REPORT on PRELIMINARY DESIGN for the ELECTRONICS SERVICE & TRAINING CENTER of the ROYAL SCIENTIFIC SOCIETY in THE HASHEMITE KINGDOM OF JORDAN

MARCH, 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

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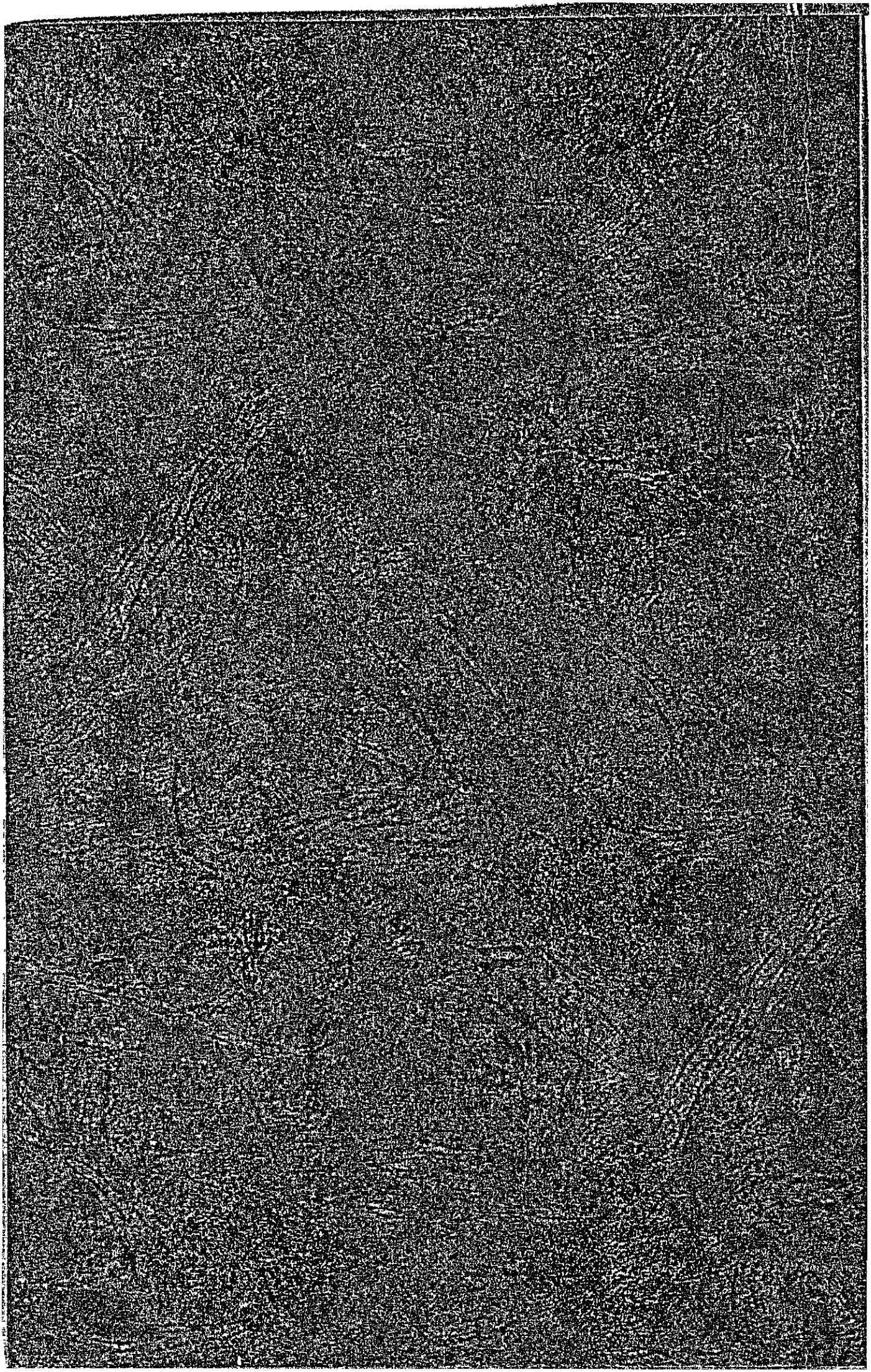

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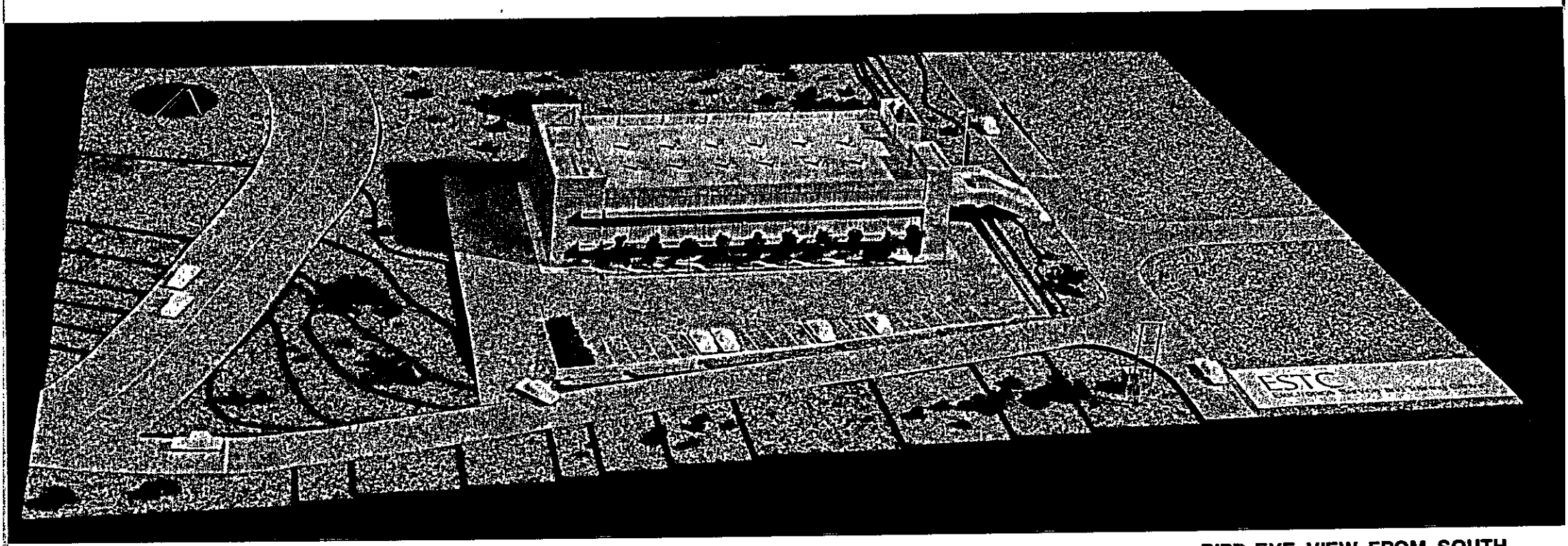
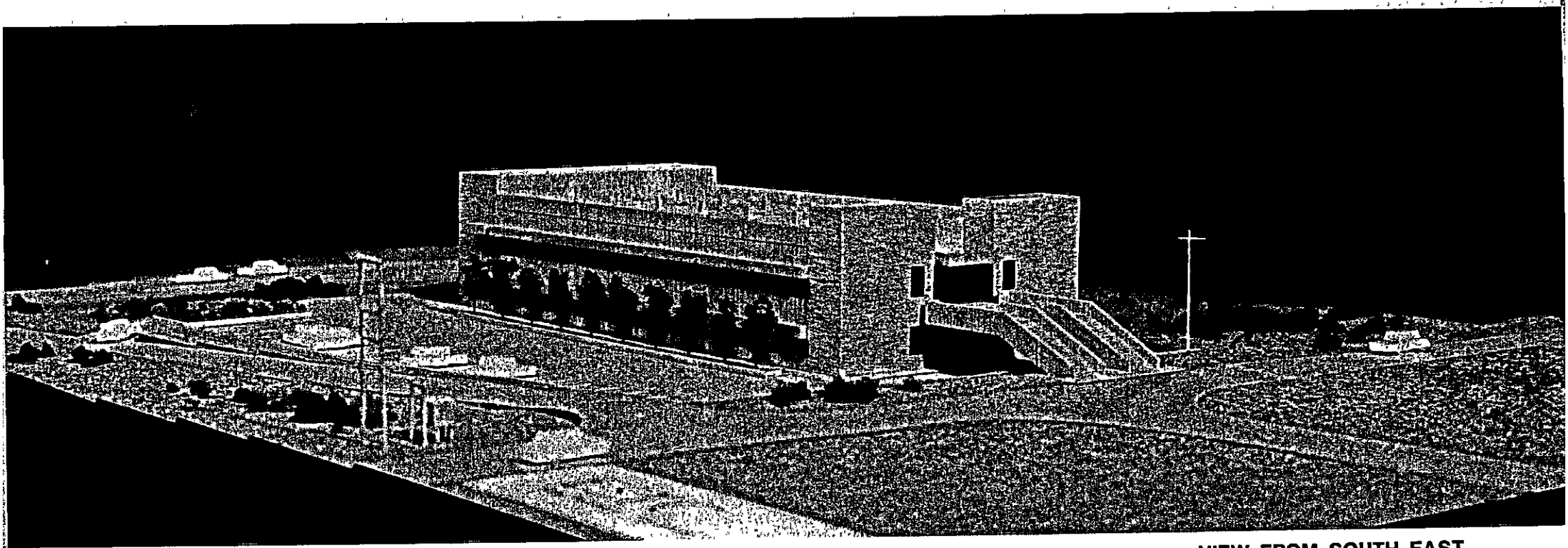
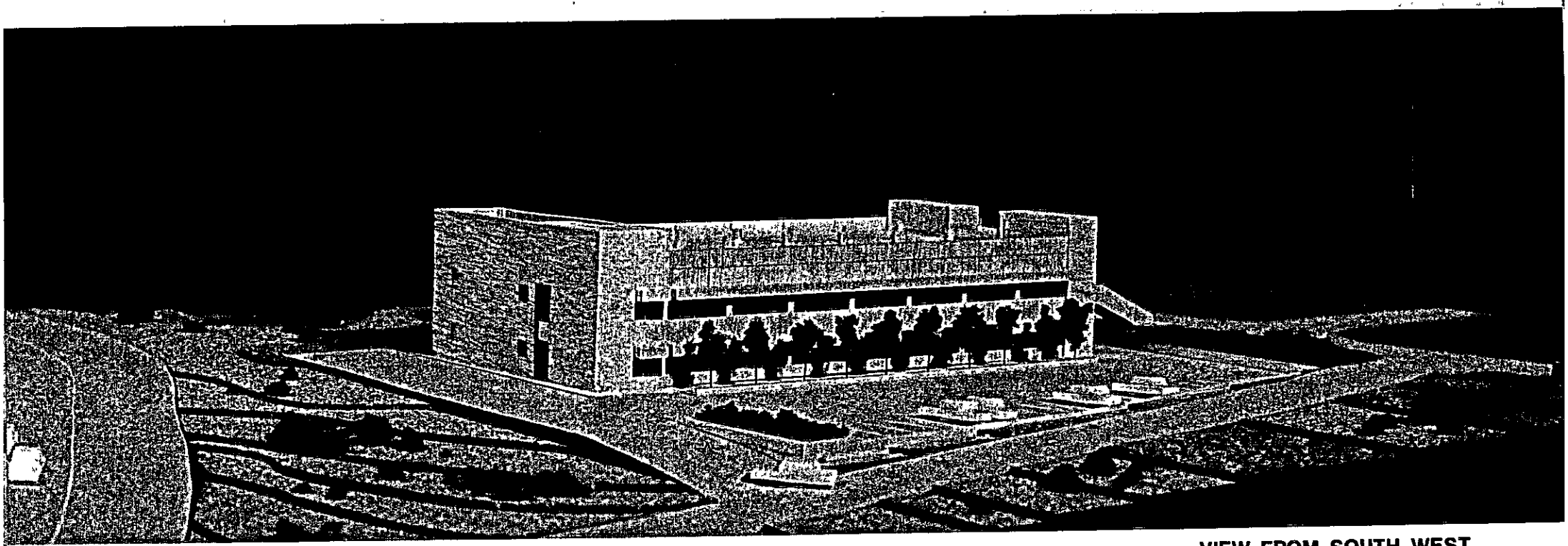


