C O N T E N T S

1 . INTRODUCTION

This report presents the outcome of the site investigation for the proposed construction sit of workshops in Sana'a - Nuqum area .

1.1 Purpose of investigation

An adequate subsurface investigation is an essential preliminary to the execution of this project . In general , sufficient information must be obtained about the physical and mechanical properties of the soil formation in order to make a safe and economic design , and to avoid any difficulties during construction .

1.2 Scope of work

The principal objectives of this investigation are :

1 / To determine the sequence , thickness , lateral extent of the soil strata and the level of the bedrock ;

2 / To obtain representative samples of the soils and rocks for identification and classification and then for use in the laboratory testing to determine the relevant soil parameters ;

3 / To identify the groundwater conditions , the existence of cavities , discontinuities , etc. ;

4 / To make useful conclusions and recommendations for foundations design and construction .

These objectives were accomplished through a close cooperation between soil engineer , geologist and the technical staff of the CEC's Laboratories Department .

2 . PROJECT DESCRIPTION AND SITE LOCATIOIN

The proposed structure is a steel framed workshops . The site is located in the city of Sana'a , in the camp of the General Corporation for Bridges and Roads - Nuqum area .

No high voltage , electrical or telephone poles , water pipes were encountered while drilling within the proposed borehole locations .

3 . FIELD EXPLORATION

3.1 Drilling

To accomplish the objectives of the investigation , one trial pit was excavated to a depth of 2.5 m and four boreholes (3x3m , 1x25 m) were drilled .

Drilling was executed using the CEC's drilling rig (Type - Mobile Drill , Model B-34) . The Rotary air flush method was used for drilling in the four boreholes . The trial pit was excavated using a backhoe .

3.2 Sampling

Due to the coarse gravelly and bouldery nature of materials encountered in the drilled boreholes , it was difficult to obtain undisturbed samples . Disturbed soil samples required for classification and determination of the important soil parameters were collected in each borehole at various depths and at each lithological change of the strata .

3.3 Subsurface conditions

The surface materials encountered in the drilled boreholes (0-2m approx.) are consisted mostly of sandy silty gravel (medium moist , medium dense).

The formation beneath this level is consisted of hard to very hard basalt boulders of black colour. At the depth of 21-23 m in borehole No.4 , a soft formation of sand of white colour was encountered .

Detailed description of soils encountered is presented on borehole logs (See Appendix) .

No groundwater was detected within the depth of drilling .

4 . FIELD AND LABORATORY TESTING

4.1 Field testing

Upon the request of the Client , the Standard Penetration Test (SPT) was performed at 1.0m intervals in the drilled boreholes to obtain relative densities of the encountered soils . The results of this test (N-values) are shown on the borehole logs , and the interpretation of these results is given in the legend to the borings (See Appendix) .

Field density test (ASTM D1556) was performed in the trial pit at the depth of 2.0 and 2.5 m . The result of these tests are attached .

4.2 Laboratory testing

The following tests were performed to evaluate the engineering properties of the soils encountered in the drilled boreholes :

1. Natural moisture content - According to the British Standard BS 1377 : 1975 .
2. Grain size analysis - BS 1377 : 1975 .
3. Liquid limit - ASTM D 423 .
4. Plastic limit - ASTM D 424 .
5. Specific gravity - ASTM D 854 .

Results of these tests are tabulated in tables 1 , 2 , and 3 in the appendix .

5 . CONCLUSIONS AND RECOMMENDATIONS

According to the field and laboratory investigations , subsurface conditions and the engineering analysis , the following recommendations can be made :

5.1 Depth and type of foundations

The foundations depth may vary according to the actual loads going to the ground from the superstructure . However , it is recommended that foundations of the proposed structures be laid on the depth not less than 1.0 m from the existing ground level .

The recommended foundation bed is suitable to support structures loads on individual and strip footings .

5.2 Bearing capacity

Since no undisturbed samples were collected and no strength tests were carried out , the bearing capacity of encountered soils can be estimated depending on the results of the Standard Penetration Test (SPT) and from the building codes depending on the soils classification .

Considering N - value = 40-50 blows (D = 0-3 m) , we obtain the allowable bearing pressure between 4.5-5.0 kg/sq.cm for width of footing = 1-2 m .

According to the British Code of Practice CP 2004 : 1972 , the bearing capacity of medium dense sandy gravel is between 2-6 kg/sq.cm (See Appendix) .

NOTE : The above recommendations are solely based on the information available from the investigated boreholes on the date of carrying out the investigation .

6 . REFERENCES

١ . دستور البناء الوطني الاردني - كود استطلاع الموقع . وزارة الاشغال العامة . عمان - ١٩٨٥ .

2. British Standard BS 5930 = 1981. Site Investigations - BSI, London.

3. British Standard 1377 (1975) : Methods of testing soils for civil engineering purposes. BSI, London.

4. Tomlinson M. J. Foundation Design and Construction. 4th ed. London.

5. Peck R., Hanson W., Thornburn T. Foundation Engineering. Willey and Sons, 1980.

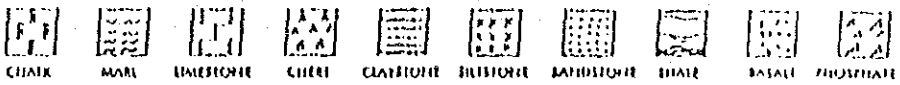
6. USSR Building Code of Practice (SNIP II - 17-77). Moscow, 1978.

7. El-Hansy R. Solved Problems in Soil Mechanic s.
Al-Rateb Publishers, Beirut, 1990.

7. APPENDIX

LEGEND TO BORING LOGS

SYMBOLS FOR COMMON SOIL AND ROCK TYPES



SAMPLER TYPE

Sample Disturbance :	*Disturbed*	*Relatively Undisturbed*	*Disturbed*	*Undisturbed*	*Relatively Undisturbed*	*Relatively Undisturbed*	*Disturbed*

S. P. T. (Blows/30 cm) : The number of blows, in the Standard Penetration test, required to drive a five centimeter diameter split tube sampler a distance of thirty centimeters using sixty five kilogramme weight falling seventy six centimeters.

Coarse Grained Soils

N-value	*Relative density*
Below 4	Very loose
4–10	Loose
10–30	Medium
30–50	Dense
Over 50	Very dense

Fine Grained Soils

N-value	*Consistency*	*Approximate unconfined compressive strength*	
		U.S. unit/ft²	*Approx. equivalent in kN/m²*
Below 2	*Very soft*	Below 0.25	Below 25
2–4	*Soft*	0.25–0.50	25–50
4–8	Medium	0.50–1.00	50–100
8–15	Stiff	1.00–2.00	100–200
15–30	Very stiff	2.00–4.00	200–400
Over 30	Hard	Over 4.00	Over 400

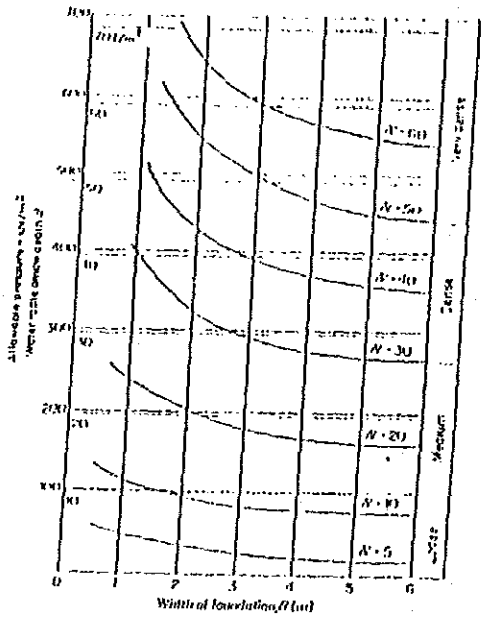
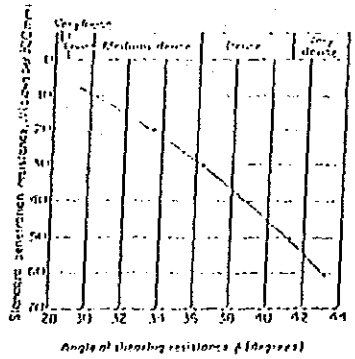
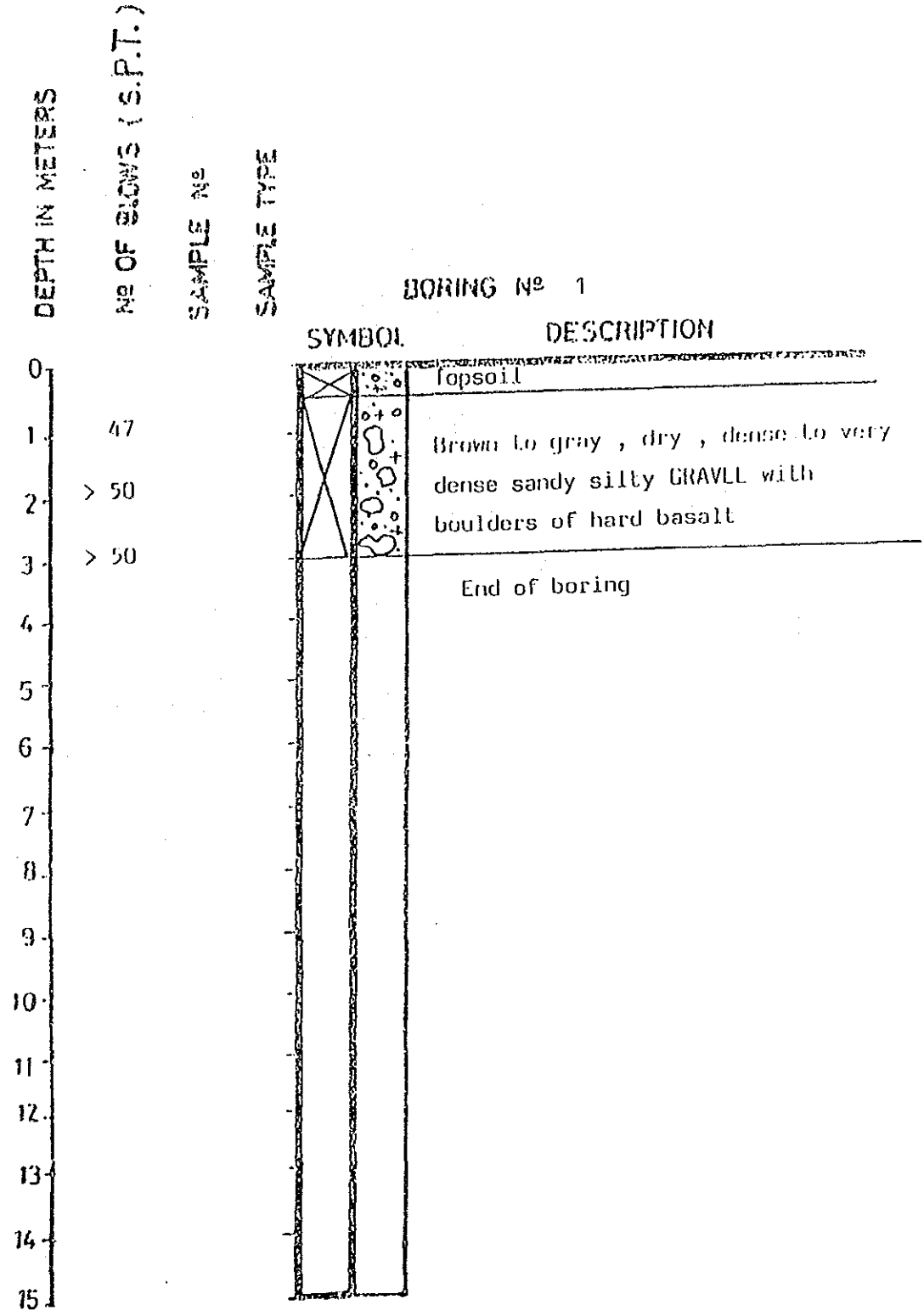


Chart for estimating allowable bearing pressure for foundations in sand on basis of results of standard penetration test (Terzaghi and Peck). *N* values are shown in blows per 300 mm.



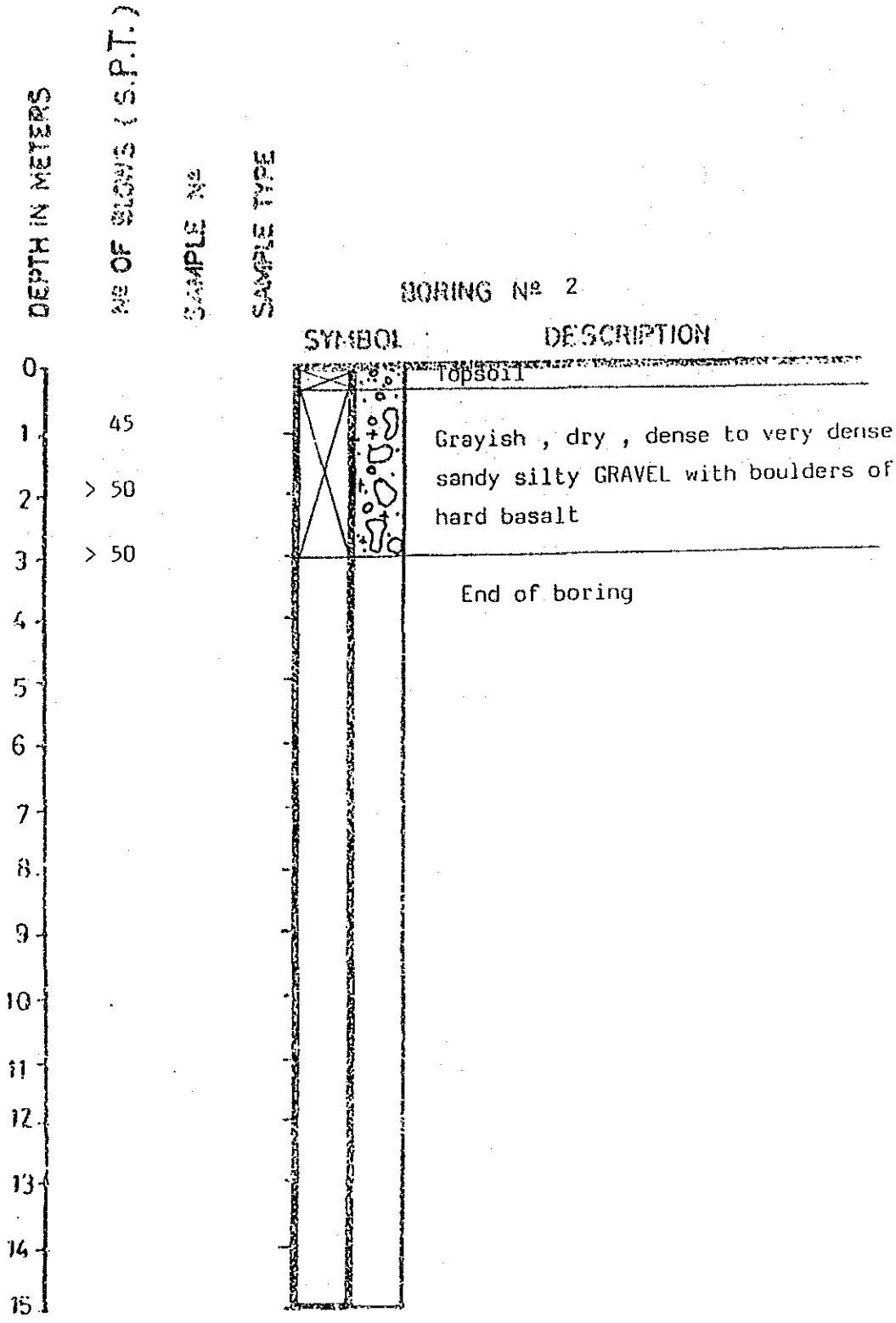
Determination of angle of shearing resistance of granular soils from in-situ tests. Relationship between standard penetration resistance (*N* values) and angle of shearing resistance of granular soil (after Peck, Hanson, and Thornburn).



