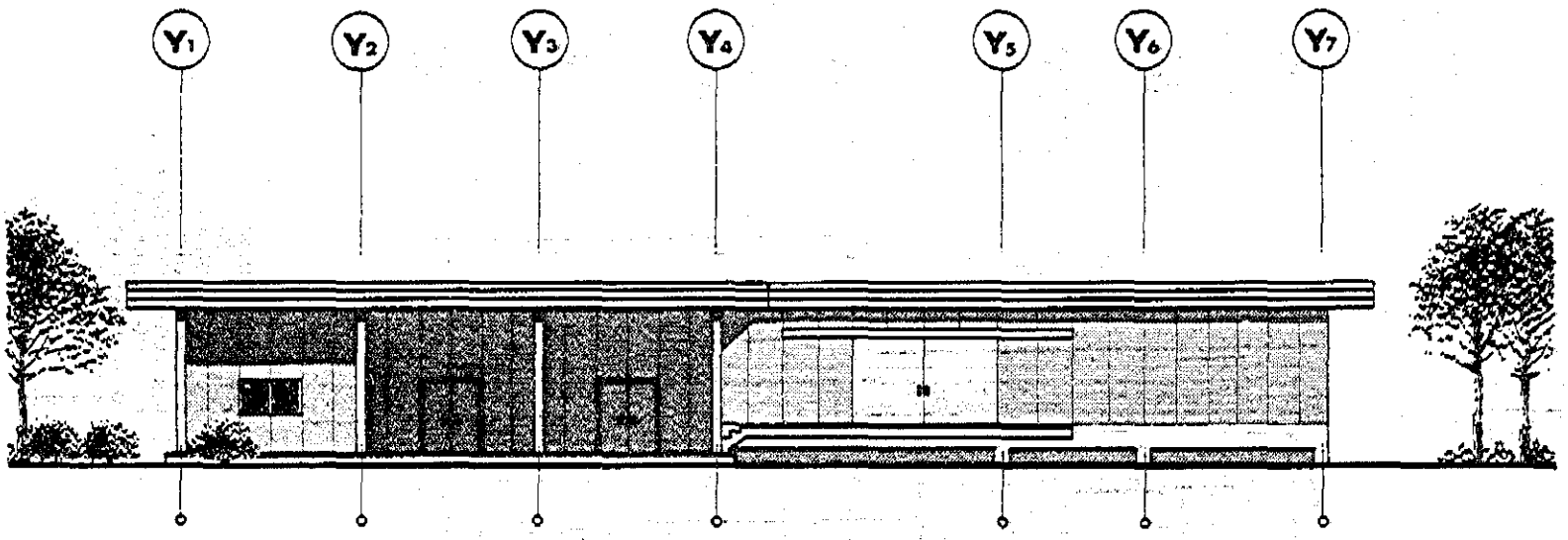
KOSTI



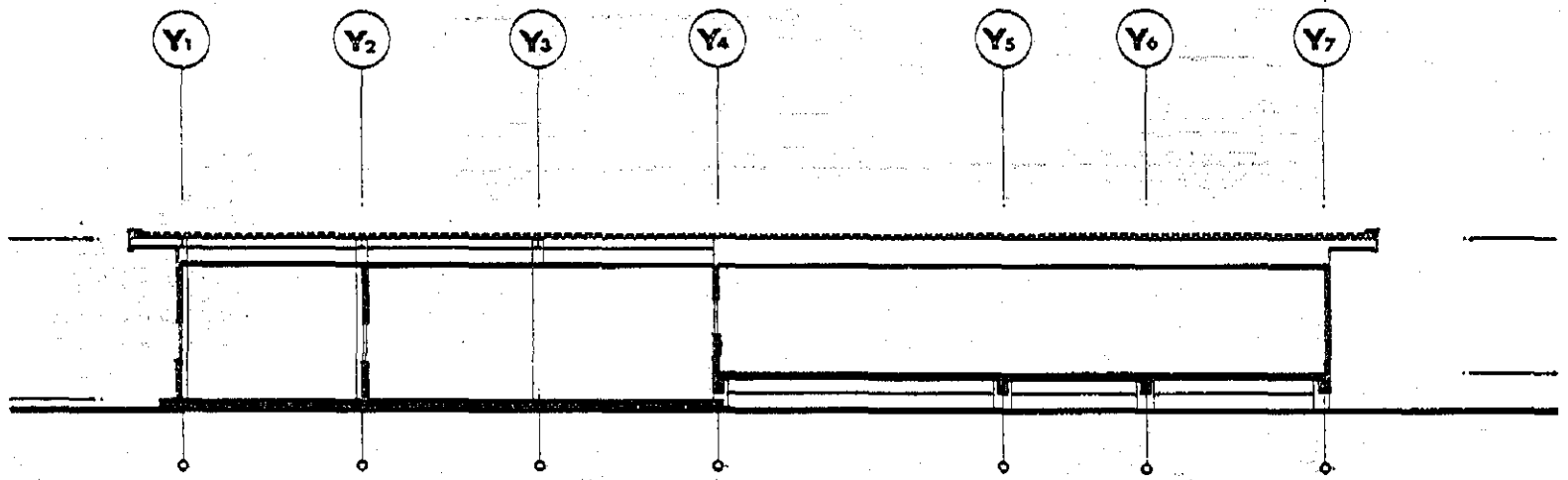
1	COLD STORE R.M	80.0
2	ICE PLANT R.M	68.0
3	PROCESSING R.M	112.0
4	LABORATORY	30.0
5	OFFICE	38.0
6	STORE R.M	30.0
7	WORK SHOP	30.0
8	UTILITY	162.0
9	TOILET	10.0
10	MACHINE R.M	10.0
	TOTAL FLOOR AREA	570.0 m²

