12) Others

a) In addition to devices and tools required for the above shops, it is necessary to provide special tools for several types of construction equipment in use at present.

b) 1-ton and 3-ton diesel forklifts will be provided for the transportation respectively of small and large parts within the premises.

c) Fuel stands and tanks

d) Repair work manuals, videos, etc.

13) Locally procured equipment

a) Personal computer for parts stock control

b) Copying machine for office use
It is preferable to locally procure the above two items, from the daily after-sales service and maintenance points of view.

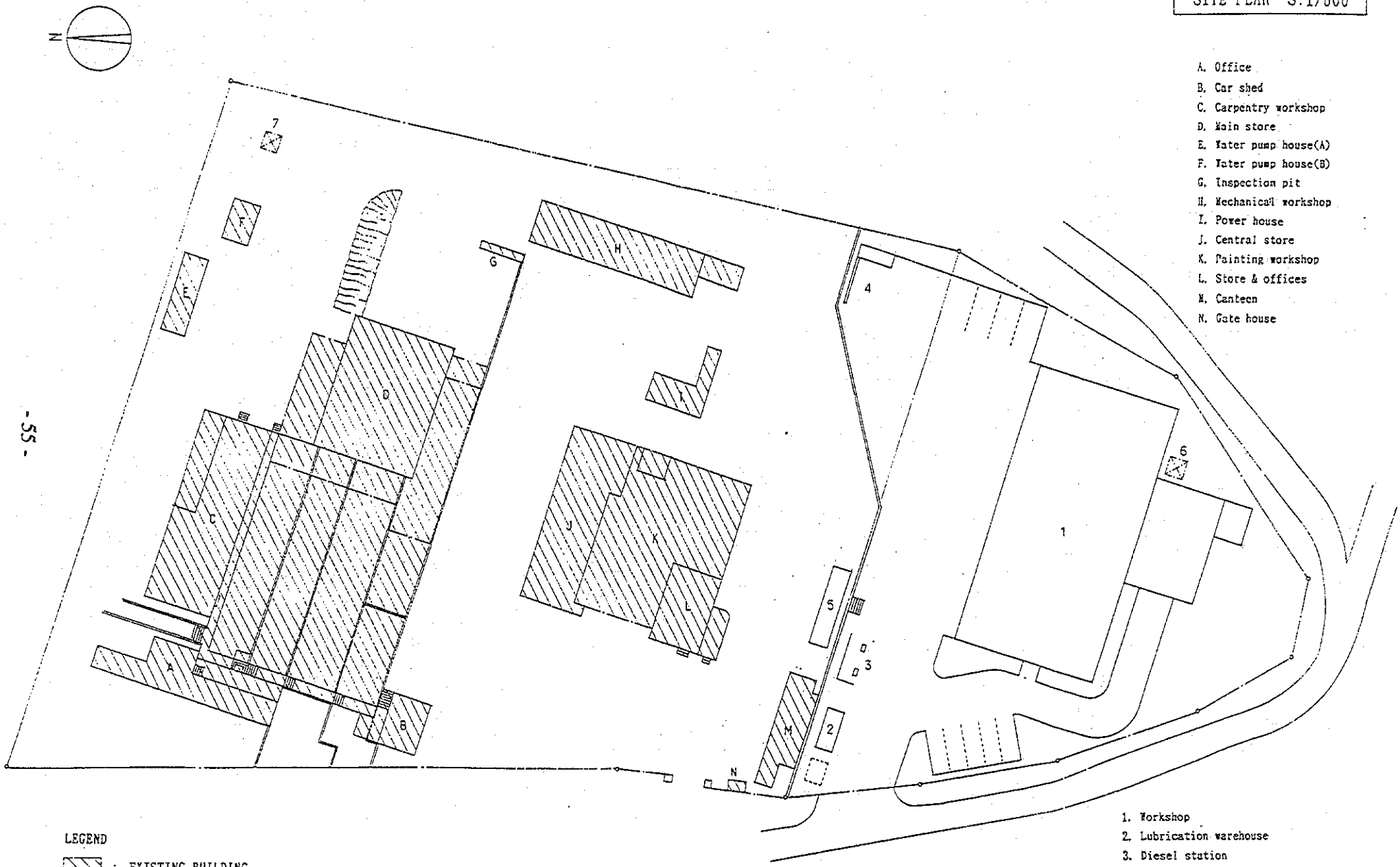
3-3-5 Basic Design Drawings

Attached in next pages are the plot plan, plan, elevation and cross-section drawings of the repair workshop to be constructed under the project.

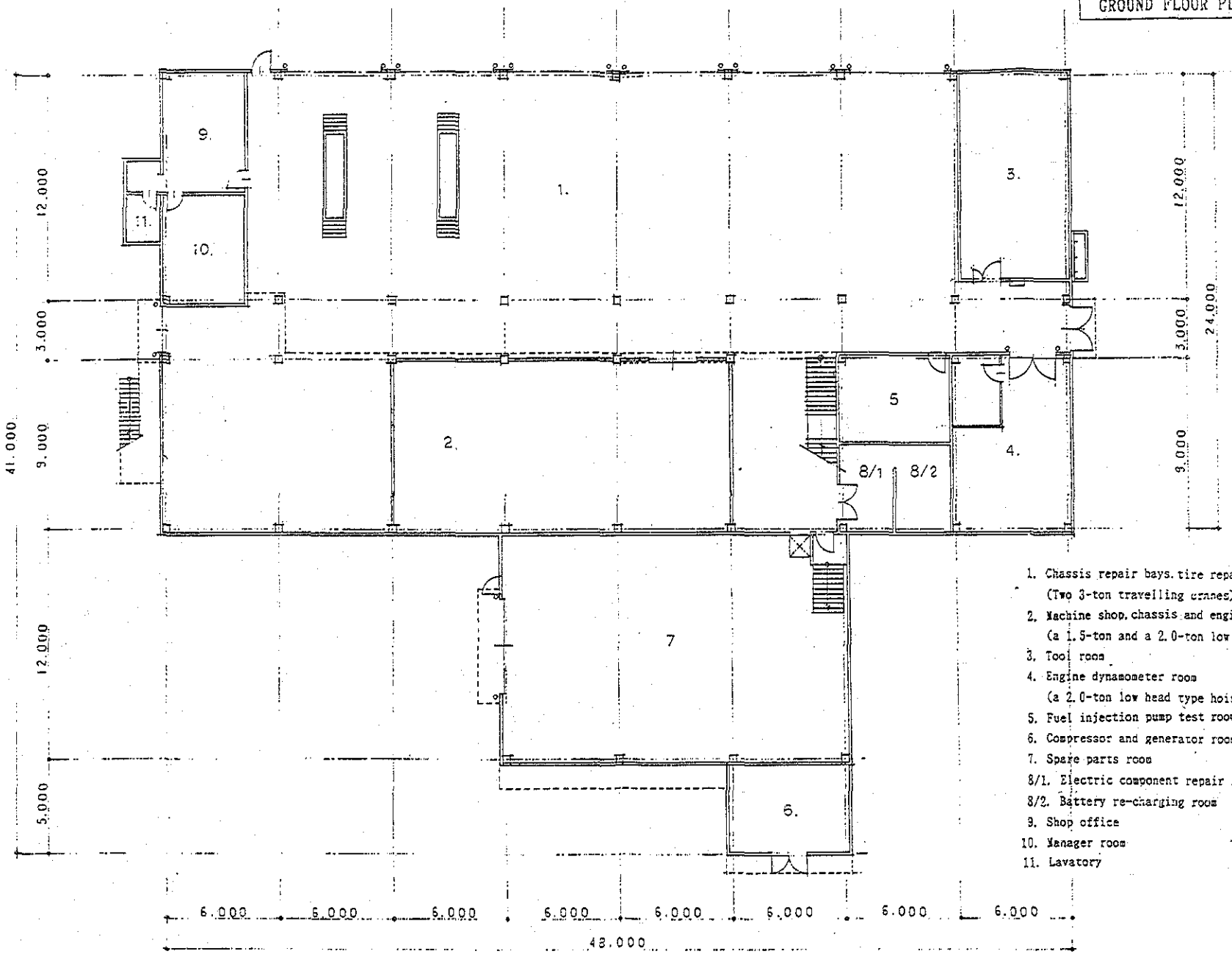
3-3-5 Basic Design Drawings

Attached in next pages are the plot plan, plan, elevation and cross-section drawings of the repair workshop to be constructed under the project.

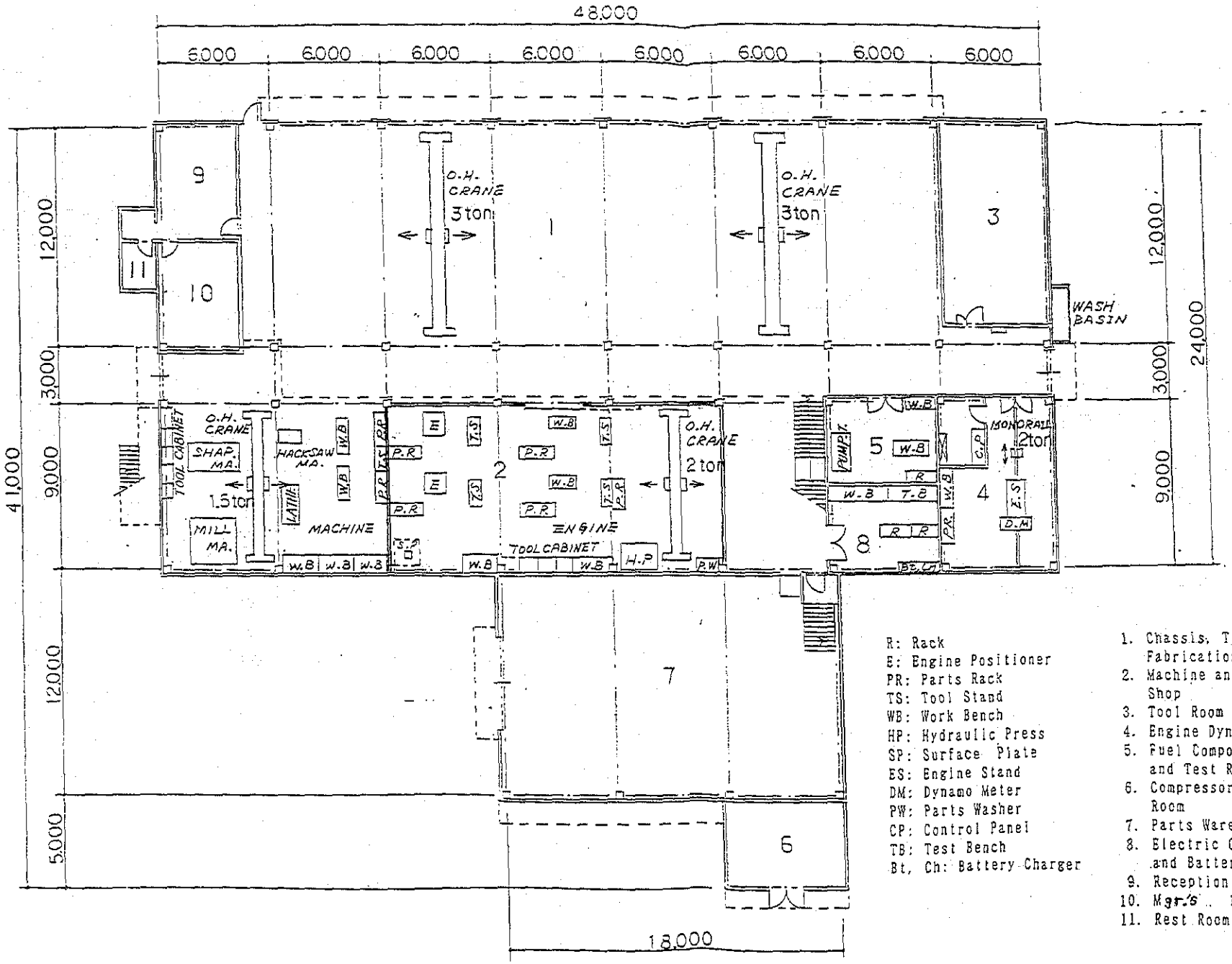
SITE PLAN S:1/600



GROUND FLOOR PLAN S:1/200



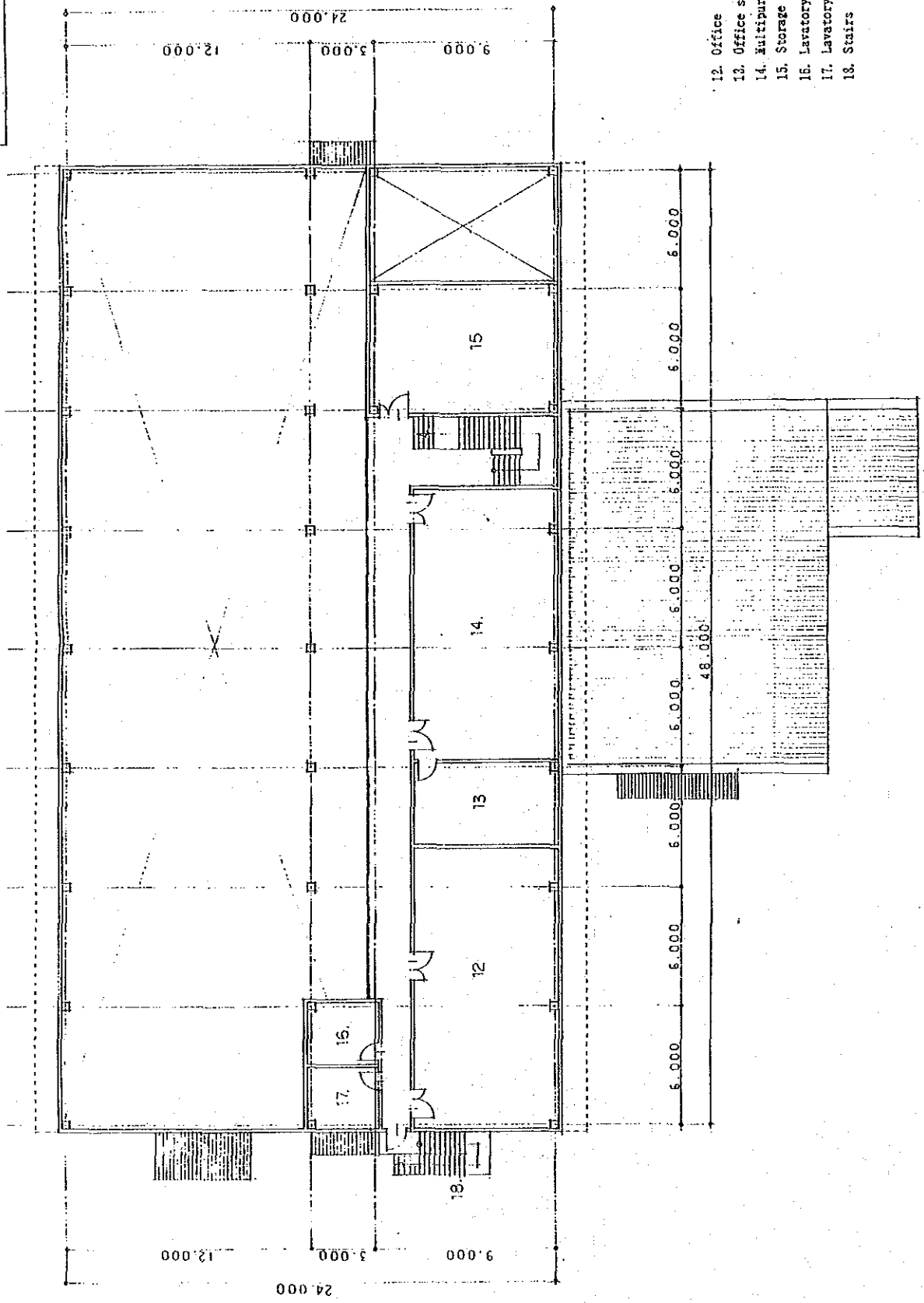
1. Chassis repair bays. tire repair and welding shop
   (Two 3-ton travelling cranes)
2. Machine shop. chassis and engine component repair room
   (a 1.5-ton and a 2.0-ton low head type hoists)
3. Tool room
4. Engine dynamometer room
   (a 2.0-ton low head type hoist)
5. Fuel injection pump test room
6. Compressor and generator room
7. Spare parts room
8/1. Electric component repair room
8/2. Battery re-charging room
9. Shop office
10. Manager room
11. Lavatory