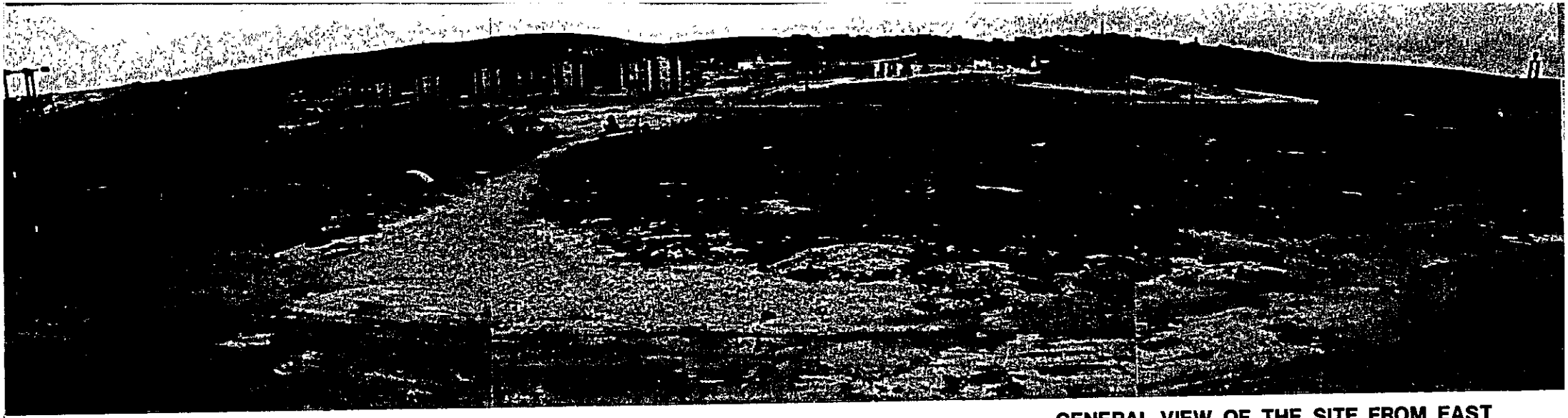
BIRD-EYE VIEW FROM SOUTH



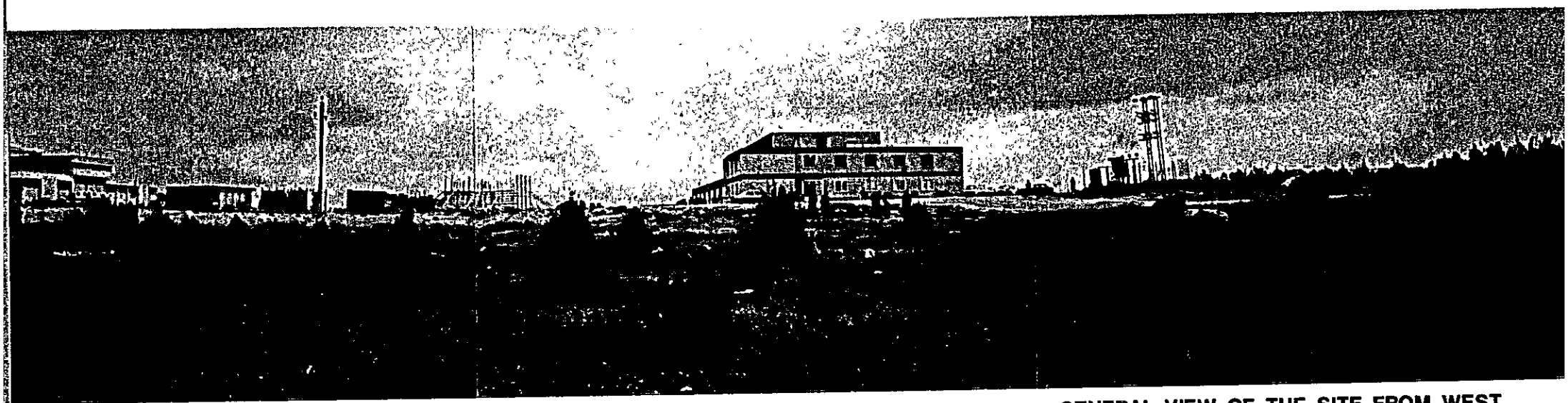
VIEW FROM SOUTH EAST



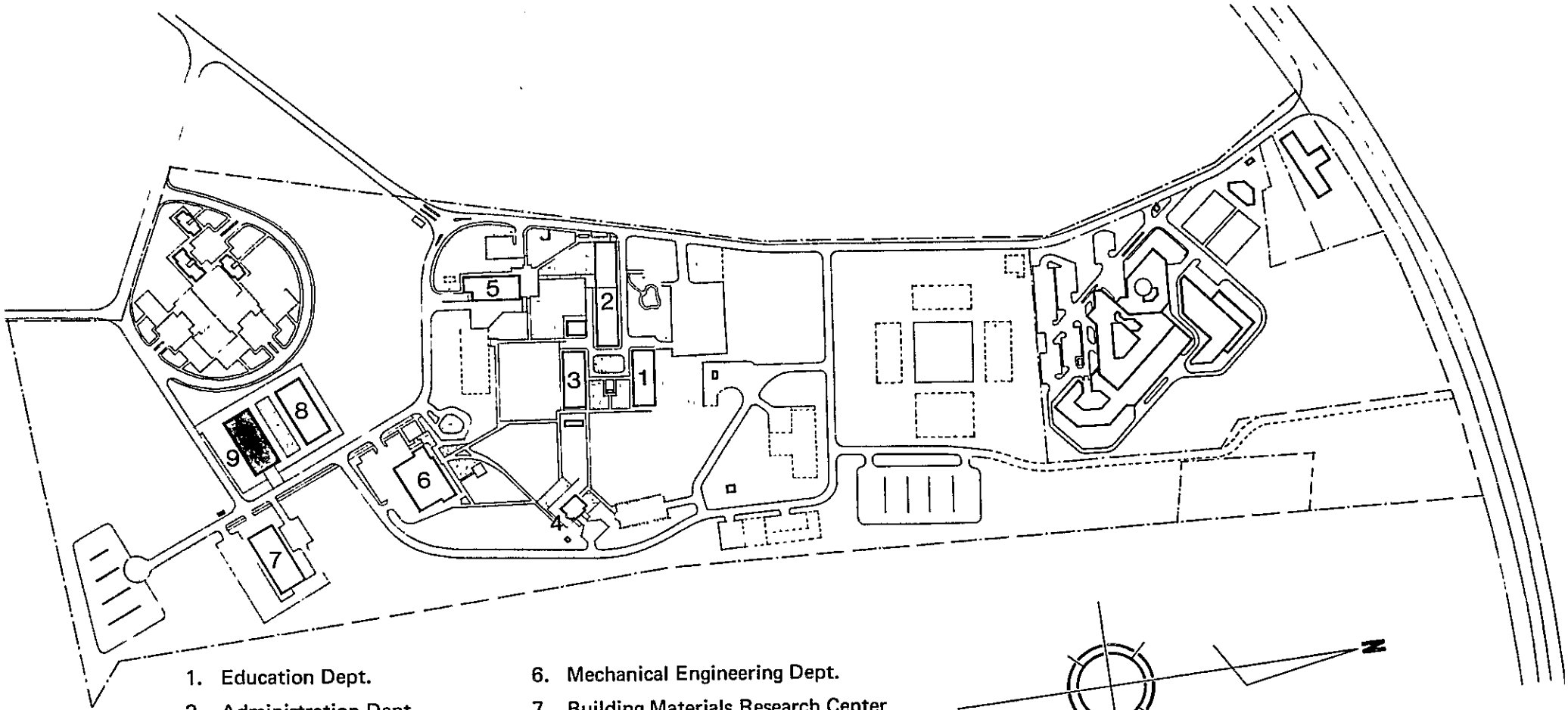
VIEW FROM SOUTH WEST



GENERAL VIEW OF THE SITE FROM EAST



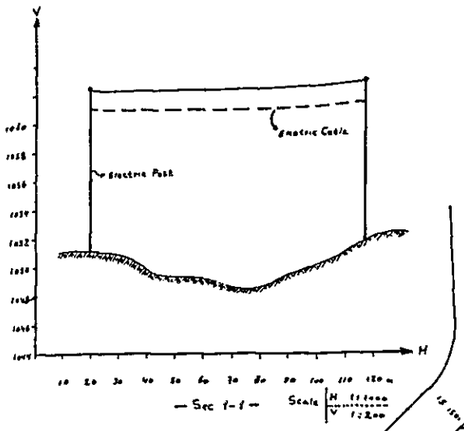
GENERAL VIEW OF THE SITE FROM WEST

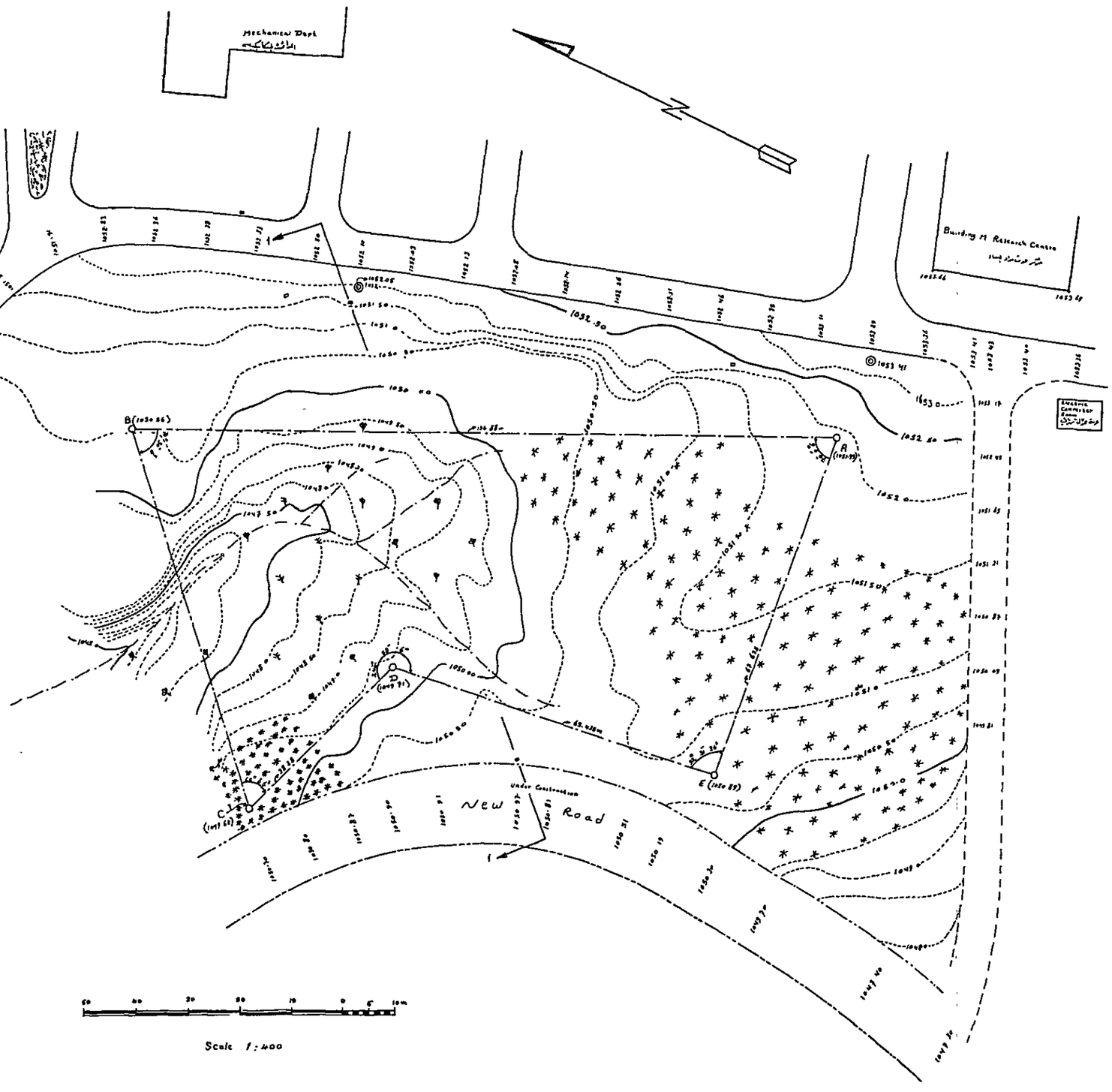


1. Education Dept.
2. Administration Dept.
3. Electronics Engineering Dept.
4. Cafeteria
5. Printing Press Dept.
6. Mechanical Engineering Dept.
7. Building Materials Research Center
8. Industrial Chemistry Dept.
9. Electronics Service & Training Center

APPENDIX D

TOPOGRAPHIC PLAN





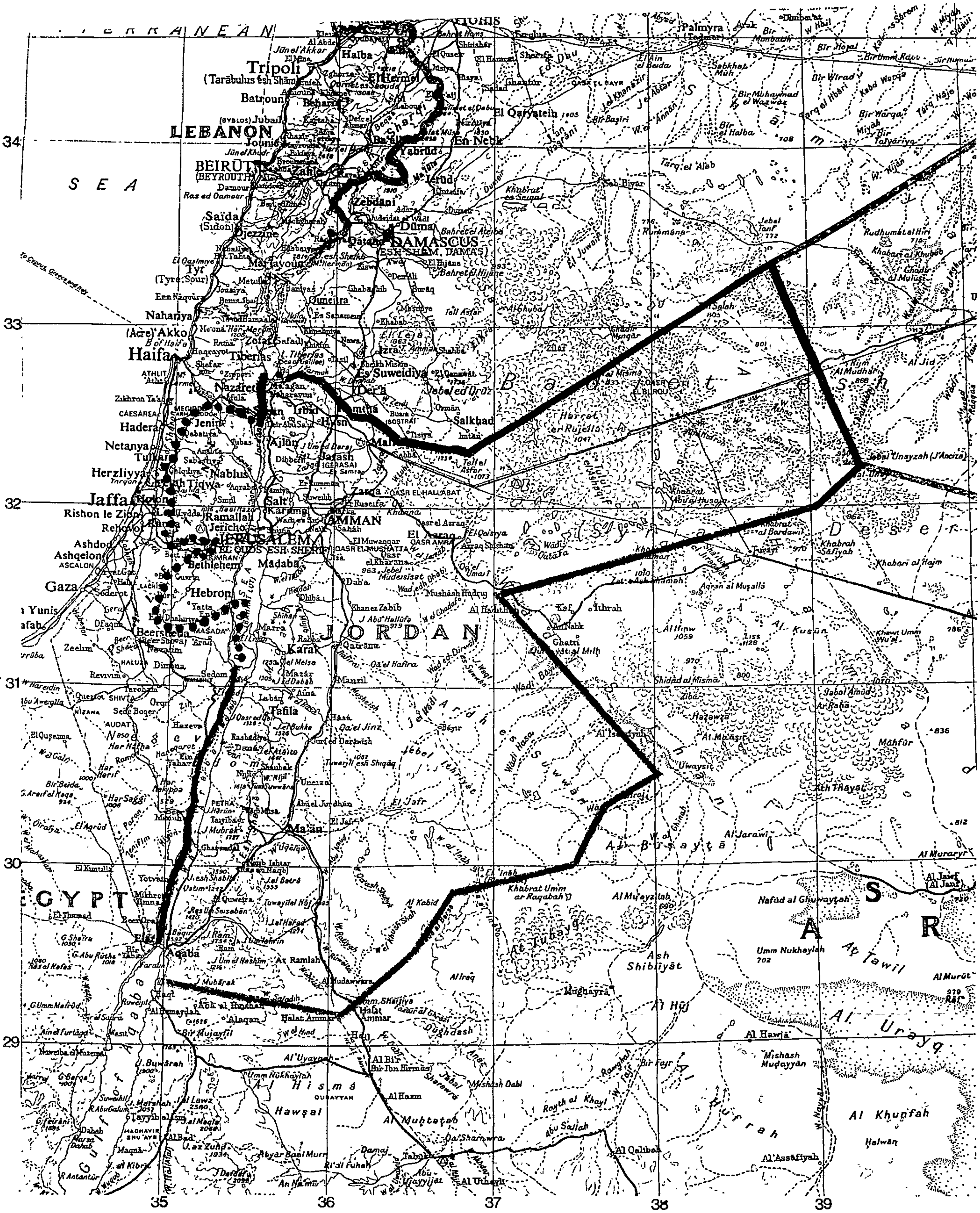
LEGEND	
Name	Symbol
Traverse Point	
Traverse Line	
Reference Point	
Under Construction Road	
High Pressure Electric Post	
Pine Trees (0.5–1.0 m Height)	
Pine Trees (1–2.5 m Height)	
Trees of Different Types	
Olive Trees	
Valley Line	
Base Contour Line	
Main Contour Line	

PROJECT TITLE
ELECTRONICS SERVICES CENTER

SHEET TITLE
TOPOGRAPHIC PLAN

	NAME	DATE	SIGN
DRAWN			
CHECKED			
APPR			
ARCH			
STR			
ELEC			
MEC			

PROJ. NO.
CONTR NO.
SCALE
DRAWING NO. 2



JORDAN AND SURROUNDING AREAS

1:1750000

PREFACE

In response to the request of the Government of the Hashemite Kingdom of Jordan, the Government of Japan decided to carry out a study necessary for the preparation of the preliminary design for the project to construct the Electronics Service and Training Center of the Royal Sientific Society, and the Japan International Cooperation Agency conducted the study.

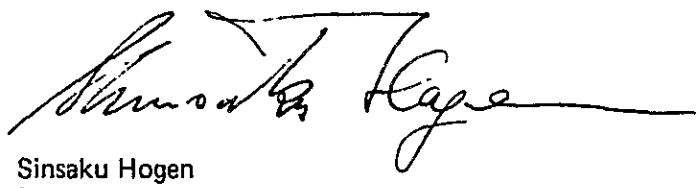
The Japan International Cooperation Agency, recognizing that the establishment of the new Center which aims at testing, maintenance and calibration of electronic apparatus as well as the training of engineers is very important for the economic development of that country through the smooth propagation of the electronics and the modernization of industry, dispatched a study team to Jordan from December 5 to 27, 1978 for the purpose of obtaining data necessary for preparating a preliminary design, discussing and exchanging views with Jordan authorities concerned on the construction and establishment of the Center.

The field servey in Jordan was carried out very smoothly, thanks to the extensive cooperation of the Royal Scientific Society, and upon its return to Japan, the study team made further studies and analyses which are compiled in this report.

I hope that this report contributes to the progress of this project and to the strengthening of the friendly relations now existing between our two countries.

I express my heartfelt appreciation to the Government and people concerned of Jordan for their close cooperation extended to the study team.

February, 1979



Sinsaku Hogen
President
Japan International Cooperation Agency

CONTENTS

1. SURVEY FOR PRELIMINARY DESIGN

1-1 Background and Purpose of Survey

On the way of economic development and industrialization in the Hashemite Kingdom of Jordan, the number of users and demand for electronics systems and devices have rapidly increased in the various fields. On the other hand, in order to spread the electronics devices and equipment with least trouble, it is necessary to provide the services of maintenance, testing and calibration pertaining to the electronics devices and equipment, and also to train and produce skilled engineers and technicians.

Considering the situations above mentioned, the Government of Jordan submitted, through the Royal Scientific Society, to the Government of Japan a request for technical assistance to establish an Electronics Service Center in December 1975. In response to the request, the Government of Japan dispatched a preliminary survey team from February to March 1977, and furthermore, basing on the preliminary survey results, an implementation survey team in December 1977.

In consequence, the Government of Japan has started its overseas project-type cooperation for the Electronics Service Center in 1978 through the International Cooperation Agency (JICA).

In regard to a building to accommodate the center's facilities, which had been initially planned to be provided by the Royal Scientific Society at the stage of surveys mentioned above, a new request for Japan's financial assistance was submitted by the Government of Jordan in 1978.

In response to the new request, the Government of Japan dispatched a survey team, the Japanese Preliminary Design Study Team for the Electronics Service and Training Center of the Royal Scientific Society in the Hashemite Kingdom of Jordan in December 1978 headed by Mr. I. Hattori.

The purpose of this survey mission was;

- To confirm the master plan of the Electronics Service and Training Center (hereinafter referred to as ESTC) building through the discussions with the Government of Jordan and the authorities concerned.
- To confirm the sharing of responsibility and scope of works.
- To survey the site for the building.
- To survey the matters necessary for the preliminary design for the construction and to collect the related data.

1-2 Preliminary Design Study Team

The Japanese Preliminary Design Study Team (hereinafter referred to as the Team), organized by the Japan International Cooperation Agency (JICA), was composed of following members.

Mr. Isuke HATTORI (Leader)	Deputy Director, Administration Division, Radio Regulatory Bureau, Ministry of Posts and Telecommunications
Mr. Satoru ITO	Assistant to Director, International Cooperation Division, Ministry of Posts and Telecommunications
Mr. Akio ITO	Special Assistant to Director, Social Development Cooperation Department, Japan International Cooperation Agency (JICA)
Mr. Koichi TAMURA	Qualified Architect, Nippon Sogo Architects' and Engineers' Office Corp., Ltd. (NSK)
Mr. Mitsunao MORIZANE	Qualified Architect & Qualified Consultant, NSK

Mr. Hiroshi INO	Qualified Building Equipment Engineer, NSK
Mr. Kota TSUJI	Qualified Architect NSK

1-3 Preliminary Design of ESTC Building

Nippon Sogo Architects' and Engineers' Office Corp., Ltd. (NSK), Tokyo carried out the preliminary design of the ESTC building observing the contract between the Japan International Cooperation Agency and NSK.

1-4 Schedule of Survey

The Team led by Mr. I. Hattori left Tokyo on December 5, 1978, made survey for twenty days from December 6 to December 25 in the Hashemite Kingdom of Jordan, and returned to Tokyo on December 27.

1-5 Memorandum of Discussions

During the visit to the Kingdom, the Team had a series of meetings with the members concerned of the Royal Scientific Society (hereinafter referred to as RSS), the Jordanian authorities concerned, and made survey of the matters necessary for the preliminary design of the ESTC building including site observation.

As a result of discussions between the Team and the Head of ESTC, the Team and RSS agreed on the issues listed below in principle and prepared a memorandum of discussions.

- Master plan of floor space allocation and building structure.
- Sharing of responsibilities and scope of works to be provided by the Government of Japan and the Government of Jordan respectively.
- Determination of the construction site.
- Basic site plan/Building location plan and floor plan.
- System of Japanese economic cooperation scheme.

The memorandum of discussions, namely, MEMORANDUM OF DISCUSSIONS BETWEEN THE JAPANESE PRELIMINARY DESIGN STUDY TEAM FOR THE ELECTRONICS SERVICE AND TRAINING CENTER (ESTC) OF THE ROYAL SCIENTIFIC SOCIETY (RSS) IN THE HASHEMITE KINGDOM OF JORDAN AND THE HEAD OF ESTC was signed by and between Dr. Albert Butros, Director General, RSS and Mr. Isuke Hattori, Leader of the Team, on 23rd December, 1978.

The Team agreed to recommend to the Government of Japan the matters referred to in the memorandum of discussions.

A copy of the memorandum of discussions is attached herewith as Appendix No. 1.

