FINAL REPORT ON THE WATER SUPPLY PROJECT FOR THE CAMBODIAN REFUGEE CAMPS IN THE KINGDOM OF THAILAND (SAKAEO DIVERSION FACILITIES)

JANUARY 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In responce to the request of the Royal Government of the Kingdom of Thailand, the Japanese Government decided to conduct a survey on the water supply project for cambodian refugee camps (Sa Kaeo diversion facilities) and entrusted the survey to the Japan International Cooperation Agency. The J.I.C.A. sent to Thailand a survey team headed by Mr.Hiroshi Yonehara from April 20 to December 25, 1980.

The team had discussions with officials concerned of the Government of the Kingdom of Thailand and conducted a field survey (in Sa Kaeo area, Prachin Buri). After the team returned to Japan, the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Royal Government of the Kingdom of Thailand for their close cooperation extended to the team.

January, 1981

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency

THE KINGDOM OF THAILAND

FINAL REPORT ON THE WATER SUPPLY PROJECT

FOR

THE CAMBODIAN REFUGEE CAMPS (SAKAEO DIVERSION FACILITIES)

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CHAPTER I : BASIC DESIGNING OF WATER INTAKE FACILITIES

1.1 Aims

The inception of the Sa Kaeo Water Intake Facilities Project dates back to a visit of the Second Cambodian Refugee Study Mission (headed by Mr Sakamoto, Director of Planning Division, Ministry of Foreign Affairs) which was sent by the Government of Japan in the latter part of February 1980. On this occasion, the Provincial Government of Prachin Buri (where the Cambodian Refugee Holding Centers are located) made a strong request for the provision of water utilization facilities, and the Government of Japan subsequently decided to accommodate such a request in terms of an emergency grant aid programme.

The content of the work assigned to this Team comprises of the final design of such facilities for assuring the supply of subsistence water on behalf of the Cambodian refugees being accommodated in No.2 Camp of the Sa Kaeo Holding Center and the provision of subsistence water as well as irrigation water to the local Thai villagers in the neighbourhood of the said Camp as a diversion weir across the Khlong Phra Prong River running northward of the same Camp, a pumping station on its left bank, and a distribution network of the pumped water to respective consumers.
The Team was also expected to give any necessary technical advice to the local contractor who undertook construction of such facilities as referred to in the above.

1.2 Team Formation

Overall Coordination	Hiroshi YONEHARA
General Designing	Fumio TAMURA
Designing (diversion-weir)	Shuntaro KODERA

Designing (pipelining)	Chu NAKAJIMA
Geology	Akinori TAKAKU
Overall inspection	Mitsumasa UENO
Economic Evaluation	Ken-ichi HIDAKA
Construction Machinery	Yooichi HIGAKI

1.3 Itinerary

The Team's work commenced on April 20, 1980 and the final designing was completed by June 15, 1980. Technical advice to the local contractor called for the construction of the diversion weir, pumping station, distributing tank, trough and pipelining inside the Camp which were completed by September 30 of the same year; and also for pipelining outside the Camp which was started on November 8, after a lapse of one month because of the monsoon rain and paddy cultivation, and completed on December 25, 1980. The actual work regarding the latter job was completed by December 13, but test operation was necessary before official hand-over which was successfully effected on December 22, 1980.

1.4 Final Design

(I) Aims of the Project

The Water Supply Plan for the Sa Kaeo No.2 Camp was originally based on the groundwater obtainable by means of deepwells (50-60m), but in consideration of the poor results of groundwater exploitation by 3 deepwells existing in Sa Kaeo No.1 Camp (poor yield due to insufficient pump capacity and frequent breakdowns, inadequate water supply pipelining, shortages of water supply equipment, etc.), the decision was made to pump the perennial riverwater from the Khlong Phra Prong which runs along the border of the Camp as a reliable source of water supply.

The pumped riverwater will be used not only for such purposes as washing and bathing by the Camp refugees but also for miscellaneous as well as irrigation purposes by the local Thai villagers in the neighbourhood of the Camp.

(2) Water-Intake Point

Three (3) water-intake points were proposed at the northern part of the Camp which lies closest to the Khlong Phra Prong and, after comparative studies on economic feasability, engineering workability, maintenance & operation conveniences, etc., the final water-intake point was decided.

(3) The Volume of Water Intake - Design and Purpose

(i) The Volume of Design Water-intake - In the absence of reliable observation data regarding the Khlong Phra Prong's levels and seasonal flows in the vicinity of the proposed diversion-weir, the observation data available in its lower stream in Kabin Buri and information obtainable from the local inhabitants were used as the basis for estimating its dry season flow.

The figure for specific discharge of 0.0004 $m^3/sec/km^2$ has been arrived at from the dry season flow as recorded at Kabin Buri during the last 5 years, and 0.56 m^3/sec has been estimated as the dry season flow at the intake point, judging from the size of the catchment area extending over 1,400 km^2.

The dry season flow has been subsequently increased to about 0.89 m^3/sec leased on information received from the local inhabitants as to the river water level and running conditions. Consequently, a mean figure of 0.6 m^3/sec has been adopted as the Khlong Phra Prong's dry season flow and the volume of design water-intake was decided at 0.2 m^3/sec.

(ii) Distribution Volume - The intake-water will be meant for the following three (3) purposes:

(a)	Subsistence water for Refugee Camp	... q = 0.0167 m^3/sec
(b)	Subsistence water for the neighbouring villagers	... q = 0.0055 "
(c)	Irrigation water for the neighbouring villagers	... q = 0.1778 "

The above allocation has been made on the assumption that 40,000 Camp dwellers will consume 20 per day per head, while the neighbouring villagers numbering 2,500 will consume 100 per day per head, and the remainder has been allocated for irrigation purpose.

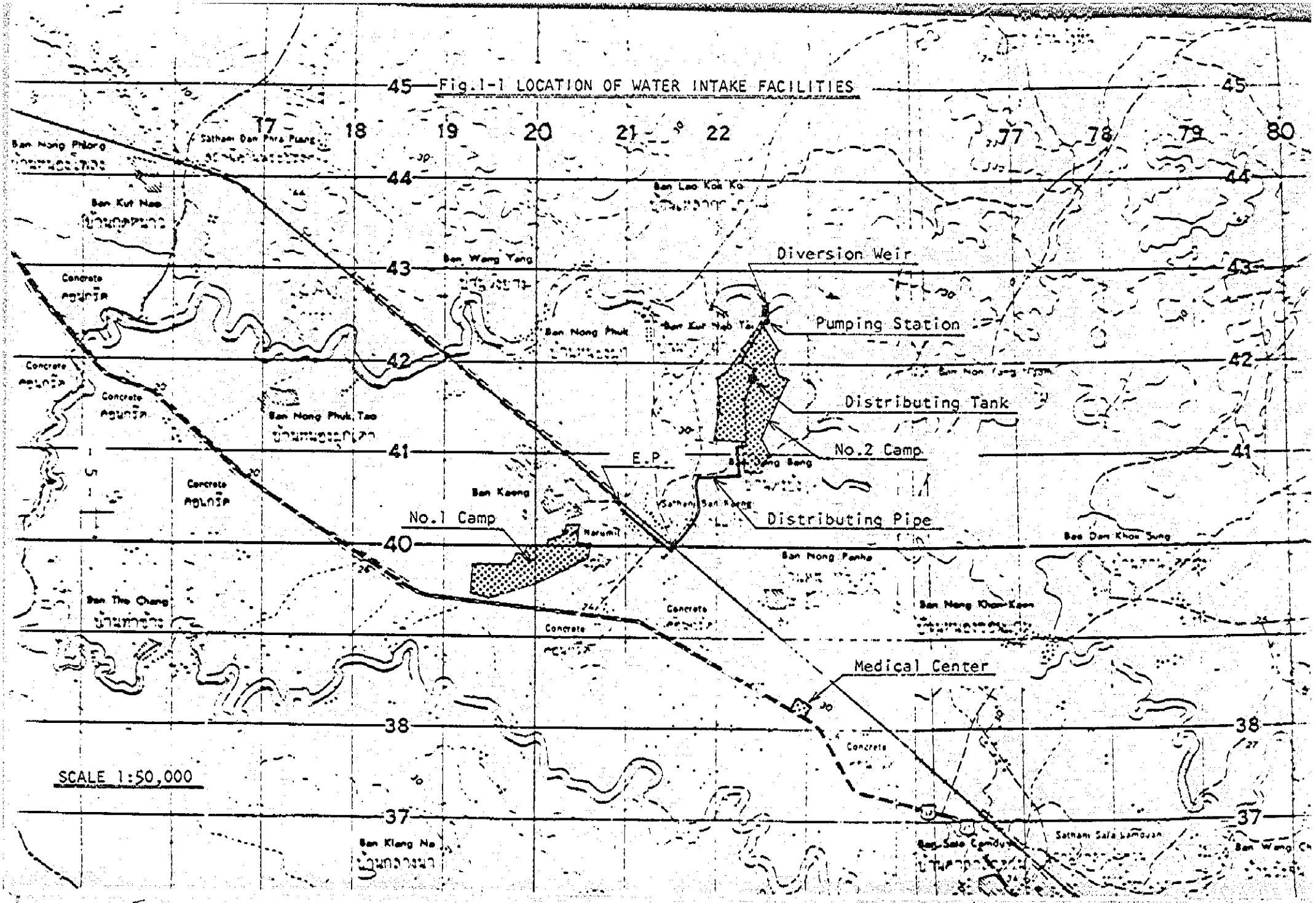


Fig.1-1 LOCATION OF WATER INTAKE FACILITIES

(4) Regulated Intake Water Level

The given topography defied the possibility of gravity flow of the river water taken from the diversion weir, hence lifting by pump is necessary. Pump-lifting favours the higher intake water level in view of both operational and construction costs of the pump itself, but it is accompanied by the drawbacks of the higher construction cost called for the bigger dam-body and the untoward effects to the upper-stream areas due to the higher weir level.

In consideration of this, the Team made the necessary hydraulic calculations and eventually determined the optional intake water level to be 1.50 m.

Backwater calculations based on a flood discharge of 400 m^3/sec and a river-bed slope of 1/3000 resulted in a possible rise of approximately 5.0 cm in the water level at the weir-site. Taking into account a minor expansion of the flow area at the weir-site from 271.7 m^2 as it is to 277.1 m^2 after construction, the water level can be assumed to alter as such due to the waves driven by wind. Thus, the upper-stream area should suffer little or no adverse effects from constructing the proposed weir.

(5) Various Dimensions of the Water-Intake Facilities

(i) Diversion Weir

The floating type diversion weir has been adopted in view of the fact that the geological formation of the proposed weir foundation was identified as sandy soil; the foundation height has been determined at 3.00 m, because the existing river-bed level is between 2.5 m and 3.5 m, and the width of the weir has been made 16.0 m according to the cross-section of the existing river.

A 1.5 m width stop log has been provided for as deposited sand measure towards the upper-stream as well as discharge measure when the dry-season flow happens to be less than the design dry-season flow (0.6 m^3/s.)

(ii) Intake Opening and Sluice

The foundation height and the width of the intake opening have been given such cross-sections in order to prevent the invasion of sand and to maintain a flow velocity of about 0.3 m/s.

A sluice crosss-section which is generally determined to maintain the intra-sluice flow velocity at around 0.6 m/s has been made Ø 800 mm in this specific case from O&M consideration.

(iii) Pumping Facilities

The actual head has been determined at 21.8 m, having been concluded from the water-intake level at dry season (- 1.80 m) and the Distributing Tank's storage water level (HWL + 20.0 m); the foundation height of the pumping station has been fixed at + 6.50 m to avoid inundation at the time of flood.

A pair of vertical mixed flow pumps has been adopted in consideration of the required duty and O&M conveniences.

(iv) Water Pipe

The water pipe has been routed along the road for the convenience of construction and O&M and the minimal distance to the Distributing Tank. Its diameter has been fixed at Ø 400 m in view of maintaining the intra-pipe velocity of the lift water

(0.2 m^3/sec) at the standard rate of 1.0 m/sec. In consideration of the waterhammering effects which are obviously anticipated because the water pipe is directly connected to the pump, we decided to use steel pipe.

(v) Distributing Tank

It has been located at the highest point inside the Camp and its HWL has been increased by 3.0 m above the existing ground level. Its capacity has been fixed at 100 m^3 which corresponds to a 10 minute lift volume, as approximately 80% of the lift water will be destined for irrigation.

(vi) Distributing Pipe

Its alignment has been determined to assure the most satisfactory supply of subsistence water on behalf of the neighbouring villagers and irrigation water for their paddyfields as well as to assure efficient O&M.

The diameter of the distributing pipe has been determined from the design discharge and the standard intra-pipe velocity of the distributing water, while asbestos-cement pipe has been selected because of the low hydrostatic pressure of around 0.3 kg/cm^2 and low cost.

(vii) Trough

It has been located just outside the Camp compound at a diverging point of the villagers' subsistence water pipe and the irrigation water pipe. It also serves as a sand settling basin.

(viii) Water Storage Tower

As the total length of the villagers' subsistence water pipe is approximately 2.5 km and the gravity flow of the water is unexpected, the height of the Water Storage Tower has been decided so as to make the permanent water pressure more than 0.3 kg/cm^2 at the end of the pipe.

Its capacity has been fixed at 30 m^3 which corresponds to 90 minutes' worth of the suppliable water.

(6) Pipe-lining for Agricultural Purposes

(i) Irrigation Plan

1) Volume of Irrigation Water ..... 0.1778 m^3/sec

2) Area to be irrigated

Estimation of the area to be irrigated (paddyfield) has been made on varying assumptions of 8 mm, 10 mm, and 12 mm (water requirements in depth) and pump operation of 10 hrs, 12 hrs, 15 hrs and 18 hrs (per day), but the conveyance loss was fixed at 15%. As a result, it has been found that approximately 80 ha (500 rai) could be irrigated during dry season. Twice as much paddyfield area will be assured with irrigation water during the rainy season, as the effective rainfall (out of the average annual rainfall for the last 10 years) would provide 50% of the total amount of water required for paddy cultivation.

3) Irrigation Area

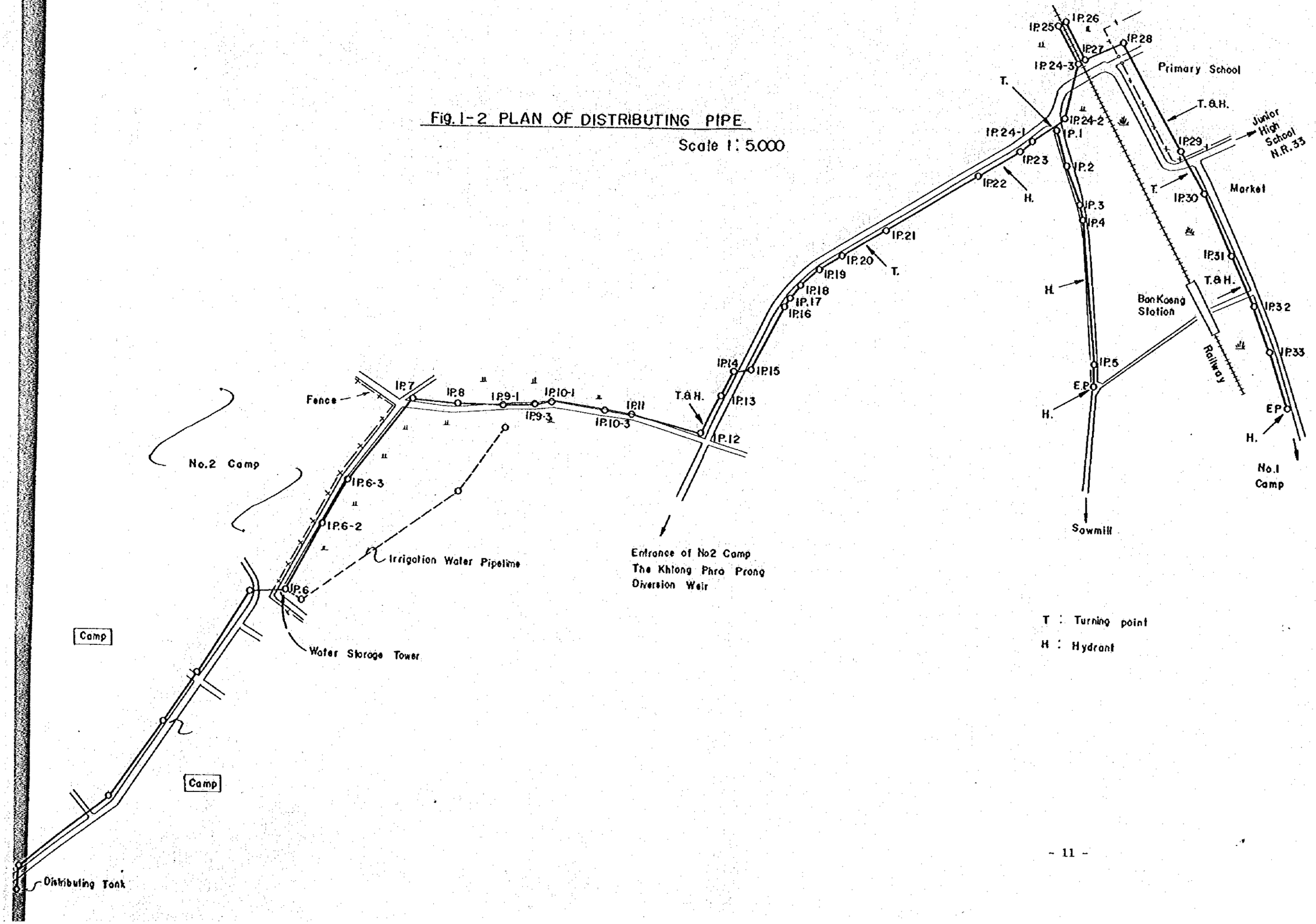
The cumulative total of the paddyfields in the neighbourhood of the Camp is approximately 150 ha as are shown on Fig. 1-7: Irrigation Area. Priority of irrigation water supply has been determined from A to E on the basis of the elevation and soil conditions of respective plots of paddyfield.