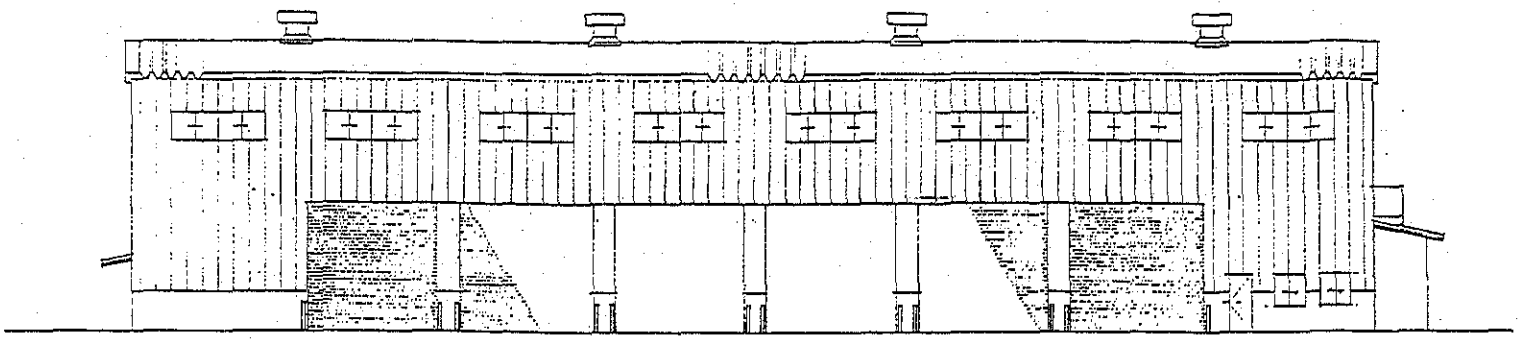
R: Rack
E: Engine Positioner
PR: Parts Rack
TS: Tool Stand
WB: Work Bench
HP: Hydraulic Press
SP: Surface Plate
ES: Engine Stand
DM: Dynamo Meter
PW: Parts Washer
CP: Control Panel
TB: Test Bench
Bt, Ch: Battery Charger

1. Chassis, Tire Welding and Fabrication Shop
2. Machine and Engine, Repair Shop
3. Tool Room
4. Engine Dynamometer Room
5. Fuel Component Repair and Test Room
6. Compressor and Generator Room
7. Parts Warehouse
8. Electric Component Repair / Test and Battery Service Room
9. Reception
10. Mgr.'s Room
11. Rest Room

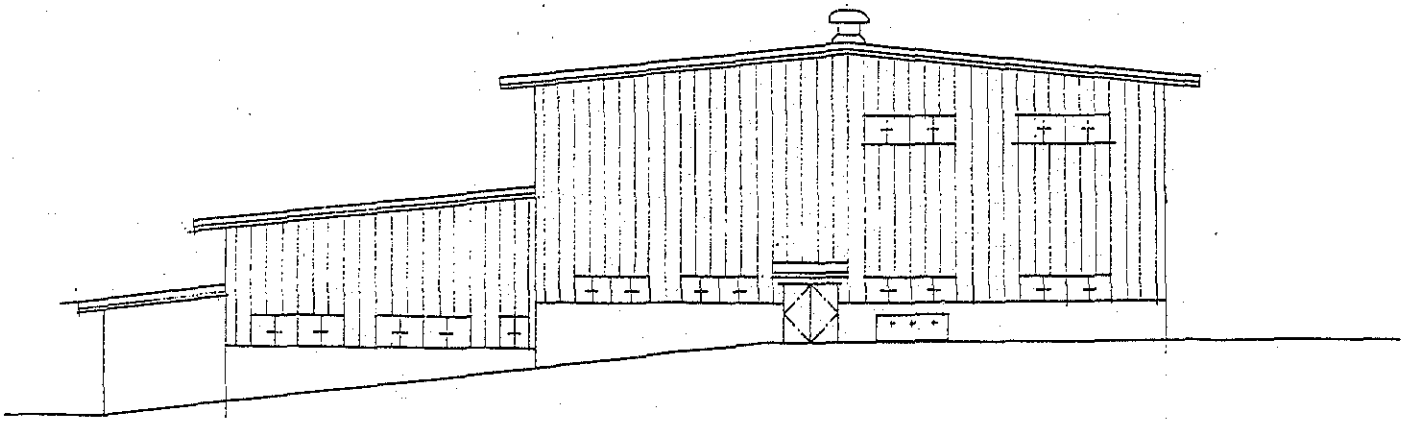
FIRST FLOOR PLAN S:1/200



ELEVATION(1) S:1/200

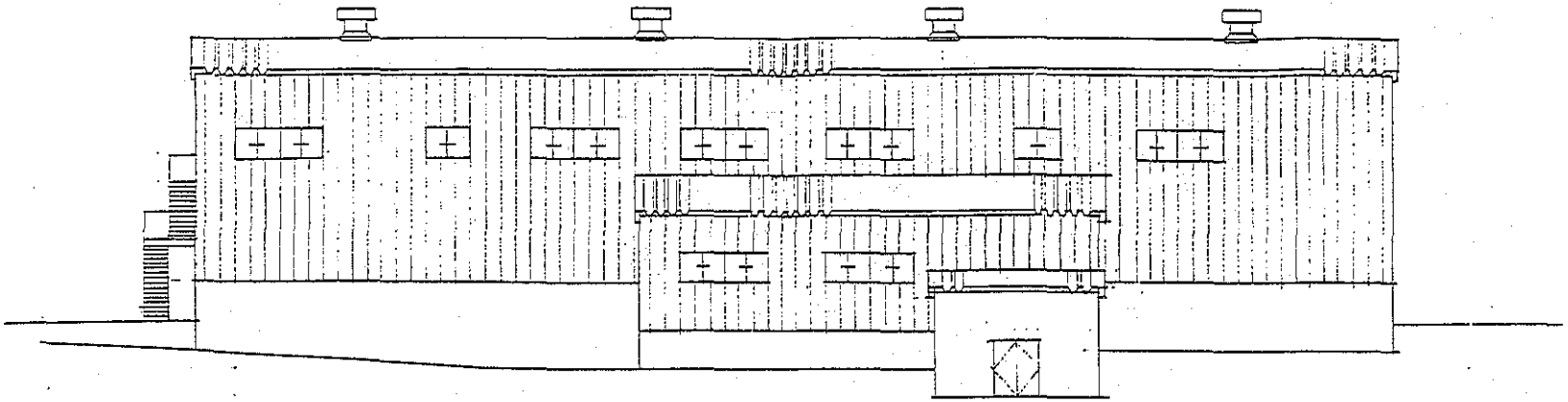


NORTH ELEVATION

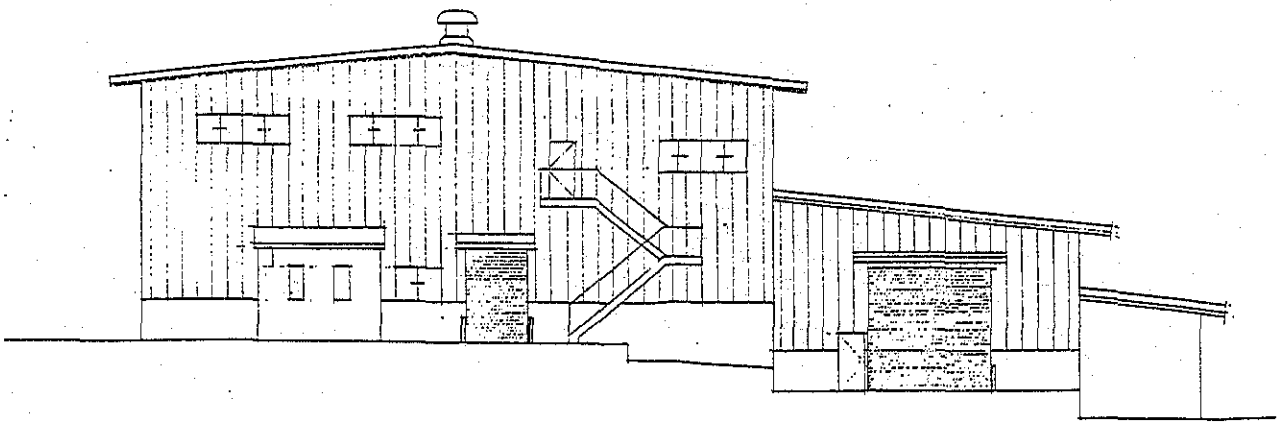


EAST ELEVATION

ELEVATION(2) S:1/200

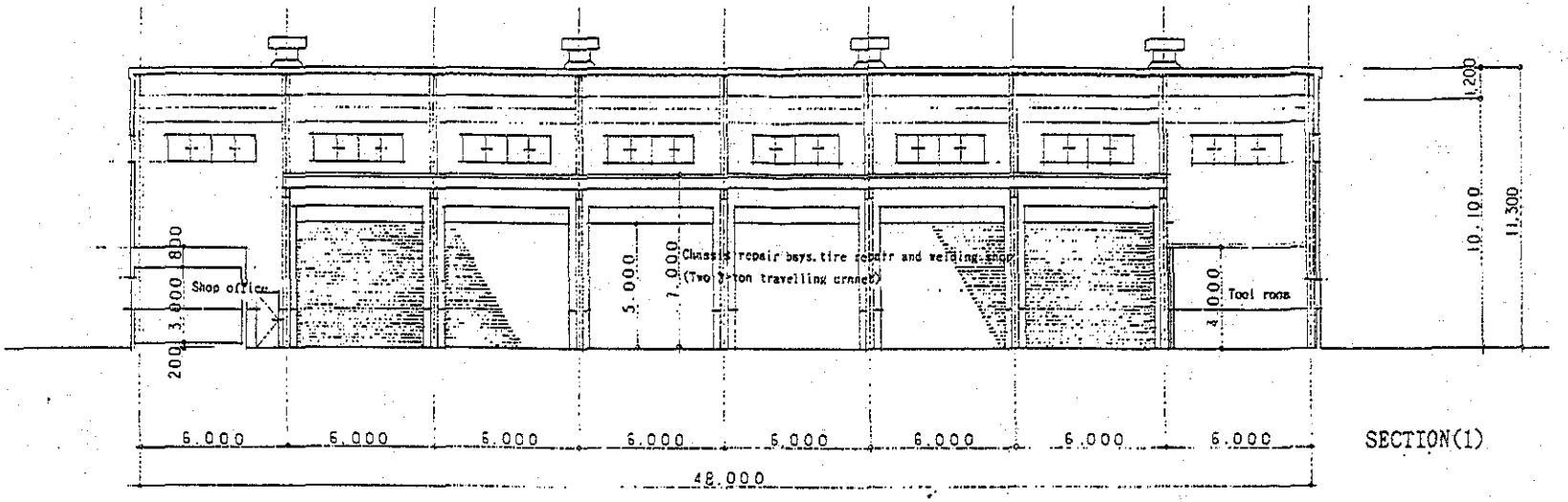


SOUTH ELEVATION

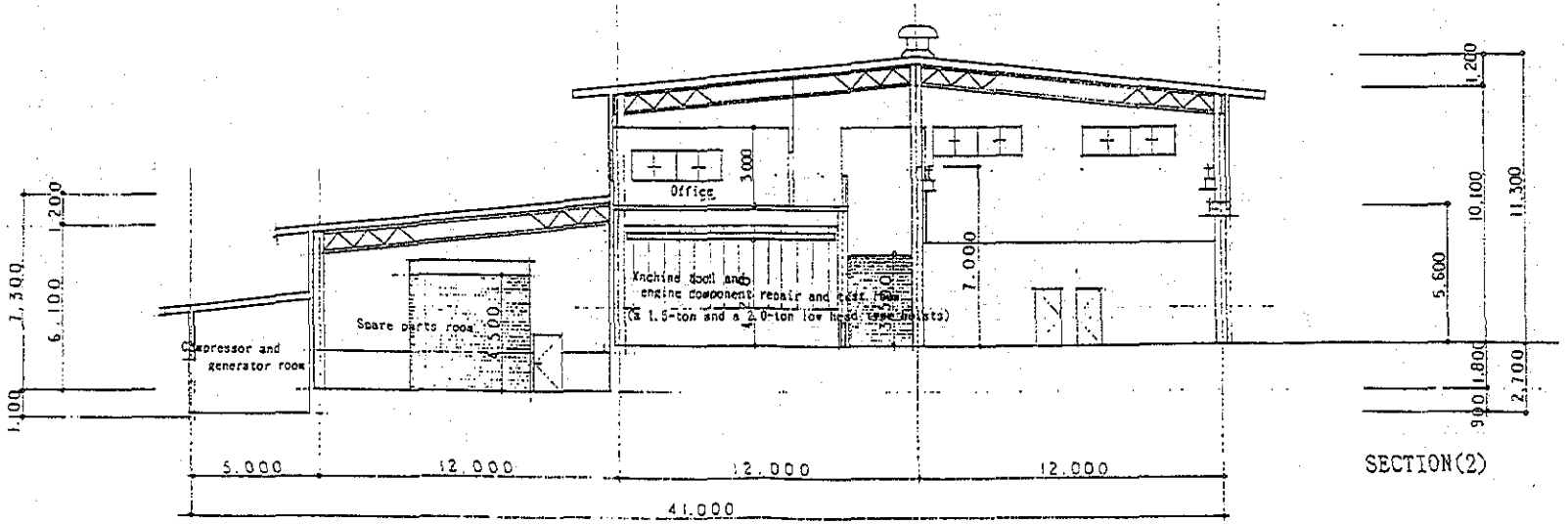


WEST ELEVATION

SECTION S:1/200



SECTION(1)



SECTION(2)

3-3-6 Existing Facility Renovation Plan

With the construction of the dedicated construction equipment and vehicle workshop, the existing workshop will be dedicated to light vehicles. Regarding this workshop, a partial renovation of the building and the provision of minimum repair equipment will be required. As has been mentioned in 2) of (2) in Chapter 2, the details are as follows:

1) Mechanical shop

The repairing of engines and vehicles is actually being carried out here. On rainy days, rainwater flows into the building and disturbs the work.
- Roofing
- Flooring
- Installation of lighting
- Installation of lifter for vehicle servicing

2) Vehicle service shop

Repairing of vehicles and adjustment of wheel balance are being carried out using the existing pit
- Renovation of roofing
- Installation of wheel balancer
- Installation of chain block
- Partial flooring
- Installation of lighting

3) Painting workshop

Painting work is actually being carried out outdoors.
- Roofing
- Flooring
- Installation of lighting

4) Electricity

All shops are to maintain enough lighting facility to conduct safe work.

5) Drainage

Change the existing U-catch drain (150mm in width and 150mm in depth) to bigger side ditch because it is too small and a considerable overflow of rainwater interfers with the workshop operations.