2. MASTER PLAN OF THE ELECTRONICS SERVICE AND TRAINING CENTER

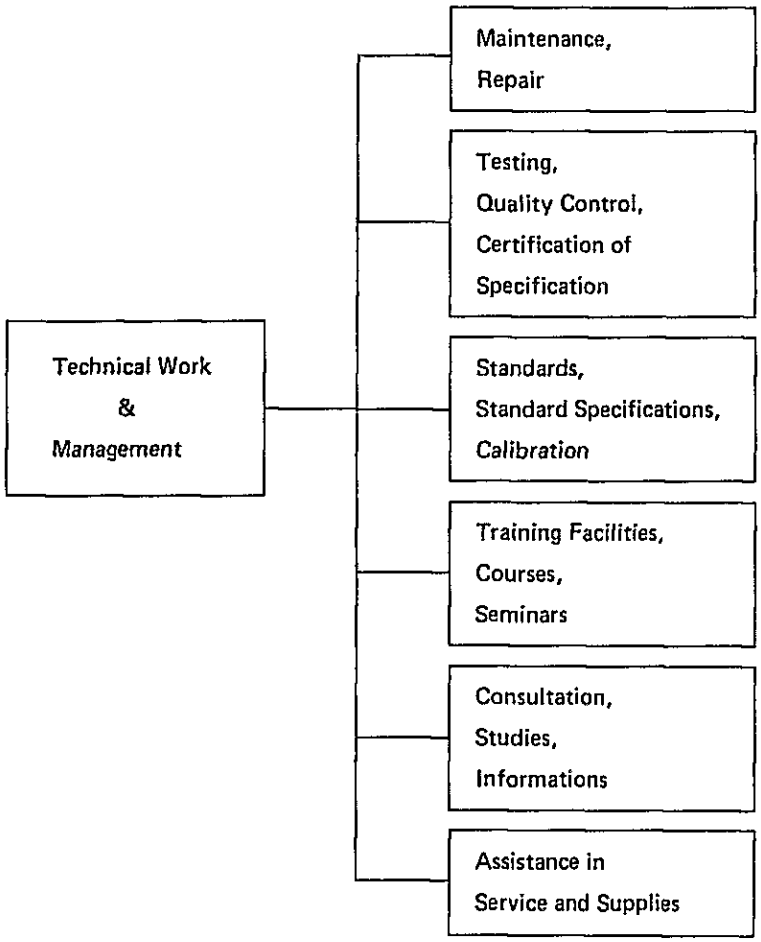
2-1 Objectives

The objectives of ESTC are to render services for repair, maintenance, testing, calibration and standards pertaining to the field of electronics applications to the private and public sectors and also to provide training for electronics engineers and technicians of various organizations concerned.

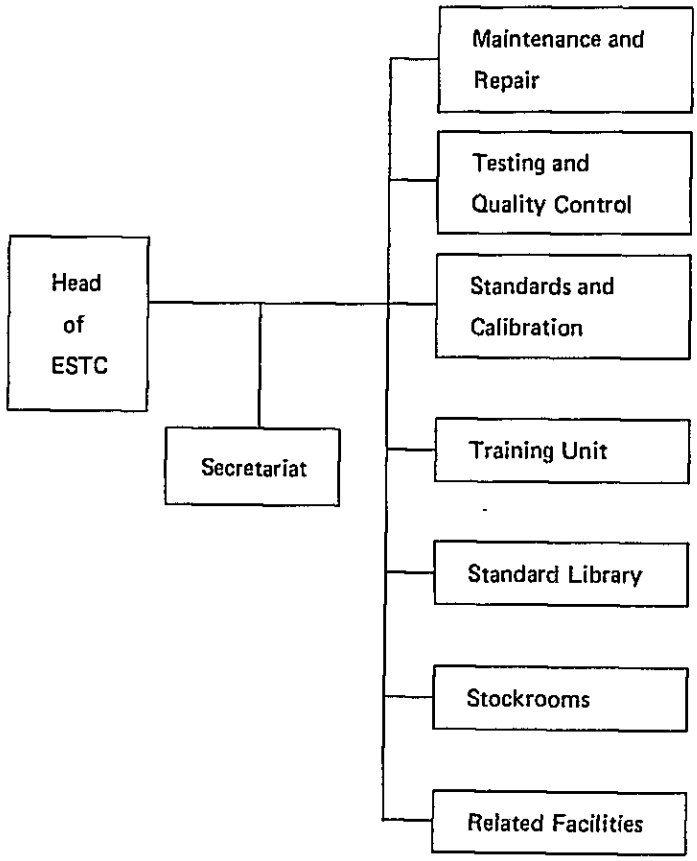
The primary services above mentioned will be for electronics measuring equipment in the field of telecommunications basing on the preceeding technical cooperation between the Government of Japan and the Government of Jordan.

2-2 Functions and Organizations

a. Functional structures of ESTC is as shown by the following chart:



b. Organizational structure of ESTC is shown by the following chart:



2-3 Personnel Placement Plan

The personnel placement plan, at the stage when the necessary electronics equipment has been furnished in proposed new ESTC building, is as shown in the following table:

Staff	
Head	1
Secretary/Typist	2
Administrative assistant	1
General office clerk	4
Custodian	1
Maintenance Laboratory staff	12
Testing Laboratory staff	12
Standards & Calibration Laboratory staff	12
Stockroom's clerk	1
Training staff	4
Total	50 (Persons)

Note: This Personnel Placement Plan is made, according to the answer by ESTC to the Questionnaire prepared by the Team, from the "Counter – Proposal" submitted by ESTC on 12 Dec. 1978.

2-4 Responsibility for the Operation of the Project

Director General of RSS will have overall responsibility for the implementation of the project.

The Head of ESTC under the supervision of the Director of Electronics Engineering Department will be responsible for operation of the project.

3. SITE

3-1 Site Location

The site of the ESTC building is located in the southeast part of RSS within an open area of some 17,000 square meters. The premises of RSS spread on a highland area of around 1,000 m above MSL in the East Jabeiha neighbourhood in the northwest suburbs of Amman (latitude 32°N, longtitude 36°E), the capital of the Hashemite Kingdom of Jordan.

The land for the site has been established with temporary boundaries which clarify the scope of works to be included in the construction project, and has area of some 3,900 square meters.

The site is generally flat land sloping to the south and southwest with scattered small pine trees, and is surrounded by existing asphalt road 7 meters wide in the NE and planned road of the same width in the SE.

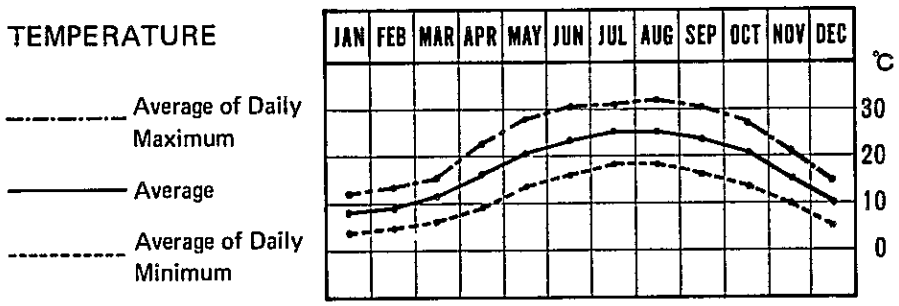
3-2 Climate

Climate of Jordan is generally characterized by a hot dry summer and cold wet winter. Amman, however, located on the highland terrain, eastern part of hilly regions of Jordan, has comparatively pleasant climate.

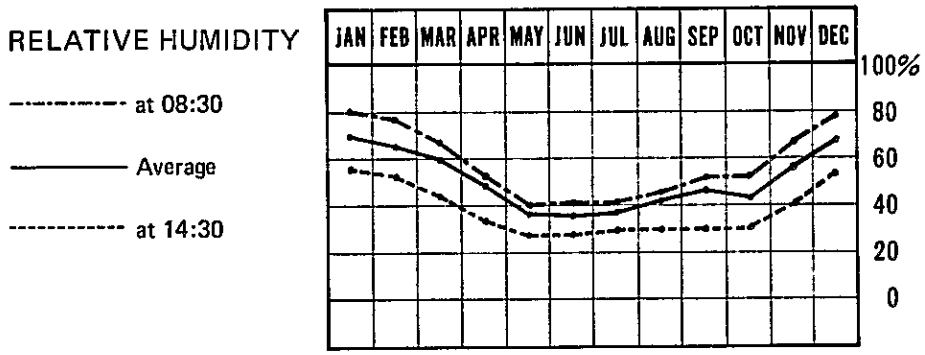
a. Temperature, Humidity and Precipitation:
   Data recorded at Amman Airport (31°57'N, 35°37'E) are shown in the following table.
   (statistic period: 1923–'47, partly–'60)

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Temperature °C	Average of Daily Max.	12.2	13.3	15 5	22.8	28.3	30.5	31.6	32.2	31.1	27.2	21.1	15.0	23.3
	Average of Daily Min.	3.9	4.4	6.1	9.4	13.9	16.1	18.3	18.3	16 6	13.9	10.0	5 5	11.1
	Average	8.2	9.3	11.7	16.2	20.9	23.6	25.2	25.6	23 4	20.7	15.3	10.1	17.5
Relative Humidity %		69	65	59	48	37	36	37	42	46	44	56	67	51
Precipitation mm		68	59	44	13	5	0	0	0	1	4	31	48	273

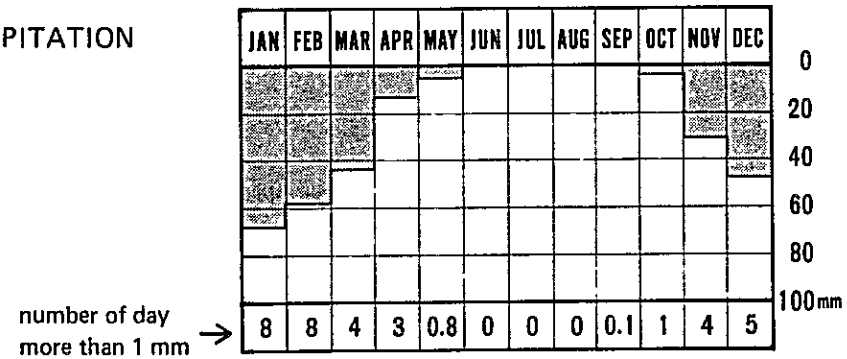
TEMPERATURE



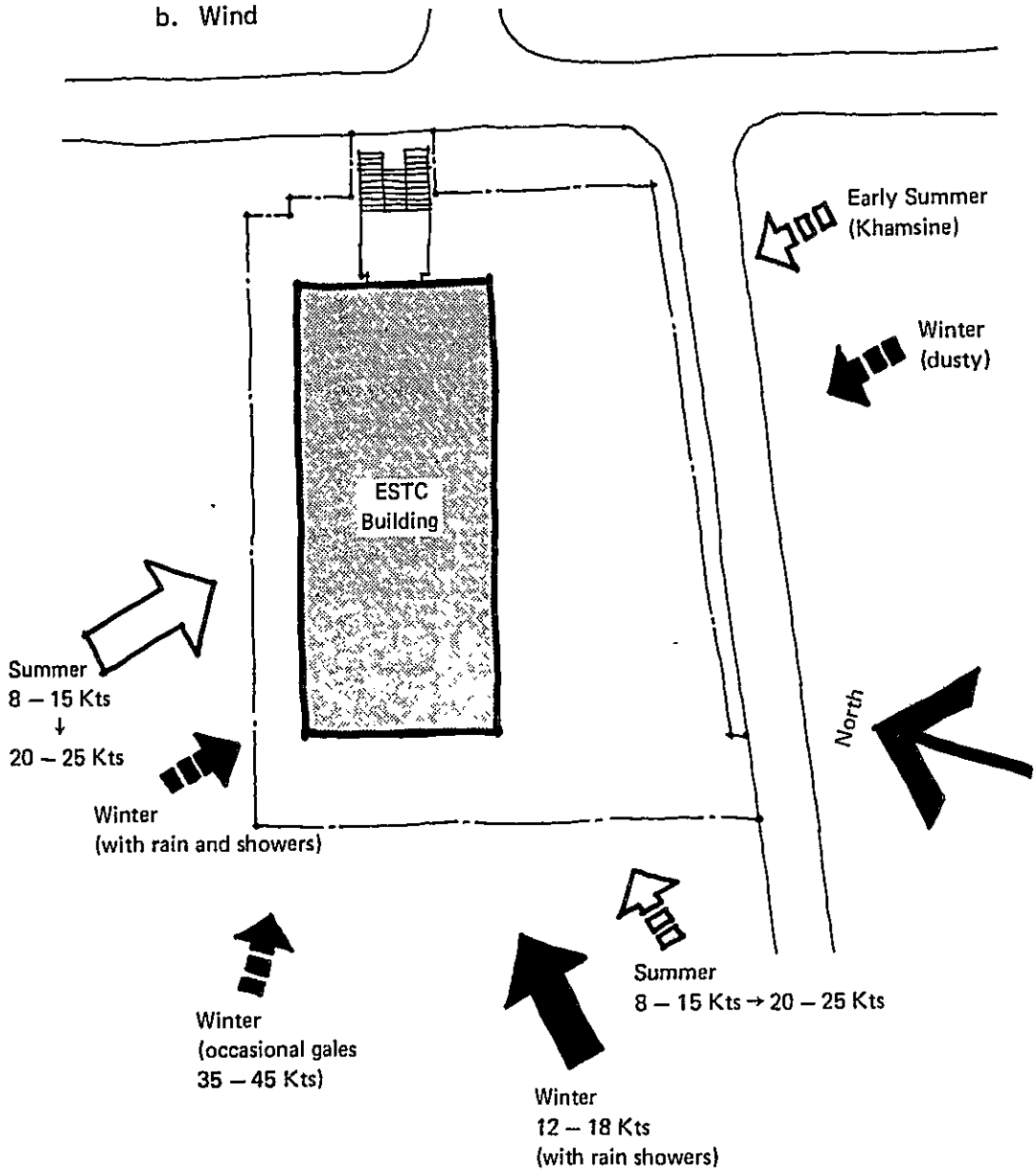
RELATIVE HUMIDITY



PRECIPITATION



b. Wind



Legend

: main wind direction in winter

: occasional wind in winter

: main wind direction in summer

: occasional wind in summer

c. Clouds and Overcast Days

Annual mean of cloud around year:	2.2 Oktas
Cloud of July:	0.3 Oktas
Cloud of Jan. and Feb.:	3.4 Oktas

d. Sunshine

	Sunshine duration under clear sky	Actual and possible duration of sunshine
July	13.14 hrs	96.2 %
Aug.	13.14 hrs	96.2 %
Dec.	6.54 hrs	65.0 %

e. Duststorms, Haze and Rising Sand

These phenomena are rare in Amman.

3-3 Earthquake

The Jordan Valley and the hills on either side make the geological features of Jordan. Some 30 million years ago, in the Lower Miocene, the Jordan Valley was formed by the sinking of a long narrow segment of the earthcrust. This sinking of the valley, or rift, was accompanied by an uprising of the land on either side. Since then the valley has continued to sink in irregular jerks, and each downwards drops has given rise to an earthquake. Such movements had continued into historical time. It is said that the earthquake which occurred in A.D. 746 seriously damaged splendid buildings of old Jerash 50 km north of Amman, and the earthquake of 1927 caused much damages in Amman itself. Such earthquakes have been attributed to movements of the Jordan Valley.

It is true that Amman has seldom suffered from earthquakes but the possibility of a major disaster still remains.

3-4 Soil Conditions

Preliminary soil tests carried out by the Building Material Research Center (BMRC), RSS has revealed that subsoils at the site are of marly limestone with an estimated allowable pressure of 1.5 kg/cm^2 at 1.20 meters depth.

RSS will furnish a comprehensive soil analysis for building purposes before commencement of final design of foundations of the building. Test will be located by RSS basing on the data which will be supplied by the Team.

3-5 Building Codes and Standards

a. As the site lies within the premises of RSS and out of the jurisdiction of the municipality there are no building codes or the like to be applied to the construction project of the ESTC building.

b. There are no particular technical specifications and standards to be applied. The specifications and standards for the designing methods and building materials should be carefully selected from the authorized ones by the architects and engineers concerned.

4. PRELIMINARY PLANNING OF BUILDING AND BUILDING FACILITIES

4-1 Planning Principles

4-1-1 General

The basic plan of the ESTC building has been drafted with reference to analysis of findings and data gathered by the Team and results of discussions with all those concerned.

4-1-2 Basic Principles

The basic plan follows the following principles.

1) To coordinate fully with the objectives and requirements of the equipment to be accommodated in the building.

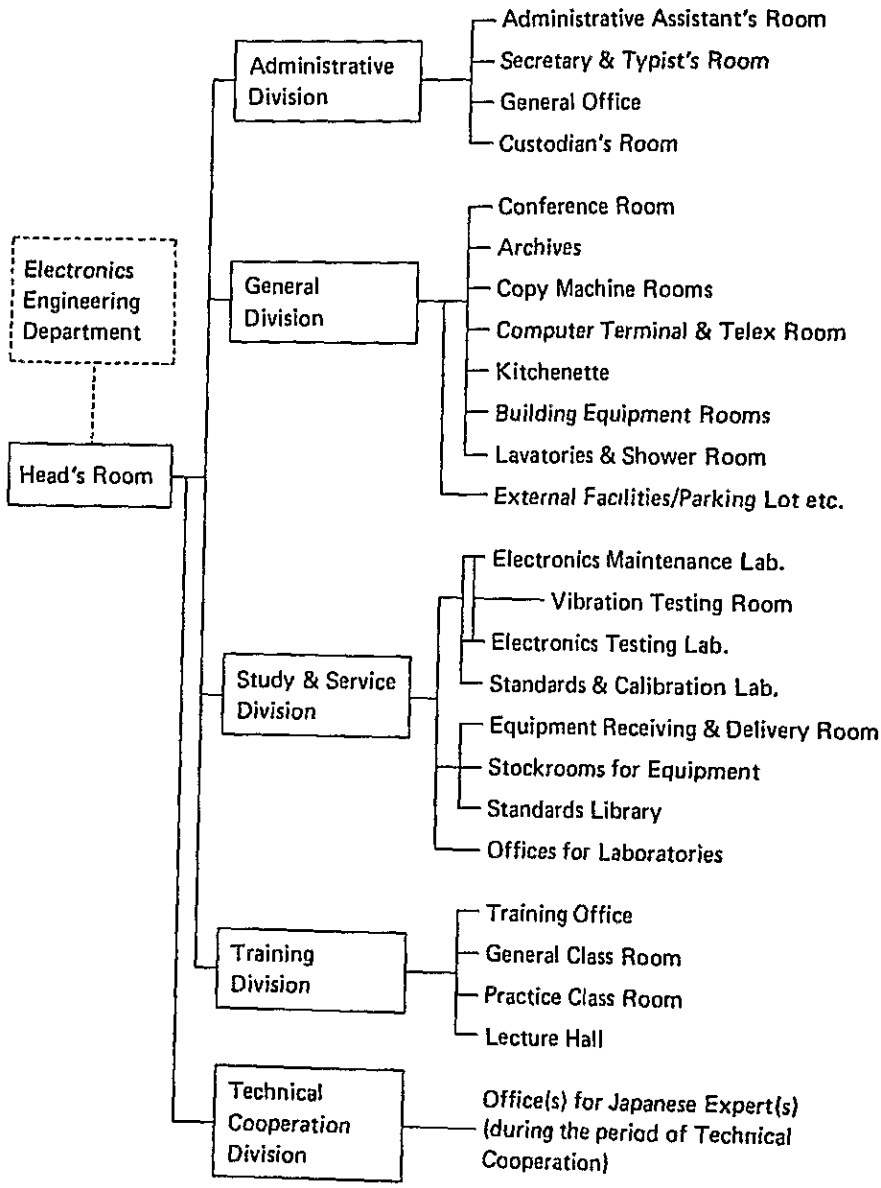
2) To design a building that;
   a) respects the customs of the people.
   b) meets the requirements of the natural environment.
   c) has an architectural form responding to the climatic conditions of the area.
   d) employs materials and methods best suited for local construction.
   e) integrates with the fabric of the society.

