3-3 Outline of the Project

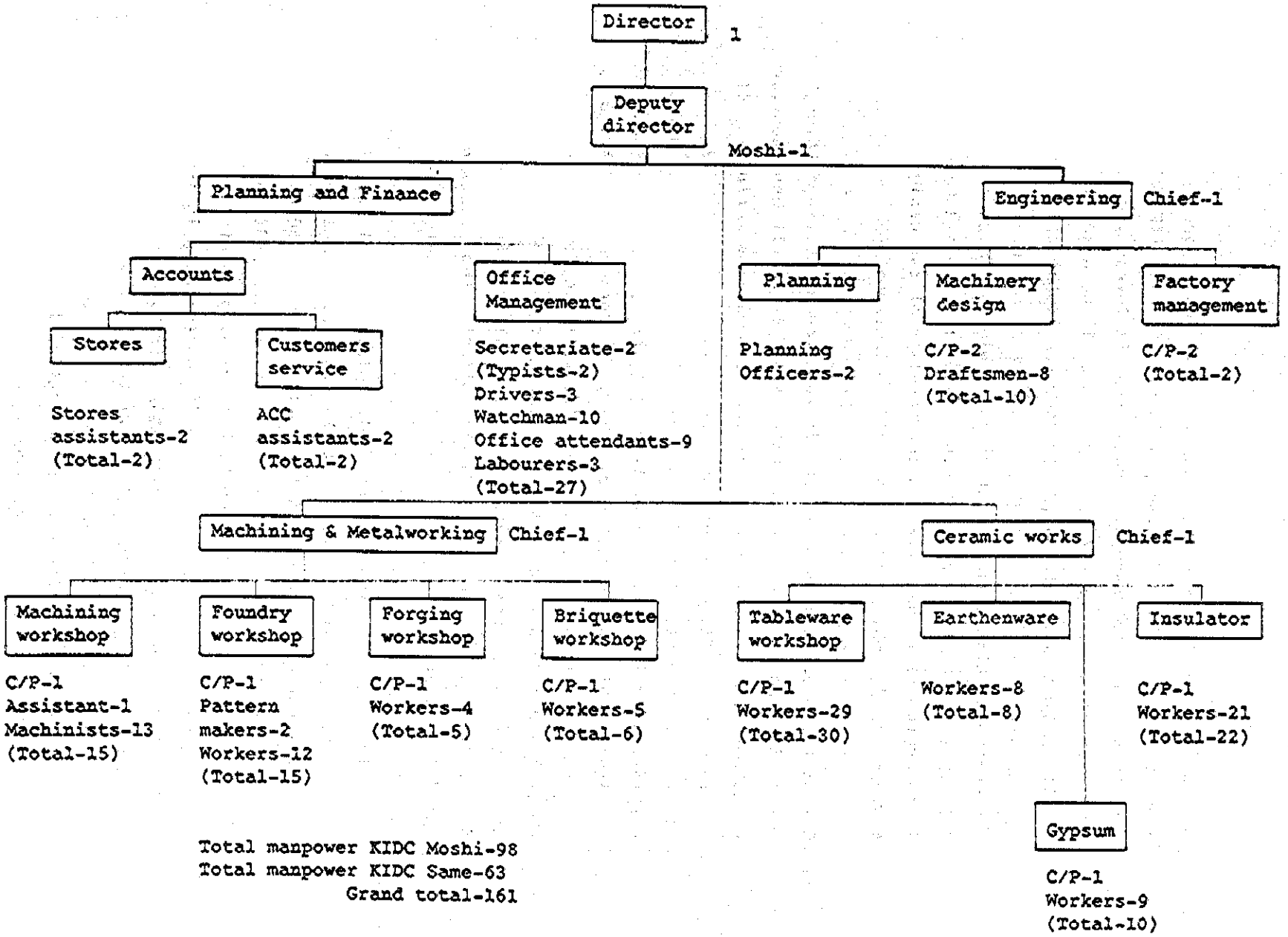
3-3-1 Organization for Implementation of the Project

The organization chart of KIDC for Phase II Technical Cooperation is shown in Fig. 3-1. It shows the new organization which was agreed upon for Phase II Technical Cooperation, and to which the tableware, insulator and foundry sections in KIDC Phase II Grant are added.

