GOVERNMENT OF SINGAPORE

DESIGN REPORT

ON

CONSTRUCTION PROJECT OF JAPANESE GARDEN

IN

JURONG TOWN

JANUARY, 1971

PREPARED FOR
OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN
BY
NAKANE'S GARDENING RESEARCH INSTITUTE
KYOTO, JAPAN

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P R E F A C E

Application for technical assistance in the preparation of a master plan for the construction of a Japanese garden was submitted by the Government of Singapore to the Government of Japan in July, 1968. In response to this request, our Government sent an expert on gardening who stayed for about one month, from September, 1968. Later, the Government of Singapore asked our Government to prepare detailed designs for such a garden based upon the master plan completed by the expert.

In consideration of the friendly relations and economic exchanges between the two countries, the Government of Japan decided to undertake the necessary studies, and entrusted the Overseas Technical Cooperation Agency (OTCA) with the execution of these said studies. In addition, OTCA delegated the definite designs for the garden to Nakane's Gardening Research Institute.

This report deals with the outline of the important role this garden is to play as a green area of Jurong, a new industrial city planned by the Government of Singapore.

With adequate attention bestowed upon the significance of the garden and its possible influence upon later city plans, the Institute successfully fulfilled its assignment.

Finally, on behalf of OTCA, I would like to take this opportunity to extend my sincere gratitude to officials of the Government of Singapore, Japanese governmental organizations as well as the Japanese Residents' Association in Singapore for their kind cooperation and assistance.

January, 1971

Keiichi Tatsuke

Director General
Overseas Technical
Cooperation Agency

Letter of Transmittal

Mr. Keiichi Tatsuke

Director General

Overseas Technical Cooperation Agency

Dear Sir:

Transmitted herewith is a report on the definite designs of a Japanese garden prepared under the contract concluded between the Overseas Technical Cooperation Agency (OTCA) and Nakane's Gardening Research Institute on November 16, 1970.

The Japanese Garden Construction Plan is to contract a typical Japanese-style garden in the Jurong industrial area covering approximately 6,000 acres.

The garden with its area of 25 acres mainly comprises a pond of 17,000m^2, stream of 270m^2, path of 24,200m^2, plants of 98,000m^2, 2 Japanese rest houses, 4 bridges and 3 kinds of Japanese summer houses.

The master plan for this work was prepared by Mr. Kinsaku Nakane, who stayed there for about one month from September, 1968, as an expert dispatched by our Government under the Colombo Plan.

Another request for the preparation of detailed designs for that purpose was made by the Government of Singapore to our Government.

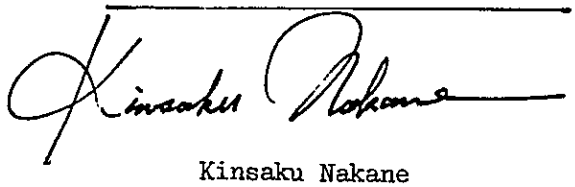
In this report is included the results of the definite studies, specifications, cost estimate, structure calculations sheets of qualities and quantities, formats required for an international tender, drawings, etc.

It is my belief that upon completion of the garden, the facility will further contribute to the promotion of mutual esteem and friendly relations between the two countries.

Finally, on behalf of OTCA, I would like to take this opportunity to extend my sincere gratitude to officials of both governments and related circles concerned for their kind cooperation.

Yours respectfully,

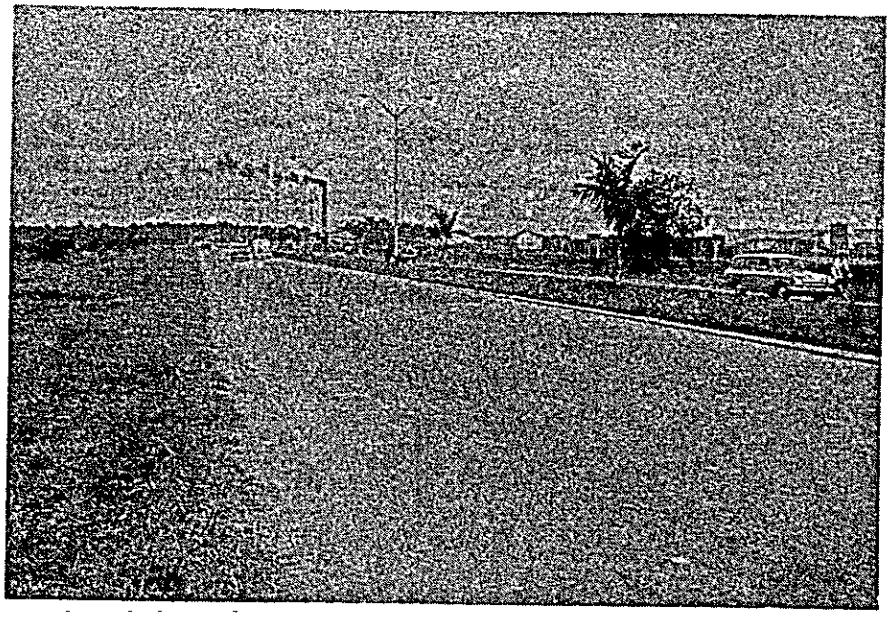
January, 1971



Kinsaku Nakane

Director
Nakane's Gardening
Research Institute

JURONG TOWN



JURONG TOWN

JURONG RIVER

JURONG RIVER

CONTENTS

Chapter I Introduction

1 - 1 Circumstances leading to enforcement plan

Jurong Town is a heavy industrial town which is being built by reclaiming the jungle area along the seashore southwest of the outskirts of Shingapore under the overall development project for the Jurong district worked out anew by the Singapore Government. This industrial town has been so designed as to take a modern shape with a green area that is essential to a modern industrial city to be created in one section of the whole area. A green area is regarded as important specifically in the construction of a city and so it should be included in any city planning. The plan for a green area should be taken up first of all in the rearrangement of a city. It constitutes an important factor in the city planning from the standpoint of the maintenance of environment including the prevention of noises, air pollution and so forth. The effects of this green area are cited hereunder.

i. Physical effects:
   a. Purify the contaminated air and regulate the temperature and humidity in a city.
   b. Prevent fires in the urban district, especially prevent a fire from spreading in a section where many houses are closely built.
   c. Provide the place where people take refuge or render relief to sufferers in case of disasters of various kinds.
   d. Furnish natural decoration for a city.
   e. Adjust the unlimited expansion of the urban districts.

ii. Spiritual effects:
   a. Provide natural recreation and entertainment for city dwellers to get rid of their irritation and fatigue in city life.
   b. Arouse neighborly sentiment toward their land.

A green area with such a mission as mentioned above has been contemplated as a matter of fact in the city planning for Jurong. In the verdant zone projected centering on the Jurong River which runs through the eastern side of Jurong Town are to be built the Chinese garden, Japanese garden and that of tropical plants, respectively. The Singapore Government calls this verdant zone "Jurong Park," and it is thinking of making it not only a resting-place for the employees in the Jurong industrial town, but also an extensive recreational spot for them and the citizens in general of

Singapore as well.

In the beginning of 1968, under this project, the Singapore Government requested the Japanese Government to send a Japanese specialist in gardening under Colombo Plan for the working out of a master plan for the Japanese garden. In response to this request, Kinsaku Nakane of the Osaka University of Arts was dispatched to Singapore, where he stayed for a month from September 19, 1968, during which time he worked out the master plan for the Japanese garden and handed it along with the estimated cost of the project, etc. to Director-General W. S. Woon of the Jurong Town Corporation which is the Development Project Bureau of the Singapore Government before returning home to Japan.

The Jurong Town Corporation was in such a hurry to carry out the project on the basis of the master plan worked out by the specialist, kinsaku Nakane, that, in the beginning of 1969, the corporation reclaimed the site in accordance with the Specialist Nakane's master plan.

In April, 1969, Director-General W. S. Woon of the Jurong Town Corporation came up with a formal request to Specialist Nakane for the enforcement plan necessary for the construction of the Japanese garden and for the supervision over the enforcement of the works and, at the same time, requested the Japanese Embassy in Singapore to send Specialist Nakane and 3 of his staff members under the Colombo Plan.

Specialist Nakane accepted this request formally at the Consultant Nakane's Gardening Institute and set about the preparations for the enforcement plan according to the 4 sections making up the garden under the master plan for the Japanese garden.

In other words, the 4 sections are (1) the garden, (2) the buildings, (3) the bridges and (4) the summer houses. Later, the Singapore Government sent to the Japanese Government a formal written request, under date of March 28, 1970, asking that the enforcement plan for the Japanese garden be worked out and the supervision over the enforcement of the works be performed under the Colombo Plan. In response to this request, Specialist Nakane, at the meeting attended by the officials in charge attached to the Overseas Technical Cooperation Agency (OTCA), Construction Ministry and so forth which was held in the Foreign Ministry on May 26, explained the details of the procedures so far taken, beginning with the working out of the master plan up to that date.

As a result of the review of the contents of the project at a series of conferences which took place afterwards, it was decided that the enforcement

plan for the Japanese garden in Jurong, Singapore, be worked out and the supervision over the enforcement of the works be performed under the contract between the Overseas Technical Cooperation Agency (OTCA) and the Consultant Nakane's Gardening Research Institute.

1 - 2 Aim of enforcement planning service

Since there are no Japanese gardening technicians in the country of Singapore at present, the government there earlier requested for the dispatch of a Japanese gardening specialist for the working out of the master plan. It is also to be noted that in Japan there are only an extremely limited number of technicians who are able to design and build gardens of the genuinely Japanese style.

Then the designer set forth to the Singapore Government the condition that the work on the buildings in the Japanese garden should be performed by a Japanese constructor. It is because no appropriate works can be performed by anyone else but a Japanese constructor as the buildings in the garden are to be of the genuinsly Japanese style in keeping with that of the Japanese garden.

It is needless to mention that the enforcement plan, the specifications and the other related documents with regard to such a specific project as the building of a Japanese garden should be prepared by a specialist who is a special technician. Accordingly, he is also to prepare the incidental designs, a written bid and so on in addition to the plans.

Because of the special character involved in this particular project, it has been decided that the cost of the designing and supervision over the enforcement of the works be borne by the Japanese Government.