3) To set up an example of Japan-Jordan cooperation.

4-2 Organization and Outline of ESTC Building

4-2-1 Organization of ESTC Building

Organization of ESTC Building is as shown by following chart:



4-2-2 Outline of Building

Outline of building is as follows:

– Outline of building:	2 stories, with penthouse, exterior stairs and bridge
– Structure:	Reinforced concrete, rigid frame structure
– Site area:	Approx. 3,960 sq.m
– Building area:	Approx. 1,193 sq.m
– Total floor area:	Approx. 2,435 sq.m
Ground floor area:	Approx. 1,187 sq.m
First floor area:	Approx. 1,193 sq.m
Penthouse area:	Approx. 55 sq.m
– Future expansion:	Vertical expansion (one story)

4-2-3 Floor Space Allocation

Floor space allocation is as tabulated below:

Room/Space	Area (sq.m.)
Maintenance Laboratory	180
Testing Laboratory	180
Standards and Calibration Laboratory	180
Vibration Testing Laboratory	50
Stockroom	110
Equipment Storage	65
Standards Library	72
Offices	468
Custodian's Room	25
Blueprinting Room	25
Photocopy, Telex, Computer Terminal & Stationary Room	40
Equipment Receiving and Delivery Room	40
Conference Room	80
Classroom 1	36
Classroom 2	72
Lecture Hall	101
Building Equipment Room	95
Kitchenette	20
Air Handling Unit's Room	25
Entrance Hall, Corridors, Staircases Lavatories and Other Miscellaneous Spaces	571
Total	2,435

4-3 Site Planning

4-3-1 Layout and Topography

The proportional placing of the ESTC building within the site is approximately same as that of the RSS Master Plan. The building will have the floor area, rooms and configuration as thought necessary

and will be two stories high. According to the topographic plan supplied to the Team by RSS, there is a difference 2.5 – 3 meters in height from the level of the existing access road and that of the lowest point within the site. The general incline is gradual and towards the southwest.

4-3-2 Planned Ground Level

In view of such matters as layout, construction schedule and soil conditions, it is of benefit to keep the excavation for the foundation work uniform. The planned ground level will be about two meters below the existing access road and the site will be kept generally flat.

4-3-3 Approach to the Site and the Building

Due to the level difference between the access road and the site, both the ground floor and the first floor levels may be reached by means of stairs and overbridge. Approach by motor vehicles will be through road to be constructed by RSS along the southeast side of the site. Vehicles will enter the site from the southwest corner.

4-4 Architectural Design

The major architectural components comprising the ESTC building can be grouped into four parts; 1) the offices, 2) the laboratories and adjunctive facilities, 3) the training rooms, 4) the supplemental facilities. From the viewpoint of flexibility and economic structural design, it is advantageous to design the four components as an integral whole. The laboratories group, which requires air conditioning, has been planned to come on the north side of the building in view of reducing solar load, while the office group which requires a good amount of illumination has been placed on the south side. The corridors are straight and linear with stairs on both ends making the circulation pattern easy to comprehend.

As mentioned in section 4-3, both the ground floor and the first floor levels may be approached from the access road with ease. But as

the main entrance hall should have a spacious ambience, it has been placed on the first floor, while the corresponding entrance on the ground floor has been planned as access for equipment and materials thus separating personnel and goods circulation.

The assumed floor height for both the ground floor and the first floor are 4.5 meters from floor to floor. This is based on the required ceiling height of 3 meters for laboratories necessary plenum space for ducts and pipes and structural design dimensions. The ceiling height of rooms not requiring air conditioning will also be 3 meters in order to reduce summer heat by increasing the room air volume. Eaves are planned for the exterior and venetian blinds for the interior of windows to reduce solar load.

Exterior finish will be of domestic stone for the ends and for the middle portion of the building durable maintenance free spray-on finish.

4-5 Future Expansion

RSS, in expectation of future expansion of ESTC activities and increase of personnel and equipment, has strongly requested the Team to make allocation for the physical expansion of the building. Through discussions and analysis of the problems it was decided to allow for vertical expansion of one story in the structure. The structural and architectural design conditions of the building for the future expansion will be carried out in the construction project. Conditions, as pertaining to the expansion, will be elaborated upon in the detailed design.

4-6 Structural Design

4-6-1 Reference Data

Data used for reference purposes for structural design are as follows:

a) Building Standard Law of Japan

b) AIJ Standard for Structural Calculation of Reinforced Concrete Structures

c) AIJ Standard for Structural Design of Building Foundation

d) AIJ Standard Specification: Reinforced Concrete Works

e) Japan Industrial Standards (JIS)

f) Authorized Standards and Codes of various institutes national and international

Note: AIJ: Architectural Institute of Japan

4-6-2 Design Strength of Structural Materials

1) Concrete

The Design standard strength of concrete will be F_c = 170 kg/cm^2 *(cylindrical strength at age of 4 weeks). The required strength for* design of mix proportion of concrete will be indicated in the technical specification. The allowable unit stresses for structural calculations will be in accordance with AIJ Standard.

2) *Reinforcing Bars*

Reinforcing bars will be SD30 conforming to JIS G 3112 (Hot-rolled Deformed Bar) or equivalents. Mechanical properties of SD30 are as follows:

Tensile Requirements in Bars – SD30

Yield Point kg/cm^2	Tensile Strength kg/cm^2	Elongation %
3,000 or more	4,900 – 6,300	14 or more

Allowable unit stresses of the bars for structural calculations will be in accordance with AIJ Standard.

3) Bearing Capacity of Soil

The subsoil layer for building supporting ground is of marly limestone. The permanent bearing capacity of the soil is assumed as 15 tons/m² at depth of 1.2 m from the ground surface as stated in data supplied by RSS in Dec. 1978.

Further soil test if scheduled to be carried out by RSS before the final design of building foundation as stated in 3-4.

Bearing capacity of soil for design is to be decided according to the results of the test.

4-6-3 Loads

1) Live Loads

With reference to the Enforcement Order of the Japanese Building Law, authorized standards of leading countries and data supplied by RSS live loads to be adopted in structural design are as follows:

Design Live Loads (kg/m²)

Room/Space	Beams & Slabs	Frames & Foundations	Seismic Force
Laboratories Stores	500	400	250
Library	800	700	500
Air Handling Unit Room	1,200	1,050	750
Roof (in Future)	180	130	60
Others	400	240	160

Note: Live loads as weight due to special equipment or others are to be considered accordingly.

2) Seismic load

The seismic load will be decided in reference to that of neighbouring countries.

$$K = k \cdot c \cdot W$$

where K: seismic load

k: geophysical modulus . . . 1

c: seismic coefficient . . . . . penthouse; 0.1
roof; 0.05
first floor; 0.04
ground floor; 0.03

W: the weight assumed to be acting at the level of roof or floor under consideration

The seismic forces calculated from the above formula will be deemed to work on cardinal axes (X-axes and Y-axes) of the building independently and to concentrate at each floor level (Z-axes).

3) Wind Load

a. Velocity Pressure: From the data supplied by RSS the wind velocity for structural design can be assumed as 120 km per hour (33.3 m per second).

For the project the following formula will be used.

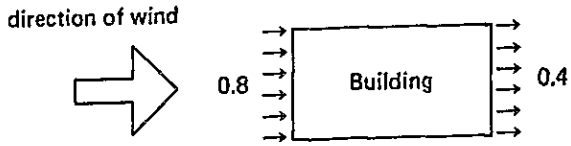
$$q = 60\sqrt[4]{h}$$

where

q: velocity pressure at h meters above ground surface (kg/sq.m)

b. Wind Force Coefficient: The wind force coefficient figures given in the Enforcement Order of the Japanese Building Law will be adopted.

The wind force coefficient are 0.8 windward and 0.4 leeward of of building vertical surfaces.



4) Earth Pressure

Earth pressure coefficient will be 0.45 as stated in data supplied by RSS.

5) Snow Load

According to the data supplied by RSS the snowfall for structural design will be of 1 meter. As the average density of snow is 0.2 the load per square meter will be 200 kilogrammes. This load is to be considered as a temporary load.

4-7 Electrical Installation

Of the electrical installation to be carried out in this construction project those relating to the various testing and experimenting devices of the laboratories (out of scope of this project) cannot be decided at this point but will be finalized at the time of detailed Designing foregoing mutual consultation with all those concerned.

4-7-1 Sub-station Equipment

1) Switch gear and medium voltage switch gear will be placed in the Building Equipment Room and will consist of a switch gear, distribution board, transformer, and automatic induction voltage regulator.

2) RSS will lead the appropriate trunk line to the switch gear which will be installed in the building by Japan side.

3) The feeder will consist of lighting and general use, power and laboratory use.
These will be distributed from a medium voltage switch gear to distribution boards and control panels installed on each floor.

4) The electrical distribution systems will be as follows:
Power supply: 380 V, 3 phases, 4 wires, 50 Hz.
Distribution: a) Lighting and socket outlet use
380/220 V, 3 phases, 4 wires, 1 earth line
50 Hz.
b) Power use
200 V, 3 phases 3 wires, 50 Hz.
c) Testing and Laboratory use
380/220 V, 3 phases, 4 wires, 50 Hz.
220 V, 3 phases, 3 wires, 50 Hz.
100 V, 1 phase, 2 wires, 50 Hz.

5) Types of transformers will be as follows;
a) Power use
3 phases, 380/200 V dry type with terminal boxes
b) Laboratory use
3 phases, 380/220 V dry type with terminal boxes
1 phase, 380/100 V dry type with terminal boxes

6) The automatic induction voltage regulator will be;
3 phases, 50 Hz., dry and air cooled type for indoor use, automatically operated, voltage fluctuation cover range ±15%

The capacity will be as the laboratory devices require.

7) The switching gear and distribution boards will have switches, protective and auxiliary relays and indicative meters with adequate capacity required by the building and will be floor mounted and self contained.

4-7-2 Lighting and Socket Outlets

1) Lighting fixtures will be mainly fluorecent lamps.

2) The intensity of illumination will be;
   a) Offices, Laboratories, Classrooms 400 lux
   b) Entrance Halls, Building Equipment Rm. 200 lux
   c) Corridors, Staircases, Lavatories, Shower Rm. 100 lux

3) Socket outlets for general use will be installed in each room and on corridors as necessary for cleaning equipment and at entrances of both floors for employees time recorders.

4) Socket outlets for laboratories will be installed inside the wiring trenches of the rooms.

5) Emergency lighting fixtures individually powered by batteries will be installed in the corridors, staircases, Laboratories and the Building Equipment Room.

6) Exterior lighting fixtures will be appropriately installed on the building or within the site to satisfy security needs.

4-7-3 Electric Clocks

The electric clock will run on alternating current and will be placed in the following rooms.

a) Head of ESTC's Room
b) Secretary/typist's Room
c) Conference Room
d) Entrance Hall
e) Testing Lab.
f) Maintenance Lab.
g) Vibration Testing Lab.

4-7-4 Fire Alarm System

1) The fire alarm system is made up of the receiving panel, fire detectors, manual alarm push buttons, alarm bells and alarm lamps.

2) Thermal fire detectors will be installed in the Testing Lab., Standards and Calibration Lab. and the building Equipment Room. Smoke fire detectors will be installed in the corridors and staircases.

3) Manual push button alarms will be installed on each floor.

4) Receiving panel will be placed in the Secretary/Typist room.

5) Fire alarm bells are required in corridors and one loud alarm bell outside the building.

4-7-5 Telephone System

1) The MDF will be placed inside the Building Equipment Room. Proper wiring and telephone sets will be installed.

2) Work for the lines leading up to the MDF will be done by RSS.

3) Telephone sets will be placed in the following rooms;

Floor	Room	No. of Set
Ground Fl.	Offices	8
	Eqpt. Receiving and Delivery Rm.	1
	Maintenance Lab.	1
	Vibration Testing Lab.	1
	Testing Lab.	1
First Fl.	Offices	6
	Standards Library	1
	Custodian's Room	1
	Classroom-2	1
	Standards and Calibration Lab.	1
	Lecture Hall	1
	Head of ESTC's Room	1
	Secretary/typist's Room	1
	Conference Room	1

An intercom system will be installed connecting the rooms of the Head of ESTC, Secretary and Typist and Conference. There will be two outlets for each line for large offices and three laboratories.

4-7-6 Earthing

1) Earthing systems having resisting values as listed below will be installed;

a) Communication systems	under 10 ohms
b) Neutral line of transformers and for protection	under 10 ohms
c) Cabinets or frames of main distribution board	under 100 ohms

2) Earthing work will include wiring from the electrodes to the various equipment and devices.

3) Earthing wires for the Laboratories will be so placed in the trenches that the earth lines of the testing and experimenting apparatuses may easily be connected.

4-7-7 TV Antenna and Outlets

1) TV antenna of not less than 3 meters in height will be installed on the roof.

2) TV antenna outlets will be provided in Maintenance Laboratory, Class rooms and Lecture Hall.

4-7-8 Dumb-Waiter Lift

A dumb-waiter lift will be provided between Testing Lab. (Ground floor) and Standards and Calibration Lab. (1st floor) for electronics equipment transportation.

4-8 Plumbing

4-8-1 Water Supply

1) Water will be served from water storage tanks placed on the Roof Floor.

2) Water will be led to the water storage tanks from the supply pipe brought to the boundary of the site by RSS. Pipes inside the building will be placed in the pipe shaft. Water from the tanks will be fed to the various parts of the building where deemed necessary.

3) The water storage tanks will be box shaped and made of galvanized steel plates. The tanks will be placed in a linear series.

4) The pipes for the water supply will be of galvanized steel seamless pipes.

5) Pipes other than those imbedded in the structure will be insulated to prevent condensation dripping.

4-8-2 Hot Water Supply

1) Lavatories of both floors and the shower room on the Ground Floor shall be served hot water from electric heaters.

2) The heaters will be placed on the walls of the aforemantioned rooms and will be one unit per room. Pipes will lead the hot water to the various fixtures.

3) The electric water heaters will be of instantaneous type.

4-8-3 Drainage

1) The drainage system within the building will be divided into soil, waste and storm drainage.

2) Once outside the building the soil and waste drainage will be converged and led to a septic tank. Storm water will be discharged overground at the appropriate place.

3) Pipes for the soil drainage will be asphalt wrapped cast iron pipes and those for waste drainage will be galvanized seamless steel pipes. Exterior drainage pipes will all be of reinforced concrete.

4) Storm water drainage pipes are to be invisible within the building.

4-8-4 Sewage Disposal

1) Sewage will be handled in a cesspool and septic tank placed adequately far from the building.
The location of cesspool and septic tank is as shown in the Site Plan.

2) The septic tank will be box shaped, of concrete and will have two sections.

3) The cesspool will be circular shaped and of concrete. Holes will be regulary placed in the walls and the bottom will be of crushed stone.

4-8-5 Plumbing Fixtures

1) The male lavatories on each floor will have two water closets, two urinals and two wash basins. Those for females will have one water closet and two wash basins.

2) The water closets will be of european type.

3) The shower will be equipped with a thermostat valve and a hand held shower head.

4) The kitchenette will be equipped with stainless steel fixtures.

5) Slop sink and closet for dusting things will be installed in the custodian's Room.

4-8-6 Fire Extinguishing System

1) Portable chemical fire extinguishers will be placed in the corridors.

2) At a convenient location along the walls of the corridors a mobile chemical fire extinguishing unit will be placed. Fire extinguishing units interlocked with fire detectors will be installed in the Standards and Calibration Lab., Testing Lab. and Maintenance Lab.

4-8-7 Miscellaneous

Drinking fountains (cooled) will be placed in the corridors.

4-9 Air-Conditioning, Heating and Ventilation

4-9-1 Air-Conditioning

Air-conditioning system will consist of remote type self contained air-conditioning unit, automatic control devices, ducts and wiring.

1) Rooms to be air-conditioned

   a) Maintenance Lab.
   b) Testing Lab.
   c) Standards and Calibration Lab.
   d) Conference Rm.

2) Room Temperature

   The Standards and Calibration Laboratory will have a constant room temperature of 23°C ± 1°C, and a constant relative humidity of 50% ± 10%. The temperature of rooms other than the above mentioned will be maintained at 25°C in summer. During the winter, rooms will be heated with a hot water radiator.

3) Unit Placement

   The Maintenance Laboratory and Testing Laboratory will be air-conditioned by air-conditioning units placed in the Building Equipment Room. Air will be supplied through ducts. The Conference Room will have its own independent air-conditioning unit directly supplying air to the room. The Standards and Calibration Laboratory will be air-conditioned by an air-conditioning unit placed in the Air-handling Unit Room on the 1st Floor.

A stand-by unit will also be placed in the room. In order to keep the environmental conditions of the laboratory at a constant state, the air-conditioning unit will be equipped with an electrical heater and a humidifier. In case of mechanical failure of the main unit switch-over to the stand-by unit will be automatic. Switch-over to the stand-by unit will be done by a motor driven damper.

4-9-2 Heating

Heating system will consist of a steel boiler, pump, expansion tanks radiators and pipe works.

1) Rooms to be Heated

All rooms except the Standards and Calibration Laboratory, Building Equipment Room, Air Handling Unit Room, stores and staircases will be heated.