0 5 10 m

GROUND FLOOR PLAN S = 1:200



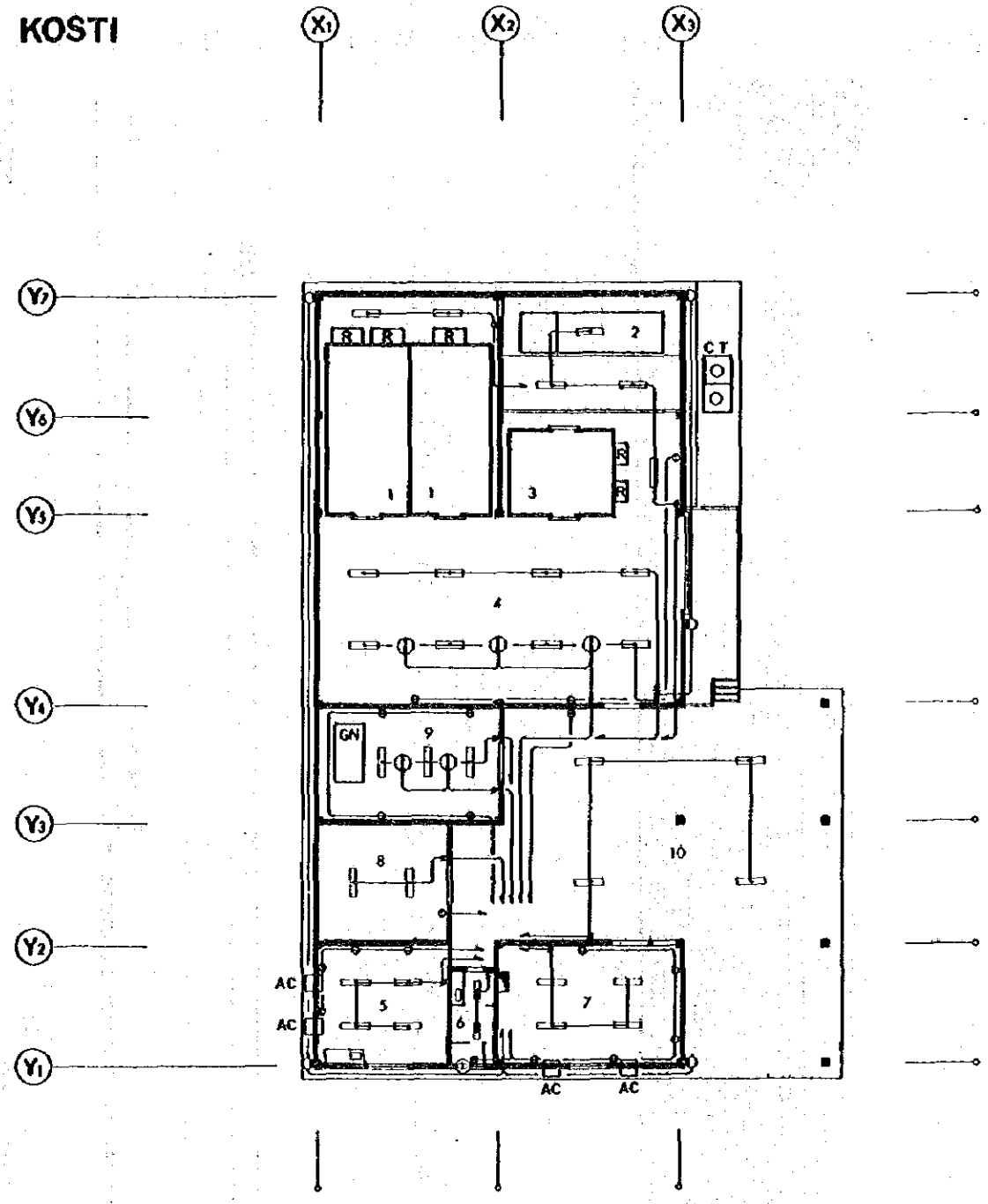
ELEVATION S = 1 : 200



SECTION S = 1 : 200

KOSTI

KOSTI



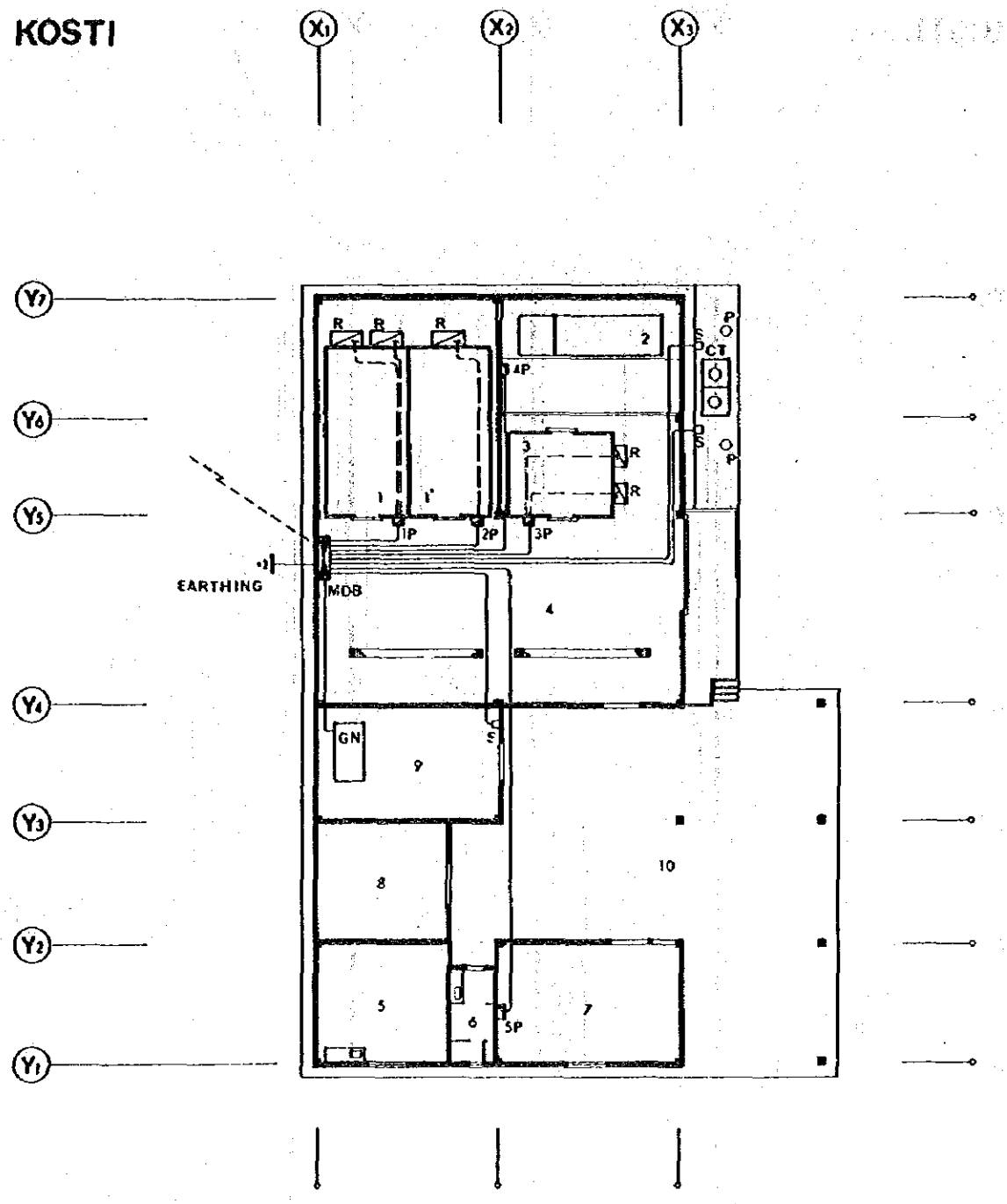
1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 ICE STORAGE BIN
4 PROCESSING RM.
5 LABORATORY
6 TOILET
7 OFFICE
8 STORE RM.
9 WORK SHOP
10 UTILITY

LEGEND

R : REFRIGARATOR
C T : COOLING TOWER
A C : AIR CONDITIONER
G N : GENERATOR
: DISTRIBUTION BOARD
: FLUORESCENT LIGHT
O : INCANDESCENT LIGHT
: OUTLET
: SWITCH
: CEILING FAN
: VENTILATING FAN

ELECTRICAL PLAN (LIGHTING)

KOSTI

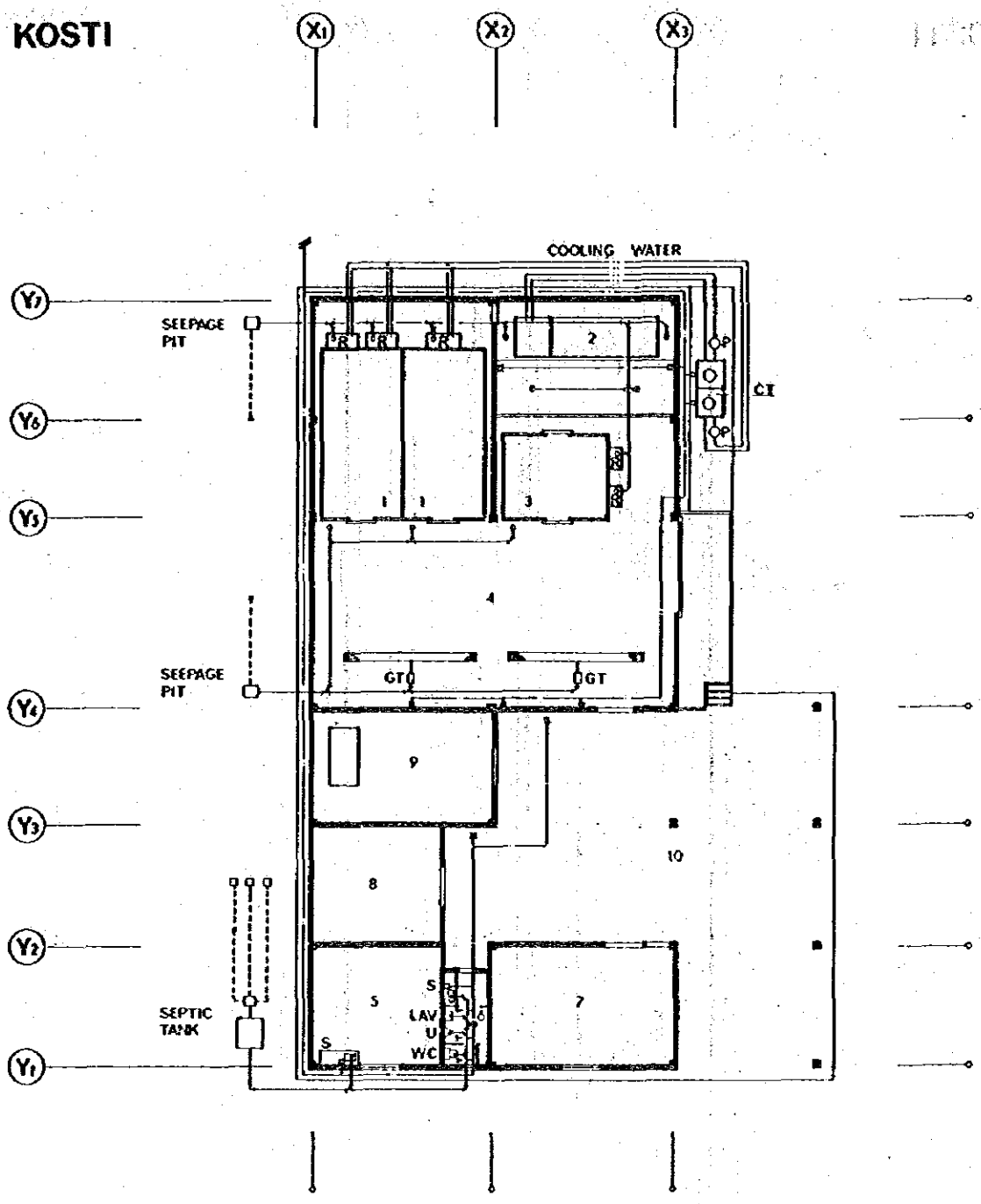


1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 ICE STORAGE BIN
4 PROCESSING RM.
5 LABORATORY
6 TOILET
7 OFFICE
8 STORE RM.
9 WORK SHOP
10 UTILITY