1 - 3 Scope of enforcement planning service

The enforcement plan for the Japanese garden in Jurong is to work out the detailing, and prepare bidding documents and others as to the structures. The structures and incidental facilities involved are as follows.

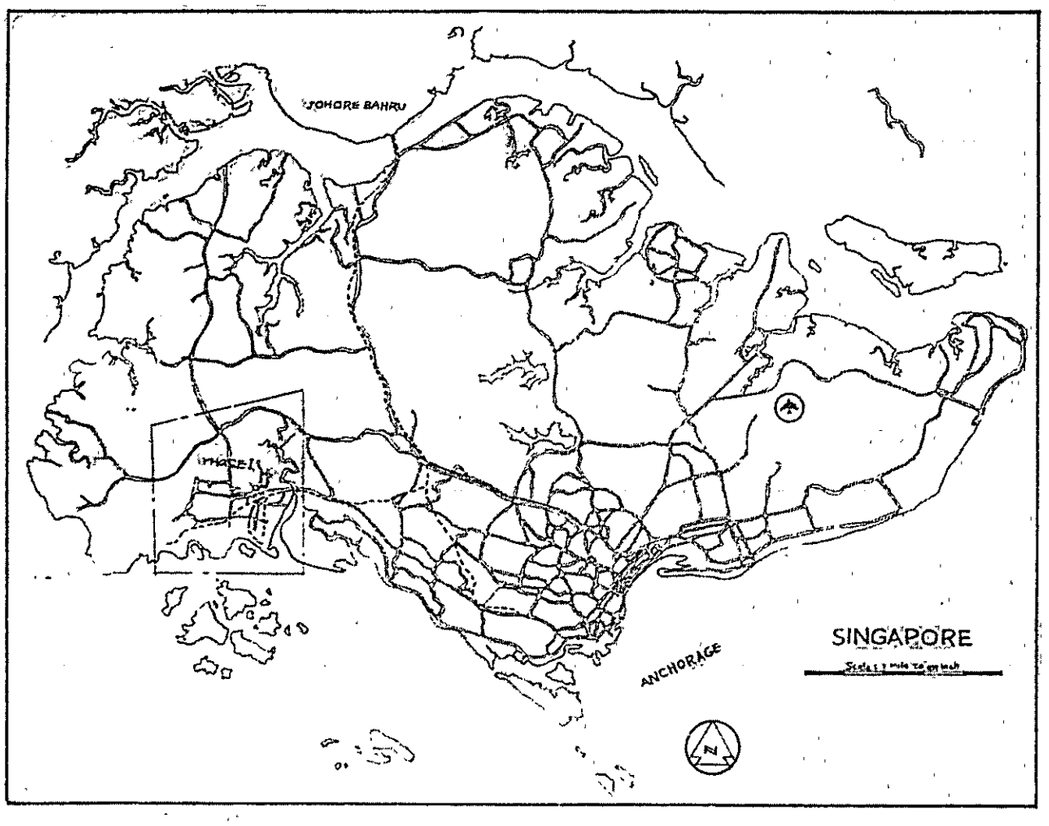
(1) Garden: Area: 25 acres (app. 30,000 tsubo)

i. Allotment of garden lot:
Arrangement and composition will be made over the entire area of 25 acres.

ii. Pond:
App. 17,000m^2. To be divided into a large pond and a small one.

iii. Stream:
App. 270^m. To be divided into 2, one connecting the large pond with the small one and the other flowing from the large pond into the Jurong River.

Fig 1 PLAN OF POSITION OF JURONG INDUSTRIAL TOWN, SINGARORE



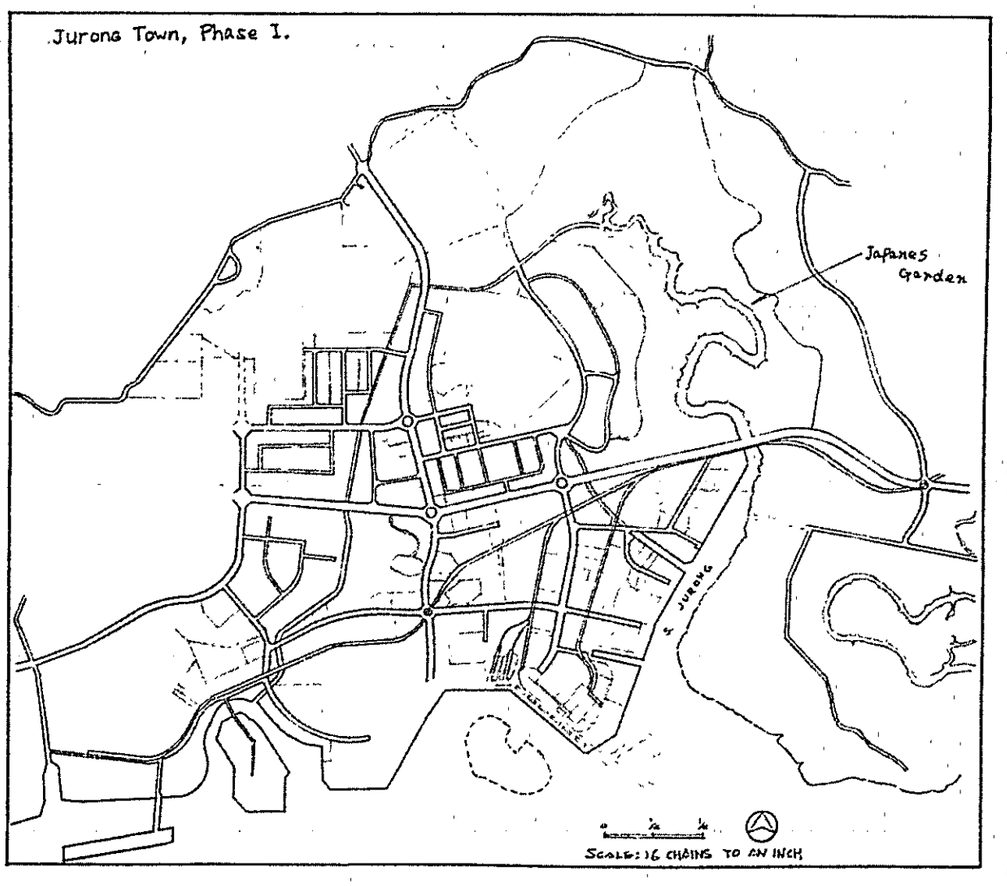


Fig. 2 JURONG TOWN.