KEY :

- = UNDISTURBED' SAMPLE
- = STANDARD PENETRATION TEST PERFORMED AND DISTURBED SOIL SAMPLE OBTAINED
- = DISTURBED SOIL SAMPLE OBTAINED ONLY WITHOUT PERFORMING STANDARD PENETRATION TEST

LOG OF BORING



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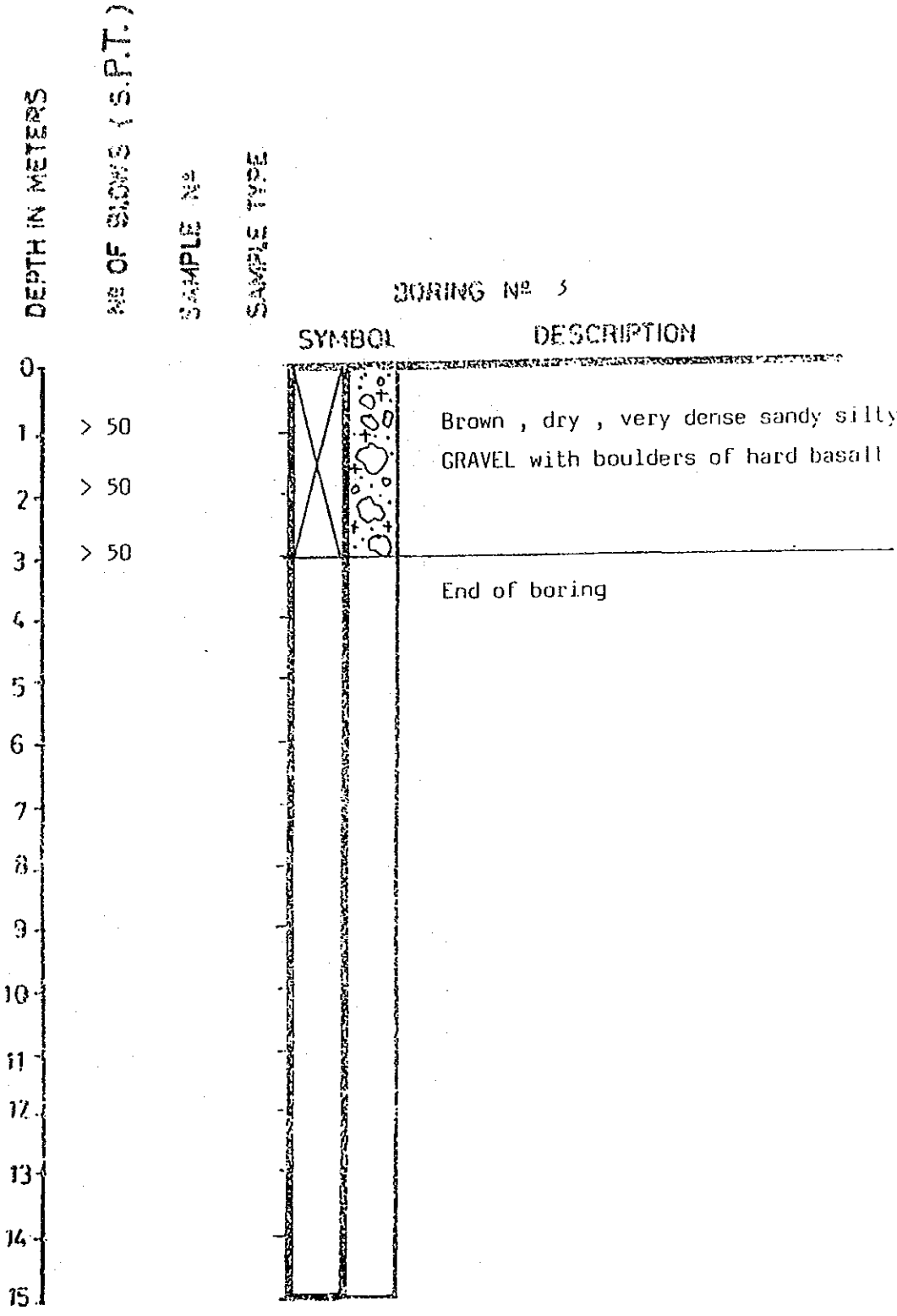
- -- DISTURBED SOIL SAMPLE OBTAINED ONLY WITHOUT PERFORMING STANDARD PENETRATION TEST

LOG OF BORING



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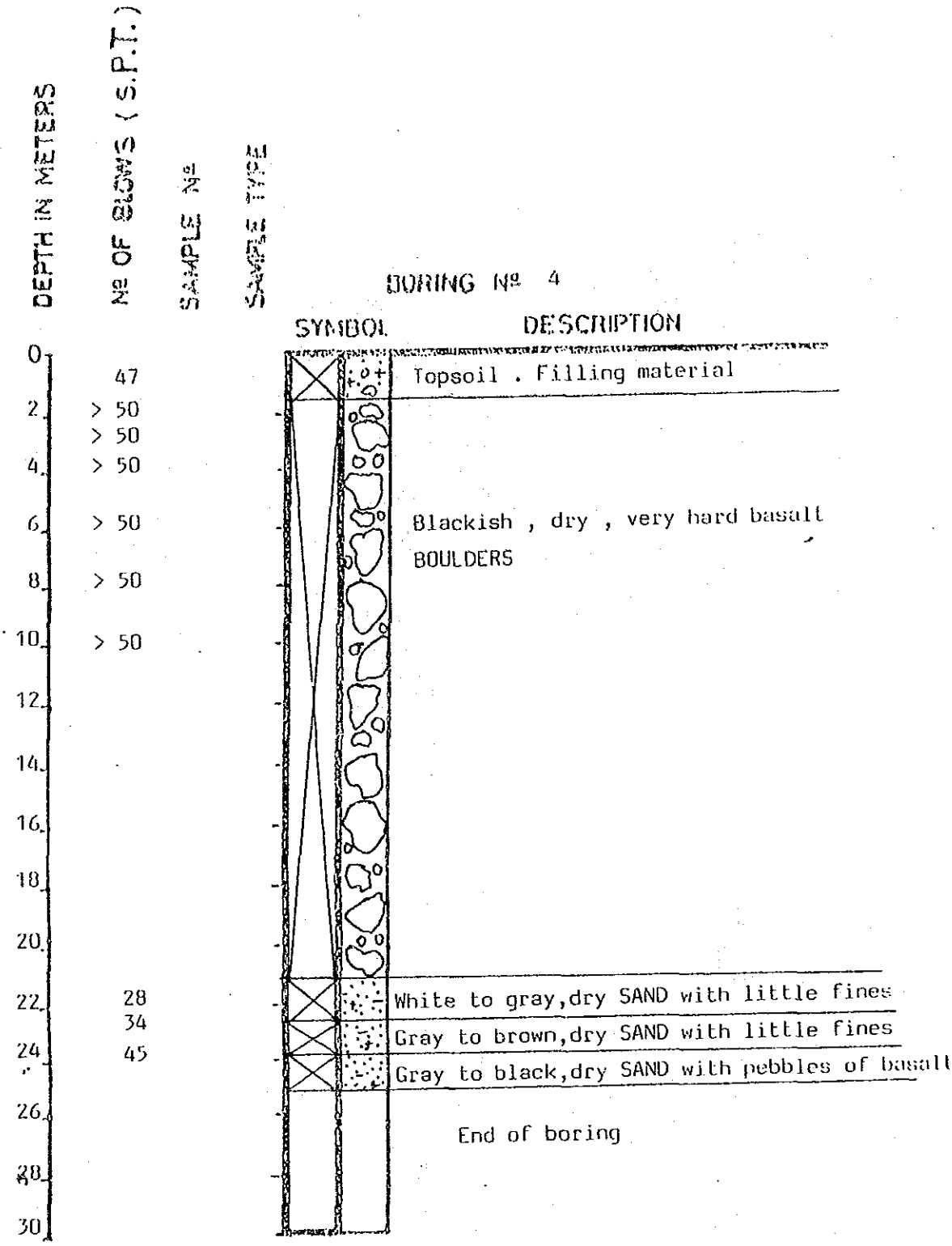
LOG OF BORING



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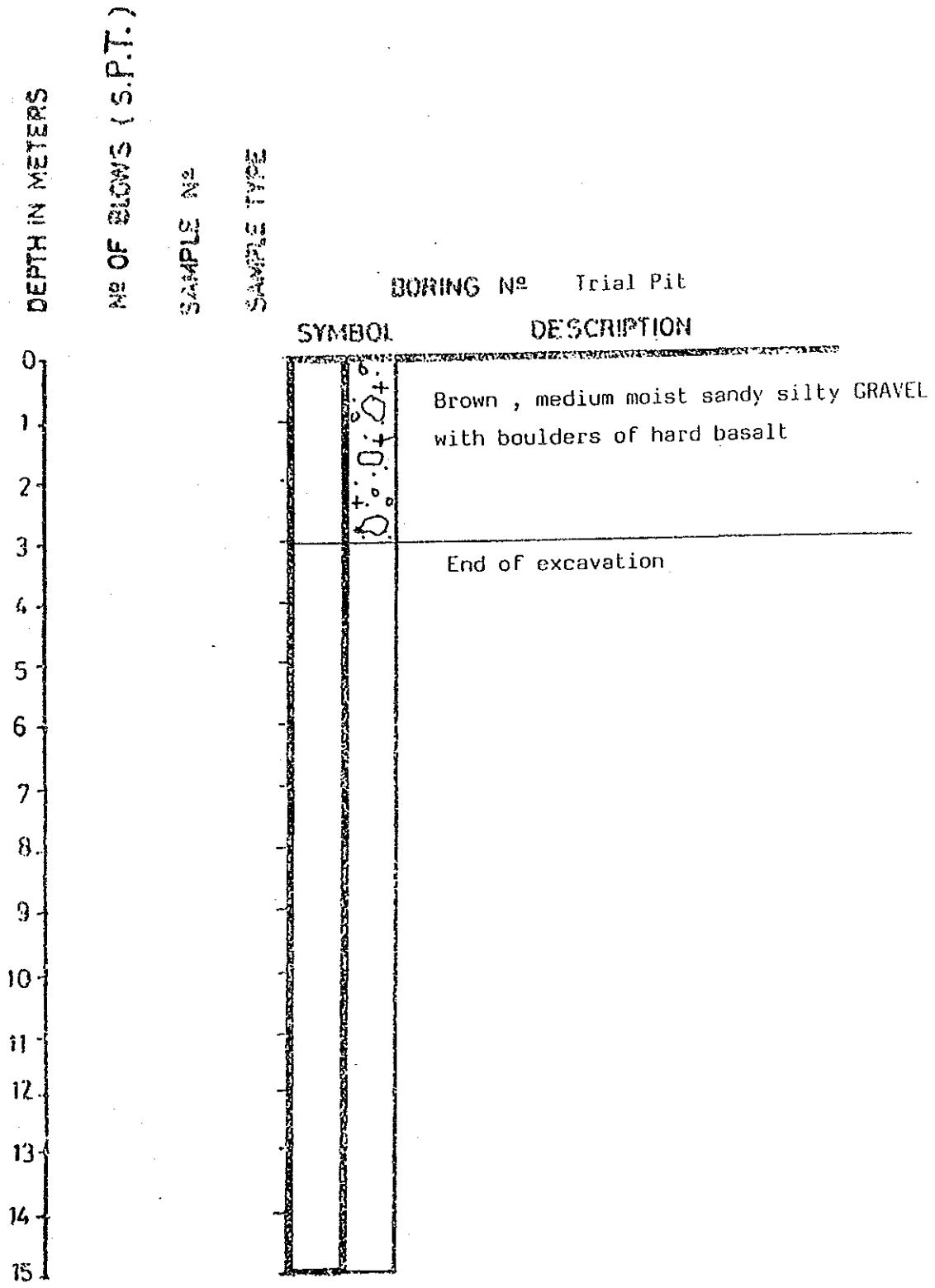
- = STANDARD PENETRATION TEST PERFORMED AND DISTURBED SOIL SAMPLE OBTAINED
- = DISTURBED SOIL SAMPLE OBTAINED ONLY WITHOUT PERFORMING STANDARD PENETRATION TEST

LOG OF BORING



KEY :

= UNDISTURBED' SAMPLE

= STANDARD PENETRATION TEST PERFORMED AND DISTURBED SOIL SAMPLE OBTAINED

= DISTURBED SOIL SAMPLE OBTAINED ONLY WITHOUT PERFORMING STANDARD PENETRATION TEST

LOG OF BORING

Borehole No.	Depth (M)	Moisture content (%)
1	0.0 - 2.3	4.7
	2.3 - 3.0	1.5
2	0.0 - 2.0	2.1
	2.0 - 3.0	2.7
3	0.0 - 0.8	3.9
	0.8 - 2.0	2.1
	2.0 - 3.0	2.2
4	0.0 - 1.0	6.0
	1.0 - 3.0	3.0
	3.0 - 5.0	3.3
	5.0 - 6.5	1.8
	6.5 - 10.0	1.6
	10.0 - 13.0	1.0
	13.0 - 19.0	2.7
	19.0 - 21.0	0.7
	21.0 - 22.5	5.1
	22.5 - 25.0	4.8
Trial Pit	0.0 - 2.5	11.23

Table (1) - Moisture content of some samples from different depths .