2) Room Temperature

Heated rooms will be kept at 20°C in winter.

3) Unit Placement

The boiler, pump and a stand-by pump will be installed in the Building Equipment Room from which hot water will be piped to the individual radiator units.

The radiators in the Head of ESTC's Room and Conference Room will be cabinet type convector units. All other rooms will be equipped with cast iron exposed type units.

The expansion tank will be placed on the Roof Floor. The boilers will use diesel oil for fuel. The diesel oil will be partitioned off in the Building Equipment room.

4-9-3 Ventilation

1) Rooms to be ventilated are as follows;

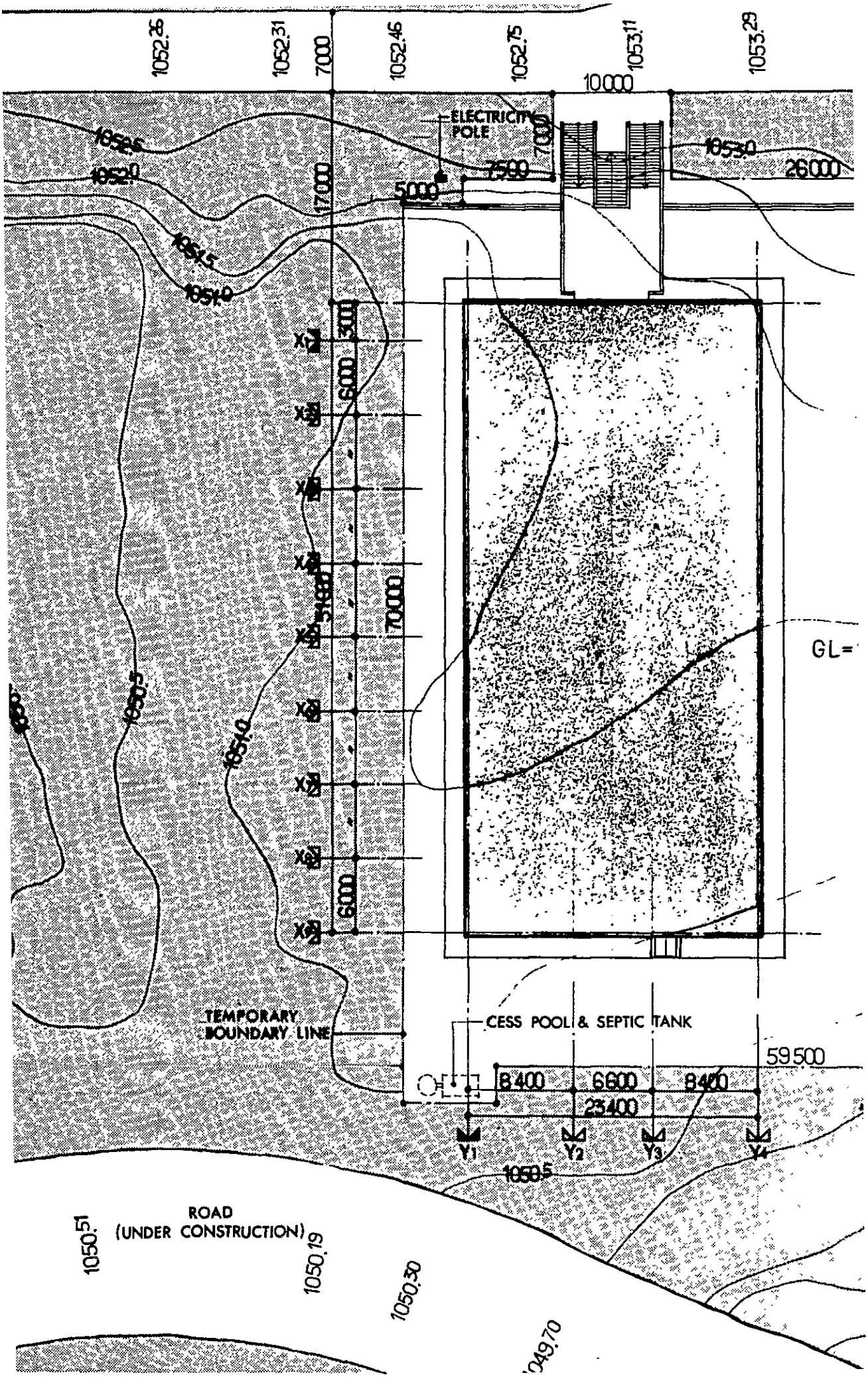
   a) Blue-printing Room
   b) Photocopy, Telex, Computer Terminal and Stationary Room
   c) Vibration Testing Room
   d) Kitchennette
   e) Lavatories
   f) Building Equipment Room

   Rooms a) and f) will have the same exhaust route. The exhaust fan will be placed in the ceiling space of f). Rooms b) and d) will also have the same route and the exhaust fan will be placed in the ceiling space of Store (2). Exhaust for the Lavatories will be through an exhaust fan installed in the ceiling space of the 1st Floor Lavatory. Stores will be properly ventilated.

5. PRELIMINARY DESIGN DRAWINGS

Preliminary Design for ESTC Building

CONTENTS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26000
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1051.0
17000
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X2
X3
X4
X5
X6
X7
X8
X9
300
6000
31000
70000
6000
1050.5
1050.0
GL=
TEMPORARY BOUNDARY LINE
CESS POOL & SEPTIC TANK
59500
8400
6600
8400
23400
Y1
Y2
Y3
Y4
1050.5
ROAD
(UNDER CONSTRUCTION)
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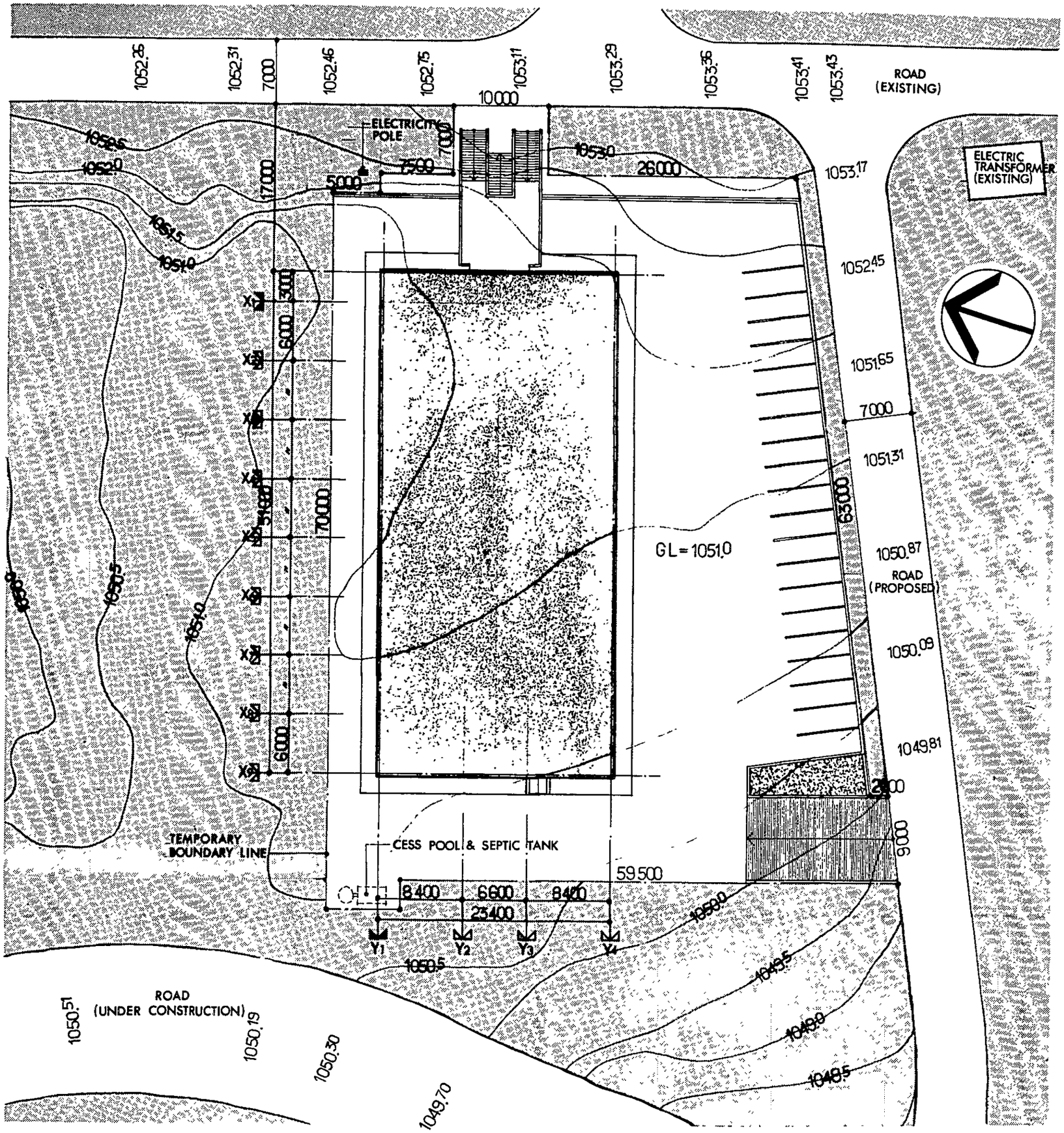
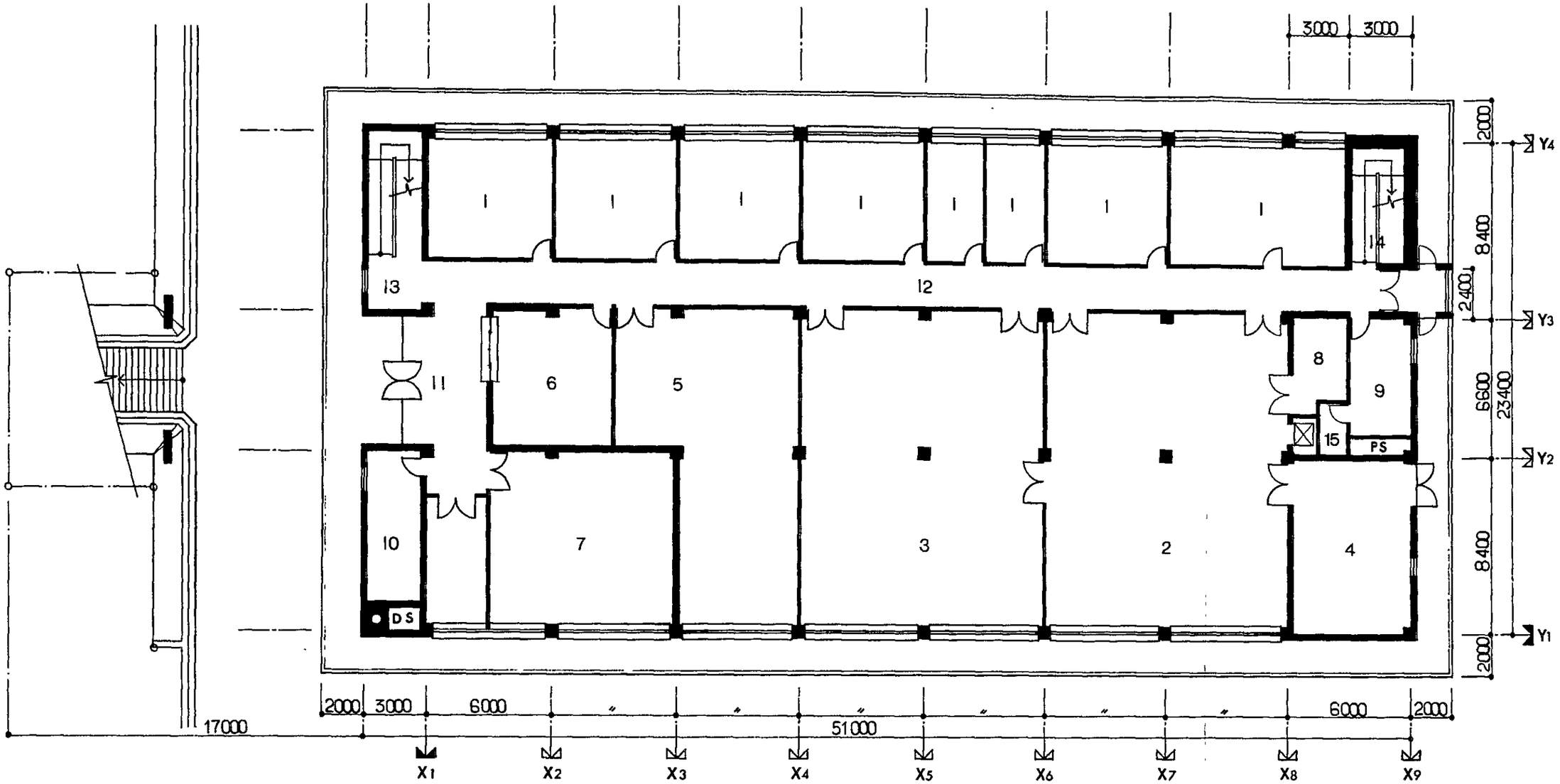
1049.70



1

ESTC

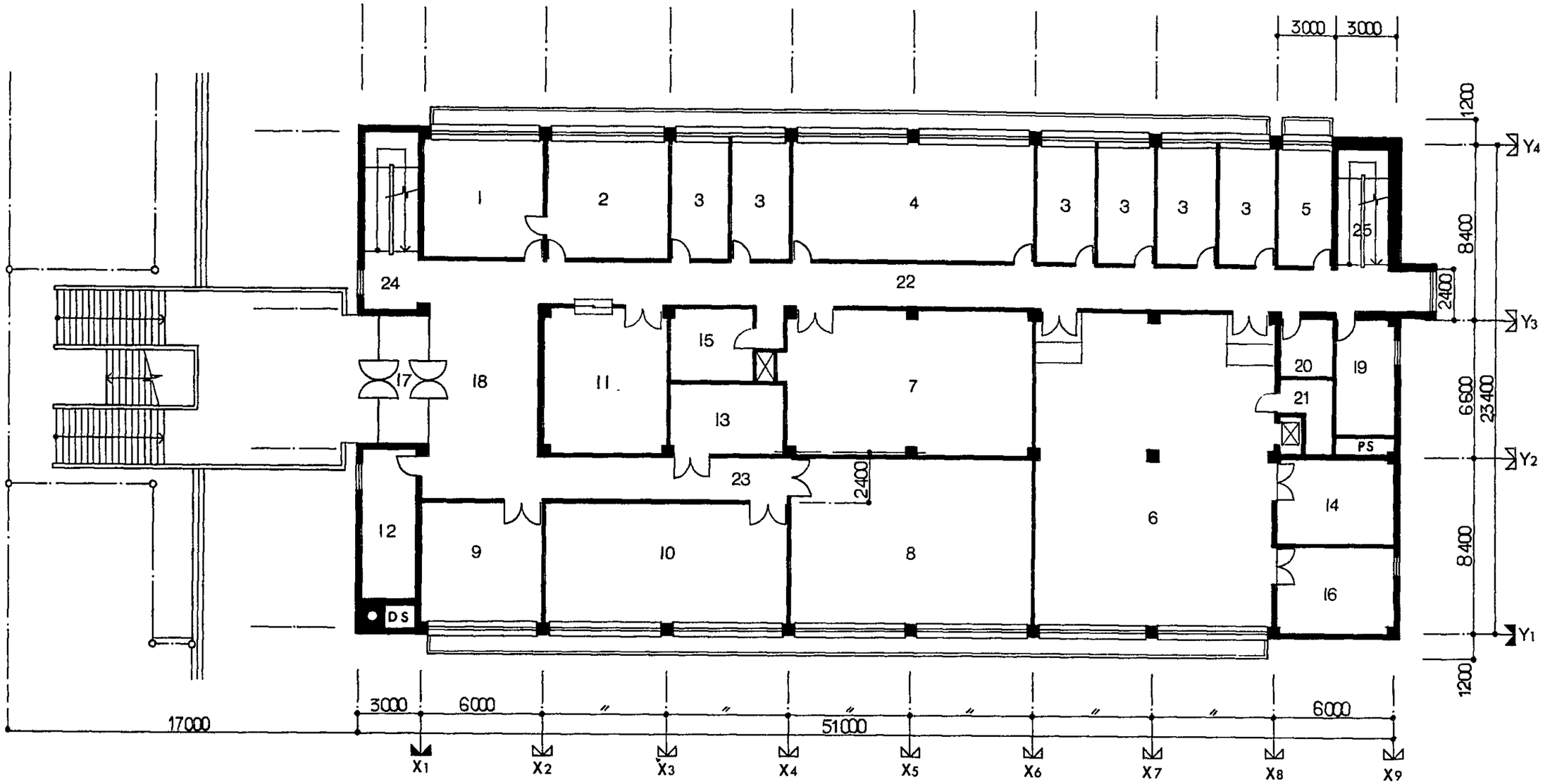
SITE PLAN 1:400



1	Offices	11	Auxiliary Entrance Hall
2	Testing Lab.	12	Corridor-1
3	Maintenance Lab.	13	Staircase-1
4	Vibration Testing Rm.	14	Staircase-2
5	Stock Rm.	15	Shower Rm.
6	Equiptment Receiving & Delivery Rm.		
7	Building Equiptment Rm.		
8	Store(1)		
9	Lavatory (Men)		
10	Blueprinting Rm.		