LEGEND

R	:	REFRIGARATOR
C T	:	COOLING TOWER
G N	:	GENERATOR
1P	:	PANELBOARD FOR RM.1
2P	:	" FOR RM.1'
3P	:	" FOR RM.3
4P	:	" FOR 2
5P	:	" FOR LIGHT
S	:	SAFETY SWITCH
P	:	CIRCULATING PUMP
MDB	:	MAIN DISTRIBUTION BOARD

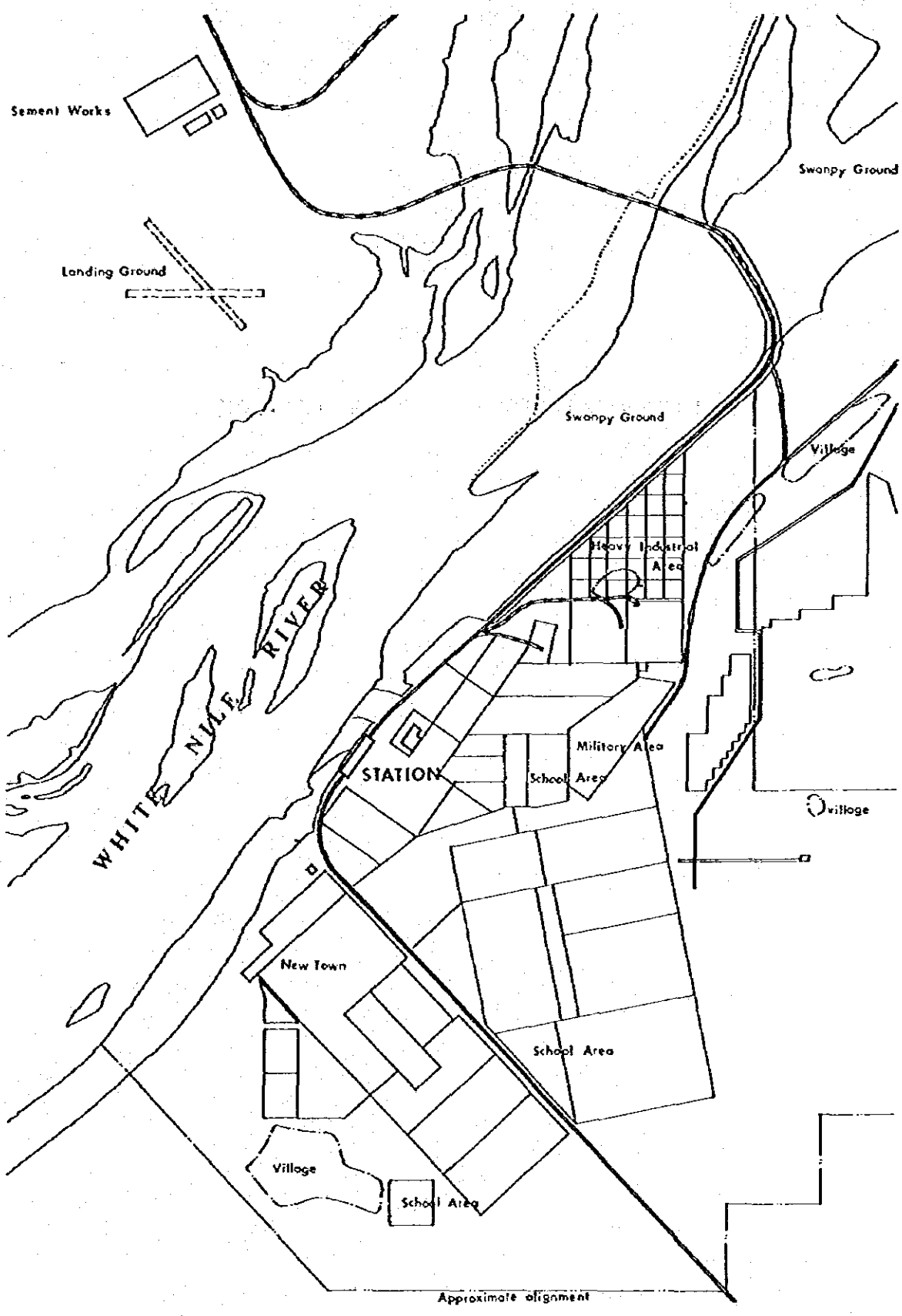
ELECTRICAL PLAN (POWER)



1 COLD STORAGE RM.
2 ICE MAKING PLANT
3 ICE STORAGE BIN
4 PROCESSING RM.
5 LABORATORY
6 TOILET
7 OFFICE
8 STORE RM.
9 WORK SHOP
10 UTILITY

LEGEND
R : REFRIGERATOR
C T : COOLING TOWER
P : CIRCURATING PUMP
S : SINK
LAV : LAVATORY
U : URINAL
WC : WATER CLOSET
• : FLOOR DRAIN
▪ : FAUCET
G T : GREASE TRAP

MECHANICAL PLAN



LOCATION MAP 0 1 2 km

SECTION 6 THE CONSTRUCTION PLAN

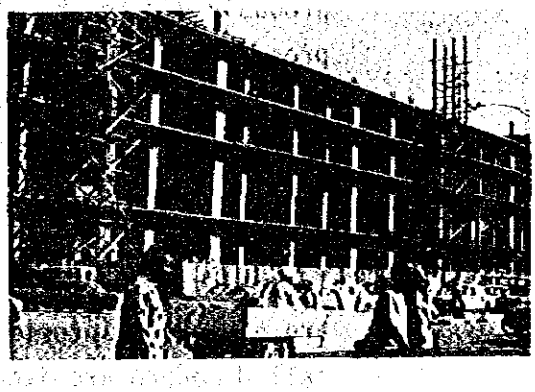
6 — 1 Construction Phase

(1) The General Construction Environment

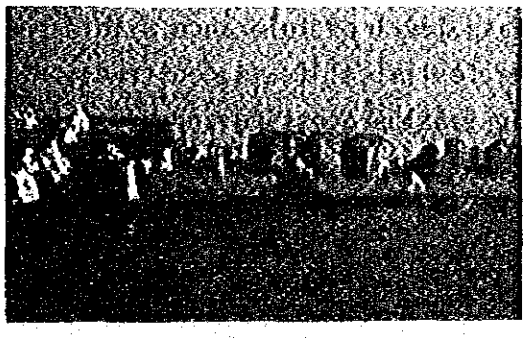
Construction practices in the Democratic Republic of the Sudan may be classified as follows by type of area:

1) Mud-block layered construction in the outlying villages;
2) Brick-layered or mud-layered construction in the small provincial cities; and
3) Brick-layered or reinforced concrete construction in the major cities.

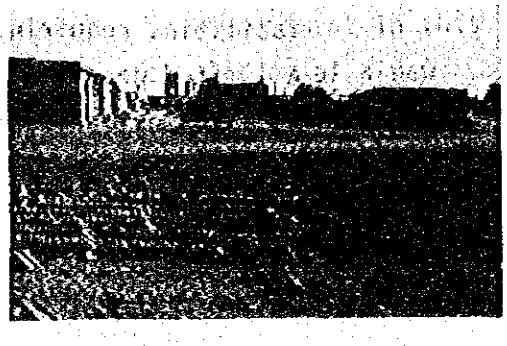
Brick-layard construction found in a local city



Reinforced concrete building under construction in Khartoum



Local house using mud-block



Production site for mud-block

This classification, however, contains an inevitable bias toward regional differences in degree of modernization. The grass roots style of construction, whereby living quarters are built by piling up materials in layers, remains common to all areas of the country.

The multi-storied buildings in the major cities are mainly of reinforced concrete construction, but, when these are inspected in detail, we see that while the pillars, beams, and slabs are of concrete construction, all other materials--including interior and exterior walls--are based almost entirely on painstaking brick laying techniques. Thus, as construction concepts, they should rather be termed layered construction.