B.H No.	Depth (m)	Liquid limit (%)	Plastic limit (%)	Plasticity Index
1	2.3 - 3.0	30	23.7	6.3
2	1.0 - 2.0	32	22.0	10.0
3	1.0 - 3.0	NP	NP	NP
4	1.0 - 19.0	NP	NP	NP
	21.0 - 22.5	NP	NP	NP
Trial pit	1.0 - 2.5	32.5	23.5	9.0

Table (2) - Atterberg limits of some samples from different depths .

B.H No.	Depth (m)	Specific gravity
1	2.3 - 3.0	2.61
2	1.0 - 2.0	2.65
	2.0 - 3.0	2.63
3	0.0 - 1.0	2.64
	1.0 - 3.0	2.60
4	1.0 - 19.0	2.57
	21.0 - 22.5	2.60
Trial pit	0.0 - 2.5	2.63

Table (3) - Specific gravity for some samples from different depths .

FIELD DENSITY BY SAND REPLACEMENT

(Small pouring cylinder, Large pouring cylinder, hand scoop method)

Job : .....
Operator : F.A
Sample No. FD (1-2)
Date : -
Location : GCRB Camp - Saman

Calibration

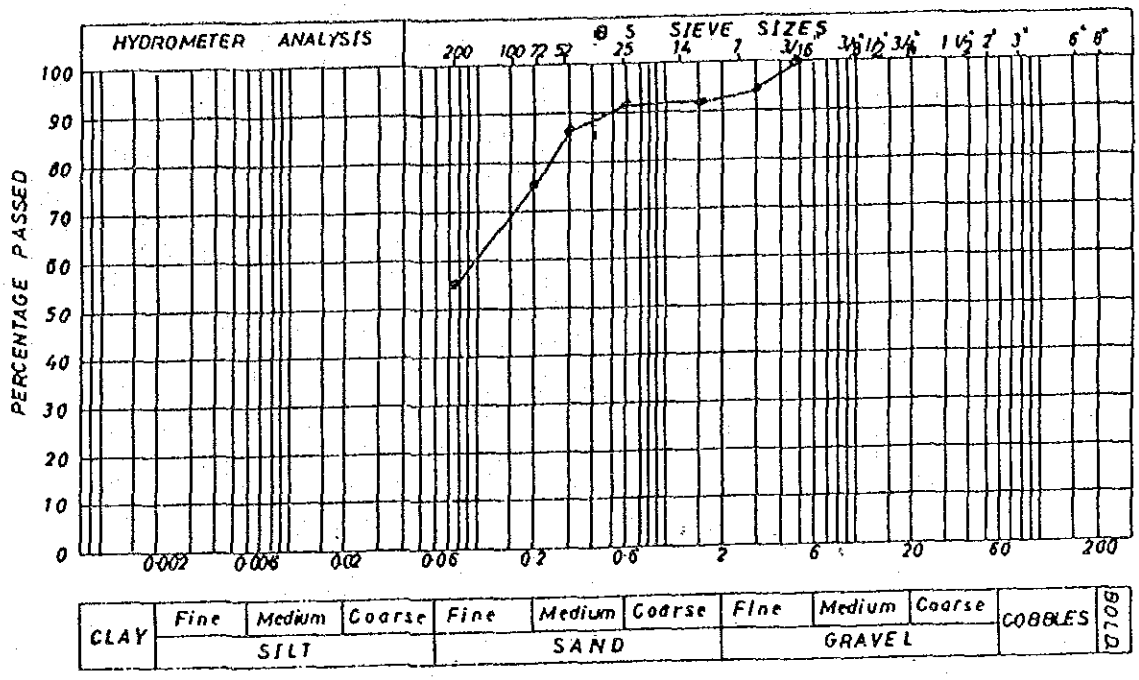
Mean wt. of sand in cone (of pouring cylinder W_2)	1430	g
Volume of calibrating container (V)	-	ml
Wt. of sand (+ cylinder) before pouring (W_1)	5000	g
Mean Wt. of sand (+ cylinder) after pouring (W_3)	-	g
Wt. of sand to fill calibrating container ($W_a = W_1 - W_3 - W_2$)	-	g

Bulk density of sand $y_s = \left(\frac{W_a}{V} \right)$ 1.30 gm/cm³ | Max. Dry. Density - g/cm³

Sample number		1	2
Wt. of wet soil from hole (W_w)	g	3248	3017
Wt. of sand (+ cylinder) before pouring (W_1)	g	5000	5000
Wt. of sand (+ cylinder) after pouring (W_4	g	1664	1794
Wt. of sand in hole ($W_b = W_1 - W_4 - W_2$)	g	1906	1776
Ratio V_b $\frac{W_b}{ys}$		1466.2	1366.2
Bulk density $\left(y = \frac{W_w}{V_b} \right)$	g/cm₃	2.22	2.21
Moisture content container No.		1	2
Moisture content (m)	%	11.2	11.2
Dry density $\left(y_d = \frac{100y}{100 + m} \right)$	gm/cm³	2.00	1.99

Delete the words or symbols that do not apply.

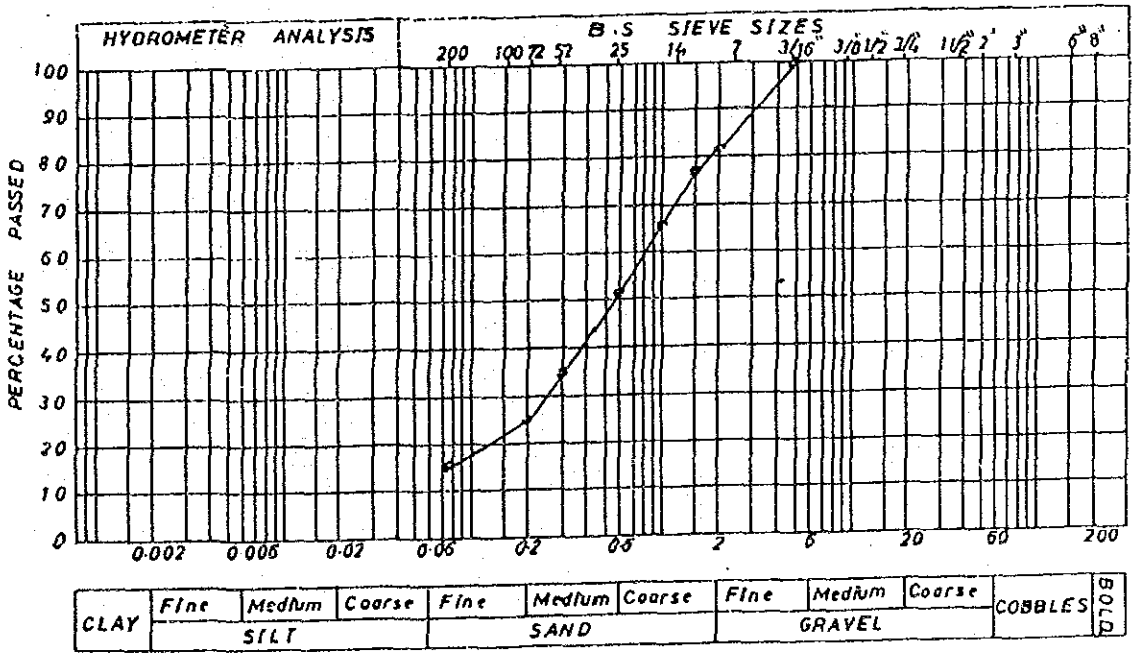
Material Engineer .....



Boring NO 1 Sample NO 1 Depth 2.3 - 3.0 metres

Soil description Sandy SILT with gravel Sieving ☒ Wet

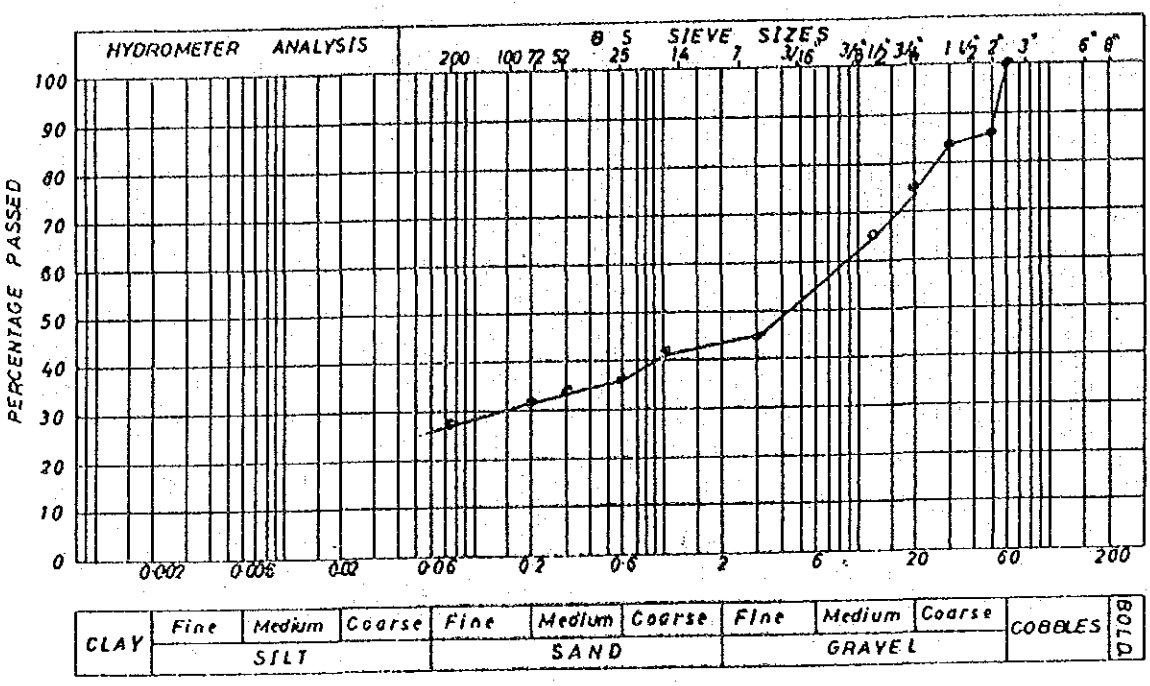
(Jack hammer drilling) ☐ Dry



Boring NO 2 Sample NO - Depth 2 - 3 metres

Soil description Silty SAND with gravel Sieving ☒ Wet

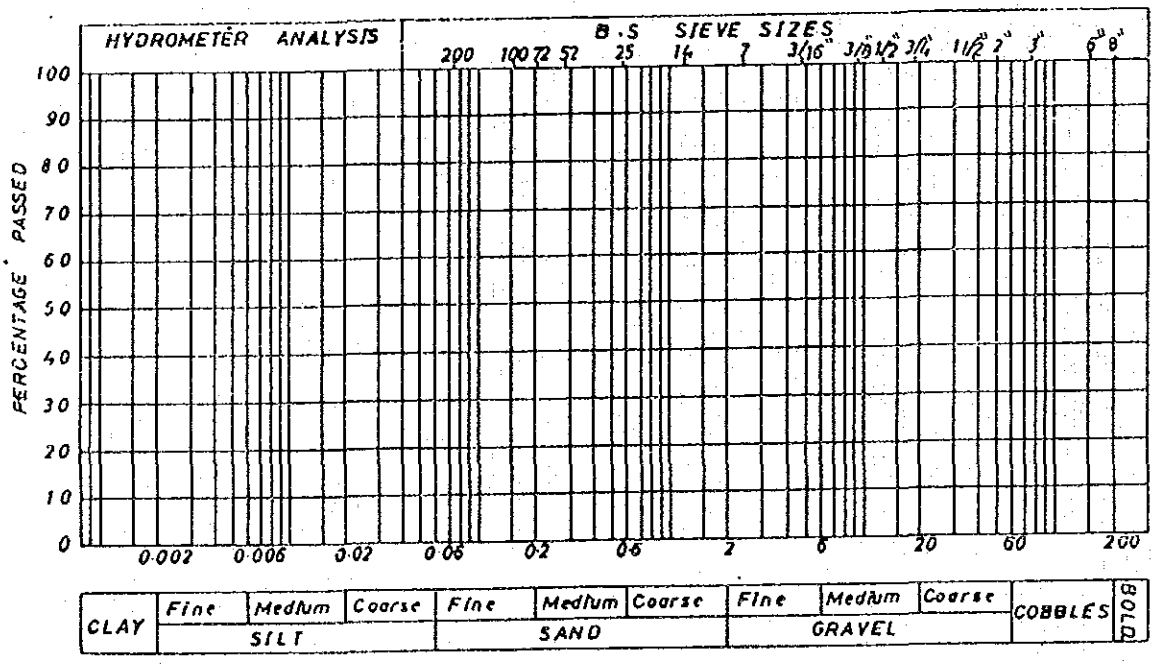
(Jack hammer drilling) ☐ Dry



Boring NO Trial pit Sample NO _____ Depth 0 - 2.5 metres

Soil description Sandy silty GRAVEL Sieving ☒ Wet

_____ ☐ Dry



Boring NO _____ Sample NO _____ Depth _____ metres

Soil description _____ Sieving ☐ Wet

_____ ☐ Dry

Table Presumed bearing values under vertical static loading

NOTE. These values are for preliminary design purposes only, and may need alteration upwards or downwards. No addition has been made for the depth of embedment of the foundation (see 2.1.2.2.1). Reference should be made to other parts of the Code when using this Table.