(ii) Alignment, Diameter and Type of Irrigation Water Pipe

Irrigation water pipe has been extended for a total length of 450 m through Priority A area, from Block No. 1 towards Block No. 2 . Its diameter has been decided at ø 400 mm from the design discharge and the intra-pipe velocity of flow. Asbestos-cement pipe has been chosen from the economic point-of-view. Two turnouts have been arranged for diversion towards Blocks Nos. 4 & 3 . It is deemed proper to start digging irrigation channels from A Blocks onward.

Fig. I-2 PLAN OF DISTRIBUTING PIPE

Scale 1 : 5,000



T : Turning point

H : Hydrant

Fig. 1-3 Distributing Pipe S_V=1:200 S_H=1:5,000

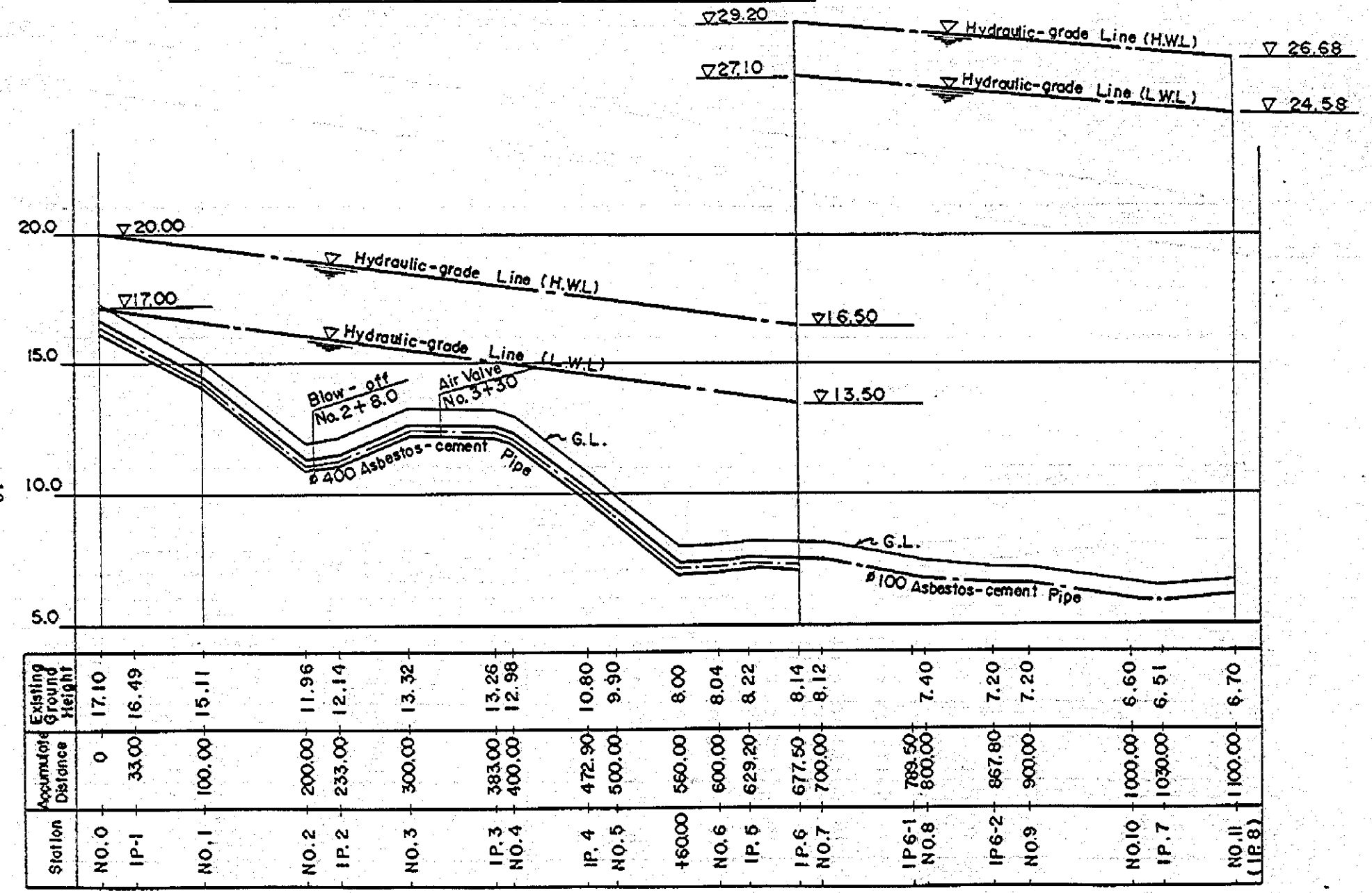
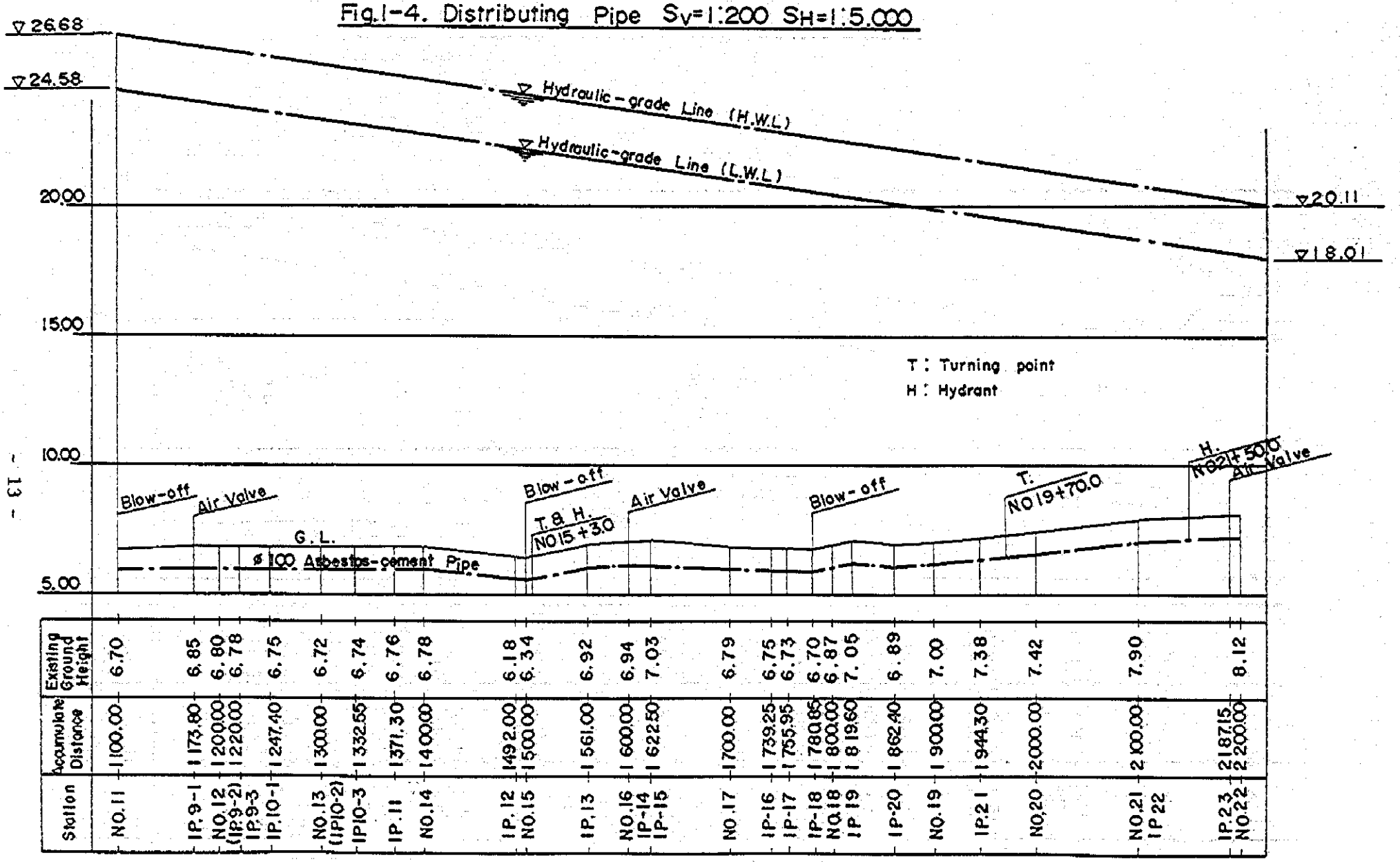
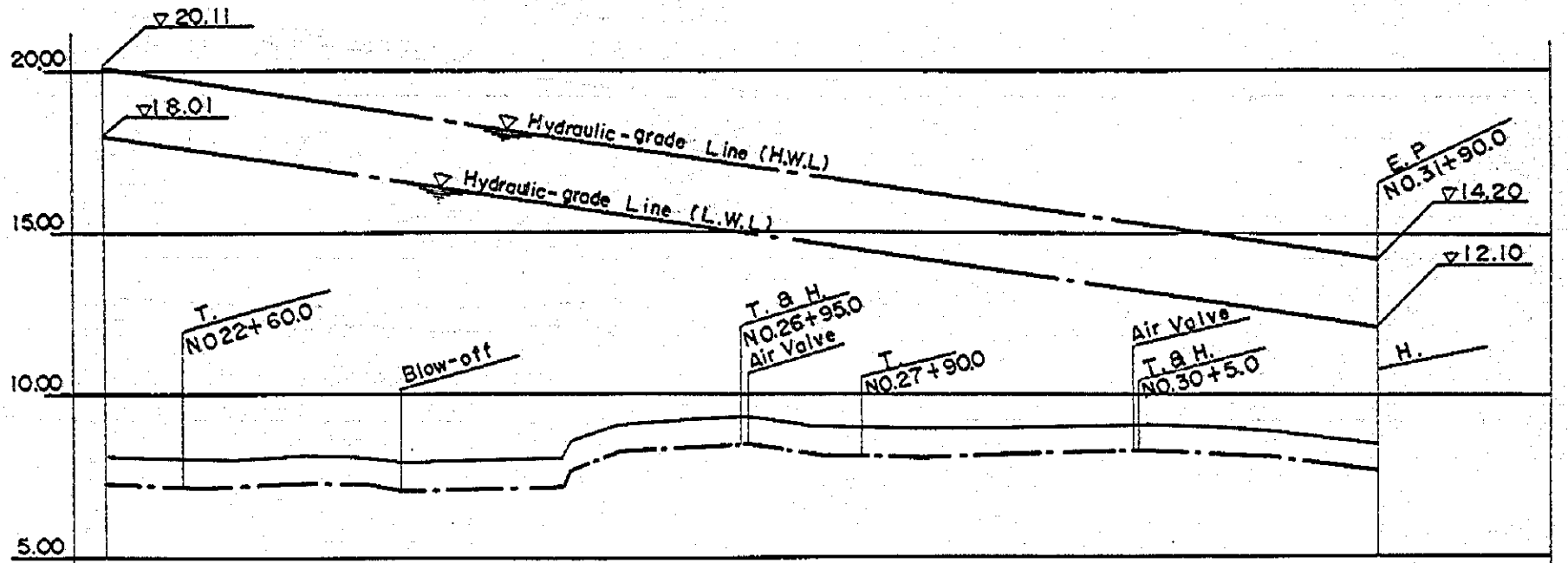


Fig.1-4. Distributing Pipe S_V=1:200 S_H=1:5,000



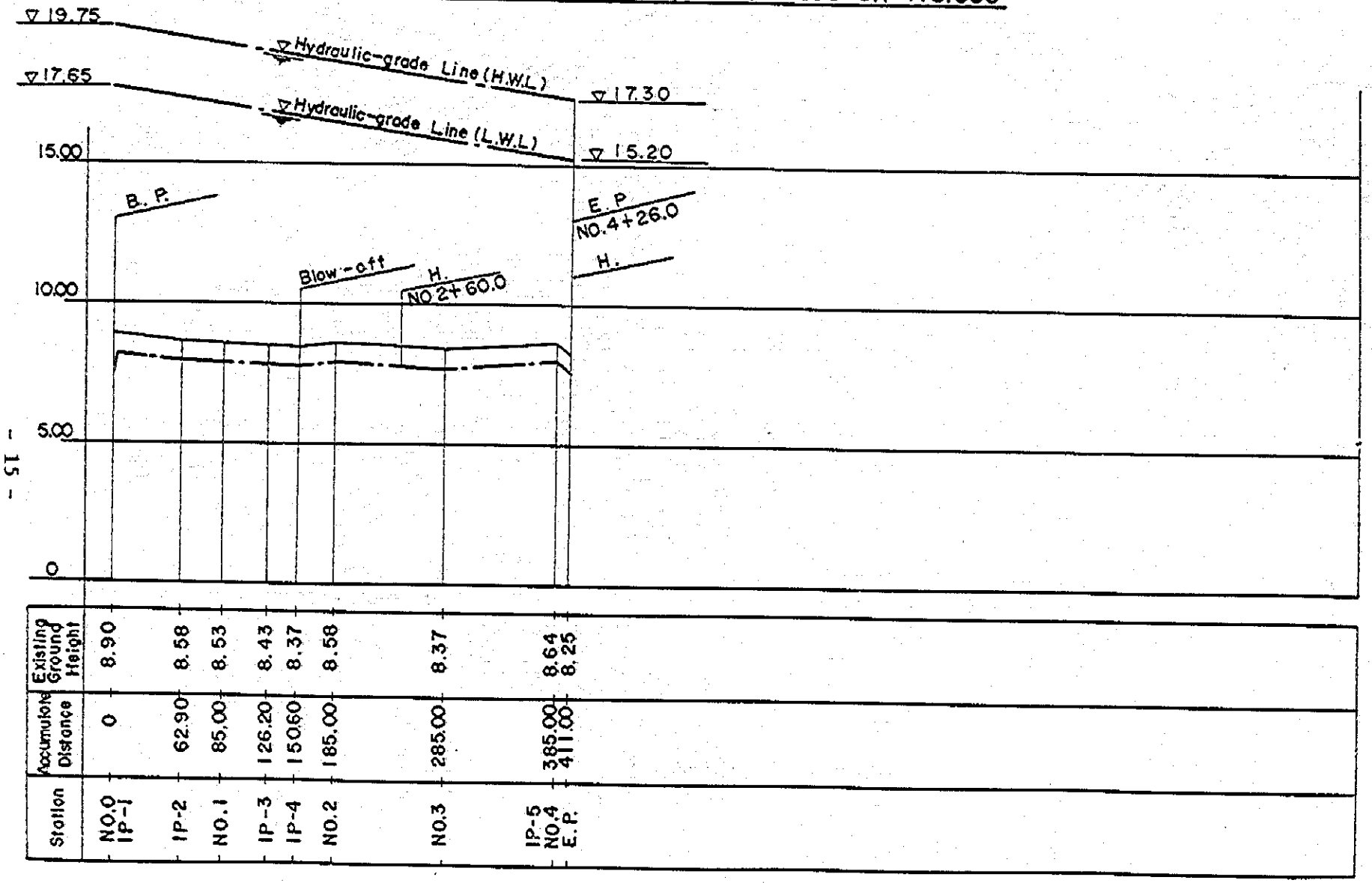
Station	Accumulate Distance	Existing Ground Height
NO.11	1100.00	6.70
IP.9-1	1173.80	6.85
NO.12 (IP9-2)	1200.00	6.80
IP.9-3	1220.00	6.78
IP.10-1	1247.40	6.75
NO.13 (IP10-2)	1300.00	6.72
IP10-3	1332.55	6.74
IP.11	1371.30	6.76
NO.14	1400.00	6.78
IP.12	1492.00	6.18
NO.15	1500.00	6.34
IP.13	1561.00	6.92
NO.16	1600.00	6.94
IP-14	1622.50	7.03
NO.17	1700.00	6.79
IP-16	1739.25	6.75
IP-17	1755.95	6.73
IP-18	1780.85	6.70
NO.18	1800.00	6.87
IP 19	1819.60	7.05
IP-20	1862.40	6.89
NO.19	1900.00	7.00
IP.21	1944.30	7.38
NO.20	2000.00	7.42
NO.21	2100.00	7.90
IP 22		
IP.23	2187.15	8.12
NO.22	2200.00	