6) Construction Material Plan

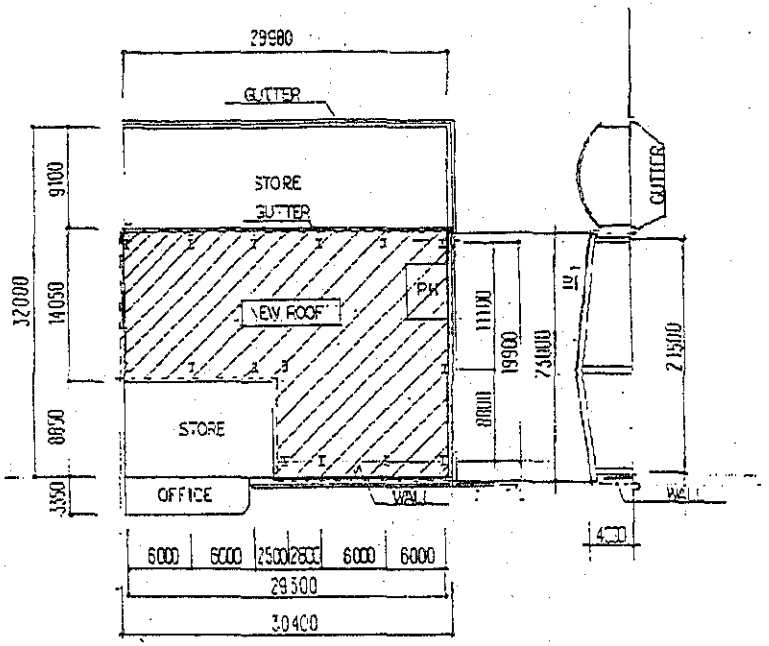
In terms of the content of repairs of mechanical shop, repair shop, and painting shop and parts shop, all of them are illustrated in (1) Renovation Plan. The materials on this renovation is shown as follows;

- Roofing materials	: Zinc plated corrugated steel sheet
- Outer wall	: Mortar improving acrylic repainting finishing
- Flooring	: Concrete finishing

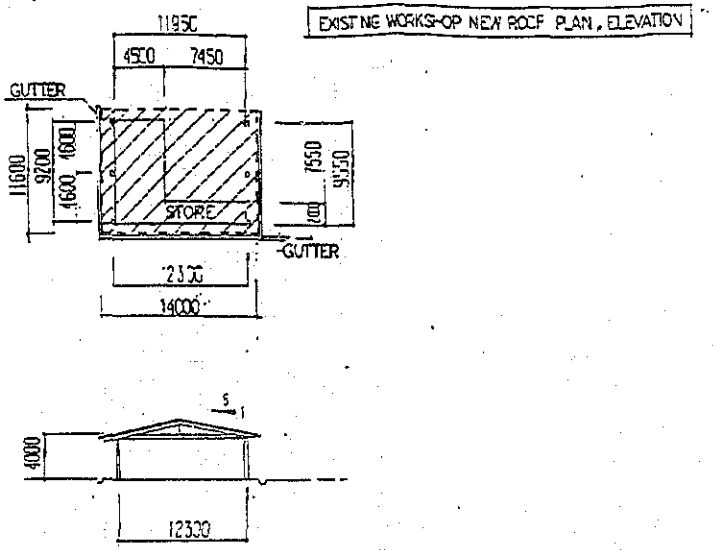
7) Equipment Plan

Currently, although the repair and maintenance of light vehicles are not sufficient condition, the minimum required equipment is provided in this project as below;

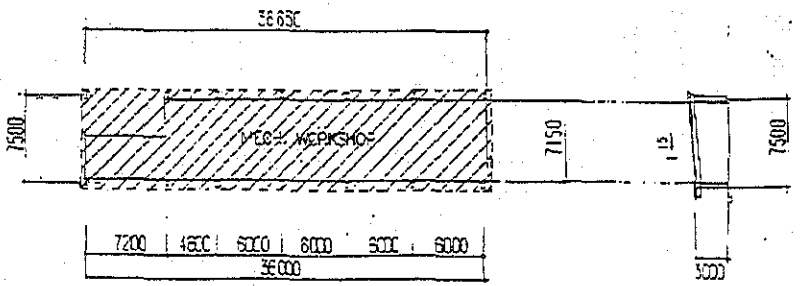
a) Mechanical shop	
- Wheel alignment shop	1
- Vehicle lifter (1,800 x 4,300mm)	1
b) Repair shop	
- Wheel balancer	1
- Chain block (1t)	2 (For 2 Inspection pits)



Painting workshop roof



Powerhouse roof



Mech. workshop roof

3-3-7 Spare Parts Supply Plan

The construction equipment and vehicles provided by the Government of Japan in two phases; i.e., in 1989 and 1990, have been smoothly operating since then. The spare parts provided with the equipment and vehicles have been consumed as necessary, and only about 37 % is left as reported in 3-3. Consumables which are generally used have already run out, and those equipment whose operation requires such consumables are obliged to stop using them, due also to the shortage of funds.

Even if the maintenance and repair work is done using the equipment provided on the occasion of the construction of the repair workshop this time, consumables and spare parts will still be required.

Therefore, this time, judging from the operating time and traveled distance, up to the present, of the equipment and vehicles provided last time, it is necessary to provide not only consumables for each equipment and vehicle but also spare parts in preparation for medium-scaled and large-scaled maintenance.

3-4 Implementation Plan

3-4-1 Construction Condition

The grant aid system of the government of Japan governs the project implementation. Therefore after the government of Uganda and the contractor have concluded the contract agreement, the project needs to be completed within 12 months. For this, Japanese consultants and contractor will despatch necessary and appropriate personnel to Uganda so as to secure construction workmanship within the construction period and to keep the construction schedule.

The consultant's representative will keep in close contact with MOLG so as to facilitate the work and to undertake necessary procedures. At the same time he will make arrangements between MOLG and the contractor so as to promote mutual understanding and smoothly to advance the work. He will contact JICA and the Embassy of Japan in Kenya to report progress condition on the work as well.

The headquarters of the consultants will support the project and keep in contact with JICA and concerned authorities in Japan so as to report the progress of the work and submit necessary documents in Japan.

3-4-2 Implementation Method

Steel structures are rarely used in Uganda. Uganda has a few steel mills, but no steel fabricators. The project structure is steel with rigid frames in both directions, moreover seismic force has been considered. Furthermore, overhead traveling cranes run over the chassis bays. For this, the project structure needs a high degree of accuracy and advanced welding technology. The steel fabricator hence will be Japanese. The main materials and equipment for the steel structure will be procured in Japan. In addition to this, most of both materials and equipment are to be imported. It therefore becomes important to control the procurement plan to keep the construction schedule. The project intends to use a Japanese constructor experienced in Uganda and a capable subcontractor.

The project takes the silty clay layer at a depth of 0.5 m from the ground surface as the supporting layer for the project workshop and apron and road in the premises. The result of the laboratory test however shows that this layer is stiff enough to support the building but it is not strong enough to safely support the building. The

project therefore will do design CBR, corrected CBR tests for apron and road constructions, and plate loading test for the building construction before starting this construction work.

3-4-3 Construction and Supervisory Plan

The consultants will dispatch a representative of the consultants to Uganda so as to supervise the work through the whole construction period, and moreover, send experts to assist the representative at every important point of the progress.

The contractor will dispatch three engineers; project manager, an accountant, an architectural and a building equipment engineer. In addition to this, the contractor will send technicians and steel erection foremen as the construction schedule requires.

3-4-4 Procurement Plan

1) Buildings

Uganda produces crushed stone, cement, bricks, brick tiles, concrete blocks, steel rounds and torsion bars and steel angles. Of these, steel bars and angles are produced from scrap iron, and cement is still in shortage because of power shortages. Other materials are imported. Availability hence restricts the type, quality and quantity of both materials and equipment.

Since it is difficult for MOLG to allocates budget for the maintenance and repair of the buildings as well as the management and operation of the center,the project will utilized durable materials and reliable equipment for the main structures and equipment. These will be procured in Japan. Inexpensive consumables, and easy accessible materials and equipment procured in Uganda will be procured in the local markets.

The materials and equipment shipped from Japan will be unloaded at the port of Mombasa in Kenya and transported by land to Kampala in Uganda. After customs clearance, they will be conveyed to the site by lorries and articulated lorries. Many importers are active in Kampala and large contractors are among them. They directly import construction materials to the bond areas in their own lots of land. With themselves, project can be implemented effectively. The project intends to place a Japanese contractor experienced in Uganda together with a large local constructor for the project implementation.

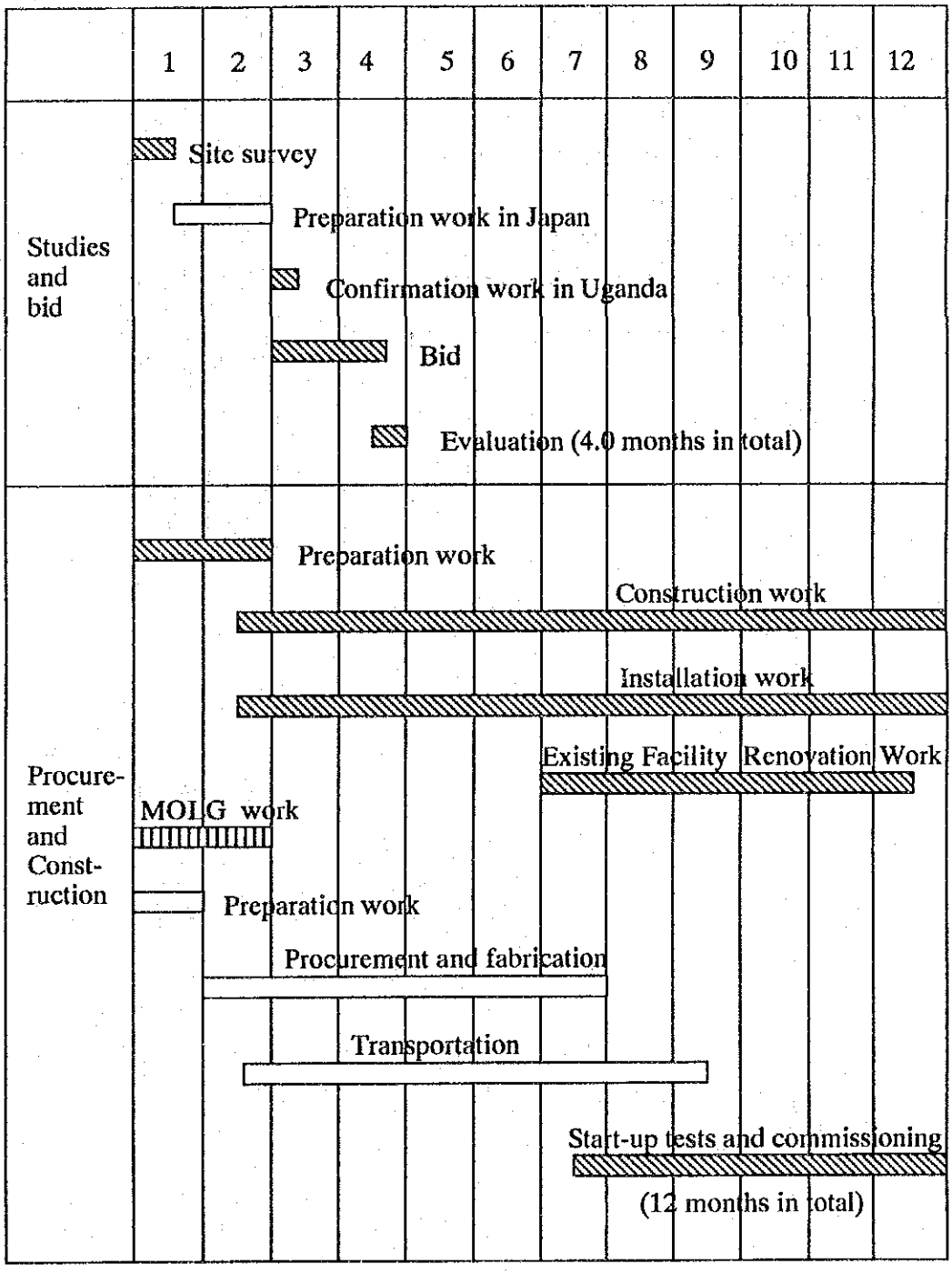
2) Equipment

As regards the equipment items, as the related performance tests and inspections are carried out before shipping and delivery, they are mainly procured in Japan. However, those items which require daily checking and maintenance such as personal computers for spare parts control and office copy machines, will be procured in Uganda. No procurements from third countries are considered.

3-4-5 Implementation Schedule

Shown in Table 3-3 below is the draft of project implementation schedule.

Table 3-3 Implementation Schedule



3-4-6 Scope of Work

Shown below is the breakdown of the cost to be borne by the Government of Uganda.

1.	Land preparation and connecting road from the outside road to the inside apron	US$7,056
2.	Side drain	US$73,000
3.	A gate, gate doors and external wal	US$7,500
4.	Two (2) guardhouses	US$3,600
5.	Tie-in work for electricity and water supply	US$19,000
6.	Fencing around the site	US$15,630
7.	Security system around the site	US$58,000
8.	Lawn and afforestation on the premises	US$12,434
	Total	US$196,220

Chapter 4 Project Evaluation and Conclusion

Chapter 4 Project Evaluation and Conclusion

1. Effects of Project

This project is designed to establish the MOLG's maintenance and repair workshop, which is located 84km east of Kampala, the capital of Uganda, as the base for feeder road rehabilitation projects throughout Uganda, by constructing a new workshop next to the existing one, to be used for the maintenance and repair of construction equipment and heavy vehicles, and providing equipment for such maintenance and repair work. The expected effects of the implementation of the project are as follows:

Table 4-1 Effects of the Implementation of the Project and Expected Level of Improvement

Present Conditions and Points at Issue	Measures to be Taken under the Project	Effects and Level of Improvement by Implementation of the Project
1. The target of the road rehabilitation work in the three districts, namely Jinja, Kamuli, Iganga, which are within the scope of equipment supply by Japanese Grant Aid, is 1,800 km. During the last four years, 60% of the target has been achieved, but the construction equipment items provided by Japan until now are approaching the time of their medium and large scale maintenance.	1. Promote the rehabilitation of vehicles not in use and of those, waiting for completion of maintenance and repair.	1. As the road rehabilitation and maintenance control project is possible to execute as continuous past pace (annual about 450 km), the achievement of the project target can be expected within 2 years.
2. Because of a lack of proper repair equipment, the repairing of construction equipment is being carried out almost entirely by hand and reassembling work is being carried out without any proper parts. Therefore, some readjustments are necessary, as this causes trouble and Power-down, some readjustments are necessary.	2. To establish a repair system, by planning and refurbishing the repair facilities and equipment, and providing spare and repair parts.	2. Normal function of equipment and vehicles can be expected by carrying out adequate repair work of repair equipment.
3. Regarding the local maintenance and repair workshop, the consciousness and technology for equipment management are insufficient condition, and does not have enough repair facilities, as well.	3. Along with repair facilities, provide spare parts, manuals and videos, etc. for the repairing and maintenance services in order to secure the training ability for repair technique.	3. Remarkable enhancement of repairing know-how and technology and equipment maintenance can provide the equipment operating rate up to 100%.

2. Proof and Verification of Soundness of the Project

In addition to the above, the following benefits can be expected by the promotion of the feeder road rehabilitation project.

(1) Roads which were initially so narrow that only a bicycle could go through but were enlarged and smoothened using equipment provided by Japan, are called "JICA roads" by local people, with a feeling of gratitude. In that way, the promotion of the project will contribute to the enhancement and stability of the life of local people.

(2) By enabling the throughfare of vehicles, the transportation of products and materials between the farming and urban areas will be facilitated, and greater economic activities will be promoted.

(3) Transportation costs will be reduced, and the price index will be stabilized.

(4) By providing easy access to city, social services such as medical and educational benefits are expected for the residents.