Group	Class	Types of rocks and soils	Presumed bearing value		Remarks
			kN/m²*	kgf/cm² or tonf/ft²*	
I	1	Hard igneous and gneissic rocks in sound condition	10 000	100	These values are based on the assumption that the foundations are carried down to unweathered rock
Rocks	2	Hard limestones and hard sandstones	4 000	40	
	3	Schists and slates	3 000	30	
	4	Hard shales, hard mudstones and soft sandstones	2 000†	20†	
	5	Soft shales and soft mudstones	600 to 1 000	6 to 10	
	6‡	Hard sound chalk, soft limestone	600	6	
	7	Thinly bedded limestones, sandstones, shales	To be assessed after inspection		
	8	Heavily shattered rocks			
II	9	Compact gravel, or compact sand and gravel	>600	>6	Width of foundation (B) not less than 1 m (3 ft). Groundwater level assumed to be a depth not less than B below the base of the foundation. For relative density and groundwater level see 2.2.2.3.2
Non-cohesive soils	10	Medium dense gravel, or medium dense sand and gravel	200 to 600	2 to 6	
	11	Loose gravel, or loose sand and gravel	<200	<2	
	12	Compact sand	>300	>3	
	13	Medium dense sand	100 to 300	1 to 3	
	14	Loose sand	<100	<1	
III	15	Very stiff boulder clays and hard clays	300 to 600	3 to 6	Group III is susceptible to long-term consolidation settlement (see 2.1.2.2.2) For consistencies of clays see Table 2
Cohesive soils	16	Stiff clays	150 to 300	1.5 to 3	
	17	Firm clays	75 to 150	0.75 to 1.5	
	18	Soft clays and silts	<75	<0.75	
	19	Very soft clays and silts	Not applicable		
IV	20	Peat and organic soils			See 2.2.2.3.4
V	21	Made ground or fill			See 2.2.2.3.5

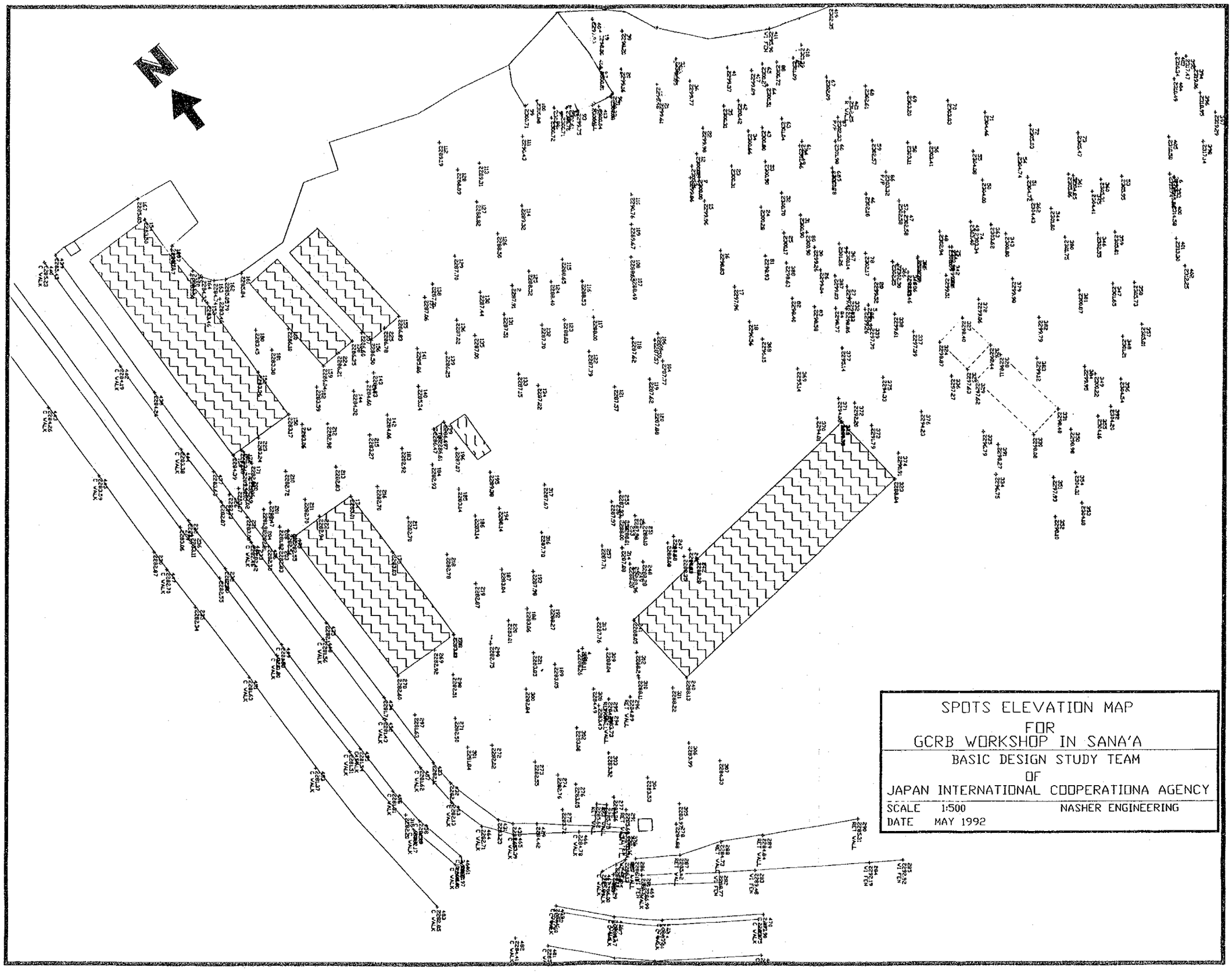
* 1 tonf/ft² = 1.094 kgf/cm² = 107.25 kN/m².

† For weakly-cemented sandstones see 2.2.2.3.1.6.

‡ For disturbed chalk see 2.2.2.3.1.8(1).

Appendix-8

Spot Elevation Map


N
SPOTS ELEVATION MAP
FOR
GCRB WORKSHOP IN SANA'A
BASIC DESIGN STUDY TEAM
OF
JAPAN INTERNATIONAL COOPERATIONA AGENCY
SCALE 1:500
NASHER ENGINEERING
DATE MAY 1992

Appendix-9

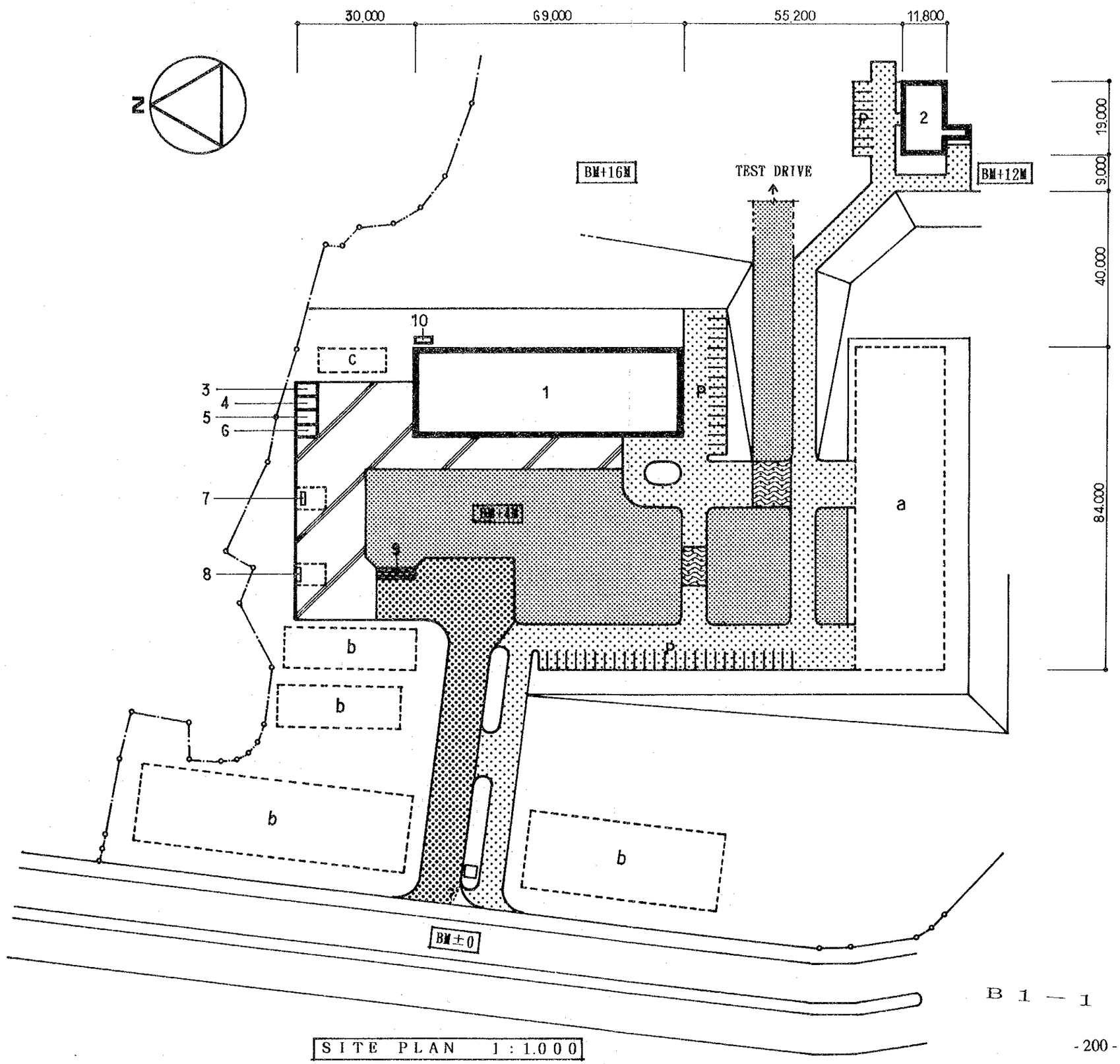
Basic Design Drawings

BASIC DESIGN DRAWINGS

Drawing No.	Description	Scale
B1-1	SITE PLAN	1:1000
B1-2	WORK SHOP FINISH SCHEDULE	
B1-3	WORK SHOP GROUND FLOOR PLAN	1:200
B1-4	WORK SHOP 1ST FLOOR PLAN	1:200
B1-5	WORK SHOP ELEVATION	1:200
B1-6	WORK SHOP ELEVATION/SECTION	1:200
B2-1	DORMITORY FINISH SCHEDULE	
B2-2	DORMITORY GROUND & 1ST FLOOR PLAN	1:200
B2-3	DORMITORY ELEVATION/SECTION	1:200
B3-1	ANCILLARIES FINISH SCHEDULE	1:200
B3-2	ANCILLARIES PLAN	1:200
B3-3	ANCILLARIES ELEVATION/SECTION	1:200
B3-4	UNLOADING DECK PLAN/ELEVATION/SECTION	1:200
M1-1	WORK SHOP EQUIPMENT LAYOUT	1:200
M1-2	ANCILLARIES EQUIPMENT LAYOUT	1:200

1	WORKSHOP
2	DORMITORY
3	CARPENTRY SHOP
4	PAINT SHOP
5	TYRE SHOP
6	LUBRICANT STORE
7	FUEL & LUBRICANT STAND
8	WASHING STAND
9	UNLOADING DECK
10	WATER POOL
P	PARKING
a	PARTS WAREHOUSE (UNDER CONSTRUCTION)
b	WAREHOUSE (EXISTING)
c	JOB SITE OFFICE

- CONCRETE PAVEMENT
- ASPHALT PAVEMENT FOR HEAVY TRAFFIC
- ASPHALT PAVEMENT FOR ORDINARY TRAFFIC
- GRAVEL
- STEEL PROTECTION COVER



SITE PLAN 1:1.000

B 1 — 1

EXTERIOR・FINISH・SCHEDULE

ROOF	EXTERIORWALL	OTHERS
BITUMINOUS MEMBRANE WATERPROOFING CEMENT TILE PAVEMENT	MORTAR EP	OPENING:ALUMINUM SASH&STEEL ROLLING SHUTTER
CHASSIS SHOP:FOLDED-PLATE ROOF		ROOF GUTTER:POLYVINYL CHLORIDE
		APRON:STEEL TROWEL FINISHED CONCRETE

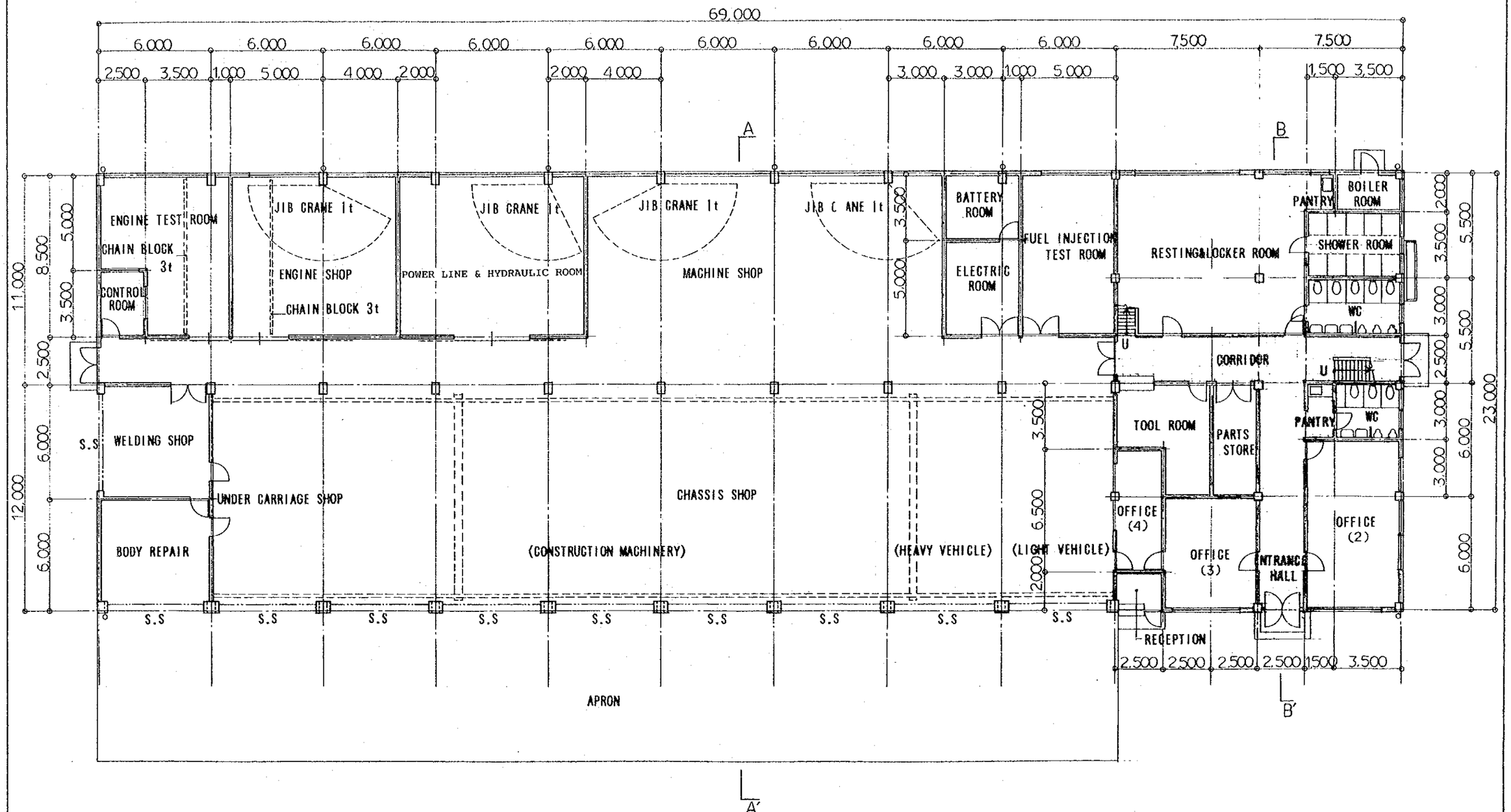
INTERIOR・FINISH・SCHEDULE

ROOM NAME	FLOOR	BASE	WALL	CEILING	HEIGHT	REMARK
(GROUND・FLOOR)						
CHASSIS SHOP	STEEL TROWEL FINISHED CONCRETE	MORTAR	MORTAR EP	FOLDED-PLATE ROOF& STRUCTURAL STEEL OP	DIRECT	GRANE
UNDER CARRIAGE SHOP	〃	〃	〃	〃	〃	
BODY REPAIR	〃	〃	〃	PATCHING MORTAR EP	〃	
WELDING SHOP	〃	〃	〃	〃	〃	
ENGINE TEST ROOM	〃	〃	〃	〃	〃	JIB CRANE CHAIN BLOCK
CONTROL ROOM	〃	〃	〃	〃	〃	
ENGINE SHOP	〃	〃	〃	〃	〃	JIB CRANE CHAIN BLOCK
POWER LINE& HYDRAULICROOM	〃	〃	〃	〃	〃	JIB CRANE
MACHINE SHOP	〃	〃	〃	〃	〃	〃
BATTERY ROOM	〃	〃	〃	〃	〃	
ELECTRIC ROOM	〃	〃	〃	〃	〃	
FUELINJECTION TEST ROOM	〃	〃	〃	〃	〃	
BOILER ROOM	〃	〃	〃	〃	〃	
RESTING& LOCKER ROOM	TERRAZZO TILE	TERRAZZO TILE	〃	〃	〃	
OFFICE	〃	〃	〃	ACOUSTIC BOARD	3.000	
ENTRANCE HALL	〃	〃	〃	〃	〃	
CORRIDOR	〃	〃	〃	〃	〃	
RECEPTION	〃	〃	〃	〃	〃	
TOOL ROOM	STEEL TROWEL FINISHED MORTAR	MORTAR	〃	PATCHING MORTAR	DIRECT	
PARTS STORE	〃	〃	〃	〃	〃	
PANTRY	TERRAZZO TILE	TERRAZZO TILE	〃	FLEXIBLE BOARD EP	3.000	
WC	〃	〃	TILE(H=2100) UPPER PART: MORTAR EP	〃	〃	
SHOWER ROOM	〃	〃	〃	〃	〃	