Very few steel-frame buildings can be seen, but this is probably due to the extremely high cost and difficulty of procuring steel frame materials as well as the fact that builders are most comfortable with traditional brick and mud-layered construction and so lack experience and skills for such construction techniques as steel frame.

In any event, construction tolerances in such structures are generally inferior to the standards demanded in so-called modern architecture. Also, from the standpoint of material supply and labor efficiency, construction periods are quite long, and considerable effort is required to keep the construction work to plan.

Based on these conditions when planning to build large facilities requiring a certain level of tolerance within a limited period of time, we feel steel frame construction will be most appropriate for local processing and on-site assembly.

In the subject Project, the planned procurement of locally available materials and the securing of transport routes constitute a very critical parts of the construction supervision process.

The roster of building contractors include the Public Corporation for Construction and Building which was established in 1973 as a government contractor and seems to have carried out a considerable number of construction projects. In urban centers, there are also several private contractors with the ability to construct multi-story buildings.

As a general rule, the larger the local construction content in the project, the more essential the cooperation of local contractors from the standpoint of securing a stable supply of building materials and construction workers.

(2) Materials Plan:

The number of locally available building materials is very limited, including only sand, cement, primary milled products and bricks. All other materials will have to be imported.

Cement plants are located in Atbara and Rabaq, with reported annual production of 150,000 MT and 50,000 MT respectively. Total cement production in the Democratic Republic of the Sudan in 1979 totaled 183,000 MT. Cement is presently in short supply, owing to the various development programs currently underway in the country. No improvement in this situation can be expected until the completion of a new 1,000,000 MT/year plant, planned in the near future in the vicinity of Atbara.

In the case of steel products, qualities of up to SS40 can be obtained, but high tension steels are not available.

Accordingly, the basic design plan is keyed to importing the bulk of the needed construction materials from Japan. Nevertheless, there are certain items for which it will be necessary to rely on local supply, such as framing materials, cement and reinforcing bars. A procurement schedule for these materials should be finalized as soon as possible for each location.

The following table gives free market prices in the Democratic Republic of the Sudan for the principal building materials as of the end of 1980:

Prices for Selected Building Materials

Gravel	14 LS/m^3
Sand	10 LS/m^3
Cement	180 LS/ton
Reinforcing bars	750 LS/ton
Concrete forms	5 LS/m^2
Bricks	25 LS/1,000 pieces

(3) Labor Plan:

There is a relatively abundant supply of brick-layers and construction workers in the Democratic Republic of the Sudan. While other trades, such as carpenters and steel workers do exist, many of these workers migrate to the Mid-East oil countries, a fact which has created a very serious shortage of skilled workers in the Democratic Republic of the Sudan. As a result, the higher the required skill level, the harder and more costly it is to procure locally. There is thus a tremendous wage difference among the various categories of workers.

We have taken these conditions into account in formulating this plan and so have increased the amount of processing and fabricating work to be done in Japan and greatly simplified the types of construction services to be performed locally. The plan calls for maximum fabrication in Japan of those items requiring skilled labor capability.

There remain, however, certain relatively highly skilled functions that will have to be obtained locally, such as steel frame assemblers and ferro-concrete labor. No time should be lost in arranging for a supply of suitable workers in these categories at the appropriate times in the construction program.

The going wage rates for selected job classifications in the Democratic Republic of the Sudan, as of the end of 1980, were as follows:

Local Wage Rates

Classification	Daily	Unit Rates
Bricklayer	10 LS	
Plasterer	8 LS	1.5 LS/m^2
Construction Worker	8 LS	
Painter	10 LS	1 LS/m^2
Carpenter	10 LS	2 LS/m^2
Mason	10 LS	5 LS/m^2
Electrician	8 LS	

(4) Transport Plan

Since most of the materials for this project will have to be brought in from Japan, the transport phase becomes of major importance. The successful execution of local transport operations will be a key element in the construction program.

As we understand it, there are only two transport methods for moving materials from Port Sudan, the port of entry, to the three planned construction sites: rail and road. Rail, which is the most important means of transportation in the country, can be used between Port Sudan and both Khartoum and Kosti. However, owing to antiquated facilities and inefficient management, rail transport capacity is extremely limited, with transport time long and unreliable.

With respect to road transport, when paved highways are completed between Haiya and Port Sudan and between Sinnar and Kosti (construction is now in progress) transportation from Port Sudan to Shajara and Kosti will be much improved. However, road conditions are poor between Kosti and Ad Duwem, with travel particularly difficult during the rainy season.

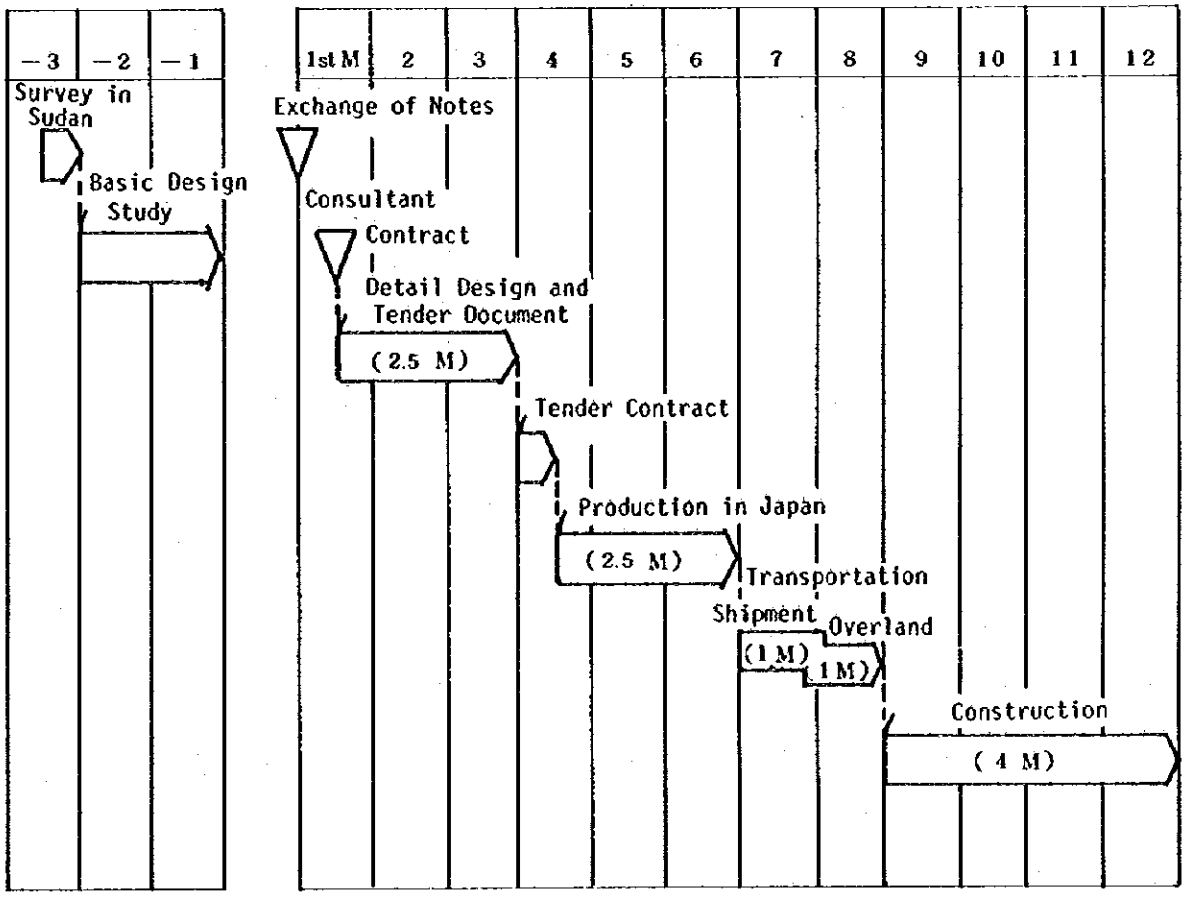
In view of these conditions, in order to ensure reliable overland transportation it will be necessary to

... program a sufficiently long transport period; and

... avoid, to the maximum extent, transporting goods during the July-September rainy season.

6－2 Construction Schedule

If this Project is activated, the implementation stages will be as shown below. As will be subsequently discussed, careful management control will be required for inland transportation and for coordinating the simultaneous construction of facilities at 3 widely scattered locations.



PROJECT PROGRESS CHART

SECTION 7 ADMINISTRATION AND PROJECT EVALUATION

7 — 1 Personnel

The staff needed to support the subject facilities will, for the time being-- i.e., until the fishermen are organized into cooperatives and the latter become capable of taking over facility management--, have to be supplied by the Government of the Democratic Republic of the Sudan. The required staff is as follows:

Shajara:

General Manager	1
Senior executive	1
Junior staff	2
Freezer technician	1
Service mechanic	1
Processing crew	6
Drivers	2

Kosti:

Staff functions and size will be the same as at Shajara, plus 4 extra hands to handle the block ice.