(5) As traffic volume of feeder road is not so heavy, it is considered that this does not much affect the environment.

Considering these advantages, the soundness of the project is clear and its earliest possible implementation is advocated.

3. Proposals

(1) Determination of Criteria to Scrap Obsolete Vehicles

Of the construction equipment and vehicles provided under past aid programs, vehicles as listed below are sometimes left in a scrapped condition in the workshop premise because of the lack of a repair budget, equipment or ability.

i) Those which are badly damaged through accidents,
ii) Those whose repair cost is increasing as a result of long-term operation, and
iii) Those missing parts while they were not in use after breakdown because they require a large amounts of money for repairing

These equipment and vehicles are taking up space and making the premises look very congested.

(2) Central control of spare parts and OJT

As can been seen in the budget of the Republic of Uganda, its enthusiasm toward education is very noteworthy and the potential of the receiving party is considered to be very high. Especially, stocks of spare parts have been well controlled, and there is no doubt that the workshops under this project will become a leading feature of the country by the implementation of spare parts control by personal computers.

The construction equipment items are widely used in the country and their necessity is increasing year by year but there are many cases where they are left unused in local repair and maintenance workshops because of the lack of spare parts and repair equipment. Also, there are cases where relatively new equipment items are left disassembled and some parts removed in the course of repairs for the same reasons.

Therefore, MOLG should urgently carry out the training of persons to take charge of local workshops after the completion of the workshops under the project in order to provide instructions in disassembling and maintenance work. It should also assess size the shortage levels of spare parts in each local workshop and establish central control systems which will enable the smooth supply of required spare parts.

Further, it is also necessary to establish a checking and maintenance system without restricting the work to irregular work involving vehicles which have broken down and are waiting for repairing in order to increase the operating ratio of the workshops by properly planning the checking and maintenance work, and increase the opportunity of providing OJT to the young technical staff.

It is important to ensure the collection of the service and spare parts costs. By doing so, business efforts will grow and the management of the repair and maintenance workshop will be stabilized, including the purchase of future spare parts, and thus contribute to activate the Ugandan economy.

Appendix

Appendix

1. Member List of Survey Team
2. Survey Schedule
3. Member List of Party Concerned in the Government of Uganda
4. Minutes of Discussion
5. Breakdown of the cost to be borne by the Government of Uganda
6. Breakdown of Operating Cost
7. Space Requirement of Workshop Facilities
8. Soil Investigations and Geotechnical Study Report
9. Topographical Survey Drawing

Appendix 1 Members List of Survey Team

Takao YOSHIMURA	Leader/Construction Machinery Advisor to Manager, Facilities Sec., Construction Dept. I, Nagoya Construction Bureau Japan Highway Public Corporation
Yujiro YABE	Grant Aid Division Economic Cooperation Bureau Ministry of Foreign Affairs
Toshiyuki IWAMA	Project Coordinator Second Basic Design Study Div., Grant Aid Study and Design Dep., JICA
Akira SHIMA	Project Manager Construction Project Consultants, Inc.
Masatoshi SOGAWA	Architect Construction Project Consultants, Inc.
Kiyohiro YOSHIKAWA	Equipment Planner Construction Project Consultants, Inc.

Appendix 2 Survey Schedule

No.	Date		Activities
1	Jun. 7	Tue.	Arrive at Entebbe, Courtesy call to Ministry of Foreign Affairs, Finance and Economic Planning, Local Government
2	8	Wed.	Meeting on Inception Report with MOLG, Collection of data
3	9	Thu.	Observation of BUGEMBE Workshop in Jinja
4	10	Fri.	Discussion of Minutes of Meeting
5	11	Sat.	Explanation of draft of Minutes of discussion with MOLG, and discussion
6	12	Sun.	Team meeting, Visit to other MOLG Workshop
7	13	Mon.	Discussion and signing of Minutes of Meeting
8	14	Tue.	Leave Kampala (Government members, Mr. Yoshimuras and Mr. Iwama: QU-520 08:50)
9	15	Wed.	- Ditto -, Collection data
10	16	Thu.	- Ditto -, Preparation of geological and topographical survey at site
11	17	Fri.	- Ditto -
12	18	Sat.	Discussion with MOLG, Collection data
13	19	Sun.	Visit to MOWTC Workshop in Kampala
14	20	Mon.	Collection of data
15	21	Tue.	Survey of BUGEMBE, Collection of Data
16	22	Wed.	- Ditto -
17	23	Thu.	- Ditto -
18	24	Fri.	Discussion with MOLG, Collection of data
19	25	Sat.	- Ditto -
20	26	Sun.	Internal Meeting
21	27	Mon.	Preparation of field report Collection of data of boring test and topographic survey at site
22	28	Tue.	- Ditto -
23	29	Wed.	Confirmation of field survey results
24	30	Thu.	Discussion with MOLG on the field report
25	Jul. 1	Fri.	- Ditto -
26	2	Sat.	Leave Kampala (QU-362 17:30)

Schedule for explanation of Basic Design Draft Report

No.	Date		Activities
1	Oct. 4	Tue.	Arrive at Entebbe
2	5	Wed.	Courtesy call to Ministry of Foreign Affairs, Finance and Economic Planning, Local Government Team meeting
3	6	Thu.	Explanation of draft of Basic Design Report with MOLG, and discussion
4	7	Fri.	Team meeting
5	8	Sat.	Making on draft of Minutes of Meeting
6	9	Sun.	Explanation on draft of Basic Design Report with MOLG, discussion
7	10	Mon.	- Ditto -
8	11	Tue.	Discussion and signing of Minutes of Meeting
9	12	Wed.	Leave Kampala (QU-530)

Appendix 3 Member List of Party Concerned in the Government of Uganda

Ministry of Local Government

Jimmy R. Lwamafa	Under Secretary	Administration Ministry of Local Goverment (M O L G) Uganda House P.O.BOX 7037, Kampala Plot No.10 Lampara Road Phone : 256838
Kagyina Karuma	Ag. Chief Engineer	Feeder Road Maintenance Project M O L G P.O.BOX 7037, Kampala Phone : 241767
John Bigabwa	Engineer	M O L G P.O.BOX 7037, Kampala Phone : 241767
Wassanyi Serukenya	Consultant	J I C A Project M O L G P.O.BOX 7037, Kampala Phone : 241767
John Kitimbo	Supervisor	J I C A Central Workshop M O L G. P.O.BOX 405 Bugembe, Jinja Phone : (043)21409

Walrama Dembe	Head Economist	Planning Unit M O L G 5 Flr., Uganda House P. O. BOX 7073 Phone : 244214
Sam Emorut-Eronot	Economist	Planning Unit M O L G 5 Flr., Uganda House P. O. BOX 7073 Phone : 244214
Okello Patric	Statistician	Planning Unit M O L G 5 Flr., Uganda House P. O. BOX 7073 Phone : 244214

A. SENINDE	Supervisor	Mpigi	District Administration Works Department
B. Wampamba	Supervisor	Masaka	District Administration Works Department
Enamel Ngirabakuni Assist	Supervisor	Masaka	District Administration Works Department
Alvan M. Rusunzu	Supervisor	Rakai	District Administration Works Department
Godfrey Tumwine	Supervisor	Mbarara	District Administration Works Department
Vincent Ndyanabangi	Project Engineer	Mbarara	District Administration Works Department
G. S. Titilbya	Supervisor	Kasese	District Administration Works Department
———	Supervisor	Kabarole	District Administration Works Department

Ministry of Foreign Affairs

J. S. Bakayana-Kityo	Acting Director	Department of Asia and Pacific Region Ministry of Foreign Affairs P. O. BOX 7048, Kampara Phone : (041) 259898

Ministry of Finance & Economic Planning

Omar T. Mattar	Ag. Commissionor	External Aid Co-ordination Department Ministry of Finance and Economic Planning P. O. BOX 8147, Kampara Phone : 235051/3 8 ext. 114/113
Isidore Byamugisha	Secretary	Central Tender Board Ministry of Finance and Economic Planning P. O. BOX 3925 Phone : 230316
Emanuel Katwe	Senior Officer	External Aid Co-ordination Department Ministry of Finance and Economic Planning P. O. BOX 7048, Kampara

Ministry of Land, Housing & Urban Development

Jared Nangai Wanyama	Chief Architect	Ministry of Land, Housing and Urban Development(M O L H U D) Phone : 243931, 243932
I. C. Obei	Electrcal Section	M O L H U D
Ciles Odongo	Quantity Serveyor	M O L H U D Phone : 242934
Justin Qwoding Augiro	Chief Structural Civil Engineer	M O L H-U D
Michael Sentongo	Structural Engineer Check Doc. & Site Inspector	M O L H U D P. O. BOX 11430, Kampara (Resident Adress)

Ministry of Labour and Social Welfare

C. K. Bassajjasubi	Deputy Labour Commissioner	Ministry of Labour and Social Welfare

Ministry of Works, Transport & Communication

Lawrence Lutaaya	Commissionor	Works (Technical) Ministry of Works, Transport and Communications (MWTC) P. O. BOX 10, Entebbe Phone : (042) 20230, 20101-9
G. W. Okurut		Central Workshop MWTC Plot No. 1 Old Portbell Road P. O. BOX 7174, Kampara Phone : 235973, 358771/9

Jinja District Administration

Muwaya Mukuwa	Supervisor	Works Department Jinja District Adminisration P. O. BOX 10, Entebbe Phone : (043) 21409

Makerere University

Dr. J. K. D. Higenyi	Dean	Faculty of Technology Makerere University P. O. BOX 7062 Phone : 530686
	President	Association of Professional Engineers
F. F. Tusubira	President	Department of Electrical Engineering Faculty of Technology Makerere University

Companies (Agents etc.)

K. Tetumoto	Technical Adviser	Uulted Garment Industry Ltd P. O. BOX 4378, Kmpara Phone : 241656
(C A T)		
Colin Smith	Service Manager	Galley & Roberts (Uganda) Ltd 7th Street Indusrial Area P. O. BOX 7126, Kmpara Phone : 235421/6
(ISUZU)		
Ali A. Khan	General Manager	Akamba (Uganda) Limited Plot 43 Jinja Road P. O. BOX 20028, Kmpara Phone : 241369
(TOYOTA, SUZUKI)		
Sam K. Walusimbi	Managing Director	Toyota, Walusimbi's Garage Ltd P. O. BOX 1148, Kmpara Phone : 259111/2
(KOMATSU, MITSUBISHI)		
Sam J. Kibuuka	Director	General Machinery Limited Plot 11 First Street P. O. BOX 6080, Kmpara Phone : 244364, 256250
(Construction Companies)		
Tom Kajumba	B. Arch (Hons)	KK Partmership Archtects Plot 1/13 Jinja Road EAGEN Mansions (2nd Floor) P. O. BOX 4906, Kmpara Phone : 236742

G. W. Katatumba B. Arch MUSA Technoplan House
18A Gerge Street
P. O. BOX 6313, Kmpara
Phone : (041) 233851, 233853
President Uganda Society of Architects

Appendix 4 Minutes of Discussion

MINUTES OF DISCUSSION
BASIC DESIGN STUDY
FOR REHABILITATION OF THE BUGEMBE WORKSHOP
IN THE REPUBLIC OF UGANDA

In response to a request from the Government of the Republic of Uganda, the Government of Japan decided to conduct a Basic Design study on the Project for Rehabilitation of the Bugembe Workshop (hereinafter referred to as the "Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Uganda a study team, which is headed by Mr. Takao Yoshimura, Advisor to Manager, Facilities Sec., Construction Dept. 1, Nagoya Construction Bureau, Japan Highway Public Corporation and is scheduled to stay in the country from June 7 to July 2, 1994.

The team held discussions with the officials concerned of the Government of Uganda and conducted a field survey at the study area. As a result of discussions and field survey, both parties have confirmed the main items described on attached sheets. The team will proceed to further works and prepare the Basic Design Study Report.

Kampala, June 13, 1994

吉村隆夫

Mr. Takao Yoshimura
Leader
Basic Design Study Team
JICA

Lwamafa

Mr. Jimmy R. Lwamafa
for Permanent Secretary
Ministry of Local Government

1. OBJECTIVE

The objective of the Project is to strengthen the Bugembe Workshop of the Ministry of Local Government (MOLG) by constructing a new workshop and providing necessary equipment for repairing the road construction machinery.

2. PROJECT SITE

MOLG's Bugembe Workshop
(Site map is attached as Annex-1)

3. EXECUTING AGENCY

Ministry of Local Government (MOLG)

4. ITEMS REQUESTED BY THE GOVERNMENT OF UGANDA

After discussions with the Basic Design Study Team, the list of major items requested by the Government of Uganda is confirmed as shown in Annex-2.

5. ITEMS AGREED

(1) The new workshop will accommodate heavy construction machinery stationed on the whole country and fill the role of the MOLG's central workshop.

(2) The new workshop will handle major repair to the heavy construction machinery.

(3) Equipment for support vehicles workshop will be provided to improve the existing facilities.

(4) Spare parts for existing vehicles and machines will be supplied as will be found necessary.

(5) The final components of the Project will be determined in Japan after further studies.

6. JAPAN'S GRANT AID SYSTEM

(1) The Government of Uganda has understood Japan's Grant Aid system explained by the team.

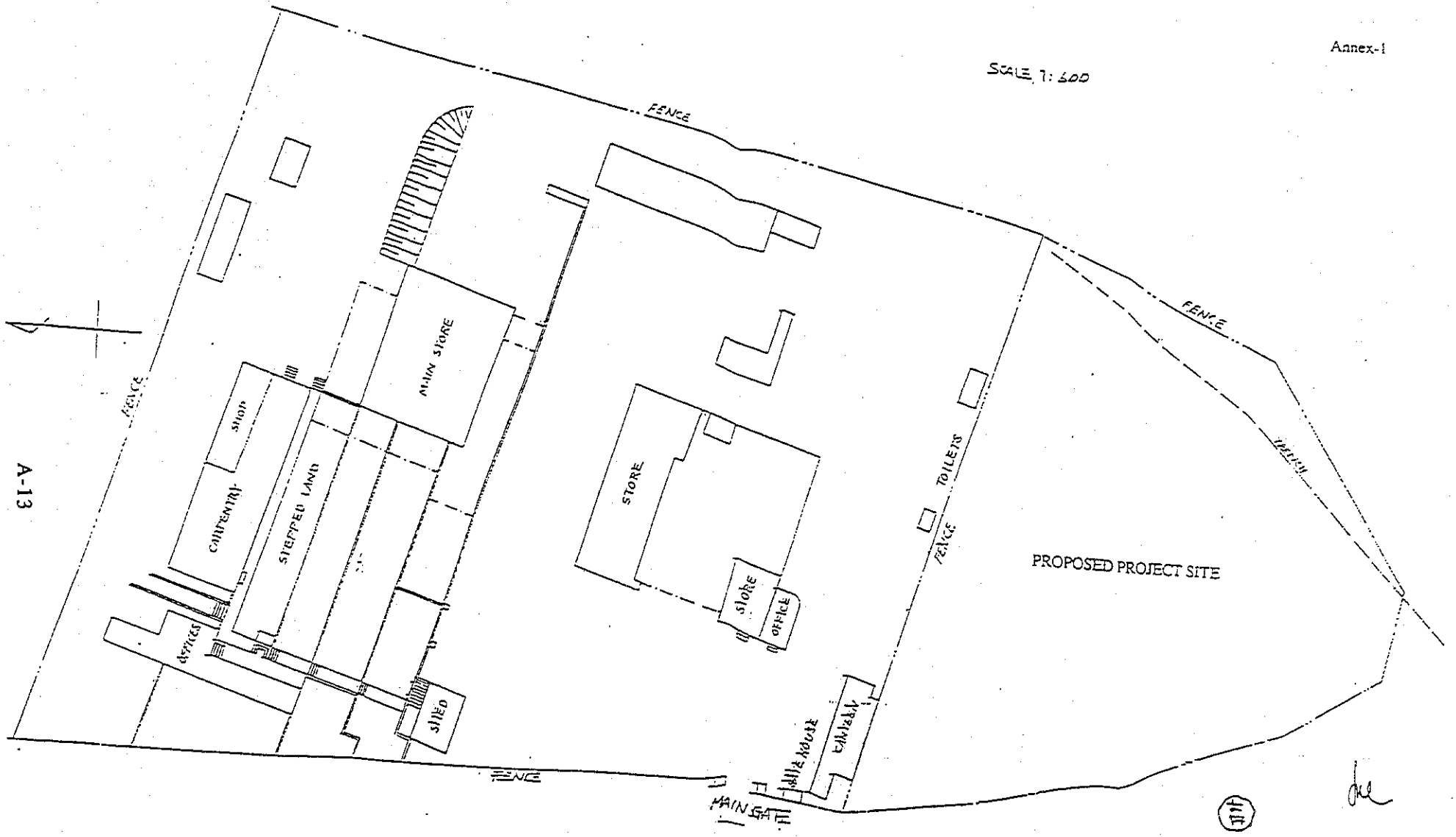
(2) The Government of Uganda will take necessary measures, described in Annex-3 for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

7. SCHEDULE OF THE STUDY

(1) The consultants will proceed to further studies in Uganda until July 2, 1994.