ROOM NAME	FLOOR	BASE	WALL	CEILING	HEIGHT	REMARK
(1ST・FLOOR)						
PRACTICE ROOM	TERRAZZO TILE	TERRAZZO TILE	MORTAR EP	ACOUSTIC BOARD	3.000	
MEETING ROOM	〃	〃	〃	〃	〃	
ENGINEERS' ROOM	〃	〃	〃	〃	〃	
DIRECTOR ROOM	〃	〃	〃	〃	〃	
OFFICE	〃	〃	〃	〃	〃	
SECRETARY ROOM	〃	〃	〃	〃	〃	
HALL	〃	〃	〃	〃	〃	
STAIRCASE	〃	〃	〃	〃	〃	
STORE	〃	〃	〃	PATCHING MORTAR EP	DIRECT	
PANTRY	〃	〃	〃	FLEXIBLE BOARD EP	3.000	
WC	〃	〃	TILE(H=2100) UPPER PART: MORTAR EP	〃	〃	

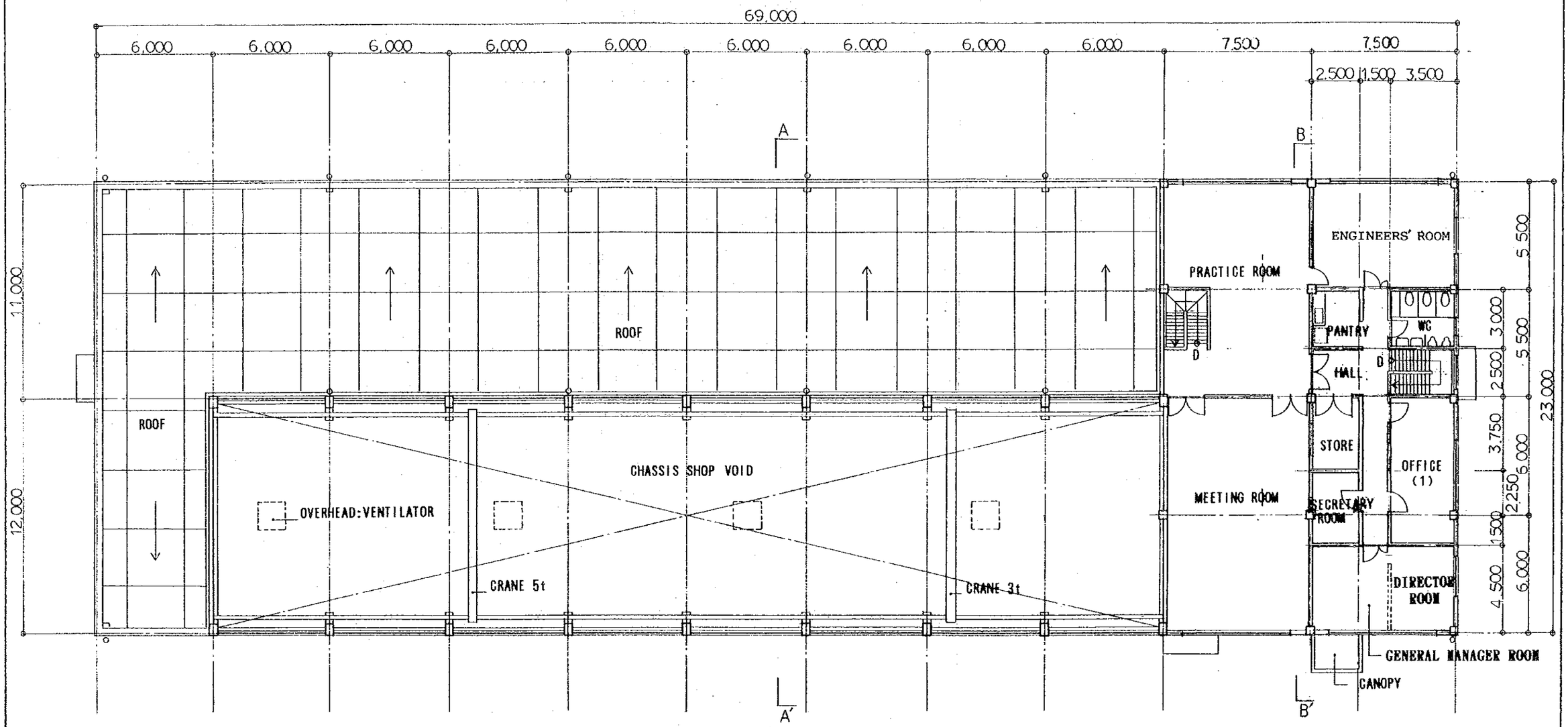
B 1 — 2

WORK SHOP



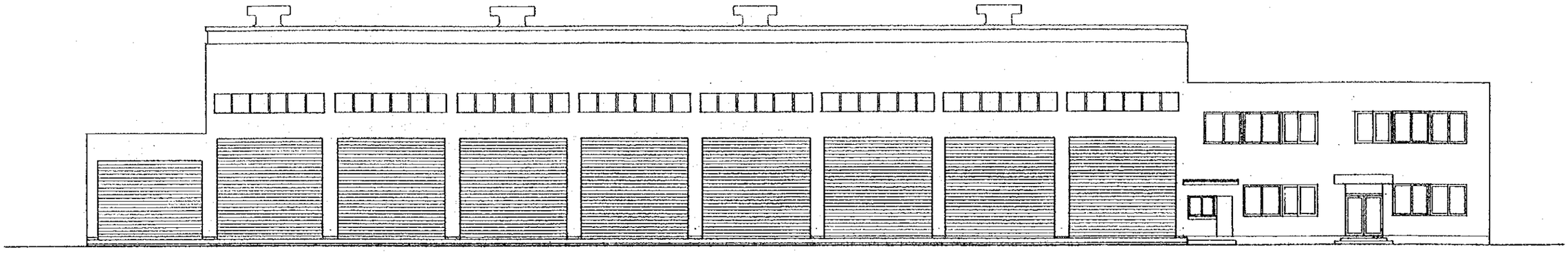
B 1 — 3

WORK SHOP
GROUND FLOOR PLAN
SCALE=1/200



B 1 — 4

WORK SHOP
1ST FLOOR PLAN
SCALE=1/200



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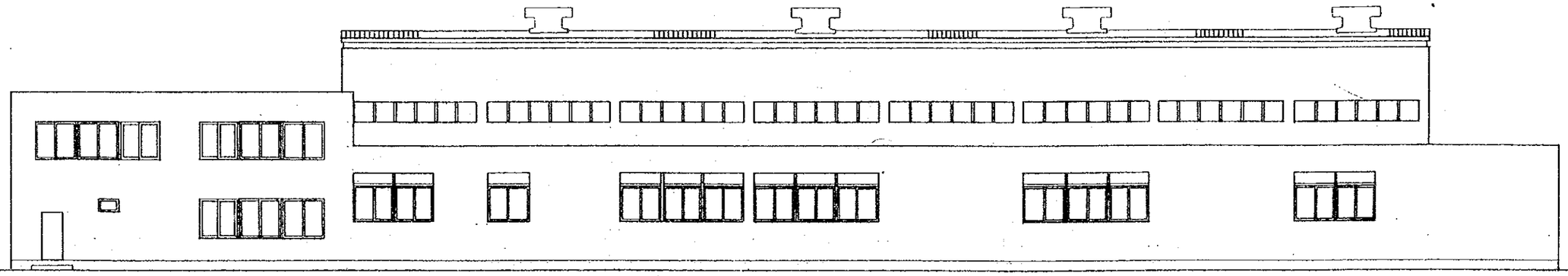
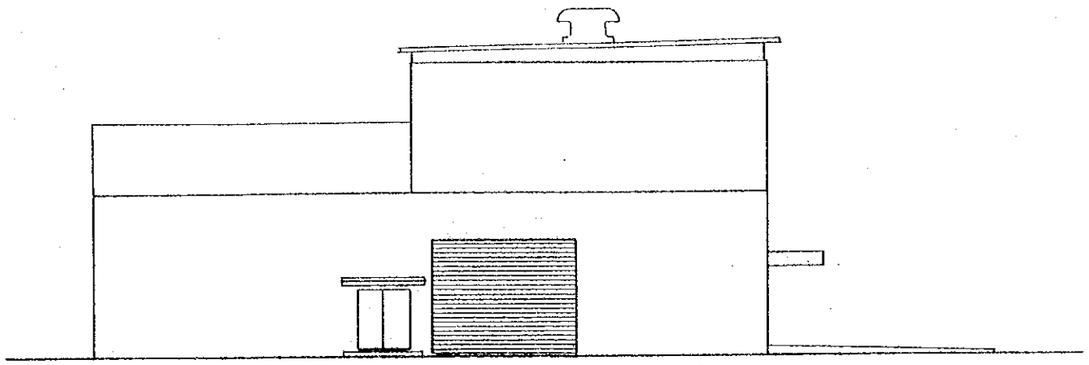


EAST

B 1 — 5

WORK SHOP
ELEVATION
SCALE=1/200



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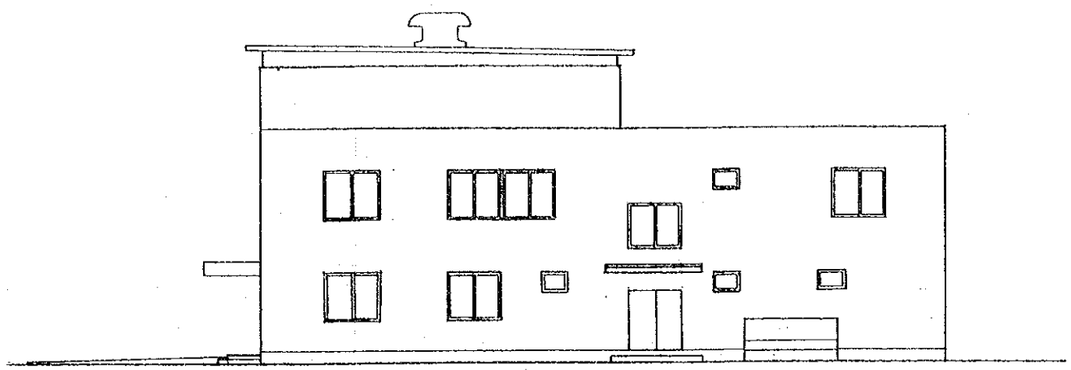
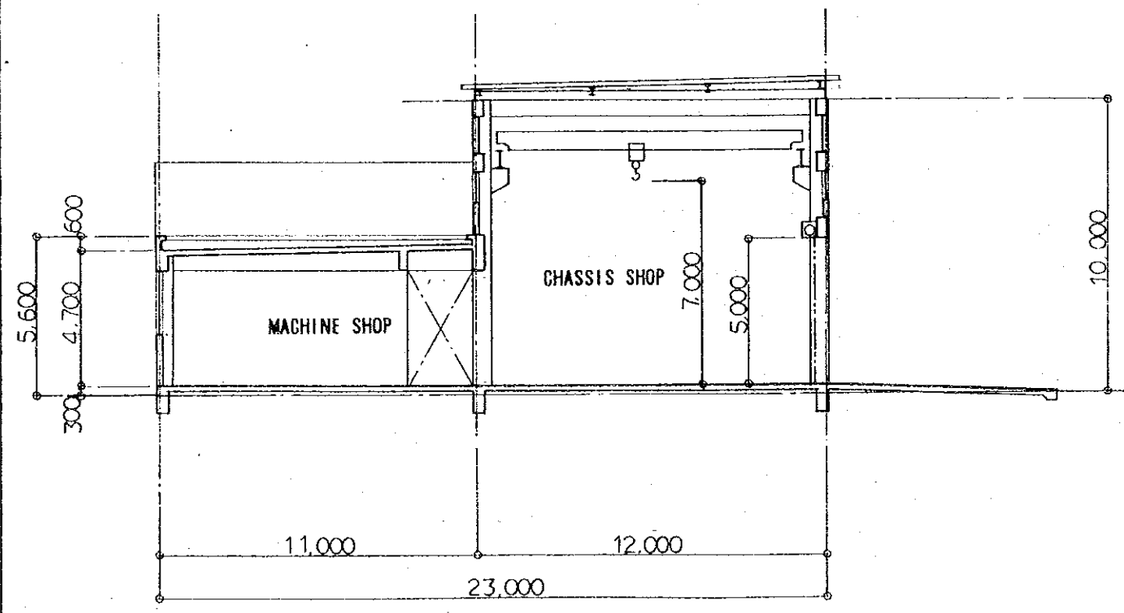