Ad Duwem:

General Manager	1
Senior executive	1
Training staff	3
Service mechanic	1
Drivers	2

Since the subject facilities are to be quasi-public, with the exception of junior staff, processing line workers, ice handlers, and drivers, it would be desirable that the organizations in the central and provincial government having direct responsibility for the facilities provide the administrative staff from among their own employees. The General Manager post could be held

concurrently by a senior civil servant of managerial rank.

While the needs for administrative personnel would be thus met from among civil servants, the line workers can be hired on a part-time basis. With regard to the training of technical staffs the Japan International Cooperation Agency offers a training program for developing countries and this facility together with any similar program prepared by other countries should be utilized to raise technical levels and develop qualified staff.

7 — 2 Management Plan

While the facilities at Shajara and Kosti are designed for distribution and processing, that at Ad Duwen is intended for extension training. That is, the former are to process catch delivered by fishermen into higher value products, while the latter, through the provision of necessary social services by the government to the fishermen, is to organize the fishermen and thereby raise their economic level with a view to expanding fishery production. While the administrative set-ups at the two types of facilities will be somewhat different, it will nonetheless be essential at all installations to maintain tight administrative control so as to fully exploit the capabilities of the respective facilities.

The basic principles of facility administration will be: 1) effective utilization; and 2) full and continuous operation.

With regard to (1), when ice demand or processing volume is low, efforts should be made to cut costs through intermittent operations and step up fishermen training in the proper use of the facilities. Also, a program of regular and diligent inspections is vital for purposes of facility maintenance.

For the initial period, administration can be in government hands but, in the future, once fishermen cooperatives and other organizations have been developed, such operations as ice-making, refrigeration, and processing can, we feel, be delegated to these associations. In this way, the government's role can be limited to providing guidance on facility management and research on processing utilization. For administrative purposes, the facilities in that case can be divided into two parts: the offices, laboratories, warehouses, and workshops to be operated by the government; and the processing, cold-storage, and ice-making operations to be run by the fishermen cooperatives. However, until the cooperatives are formulated the government will have to establish its own administrative structure to assure proper facility operation.

The principal areas of administrative responsibility will be:

1. Collection of usage fees from facility users and establish rules for their payment and collection.

2. Establishment of criteria for use eligibility.

3. To decide how the processing and marketing facilities are to be made available to fishermen on a contract basis and how the government is to ship product directly to consuming markets. However, this presumes that, at some time in the future, these functions will be turned over to the fishermen.

4. Establishment of leasing/usage fees for the above services.

5. Compilation and release of data on: species handled, species volume and prices, commission income, ice production and sales volume, and cold storage movement.

In contrast to the above facilities the Center at Ad Duwem is intended to coordinate and assist in fishermen extension train-

ing. Ad Duwen should be completly and permanently managed and funded by the government.

Ice and cold storage services at Ad Duwem in connection with training activities will, in principle, be provided without charge. However, should the fishermen in the area make extensive demands on these facilities, then ice and cold storage services can be offered them on a charge basis to the extent that this does not prejudice the primary training function of the Center.

7 — 3 Operating Costs

We have, in this section, prepared estimates of the expenses that will be required to insure smooth and efficient operation of the various facilities.

With regard to the facilities at Shajara and Kosti, we have made a financial analysis to determine whether these facilities can stand on their own, as and when they are turned over to the fishermen cooperatives. However, in the case of Ad Duwem, as shown in the Management Plan, this is to be essentially a vehicle for providing governmental administrative services to the fishermen and so does not lend itself to financial analysis.

Facility operating costs have been grouped into: personnel, power, water, and other maintenance and administration.

Operating income has been classified into ice sales, contract processing, and cold storage services.

1. Operating Expenses:

(1) Assumptions:

As explained in Section 7-1, we assume that all personnel, with the exception of the General Manager and senior staff, who are to be dispatched directly by the Government, will be newly recruited. We have converted their monthly wages into an annual payroll figure.

Power costs may vary slightly by area, but, as an average, we have taken a figure of 8 PT/kwh for industrial power use. Water has been figured at 10 PT/m^3.

We have estimated a flat LS 5,000 per annum per Center for all other miscellaneous direct administrative expenses, including the operation of freezer trucks to be attached to the various Centers, petrol, expendables, and other costs.

(2) Shajara

1) Personnel

	Per Month (LS/person)	No. of Employees	Annual Cost (LS)
Junior staff	150	2	3,600
Freezer technician	200	1	2,400
Service mechanic	250	1	3,000
Processing crew	130	6	9,360
Drivers	180	2	4,320
		Total	22,680LS

2) Power

Ice-maker

At 200 days/year utilization, power consumption will be:

a) Compressor--

7.5 kw x 27.5 minutes x 48 times = 165 kwh

b) Circulating water pump--

0.4 kw x 27.5 minutes x 48 times = 8.8 kwh

c) Crusher--

0.75kw x 2.5 minutes x 48 times = 1.5 kwh

d) Cooling tower and coolant pump--

1.4 kw x 27.5 minutes x 4.8 x 0.8 = 24.6 kwh

e) Compressor for ice storage unit--

1.8 kw x 2 units x 0.4 x 24 hrs. = 34.3 kwh

234.2 kwh

234.2 kwh x 200 days = 46,840 kwh

Refrigerator

While intended for regular use, we have provided two independent compartments and so estimate 70% utilization for the entire facility. Power consumption will be:

a) Compressor--

5.7 kw x 2 units x 0.8 x 24 hrs. = 219 kwh

b) Cooling tower and coolant pump--

1.75 kw x 0.8 x 24 = 33.6 kwh

252.6 kwh

252.6 kwh x 365 days x 70% = 64,540 kwh

Other

Lighting, air conditioning and other office requirements--- 4 kwh

4 kwh x 8 hours x 300 days = 9,600 kwh

Summary: Total power costs per year:

(46,840 kwh + 64,540 kwh + 9,600 kwh) x 8 PT/kwh

= 9,678.4 LS ≒ 9,680 LS

3) Water

Ice-maker

a) Raw water for ice ----------2.496 m^3/day

b) Supply for cooling tower

(30 ltr/min. x 60 x 24 x 0.03 x 0.8) = 4.493

6.989 m^3/day

7 m^3/day x 200 days = 1,400 m^3

Cooling tower supply for refrigerator use

130 ltr/min. x 60 x 24 x 0.03 x 0.8 = 4.493 m^3/day

4.5 m^3/day x 365 days = 1,642.5 m^3

Other water

1 m^3/day x 300 days = 300 m^3

Summary: Total annual water cost:

(1,400 m^3 + 1,642.5 m^3 + 300 m^3) x 10 PT/m^3 =

334.25 LS≒335 LS

4) Other direct costs--- 5,000 LS

Comulating the above cost items---

TOTAL ANNUAL OPERATING COSTS AT SHAJARA ---------- 37,695 LS

(3) Kosti:

1) Personnel

Adding 4 extra ice handlers to the Shajara budget, we have

	Per Month (LS/person)	No. of Employees	Annual Cost (LS)
Ice handlers	150	4	7,200
Shajara payroll			22,680
	Total		29,880 LS

2) Power

Ice-maker

Consumption at 200 days/year utilization

a)	Compressor--	1.4 kw x 20 hrs. x 0.8 =	224 kwh
b)	Brine agitator--	1.5 x 20 x 0.8 =	24 kwh
c)	Brine pump--	1.5 x 20 x 0.8 =	24 kwh
d)	Cooling tower & coolant pump --	1.4 x 20 x 0.8 =	22.4 kwh
e)	Compressor for ice-storage unit--	1.8 kw x 2 units x 0.4 x 24 hrs. =	34.3
			328.7kwh
		328.7 kwh x 200 days =	65,740kwh

Refrigerator

Same as for Shajara:

252.6 kwh x 365 days x 70% = 64,540kwh

Other power

Same as for Shajara:

4 kwh x 8 hrs. x 300 days = 9,600kwh

Summary: Total power costs per year:

(65,740 kwh + 64,540 kwh + 9,600 kwh) x 8 PT/kwh

= 11,190.4 LS ≒ 11,200LS

3) Water:

Ice-maker

a) Raw water for ice 3.75 m^3/day

b) Supply for cooling tower
(130 ltr/min x 60 x 24 x 0.03 x 0.8) = 4.493
8.243 m^3/day
8.3 m^3/day x 200 days = 1,660 m^3