(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents by the end of September, 1994.

Annex-I



WORKSHOP OF MINISTRY OF LOCAL GOVERNMENT AT BUGEMBE

EXISTING ARRANGEMENT OF BUILDING

Annex-2 Items requested by the Government of the Republic of Uganda

Construction of a new workshop containing the following rooms equipped with the necessary machines and tools:

1. Chassis repair shop
2. Engine repair shop
3. Engine dynamometre room
4. Fuel component repair and test room
5. Electrical component repair and test room
6. Hyd. component repair and test room
7. Battery service room
8. Power train repair room
9. Tyre service room
10. Machine shop
11. Welding and fabrication shop
12. Undercarriage rebuilding shop
13. Compressor room
14. Cleaning area
15. Painting room
16. Tool room
17. Parts room
18. Special tool room

Annex-3 Necessary measures to be taken by the Government of the Republic of Uganda in case Japan's Grant Aid is executed

1. To secure the site for the Project.

2. To clear, level and reclaim the site as well as to relocate the existing facilities prior to the commencement of the construction.

3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.

4. To provide the following facilities;

   1) Power distribution line to the site
   2) Power supply to the equipment procured under the Grant for the support vehicles workshop.
   3) Provision of water supply to the site
   4) Provision of drainage from the site
   5) Telephone trunk line and the main distribution frame/panel of building
   6) Provision of gas, if any

5. To ensure prompt unloading, tax exemption, customs clearance at place of disembarkation in Uganda and prompt internal transportation of the items purchased under the Grant Aid.

6. To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A).

   1) Advising commission for the Authorization to Pay
   2) Commission for the Payment

7. To exempt Japanese nationals involved in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Republic of Uganda with respect to the supply of the products and services under the verified contracts.

8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Republic of Uganda and stay therein for the performance of their work.

9. To bear all the expenses other than those to be borne by the Grant, necessary for the construction of the facilities as well as for the transportation and the installation of the equipment.

10. To ensure the necessary budget and personnel for the proper and effective implementation of the Project, including operation and maintenance of the equipment under the Grant Aid.

MINUTES OF DISCUSSION
BASIC DESIGN STUDY
FOR REHABILITATION OF THE BUGEMBE WORKSHOP
IN THE REPUBLIC OF UGANDA
(CONSULTATION ON DRAFT REPORT)

In June, 1994, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Rehabilitation of The Bugembe Workshop (hereinafter referred to as "the Project") to the Republic of Uganda, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and consult the Republic of Uganda on the components of the draft report, JICA sent to the Republic of Uganda a study team, which is headed by Mr. Takao Yoshimura, Advisor to Manager, Facilities Sec., Construction Dept. I, Nagoya Construction Bureau, Japan Highway Public Corporation, and is scheduled to stay in the country from October 4 to October 12, 1994.

As a result of discussion, both parties confirmed the main items described on the attached sheets.

Kampala, October 11, 1994

吉村隆夫

Mr. Takao Yoshimura
Leader
Basic Design Study Team
JICA

矢部優治郎

Mr. Yujiro Yabe
Witness
Ministry of Foreign Affairs
Japan

Mrs. T. Kinalwa
Permanent Secretary
Ministry of Local Government
The Republic of Uganda

Mr. Emmanuel Katwe
Witness
Senior Finance Officer
External and Coordination Dept.
Ministry of Fin. & Econ. Plan.
The Republic of Uganda

11/10/94

1. Components of Draft Report

The Government of the Republic of Uganda has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid System

(1) The Government of the Republic of Uganda has understood the system of Japanese Grant Aid explained by the team.

(2) The Government of the Republic of Uganda will take the necessary measures described in Annex for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further Schedule

The team will make the Final report in accordance with the confirmed items, and send it to the Government of the Republic of Uganda by December, 1994.

Annex: Necessary measures to be taken by the Government of the Uganda in case Japan's Grant Aid is executed.

1. To secure the site for the Project.

2. To clear, level and reclaim the site including expanded space to existing workshop area prior to commencement of the construction.

3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.

4. To construct the access road to the site and to remove a part of existing workshop prior to commencement of construction.

5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.
   (1) Electricity distributing line to the site.
   (2) Water distribution main to the site.
   (3) Drainage main to the site.
   (4) Telephone trunk line and the main distribution panel of building.
   (5) General furniture such as carpets, curtains, tables, chairs and others.
   (6) Provision of gas, if any.
   (7) Provision of temporarily site for houses and material.

6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.

7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkment.

8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Republic of Uganda and stay therein for the performance of their work.

9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.

10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

Appendix 5 Breakdown of the cost to be borne by The Government of Uganda

1.	Land preparation and Connecting road from the outside road to the inside apron	lump sum	US$7,056
2.	Side drain	"	US$73,000
3.	A gate and gate doors and external wall	"	US$7,500
4.	A guardhouse	"	US$3,600
5.	Tie-in works for electricity and water supply	"	US$15,000
6.	Fencing around the site	"	US$15,630
7.	Security line around the site	"	US$58,000
8.	Lawn and tree planting on the premises	"	US$12,434
	Total		US$196,220

Appendix 6 Breakdown of Operating Cost

1. Operating Cost of the Workshop

Operating cost consists of the items below:

(1) Operating cost of workshop facilities
(2) Labour cost

2. Operating cost of facility

(1) Operating cost of facility is including the lubricating oil cost for the power electric generator.

Generator	300 KVA	
Fuel consumption	35 l/m x 65 H/day x 250 day/year	= 56,875 l/year
	US$ 0.38/l x 56,875 l	= US$ 21,612/year

(2) Labour cost
See below

2. Labour Cost

Labour cost was calculated as a fixed cost on the assumption that secures the necessary labour employment with an operation aim.

Labour cost consists as below;

(1) Road maintenance work
(2) Heavy equipment maintenance work (Workshop)

1) The fixed cost was calculated by accumulating annual operating number in each operation section for the road maintenance work. Regarding the operation cost of heavy equipment, the calculation was made in the items of new equipment operation cost.

2) The fixed cost was calculated based on the heavy equipment maintenance operation that assumed the assigned labour employment to the workshop.

Appendix 7 Space Requirement for Workshop Facilities

		Qt'y	L x W x H
1. Chassis repair shop			
1) Overhead Crane	3 t	2	
2) Parts Rack		6	1,500 x 400 x 1,200 (Approx.)
2. Engine & Component repair shop			
1) Overhead Hoist Crane	2 t, 1.5t	each 1	
2) Hydraulic press	55 t	1	1,200 x 700 x 1,700 (Approx.)
3) Work Bench		3	1,800 x 800 x 740 (")
4) Tool Cabinet		3	740 x 400 x 840 (")
5) Hydraulic Test Stand of Cylinder Head		1	1,000 x 500 x 470 (")
6) Mobile Work Bench		4	1,000 x 600 x 700 (")
7) Surface Plate		1	1,000 x 1,200 x 120 (")
8) Engine Positioner		6	1,200 x 700 x 1,000 (")
3. Engine Dynamometer room			
1) Engine Dynamometer		1	960 x 1,000 x 1,600 (")
2) Work Bench		1	1,800 x 800 x 740 (")
3) Parts Rack		1	1,500 x 400 x 1,200 (")
4) Tool Cabinet		1	1,200 x 400 x 1,200 (")
5) Mono-rail	2t	1	
4. Fuel Injection Pump Test Room			
1) Injection Pump Test Stand		1	1,700 x 850 x 1,810 (")
2) Work Bench		3	1,800 x 800 x 740 (")
3) Tool Cabinet		2	1,200 x 400 x 1,200 (")
4) Parts Cleaner		1	1,500 x 720 x 1,400 (")
5. Electric Component Repair Room			
1) Starter Generator Test Bench		1	1,600x1,000x1,500 (")
2) Work Bench		1	1,800 x 800 x 740 (")
3) Tool Cabinet		1	740 x 1,40 x 840 (")
6. Battery Service			
1) Hand Truck		1	900 x 600 (")
2) Parts Rack		2	1,500 x 400 x 1,200 (")
3) Battery Charger		2	580 x 360 x 830 (")
7. Tire Repair Shop			
1) Tire mounting & Dismounting machine		1	3,800x3,800x1,900 (")
2) Tool Locker		1	1,200 x 400 x 1,200 (")
8. Machine Shop			
1) Lathe		1	4,000x1,500x1,500 (")
2) Universal Milling Machine		1	2,500x2,230x1,620 (")
3) Hack Saw Machine		1	1,500x740x1,000 (")
4) Bench Electric Grinder		1	350 x 500 x 400 (")
5) Work Bench		2	1,800 x 800 x 740 (")
6) Tool Locker		7	1,200 x 400 x 1,200 (")
7) Bench Lathe		1	1,680 x 680 x 600 (")
8) Shaping Machine		1	2,560x1,280x1,740 (")
9. Welding & Fabrication Shop			
1) AC Arc Welder		1	400 x 580 x 640 (")
2) Diesel Engine Welder		1	1,880x840x1,150 (")
3) High-speed Cut-off machine		1	970 x 390 x 970 (")
4) Hydraulic Press	100t	1	1,200 x 700 x 1,800 (")

		Qt'y	L x W x H
10. Compressor Room			
1) Air Compressor		1	2,000x1,500x1,300 (Approx.)
2) Reserver Tank		1	1,000x1,000x2,000 (")
11. Washing Space			
1) High Pressure Washer		1	1,560 x 890 x 1,330 (")
2) Steam Cleaner		1	1,210 x 640 x 1,210 (")
12. Tool Room			
1) Parts Rack		4	2,000 x 700 x 2,000 (")
13. Light Vehicle Repair Shop			
1) Alignment Test Lift		1	5,000x1,700x1,600 (")
2) Four Post Lift	3t	1	4,370x1,800x1,800 (")
3) Wheel Balancer		1	450 x 980 x 1,100 (")

THE REPUBLIC OF UGANDA

MINISTRY OF WORKS, TRANSPORT AND COMMUNICATIONS

SOIL INVESTIGATIONS AND GEOTECHNICAL STUDY OF THE SITE PROPOSED FOR THE MINISTRY OF LOCAL GOVERNMENT WORKSHOP AT JINJA

CHIEF MATERIALS ENGINEER
CENTRAL MATERIALS LABORATORY
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KAMPALA

JUNE 1994

Contents

List of Symbols used

BH	-	Borehole
c_u	-	Undrained Cohesive Strength
D_f	-	Depth of Foundation
e	-	Void Ratio
e_o	-	Initial Void Ratio
E_s	-	Secant Modulus
GWT	-	Ground Water Table
LL	-	Liquid Limit
m_v	-	Coefficient of Volume Compressibility
NM	-	Natural Moisture Content
NP	-	Non-plastic
OMC	-	Optimum Moisture Content
P_c	-	Preconsolidation Pressure
P_o	-	Overburden Pressure
PI	-	Plasticity Index
PL	-	Plasticity Limit
SPT	-	Standard Penetration Test
γ_b	-	Bulk Density
U - 100	-	Undisturbed Sample
D - 35	-	Disturbed Sample
p	-	Foundation Pressure
σ	-	Stress
σ_1	-	Major Principal Stress
σ_3	-	Minor Principal Stress
BS	-	British Standard

1. INTRODUCTION

1.0 At the request of M/S Roko Construction Limited, Central Materials Laboratory conducted soil investigations and Geotechnical studies of the site for the proposed Ministry of Local Government Workshops.

The investigations entailed conducting field tests and soil sampling. The samples were tested in the Laboratory in conformity with standard testing procedures in order to obtain soil strength parameters and to enable the soil classification.

In the absence of data on the structure, suitable assumptions were made and used in the evaluation of the Bearing Capacity.

1.2 Methods of field Investigation Used

1.2.1 Drilling using powered rotary augering was used in order to extend holes into the ground strata. The standard penetration test, sampling of both the disturbed and undisturbed samples were done.

1.2.2 The Standard Penetration Test is a field test used mainly in granular soils. The values obtained from this test can be used in the Bearing Capacity evaluation.

A split spoon sampler of internal dimension of 35mm and 50mm external diameter was attached to suitable length of SPT rods to reach required depth and driven by blows of 65kg hammer falling freely through 760mm. The blows for the 300mm after the initial penetration of 150mm were taken as SPT blows.

1.2.3 The soils recovered from the sampler were visually identified and kept as disturbed samples.

1.2.4 Steel cores of 100mm internal diameter and 450mm length were attached to suitable length of SPT rods and driven into the ground by percussion method. The sample recovered in the cores were preserved for subsequent testing.

1.3 Laboratory Testing

The tests were conducted in accordance with BS 1337, 1975. As many tests as would enable the soil classification and calculation of settlement and bearing capacity were done.

1.4 Analysis of Bearing Capacity

No information was provided about the foundation size, shape and loading. Assumptions were therefore made in order to obtain the Bearing Capacity values, the Boussinesq and Westergaard stress equations.
The Terzaghi's Bearing Capacity and Jambu et al. settlement methods were applied to the data from both the field and the Lab. in order to obtain the soil Bearing Capacity for varying conditions.

2.0 GROUND INVESTIGATION

2.1 Field Work

The ground investigations were conducted in accordance with BS 5930 "Code of Practice for Site Investigations".

The holes were advanced by rotary augering using a mobile drill. This has the capacity to drill 200mm and 100mm diameter holes.

The location of the Boreholes is well known to the client.

The 2 Boreholes were each extended to 25m with a rate of Standard Penetration Testing of one test per 3.00m up to 25m depth.

The soils recovered from the SPT sampler were preserved as disturbed samples in polythene bags. The disturbed samples were sealed with wax to prevent moisture losses.

In the course of drilling, the extructed samples were examined visually in order that the stratigraphy of the area can be drawn.

2.2 Stratigraphy

The stratigraph is shown in figures 1 and 2 in the appendices.

It is clear that the top layer of 0.5m is a fill followed by a layer of red clay of depth from 0.5 to 4.0m. The 3rd layer is composed of lateritic gravel from 4.0m to 8.0m. The 4th layer is composed of silts with kaolin and mica. The layer from 20m to 25m is made of clay-silt soil.

2.3 Geological Inference

The stratigraph shows the mineralogical change during weathering leading to the formation of laterite.

The weathered zone extends at least up to 25m depth. The laterite zone is from 0.5m to 8m.