SOUTH

B 1 — 6 WORK SHOP
ELEVATION
SCALE-1/200



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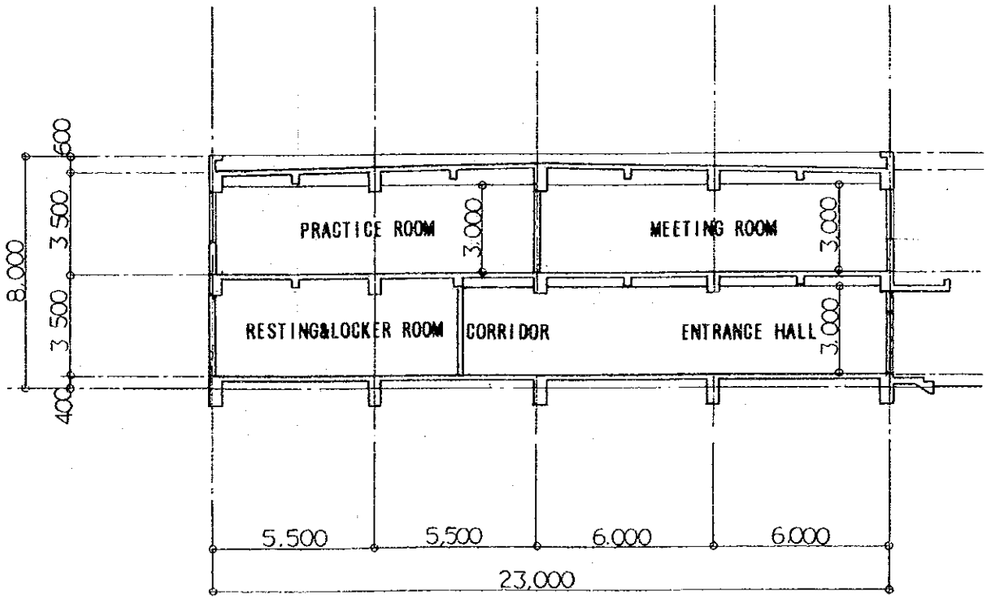


B—B´

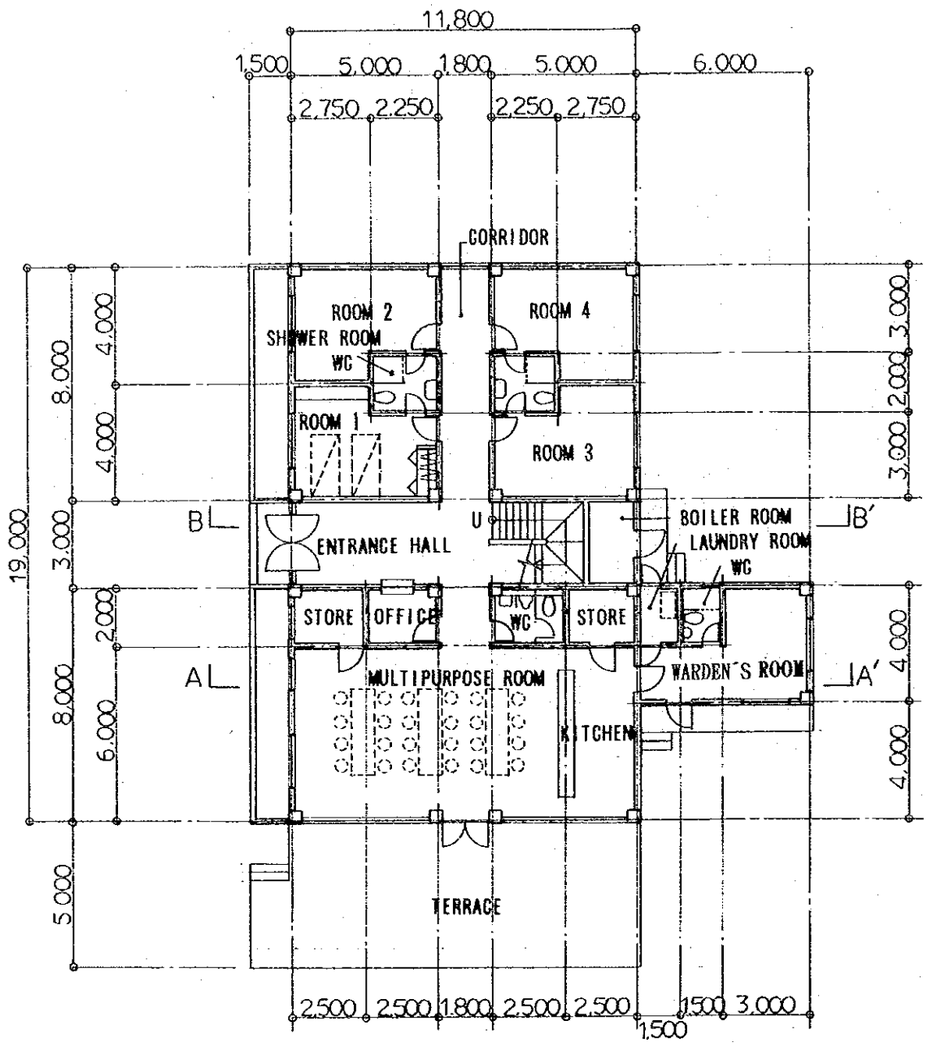
B 1 — 6 WORK SHOP
SECTION
SCALE-1/200

EXTERIOR・FINISH・SCHEDULE

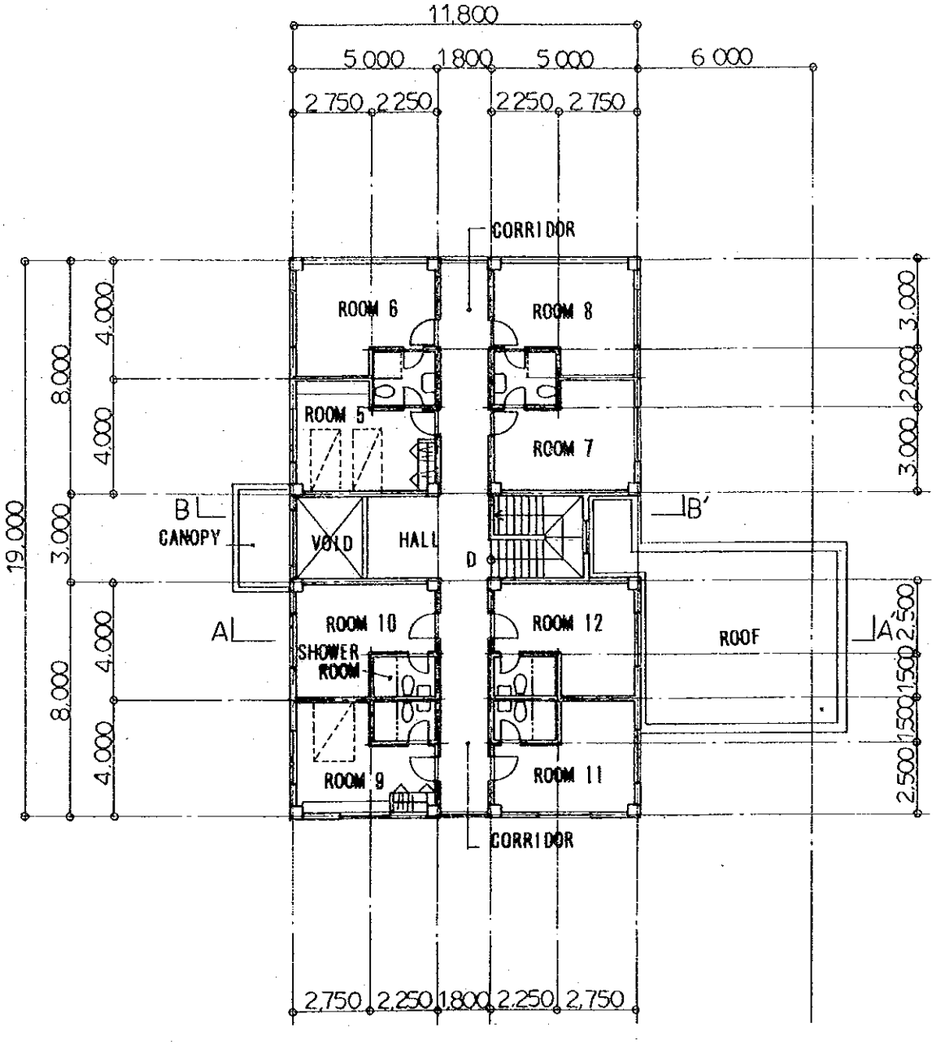
ROOF	EXTERIORWALL	OTHERS
BITUMINOUS MEMBRANE WATERPROOFING CEMENT TILE PAVEMENT	MORTAR EP	OPENING:ALUMINUM SASH
		ROOF GUTTER:POLYVINYL CHLORIDE
		TERRACE:STEEL TROWEL FINISHED CONCRETE

INTERIOR・FINISH・SCHEDULE

ROOM NAME	FLOOR	BASE	WALL	CEILING	HEIGHT	REMARK
(GROUND・FLOOR)						
ENTRANCE HALL	TERRAZZO TILE	TERRAZZO TILE	MORTAR EP	PATCHING MORTAR EP	DIRECT	
CORRIDOR	〃	〃	〃	〃	〃	
OFFICE	〃	〃	〃	PATCHING MORTAR EP	〃	
MULTIPURPOSE ROOM	〃	〃	〃	〃	〃	
KITCHEN	〃	〃	〃	〃	〃	COUNTER
WARDEN'S ROOM	〃	〃	〃	〃	〃	
ROOM 1~4	〃	〃	〃	〃	〃	DESK WARDROBE (BUILT-IN)
SHOWER ROOM& WC	〃	TILE(H=2100) UPPER PART: MORTAR EP	〃	〃	〃	
WC	〃	〃	〃	〃	〃	
LAUNDRY ROOM	〃	〃	〃	〃	〃	
STORE	〃	〃	〃	〃	〃	
BOILER ROOM	〃	〃	〃	〃	〃	
(1ST・FLOOR)						
HALL ・CORRIDOR	TERRAZZO TILE	TERRAZZO TILE	MORTAR EP	PATCHING MORTAR EP	DIRECT	
STAIRCASE	〃	〃	〃	〃	〃	
ROOM 5~8	〃	〃	〃	〃	〃	DESK WARDROBE (BUILT-IN)
〃 9~12	〃	〃	〃	〃	〃	〃
SHOWER ROOM& WC	〃	〃	TILE(H=2100) UPPER PART: MORTAR EP	〃	〃	
SHOWER ROOM	〃	〃	〃	〃	〃	



GROUND FLOOR

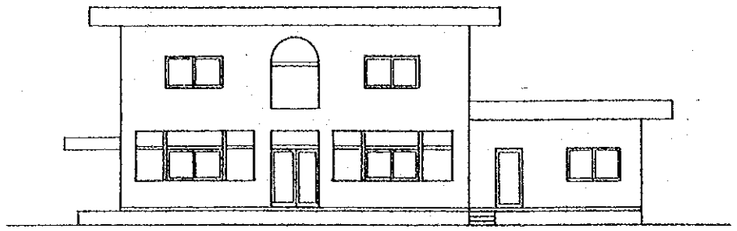


1ST FLOOR

B 2 — 2

DORMITORY FOR
TRAINEE

PLAN
SCALE=1/200



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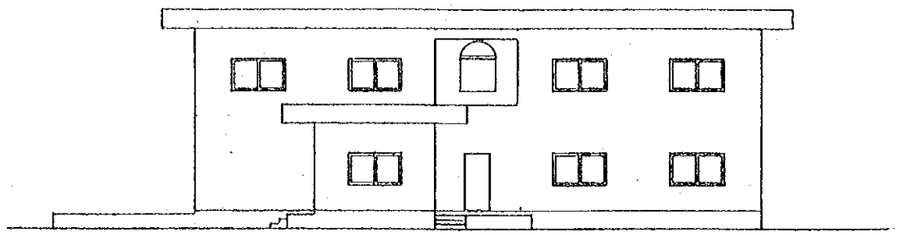

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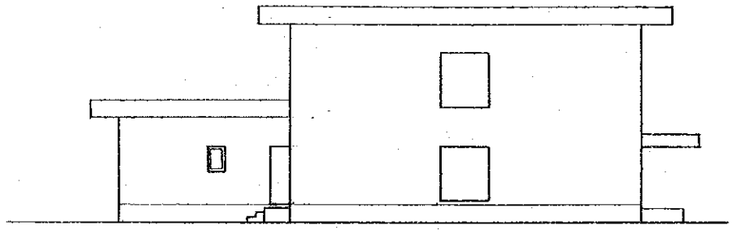

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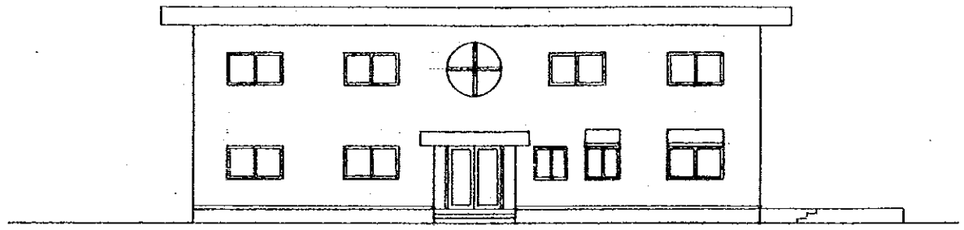
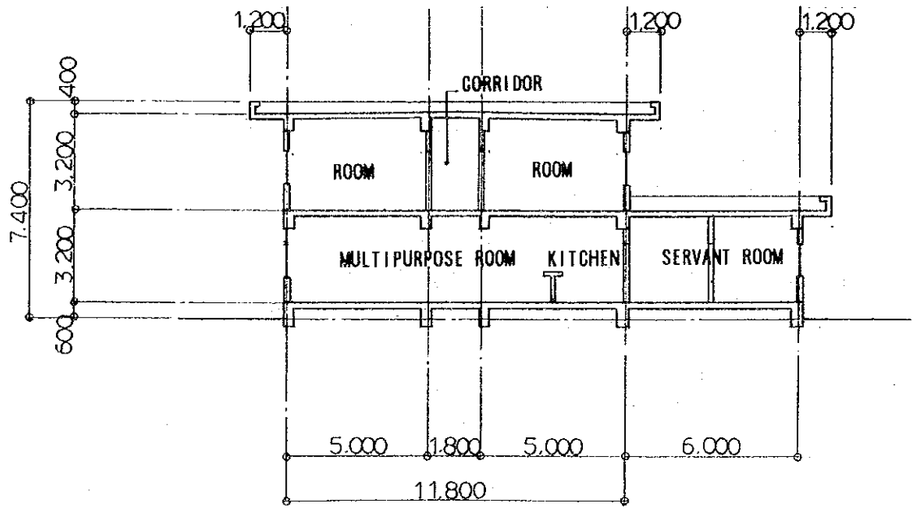