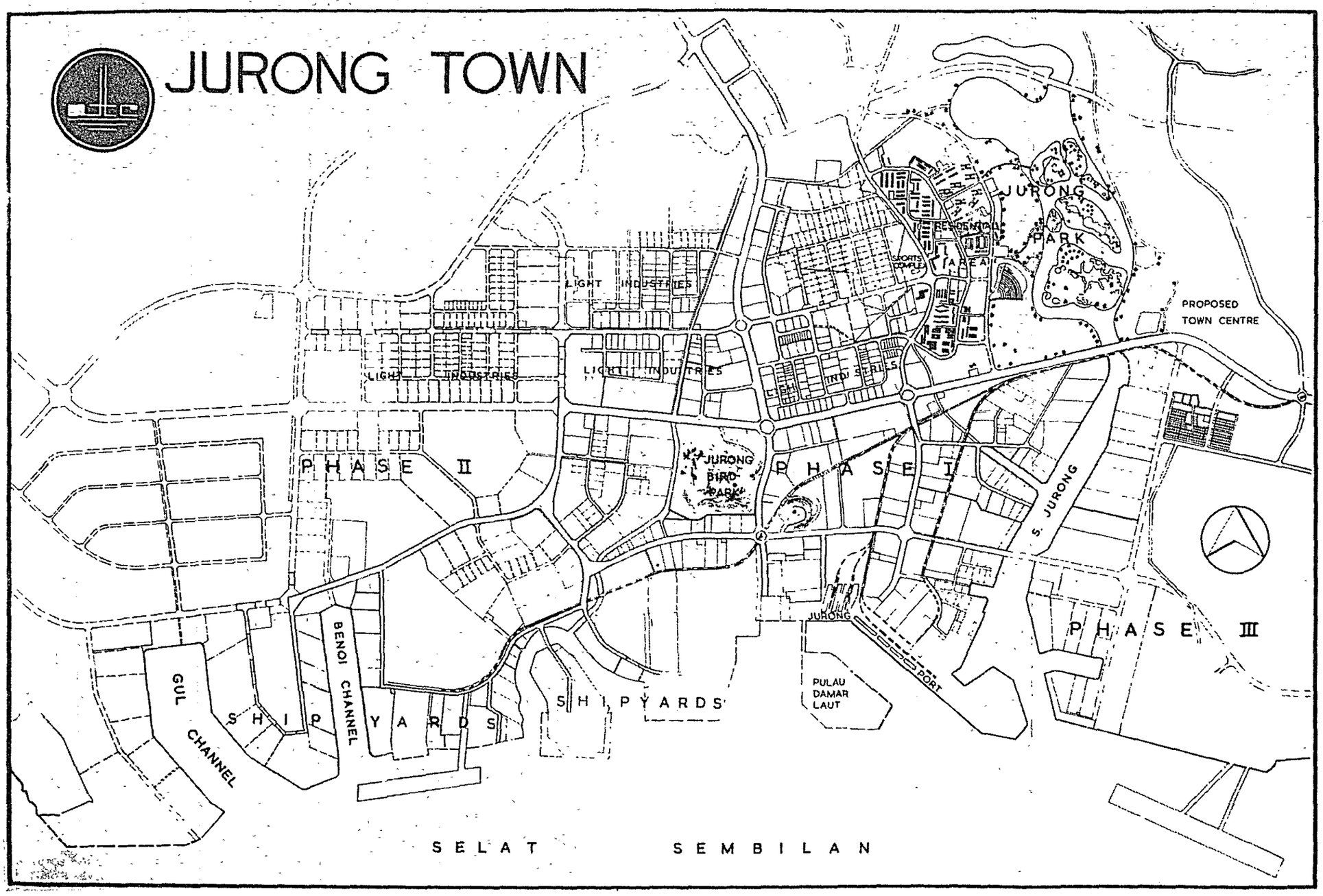


Fig. 3 PUBLIC PARK IN JURONG

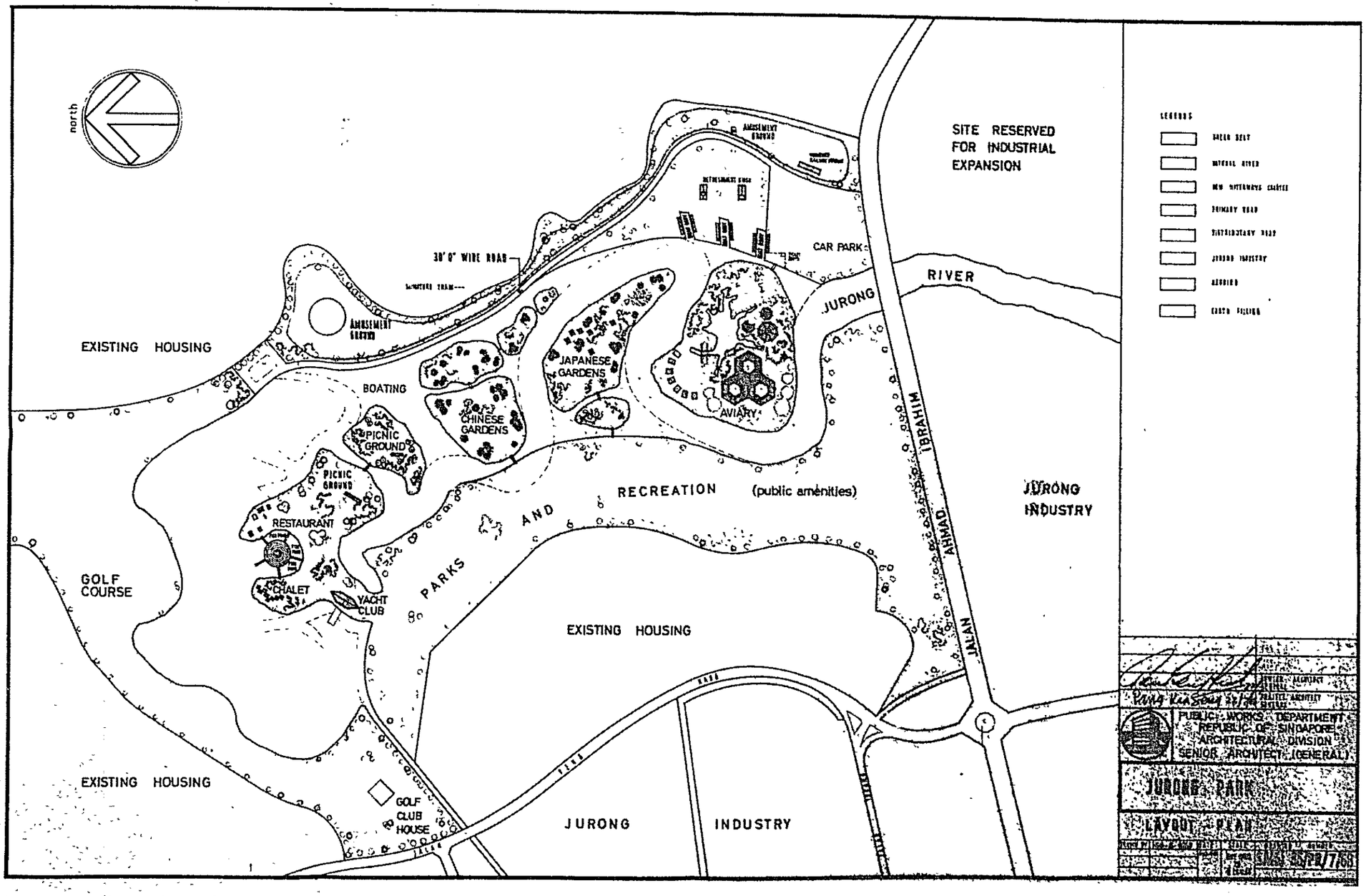


Fig. 4 JAPANESE GARDEN PLAN (MASTER PLAN)

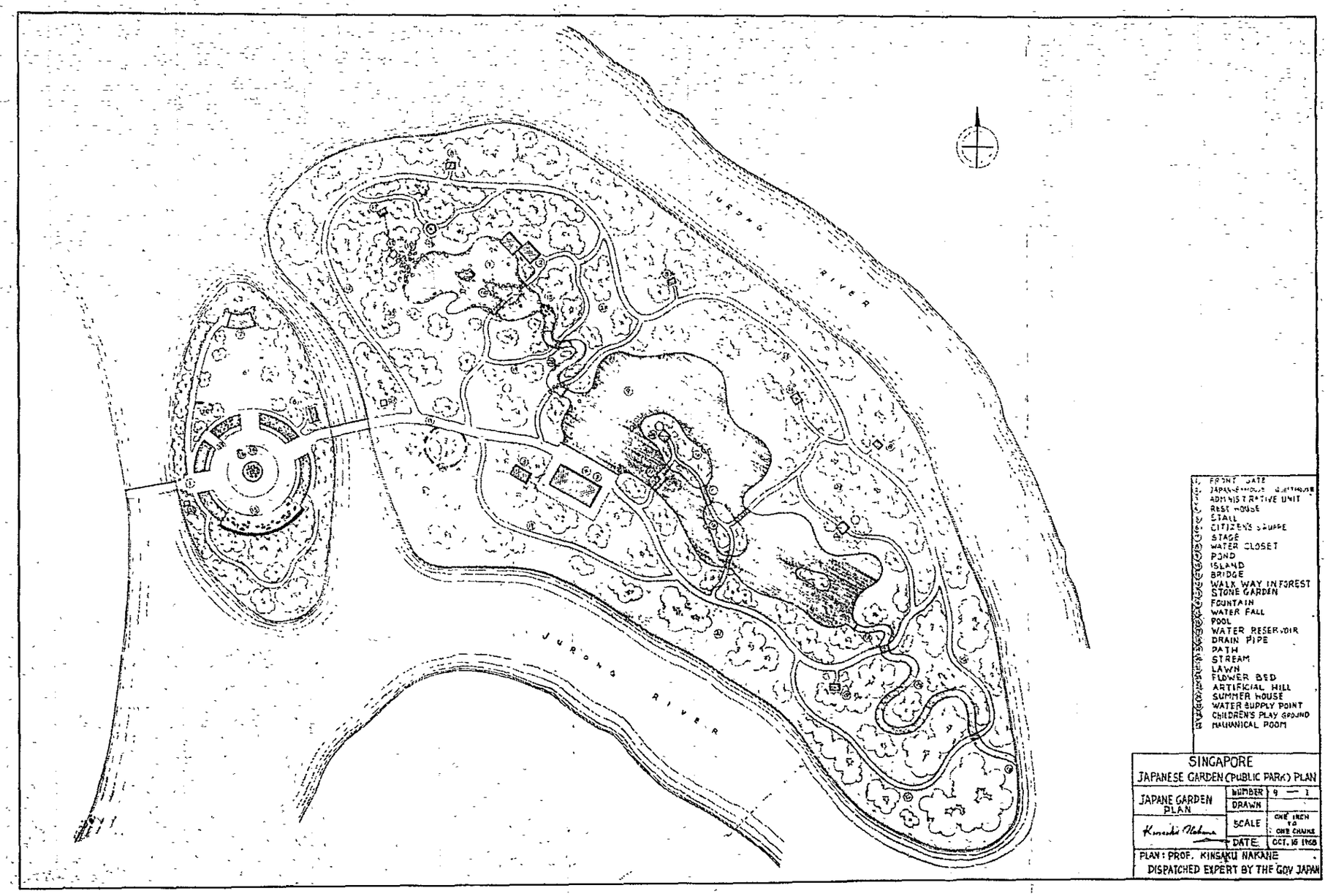
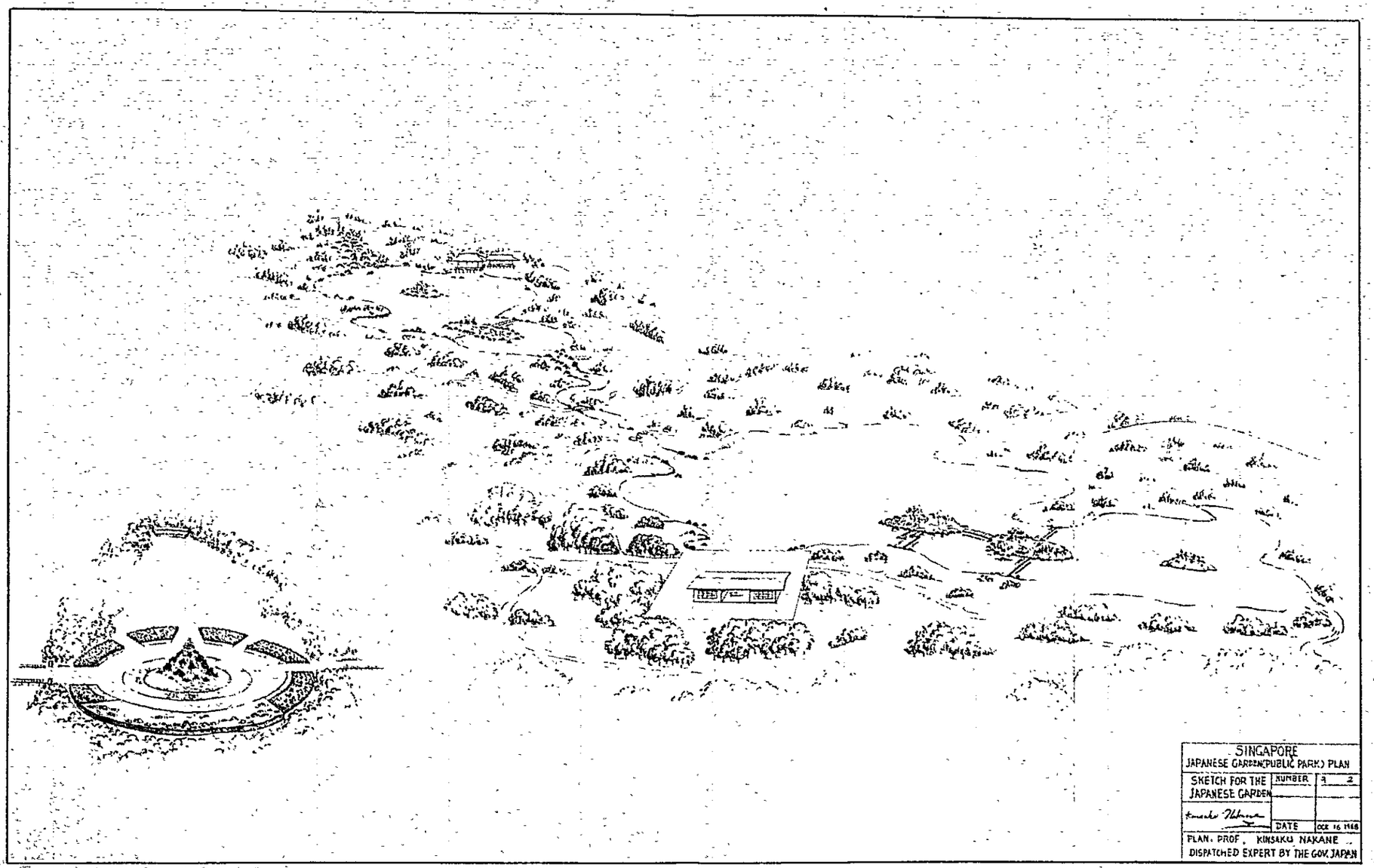