The tableware and insulator sections included in the Same Phase II will require additional staff as follows:

Section	Number of personnel
Same Centre	
Insulator section	22
Ceramics section	10
Tableware section	-4 (decreased)
Moshi Centre	
Design and engineering section	12
Machining section	7
Foundry section	1
Forging section	-2 (decreased)
Total	46 (increased)

Fig. 3-1 Organization Chart-KIDC Project Phase II



The foundry section of Moshi Phase II will require one operator for a newly installed high frequency induction furnace. The number of workers need not be changed, because the oil furnace, cupola and high frequency induction furnace will not all be used simultaneously and the molten iron will be poured from one of those furnaces.

The design section will consist of one design engineer and five draftsmen at the first step of KIDC Phase II Technical Cooperation. It is appropriate that this section consists of two design engineers and eight draftsmen at the final stage.

One of the present issues in KIDC is that revenues earned through OJT activities contribute only 30% of its development and recurrent budget under the present severe economic conditions. KIDC is, of course, a nonprofit organization. However, KIDC makes less conspicuous contributions to the region in addition to its actual contributions in the fields of technology transfer, consulting services, training courses, etc. NVTC, as mentioned in CHAPTER 2, is highly appreciated because it periodically sends graduates to communities in its region, and its system of technological qualifications is well established. Under these circumstances, it is preferable that KIDC improves the following two points to develop local industries.

(1) KIDC will organize a system which plays a vital role in developing local industries. All the concerned companies will be registered with KIDC and KIDC will manage periodical exchange of information and training courses, and in addition provide information and advice on technologies, product development, factory management, etc. In addition to this, it is important to establish a close relationship with the governmental organization as described in CHAPTER 2.

    Technology transfer through the activities of the scrap recycling centre will be useful for establishing the above systems.

(2) KIDC operation shall be strengthened and improved internally in following manners:

1) Recruiting good personnel.
2) Accumulating and applying technical and business development know-how to foster and support the local industries.
3) Upgrading the production management and business role.

In addition, budget allocation and official procedure for purchasing raw materials and equipment shall also be improved. With the improvement efforts as mentioned above, it is desirable that development and recurrent budgets of KIDC and its revenue earned through OJT activities achieve good balance in the future. For reference in this regard, a rough estimation of future revenue is made partially based on the data collected in this survey.

One low voltage insulator imported from the United Kindgom costs 0.95 U.K. pound (approximately 160 TSh). Expected production of the insulator section of Same Phase II is more than 15 tons (60,000 insulators) per year. 60,000 insulators are valued at 9,600,000 TSh on import basis and the amount is equivalent to about 135% of KIDC fiscal budget in 1986/87.

3-3-2 Basic Schemes for Planning

(1) Same Phase II

The KIDC Phase II Technical Cooperation has been provided to the KIDC Same Centre for about seven years. The Ceramic Research and Development Centre (CRDC) was planned in consideration of abundantly deposited raw materials in this district. As the primary institution to promote the plan, the KIDC Same Centre was established in a building which was used as textile factory following the establishment of the KIDC Moshi Centre.

The main objective of the Same Centre is to provide technical services to medium and small-scale companies in ceramics in Kilimanjaro Region and to promote such companies in the region. The technology transfer through OJT activities in Phase I has been achieved satisfactorily and the position of the centre will be consolidated in Phase II Technical Cooperation which will be continued.