Cooling tower supply for refrigerator use
Same as for Shajara 1,642.5 m^3

Other water
Same as for Shajara 300 m^3

Summary: Total annual water cost:
(1,660 m^3 + 1,642.5 m^3 + 300 m^3) x 10 PT/m^3
= 360.25 LS ≒ 360 LS

4) Other direct costs-- 5,000 LS

Cumulating the above cost items--
TOTAL ANNUAL OPERATING COSTS AT KOSTI-- 46,440 LS

(4) Ad Duwem:

1) Personnel:

	Per Month (LS/person)	No. of Employees	Annual Cost (LS)
Training staff	250	3	9,000
Service mechanic	250	1	3,000
Drivers	180	2	4,320
	Total		16,320 LS

2) Power:

Ice-maker

Based on 180 days/year utilization, power consumption will be:

a) Compressor--

3.7 kw x 27.4 min./hr x 48 times/day = 81.4 kwh

b) Circulating water pump--

0.25kw x 27.5 min./hr x 48 " = 5.5 kwh

c) Crusher

0.75kw x 2.5 min./hr x 48 " = 1.5 kwh

d) Cooling tower & coolant pump

1.05kw x 27.5 min./hr x 48 " = 18.5 kwh

e) Compressor for ice storage bin

1.8kw x 0.4 min./hr x 24 hrs. = 17.3 kwh

124.2 kwh

124.2 kwh x 180 days = 23,356 kwh

Refrigerator

Same as for Shajara and Kosti. However, since no processing will be done at Ad Duwem, the utilization rate will be only 50%. Also, since the freezer is to be air-cooled, no cooling tower is used.

Compressor--

1.8 kwh x 2 units x 0.8 x 24 hrs. = 69.2 kwh

69.2 kwh x 365 days x 50% = 12,692 kwh

Other power

Lighting, air conditioning, other = 3 kwh

3 kwh x 8 hrs. x 300 days = 7,200 kwh

Summary: Total power costs per year:

(23,356 kwh + 12,629 kwh + 7,200 kwh) x 8 PT/kwh

= 3,454.8 LS ≒ 3,460 LS

3) Water:

Ice-maker

a) Raw water for ice-- 1.248 m^3/day

b) Supply for cooling tower--

60 ltr/min x 60 x 24 x 0.03 x 0.8 = 2.074

3.322 m^3/day

3.4 m^3/day x 180 days = 612 m^3

Refrigerator

No water required, since this is to be air-cooled.

Other water

1 m^3/day x 300 days = 300 m^3

Summary: Total annual water costs:

(612 m^3 + 300 m^3) x 10 PT/m^3

= 91.2 LS ≒ 92 LS

4) Other direct costs -- 5,000 LS

Cumulating the above cost itesm--

TOTAL ANNUAL OPERATING COSTS AT AD DUWEM ---------- 24,872 LS

(5) Annual Operating Costs by Facility:

Annual operating budgets for the three facilities, as calculated in 1980 prices, may be summarized as follows:

Facility	Annual Operating Budget
Ad Duwem Extension Center	24,872 LS
Shajara Process and Market Center	37,695 LS
Kosti Process and Market Center	46,440 LS

(6) Facility Renewel

The useful life of the ice-maker and refrigerator has been set at 9 years. It is assumed that these items will be completely replaced at the end of this period.

2. Operating Income:

The sources of operating income are expected to be: ice sales, contract fish processing, and cold storage services.

While various assumptions had to be made, we have projected revenues as follows for Shajara and Kosti. In the case of Ad Duwem, no revenues are anticipated.

(1) Ice Sales:

With the exception of ice manufactured by hotels and restaurants for their own consumption, commercial ice sales are not particularly prevalent in the Khartoum area. Thus, ice selling prices have been assumed at the same level -- 6 PT/kg-- as at the ice plants in Kosti.

Annual ice sales revnue:

Shajara:

2 tons/day x 200 operating days/year @ 6 PT/kg= 24,000LS

Kosti:

3 tons/day x 200 operating days/year @ 6 PT/kg= 36,000LS

(2) Contract Processing Revenue

For the time being, it is assumed that processing will be limited to the primary stage--i.e., gutting and filleting only.

We have assumed maximum fish receipts of 3 tons/day. However, depending on the species, primary processing may not be required. We assume, therefore, that 50% of the volume, primarily Tilapia will be processed.

At present, there is a 5-6:1 spread between the official government consumer price and the price fishermen receive from middlemen-- this comes to as high as 50-100PT/kg. Of this total, we figure that primary processing represents 5 PT/kg. Based on 300 days/year utilization of the processing facilities, total annual revenues from contract processing will be:

1,500 kg/day x 5PT/kg x 300 days = 22,500 LS

(3) Cold Storage Revenues:

Refrigerated capacity is 100 m^3. Assuming as effective utilization rate of 40%, the storable product weight may be projected at:

100 m^3 x 0.4 = 40 m^3

40 m^3 x 0.8 (internal space factor for refrigeration chamber x 0.4 (ratio of fish to cubic volume) = 12.8 tons

Figuring 0.5 PT/kg as a daily storage rate, annual revenue from cold storage services will be:

12,800 kg x 0.5 PT x 365 days = 23,360 LS

(4) Annual Revenue Summary:

Total annual revenues projected for Shajara and Kosti may be summarized as follows:

Facility	Annual Revenues
Shajara Process and Market Center	69,860 LS
Kosti Process and Market Center	81,860 LS

3. Financial Analysis:

Based on the above revenues and expenditures, and estimating, for evaluation purposes, a 25-year project life following completion of the facilities and an independent operations between Shajara and Kosti facilities, we have prepared the following cash-flow analysis.

Financial Analysis -- Shajara

(1980 prices in thousand LS)

Year	Net Income				Net Present Value at 9%	Operating Expenses						Balance	Net Present Value at 9%
	Ice Sales	Processing Revenue	Cold Storage Revenue	Total		Labor	Power	Water	Maintenance	Facility Renewal	Total		
1982	24.0	22.5	23.4	69.9	69.9	22.7	9.7	0.3	5.0	—	37.7	32.2	32.2
3	24.0	22.5	23.4	69.9	64.1	22.7	9.7	0.3	5.0	—	37.7	32.2	29.5
4	24.0	22.5	23.4	69.9	58.8	22.7	9.7	0.3	5.0	—	37.7	32.2	27.1
5	24.0	22.5	23.4	69.9	54.0	22.7	9.7	0.3	5.0	—	37.7	32.2	24.9
6	24.0	22.5	23.4	69.9	49.5	22.7	9.7	0.3	5.0	—	37.7	32.2	22.8
7	24.0	22.5	23.4	69.9	45.4	22.7	9.7	0.3	5.0	—	37.7	32.2	20.9
8	24.0	22.5	23.4	69.9	41.7	22.7	9.7	0.3	5.0	—	37.7	32.2	19.2
9	24.0	22.5	23.4	69.9	38.2	22.7	9.7	0.3	5.0	—	37.7	32.2	17.6
1990	24.0	22.5	23.4	69.9	35.1	22.7	9.7	0.3	5.0	—	37.7	32.2	16.2
1	24.0	22.5	23.4	69.9	32.2	22.7	9.7	0.3	5.0	175.0	212.7	△ 142.8	△ 65.7
2	24.0	22.5	23.4	69.9	29.5	22.7	9.7	0.3	5.0	—	37.7	32.2	13.6
3	24.0	22.5	23.4	69.9	27.1	22.7	9.7	0.3	5.0	—	37.7	32.2	12.5
4	24.0	22.5	23.4	69.9	24.9	22.7	9.7	0.3	5.0	—	37.7	32.2	11.4
5	24.0	22.5	23.4	69.9	22.8	22.7	9.7	0.3	5.0	—	37.7	32.2	10.5
6	24.0	22.5	23.4	69.9	20.9	22.7	9.7	0.3	5.0	—	37.7	32.2	9.6
7	24.0	22.5	23.4	69.9	19.2	22.7	9.7	0.3	5.0	—	37.7	32.2	8.8
8	24.0	22.5	23.4	69.9	17.6	22.7	9.7	0.3	5.0	—	37.7	32.2	8.1
9	24.0	22.5	23.4	69.9	16.2	22.7	9.7	0.3	5.0	—	37.7	32.2	7.4
2000	24.0	22.5	23.4	69.9	14.8	22.7	9.7	0.3	5.0	175.0	212.7	△ 142.8	△ 30.3
1	24.0	22.5	23.4	69.9	13.6	22.7	9.7	0.3	5.0		37.7	32.2	6.2
2	24.0	22.5	23.4	69.9	12.5	22.7	9.7	0.3	5.0	—	37.7	32.2	5.7
3	24.0	22.5	23.4	69.9	11.4	22.7	9.7	0.3	5.0	—	37.7	32.2	5.3
4	24.0	22.5	23.4	69.9	10.5	22.7	9.7	0.3	5.0	—	37.7	32.2	4.8
5	24.0	22.5	23.4	69.9	9.6	22.7	9.7	0.3	5.0	—	37.7	32.2	4.4
6	24.0	22.5	23.4	69.9	8.8	22.7	9.7	0.3	5.0	—	37.7	32.2	4.1
Total	600.0	562.5	585.0	1,747.5	748.3	567.5	242.5	7.5	125.0	350.0	1,292.5	455.0	226.8