NORTH

B 2 — 3

DORMITORY FOR TRAINEE

ELEVATION
SCALE=1/200



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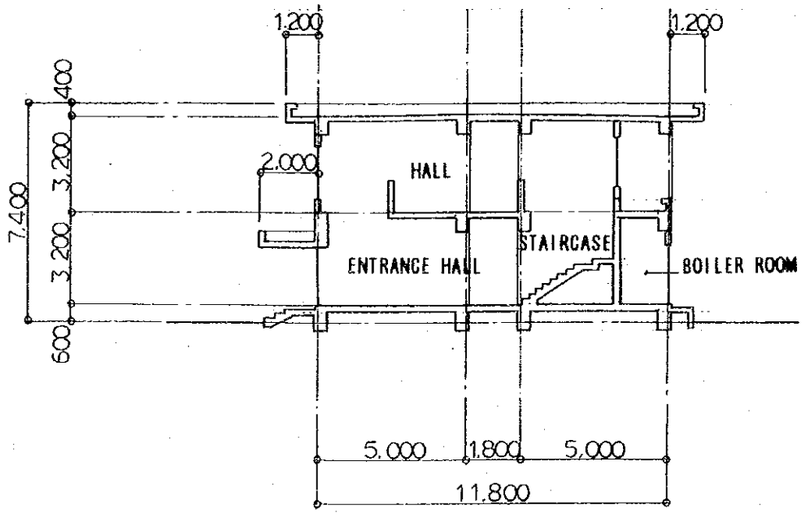


B—B´

B 2 — 3

DORMITORY FOR TRAINEE

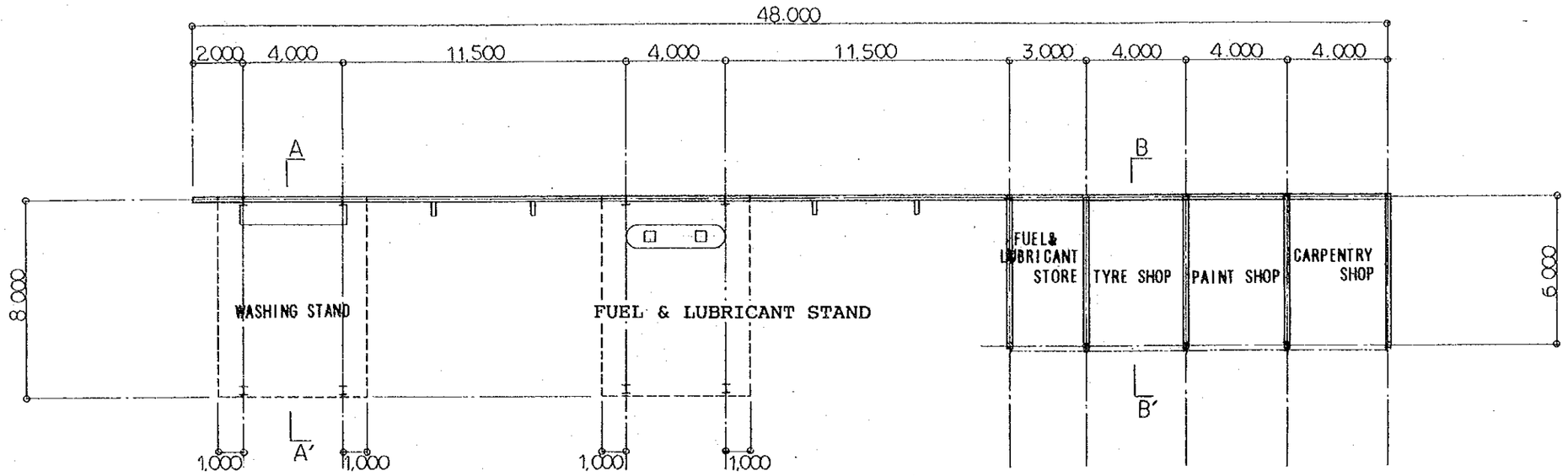
SECTION
SCALE=1/200

EXTERIOR・FINISH・SCHEDULE

ROOF	EXTERIORWALL	OTHERS
FOLDED-PLATE ROOF	EXPOSED CONCRETE& CONCRETEBLOCK (FALSEJOINT)	OPENING:STEEL ROLLING SHUTTER
		(FUEL&LUBRICANT STANDO) FLOOR-STEEL TROWEL FINISHED CONCRETE COLUMN-STRUCTUPAL STEEL OP CEILING-FOLDED-PLATE ROOF& STRUCTURAL STEEL OP

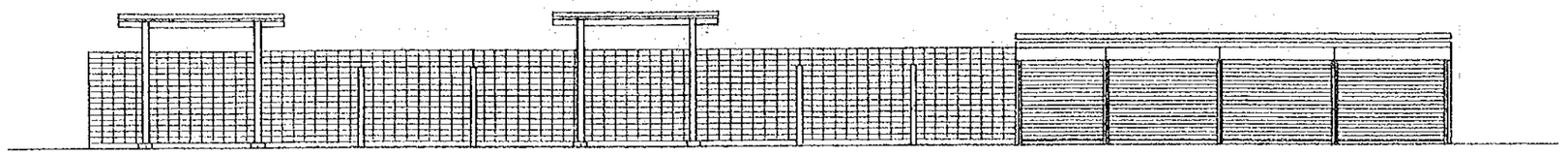
INTERIOR・FINISH・SCHEDULE

ROOM NAME	FLOOR	BASE	WALL	CEILING	HEIGHT	REMARK
CARPENTRY SHOP	STEEL TROWEL FINISHED CONCRETE	EXPOSED CONCRETE	EXPOSED CONCRETE& CONCRETEBLOCK	FOLDED-PLATE ROOF& STRUCTURAL STEEL OP	DIRECT	
PAINT SHOP	〃	〃	〃	〃	〃	
TYRE SHOP	〃	〃	〃	〃	〃	
FUEL& LUBRICANT STORE	〃	〃	〃	〃	〃	

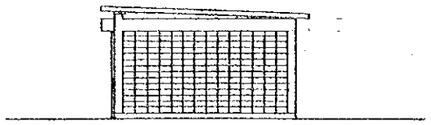


B 3 — 2

ANCILLARIES
PLAN
SCALE=1/200



SOUTH



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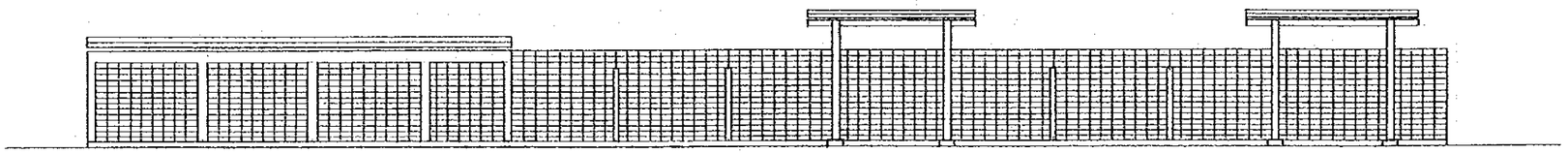

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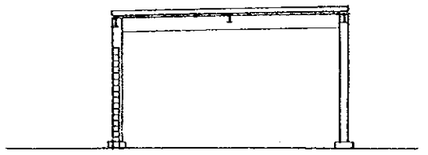
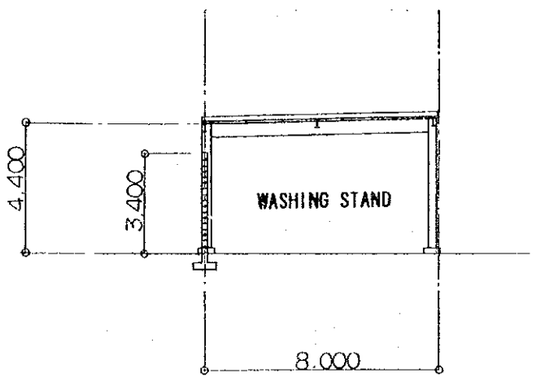


EAST

B 3 — 3

ANCILLARIES
ELEVATION
SCALE=1/200



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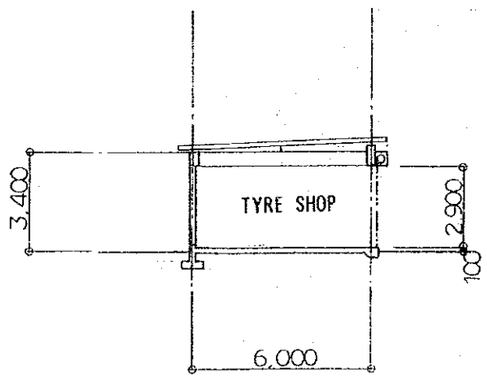
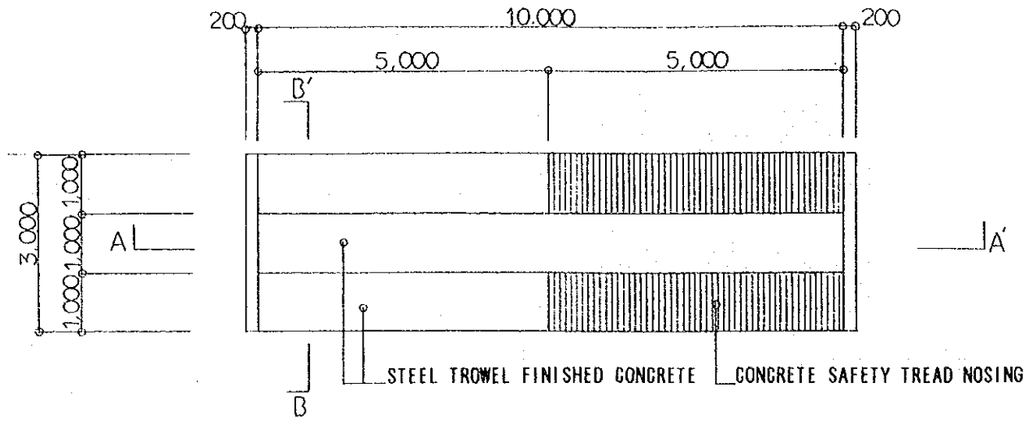


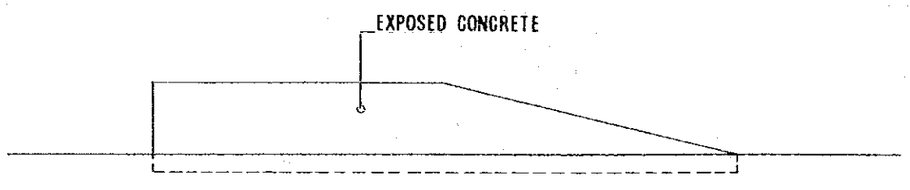
B—B´

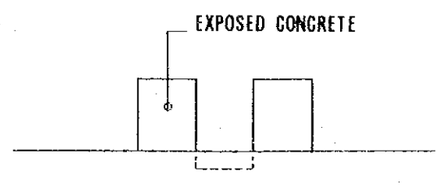
B 3 — 3

ANCILLARIES
SECTION
SCALE=1/200

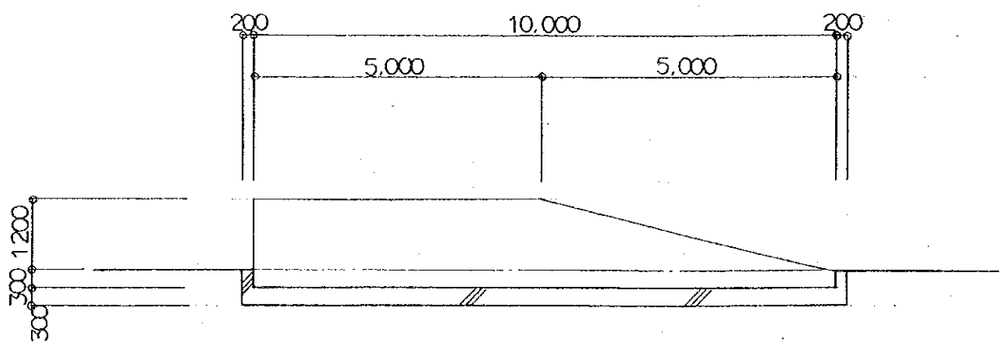


PLAN 1/100

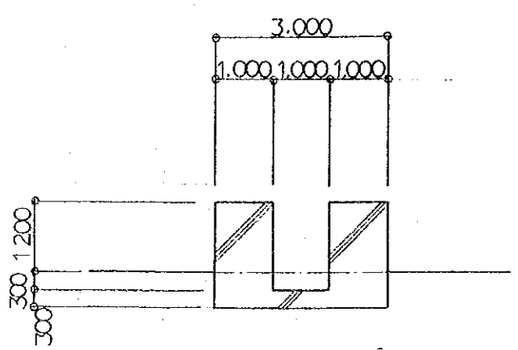




ELEVATION SCALE=1/100



A - A'

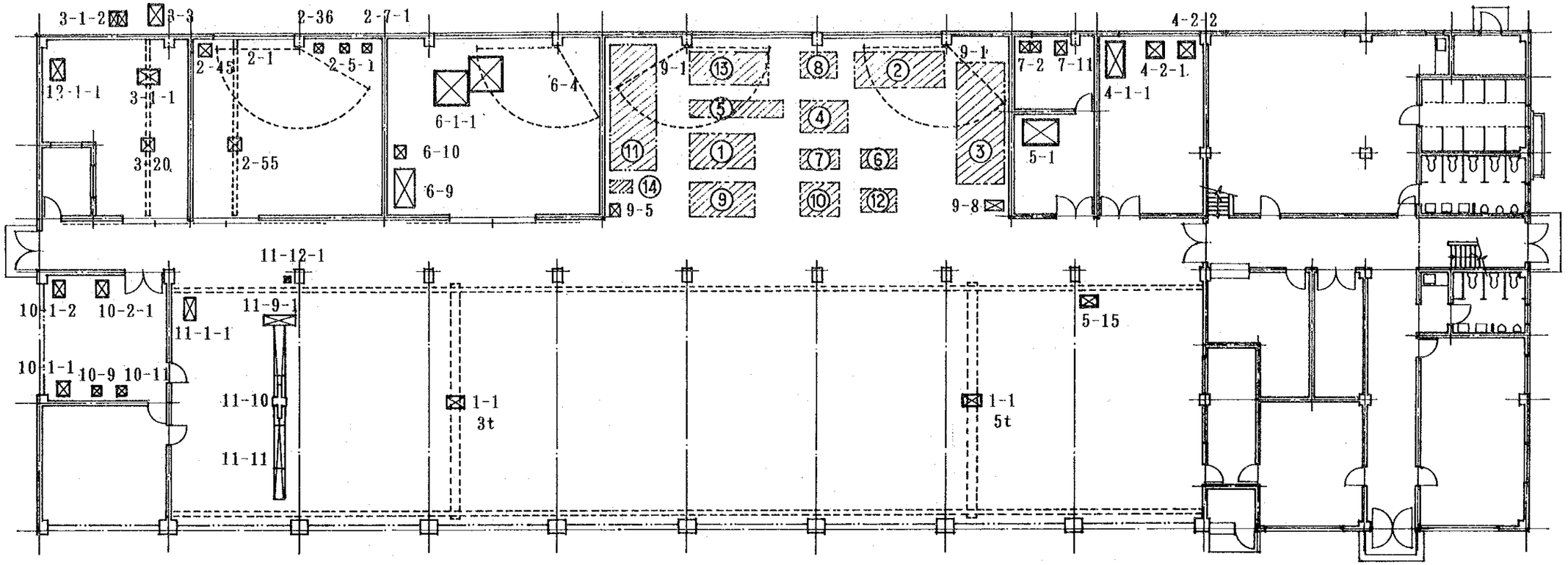


B - B'