Fig. 5 SKETCH FOR JAPANESE GARDEN (MASTER PLAN)



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iii. Stream:
App. 270^m. To be divided into 2, one connecting the large pond with the small one and the other flowing from the large pond into the Jurong River.

iv. Artificial hill:

App. 270,000m^3. To be divided into 3 hills.

v. Waterfall:

To be built at one corner of the small pond. Height: 6^m

vi. Paths:

Main path: App. 15,700m^2 Narrow paths: 7,500m^2 Open space: 1,000m^2

vii. Planting:

To be planted in an area of 98,000m^2

To be classified into tall trees, medium-high trees and shrubs.

(2) Buildings: 2 buildings of the Japanese style.

i. Guest House: 1 350.00m^2 (100 tsubo)

ii. Rest House: 1 608.00m^2 (200 tsubo)

(3) Bridges: 4

i. Arched bridge: Length: 12.00^m Width: 2.5^m (No.1)

ii. Semicircular bridge: Length: 12.50^m Width: 2.5^m (No.2)

iii. Wild-geese-flying-style bridge:
Length: 22.00^m Width: 2.5^m (No.3)

iv. Arched bridge: Length: 8.00^m Width: 2.2^m (No.4)

(4) Summer houses: 3 types 4

A and B Houses: Area: 12.96m^2 Height of the eaves: 2.55^m

C House: Area: 19.44m^2 Height of the eaves: 2.45^m

D House: Area: 19.62m^2 Height of the eaves: 2.60^m

1 - 4 Process of enforcement plan

(1) Survey for the sake of enforcement plan:

Professor Kinsaku Nakane already surveyed the site when he worked out the master plan while staying in Singapore for a month from September 19, 1968 under the Colombo Plan.

(2) Master plan:

Professor Kinsaku Nakane worked out the master plan at the site and submitted it to the Singapore Government.

(3) Current situation of Jurong Town:

The Jurong industrial area subject to the overall development project is 6,000 acres in total area, and the number of enterpises brought in from other countries up until the end of March, 1967

totalled 73 firms, whose total amout of fixed capital invested stood at 182,000,000 Singapore dollars and whose employees numbered about 7,000 persons (as of 1966). The development project for the industrial district has been going on steadily and the construction site of the Japanese garden has already been reclaimed.

(4) Plan of constructing Japanese garden in Jurong:
Jurong Town has been built by the Singapore Government as an industrial town under the overall development project, but it is not well just to build factories and plants alone, so the district is also under the plan of its providing cultural facilities as a recreational place for both the employees in the Jurong district and the citizens of Singapore. Accordingly, the construction of a Japanese garden is required at any cost, also for the purpose of introducing Japanese culture abroad.

(5) Scale of plan:
The construction of the Japanese garden is to be carried out by reclaiming the middle shoals located near the mouth of the Jurong River and making them into islands on one of which the garden is to be built. Its area is 25 acres (30,000 tsubo).
The garden will be made up of 2 ponds, large and small, a stream connecting these 2 ponds, waterways coming into and going out of the ponds, 3 artificial hills, waterfall, rock garden and so on. Close to the 2 ponds will be built the guest house and the rest house to be used by the citizons as resting-places, and 4 summer houses be set up on the hills and island. Moreover, bridges will be constructed between the island and the border of the ponds so people will be able to cross over the ponds. The garden is to be one on a large scale in the form of what is called the "tsukiyama-rinsen-kaiyushiki" (a sort of landscape garden which one can enjoy seeing by walking about). From the point of view of its vast area and a great number of people expected to visit it, it is to have a number of paths as we have in a park. The garden is to be constructed according to the method which is employed for a purely Japanese style garden. The same applies to the buildings, bridges and summer houses.

(6) Detailing:
On the basis of the local survey conducted and the master plan worked out in the year of 1968, the detailing was worked out for each of

those items stated in 1 - 3 "Scope of enforcement planning service," that is, the garden, buildings, bridges and summer houses. The process of this enforcement planning service is shown in the Table attached herewith (Table - 1)

1 - 5 List of drawings and other documents completed:

(1) Enforcement drawings:

i. Garden

(a) Plans (1/800 - 1/200)	9	pieces
(b) Elevations	13	"
(c) Structural figures (1/50 - 1/10)	41	"
(d) Planting figures (1/500 - 1/200)	2	"

ii. Buildings:

(a) Plans (1/100 - 1/50)	2	"
(b) Elevations (1/100 - 1/50)	2	"
(c) Structural figures (1/30 - 1/2)	41	"

iii. Bridges:

(a) Plans (1/50)	4	"
(b) Elevations (1/50)	4	"
(c) Structural figures (1/20 - 1/5)	16	"

iv. Summer houses:

(a) Plans (1/50)	1	"
(b) Elevations (1/50)	1	"
(c) Structural figures (1/20 - 1/10)	1	"
Total	133	"

(2) Documents required for bidding:

They consist of the following.

i. Instructions to bidders

ii. Written bid

iii. Written agreement on contract

iv. Provisions of contract

v. Specifications

vi. Detailed statement of quantity (Table of quantity)

vii. Table of prices (Statement of estimate)

viii. Statement of structural factors of safety computed (Structural calculation)

ix. Drawings

(3) Instructions to bidders:

The instructions to bidders contain the instructions and attention to be paid concerning the procedures for bidding.

i. Attention to be paid when the bidding form is filled out
ii. Submit program for enforcement of works
iii. Submit guaranty for bidding
iv. Submit data concerning foreign currency involved
v. Handle documents as confidential
vi. Attention to be paid when substitute proposal is submitted
vii. The expenses spent by the contractor for bidding will not be reimbursed
viii. How to submit the written bid
ix. Retraction of bid
x. Return of documents

Chapter 2 Designs

2 - 1 Detailing

(1) Design for garden:

i. Allotment of lot:

The arrangement and composition of the ponds, artificial hills, streams, rock garden, islands, paths, etc. will be made according to the drawing in the site of approximately 25 acres. The allotment of the lot will be made by calculating the topographical features of ups and downs of the entire area.

ii. Ponds:

We shall have 2 ponds, large and small. According to the plans, respectively, their area and depth will be computed. The bottom of the pond each will be made into 2 tiers, and the border between its deep part and shallow part will be in the form of declivity. The bottom of the ponds will be reinforced with clay, and its surface be coated with mortar in the thickness of 3cm for the prevention of water from getting turbid. Both the upper and lower ponds will have beach, which is to be covered with round stones measuring 10^{cm} to 15^{cm} each.

iii. The levee of the ponds and stone arrangement:

The bank of the ponds will be finished with ferro-concrete walling for the prevention of earth and sand from collapse. The top of this ferro-concrete walling will be chamfered in order to give soft feeling. The stone arragement in the ponds will be made after the coating of its bottom with mortar. At the key points of the watersides of both the ponds and islands will be put up imitation wooden stakes of concrete in a proper order to hide their parts a little above the surface of water from public view.

iv. Waterfall:

The height of the waterfall will be 6.00^{m} from the surface of the pond and set up on the side of the artificial hill facing the small pond on the upper side. At the waterfall will be made stone arrangement, and for this will be used mainly the garden stones produced in Japan. The water will be supplied here by the works to be performed separately.

v. Artificial hills:

There will be 3 hills, large and small. The hills will have ups and downs for the elimination of monotony. Their surface will be turfed.

vi. Streams:

The streams will be set up at 2 places. One of them will connect the large pond with the small one. The stone arrangement will be so made as is seen in the natural mountain stream. The other stream will be concurrently used as the drainage ditch. At the outlet of the pond will be set up a weir, which is to determine the water-level. The bottom of the streams will be reinforced with clay and its surface be coated with mortar in the thickness of 3^{cm} for the prevention of water from getting turbid.

vii. Islands:

4 islands will be built in the large pond and 2 in the small one. Bridges will be constructed between these islands.

viii. Rock garden:

The rock garden will be set up close to the entrance to the Japanese garden. A small artificial mountain will be built. The garden will be what is caled the "kare-senzui" (Dry landscape) garden in which the waterfall, mountain streams, etc. are to be built.

ix. Paths and open space for resting:

The paths will be so built that the visitors can go round the garden by the main path and walk this way and that inside the garden by narrow paths. The open space will be made up in part of the ponds, streams and so forth.

5^{m} or over	path: $2,545^{m}$	Area:	$15,784m^{2}$
3^{m}	path: $1,895^{m}$	Area:	$5,685m^{2}$
2^{m}	path: 978^{m}	Area:	$1,956m^{2}$
Open space:	$1,000m^{2}$		

Path-bridges will be constructed where the paths cross over the streams. There will be 4 such bridges. All of them will be built of ferro-concrete.

Effective Width	Length of Bridge
5.400m	5.000m
2.500	5.000
1.500	5.000
1.620	4.000

Drainage will be the path-drainage, with L-type ditches to be built. Draining system will be shown in the drawing. Drainage of the pond water will be shown in the detail drawing of the ponds.

x. Planting:

The trees will be divided into tall trees (large and small), medium-high trees and shrubs. The ground cover will be made of turf. The trees will be arranged as shown in the drawing of planting.