Fig.1-5. Distributing Pipe S_V=1:200 S_H=1:5,000



Station	Accumulate Distance	Existing Ground Height
NO.22	2 200.00	8.12
IP.24-1		
IP.24-2	2 272.15	7.96
NO.23	2 300.00	7.98
IP.24-3	2 345.65	8.15
NO.24	2 400.00	8.08
IP. 25		
IP. 26		7.90
IP.27		
NO.25	2 500.00	8.01
IP. 28	2 560.30	8.60
NO.26	2 600.00	9.12
NO.27	2 700.00	9.33
IP. 29	2 752.30	8.99
NO.28	2 800.00	8.94
IP. 30	2 827.00	8.89
NO.29	2 900.00	8.99
IP 31	2 934.30	8.99
NO.30	3 000.00	9.07
IP-32	3 021.20	9.05
IP.33		
NO.31	3 100.00	8.90
E P	3 190.00	8.50

Fig.1-6. Distributing Pipe S_V=1:200 S_H=1:5.000



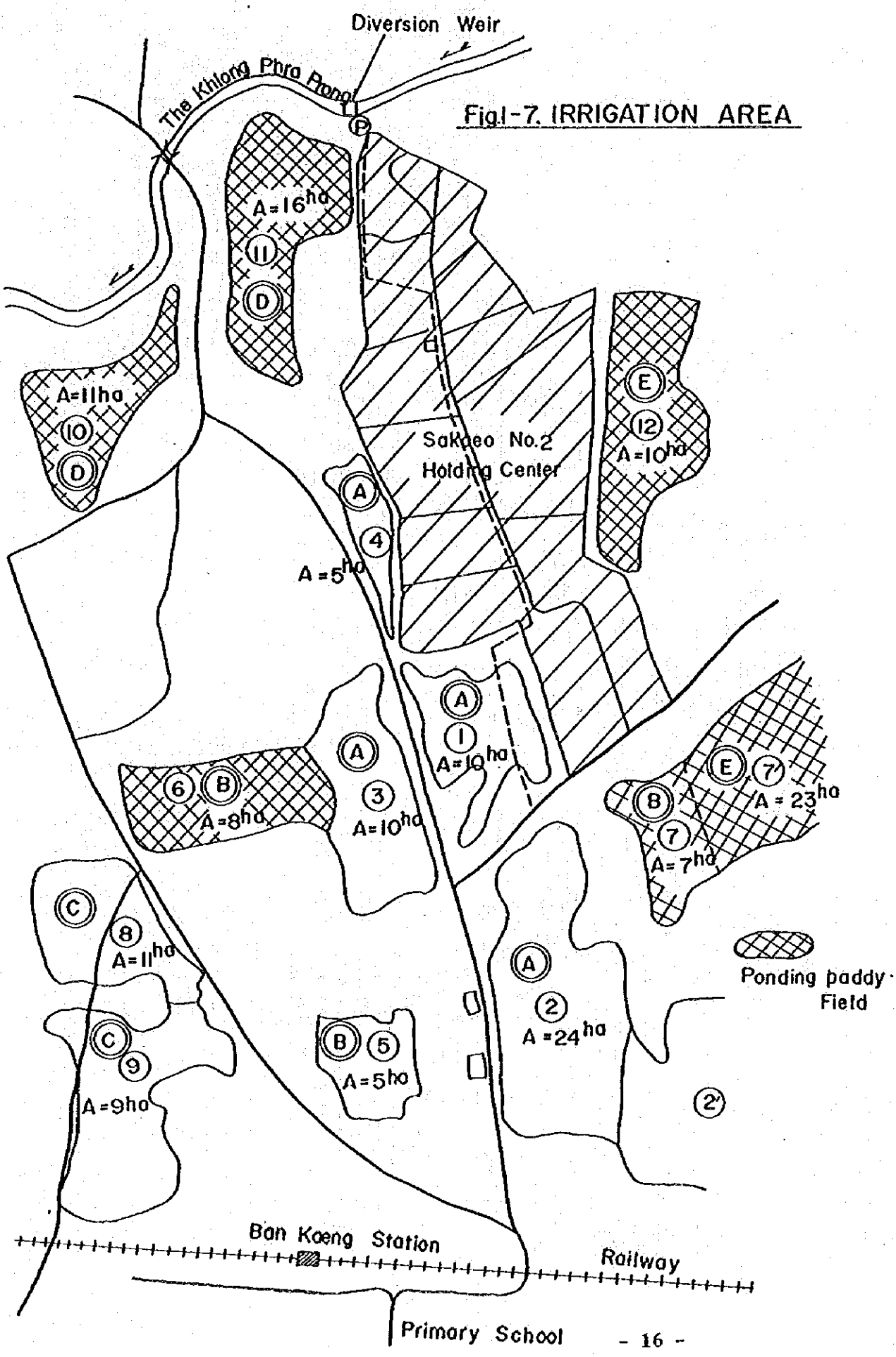


Fig.1-7. IRRIGATION AREA

Fig.I-8 IRRIGATION NET WORK

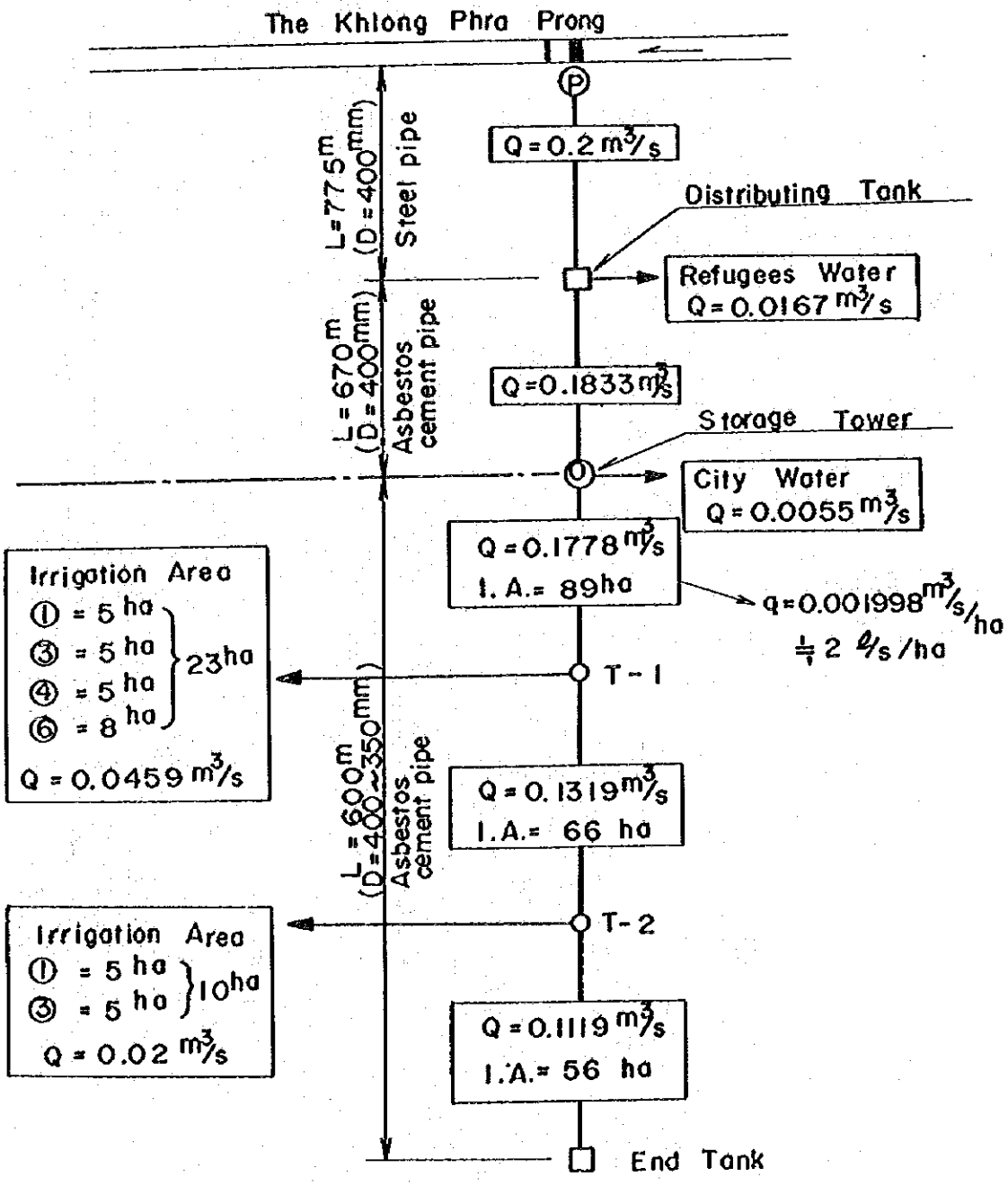


Fig. 1-9 PLAN OF IRRIGATION WATER PIPE

S = 1 : 5,000

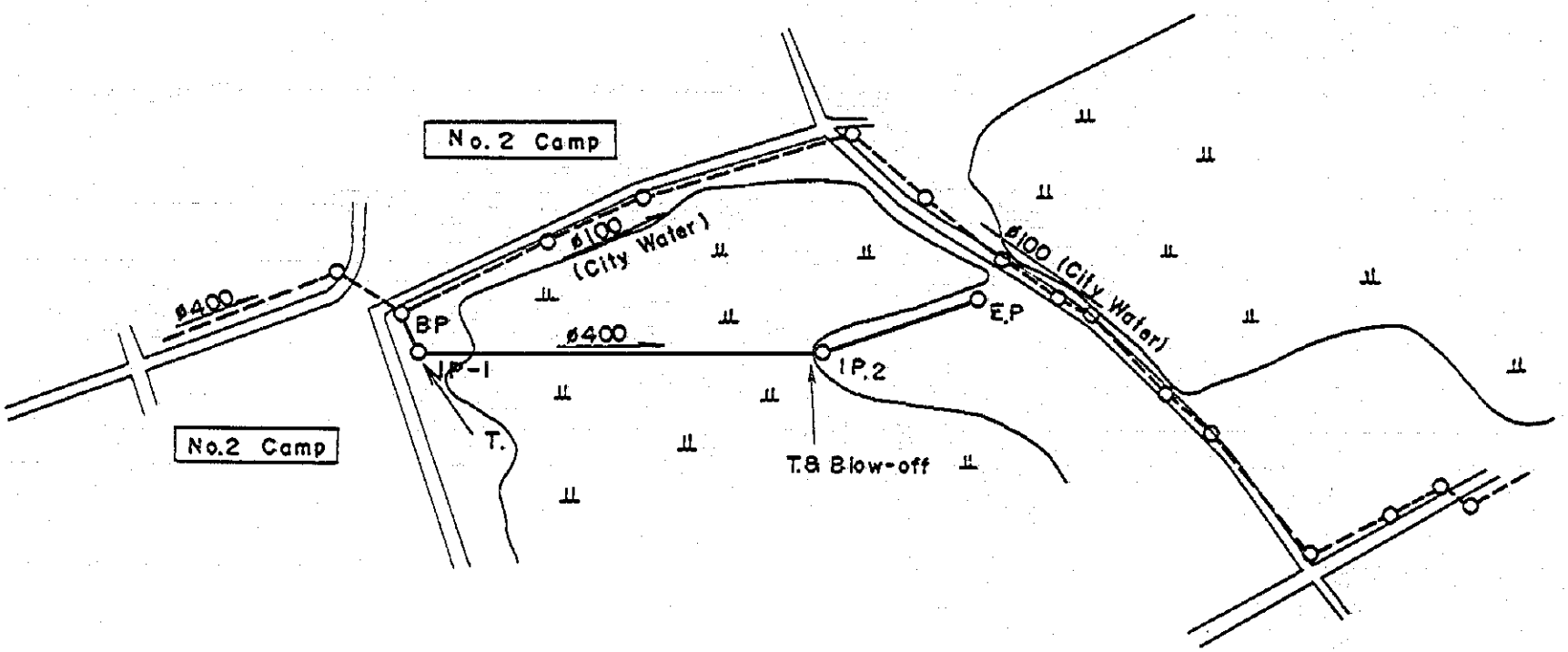
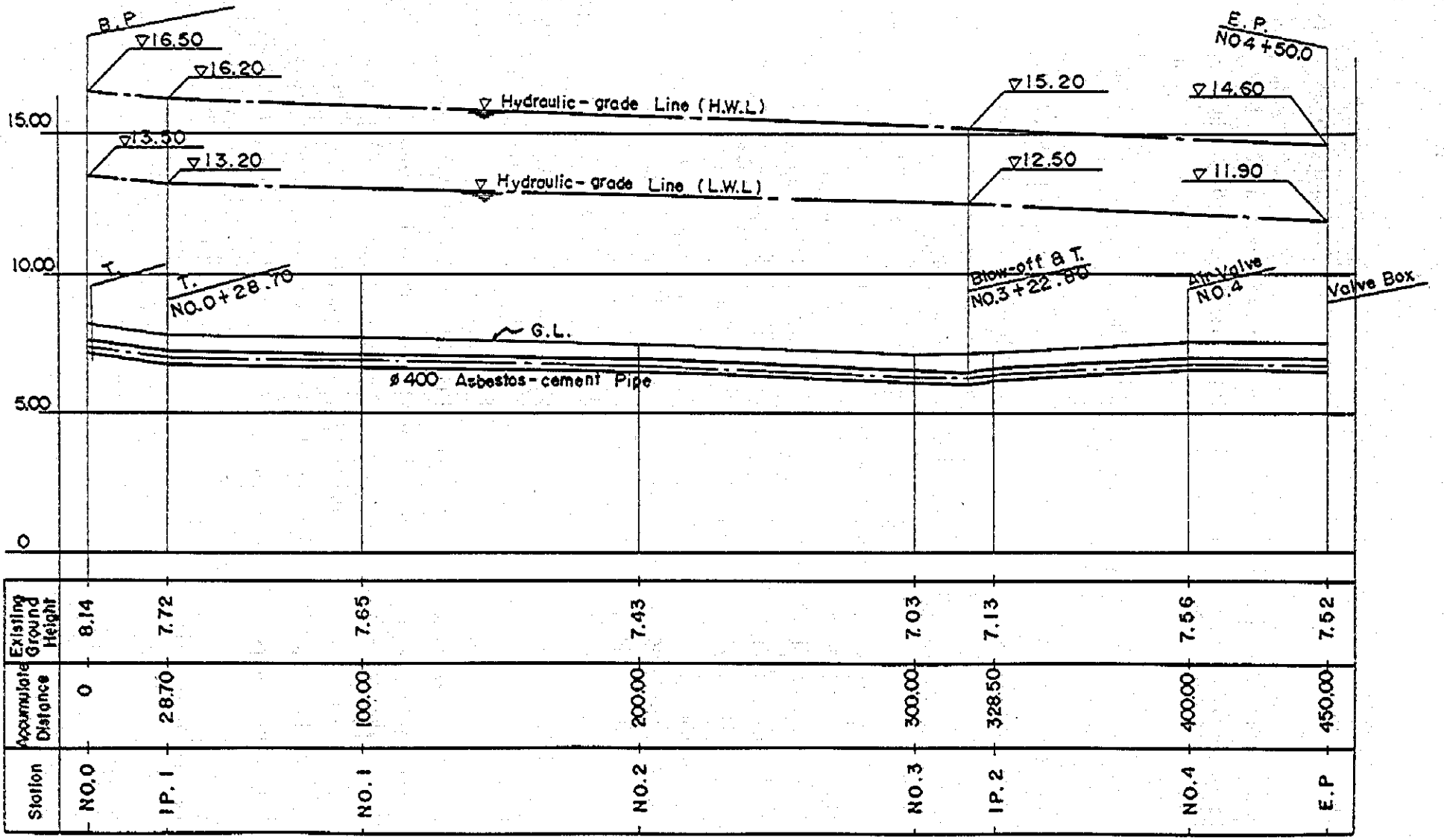


Fig.1-10. Irrigation Water Pipe Sv = 1 : 200 SH = 1 : 2 000



(7) Construction Cost

The total construction cost earmarked for the emergency grant aid is 200,000,000 Yen which will be spent under different construction heads as follows:

Breakdown of Construction Cost

1.	Diversion weir works	2,679,055 Bhats
2.	Pumping facility works	5,326,237 "
3.	Water distribution piping works	3,088,398 "
4.	Temporary works	3,235,140 "
5.	Additional water distribution piping works	193,106 "
6.	Irrigation water distribution piping works	1,078,022 "
	Sub-Total	15,599,958 "
7.	Project overhead	1,264,627 "
8.	Office overhead	1,486,000 "
	Grand Total	18,350,585 Bhats = 200,000,000 Yen

1.5 Construction Work

(1) General

The construction period of this project was originally set to last for 4 months, from May to the end of August 1980, to assure water supply for the next dry season in 1980. Among the facilities envisaged, two riparian works, viz., diversion weir and pumping station, were scheduled for completion by the end of July, before the arrival of full-scale monsoon rains, and the other land works would be completed by the end of August 1980.