3.0 LABORATORY TESTING

3.1 The Laboratory tests conformed to BS 1377, 1975, "Method of test of soil for Civil Engineering Purposes". All disturbed and undisturbed samples were subjected to classification tests namely Sieve analysis, Liquid and Plastic Limit and Natural Moisture Content. Consolidation, Unconfined Compression and triaxial tests were done on selected undisturbed samples.

3.2 The Natural Moisture Content Test

This test was done in accordance with test 1A of BS 1377. A representative specimen was obtained from the samples, weighed when wet, oven dried at temperatures between 105° and 110° c for 24 Hours and again weighed. The Moisture Content was expressed as the percentage by mass of moisture lost during drying to the mass of the dried soil.

Results appear on tables 1 to 6 in the appendices.

3.3 Liquid Limit test (LL)

The LL tests were performed using the BS Cone Penetrometer in accordance with test 2A of BS 1377.

A portion of sample was air dried, powdered and sieved through a 0.425mm sieve. About 300g of the fraction passing was mixed with distilled water and cured for 24 hours in an air-tight bag.

The soil was then remixed and sufficient amount of water added to achieve two penetrations in the range between 15mm and 25mm. After each penetration, a portion of soil from the specimen was subjected to moisture content test.

The LL was the Moisture Content obtained by plotting moisture content against penetration where the curve crosses the 20mm penetration line.

Results appear in table 1 to 6 in the appendices.

3.4 The Plasticity Index test (PL)

The portion of specimen remaining after the LL test was used and the test conformed to test 3 of BS 1377.

The soil above was rolled into a ball between the hands and then into treads between the palm and a glass plate. The PL was the moisture content of the treads which developed transverse cracks when they were about 3mm diameter.

Results appear in tables 1 to 6.

3.5 The Plasticity Index (PI)

The PI is the numerical difference between the LL and Pl.

Results appear in tables 1 to 6.

3.6 The Sieve Analysis test (SA)

The Wet Method which conforms to test 7A of BS 1377 was adopted.

A specimen for this test was oven dried for 24 hours in an oven at 105° to 110° c. It was then washed through a sieve of 0.063mm until the retained portion was clean.

The retained was again oven dried for 24 hours at the same temperatures and sieved through a nest of sieves in a descending order of aperture sizes. The fractions retained on each sieve were then weighed and the proportions of original dry specimen which passed given sieves were determined.
Results appear in tables 1 to 6.

3.7 The Strength tests

3.7.1 The Direct Shear Test

This test was performed on granular soils, which were undisturbed or remoulded. It conformed to test ASTMD 3080.

A specimen of 60mm x 60mm x 20mm deep was given a fixed normal stress close to the respective overburden pressure and sheared along a horizontal plane through its mid-depth to

failure. This was done on two other specimen subjected to successively higher fixed normal loads and the failure points noted.

A plot of Shear Stress at failure against the normal stress was made the slope of which was the angle of friction ϕ_u, while the intercept was the cohesion c_u.
Results appear on fig. 3.

3.7.2 <u>The Undrained Triaxial Compression Test</u>

This conformed to test 21 of BS 1377. Three specimens were extruded as for the Unconfined Compression test. They were further sealed in rubber membranes and placed in a water pressure cell one by one. Water pressure was applied and the specimens were compressed to failure while noting the deformation and compression values. The three specimens were subjected to successful high cell pressure and strained at a rate of 2mm per minute.

A plot of stress points was made as in figures 4, 6 and 8 to give the c_u and ϕ values. A plot of stress against strain was also made in order to determine the Secant modulus (figures 5, 7 and 9).

3.8 The Compressibility tests (Consolidation)

This test conformed to test 17 of BS 1377.
A specimen of 76mm diameter and 20mm height was cut from the undisturbed sample and placed in a floating ring of the oedometer cell. It was loaded with an initial static load and reading of deformation and time started with soaking of the sample. Successively higher loads were applied each after 24 hours until seven cycles were over.

In the meantime the specific gravity of the sample was determined.

The subsequent calculations led to a plot of void ratio against cell pressure from which the parameters coefficient of volume compressibility, m_v and overconsolidation pressure p_c, were read off.

Results appear in figures 10, 11 and 12.

3.9 Analysis of Laboratory Data

3.9.1 Soil Classification

Tables 1 to 6 give the classification of the soils in accordance with the Unified Soil Classification System.

In general the classification is as below:

0.0m - 0.5m	-	fill material
0.5m - 4.0m	-	Clay of high plasticity
4.0m - 8m	-	Gravel and gravelly sands
8.0m - 18m	-	Silts of low plasticity
18m - 25m	-	Silt-clay of high plasticity

The Natural Moisture content values are generally below the corresponding values of Plastic Limit indicating that the strata are preconsolidated.

All the soils up to 9m are clays of low plasticity while soils beyond that depth are silty sands.

3.9.2 Strength and Compressibility

See table 7

All the soils are preconsolidated as evidenced by the higher values of preconsolidation pressures than the overburden pressures.

The coefficient of volume compressibility values indicate soils with intermediate compressibilities.

The values of cohesion and angle of friction are variable from the data available.

4. ANALYSIS OF BEARING CAPACITY

4.1 No information was provided about the foundation loading, size, shape and depth. A number of assumptions were therefore made in order to come up with some reasonable Bearing Capacity Values.

4.2 Assumptions

(i) The soil is homogeneous and isotropic and the average parameters prevail through the zone of influence of the foundations.

Thus Average c_u = 72 kN/m²

Average tan ϕ_u = 0.6937

Therefore: " ϕ_u = 34.8°

Average E_s = 21700 kN/m²

" m_v = 0.55 m²/MN

γ_b = 21 kN/m²

(ii) A strip footing weilds influence within a depth of 3 times the width while a square footing has influence within 2 times the width.

(iii) The compressible layer is from 0.0m to 8.0m, the soil becomes incompressible thereafter.

(iv) The factor of safety against shear failure was 3.

(v) A maximum absolute settlement of 50mm which corresponds to a maximum angular distortion of 1/300 applies.

(vi) Terzahi's, Skempton's and Jambu et at Bearing Capacity and Settlement equations applied.

4.3 The Allowable Bearing Capacity

4.3.1 A Bearing Capacity which ensures no shear failure and excessive settlement was computed from the parameters above. It can be inferred that the most critical issue is excessive settlement. The calculations were based on Fadum's influence chart, Jambu's settlement coefficients and the consolidation settlement theory. The results for several foundation options were tabulated.

4.3.2 **Bearing Capacity of strip footing**

Options: 1 m wide footing at 1.5m depth

1 m wide footing at 3.0m depth

	B = 1m D_f = 1.5m	B = 1 D_f = 3.0m
Foundation pressure q(kN/m²)	105	105
Immediate Settlement S_i (mm)	6.2	5.5
Consolidation Settlement S_c (mm)	68.8	69.5
Total Settlement $S_t = S_i + S_c$ (mm)	75	75

Thus Allowance Bearing Capacities for a 1 m wide strip footing at 1.5m or 3.0m depth is 105 kN/m²

4.3.3 **Bearing Capacity of square footing**

Options: (i) 1m wide footing at 1.5 m depth

(ii) 1m wide footing at 3.0m depth

(iii) 2.0m " " 1.5m depth

(iv) 2.0m " " 3.0m depth

	B = 1m		B = 2m	
	D_f=1.5m	D_f=3.0m	D_f=1.5m	D_f=3.0m
Foundation pressure q kN/m²	175	176	87	87
Immediate Settlement S_i (mm)	3.6	3.1	4.2	3.5
Consolidated Settlement S_c (mm)	71.4	71.9	70.6	71.5
Total Settlement $S_t = S_i + S_c$ (mm)	75	75	75	75

Thus Allowable Bearing Capacies are:

Option: (i) 175 kN/m²

(ii) 176 kN/m²

(iii) 87 kN/m²

(vi) 87 kN/m²

5. CONCLUSIONS

i) The investigations conducted at the site for the proposed Workshops enabled information on the ground to be obtained.

ii) The stratigraphy is typical of tropical weathering of certain rocks which lead to formation of laterites.

iii) No data on the foundation depth, type, size and loading was available to enable concrete Bearing Capacity calculations to be made. However, assumptions were made in order to obtain the Allowable Bearing Capacities of serval foundation options.

vi) Fresh calculations need to be done where the foundation properties differ from those assumed.

v) The data and information herein is hopefully adequate for a sound design.

6. REFERENCES USED

i) BRITISH STANDARDS INSTITUTION. British Standard 1377: 1975. Methods of Test for Soils for Civil Engineering Purposes. London, 1975.

ii) BRITISH STANDARDS INSTITUTION. British Standard 5930: 1981. Code of Practice for Site Investigations. London, 1981.

iii) G.N. SMITH AND EL. POLE. Fifth Edition, 1984. Element of Foundation Design.

iv) R.F. CRAIG. 2nd Edition 1982.

v) F.D.C HENRY. Second Edition, 1986. The Design and Construction of Engineering Foundations.

7. APPENDICES

Project: MOLG WORKSHOPS - JINJA

BH NO. 1 Ground Water Table not reached

Depth (m)	Soil Description	Log	Sample U-100 D - 30	SPT Blows	SPT Value
	Fill soil	//////			
	Red clay	- - -			
5	Red lateritic gravel with medium to fine particles	o o . . . o - o o. . - o o . o . o - . o o . o -		2 2 4 9 7 6	 6 13
10	Grey-yellow-brown sandy silt with occasional quartz particles and mica flakes	x x x x x x x x x x x x x x x x x		8 12 14 7 9 13	 26 22
15		x x x x x x x x x x x x x x x x		5 10 12 19 27 33	 22 60
20	Yellow-red-brown black gravelly sandy clay-silt	. . - .- x - o o . - - . - . o . o		7 23 18	 41
25	End of BH				

Fig. 1

Project: MOLG WORKSHOPS - JINJA

BH NO. 2 Ground Water Table not reached

Depth (m)	Soil Description	Log	Sample U-100 D - 30	SPT Blows	SPT Value
	Fill soil	//////			
	Red silty clay	– – x x – – – – x		3	
5	Red lateritic gravelly sand	– . o – . . o . . . o – . – . . o –		3 4 6 7 8	7 15
10	Brown-red-white clay with kaolin	– – – – – – – –		4 6 8	14
15	Grey-brown-red sandy silts with mica flakes	x x x x x x x x x x x x x x x x x x x x x		6 10 13 8 10 13 7 10	23 23
20	Red-yellow-brown black clay-silt	– x x – – – – – – x – – – x x x – – x x x		12 7 9 11 13 15	22 20
25	End of BH			20	35

Fig. 2

PARTICLE-SIZE DISTRIBUTION&ATTERBERG LIMITS

CENTRAL MATERIALS LABORATORY KIREKA

BH 1

PROJECT : MOLG WORKSHOP - JINJA

Percentage passing BS sieve mesh Depth (m)	1.50-1.95		3.00-3.45		4.50-4.95		6.00-6.45	
37.5 mm								
20.0 mm			100		100		100	
10.0 mm			98		95		83	
6.3 mm			93		79		77	
5.0 mm	100		88		68		74	
2.0 mm	99		70		32		60	
600 microns	94		64		27		54	
425	94		64		26		53	
300	93		64		26		53	
212	93		63		26		52	
150	92		63		25		51	
63	90		61		24		49	
LL%	53		53					
PL%	24		23					
PI%	29		30					
N.M %	26		19		12		14	
USCS	CH		CH					

PARTICLE-SIZE DISTRIBUTION&ATTERBERG LIMITS

CENTRAL MATERIALS LABOBATORY KIREKA

PROJECT : MOLG WORKSHOP - JINJA

BH 1

Percentage passing BS sieve mesh Depth (m)	9.00-9.45	12.00-12.45	15.00-15.45	18.00-18.45
37.5 mm				
20.0 mm		100		
10.0 mm		98		
6.3 mm		89		
5.0 mm		88	100	
2.0 mm		86	99	100
600 microns		84	97	97
425	100	84	96	96
300	99	83	95	94
212	99	82	94	93
150	97	81	93	92
63	91	78	89	89
LL%	55	57	58	48
PL%	NP	NP	NP	NP
PI%				
M.M %	25	24	33	18
USCS	ML	ML	ML	ML

PARTICLE-SIZE DISTRIBUTION&ATTERBERG LIMITS

CENTRAL MATERIALS LABORATORY KIREKA

BH 1

PROJECT : MOLG WORKSHOP - JINJA

Percentage passing BS sieve mesh	Depth (m)	21.00-25.00
37.5 mm		
20.0 mm		100
10.0 mm		91
6.3 mm		85
5.0 mm		84
2.0 mm		78
600 microns		73
425		71
300		69
212		67
150		75
63		63
LL%		68
PL%		32
PI%		36
N.M %		29

USCS CH-MH

Table 3

PARTICLE-SIZE DISTRIBUTION&ATTERBERG LIMITS

CENTRAL MATERIALS LABORATORY KIREKA

BH 2 PROJECT : MOLG WORKSHOP - JINJA

Percentage passing BS sieve mesh Depth (m)	1.50-1.95		3.00-3.45		6.00-6.45		9.00-9.45			
37.5 mm										
20.0 mm										
10.0 mm						100				
6.3 mm		100				99				
5.0 mm		99		100		97		100		
2.0 mm		97		99		79		99		
600 microns		92		95		73		98		
425		91		94		16		98		
300		91		94		15		98		
212		90		93		14		97		
150		89		93		13		97		
63		89		91		10		95		
LL%		52		54		48		49		
PL%		28		20		19		19		
PI%		24		34		29		30		
N.M %		25		22		18		24		
USCS		CH-MH		CH		SP		CL		

PARTICLE-SIZE DISTRIBUTION&ATTERBERG LIMITS

CENTRAL MATERIALS LABORATORY KIREKA

BH 2

PROJECT : MOLG WORKSHOP - JINJA

Percentage passing BS sieve mesh / Depth (m)	12.00-12.45	15.00-15.45	18.00-18.45	21.00-21.45
37.5 mm				
20.0 mm				
10.0 mm				
6.3 mm				
5.0 mm				
2.0 mm		100		100
600 microns		99	100	99
425		99	99	99
300		99	99	98
212	100	99	99	98
150	99	98	98	97
63	96	96	95	93
LL%	55	62	69	66
PL%	NP	NP	20	38
PI%			49	28
M.M %	25	26	37	48

PARTICLE-SIZE DISTRIBUTION&ATTERBERG LIMITS

CENTRAL MATERIALS LABORATORY KIREKA

BH 2

PROJECT : MOLG WORKSHOP - JINJA

Percentage passing BS sieve mesh Depth (m)	24.00-24.45
37.5 mm	
20.0 mm	
10.0 mm	
6.3 mm	
5.0 mm	
3.0 mm	100
600 microns	99
425	99
300	97
212	96
150	94
63	89
LL%	65
PL%	25
PI%	40
N.M %	41