Estimated number of trees are;

Tall trees (large)	1,111 pieces
" (small)	1,400 "
Medium-high trees	10,000 "
Shrubs	100,000 "

All of the trees will be chosen from among those which are produced locally. However, only those which match the view of the Japanese garden will be selected.

(2) Designs for buildings:

i. Guest House:

Total floorage: 350.00m^2 (not including the balcony)
Height of highest eaves: 5,200mm
Height of highest portion: 7,250mm (To the top of the finial)
Structure: Iron-framed, single-storied
External finish: Pillars and beams, Marine-paint, rough-surfacing finish.
Outside wall: To be coated with mortar, spraying the wall with vinyl-paint
Roof: Shingle-roofed
Separate works: Works on electricity, watersupply and drainage and air-conditioning

ii. Rest House:

Total floorage: 608.00m^2 (not including the corridor)

Height of highest eaves: 3,600mm

Height of highest portion: 5,750mm (To the top of the tile)

Structure: Light-weight iron-framed, single-storied

External finish: Pillars and beams, oil-paint and rough-surfacing finish

Ourside wall: Mortar-coated and rough-surfacing finish, to be coated with vinyl paint

Roof: Oriental metal (B-rib type)

Separate works: Works on electricity, watersupply and drainage

(3) Design for bridges:

Scale: a. Arched bridge: Length: 12.00m Width: 2.5m

b. Semicircular bridge: Length: 12.50m Width: 2.5m

c. Wild-geese-flying style bridge: Length: 22.00m Width: 2.5m

d. Arched bridge: Length: 8.00m Width: 2.2m

Structure: Foundation and abutment Ferro-concrete. Cobble-stones will also be used for the foundation.

Bridgetruss: Iron-framed

Floor-slab: Ferro-concrete

"GIBOSHI" (Ornamental tops of posts in bridge railings): To be brass-cast and its surface will be plated with bronze.

Bridge-pier: The submerged portion of the pier will be coated with water-proof mortar up to 100mm from the surface of water, followed by the scrubbed finish of coarse sand.

Floor-slab: The top and side of the concrete foundation will be subject to scrubbed finish of coarse sand (or average gravel) mortar, and its bottom be vinyl-painted twice.

Iron parts: To be finished with oil-painting (rust-resisting painting: twice, and intervening and finish painting: 3 times)

(4) Design for summer houses:

3 types. 4 houses: Square 2, Oblong 1 and Round 1

Structure: Iron-framed

2 - 2 Matters heeded in the working out of the detailing:

Special attention was paid to the following matters in the working out of the enforcement plan:

a. Not involving anything that indicates something of the Western style as the Singapore Government desired the garden to be one of the purely Japanese style from the very beginning when the master plan was worked out.

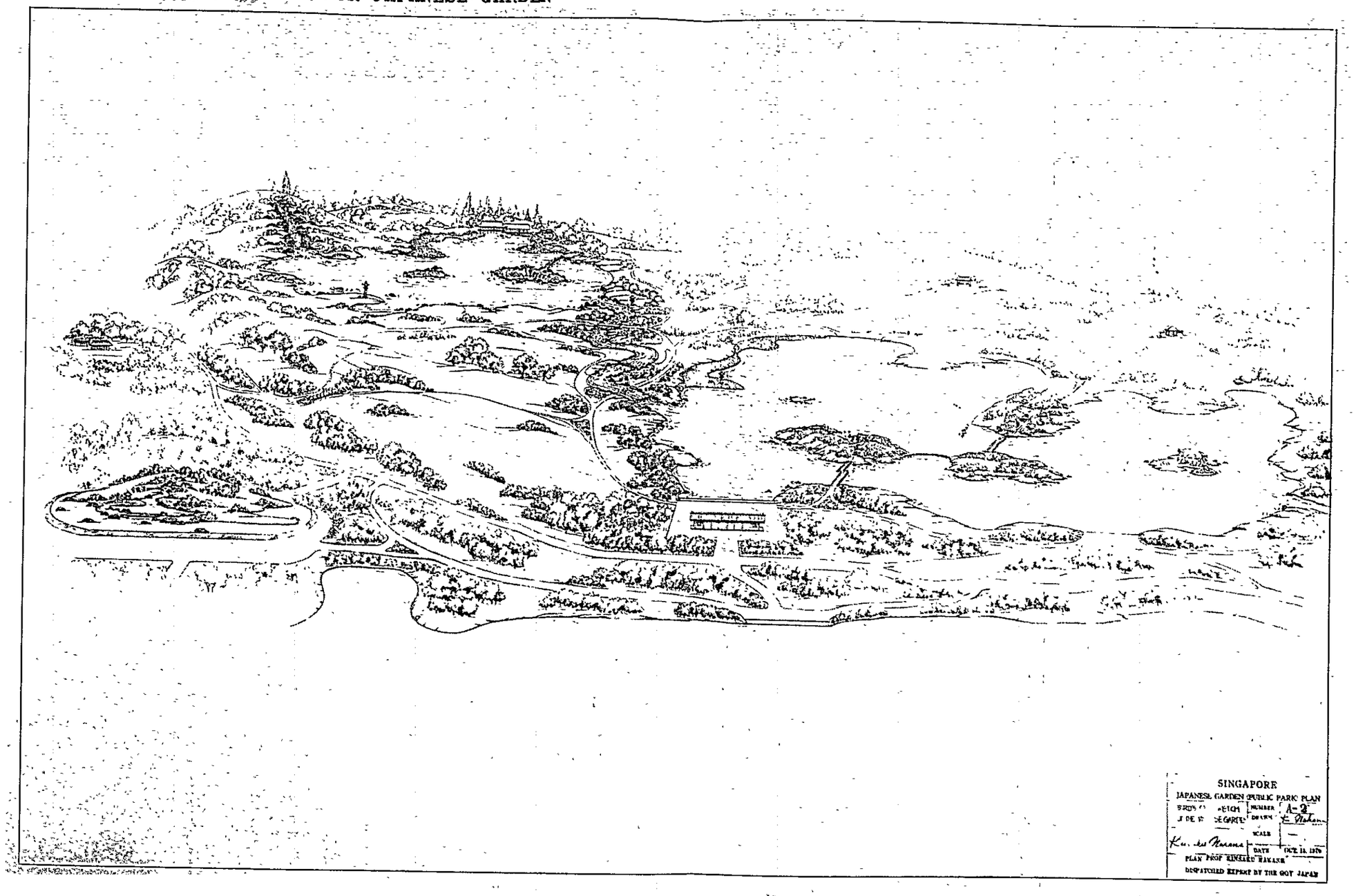
b. That the Singapore Government is to bear all the cost except that to be paid under the Colombo Plan.
It seems that the invitation to bids for the buildings, bridges and summer houses will be issued to the Japanese construction firms in Singapore and that the works on the garden itself will be performed under the direct management of the Singapore Government.

c. That the works will be carried out safely, inexpensively and in a brief period of time, and the administraion and operation of the garden after the completion of the works be conducted in an appropriate manner.

d. Adopting as many locally-produced materials as possible in the designing.

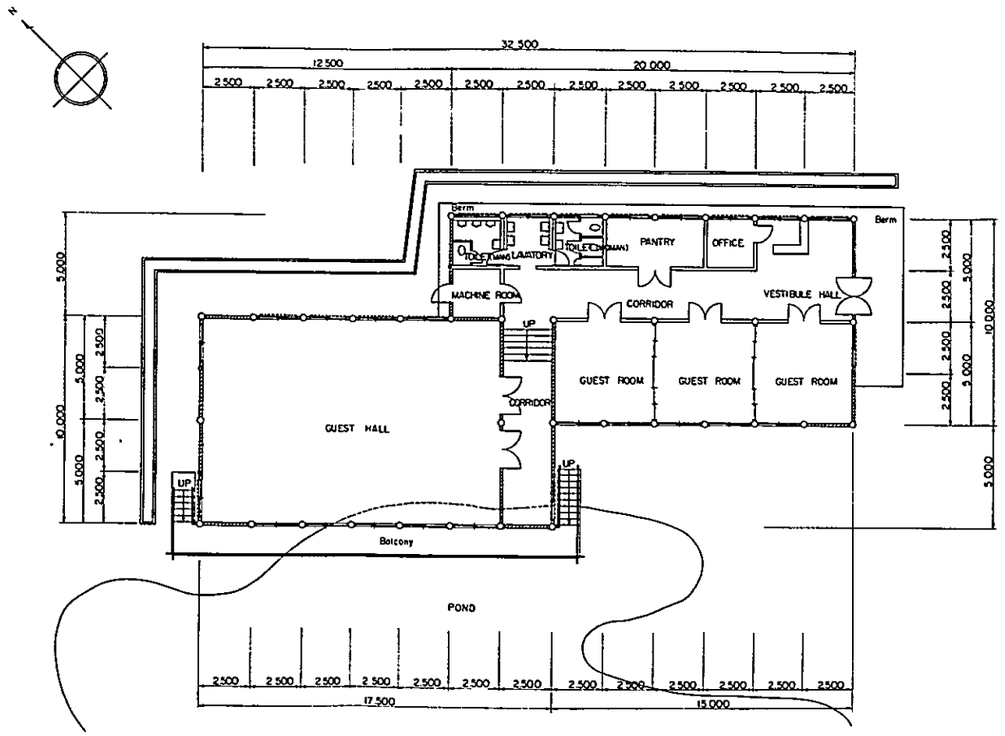
Fig. 6 JAPANESE GARDEN PLAN

Fig. 7 SKETCH FOR JAPANESE GARDEN



SINGAPORE
JAPANESE GARDEN PUBLIC PARK PLAN
NUMBER A-2
SCALE —
DATE OCT. 18, 1970
PLAN PROF KINJIRO WAKAMI
DISPATCHED EXPERT BY THE GOV JAPAN