However, extraordinary rains which started falling around June 10 disturbed the excavation work of the diversion weir and the resulting rise of the river water level necessitated the elevation of the coffer-dam within a month's time after commencement of the construction work. Moreover, the foundation ground proved to be unexpectedly hard which necessitated a change in the original method of protection for the weir-body. The result of these adverse conditions was the postponement of the completion date to the end of August 1980, completion dates being altered to the end of September for the to diversion weir, trough and water storage tower, and the end of October to mid-December (with a one month interval) for the other works between the trough and the terminal ends of the villagers' subsistence water pipeline and the irrigation water pipeline.

In spite of the initial delay as mentioned above, the entire construction work was completed on December 13, 1980.

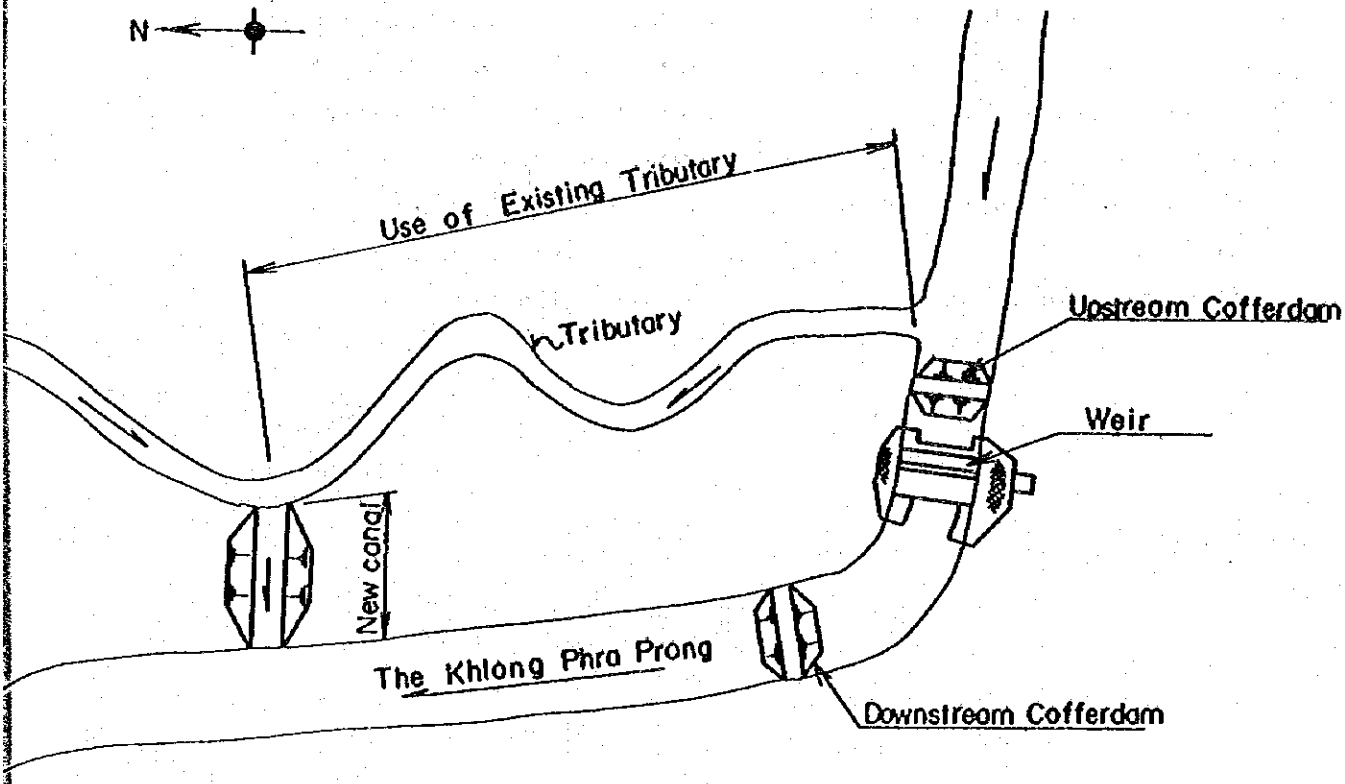
(2) Temporary Works

For the completion of the riparian works, construction of a coffer-dam across the entire width of the river, associated with the bypass canal method, was preferred because of the narrow distance between the two banks and also to shorten the construction period.

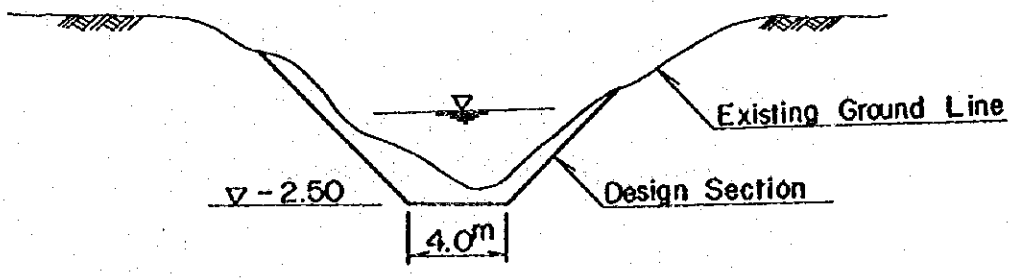
(i) By-pass Canal

As is shown in Fig. 1-11: By-pass Canal Plan, a bypass canal was prepared by excavating the bed of a feeder to the depth of 0.5 m - 0.8 m and slightly widening its opening. Thus, the total length of the bypass canal has been limited to 70 m. Its cross-section was pre-decided from the flow available at the end of July, and the flow increment due to extraordinary precipitation did not cause any trouble because its cross-section was naturally enlarged through the failure of the slopes.

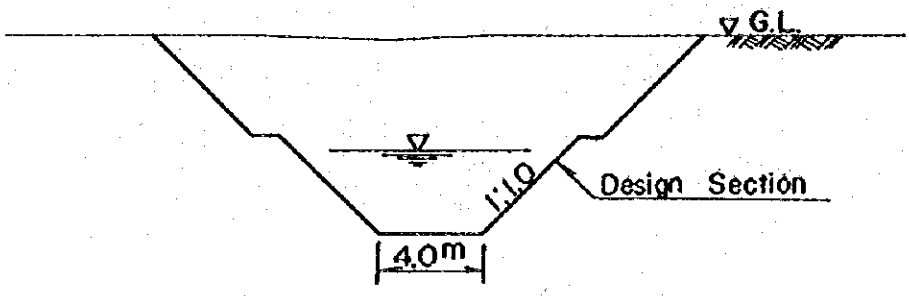
Fig. I-II BY-PASS CANAL PLAN



TRIBUTARY CROSS SECTION



NEW CANAL CROSS SECTION



(ii) Cofferdam

The crest of the cofferdam was originally planned at + 2.70 m from the flood water level as estimated in mid-July when the bypass canal cross-section was determined. It was eventually raised to + 4.40 m to cope with the ensuing water level rises. Clay soil transported from the nearby low-lying area was used as embankment material to prevent leakage and slope failure as the soil available on the spot was made up of sandy soil.

Fig.I-12 COFFERDAM CROSS SECTION

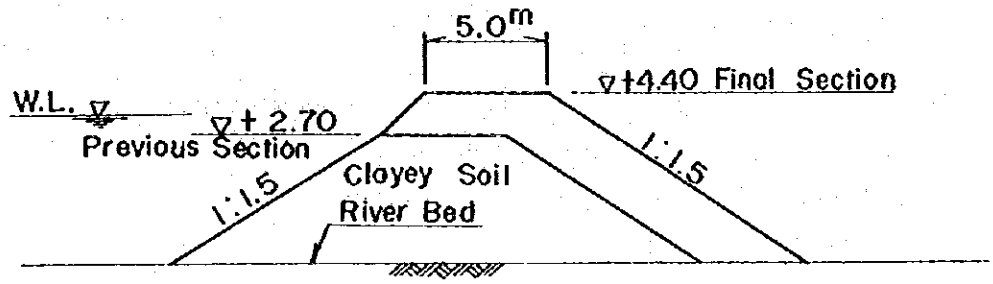
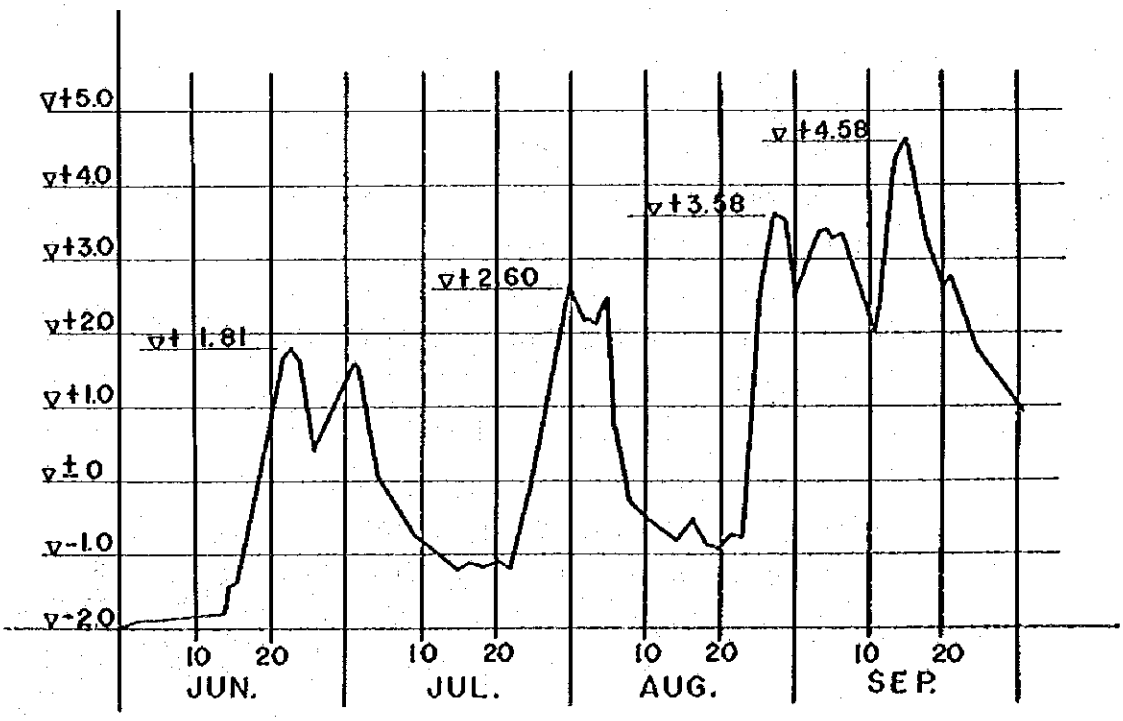


Fig.I-13 THE KHLONG PHRA PRONG— WATER LEVEL



(3) Principal Works

(i) Diversion Weir Works

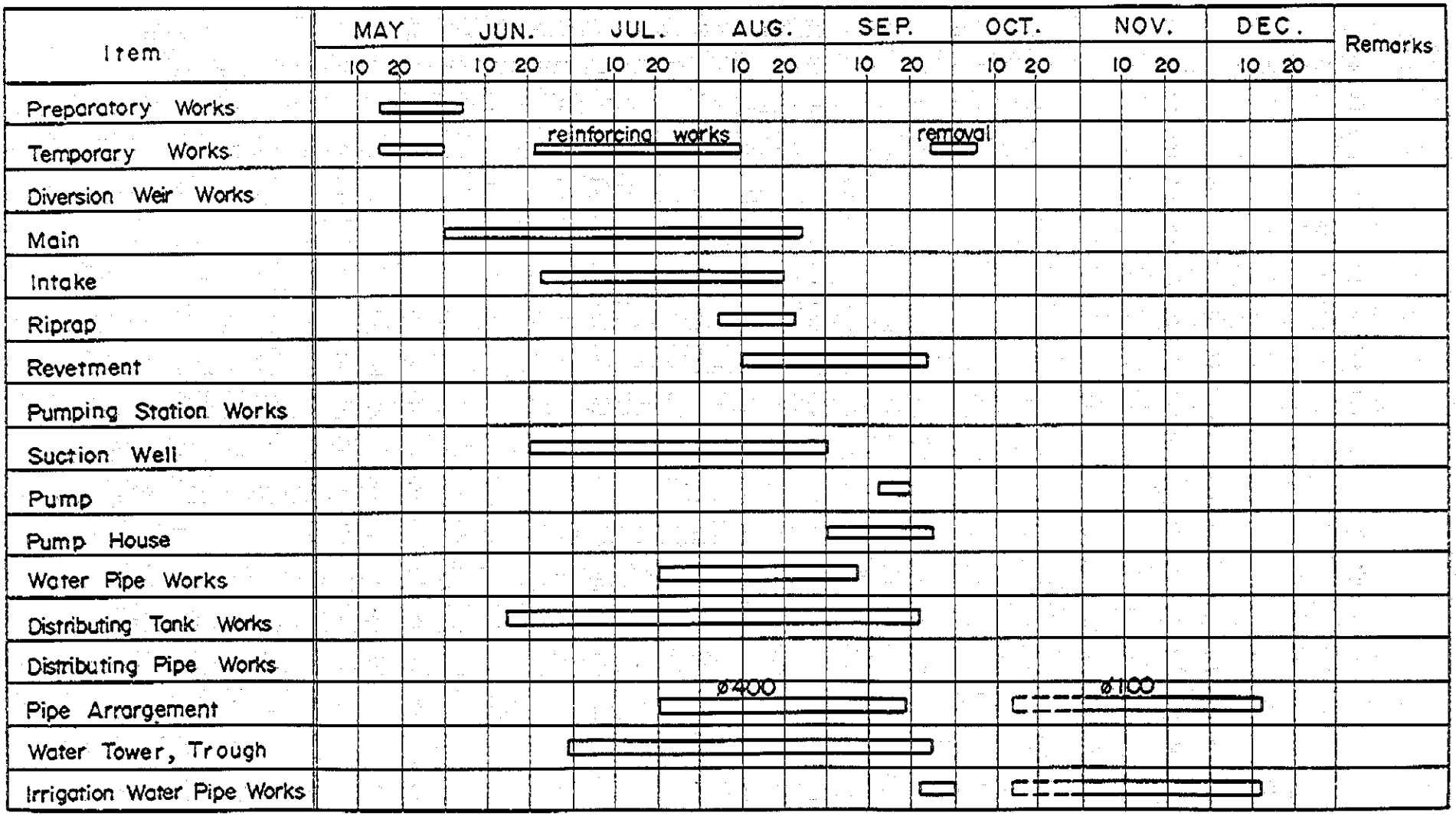
Extraordinary rainfall which followed the completion of the cofferdam caused a considerable slope failure along the excavation cross-sections which helped refilling the excavation sites of the previous days and increased the duty of the drainage work. This was the main reason why many more days were required for completion of the excavation work. Moreover, the foundation ground proved to be unexpectedly hard (betraying insufficient soil survey) and steel sheet piles could not be easily inserted into the foundation ground; the sheet-piling method was eventually changed to the cutoff method. All of these adverse conditions cumulatively helped postpone the completion date by two months to the end of September.

(ii) Water Distribution Piping Works

The above-said delay in completion of the diversion weir works made it necessary postpone the commencement of the water distribution piping works which was originally scheduled in mid-June. In the meanwhile, the route of the Ø 100 mm pipe and the paddyfield through which the irrigation water pipe was planned to be set were immersed in water, threatening a considerable increase in the construction cost. Accordingly, the distributing pipe works and the piping works down to the trough were completed by the end of September and the remaining piping works (Ø 100 L = 2,900 m, Ø 400 L = 450 m) were undertaken from the end of October to mid-December.

Upon completion of the piping works, leakage and pressure tests to confirm the pipelines' water tightness and safety were effected and proved a success.

Table 1-1 CONSTRUCTION SCHEDULE



CHAPTER II : OPERATION-AND-MAINTENANCE STANDARDS OF WATER INTAKE FACILITIES

Periodical O&M according to the following standards will ensure the smooth and proper functioning of various facilities provided under the Project.

2.1 Diversion Weir

(1) Stop Log

A stop log is meant, through its proper opening-closing operation, to prevent sand accumulated on the upper-stream side of the diversion weir to flow into the intake opening. A stop log should be installed at some time during the beginning of the dry season to the beginning of the rainy season; it should be installed/removed when the river water level rises 0.2 m above the weir crest.

While it is not actually in use, it should be stored inside the pumping station, and shall be coated with creosote or some other antiseptic once a year.

(2) Upper-stream Apron

Sand accumulated on the upper-stream apron needs to be swept away once a year through the operation of the stop log, but a complete sand dredging work must be done once in three years.

2.2 Water-Intake Opening

Floating rubbish stuck to the front-screen will bring down the pump-well and, thereby, impede the proper functioning of the pump(s). It is, therefore, necessary to remove such rubbish once a week.

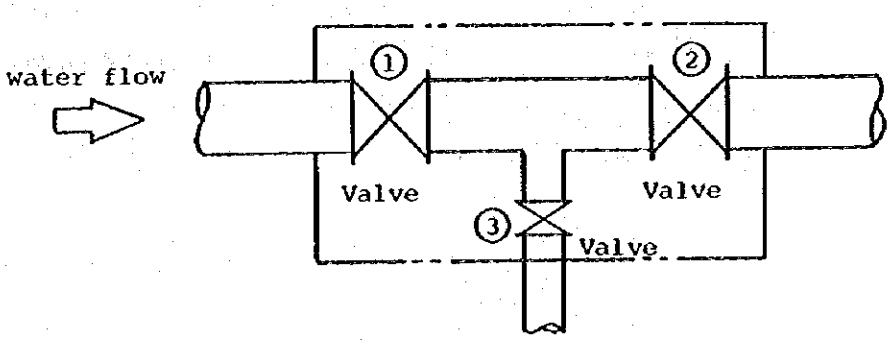
2.3 Pumps

No.1 Pump and No.2 Pump must be put in operation each alternative week; no single pump shall be operated continuously for longer than one week.