USCS CH-MH

Table 6

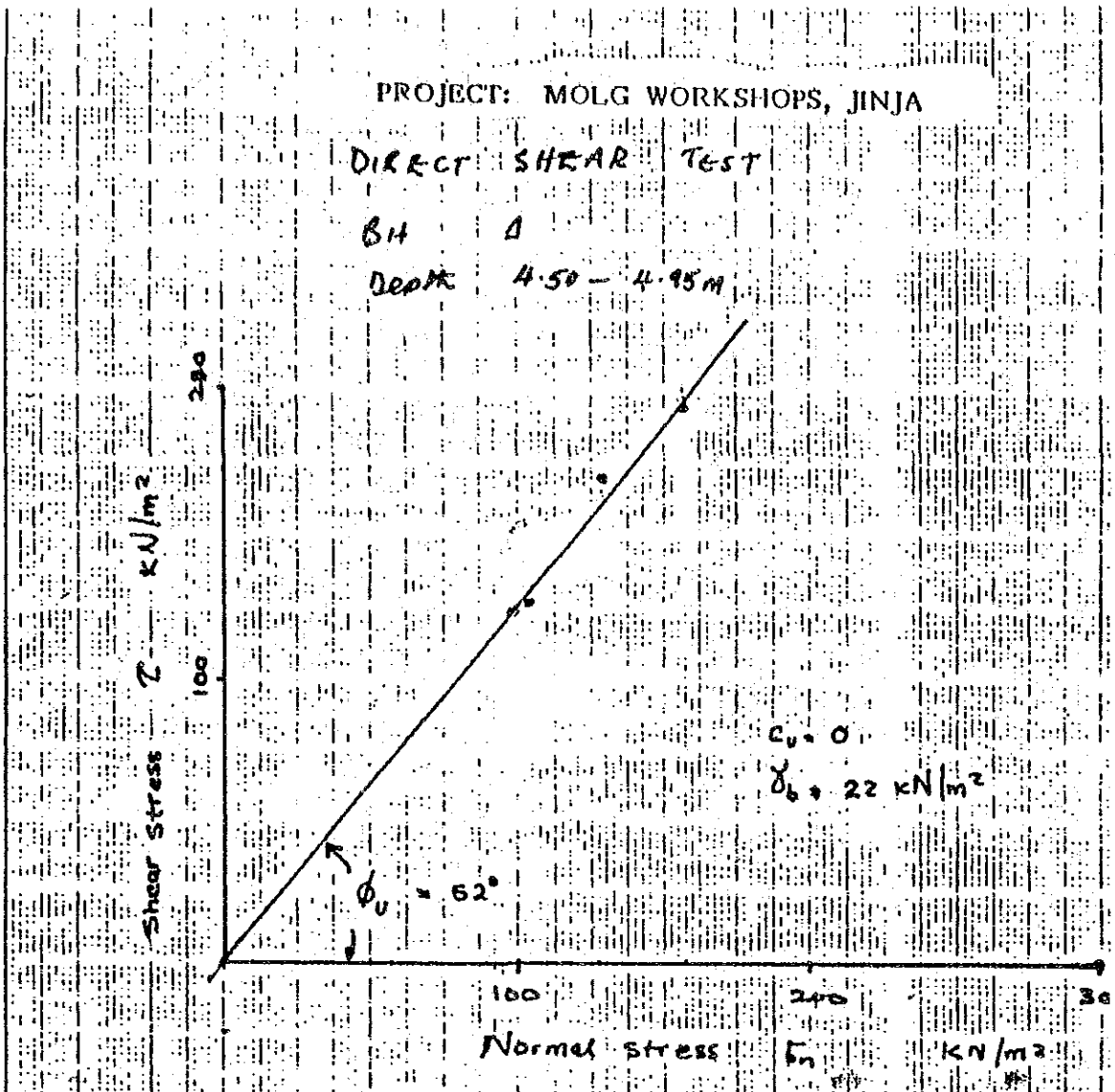

PROJECT: MOLG WORKSHOPS, JINJA
DIRECT SHEAR TEST
BH A
Depth 4.50 – 4.95 M
200
100
Shear stress τ – kN/m²
$c_u = 0$
$\gamma_b = 22$ kN/m²
$\phi_u = 62°$
100
200
300
Normal stress σ_n kN/m²

Fig. 3

PROJECT: MOLG WORKSHOPS, JINJA

UNDRAINED TRIAXIAL TEST

Stress Relationship

BH 1

Depth 1.50 – 1.95 m

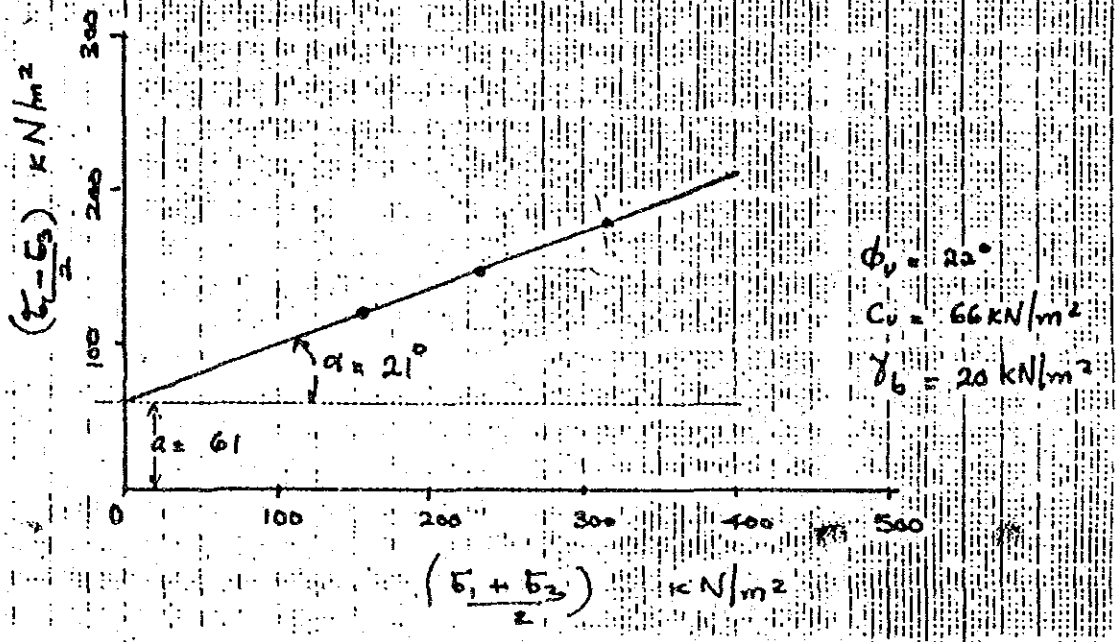


Fig. 4

PROJECT: MOLG WORKSHOPS, JINJA

UNDRAINED TRIAXIAL TEST

Stress - Strain Relationship

BH NO 3

Depth : 1·50 — 1·95 m.