Fig. 8 GUEST HOUSE PLAN

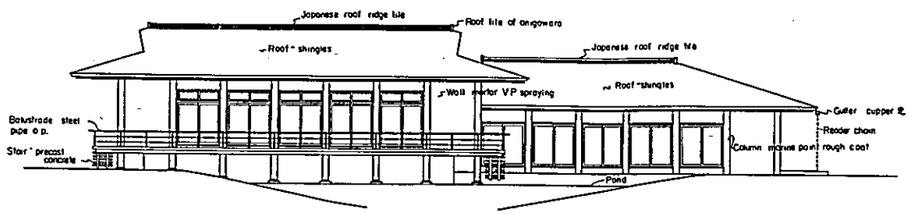


PLAN

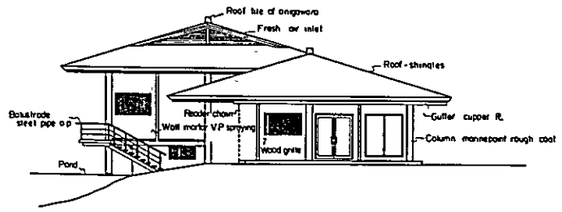
Concrete wall
Concrete block wall

SINGAPORE		
JAPANESE GARDEN (PUBLIC PARK) PLAN		
GUEST HOUS PLAN	NUMBER	B-1
	DRAWN	
Kinsaku Nakane	SCALE	1/100 mm
	DATE	OCT 15 1970
PLAN PROF KINSAKU NAKANE DISPATCHED EXPERT BY THE GOV JAPAN		

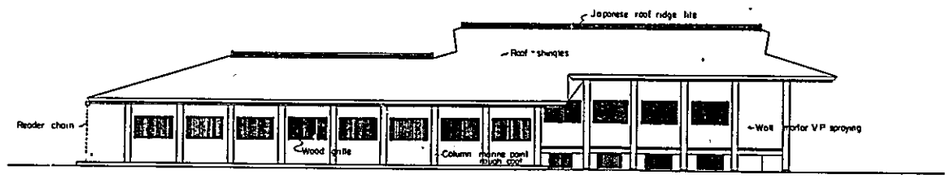
Fig. 9 GUEST HOUSE ELEVATION



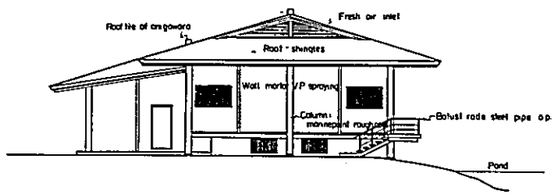
SOUTH SIDE ELEVATION



EAST SIDE ELEVATION



NORTH SIDE ELEVATION



WEST SIDE ELEVATION

SINGAPORE JAPANESE GARDEN (PUBLIC PARK) PLAN		
GUEST HOUS ELEVATION	NUMBER	B-2
	DRAWN	Miura Natsu
Kinsaku Nakane	SCALE	1/100 mm
	DATE	OCT 15, 1970
PLAN PROF KINSAKU NAKANE DISPATCHED EXPERT BY THE GOV JAPAN		

Fig. 10 REST HOUSE PLAN

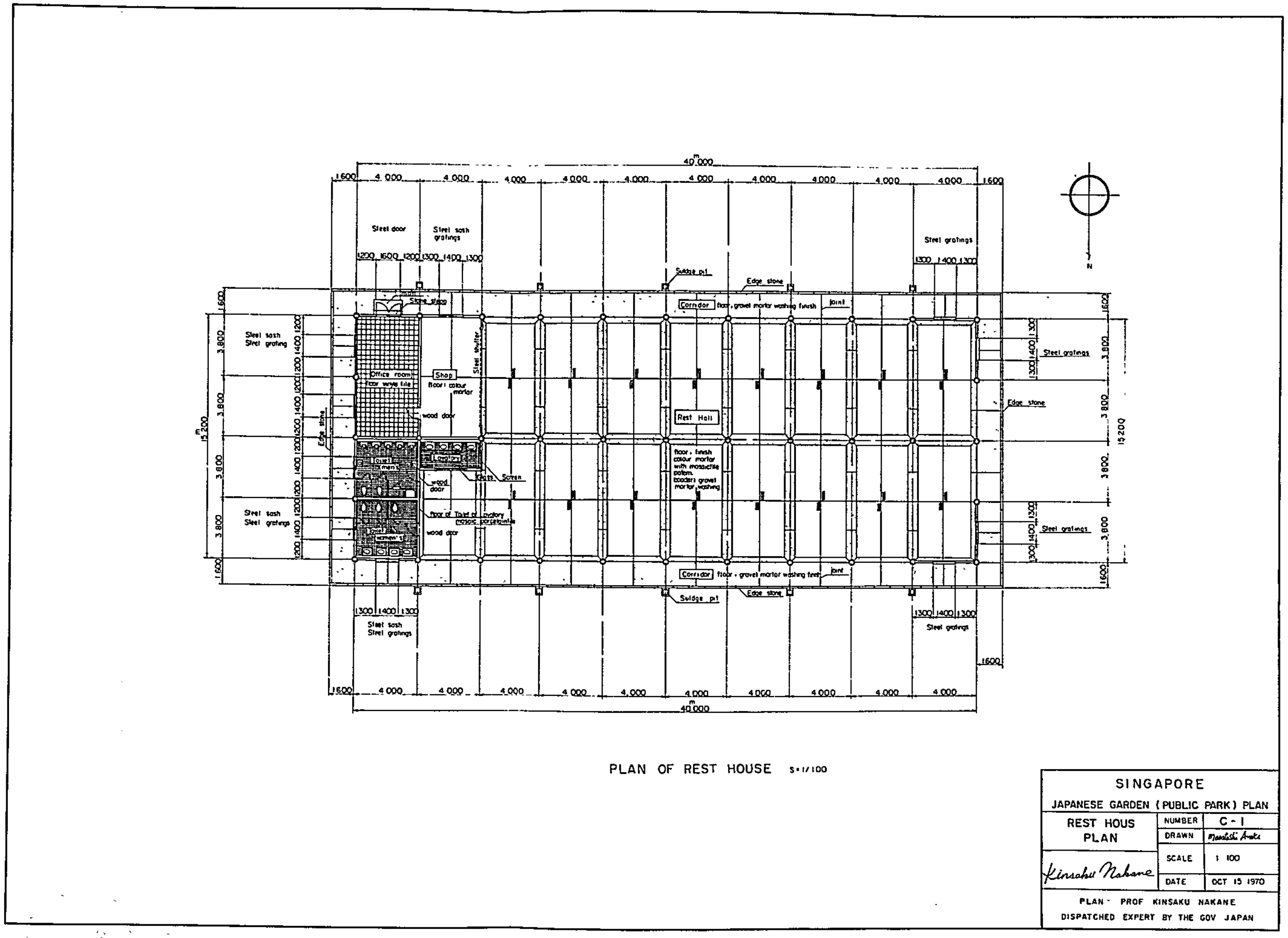
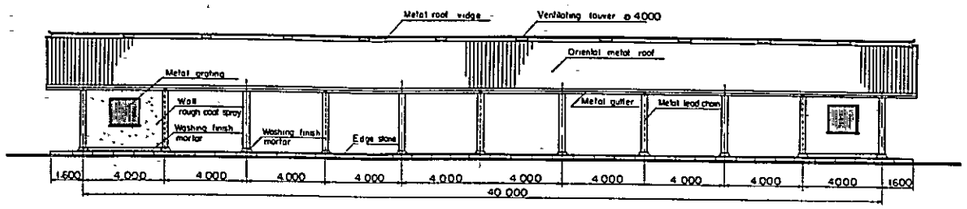
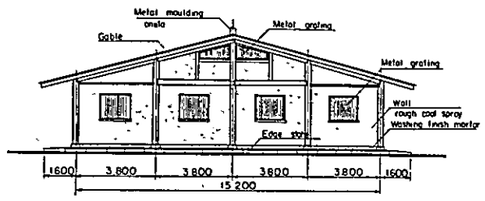


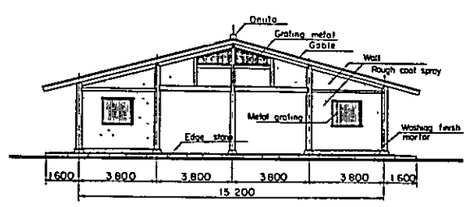
Fig. 1.1 REST HOUSE ELEVATION



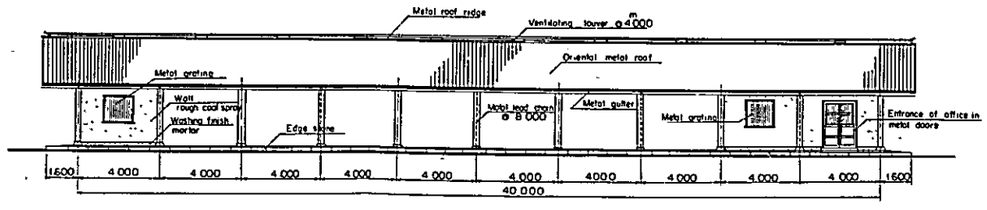
NORTH SIDE ELEVATION S=1/100



EAST SIDE ELEVATION S=1/100



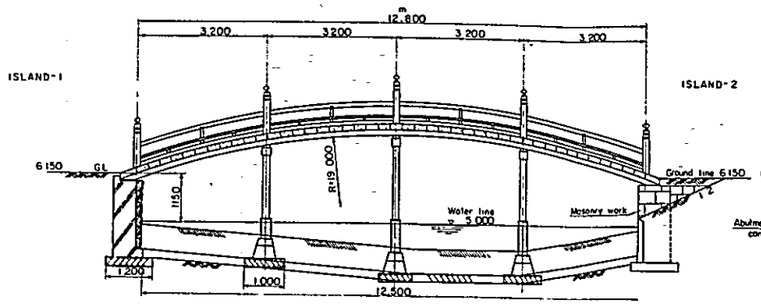
WEST SIDE ELEVATION S=100



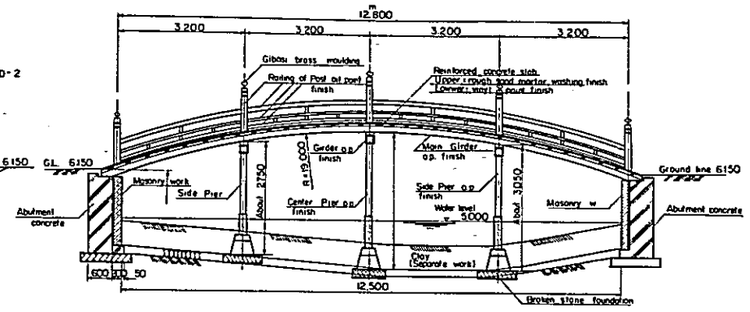
SOUTH SIDE ELEVATION S=1/100

SINGAPORE		
JAPANESE GARDEN (PUBLIC PARK) PLAN		
REST HOUS ELEVATION	NUMBER	C-2
	DRAWN	Yasutoshi Araki
Kinsaku Nakane	SCALE	1 100
	DATE	OCT 15 1970
PLAN: PROF. KINSAKU NAKANE DISPATCHED EXPERT BY THE GOV JAPAN		