ESTC

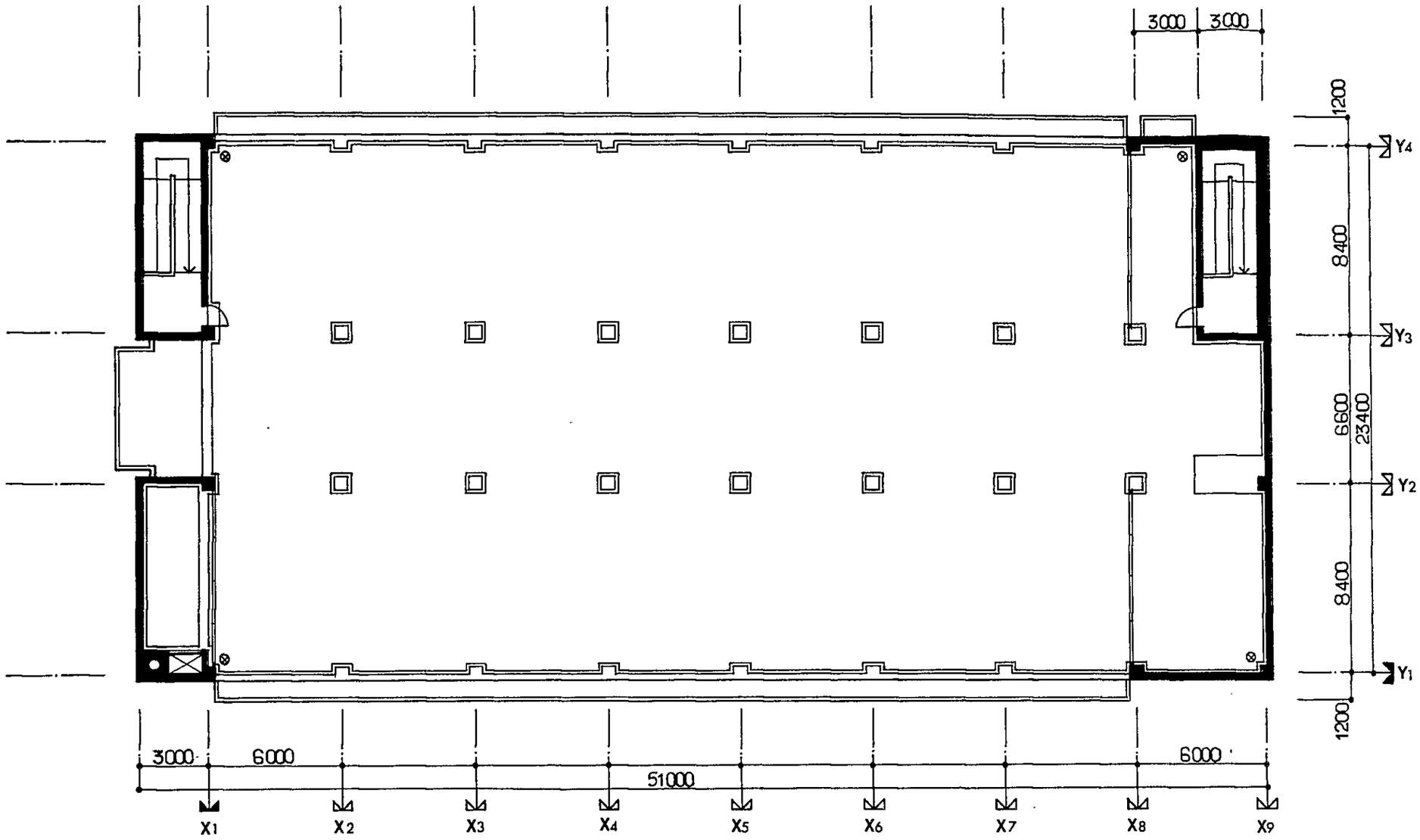
GROUND FL. PLAN 1:200



1	Secretary & Typist's Rm.	11	Photocopy, Telex, Computer Terminal & Stationary Rm.		
2	Head of ESTC's Rm.	12	Custodian's Rm.		
3	Offices	13	Store (2)	21	Store (4)
4	Standards Library	14	Store (3)	22	Corridor–2
5	Archives	15	Kitchenette	23	Corridor–3
6	Standards & Calibration Lab.	16	Air Handling Unit Rm.	24	Staircase–1
7	Conference Rm.	17	Entry	25	Staircase–2
8	Lecture Hall	18	Main Entrance Hall		
9	Classroom–1	19	Lavatory (Men)		
10	Classroom–2	20	Lavatory (Women)		

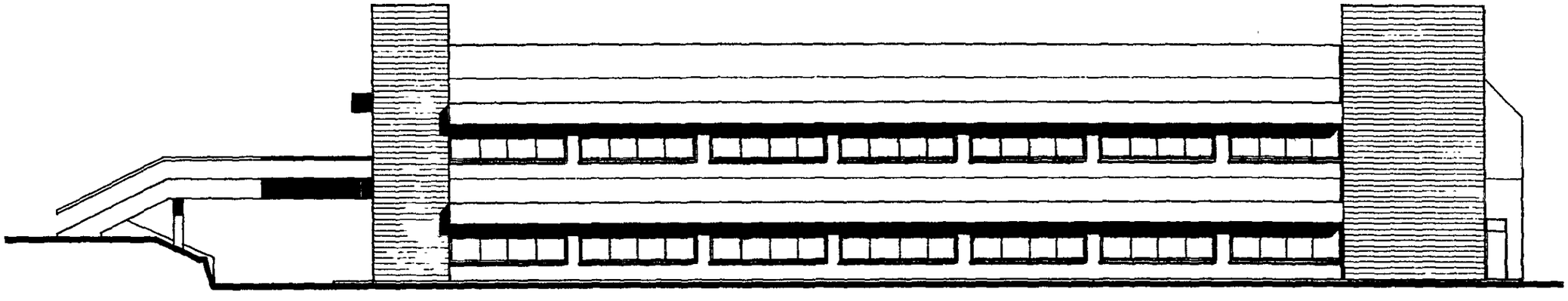
ESTC

FIRST FL. PLAN 1:200

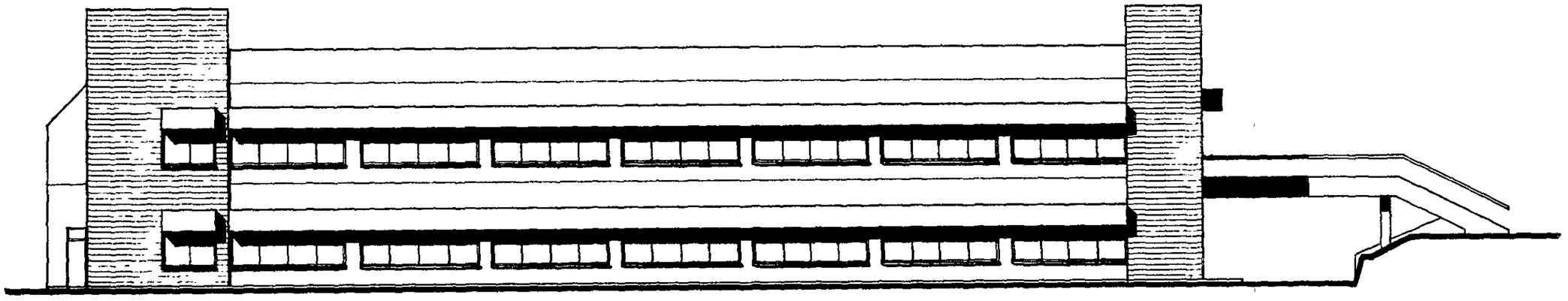


ESTC

ROOF FL. PLAN 1:200



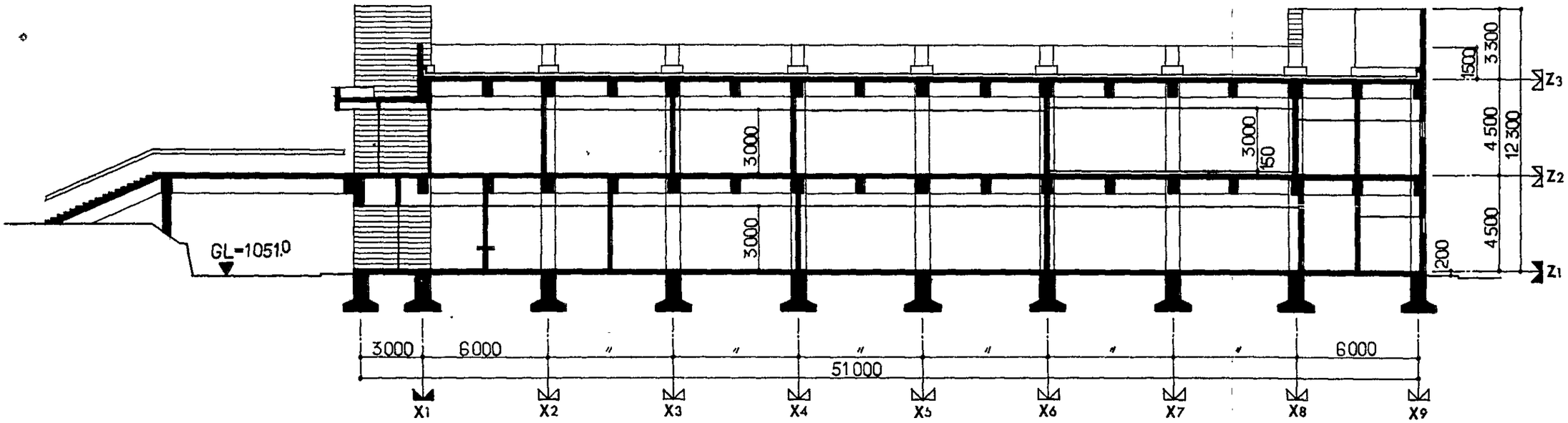
NORTH ELEVATION

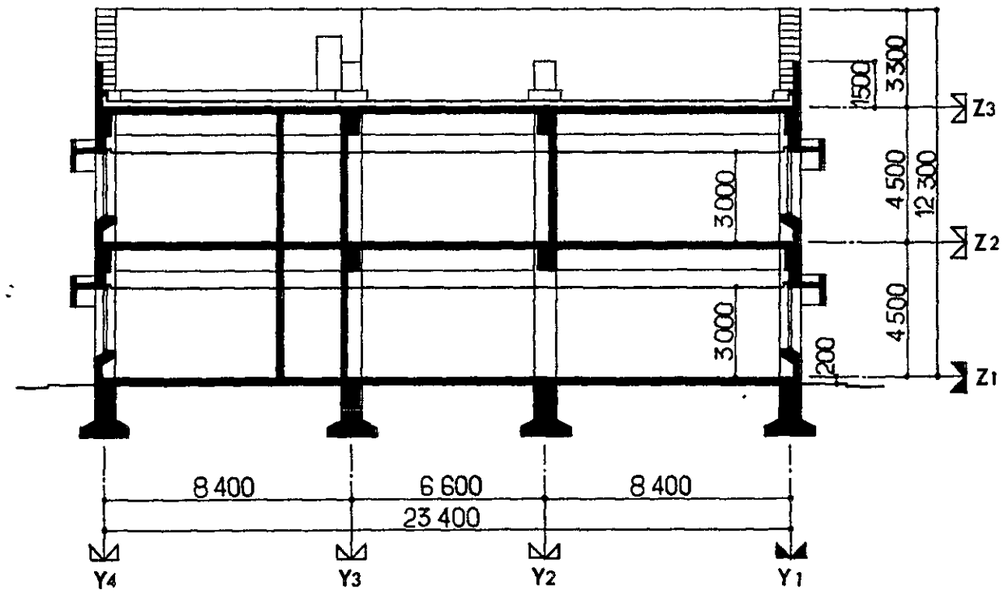


SOUTH ELEVATION

ESTC

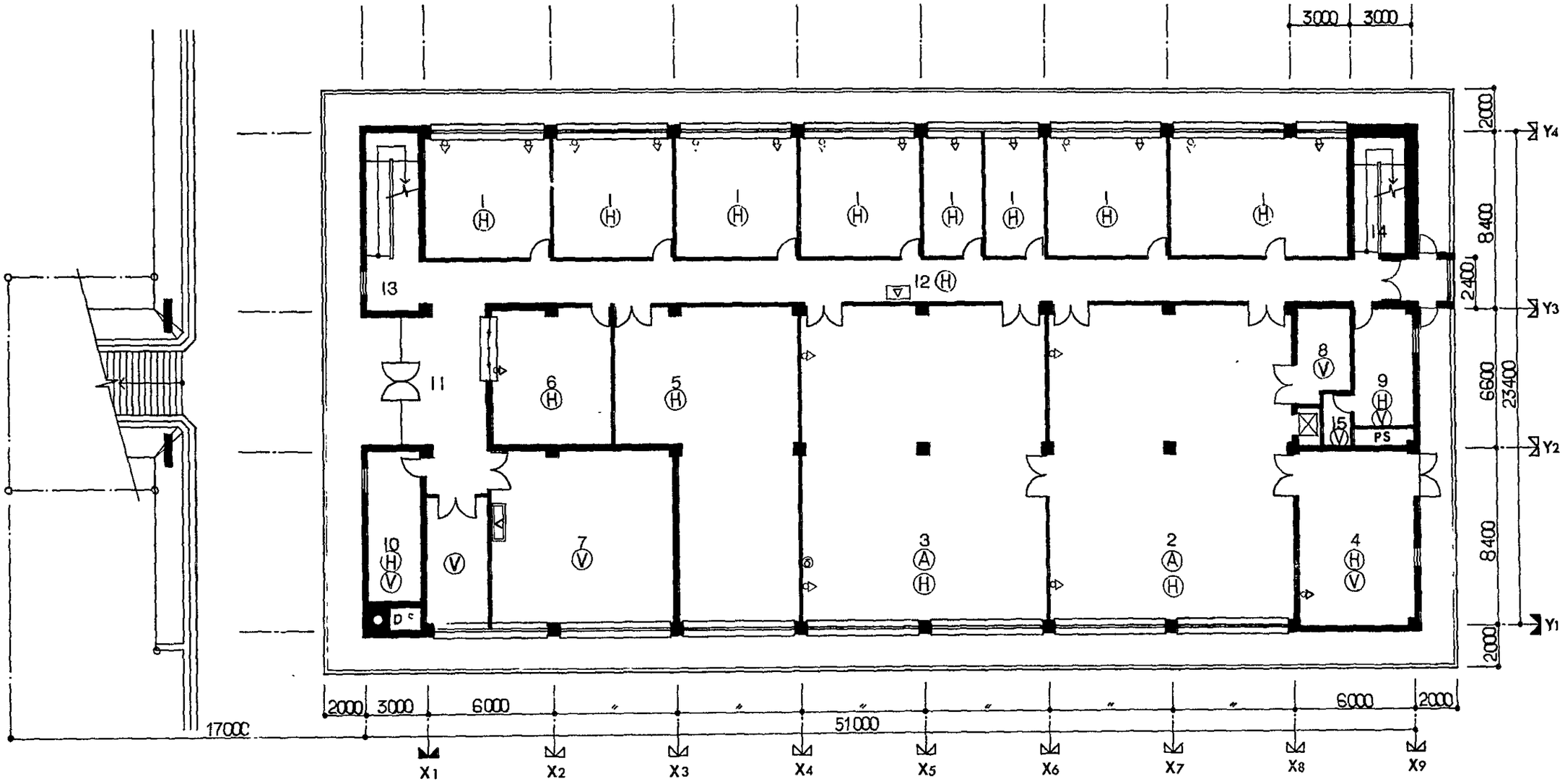
ELEVATIONS 1:200





ESTC

SECTIONS 1:200



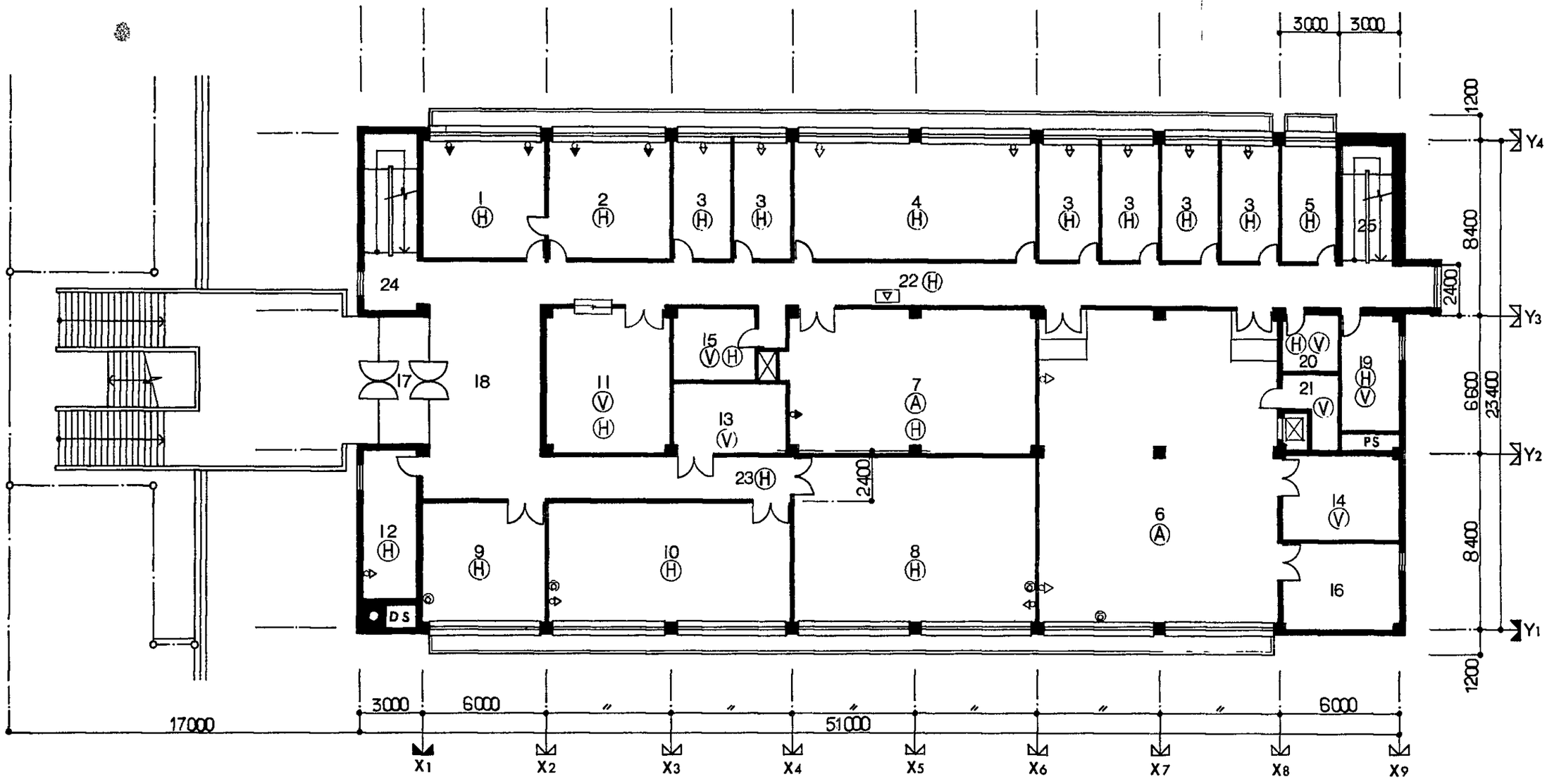
1 Offices
2 Testing Lab.
3 Maintenance Lab.
4 Vibration Testing Rm.
5 Stock Rm. (1)
6 Equiptment Receiving & Delivery Rm.
7 Building Equiptment Rm.
8 Store
9 Lavatory (Men)
10 Blueprinting Rm.
11 Auxiliary Entrance Hall
12 Corridor-1
13 Staircase-1
14 Staircase-2
15 Shower Rm.