The completion of irrigation channels down to their terminal ends will take another two-three years; in the meanwhile, operation of the pump(s) will be limited to within ten (10) hours a day, from 08:00 hrs to 18:00 hrs. The pump operator must be on duty in the pumping room, accordingly. Supply of oil to the pump(s) and inspection thereof will follow the descriptions in the attached "Pump Manual".

2.4 Removal of Mud/Sand from the Pipe

Mud and sand deposited inside the pipe needs to be removed more than once a year to prevent the choking of the pipe.



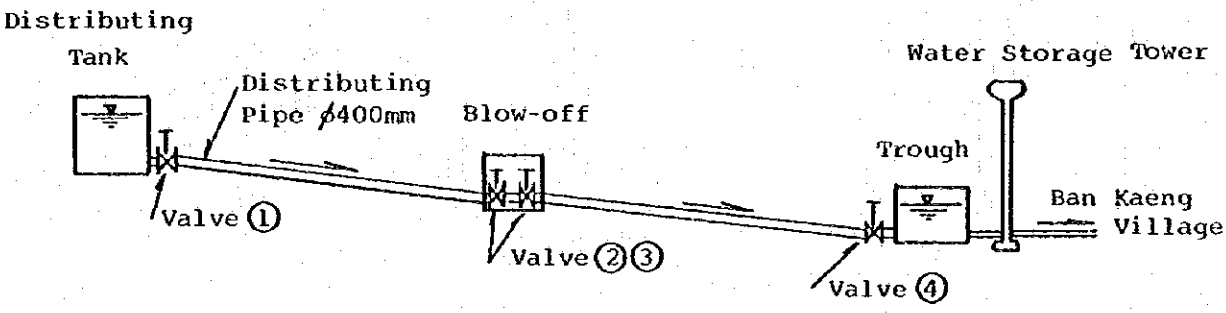
Operational Order for Removal of Sand/mud:

1. Open Valve ③ , and closed Valve ② ;
2. Closed Valve ① , and open Valve ② ;
3. Open Valve ① , and closed Valve ③ .

1 - 2 : for 20 minutes

2 - 3 : for 10 minutes

2.5 Valve Control between Distributing Tank and Trough



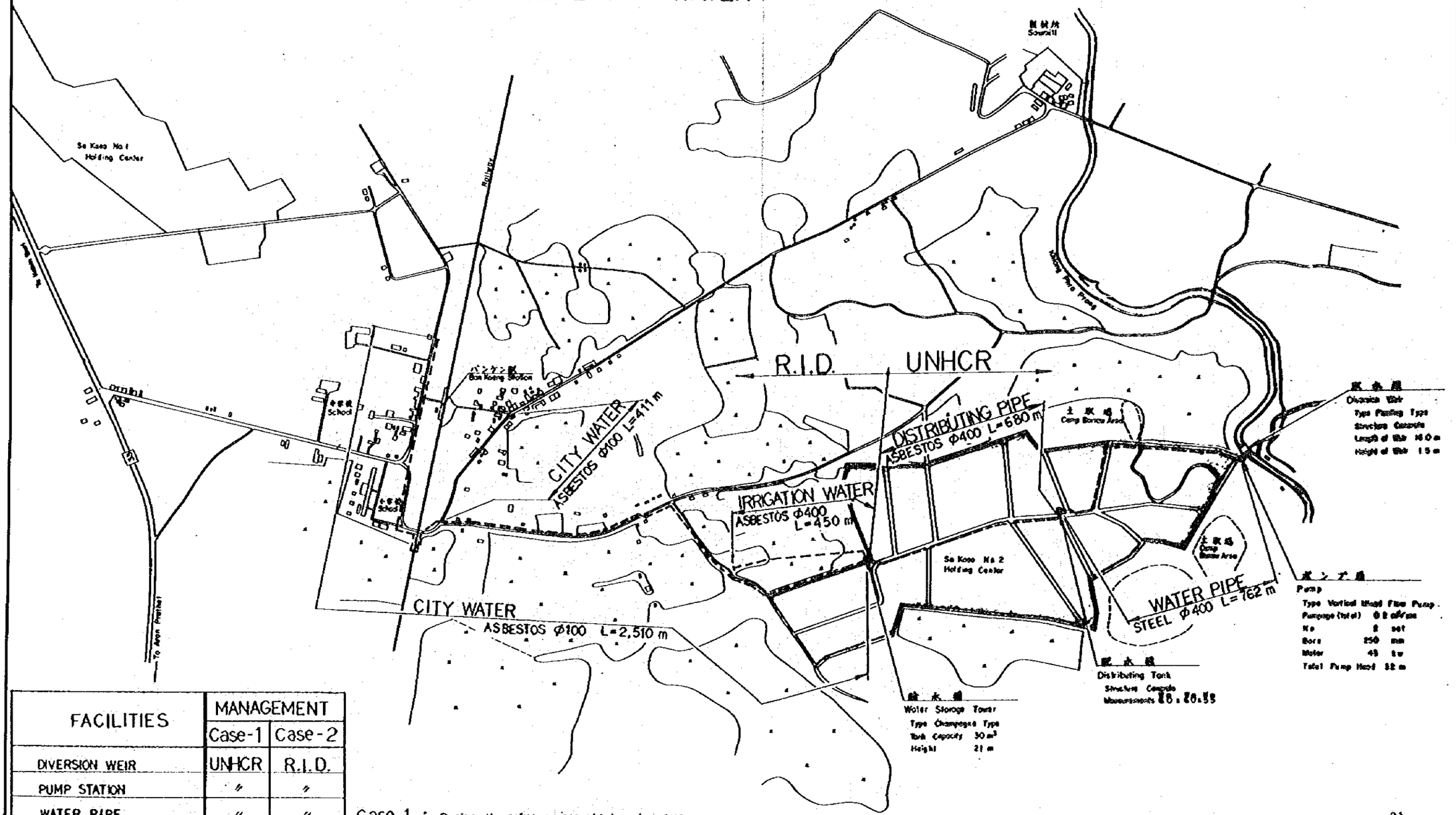
Approximately 80% of the entire design lift water volume is destined for irrigation which, however, will be available in a few years. In the meanwhile, it is necessary to control the volume of water running into the distributing pipe. Until the irrigation channel network is completed, Valves ① through ④ must be 90% closed.

The consumption of the subsistence water by the villagers in Ban Kaeng will fluctuate from time to time throughout the day, and it is necessary to attach one watchman at the Trough so that he will regulate Valve ④ whenever the Trough overflows.

2.6 Trough

The blow-off valve of the Trough needs to be opened for about 10 minutes, more than once a year, to remove mud and sand which will be deposited inside the Trough.

DIVISION OF MANAGEMENT OF WATER INTAKE FACILITIES



FACILITIES	MANAGEMENT	
	Case-1	Case-2
DIVERSION WEIR	UNHCR	R.I.D.
PUMP STATION	〃	〃
WATER PIPE	〃	〃
DISTRIBUTING TANK	〃	〃
DISTRIBUTING PIPE	〃	〃
CITY WATER INTAKE TANK	R.I.D.	〃
WATER STORAGE TOWER	〃	〃
CITY WATER PIPE	〃	〃
IRRIGATION WATER PIPE	〃	〃

Case-1 ; During the refugees are staying in camp

Case-2 ; After the camp has been vacated by the refugees

R.I.D. ; Including PRACHIN BURI PROVINCE

S = 1 : 6000

WATER SUPPLY PROJECT FOR CAMBODIAN REFUGEE CAMPS

THE KINGDOM OF THAILAND

LOCATION MAP
(GENERAL LAYOUT)

Date

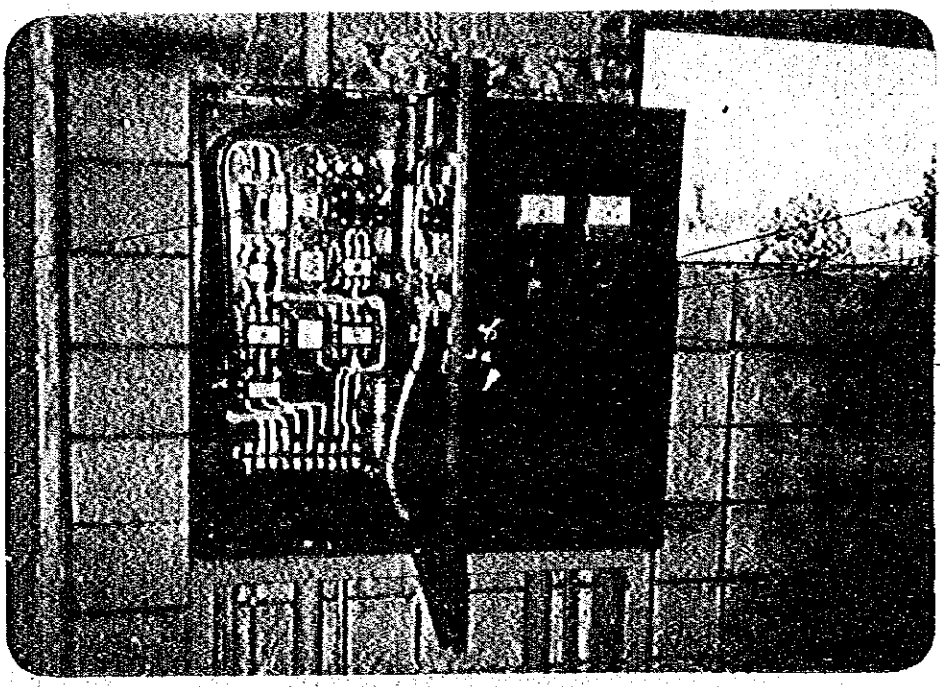
DWG. No. 1

JAPAN INTERNATIONAL COOPERATION AGENCY

ANNEX I

OPERATION MANUAL

FOR PUMP



PUMP NO. 1 PUMP NO. 2

วิธีใช้

เปิด เมนสวิทช์ (MAIN SWITCH) จุด (1)

วิธีใช้แบบอัตโนมัติ (AUTOMATIC CONTROL)

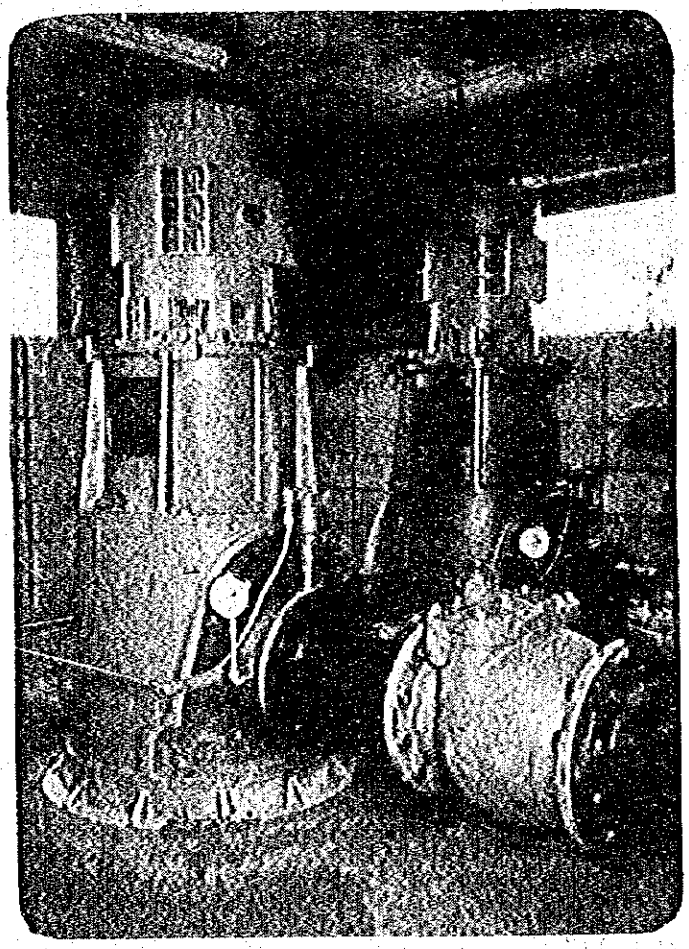
บิดสวิทช์ จุดเครื่องหมาย (2) ไปทางด้าน "A" (AUTOMATIC) ถ้าน้ำในถังต่ำกว่าระดับที่ตั้งเอาไว้ ปั๊ม (PUMP) จะทำงานตามปกติ แต่เมื่อถ้าน้ำในถังเต็มตามที่กำหนดไว้ ปั๊ม (PUMP) จะหยุดโดยอัตโนมัติ

วิธีใช้แบบมือหมุน (MANUAL CONTROL)

จะใช้สอนหลองเครื่องอย่างเดียว

1) หมุนจุดเครื่องหมาย (2) ไปทางด้าน "H" (MANUAL)
2) กดปุ่มตรงจุดเครื่องหมาย (4) ปั๊ม (PUMP) ก็จะทำงาน
3) กดปุ่มตรงจุดเครื่องหมาย (3) ปั๊ม (PUMP) ก็จะหยุดทำงาน

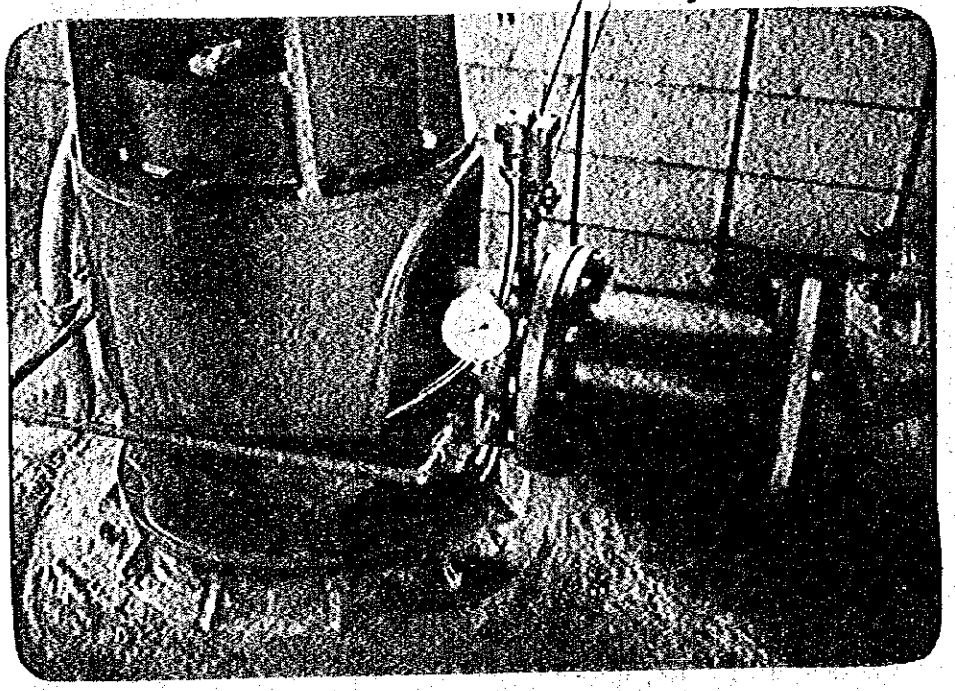
ข้อระวัง เมื่อเราจะใช้ปั๊ม NO. 1 ทำงานจะต้องบิดปุ่มเครื่องหมาย (2) ไปทาง "H" (MANUAL) หรือมิฉะนั้นก็ปิดเมนสวิทช์ (MAIN SWITCH) ของตู้ NO. 2 เสียก่อนอย่าเดินเครื่องพร้อมกัน 2 เครื่อง ปั๊ม NO.1 และปั๊ม NO.2 นั้น ควรสลับกันใช้ครั้งละ 1 เดือนตลอดไป และก่อนเปิดปั๊มนั้นอย่าลืมเปิดน้ำระบายความร้อนเสียก่อนทุกครั้ง ก่อนที่จะทดลองปั๊มหรือเปิดให้ปั๊มทำงาน หรือมิฉะนั้นก็ต้องเปิดน้ำระบายความร้อนนั้นตลอดเวลาทั้งสองเครื่อง ถ้ามิฉะนั้นแล้วจะทำให้เครื่องเสีย.