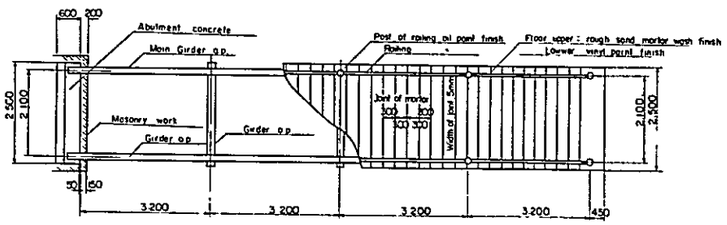
Fig. 12 SEMICIRCULAR BRIDGE



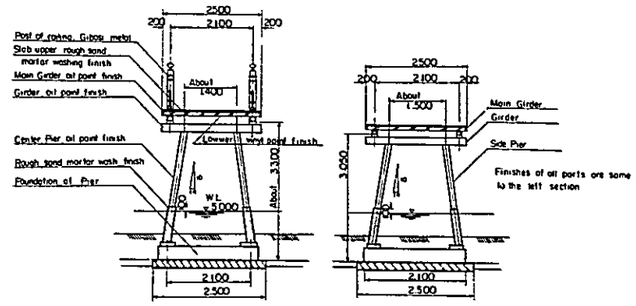
ELEVATION S=1/50



SECTION S=1/50 o.p mean oil painting finish

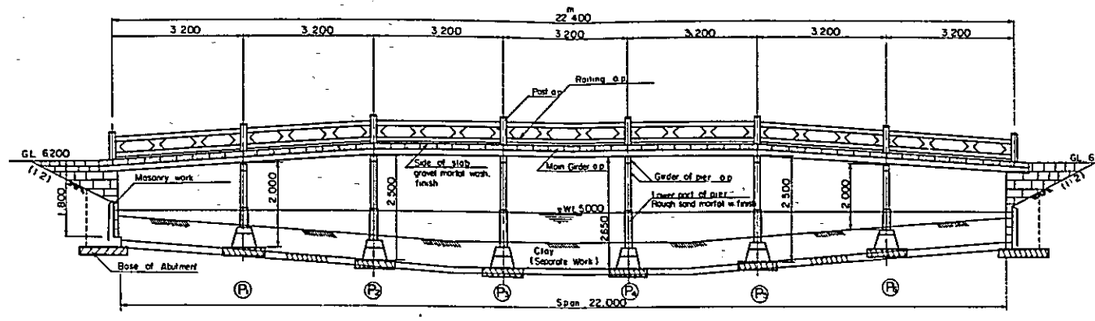


PLAN S=1/50

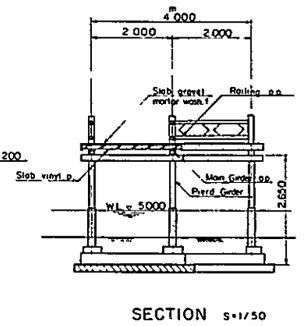


SINGAPORE		
JAPANESE GARDEN (PUBLIC PARK) PLAN		
BRIDGE NO. 2 PLAN, ELEVATION, SECTION	NUMBER	D-6
	DRAWN	Syojiro Kitamura
Kinsaku Nakane	SCALE	1/50
	DATE	OCT. 15 1970
PLAN: PROF. KINSAKU NAKANE DISPATCHED EXPERT BY THE GOV JAPAN		