EXPLANATION OF SYMBOLS

SYMBOLS	ITEMS
Ⓐ	AIR CONDITIONING
Ⓗ	HEATING
Ⓥ	VENTILATING
▽	MDF CABINET 80P-DT
▽	TELEPHONE CABINET
●	TELEPHONE OUTLET
●	STENOGRAPHER'S TELEPHONE OUTLET
◎	TV. ANTENNA OUTLET

ESTC

AIR CONDITIONING, HEATING, VENTILATING & TELEPHONE LAY OUT



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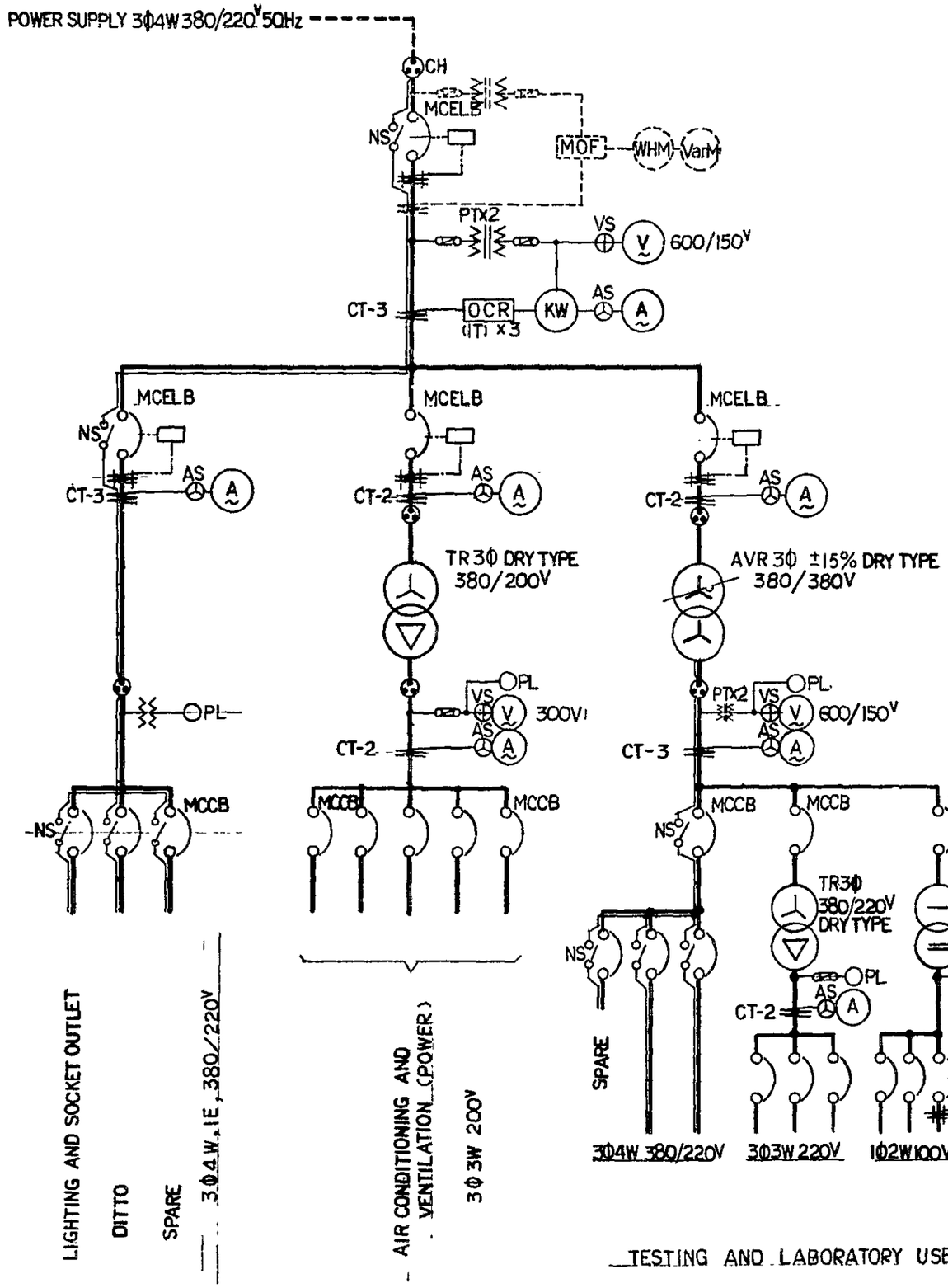
ESTC

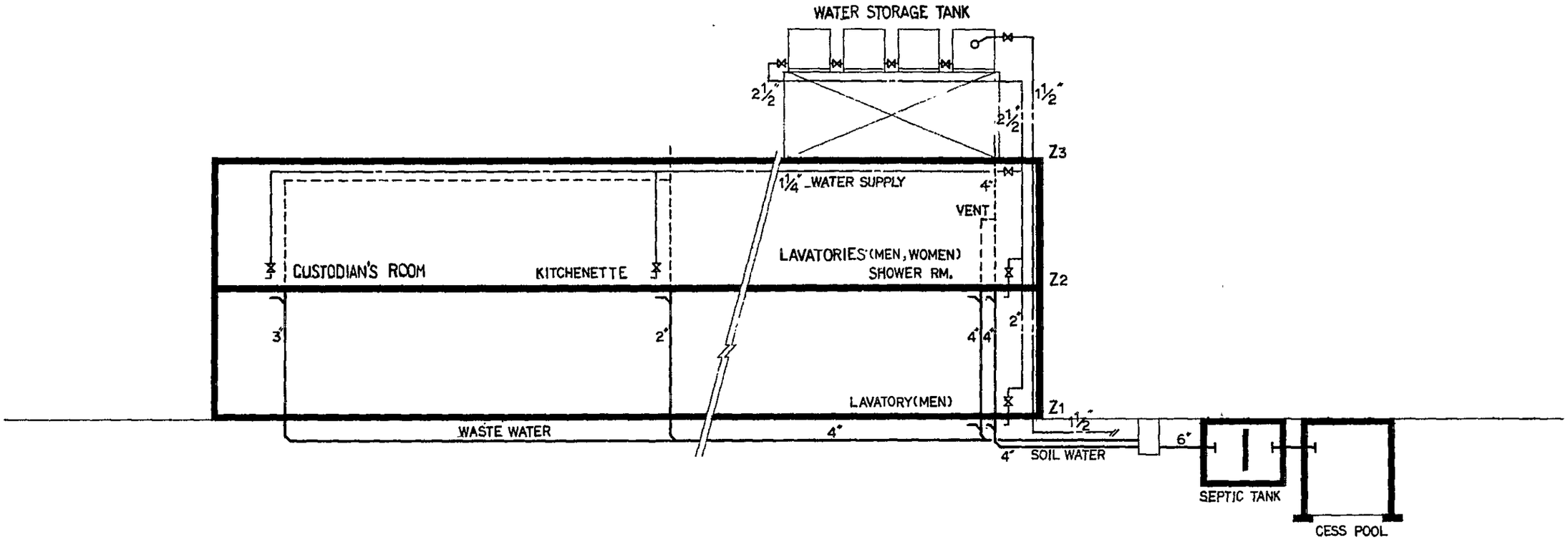
AIR CONDITIONING, HEATING, VENTILATING & TELEPHONE LAY OUT



LEGEND

CH	CABLE HEAD	
MOF	METERRING OUT FIT	(NOT INCLUDED)
WHM	WATT HOUR METER	(DITTO)
VarM	REACTIVE POWER WATT HOUR METER	(DITTO)
MCELB	MOLDED CASE EARTH LEAKAGE BREAKER	
MCCB	MOLDED CASE CIRCUIT BREAKER	
NS	NEUTRAL SWITCH	
PT	POTENTIAL TRANSFORMER	
CT	CURRENT TRANSFORMER	
OCR	OVER CURRENT RELAY (PROTECTIVE RELAY)	
AVR	AUTOMATIC INDUCTION VOLTAGE REGULATOR	
VS	VOLT METER CHANGE SWITCH	
AS	AMPER CHANGE SWITCH	
PL	PILOT LAMP (INDICATOR OF POWER SUPPLY)	

ESTC
ELECTRIC SINGLE LINE DIAGRAM



ESTC
SANITARY & PLUMBING DIAGRAM

6. SHARING OF RESPONSIBILITY AND SCOPE OF WORKS

6-1 General

The construction project for ESTC building will have to be carried out through cooperation between the Government of Japan and the Government of Jordan through RSS.

The Team assumed the construction of the ESTC building could be financed by Japan's grant aid programme.

6-2 Works to be Covered by RSS

a) Securing of Site

Site for the ESTC building has been secured within the premises of RSS by means of temporary boundary lines shown in Appendix (A) of memorandum of discussions. (refer to Appendix No. 1) The site is generally flat with gentle slopes and scattered with small pine trees.

b) Site Clearance

The trees within the site are to be removed and the ground surfaces are to be cleared before the start of the construction.

c) Provision of Road

The road planned along the southeast boundary of the site is to be provided before the start of the construction. Final pavement of the road will be done by RSS at the end of the construction.

d) Water Supply Line

Water supply line is to be provided up to the boundary of the site.

A hand-hole is to be constructed at the boundary and an end valve is to be fixed at the end of the water supply pipe within the hand-hole.

e) Electric Power Supply Line

Electric power supply cable is to be connected to the sub-main switchgear provided by the Japan side.

f) Telephone Lines

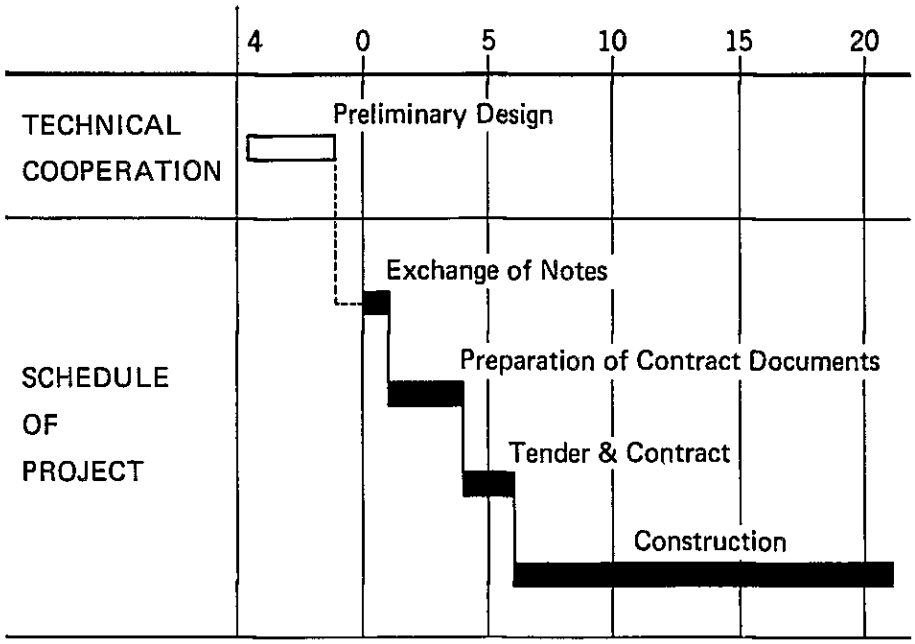
Telephone lines from the PBX of RSS to the MDF are to be provided. The MDF is to be installed in the building by the Japan side.

g) Water and Electric Supply for Construction Works

Water and electricity facilities for use during the construction work are to be provided to the boundary of the site.

7. SCHEDULE OF PROJECT

The tentative schedule of the construction project is planned as tabulated below:



Note: Stage for the preparation of contract documents includes the contract between RSS and Japanese consultant.

8. ROUGH COST ESTIMATE

8-1 Assumptions

The rough construction cost was estimated on the following assumptions:

a. The construction will be carried out by the construction company/ contractor of Japanese nationals, and the subcontractors will be of Jordanian nationals as far as technical problems permit.

b. Construction materials produced in Japan and available in local market will be used in principle. The cost of the materials imported from Japan includes packing cost, marine freight, inland transportation and insurance premiums. The materials available in local market will consist of materials produced in Jordan and the materials imported from the countries other than Japan. All the materials shall be pursuant to the grade of the building to be designed.

c. Custom duties, internal taxes and other fiscal levies which may be imposed on the Japanese nationals in Jordan with respect to the supply of the materials and services under the contracts will be exempted.

d. Foreign currency exchange rate
   — 1 Jordanian dinar (JD) = 0.297 US dollers
   ≒ 660 Japanese Yen (¥)

e. Consulting services will be done by the consultant of Japanese national.

8-2 Summary of Construction Cost

The summary of construction cost roughly estimated in accordance with scope of work given in section 6-1 and 6-2 is as follows:

I.	Building Construction Work	¥ 859,100,000-
II.	External work	¥ 25,900,000-
III.	Consulting Service Fee	¥ 115,000,000-
		¥1,000,000,000-

Note: The above rough estimate of cost has been made in reference to data gathered by the Team during the Survey made in December of 1978.

APPENDIX

MEMORANDUM OF DISCUSSIONS BETWEEN THE JAPANESE PRELIMINARY DESIGN STUDY TEAM FOR THE ELECTRONICS SERVICE AND TRAINING CENTER (ESTC) OF THE ROYAL SCIENTIFIC SOCIETY (RSS) IN THE HASHEMITE KINGDOM OF JORDAN AND THE HEAD OF ESTC

AMMAN, DECEMBER 6 – 25, 1978

On the way of enhancing the fruitful cooperation between the Government of Japan and the Government of the Hashemite Kingdom of Jordan, and further to the request submitted by the Government of the Hashemite Kingdom of Jordan through the Royal Scientific Society (hereinafter referred to as RSS) to the Japanese Government for the financing of a building for the Electronics Service and Training Center (hereinafter referred to as ESTC) at RSS, the Japanese Preliminary Design Study Team for the ESTC building (hereinafter referred to as the Team) headed by Mr. Isuke Hattori, Special Assistant to Director, Administration Division, Radio Regulatory Bureau, Ministry of Posts and Telecommunications in Japan, visited RSS in the period from December 6 until December 25, 1978 for the purpose of discussing and working out the preliminary design study for the ESTC building project (hereinafter referred to as the Project).

During the visit of the Team to the Hashemite Kingdom of Jordan, extensive meetings were held at the Electronics Engineering Department of RSS between the members of the Team and the Head of ESTC, Dr. Awn Rifai. In these meetings, the issues related to the Project were discussed and agreed upon in principle.

As a result of the discussions, the Team agreed to recommend to the Government of Japan the matters included in the document attached herewith.

Amman, December 23, 1978.

Mr. Isuke Hattori,
Head of the Japanese
Preliminary Design Study Team.

Dr. Albert Butros,
Director General,
Royal Scientific Society.

THE ATTACHED DOCUMENT

I. Cooperation between Japan and Jordan

The Government of Japan and the Government of Jordan are to cooperate in the building project for ESTC. The terms of implementing this project are outlined in the following sections. The main issues discussed during the meetings at RSS were:

- System of Japanese grant aid for developing countries.
- Schedule of implementation of the Project.
- The basic plan for the Project.
- Measures to be taken by both sides.

II. Schedule of Implementation of the Project

The Project will be implemented according to the following schedule:

– Draft of preliminary design report and confirmation by RSS; in Amman.	February 1979
– Submission of final report to RSS; by mail.	March 1979
– Negotiations and signing of the Exchange of Notes; between Japanese Embassy in Amman and representatives of the Government of Jordan.	May 1979
– Contract on consulting services; between RSS and Japanese firm.	June 1979
– Contract on construction work; between RSS and Japanese firm.	October 1979
– Completion of construction work.	February 1981.

III. Basic Plan for ESTC Building

The building will be constructed on the site indicated by the boundaries shown on the map attached as Appendix A. This site has an area of approximately 3800 m^2. The building will comprise of two storeys. The floor space allocation is shown in the list given below and in the drawing attached as Appendix B. RSS will provide the land necessary for the construction of the building, cleared of any existing trees. The accessibility to the construction area through the existing/planned roads near the site will be secured by RSS.