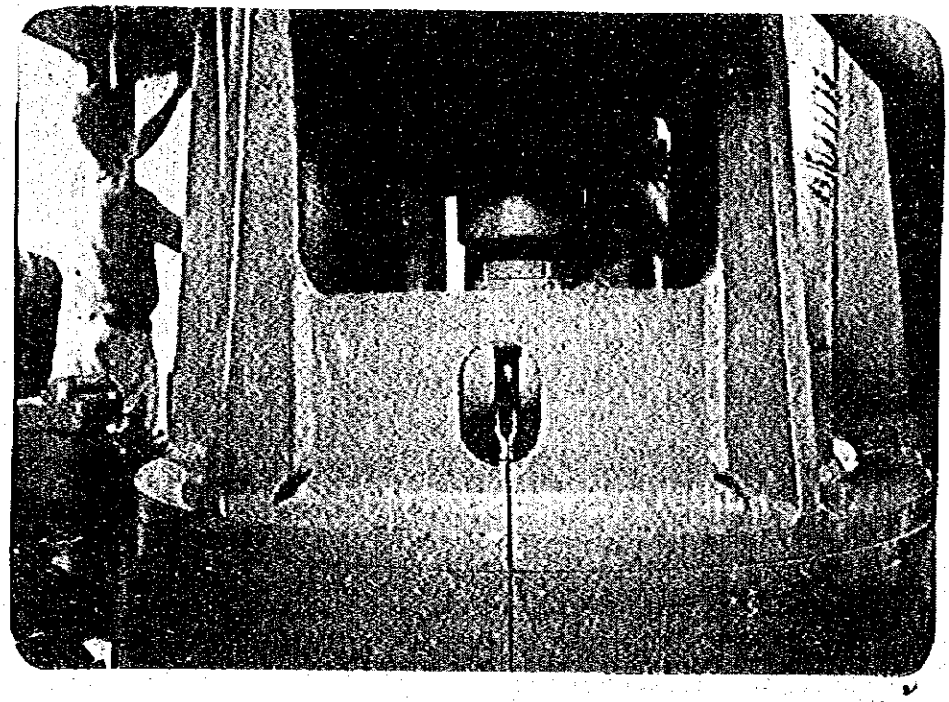


AIR RERIEF VALVE (ประตูระบายอากาศออก)

VALVE (ORDINARY TIME : OPEN)

ประตูปิดเปิดน้ำ (เวลาปกติต้องเปิดน้ำผ่าน)





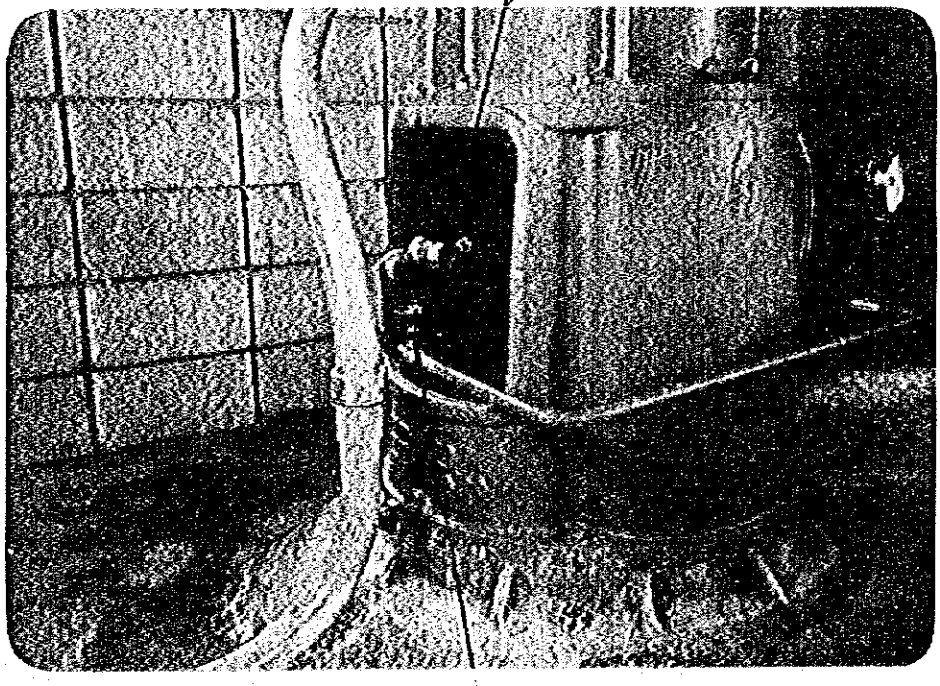
OIL GAUGE COCK (หลอดวัดน้ำมันหล่อลื่น)

(SHELL TELLUS 68)

ข้อระวัง อย่าใช้น้ำมันหล่อลื่นลดต่ำกว่าขีดแดง

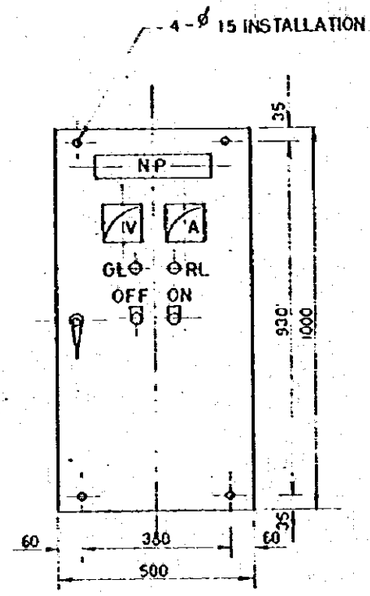
SIGHT GLASS FOR COOLING WATER

กระจกที่จะแสดงการไหลของน้ำที่จะระบายความร้อน

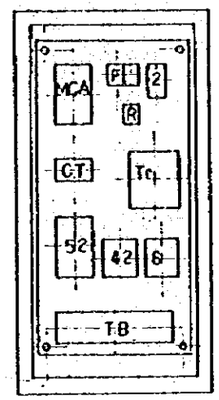


VALVE (ORDINARY TIME : OPEN)

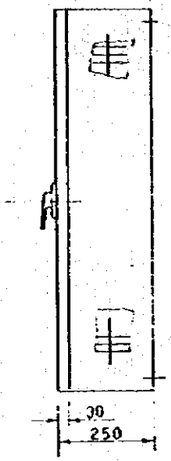
ประตูปิดเปิด (เวลาปกติต้องเปิดให้น้ำผ่านตลอดเวลา)



FRONT VIEW



INSIDE VIEW

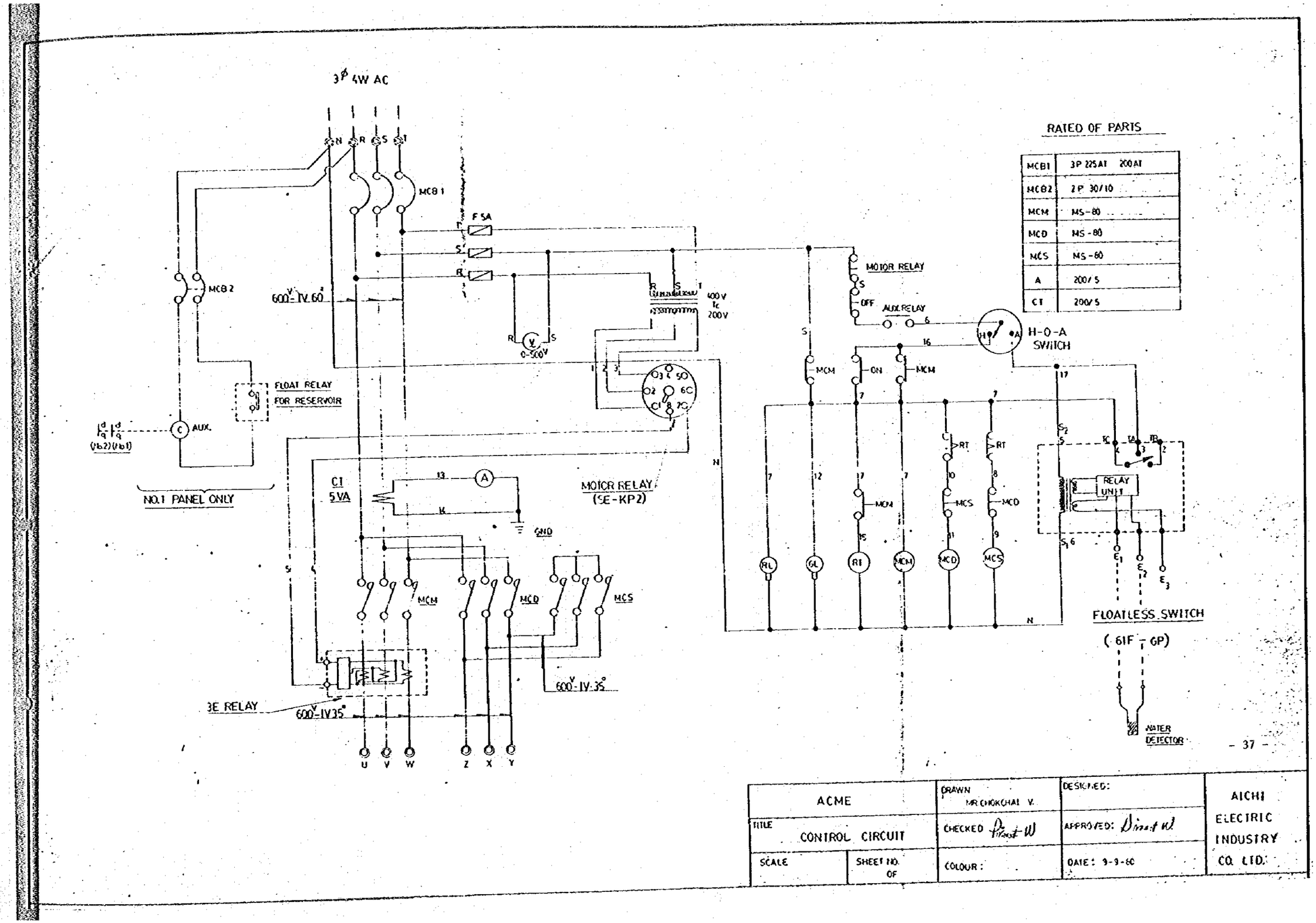


RIGHT SIDE VIEW

SYMBOL	NAME
NP	NAME PLATE OF PANEL
A	AC AMMETER
V	AC VOLT METER
RL	OPERATING DISPLAY LIGHT
GL	STOPPING DISPLAY LIGHT
MCB	CIRCUIT BREAKER
ON	START PUSH BUTTON SWITCH
OFF	STOP PUSH BUTTON SWITCH
F	FUSE
TB	TERMINAL BLOCK
52	MAIN CONTACTOR
42	OPERATING CONTACTOR
6	STARTING CONTACTOR
2	TIME RELAY
CT	CURRENT TRANSFORMER
Tr	TRANSFORMER
R	MULTIPLIER

WALL MOUNTING TYPE	
WEIGHT	Kg
Q'ty. 2	UNIT

ACME		
TITLE STARTER PANEL OUTLINE DIAGRAM		
DRAWN		AICHI ELECTRIC INDUSTRY CO., LTD.
DESIGNED		
CHECKED		
APPROVED		
COLOR		
FINISHED		
SCALE 1/10	SHEET NO.	



RATED OF PARTS

MCB1	3P 225AT 200AT
MCB2	2P 30/10
MCM	MS-80
MCD	MS-80
MCS	MS-60
A	200/5
CT	200/5

ACME		DRAWN MR CHOKCHAI V.	DESIGNED:
TITLE CONTROL CIRCUIT		CHECKED Pimat W	APPROVED: Dimat W
SCALE	SHEET NO. OF	COLOUR :	DATE : 9-9-60

AICHI ELECTRIC INDUSTRY CO. LTD.

エハラ立軸斜流ポンプ仕様書
PUMP DATA SHEET

ANNEX II

図番 DOCUMENT NO.	RA10191-84	REV. NO.	0

注文主 Customer.			
使用先 End User			
プロジェクト Project	WATER SUPPLY PROJECT FOR CAMBODIAN REFUGEE CAMPS		
ポンプ名称 Service	WATER PUMP	Ebara MFG. No.	RA10191
Job No.		Ebara Model	250 VY2M
Item No.		Page	5 in all

設計変更
ENGINEERING CHANGE

Rev. 0 / BY

Rev. 1 / BY

Rev. 2 / BY

Rev. 3 / BY

Rev. 4 / BY

配付先 DISTRIBUTION	部数 Q'TY

Prepared by 設計 DESIGN SECTION	承認 Approved by	調査 Checked by	担当 Prepared by	日付 Date
			J. Minamoto	Aug. 7 '80

EBARA CORPORATION KAWASAKI PLANT, Kawasaki Cty. Japan

株式会社 荏原製作所 川崎工場

1. 一　般　GENERAL

注文数量	NUMBER OF UNITS	2 SETS
駆動方式	DRIVING FORM	MOTOR
原動機の支給	SUPPLIER OF DRIVER UNITS	
☑モーター	MOTOR ☐使用先 END USER, ☐注文主 CUSTOMER, ☑荏原 EBARA	
☐エンジン	ENGINE ☐使用先 END USER, ☐注文主 CUSTOMER, ☐荏原 EBARA	
☐ギアーヘッド	GEAR HEAD ☐使用先 END USER, ☐注文主 CUSTOMER, ☐荏原 EBARA	
設置場所	INSTALLATION PLACE	屋内 ☑INDOOR, 屋外 ☐OUTDOOR

2. 運転条件　OPERATION CONDISION

揚液	LIQUID to be pumped	WATER
比重	SPECIFIC GRAVITY	1.0
液温	TEMPERATURE . ℃	NOR.
吐出量	RATED CAPACITY . m³/min	6
全揚程	RATED TOTAL HEAD m	32
回転数	RATED SPEED . r.p.m	S.S. 1500
許容最大吐出量	MAX. ALLOWABLE FLOW . m³/min	7.5
連続運転可能最小吐出量	MIN. DISCHARGE FLOW . m³/min	1.2
ポンプ軸馬力	PUMP SHAFT POWER . KW ~~or PS~~	42.9
原動機出力	DRIVER OUTPUT . KW ~~or PS~~	45
ポンプ効率	PUMP EFFICIENCY . %	73
回転方向	ROTATION(VIEWED RFOM DRIVER)	時計方向C.W.
水圧試験	HYDROSTATIC TEST . kgf/cm²	20

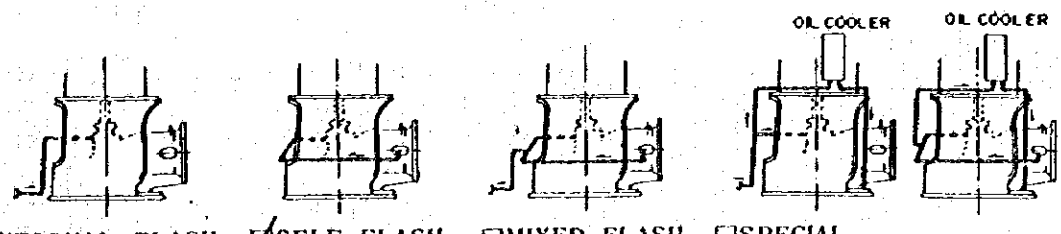
記事 NOTE, ポンプ性能判定はJIS B 8301－1976による。
Judgenent of Pumping Performance shall be made in accordance with JIS B 8301－1976.

3. ポンプの構造　CONSTRUCTION

起動最低水位	LOW WATER LEVEL (FROM GLAND LEVEL) . mm	8380
ベルマウス径	SUCTION BELL DIA. (INNER DIA) . mm	300
吐出口径	DISCHARGE CASING I.D. . mm	250
吐出フランジ	DISCHARGE FLANGE	JIS 10K F.F.
羽根車径	IMPELLER DIA. . mm	282 / 292
羽根車型式	IMPELLER TYPE	☑CLOSED, ☐SEMI-OPEN
羽根車段数	STAGE OF IMPELLER	2
ラジアル軸受形式 & 材料	RADIAL BEARING TYPE & MATERIAL	SLEEVE ☑GRAPHITE ☐BC

ラジアル軸受潤滑方式 LUBRICATING METHOD

潤滑方式系統図
LUBRICATION DIAGRAM



☐EXTERNAL FLASH, ☑SELF FLASH, ☐MIXED FLASH, ☐SPECIAL

潤滑水仕様 SPECIFICATION OF LUB. WATER	☐FRESH WATER (INDUSTRIAL WATER) ☐SEA WATER
○水　量 QUANTITY , ℓ/min	☐15～20 ☐
○水　圧 FLUSHING PRESSURE , kgf/cm²	☐1.5～3.0 ☐

スラスト軸受形式 THRUST BEARING TYPE ……BALL BEARING NO. 6314

ポンプ持ち	ギャーヘッド持ち	モーター持ち
☑MOUNTED ON PUMP,	☐MOUNTED ON GEAR HEAD	☐MOUNTED ON MOTOR

○潤滑方式 LUBRICATING METHOD ☑OIL BATH

○油　量 OIL QUANTITY PUMP:☑ 1.8ℓ, ☐ 2.8ℓ, GEAR HEAD: ☐

○油　種 OIL QUARITY PUMP:☑TURBINE #140, GEAR HEAD :☐

カップリング形式 COUPLING TYPE

☑MOTOR TO PUMP,	☑FLEXIBLE	☐RIGID		
☐ENGINE TO GEAR HEAD	☐FLFXIBLE	☐RIGID	☐UNIVERSAL SHAFT	
☐MOTOR TO GEAR HEAD	☐FLEXIBLE	☐RIGID		

機器の概算重量 APPROX. WEIGHT OF EQUIPMENTS				
☑ポンプ乾燥重量	APPOX. WEIGHT OF PUMP(DRY)		, kgf	2570
☑ポンプの液体重量	APPROX. WEIGHT OF LIQUID		, kgf	670
☑モータ重量	DITTO	OF MOTOR	, kgf	270
☐エンジン重量	DITTO	OF ENGINE	, kgf	
☐ギアーヘッド重量	DITTO	OF GEAR HEAD	, kgf	

記事NOTE

ポンプの長さLは次の寸法を意味する。

Pump Length(L)shall be called as Fig 1.