SECTION SCALE=1/100

B 3 — 4

UNLOADING DECK



1. Chassis shop
   - 1-1. Overhead crane. 3 ton
   - 1-1. Overhead crane. 5 ton

2. Engine shop
   - 2-1. Jib crane. 1 ton
   - 2-5-1. Bench electric grinder
   - 2-7-1. Bench drill press
   - 2-36. Piston heater
   - 2-45. Parts washer
   - 2-55. Mono-rail crane. 3 ton

3. Engine test room
   - 3-1-1. Engine dynamometer
   - 3-1-2. Water pump
   - 3-3. Silencer
   - 3-20. Mono-rail crane. 3 ton

7. Battery room
   - 7-2. Silicon quick charger
   - 7-11. Water purifier

4. Fuel injection test room
   - 4-1-1. Diesel fuel injection pump tester
   - 4-2-1. P.T. pump test stand
   - 4-2-2. Injection flow comparator

5. Electrician room
   - 5-1. Starter generator test bench
   - 5-15. Head light tester

6. Power line & hydraulic room
   - 6-1-1. Hydraulic component universal tester
   - 6-4. JIB crane. 1 ton
   - 6-9. Hydraulic cylinder service stand
   - 6-10. Hydraulic hose crimping machine

9. Machine shop
   - 9-1. JIB crane. 1 ton
   - 9-5. Bench drill press
   - 9-8. Hack sawing machine
   - ① Precision lathe
   - ② Crankshaft grinder large size
   - ③ Crankshaft grinder middle size
   - ④ Cylinder boring machine middle size
   - ⑤ Cylinder boring machine small size
   - ⑥ Cylinder boring machine
   - ⑦ Conrod grinder
   - ⑧ Horizontal boring machine
   - ⑨ Milling machine
   - ⑩ Surface grinder
   - ⑪ Shaper
   - ⑫ Shaft grinder
   - ⑬ Brake lining riveter
   - ⑭ Hydrauric press

12. Air compressor
   - 12-1-1. Air compressor

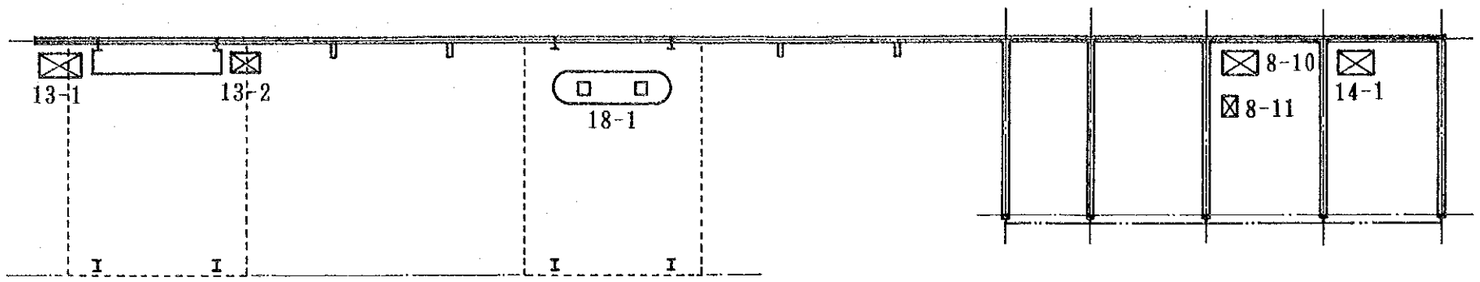
10. Welding & body repair shop
   - 10-1-1. AC arc welder
   - 10-1-2. Diesel engine drive type welder
   - 10-2-1. CO_2 semi auto welder
   - 10-9. Hydraulic press. 100 ton
   - 10-11. High speed abrasive cut-off machine

11. Undercarriage shop
   - 11-1-1. Roller idler press
   - 11-9-1. Track press
   - 11-10. Shoe bolt impact wrench
   - 11-11. Conveyors and shoot
   - 11-12-1. Electric grinder

M 1 − 1

WORK SHOP

EQUIPMENT LAYOUT



8. Tyre service :

8-10. Air compressor

8-11. Wheel balancer

13. Cleaning area

13-1. Hot water high pressure washer

13-2. Steam cleaner

14. Paint shop

14-1. Air compressor

18. Fuel and lubricant stand

18-1. Fuel station

M 1 – 2

ANCILLARIES

EQUIPMENT LAYOUT

Appendix-10

Japanese Economic Cooperation for Yemen

(1976-1990)

Appendix-10 Japanese Economic Cooperation for Yemen (1976-1990)

(Loan)

Year	Former North Yemen		Former South Yemen	
	Project	Amount (million yen)	Project	Amount (million yen)
1977	Local Water Supply	3,880	—	—
1978	—	—	—	—
1979	Thermoelectric Generation Plant	8,200	—	—
1980	—	—	—	—
1981	—	—	—	—
1982	Hodeidah Port No.7 Berth	8,200	—	—
1983	—	—	—	—
1984	—	—	—	—
1985	—	—	—	—
1986	—	—	—	—
1987	—	—	—	—
1988	Cement Plant	22,070	—	—
1989	—	—	Aden Telephone Network Improvement	6,969

(Grant)

Year	Former North Yemen		Former South Yemen	
	Project	Amount (million yen)	Project	Amount (million yen)
1976	Food Assistance	308	Food Assistance	92
1977	Food Assistance	363	Food Assistance	259
			Fishing Training Vessel	450
1978	Food Assistance	421	Food Assistance	164
1979	Food Production Increase	500		
	Debt Relief	5		
1980	Debt Relief	16		
1981	Local Water Supply Improvement(I)	500		
	Food Assistance	278		
	Debt Relief	25		
1982	Local Water Supply Improvement(II)	500	Disaster (Flood) Relief	57
	Food Production Increase	500		
	Debt Relief	66		
	Disaster (Earthquake) Relief	117		
	Research Equipment for Sana'a University Graduate School	45		
1983	Local Water Supply Improvement(III)	600	Food Assistance	141
	Rehabilitation of Earthquake Damage	800		
	Food Production Increase	500		
	Debt Relief	84		
1984	National Tuberculosis Centre Expansion (I)	918		
	Rehabilitation of Earthquake Damage	250		
	Food Production Increase	600		
	Debt Relief	47		

1985	National Tuberculosis Centre Expansion (II)	1,080	Marine Culture Research Centre	941
	Food Production Increase	500		
	Debt Relief	155		
	Scanning Electron Microscope for Sana'a University	41		
1986	Local Water Supply Improvement(IV)	319		
	Food Production Increase	500		
	Debt Relief	106		
1987	Local Water Supply Improvement(V)	915		
	Food Production Increase	500		
	Debt Relief	200		
1988	Local Water Supply Improvement(VI)	961	Fishing Training Vessel Refurbishment	195
	Food Production Increase	400		
	Debt Relief	290		
1989	Local Telecommunication Network Improvement (I)	961	Emergency Aid (for Flood Damage)	14
	Food Production Increase	250	Food Production Increase	200
	Debt Relief	172		
	Debt Relief	286		
	Educational and Cultural TV Programme Production Equipment for National Broadcasting Company	47		
	Small-Scale Grants	11		
	Unified Yemen			
1990	Local Telecommunication Network Improvement (2)			663

(Source: Ministry of Foreign Affairs)

Appendix-11

List of Collected Materials

Materials Collected in Connection with Study Purposes

Category	Title	Summary
Development Planning	Third Five Year Plan	Published by: Central Planning Organization Publication Date: 1987 Original/Copy: Copy Contents: Third Five-Year Plan prepared by Central Planning Organization of former North Yemen
Development Planning	Statistical Year Book (1990)	Published by: Ministry of Planning and Development Publication Date: 1990 Original/Copy: Copy Contents: annual statistical book for former North Yemen published by Ministry of Planning and Development, an important source of data on population, agricultural products, natural environment, education, medical care and trade, etc.
Development Planning	Statistical Year Book (1988)	Published by: Central Statistical Organization Publication Date: 1988 Original/Copy: Copy Contents: annual statistical book for former South Yemen published by Central Statistical Organization in former South Yemen
Development Planning	Development of National Highway Master Plan	Published by: Survey Authority: Sana (Sana'a) Publication Date: 1989 Original/Copy: Copy Contents: road construction master plan for former North Yemen
Development Planning	Economic Planning in Yemen Arab Republic	Published by: Dar Azal Publication Date: 1985 Original/Copy: Original Contents: analysis of current economy of former North Yemen and future forecast
Development Planning	National Population Strategy 1990-2000 and Population Action Plan	Published by: Ministry of Planning and Development Publication Date: 1991 Original/Copy: Original Contents: booklet addressing population problem in Republic of Yemen
Preliminary Study	Preliminary Study Report on Urban Transport Programme in Yemen Arab Republic	Published by: Japan International Cooperation Agency Publication Date: June, 1987 Original/Copy: Copy Contents: report of preliminary study for improvement of urban transport conditions in Sana'a, Taiz and Hodeida
Preliminary Study	Report of Basic Study for Overseas Cooperation for Agriculture and Forestry Development by Country (or Region): Yemen Arab Republic	Published by: International Development Center of Japan Publication Date: March, 1988 Original/Copy: Copy Contents: examination of possible agricultural cooperation for Yemen Arab Republic by Japan while analysing current conditions of agriculture, forestry, stock raising and fisheries of said country

Regional Information	Middle East Situation by Country: Information on Political, Economic and Energy Issues	Published by: Research Institute of Middle Eastern Economics Publication Date: December, 1991 Original/Copy: Copy Contents: collection and analysis of latest information on political, economic and energy issues of Middle Eastern and North African countries
Regional Information	Current Conditions of Yemeni Politics and Economy and Future Prospect	Published by: Japan Cooperation Center for the Middle East Publication Date: August, 1991 Original/Copy: Copy Contents: based on Middle Eastern situation after Gulf War, current state of politics, economy and diplomacy of Yemen is analysed together with discussions on future prospect
Information Gathering Survey	Overseas Information Gathering Survey - Middle East and Africa: Report by Working Group B (on Saudi Arabia, Yemen and Egypt)	Published by: Association of Consultants on Overseas Transport Publication Date: February, 1984 Original/Copy: Copy Contents: current state of railways, urban transport, ports and harbours and airports of 3 Middle Eastern countries is studied with a view to identifying promising projects and examining possibility of technical cooperation
Information Gathering Survey	Overseas Information Gathering Survey - Middle East and Africa: Report by Working Group D (on North Yemen)	Published by: Association of Consultants on Overseas Transport Publication Date: March, 1990 Original/Copy: Copy Contents: general information on North Yemen's ports and harbours, shipbuilding and airports is collected and the possibility of technical cooperation for the country is examined
Regional Information	APIC Country Data: Middle East - Yemen	Published by: Association for Promotion of International Cooperation (APIC) Publication Date: May, 1991 Original/Copy: Copy Contents: chronological listing of events relating to domestic politics, diplomacy and economy, etc. with brief explanations
Preliminary Study	Preliminary Study Report on Dubah-Al Hussiania Agricultural Road Construction Project and Utmah District Development Project	Published by: Association of Consultants on Overseas Agricultural Development Publication Date: October, 1986 Original/Copy: Copy Contents: preliminary study report on agricultural road construction project and regional development project, both of which are designed to promote the development of local villages
Master Plan Study/ Feasibility Study	Urban Transport Study in Yemen Arab Republic, Draft Final Report, Volume 1, Main	Published by: Japan International Cooperation Agency Publication Date: August, 1988 Original/Copy: Copy Contents: study to prepare master plan for urban transport improvement in Sana'a, Taiz and Hodeida

Master Plan Study/ Feasibility Study	Urban Transport Study in Yemen Arab Republic Action Plans for Sana'a - Drawings (Draft) -	Published by: Japan International Cooperation Agency Publication Date: June, 1988 Original/Copy: Copy Contents: collection of master plan drawings for urban transport improvement in Sana'a
Topographic-al Map	Topographical Map for Areas Around Sana'a	Published by: Government of Yemen Arab Republic Publication Date: 1980 Original/Copy: Original Contents: road and topographical map (scale: 1/50,000) covering areas around Sana'a, the capital of Yemen Arab Republic
Topographic-al Map	Topographical Map for Areas Around Taiz	Published by: Government of Yemen Arab Republic Publication Date: 1980 Original/Copy: Original Contents: road and topographical map (scale: 1/50,000) covering areas around Taiz
Topographic-al Map	City Map of Sana	Published by: Survey Authority: Sana (Sana'a) Publication Date: 1982 Original/Copy: Copy Contents: street map of central Sana'a (scale: 1/10,000)
Tourist Guide	Tourist Guide of Yemen Arab Republic	Published by: Ministry of Information and Culture Publication Date: Unknown Original/Copy: Original Contents: official guidebook for tourists visiting Yemen Arab Republic
Development Planning	Yemen: Multi-Mode Transport Project	Published by: International Development Association Publication Date: 1990 Original/Copy: Copy Contents: IDA's assistance programme for road and transport sectors in Republic of Yemen

Appendix-12

List of Cited Materials

Appendix 12 List of Cited Materials

1) P.4 National Population Strategy 1990-2000 and Population Action Plan

2) P.34 North Yemen's Third Five-Year Plan

3) P.35 South Yemen's Third Five-Year Plan

4) P.36 Road Improvement Master Plan 1986-1996

5) P.39 Yemen: Multi-Mode Transport Project

6) P.42 Minutes of Discussions for Preliminary Study

7) P.43 Minutes of Discussions for Basic Design Study

8) P.104 Draft Standards for Building Load Explained (Architectural Institute of Japan)