B/C Ratio when 9% $Bo/Co = \frac{748.3}{521.5} = 1.4349$

Financial Analysis -- Kosti

(1980 prices in thousand LS)

Year	Net Income				Net Present Value at 9%	Operating Expenses						Balance	Net Present Value at 9%
	Ice Sales	Processing Revenue	Cold Storage Revenue	Total		Labor	Power	Water	Maintenance	Facility Renewal	Total		
1982	36.0	22.5	23.4	81.9	81.9	29.9	11.2	0.4	5.0	–	46.5	35.4	35.4
3	36.0	22.5	23.4	81.9	75.1	29.9	11.2	0.4	5.0	–	46.5	35.4	32.5
4	36.0	22.5	23.4	81.9	68.7	29.9	11.2	0.4	5.0	–	46.5	35.4	29.8
5	36.0	22.5	23.4	81.9	63.2	29.9	11.2	0.4	5.0	–	46.5	35.4	27.3
6	36.0	22.5	23.4	81.9	58.0	29.9	11.2	0.4	5.0	–	46.5	35.4	25.1
7	36.0	22.5	23.4	81.9	53.2	29.9	11.2	0.4	5.0	–	46.5	35.4	23.0
8	36.0	22.5	23.4	81.9	48.8	29.9	11.2	0.4	5.0	–	46.5	35.4	21.1
9	36.0	22.5	23.4	81.9	44.8	29.9	11.2	0.4	5.0	–	46.5	35.4	19.4
1990	36.0	22.5	23.4	81.9	41.1	29.9	11.2	0.4	5.0	–	46.5	35.4	17.8
1	36.0	22.5	23.4	81.9	37.7	29.9	11.2	0.4	5.0	232.5	279.0	△ 197.1	△ 90.7
2	36.0	22.5	23.4	81.9	34.6	29.9	11.2	0.4	5.0	–	46.5	35.4	15.0
3	36.0	22.5	23.4	81.9	31.7	29.9	11.2	0.4	5.0	–	46.5	35.4	13.7
4	36.0	22.5	23.4	81.9	29.1	29.9	11.2	0.4	5.0	–	46.5	35.4	12.6
5	36.0	22.5	23.4	81.9	26.7	29.9	11.2	0.4	5.0	–	46.5	35.4	11.5
6	36.0	22.5	23.4	81.9	24.5	29.9	11.2	0.4	5.0	–	46.5	35.4	10.6
7	36.0	22.5	23.4	81.9	22.5	29.9	11.2	0.4	5.0	–	46.5	35.4	9.7
8	36.0	22.5	23.4	81.9	20.6	29.9	11.2	0.4	5.0	–	46.5	35.4	8.9
9	36.0	22.5	23.4	81.9	18.9	29.9	11.2	0.4	5.0	–	46.5	35.4	8.2
2000	36.0	22.5	23.4	81.9	17.4	29.9	11.2	0.4	5.0	232.5	279.0	△ 197.1	△ 41.8
1	36.0	22.5	23.4	81.9	15.9	29.9	11.2	0.4	5.0	–	46.5	35.4	6.9
2	36.0	22.5	23.4	81.9	14.6	29.9	11.2	0.4	5.0	–	46.5	35.4	6.3
3	36.0	22.5	23.4	81.9	13.4	29.9	11.2	0.4	5.0	–	46.5	35.4	5.8
4	36.0	22.5	23.4	81.9	12.3	29.9	11.2	0.4	5.0	–	46.5	35.4	5.3
5	36.0	22.5	23.4	81.9	11.3	29.9	11.2	0.4	5.0	–	46.5	35.4	4.9
6	36.0	22.5	23.4	81.9	10.4	29.9	11.2	0.4	5.0	–	46.5	35.4	4.5
	900.0	562.5	585.0	2,047.5	876.6	747.5	280.0	10.0	125.0	465.0	1,627.5	420.0	222.8

B/C Ratio when 9% $Bo/Co = \frac{876.6}{653.8} = 1.3407$

It is assumed that construction costs for the facilities will be covered by a grant-in-aid, so this elements does not enter into our financial calculations.

As a discount rate, we have assumed 9%-- which at present would correspond to a relatively favorable interest rate from the Industrial Bank of the Sudan.

In the case of Kosti, the cost/benefit ratio would be 1.3407, with a net present value of 222,800 LS. For Shajara, the cost/benefit ratio would be 1.4349, with a net present value of 226,800 LS.

Accordingly, excluding building depreciation, it may be projected that, at both facilities, the prospective operating revenues should be sufficient to cover operating costs and facility renewal costs.

7 — 4 Overall Project Evaluation

Assuming, as noted in Section 7-3, that the initial construction of the Kosti and Shajara facilities will be covered by a grant-in-aid, these facilities are indicated by our financial analysis to be potentially self-supporting. Even apart from this viability finding, however, the subject project, from several vantagepoints, has considerable importance to the national economy of the Democratic Republic of the Sudan.

In the first place, it will help to bring about structural changes in the social position of local fishermen. In comparison with agriculture, Sudanese society has traditionally displayed little interest in the fishing industry and fishermen. As a result, they have suffered from a very low socio-economic status. Distribution of the fish catch has been entirely under the

control of middlemen. In many cases, fishermen must lease virtually all of the means of production, such as vessels and gear, from these middlemen. As a result, prices received by fishermen for their catch are very low.

If it becomes possible for fishermen to market their catch independently or through their own organizations, considerable benefits will flow to the local society. These would include: a rise in producer incomes through improvement and stabilization of selling prices; a corollary impact on final demand: the effects produced by the intermediate demand needed to support this production: stabilized population concentration along with concentration of economic activity; and improvement of local living conditions. If the social level of the fishermen can be raised through this kind of social invigoration we feel the Project has considerable significance on this score alone.

Secondly, we may take note of the benefits to be derived from preserving the freshness of the catch. Fish tends to decompose much faster than other fresh foods. Its production, moreover, is unstable, being greatly affected by weather and resource conditions. Also, the fish producing areas as in the case of the White Nile--target area for this project-- are quite limited, so that the catch must be given a much broader distribution range.

Through freshness control, it will be possible to solve the problems arising from the special characteristics of fish products. Through this, we can anticipate an increased distribution flow and an increase in total fish supply. And we should not overlook the indirect benefits of freshness control from a food sanitation standpoint.

Finally we may consider the increased self-sufficiency in animal proteins as well as the increase in livestock exports that this project will make possible.

In the Six-Year Plan of Economic and Social Development presently being implemented by the Government of the Democratic Republic of the Sudan, one key objective is to reduce the share of cotton in the country's exports to 50% by the target year 1982/83 and, in turn, increase the shares of groundnuts, livestock, and sugar, with a view to diversifying and stabilizing export earnings.

The export target for livestock is 80,000 tons/year, a goal which should not be so difficult to fulfill considering both the prospective meat demand from the various Arab states and potential production on the wide area suitable for grazing in the Democratic Republic of the Sudan. However, to make this possible, the country must make itself self-sufficient in protein foodstuffs, and an increase in fish production will certainly yield a major contribution in that direction.

In contrast to agriculture, fisheries do not lend themselves to increasing output through mechanization or large-scale operations. There is, therefore, immense significance in the objective, as embodied in the present Project, of increasing fish production in an indirect manner by raising the social status of fishermen and improving the distribution of fish products.

There is thus no denying the manifold benefits, as above described, which the subject Project will bring to the national economy.

One of the principal goals set forth in the Six Year Plan of Economic and Social Development, which stands behind the subject Project, is not only to achieve large-scale development but also, in conjunction with the development of the traditional small scale production sectors, to raise real income levels and produce an equitable income distribution.

There is considerable justification in focusing, as a target for area development, on the Jabal Awlia district which, despite its proximity to Khartoum, has lagged behind in economic development and in promoting the development of the fishing industry, which constitutes an important source of livelihood for the area's population.

Also, as a means of developing the fishing industry, the intent is not simply to increase output through investment in modern factors of production but rather to improve the socio-economic status of fishermen by providing them with social services assisting them in developing fishing organizations, assuring through improved distribution, an increase in and a balanced distribution of fishermen incomes, and in the end bringing about a growth in total fish production.