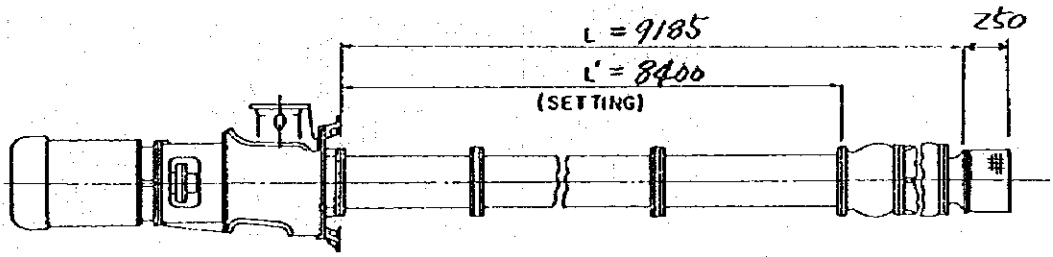


Fig 1.

4. 主要部品の材料 MATERIAL OF MAIN PARTS

品番 PART NO	部品名 NAME OT PARTS		材料名 MATERIAL	摘要 REMARKS
004 005 006	ポンプケーシング	PUMP CASINGS	FC20	
~~003~~ or 177	~~吐出ケーシング~~ or 吐出曲管	~~DISCHARGE CASING~~ or DISCHARGE BEND PIPE	FC20	
171	外管	COLUMN PIPE	FC20	
172	内管	SHAFT ENCLOSING TUBE	SGP	
032 033 034	軸	SHAFT	SUS420J1	
041	スリーブ	SLEEVE	SUS420J1	

021	羽根車	IMPELLER	BC6	
107	ライナーリング	LINER RING	BC6	
147	軸継手	MAIN COUPLING	FC20	
	液に触れるボルト	BOLTS exposed to Liquid	SS41	
	ナット	NUTS		
	~~ワッシャ~~	~~WASHERS~~		

5. 塗装 PAINTING

○接液部 PART exposed to Liquid

下塗 ☐PRIMER Zinc Chromate Primer　　上塗 ☐FINISH Acrylic Alkyd Resin base (DNT. SUBOID Z#10)　　COLOR ☐塗装色 ——

○地上部 PART upper BASE

下塗 ☐PRIMER Zinc Chromate Primer　　上塗 ☐FINISH Alkyd Resin Enamel　　COLOR ☐塗装色 2.5PB4/2

6. 付属品 ACCESSORIES

○印付属致します。　○ shall be supplied by EBARA

○	ベース BASE	2
○	基礎ボルト ANCHOR BOLT	2 SETS
○	軸継手 COUPLING	2 SETS
○	連成計(配管共) COMPOUND GAUGE (with piping instrument)	2 SETS
○	相フランジ (250 φ) ACCESSORY FLANGE ☑ JIS 10 K, ☐ANSI LBS	6
	仕切弁 (φ) SLUITH VALVE ☐ JIS K, ☐ANSI LBS	
○	逆止弁 (250 φ) CHECK VALVE ☑ JIS 10 K, ☐ANSI LBS	2
○	空気抜弁(配管共) AIR EXHAUST VALVE (with piping instrument)	2 SETS
○	分解工具 TOOLS	2 SETS
○	吸込ストレーナ SUCTION STRAINER	2
○	潤滑配管 PIPING FOR LUBRICATION 内訳 (THE ITEMS) ☐フローリレー FLOW RELAY　☐ストレーナ STRAINER ☐電磁弁 SOLENOID VALVE ☑ストップバルブ BALL VALVE ☐チェッキバルブ CHECK VALVE ☑フローサイト FLOW SIGHT ☑配管小物部品 PIPING & FITTING	2 SETS
	その他	

記事 NOTE

補機操作電源 ~~AC V Hz, DC V~~

(ELECTRIC RESOURCE BY OTHERS)

7. 予備品(　　), SPARE PARTS LIST

○印付属致します。　○ shall be supplied by EBARA

	品番 PART NO	部品名 NAME OF PART	個数 QUANTITY(%)
	119	グランドパッキン	GLAND PACKING	
	117	ガスケット	GASKET	
	124	オイルシール	OIL SEAL	
	115	Oリング	O. RING	
	277	Vリング	V. RING	
	123	カップリングゴム	COUPRING RUBBER	
	056	玉軸受	BALL BEARING	
	107	ライナーリング	CASE WEARING RING	
	111	メカニカルシール	MECHANICAL SEAL	
	041	スリーブ	SLEEVE	
	052	スリーブ軸受	SLEEVE BEARING	

8. 提出書類, DRAWINGS

○印の図面は提出されます。
○DWG shall be prepared by EBARA.

	図名 TITLE	図番 DOCUMENT ON	提出予定日 SCH. DATE	提出日 ACT. DATE
○	外形図 GENERAL VIEW DWG	RA10191-81		
○	断面図 SECTIONAL VIEW DWG	RA10191-82 SB-7501614		
○	計画曲線 PERFORMANCE CURVE	RA10191-83		
○	取扱説明書 INSTRUCTION MANUAL			

50 Hz

PERFORMANCE CURVE

(ESTIMATED)

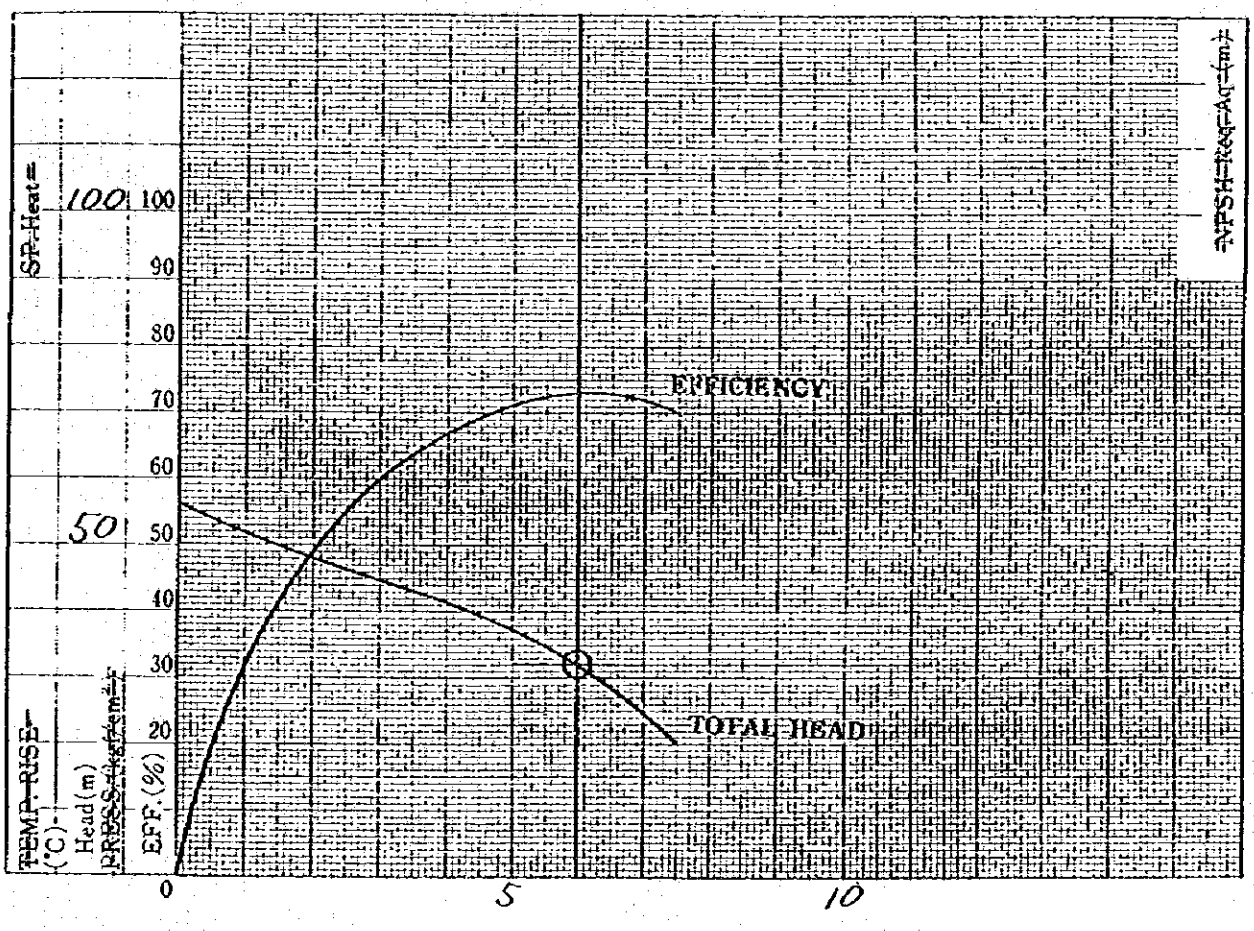
ITEM NO.

FOR MESSRS: WATER SUPPLY PROTECT FOR CAMBODIAN REFUGEE CAMPS

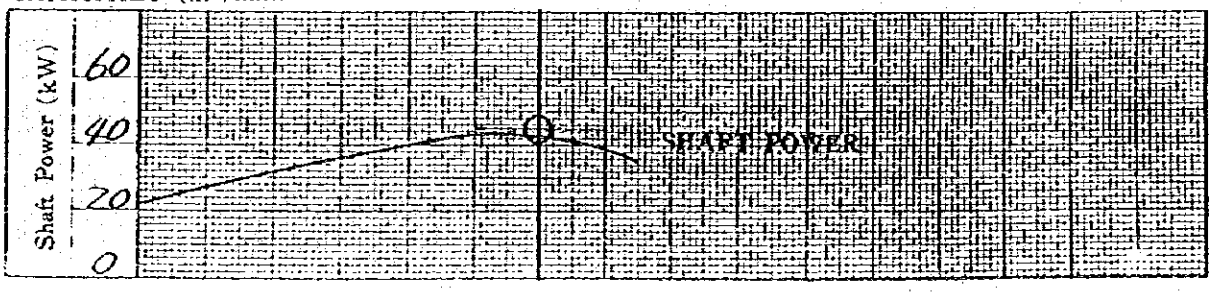
MFG.NO: R A 10191 TYPE: 250VYZM

RATING: 6 m³/min × 32 m × 5.5 rpm × 1500 × 45 kW

Liquid Handled WATER
S.G. 1.0
Temp. NOR.
Vis. —



CAPACITIES (m³/min)

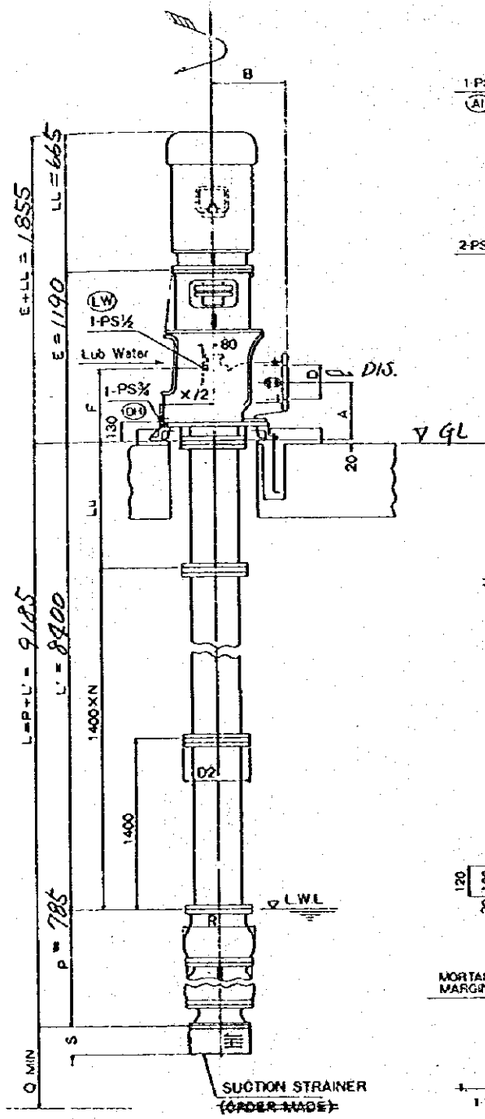


Date: Aug. 7 '80

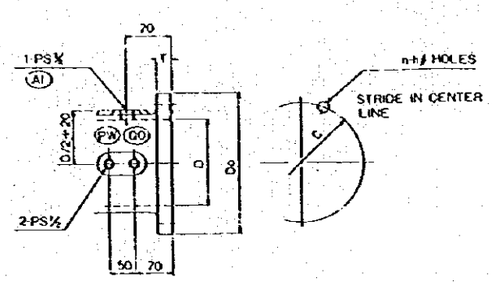
EBARA CORPORATION

J. Miyazawa

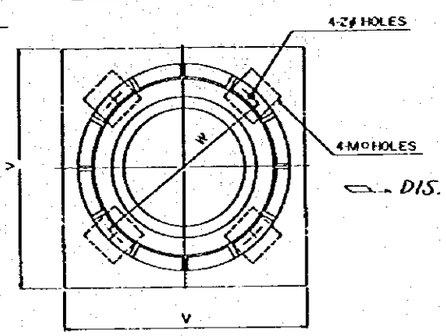
DWG.NO. RA10191-83

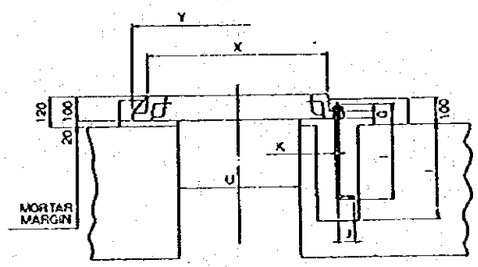


DETAIL OF DISCHARGE FLANGE



DETAIL OF FOUNDATION





1. DEMAND FOR LUBRICATING SYSTEM
   1-1 In case of external lubricating way, prepare suitable fresh water or clear industrial water for lubricating system as follows:
   At the entrance of the stuffing box
   Quantity : 15 to 20 ℓ/min.
   Pressure : 1.5 to 3.0 kgf/cm²
   Temperature : less 40°C
   1-2 Connect the lubricating equipment on the part, PW, LW shown in the GENERAL ARRANGEMENT.
2. DEMAND FOR LUBRICATING OIL OF THRUST BALL BEARING
   Kind of oil : TURBINE #140 (or the same quality as)
   Quantity : Frame no. 240 ····· 1.8 liter
   ~~250 2.3 liter~~
   Supply oil to the red line on the oil level gauge after taking off the air breather.
3. EXPLANATION OF SIGNS PRINTED IN THE GENERAL ARRANGEMENT.