The center focusing on the local industries will be completed if technologies in tableware production will be improved and technologies in production of the low voltage insulators will be added. If the centre plays most active role in promoting the local industries, the welfare of the people in this area will be raised, import substitution products will be manufactured, and foreign currencies will be conserved.

The results of the field investigation on quarry sites in Same are as follows:

Feldspar and siliceous stone were observed to be abundantly deposited at four quarry sites in Same district. The clay was also observed to exist there. The kaolin was confirmed to be collected in Kisarae near Dar es Salaam.

In past surveys, Moshi, Mwanga and Same were candidate sites for the construction of the ceramic centre. As a result of the present investigation, the existing Same Centre is considered most suitable in terms of the following points:

1) The effective use of the existing facilities,
2) The nearest location to quarry sites of the necessary raw materials,
3) A lot of trainees could be secured in the district, and
4) Same district office strongly desires to locate the centre in this district.

The other two places do not have the above advantages. It was pointed out that the centre does not supply sufficient amount of water and the results of the water survey are as follows:

1) As a result of the field reconnaissance and according to advices given by the regional water engineer, it was found that there was no possibility that water was supplied to the center from a rivulet on a mountain side close to the centre site.

2) The Kilimanjaro Regional Government has recently carried out an additional survey on the undergroundwater in Same district and has found the existence of water veins. Additional borings are decided to be conducted at several places around Same Centre. This survey includes the site of the Same Centre. The Same Centre and its surrounding area will have water to supply.
(Refer to APPENDIX VII for Hydrological Investigations Report for Boreholes, Same.)

3) Water supply from a well in the Same Centre is desirable, but water supply from off-premise point (300 m from the Same Centre) is also planned as an alternative water supply source.

All the above described conditions considered, the site of the existing Same Centre was decided on as the site for Same Phase II. The following is the outline of the Same Phase II:

a) Equipment

Tableware section	:	Improvement of equipment for clay section.
Insulator section	:	To share clay section with tableware section. To have forming, drying, firing and glazing sections provided with new equipment
For raw materials research and transportation	:	Two vehicles are to be granted.

b) Facilities

Building for insulator section	:	New construction (10 m x 40 m)
Road:	:	New construction of the on-site road
Water supply	:	Well
Electrical system	:	Improvement of the receiving and substation facilities.

The present condition of the Same Centre is shown in APPENDIX VIII. Tables 3-1 and 3-2 show the main features of the facilities and equipment for Same Phase II according to the basic design described in CHAPTER 4.

Table 3-1 Comparison of Facilities for Same Phase II

Description	Existing Facilities	Facilities to be Constructed in Phase II Grant	Facilities for Same Phase II
Total floorspace	670 m^2	400 m^2	1,070 m^2 (including the existing floorspace)
On-site road	-	Low-cost pavement	Low-cost pavement
Required power considering load factor	200 kVA	250 kVA	450 kVA
Water supply for equipment	Approx. 3 m^3/day	Approx. 2 m^3/day	5 m^3/day
Water supply for facilities	-	Approx. 5 m^3day	5 m^3/day
Water supply capacity	Approx. 3 m^3/day (City water. Frequent water stoppage)	20 m^3/day or more (from newly bored well)	20 m^3/day or more (from newly bored well)

Table 3-2 Comparison of Main Equipment

Item	Existing Equipment	Equipment for Same Phase II (including existing equipment)	
Clay section			
Agitator	2	6	
Tank	3	3	
Vibrating screen	1	1	
Ball mill	3	4	
Filter press	2	3	
Membrane pump	1	2	*
De-airing auger machine	1	1	
Slip pump	0	1	
Vibration sieve	0	1	
Magnetic ferro filter	0	1	
High speed agitator	0	1	
Portable agitator	0	1	
Gypsum plaster mould section			
Vacuum gypsum agitator	1	1	
Potter's wheel	1	1	
Tableware forming section			
De-airing auger machine	0	1	
Potter's wheel	6	6	
Electric potter's wheel	5	5	
Drying shelf	4	4	
Hot air generator	0	1	
Insulator forming section			
De-airing auger machine	0	1	
Scrapping machine	0	2	
Drying & firing section			
Hot air generator	0	1	*
Firing kiln	2	4	
Decoration section			
Glazing tank, agitator	1	2	
Silk-screen printing section			
Camera	1	1	
Developer	1	1	
Exposer	1	1	

Note * This equipment will be commonly used for tableware and insulator sections.