The subject Project seeks to achieve a staged development of fishing communities and the fishing industry that will be fully compatible with the present technical capabilities of the fishermen as well as the present conditions of fish distribution. From this standpoint too, the subject Project is, in our judgement, enormously significant and deserving of implementation.

Survey Itinerary

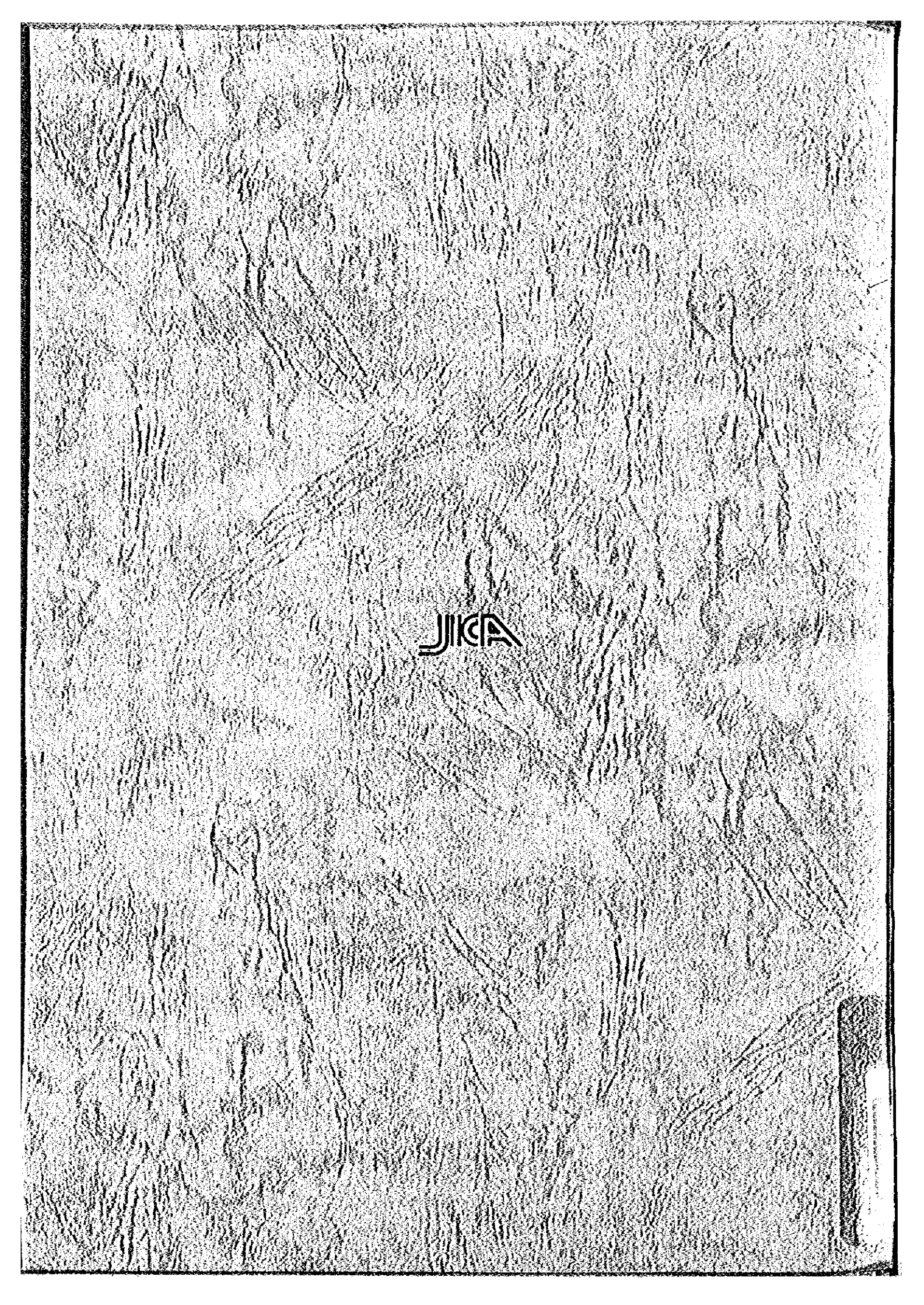
1.	Dec. 10	Wed.	Lv. Tokyo Ar. Copenhagen
2.	11	Thu.	Lv. Copenhagen Ar. Khartoum via Paris
3.	12	Fri.	(Public Holiday) Preliminary discussion with Director, Fisheries Administration, Ministry of Agriculture, Food, and Natural Resources (MAFNR)
4.	13	Sat.	Discussion with Director, Fisheries Administration Meeting with Embassy of Japan
5.	14	Sun.	Visit to Khartoum Central Market Curtesy call on Acting Undersecretary, MAFNR Visit to APPC cold storage facility
6.	15	Mon.	Lv. Khartoum Site survey at Shajara Fisheries Training Institute Visits to Fisheries Extension Camp at Jabal Aulia, Wad Balal, Mongera Ar. Ad Duwem
7.	16	Tue.	Visit to fish landing place Curtesy call on Deputy Commissioner, White Nile Province Visit to Abu Gasaba Experiment Rice Field Site survey and visit to power plant Lv. Ad Duwem Ar. Kosti
8.	17	Wed.	Visit to Kosti Town Council for discussion on site Site survey Visit to Veterinary Office for fisheries data collection in Kosti Visit to ice making plant Lv. Kosti Ar. Khartoum via Wad Medani
9.	18	Thu.	Reduction of field survey data and formulation of basic plan
10.	19	Fri.	(Public Holiday)
11.	20	Sat.	Report of field survey result to Director, Fisheries Administration Visit to Ministry of Construction and Public Works (MCPW) for collecting data and information Visit to Director General, APPC Visit to Public Corporation for Construction and Building

12.	Dec. 21	Sun.	Discussion with Director, Fisheries Administration on the Minutes of Discussions Visit to Meteorological Bureau for data collection Visit to a local architect office for data collection
13.	22	Mon.	Visit to MCPW for supplementary survey Signature of Minutes of Discussions Curtesy call to Undersecretary and report of survey results
14	23	Tue.	Lv. Khartoum Ar. Paris
15.	24	Wed.	Lv. Paris
16.	25	Thu.	Ar. Tokyo

Discussants

Name	Organization	Position
Hazmer Mohamed Hassein	Ministry of Agriculture, Food and Natural Resources (MAFNR)	Undersecretary
El Kheir Mustafa Badr El Din	"	Acting Undersecretary
Samir Yanni Mishrigi	"	Director, Fisheries Administration
Abdel Gadiv Saied	Fisheries Administration, MAFNR	Assistant Dean of Fisheries Training Institute
Abdelrhaman Elmhdi Hassan	"	Fisheries Technician, Jabel Aulia
Gaafar Courshe Ali	"	Fisheries Technician, El Mongera
Mohamed Babiker	"	Fisheries Officer, Wad Balal
Hamad Alieltom	White Nile Province	Deputy Commissioner
Mubarak Abbas		Administrative Manager
Abdelaziz Abdalla	"	Deputy Assistant Commissioner for Agriculture, Ad Dueim
El Sadk Ahmed	"	Fisheries Officer
Omer Izzat	Regional Waterworks Corporation, Ad Dueim	Regional Manager
Mahmoud Mohamada Nur	Ministry of Construction and Public Works	Acting Undersecretary

Name	Organization	Position
Abdel Kerim Mohamad Awas El Kerim	Ministry of Construction and Public Works	Deputy Undersecretary
Abdel Rhman El Fadil Idris	"	Chief Structural Engineer
Mohamad S Bakhreiba	Public Corporation for Construction & Bluilding	Deputy General Manager
Abdalle Mohiedeen	Khartoun Municipal Engineer's Office	Architect
Amin M. Abdoun	Chairman	Amin Enterprises Ltd.
El Rayah Ahmel	Ministry of Agriculture, Food and Natural Resources	Project Manager Abu Gasaba Agricultural Development Project, Ad Dueim
Zakaria Ismail	Public Electric and Water Corporation, Ad Dueim	Deputy Engineer
Abdel Rahman Ibrahim	Kosti Town Countil	Local Government Officer
Abdelslam M. Kheir	Kosti Local Government	Land Inspector
Mansour Tayfour	Public Electric Water Corporation, Kosti	Water Engineer
Mohamed Hassabulli	Kosti Veterinary Office	Officer
Mustafa Bedawi Bashier	Animal Production Public Corporation	Director General
Suliman Ahmed	"	Fisheries Inspectotor
Fumio Hirano	Embassy of Japan	Ambassador
Hidehiro Yoshii	"	Third Secretary
Eiichi Matsumoto	J I C A	Agriculture Machinery Expert
Takayuki Mizuno	J I C A	Irrigation Expert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