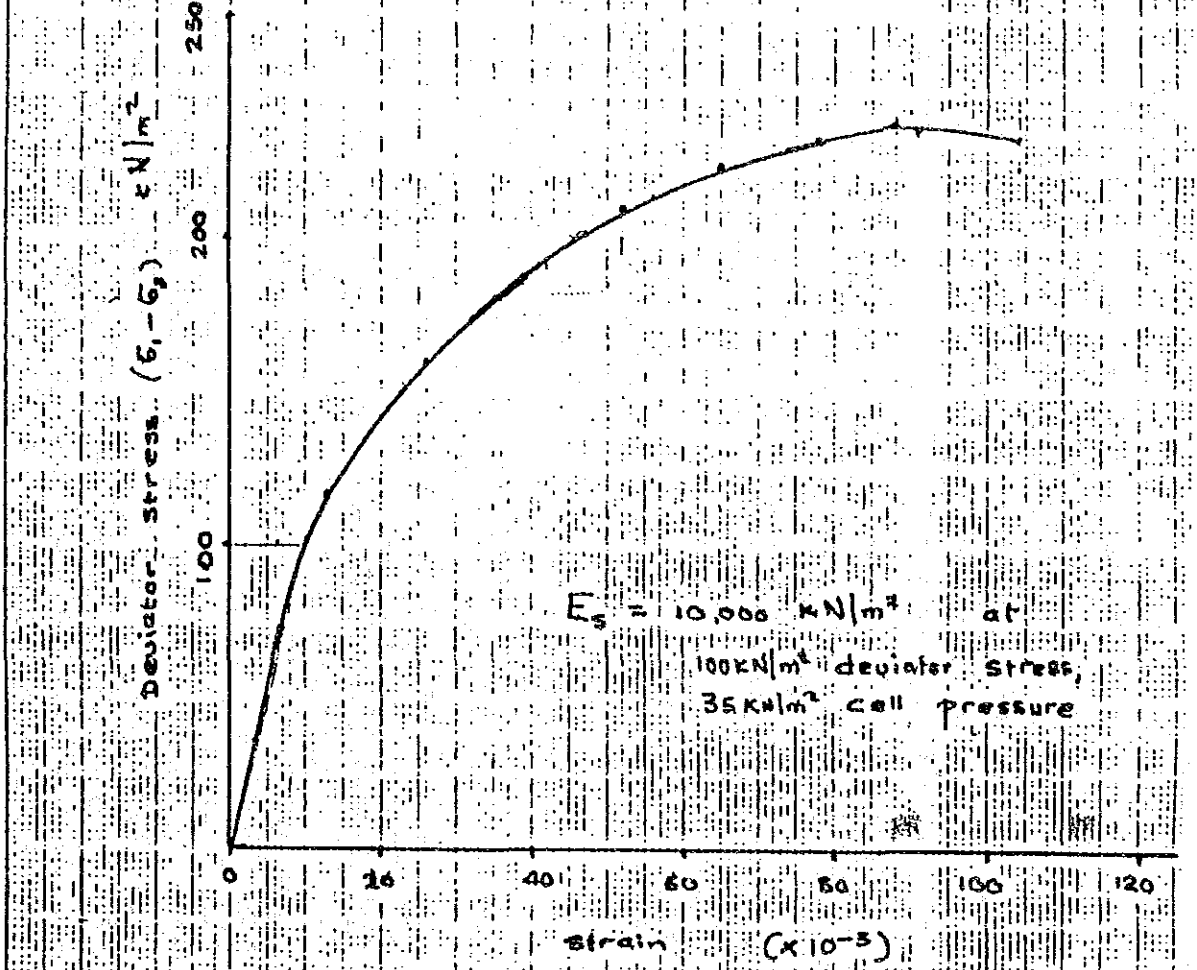


Fig. 5

PROJECT: MOLG WORKSHOPS, JINJA

UNDRAINED TRIAXIAL TEST

Stress Relationship

BH 2

Depth 1.50 – 1.95m

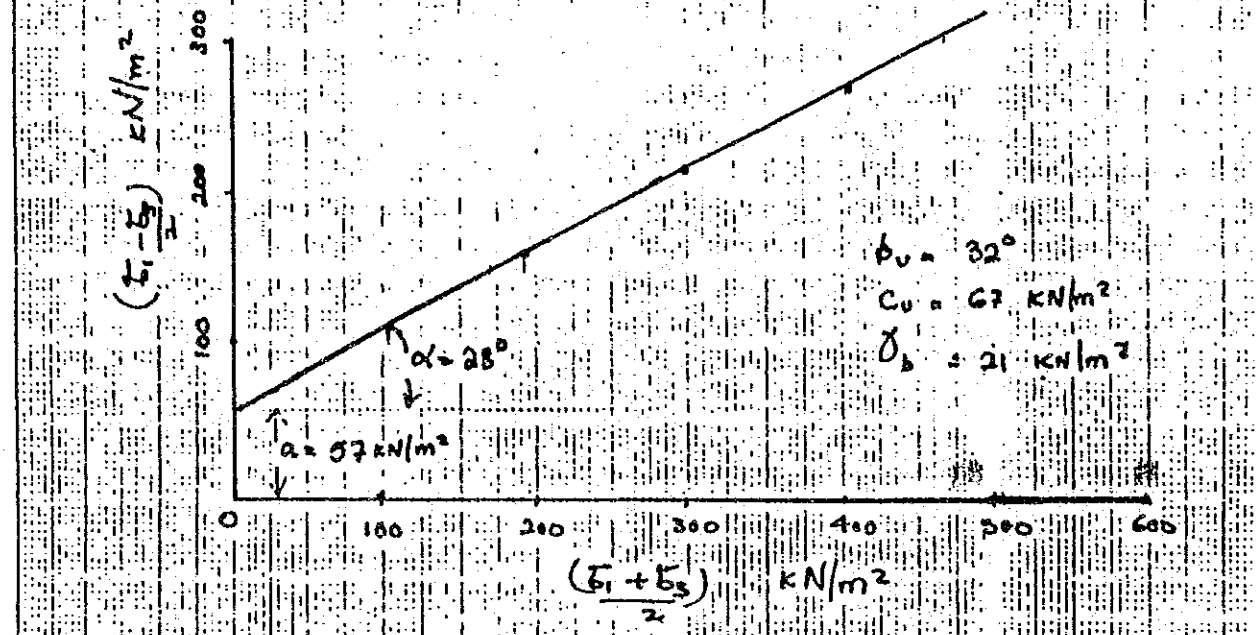


Fig. 6

PROJECT: MOLG WORKSHOPS, JINJA

UNDRAINED TRIAXIAL TEST

Stress - strain Relationship

BH NO 2

DEPTH 1·50 - 1·95m

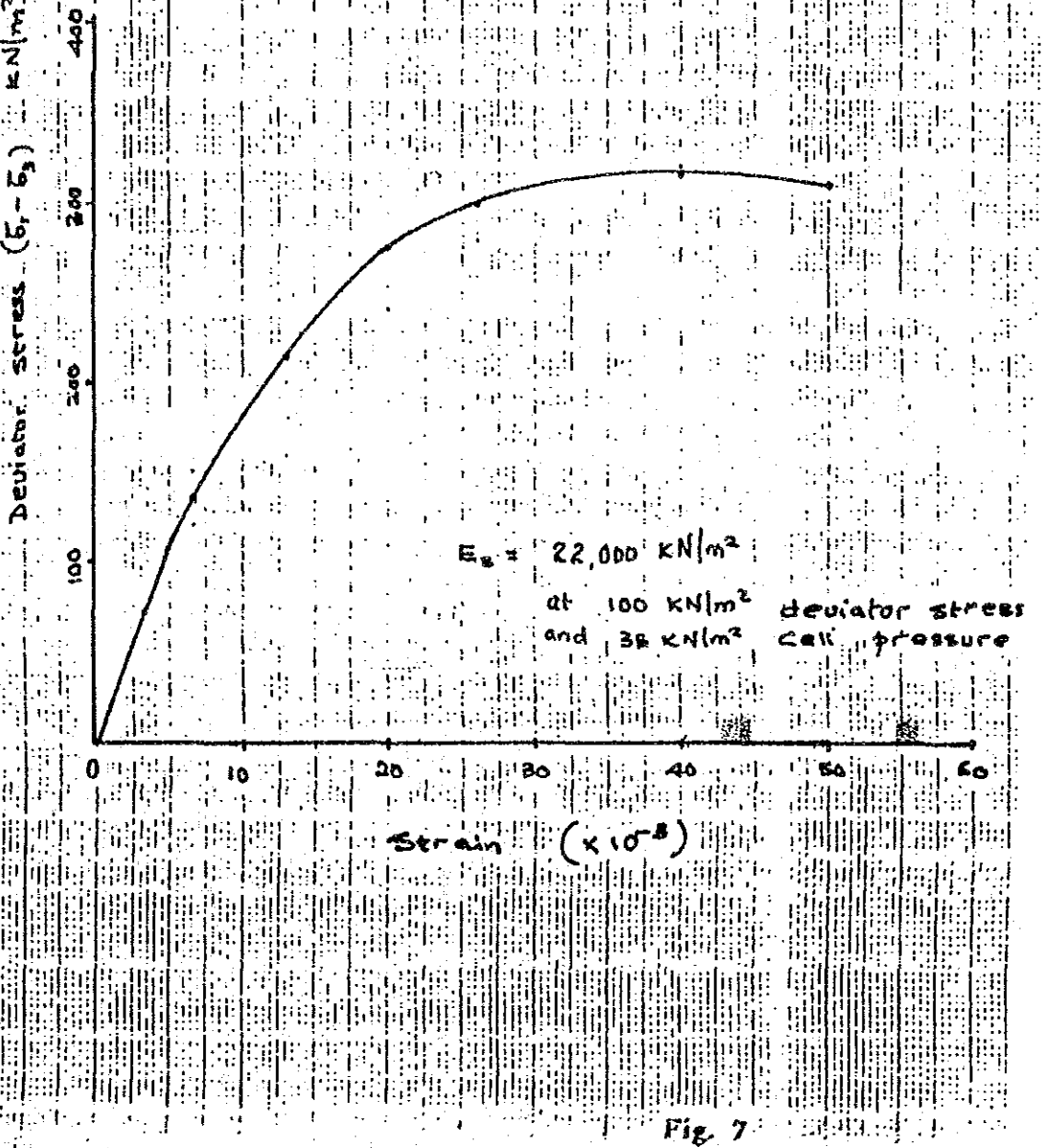


Fig. 7

PROJECT: MOLG WORKSHOPS, JINJA

UNDRAINED TRIAXIAL TEST

Stress Relationship

BH 2

Depth 3.00 - 3.45M

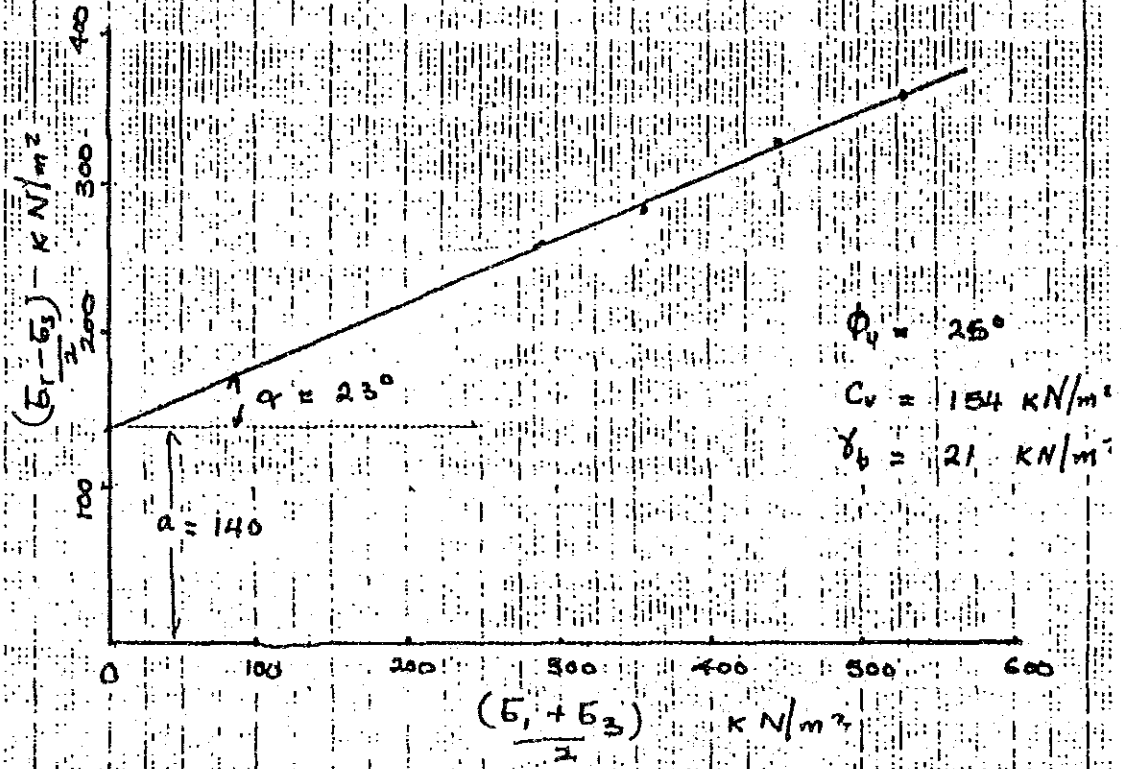


Fig. 8

PROJECT: MOLG WORKSHOPS, JINJA

UNDRAINED TRIAXIAL TEST

Stress - Strain Relationship

BH 2

Depth 3.00 - 3.45 m

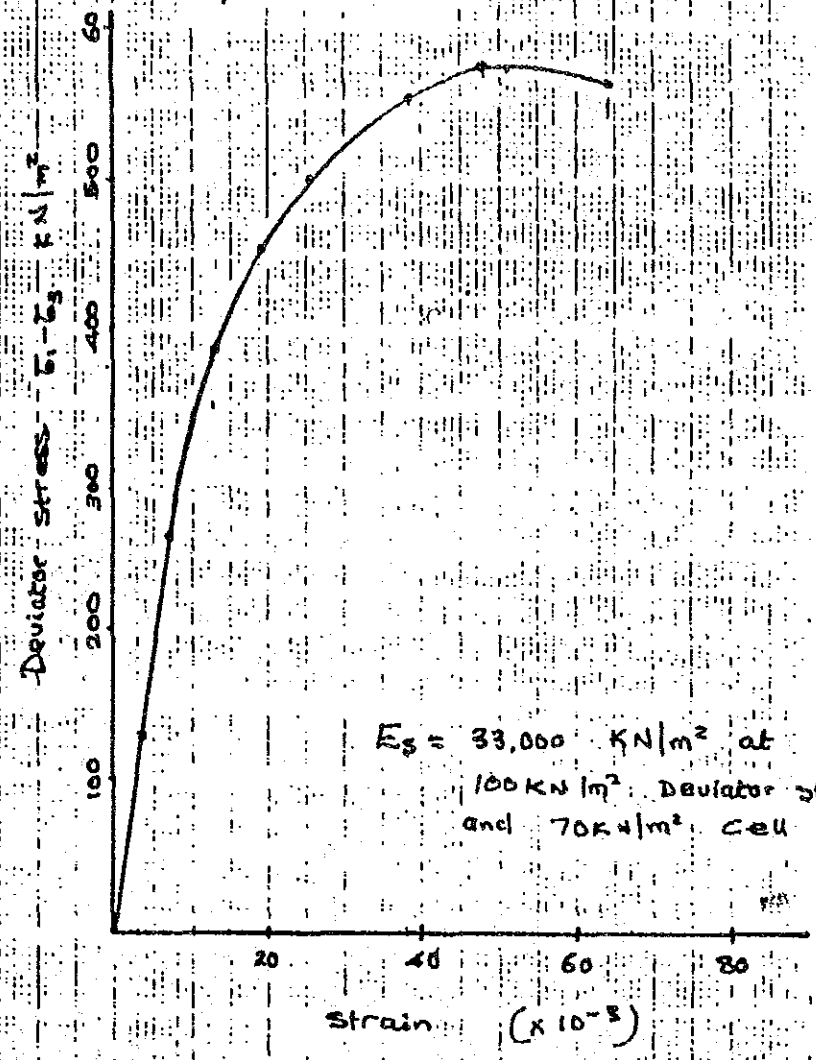


Fig. 9

SAMPLE		Bulk Density γ_b	TRIAXIAL TEST Cohesion c_u	Angle of friction ϕ_u	Secant Modulus E_s	CONSOLIDATION TEST m_v	p_c	p_o	e_o
BH No.	Depth (m)	kN/m³	kN/m²	degree	kN/m²	m²/MN	kN/m²	kN/m²	-
1	1.50 - 1.95	20	66	22	10,000	0.563	60	35	0.775
	4.50 - 4.95	22	0*	52*					
2	1.50 - 1.95	21	67	22	22,000	0.537	75	36	0.713
	3.00 - 3.95	21	154	25	33,000				

N.B * Value obtained from the Direct Shear test

Table 7

Appendix 9 Topographical Survey Drawing

ROKO Construction Limited

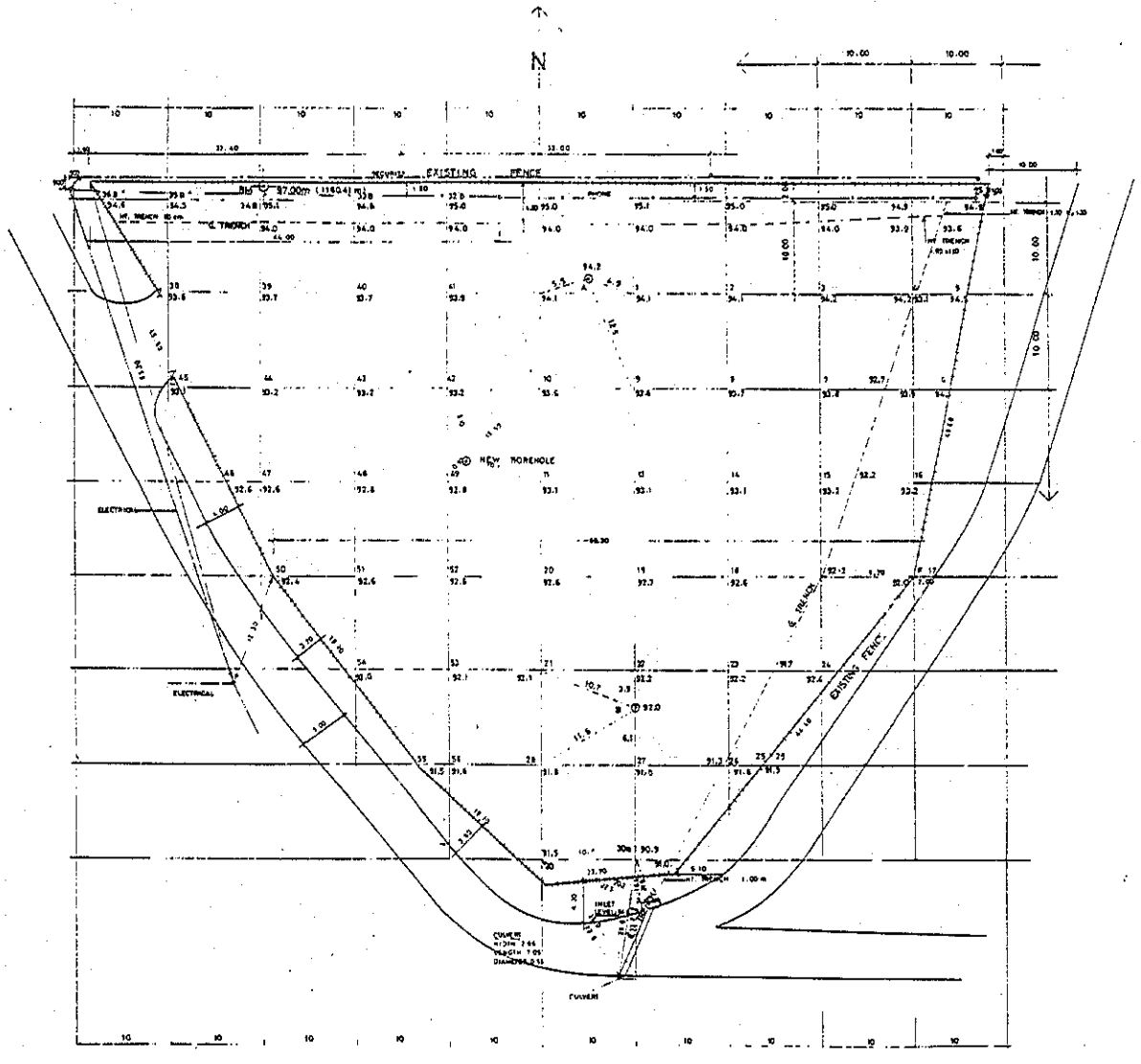
P.O. Box 172 Kampala Uganda Tel: 67305 or 67331 Telex: 61148

WORKSHOP OF MINISTRY OF LOCAL GOVERNMENT AT BUGEMBE

Scale 1 : 250	Revised	Date	Name
Drawn M.I.W.			
Date 25.6.94			
No. B			

Topographical survey of plot extention

A-63



KEY:

1, 2, 3 GRID lines AT INTERVALS OF 10 m

94.0 SPOT HEIGHTS - METRES

R.B.M. REFERENCE POINT (97.00)

A & B SMALL IRON BARS

FENCE

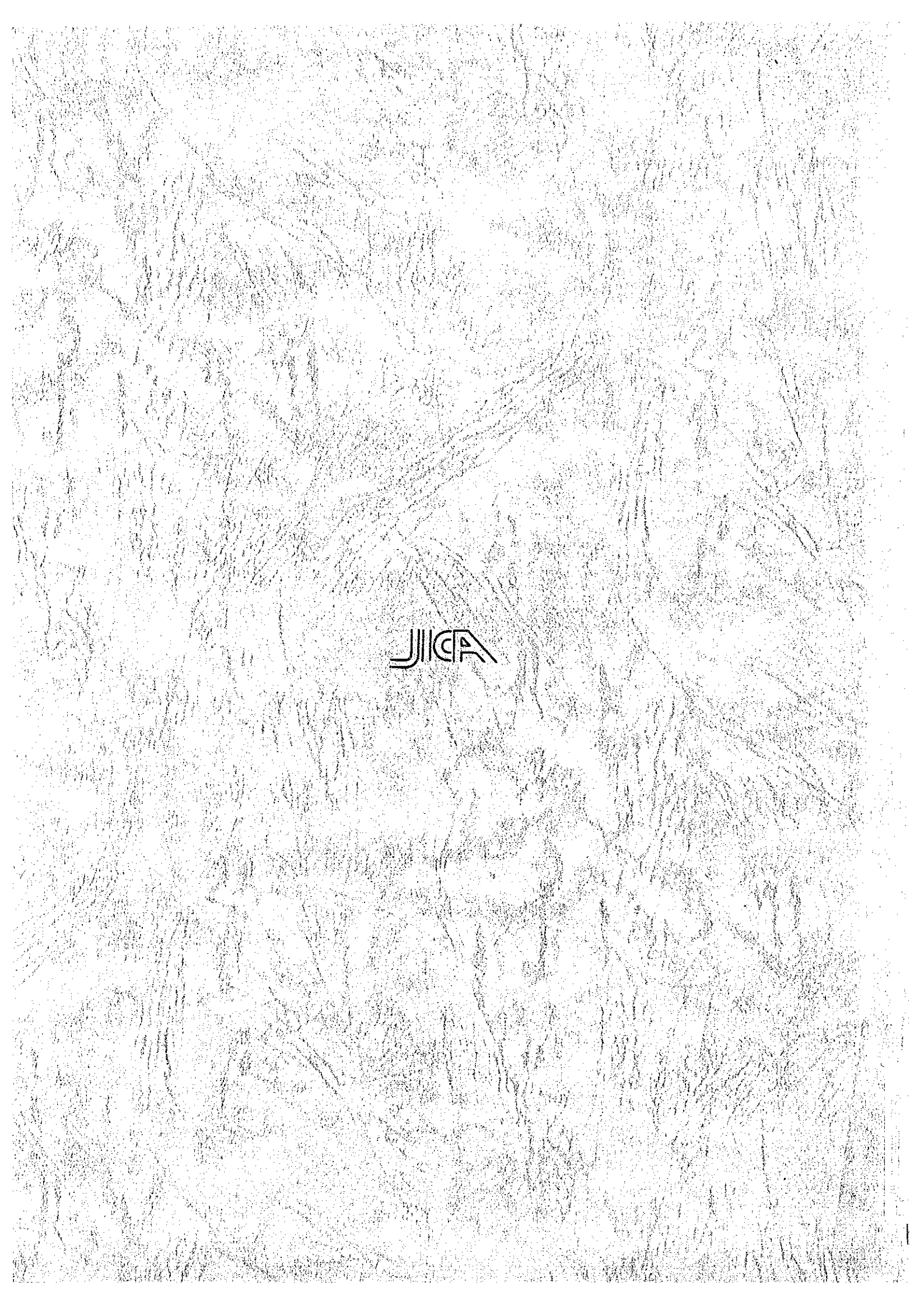
CENTRE LINE OF TRENCHES
WIDTH NORTHERN = 1.5 m
EASTERN = 1.8 m

PROPOSED ENTRANCE

SECURITY

PHONE

ELECTRICAL


JICA