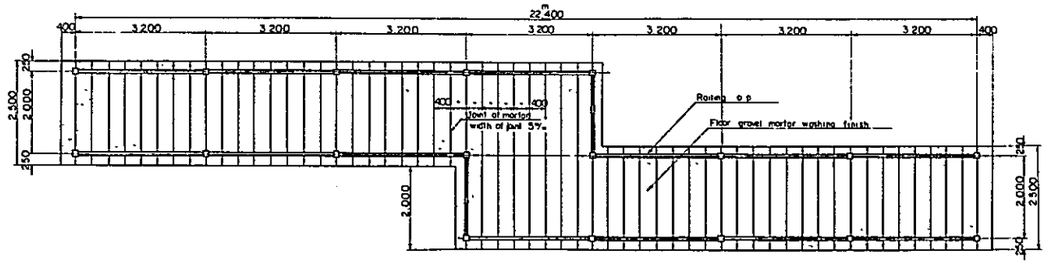
Fig. 13 WILD-GEESE-FLYING-STYLE BRIDGE



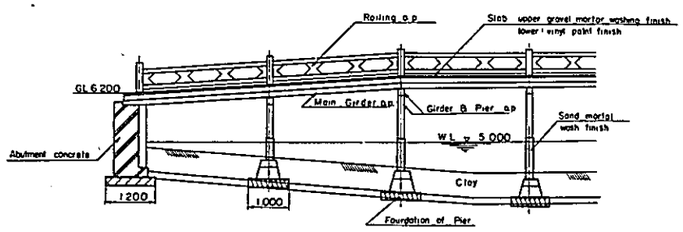
ELEVATION S=1/50



SECTION S=1/50



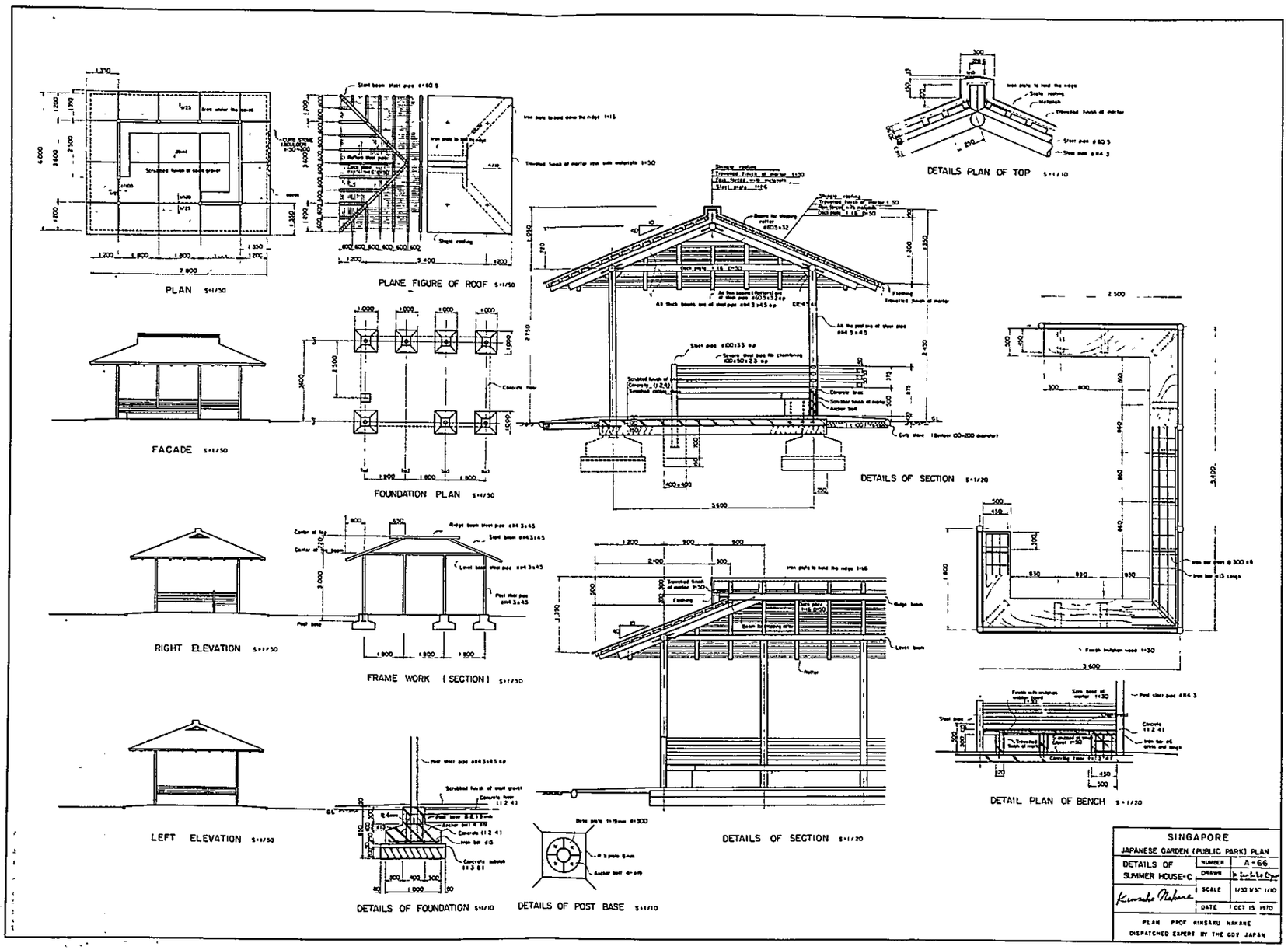
PLAN S=1/50



SECTION S=1/50

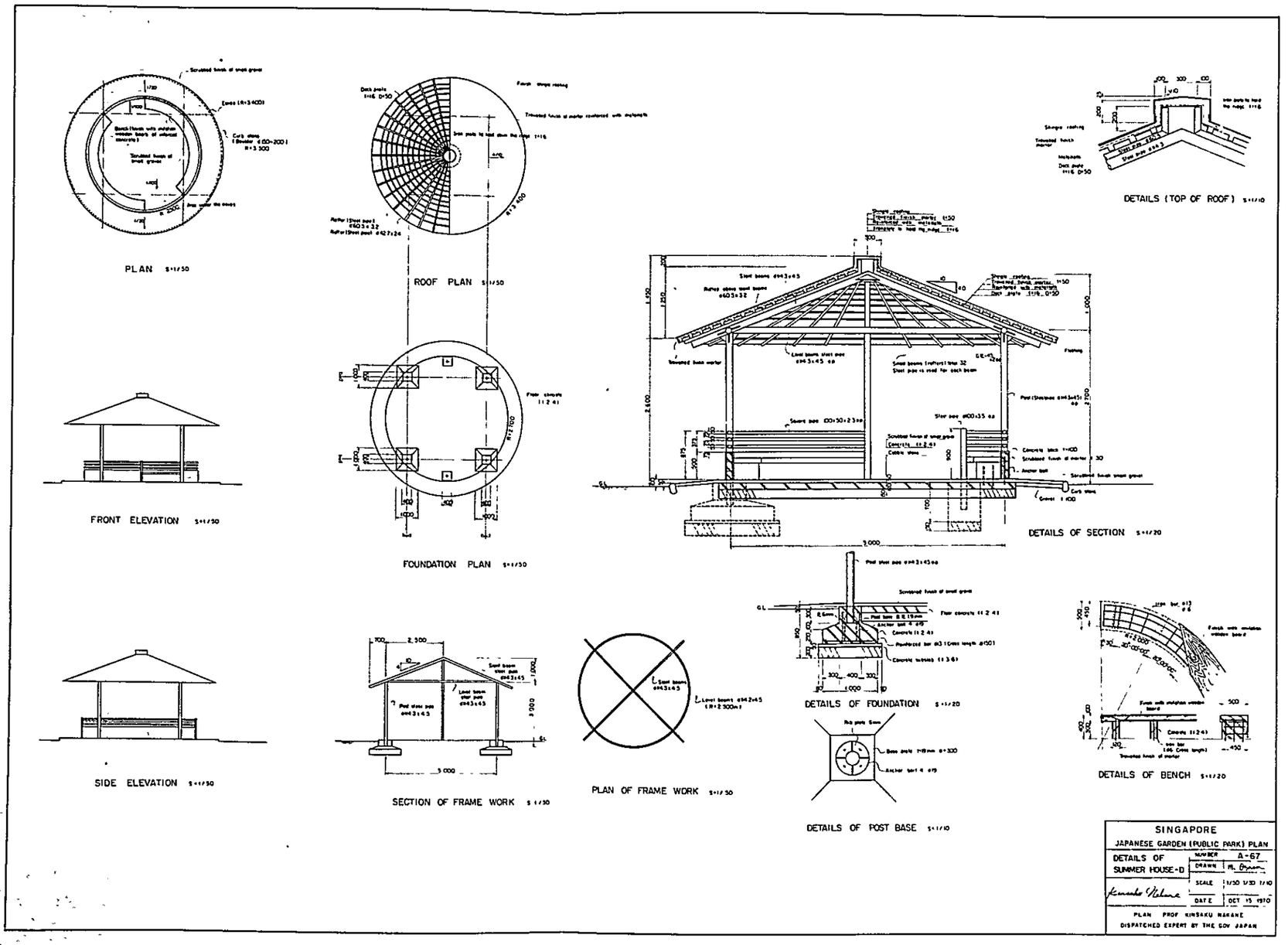
SINGAPORE		
JAPANESE GARDEN (PUBLIC PARK) PLAN		
BRIDGE NO.3 PLAN, ELEVATION, SECTION	NUMBER	D - 11
	DRAWN	Katsuya Muyoshi G.
Kinsaku Nakane	SCALE	1/50
	DATE	OCT 15 1970
PLAN : PROF KINSAKU NAKANE DISPATCHED EXPERT BY THE GOV JAPAN		

Fig. 14 SUMMER HOUSE-C



SINGAPORE		
JAPANESE GARDEN (PUBLIC PARK) PLAN		
DETAILS OF SUMMER HOUSE-C	NUMBER	A-66
	DRAWN	
Kinsaku Nakane	SCALE	1/50 M.S. 1/10
	DATE	OCT 15 1970
PLAN PROF KINSAKU NAKANE		
DISPATCHED EXPERT BY THE GOV JAPAN		

Fig. 15 SUMMER HOUSE-D



Chapter 3 Enforcement program

The enforcement program herein described is the summary dealing with the enforcement of the works on the Japanese garden. In carrying out the works, the construction firm which has made a successful bid will prepare and submit the enforcement program and, after getting the approval of the specialist sent there, will perform the works according to his instructions.

3 - 1 Basic conditions for the enforcement:

The following matters should be taken into account when the program is worked out.

i. Of the natural conditions at the locality, the important matters are;

a. Situation of rainfall:

The program will be worked out in the light of the rainfall situation over the 6 months of the enforcement of supervision.

ii. Concerning the locally-available material, machines and skilled laborers:

a. All the materials will be procured locally, and if there are any that are not procurable locally, the design will be changed, or else they will be imported.

b. 500 tons of stones and 10 stone lanterns for the garden will be hauled from Japan and other stones be procured locally.

c. All of the machines to be used for the enforcement will be procured locally.

d. Skilled laborers:

Operators of motor-cars and other machines will be available locally, and there seems to be no difficulty in procuring laborers as the contractor is a Japanese construction firm.

3 - 2 Preparatory actions to be taken by the contractor:

Before setting about the works at the site, the contractor should take the following actions.

i. Exploration of the area in and around the site:

The site is a reclaimed land. He should have a complete knowledge of the situation in and around the site and select the building lots for his office, storehouse and so forth and level the ground.

ii. Arrangement of various temporary installations for the works:
All the temporary installations necessary for the works, viz., electricity, water-supply, telephones, first-aid medical facilities, etc. should be arranged and made ready for use at any moment.

iii. Procedures and reports to the government and public offices concerned:
All the procedures should be taken and reports be made concerning the setting up of the "Off-Limits" areas, transportation of the materials and machines to be used for the works, the handling of dangerous things and so on.

iv. Surveying and investigation of soil at the site:
Since the site is a reclaimed land, the nature of the soil there should be investigated again, with special attention paid to the spot where buildings are to be constructed.

v. The contractor's office, storehouse and so on should be built in the neighborhood of the site.

vi. Arrangement of building materials:
Vehicles and building materials should be arranged, and it is necessary to confirm the capacity of their supply per diem.

vii. Arrangement of laborers:
Special skilled laborers should be arranged, and common laborers be so arranged as to be hired locally.

3 - 3 Specifications:

Invitation to bids is to be issued to the Japanese construction firms in view of the character of the works, so that the specification and the detailed statement of quantity are prepared according to the standards which are usually applicable in Japan.

3 - 4 Various works:

i. Water-supply facilities:
The industrial water-supply facilities will be adopted. Full talks should take place about the distribution of service pipes, their position and so on.

ii. Electric facilities:
The industrial electric facilities will be adopted. As to the service wire to the transformer substation at the site, full talks should take place prior to the enforcement of the works about the wiring routes, the position of the substation at the site and so on.

Chapter 4 Work schedule

4 - 1 Period of enforcement plan:

It is 5 months as shown in the Work Schedule of the Enforcement Plan attached herewith (Table-1)

4 - 2 Period of enforcement and supervision of the works:

6 months. The reason the period of the supervision over the enforcement of the works has been fixed at 6 months is that the designing, enforcement and supervision being conducted by the Japanese technicians, consideration was given to curtailing the cost of their stay in Singapore, about which talks took place with the Singapore Government's officials concerned, as a result of which it was decided that by the time the Japanese technicians arrived, the fundamental works, such as the reclamation and leveling of the site, excavation of the ponds, building of the artificial hills and so on, would have been completed anyway by the Singapore Government on the basis of the master plan (some of the drawings for the enforcement plan have been sent there) and that after the technicians had arrived, the modification of those works already initiated as stated above and the stone arrangement and other full-scale works would get underway, so the 6-month period will be enough for the whole works to be accomplished. (Table-2)

4 - 3 Bidding schedule:

The bid for the works will be made by the designnated firms selected. The following actions should be taken before the contractor to perform the works is determined and the orderer enters into a contract with the contractor.

i. Advertisement
ii. The screening of the qualification of those desiring to make bids and the selection and final determination of the bidders.
iii. Bidding
iv. Check up of the bidding documents
v. Decision on the successful bidder
vi. Conclusion of the contract

(Table - 1)

Process of Enforcement Plan for Japanese Garden in Jurong, Singapore

Month / Contents	1970 October	November	December	1971 January	February
1) Enforcement plan for garden	(Preparation)				
2) Enforcement plan for buildings					
3) Enforcement plan for bridges					
4) Enforcement plan for summer houses					
5) Preparation for commencement of works (Preparation of documents)					

(Table - 2)

Work Schedule of Construction Works
on Japanese Garden in Jurong, Singapore

Contents \ Month	1970 October	November	December	1971 January	February
1) Inspection of Garden materials (in Japan)			(to be shipped at November-end)		
2) Modification of enforcement plan at the site					
3) Enforcement and supervision of the works					
4) Preparation of report of the works					

Contents \ Month	1971 March	April	May	June	July
1) Inspection of Garden materials (in Japan)					
2) Modification of enforcement plan at the site					
3) Enforcement and supervision of the works					
4) Preparation of report of the works	(To be prepared in 5-month period after completion of works)				

Chapter 5 Calculation of construction cost

5 - 1 Conditions for calculation of construction cost:

The cost of the construction works has been calculated according to the following conditions.

Since the works concern the garden and buildings both of which are of a special nature based on the Japanese style, the construction cost has been calculated by the standards which are applied to the works being performed in Japan. The estimation has been made with the same estimated unit prices as those for the works being done in Japan taken as the stanards. However, many of the garden materials for this kind of Japanese garden cannot be priced uniformly according to the official prices as in the case of the civil enginnering materials in general, depending on their appearance, shape and quality, and how much labor it will take per m^2 cannot be determined uniformily, either. That is, it is necessary to expect that it will require a great deal of labor to finish the stone arrangement and beachline, the shaping of the edge-line of the artificial hills, the streams and so on. In other words, building a garden is to delineate a cubic picture in space, so it is somehow impossible in fact to determine the labor cost definitely at the outset.

5 - 2 Construction cost:

The construction cost has been figured out with the cost in Japan taken as the standard, but it is said that the construction cost of the buildings and so on will be found a little lower locally than in Japan.

5 - 3 Detailed statement of quantity:

The amount of money entered in the detailed statement of quantity is indicated in US$.

The quantity entered in the detailed statement of quantity is an estimated one. After each of the works has been finished, the net quantity used will be measured according to the method described in the detailed statement of quantity, and thus quantity for which payment should be made will be finally determined.