SIGNS	SIZE	CONNECTING PLACE	PARTS at the shipment
PW	PS1/2	Outlet of self lubricating water	~~fitting~~ Piping
LW	PS1/2	Entrance of lubricating water	Piping ~~outfitting~~
GO	PS1/2	Outlet of compound gauge	Piping ~~outfitting~~
AI	PS3/4	Outlet of air breather	Air breather ~~outfitting~~
OH	PS3/4	Entrance of drainage	3/4B UNION

4. The tolerance for the levelness of pump is less than 5/1000mm per 1m.

NOZZLE	FRAME NO.	DIMENSIONS OF PUMP								BASE PLATE				FOUNDATION BOLT			FOUNDATION				FLANGE (JIS 10K)				
		A	B	D2	E	F	R	S	Q	X	Y	G	Z	ℓ	J	K	U	V	W	M	Do	C	T_1	Tj	n-h
150	FF240S	350	420	320	1090	462	285	160	250	680	800	30	24	400	80	20	500	900	750	150	280	240	26	22	8-23
150	FF240L	400	420	320	1190	535	285	160	250	740	870	30	24	400	80	20	500	1000	820	150	280	240	26	22	8-23
200	EE240S	350	420	400	1090	462	422	200	300	680	800	30	24	400	80	20	500	900	750	150	330	290	26	22	12-23
200	GG240S	350	420	400	1090	462	450	200	300	680	800	30	24	400	80	20	500	900	750	150	330	290	26	22	12-23
200	GG240L	400	500	400	1190	535	450	200	300	740	870	30	24	400	80	20	500	1000	820	150	330	290	26	22	12-23
200	GG260	400	500	400	1260	535	450	200	300	920	1070	35	26	500	90	22	500	1300	1020	170	330	290	26	22	12-23
250	CE240T	350	420	445	1090	462	440	250	400	680	800	30	24	400	80	20	500	900	750	150	400	355	30	24	12-25
250	CE240S	350	420	445	1090	462	440	250	400	680	800	30	24	400	80	20	500	900	750	150	400	355	30	24	12-25
250	CG240T	350	420	445	1090	462	440	250	400	680	800	30	24	400	80	20	500	900	750	150	400	355	30	24	12-25
250	GG240S	350	420	445	1090	462	450	250	400	680	800	30	24	400	80	20	500	900	750	150	400	355	30	24	12-25
250	GG240L	400	500	445	1190	535	450	250	400	740	870	30	24	400	80	20	500	1000	820	150	400	355	30	~~24~~	12-25
250	GG260	400	500	445	1260	535	450	250	400	920	1070	35	26	500	90	22	500	1300	1020	170	400	355	30	24	12-25
300	BC240N	400	500	445	1190	535	530	300	500	740	870	30	24	400	80	20	600	1000	820	150	445	400	32	24	16-25
300	BC240M	400	500	445	1190	535	530	300	500	740	870	30	24	400	80	20	600	1000	820	150	445	400	32	24	16-25
300	BB240N	400	500	445	1190	535	530	300	500	740	870	30	24	400	80	20	600	1000	820	150	445	400	32	24	16-25
300	GF240L	400	500	445	1190	535	484	300	500	740	870	30	24	400	80	20	600	1000	820	150	445	400	32	24	16-25
300	GF260	400	500	445	1260	535	484	300	500	920	1070	35	26	500	90	22	600	1300	1020	170	445	400	32	24	16-25
300	GG240L	400	500	445	1190	535	484	300	500	740	870	30	24	400	80	20	600	1000	820	150	445	400	32	24	16-25
300	GG260	400	500	445	1260	535	484	300	500	920	1070	35	26	500	90	22	600	1300	1020	170	445	400	32	24	16-25

T_1 : GRAY IRON CASTING
~~T_1 : STAINLESS STEEL~~

COLUMN LENGTH		
L'	N	Lu
1400	1	0
1800	1	400
2200	1	800
2600	1	1200
2800	2	00
3200	2	400
3600	2	800
4000	2	1200
4200	3	0
4600	3	400
5000	3	800
5400	3	1200
5600	4	0
6000	4	400
6400	4	800
6800	4	1200
7000	5	0
7400	5	400
7800	5	800
8200	5	1200
8400	6	0
8800	6	400
9200	6	800
9600	6	1200

TYPE	FRAME NO.	P	PUMP WEIGHT kg	WATER WEIGHT kg
150VY M	FF240S	362	630+(0.08×L')	30+(0.03×L')
150VY IIM	FF240S	534	665+(0.08×L')	30+(0.03×L')
150VY IIIM	FF240S	706	700+(0.08×L')	30+(0.03×L')
150VY IVM	FF240S	878	735+(0.08×L')	30+(0.03×L')
150VY VM	FF240L	878	835+(0.08×L')	30+(0.03×L')
150VY VIM	FF240S	1050	770+(0.08×L')	30+(0.03×L')
150VY VIM	FF240L	1050	870+(0.08×L')	30+(0.03×L')
150VY VIIM	FF240L	1222	905+(0.08×L')	30+(0.03×L')
150VY VIIIM	FF240L	1394	940+(0.08×L')	30+(0.03×L')
150VY IXM	FF240L	1556	975+(0.08×L')	30+(0.03×L')
150VY IXM	FF240L	1738	1010+(0.08×L')	30+(0.03×L')
200VZ M	EE240S	480	620+(0.14×L')	40+(0.05×L')
200VY M	GG240S	465	620+(0.14×L')	40+(0.05×L')
200VY M	GG240L	465	880+(0.14×L')	40+(0.05×L')
200VY IIM	GG240S	735	740+(0.14×L')	60+(0.05×L')
200VY IIM	GG240L	735	1010+(0.14×L')	60+(0.05×L')
200VY IIIM	GG260	735	1460+(0.15×L')	60+(0.05×L')
200VY IIIM	GG260	1005	1560+(0.15×L')	80+(0.05×L')
200VY IVM	GG260	1275	1650+(0.15×L')	110+(0.05×L')

TYPE	FRAME NO.	P	PUMP WEIGHT kg	WATER WEIGHT kg
250VZ M	CE240T	580	720+(0.17×L')	60+(0.07×L')
250VZ M	CE240S	580	720+(0.17×L')	60+(0.07×L')
250VZ M	CG240T	580	730+(0.17×L')	60+(0.07×L')
250VY M	GG240S	485	710+(0.17×L')	50+(0.07×L')
250VY M	GG240L	485	990+(0.17×L')	50+(0.07×L')
250VY IIM	GG240L	785	1140+(0.17×L')	80+(0.07×L')
250VY IIM	GG260	785	1530+(0.19×L')	80+(0.07×L')
250VY IIIM	GG260	1085	1680+(0.19×L')	100+(0.07×L')
250VY IVM	GG260	1385	1840+(0.19×L')	130+(0.07×L')
300VZ M	BC240N	690	1090+(0.17×L')	90+(0.07×L')
300VZ M	BC240M	690	1090+(0.17×L')	90+(0.07×L')
300VZ M	BB240N	690	1100+(0.17×L')	90+(0.07×L')
300VY M	GF240L	570	1040+(0.17×L')	60+(0.07×L')
300VY M	GF260	570	1440+(0.19×L')	60+(0.07×L')
300VY M	GG240L	570	1040+(0.17×L')	60+(0.07×L')
300VY M	GG260	570	1430+(0.19×L')	60+(0.07×L')
300VY IIM	GG260	900	1620+(0.19×L')	100+(0.07×L')
300VY IIIM	GG260	1230	1820+(0.19×L')	140+(0.07×L')

APPROXIMATE WEIGHT	
PUMP	2570 kg
WATER	670 kg
MOTOR	270 kg

REVISION HISTORY		
⚠		
⚠		
⚠		

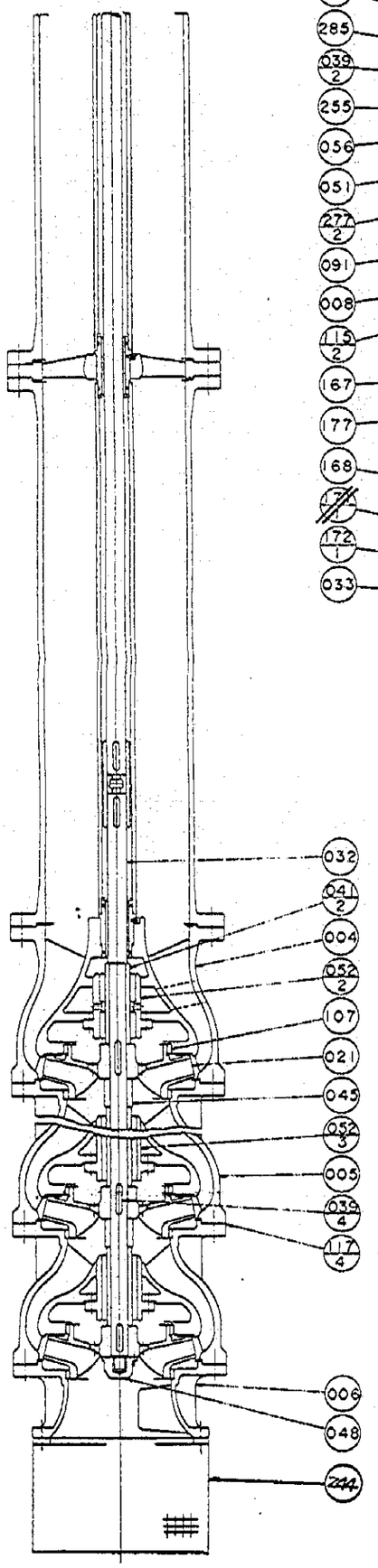
(代1,481) 80—6

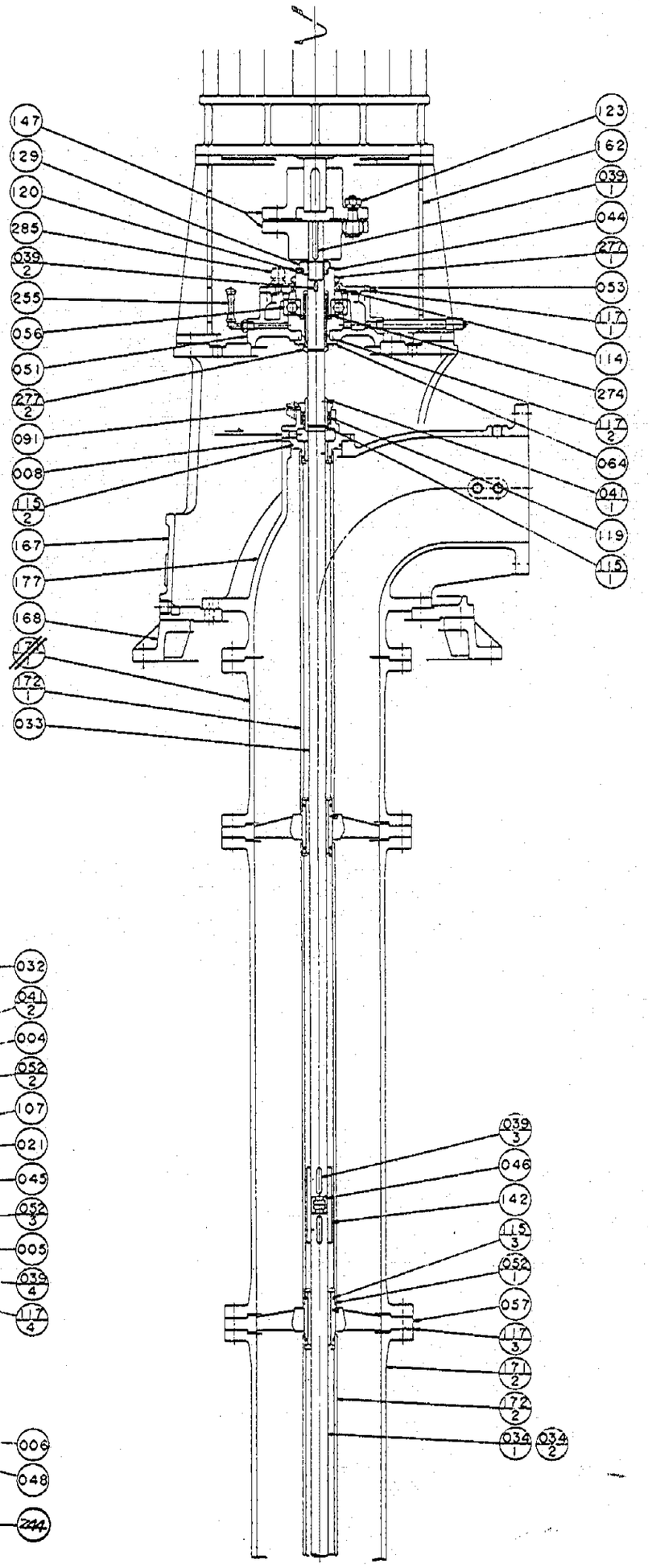
FOR MESSRS : WATER SUPPLY PROJECT FOR CAMBODIAN REFUGEE CAMPS — ITEM NO.

MFG. NO.	RA10191	PUMP TYPE	250VY2M	SETS	2
CAPACITY	HEAD	R.P.M.	DRIVER O.P.	REMARKS	
6 m³/m	32 m	S.S. 1500	45 kW		

EBARA CORPORATION — DRAWING NO. RA10191-81

J. Shinoda





RA10191 250 VY 2M

TYPE VYM WATER LUBE

EBARA CORPORATION | DWG. NO. | S8–7501614

(光1009) 75–5

NO. 3

PART. No. / L'	034-1	034-2	033-3	046 142	052-1	057 171-2 172-2	115-3	117-3	171-1
1400~2600(1400)	0	0	2	1	2	1	5	4(3)	1(0)
2800~4000(2800)	0	1	4	2	3	2	7	6(5)	1(0)
4200~5400(4200)	1	0	4	2	4	3	9	8(7)	1(0)

PART. No. / L'	034-1	034-2	033-3	046 142	052-1	057 171-2 172-2	115-3	117-3	171-1
5600~6800(5600)	1	1	6	3	5	4	11	10(9)	1(0)
7000~8200(7000)	2	0	6	3	6	5	13	12(11)	1(0)
8400~9600(8400)	2	1	8	4	7	6	15	14(13)	1(0)

PART NO.	NAME OF PART		MATERIAL (JIS)	NO. FOR 1 SET	REMARKS
244	SUCTION STRAINER		SS41 & SUS304	1	
285	AIR BREATHER	:空気抜	POLY CARBONATE	1	
277-2	"V" RING	:"V"リング	RUBBER	1	
277-1	"V" RING	:"V"リング	RUBBER	1	
274	SNAP RING	:止め輪	SK5	1	
255	LEVEL GAUGE	:油面計	Bs & ACRYL	1	
177	DISCHARGE BEND PIPE	:吐出曲管	FC20	1	
172-2	INTERMEDIATE TUBE	:中間内管	SGP	6	
172-1	UPPER TUBE	:上部内管	SGP	1	
171-2	INTERMEDIATE COLUMN PIPE	:中間外管	FC20	6	
~~171-1~~	~~UPPER COLUMN PIPE~~	~~:上部外管~~	~~FC20~~	~~1~~	
168	BASE	:ベース	FC20	1	
167	PEDESTAL	:軸受台	FC20	1	
162	MOTOR FRAME	:モータ台	SS41	1	
147	FLEXIBLE SHAFT COUPLING	:軸継手	FC20	1 SET	
142	SOCKET TYPE SHAFT COUPLING	:ソケットカップリング	SUS420J1	4	
129	SHAFT NUT	:軸頂ナット	SS41	1	
123	COUPLING BOLT	:軸継手ボルト	SS41 & RUBBER	8	<110KW 10 / 90KW 8
120	SET BIS	:セットビス	~~SCM~~ SCM435	1	
119	GLAND PACKING	:グランドパッキン	VALQUA #134	3	
117-4	GASKET	:ガスケット	VALQUA #1501	2	T = 0.5 n
117-3	GASKET	:ガスケット	VALQUA #1501	13	T = 0.5
117-2	GASKET	:ガスケット	VALQUA #1501	1	T = 0.5
117-1	GASKET	:ガスケット	PAPER	1	T = 0.2
115-3	"O" RING	:"O"リング	RUBBER	15	G - 65 <(40) 65 (60) 90
115-2	"O" RING	:"O"リング	RUBBER	1	G - 115
115-1	"O" RING	:"O"リング	RUBBER	1	
114	OIL SEAL	:オイルシール		1	TB ~~S011513~~ <(40) 9011513 (60)12015014
107	LINER RING	:ライナリング	~~BC1~~ BC6	4	2n
091	GLAND	:パッキン押え	BsF	1	
064	OIL RESERVOIR	:油筒	SS41 & SGP	1	
057	INTERMEDIATE BEARING SUPPORT	:中間軸受支え	FC20	6	
056	BALL BEARING	:玉軸受		1	# 6314 <(40)6314 (60)6320
053	BEARING COVER	:軸受カバー	FC20	1	
052-3	SLEEVE BEARING - CASING	:ケーシング用軸受	FC20 & GRAPHITE	1	n-1
052-2	SLEEVE BEARING - TOP CASING	:上部ケーシング用軸受	FC20 & GRAPHITE	1	
052-1	SLEEVE BEARING - INTERMEDIATE	:中間軸受	FC20 & GRAPHITE	7	
051	BEARING CASING	:軸受ケーシング	FC20	1	
048	IMPELLER NUT	:羽根車ナット	SUS316	1	
046	SPLIT RING	:割リング	SUS420J1	4 SETS	
045	DISTANCE PIECE	:ディスタンスピース	SUS420J1	1	n-1
044	BEARING ADAPTER	:軸受アダプタ	SS41	1	
041-2	SHAFT SLEEVE	:軸スリーブ	SUS420J1	2	n
041-1	PACKING SLEEVE	:パッキン用スリーブ	SUS420J1	1	
039-4	KEY	:キー	SUS316	2	n
039-3	KEY	:キー	SUS316	8	
039-2	KEY	:キー	S45C	1	
039-1	KEY	:キー	S45C	1	
034-2	INTERMEDIATE SHAFT - LOWER	:下部中間軸	SUS420J1	1	L = 1400
034-1	INTERMEDIATE SHAFT	:中間軸	SUS420J1	2	L = 2800
033	UPPER SHAFT	:上部軸	SUS420J1	1	
032	PUMP SHAFT	:ポンプ軸	SUS420J1	1	
021	IMPELLER	:羽根車	BC6	2	n
008	STUFFING BOX	:スタフィングボックス	FC20	1	
006	BOTTOM CASING	:下部ケーシング	FC20	1	
005	INTERMEDIATE CASING	:中間ケーシング	FC20	1	n-1
004	TOP CASING	:上部ケーシング	FC20	1	

FOR MESSRS. WATER SUPPLY PROJECT FOR CAMBODIAN REFUGEE CAMPS

ITEM NO.

MFG. NO. RA10191 | PUMP TYPE 250VYZM | SETS 2

EBARA CORPORATION | DRAWING NO. RA10191-82

(光1,447)79-12 GENERAL SECTION VIEW DWG. NO. S8-7501614 MODEL 2 VZ 多分弁