The following is the floor space allocation:

Space name	Area m^2
Maintenance laboratory	180
Testing laboratory	180
Standards and Calibration laboratory	180
Vibration testing room	50
Stockroom	110
Equipment storage	65
Standards library	72
Offices	468
Custodian	25
Blueprinting room	25
Photocopy, telex, computer terminal, stationery	40
Equipment receiving and delivery	40
Conference room	80
Classrooms	108
Lecture hall	101
Building equipment room	95
Kitchenette	20
Air handling unit room	25
Others (entrance, lavatories, corridors, circulation, . . .)	523
Approximate total area	2,387

IV. Other Facilities Related to the Project

The following items will be included in the Project:

a) **Furniture**

The furniture to be supplied will be decided after the preliminary design in Japan of ESTC building.

b) **Heating system**

Hot water radiator type heating system will be installed in every room except for the Standards and Calibration laboratory. Heat source will be centralized regionally for ESTC building, independent of other buildings in RSS.

c) **Air conditioning system**

Air conditioning system will be installed in the following rooms:

Maintenance laboratory
Testing laboratory
Standards and Calibration laboratory
Conference room

The necessary air conditioning in the Standards and Calibration laboratory will be designed to have temperature and humidity control as required by Japanese experts in connection with the supply of the electronic equipment.

d) **Electric power distribution system**

A power distribution system of three phases, four lines, plus an earth line will be installed in the building. The rated voltage will be 220/230 volts single phase, 380/400 volts 3-phase, frequency 50 Hz. RSS will lead the appropriate trunk line into the switchgear of the sub-main switchboard which will be installed in the building under the grant aid. Automatic voltage regulators will be installed in the following rooms:

Maintenance laboratory
Testing laboratory
Standards and Calibration laboratory

Battery operated emergency lighting will also be installed as required.

e) **Water supply**

The appropriate water supply facilities will be installed in the building. RSS will install the necessary and adequate water supply line as far as the established boundary line, and provide a hand hole and a stop-valve at the end. Water tanks will be installed on the roof as required.

f) **Telephone conduit system**

The telephone conduit system will be installed under the grant aid in addition to the telephone sets required.

g) **Earthing**

A proper electric earthing system will be constructed as required by the equipment to be housed in the building, and by the building equipment included in this grant aid. The earthing will be of 10 ohms and 100 ohms in resistance value.

h) **Exterior work**

Exterior work, such as roads, pavements, paths, car park, and others within the established boundaries of the land will be constructed under the grant aid.

i) **Water and electricity for construction**

Water and electricity facilities for use during the construction work will be provided by RSS up to the boundaries of the site. The cost of water and electricity consumed will be borne by the Japanese contractors.

j) **Future expansion**

The structural design of the building will be in such a manner as to allow future expansion in the vertical direction of one more storey.

k) **Miscellaneous items**

Miscellaneous items such as a proper ventilation system, a proper sewage system, lighting, false ceiling, drinking fountains, fire extinguishers and alarms, ... are included in the Project.

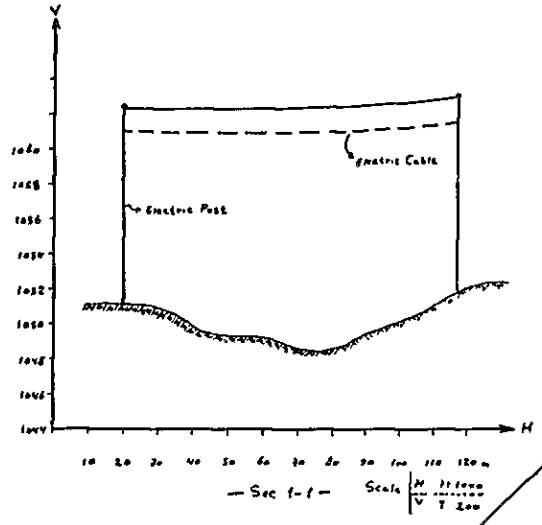
V. Mutual Consultation

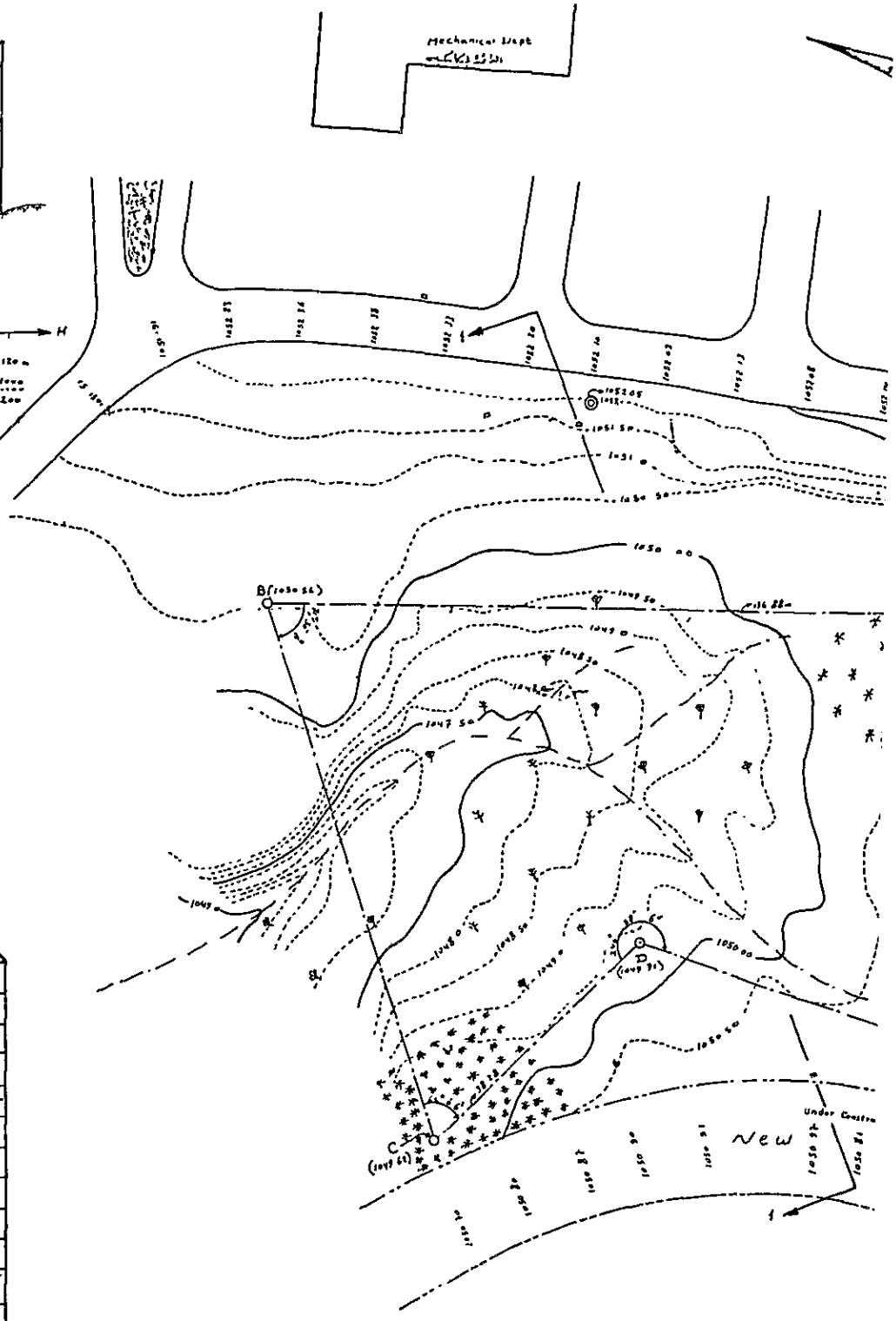
Any matters arising from or in connection with the project will be decided by mutual consultation between the Government of Japan and the Royal Scientific Society.

* Attached: Appendices A and B.

APPENDIX (A)

TOPOGRAPHIC



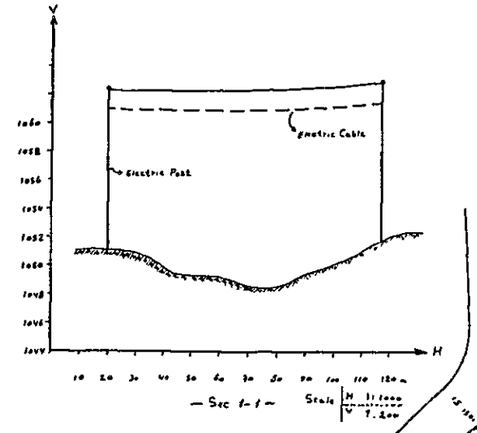


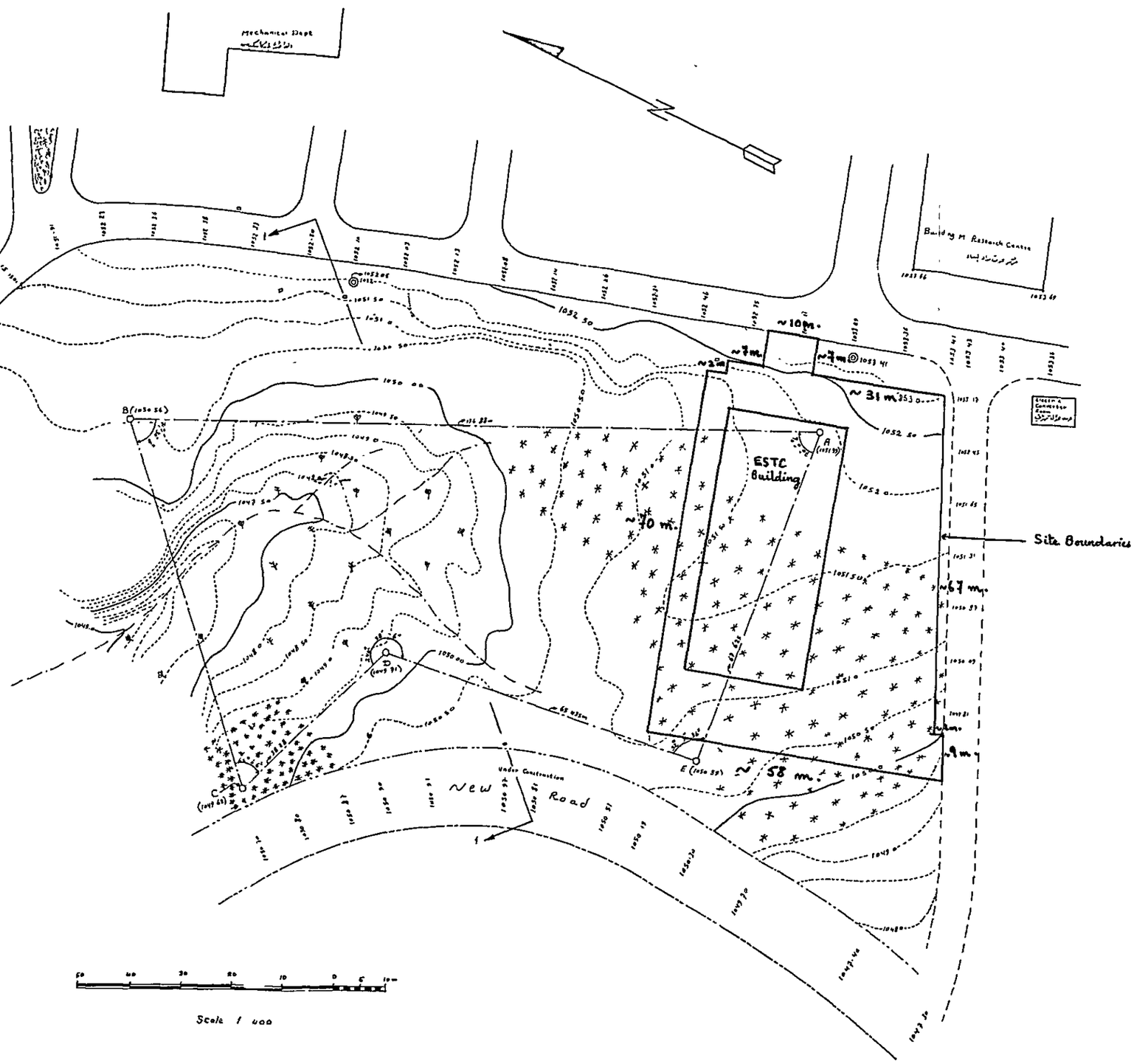
LEGEND	
Name	Symbol
Traverse Point	
Traverse Line	
Referance Point	
Under Construction Road	
High Pressure Electric Post	
Pine Trees (0.5-1 m height)	
Pine Trees (1-2.5 m Height)	
Trees of Different Types	
Olive Trees	
Valley Line	
Base Contour Line	
Main Contour Line	

Scale 1 : 400

APPENDIX (A)

TOPOGRAPHIC PLAN





LEGEND

Name	Symbol
Traverse Point	⊙
Traverse Line	— — —
Reference Point	◎
Under Construction Road	——·——
High Pressure Electric Post	▫
Pine Trees (0.5–1.5 m Height)	✳
Pine Trees (1–2.5 m Height)	✳
Trees of Different Types	✳
Olive Trees	✳
Valley Line	~~~
Base Contour Line	~~~
Main Contour Line	~~~

50 40 30 20 10 0 5 10

Scale 1 400

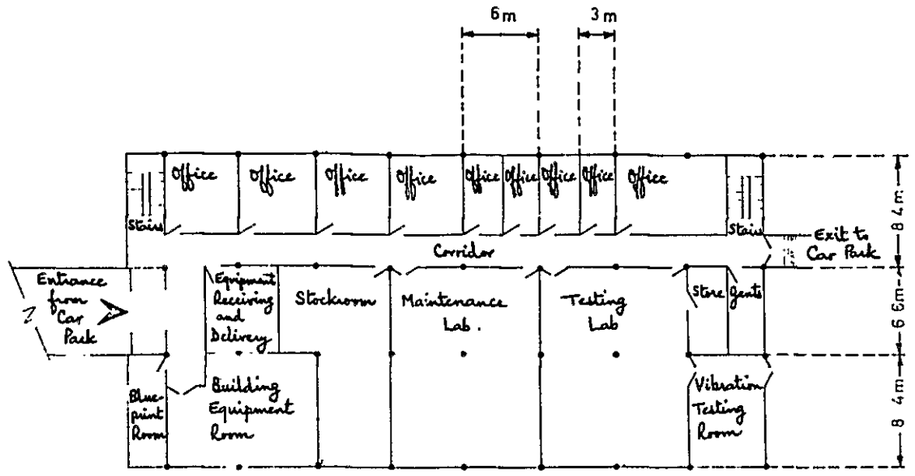
PROJECT TITLE
ELECTRONICS SERVICES CENTER

SHEET TITLE
TOPOGRAPHIC PLAN

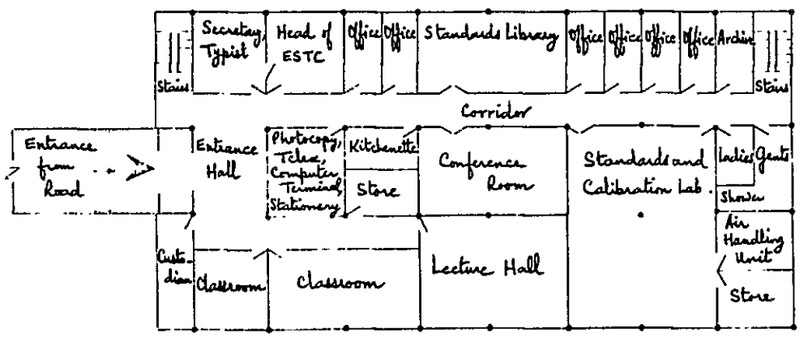
	NAME	DATE	SIGN	
DRAWN				PROJECT
CHECKED				UNITS NO.
APPR				SCALE
ARCH				DRAWING NO. 2
STR				
ELEC				
MEC				

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

APPENDIX (B)



GROUND FLOOR



FIRST FLOOR

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS

TOLERANCES
.X 3 ANGULAR
.XX .1 0 30
.XXX .03

MATERIAL

FINISH

CONTRACT NUMBER

PROG MGT		
PROD ASSUR		
MFG		
ENGR		
CONFIG		
CHECK		
DESIGN APPROVAL	DATE	

RSS ELECTRONICS ENGINEERING
POB 6945, AMMAN, JORDAN

BUILDING OF THE ELECTRONICS SERVICE & TRAINING CENTER.

SIZE	CODE IDENT NO	DRAWING NUMBER	REV
C			

SCALE 1 300 SHEET OF

ESTC BUILDING MAINTENANCE COST

Cost for the physical maintenance of the ESTC building will be made up of the following items:

1) Labor cost of maintenance staff
2) Clearance cost
3) Maintenance cost of building equipment
4) Cost of repair work
5) Cost of electricity, water and heating fuel
6) Miscellaneous

Of the above listed items we will study item 5) in detail.

First we will compute the estimated annual consumption of the three utilities, electricity, water and heating fuel (diesel oil). Then using the unit rates that are now charged in Amman (data supplied by RSS) for the above mentioned we will compute the estimated total cost of these utilities.

Note: As an example of maintenance staffing the placing of one attendant each for electrical and air-conditioning maintenance purposes is a valid arrangement. But as the RSS complex is made up of various other buildings a permanent maintenance staff just for the ESTC building will prove uneconomical.

1. Electricity

a. Assumed Rate of Operation and Annual Consumption

Item	I	II	III	IV	V
Air-conditioning (Cooling)	30	8.5	21	4.5	24,100
Air-conditioning (Std. & Calib. Lab.)	32	24	365 days		280,300
Ventilation	4.15	8.5	21	12	8,900
Heating	3	8.5	21	4	2,140
Water Heaters	33	8.5 x (0.3)	21	12	21,200
Lighting & Others	48	8.5 x (0.6)	21	12	61,700
Laboratory Use	20	24 x (0.6)	365 days		105,120
			Total		503,460

The annual consumption has been integrated with the assumed rates for the conditions from I to IV.

where;

I: Capacity
II: Hours in operation in a day (Operation rate)
III: Days of operation in a month
IV: Months of operation in a year
V: Annual consumption

b. Cost

Unit rate of electricity 1 kilowatt 15 fils (0.015 JD); assumed at 2500 kVA class 503,500 (kW) x 0.015 = 7,552.5 JD

2. Diesel oil (for heating boiler use)

a. Assumed Rate of Operation and Annual Consumption

Assuming that the rate of diesel oil consumption is 63 litres per hour, the load rate is 0.6, the boiler is operated 9 hours per day, 21 days a month, and 4 months annually, the annual consumption of diesel oil will be;

63 ℓ/hr x 9 hrs x 0.6 x 21 days/month x 4 months = 28,000 litres/year

b. Cost

Unit rate of diesel oil: 1 litre 17 fils (0.017 JD)

28,000 x 0.017 = 476 JD

3. Water

a. Assumed Rate of Consumption and Annual Consumption

Assuming that 50 people will daily use the building, one person will consume 60 litres a day, 250 days a year, the total consumption will be;

50 persons x 60 ℓ/person-day x 250 days = 750,000 litres

b. Cost

Unit rate of water: 1 cubic meter 90 fils (0.09 JD)

750 cubic meter x 0.09 = 67.5 JD

SUMMARY

The summary of the annual cost of electricity, diesel oil and water is as follows:

Item	Annual consumption		Cost
Electricity	503,460	Kilowatts	7,550 J.D.
Diesel oil	28,000	Litres	480 J.D.
Water	750	Cubic Meters	70 J.D.
		Total	8,100 J.D.

* Electricity cost does not include basic fixed charge.