(2) Moshi Phase II

When KIDC started, the machining and metalworking section aimed at the development sector to provide guidance on product development technology, repair service, training and medium and small business consulting in Kilimanjaro Region. Japan's technical cooperation during Phase I aimed at the basic technology transfer through OJT and granting of necessary equipment. The expected results were achieved.

However, the transferred technology and granted equipment during Phase I were very basic and the results of the past seven years may be lost without follow-up technical assistance. It is also time to repair or replace some parts of the granted facilities and equipment.

It is necessary to reconfirm the significance of Moshi Centre at the beginning of Phase II. The purposes of the Centre should be made clear by:

- Clearly defining the characteristics of the facilities and equipment to substantiate the technical transfer,
- Adding factory management training, highlighting the profit motive,
- Equipping it with the machines required for a metal foundry as the metal scrap recycling centre in Kilimanjaro,
- Keeping close contact with local industries for the extension of acquired skills considering its position as a training institute of the region.

The local machining and metalworking industry consists of a large number of small workshops. The larger ones are engaged in automobile repair work and some manufacture simple agricultural equipment and kitchenware. Most of the equipment of these small shops needs improvement and KIDC is expected to play a role as a stable parts supplier.

It is important for the centre to lead these small businesses to further development in the future.

The local industries depend on imported raw materials and have no facility to produce materials. They are always suffering from a shortage of parts. If KIDC has foundry equipment, it is likely to make a significant contribution to the development of local industry by means of the spread of raw material production techniques through OJT and parts supply. In Phase II, the additional foundry equipment will be provided to establish the raw material production techniques. Using the results of this technology transfer the Centre will assist the development of local industries.

The outline of Moshi Phase II is as follows:

a) New equipment

Metalworking section	:	High frequency induction furnace (300 kg) and its associated equipment
Machining section	:	Vertical lathe, universal milling machine, cylinder boring machine, etc.
For raw materials research and transportation	:	Three vehicles
Engineering and design section	:	Drawing equipment and accessories

b) New facilities

Foundry section building: To construct an additional building with a space 15 m x 35 m (with an overhead travelling crane)

Water supply system : A well is to be sunk for exclusive use by the centre.

Power distribution : Improvement of power receiving and substation facilities, and installation of emergency power supply system

Engineering and design section : Modification of the existing tool storage room

The present situation of Moshi Centre is shown in APPENDIX IX. Tables 3-3 and 3-4 show the comparison of existing equipment and facilities with those of Moshi Phase II according to the basic design described in CHAPTER 4.

Table 3-3 Comparison of Facilities for Moshi Phase II

Item	Existing Facilities	Facilities to be Constructed in Phase II Grant	Facilities after Expansion
Floorspace of foundry section building	300 m^2	525 m^2	825 m^2
Required power considering load factor	200 kVA	800 kVA	1,000 kVA
Water supply for equipment		Approx. 5 m^3/day	Approx. 5 m^3/day
Water supply for facilities		Approx. 10 m^3/day	Approx. 10 m^3/day
Water supply capacity	Approx. 10 m^3/day (City water. Frequent water stoppage)	15 m^3/day (from newly bored well)	15 m^3/day or more (from newly bored bored well)

Table 3-4 Comparison of Main Equipment

Item	Existing Equipment	Equipment for Moshi Phase II (including existing equipment)	Remarks
Metalworking section			
Heavy oil furnace			
(300 kg)	1	1	
(100 kg)	1	1	
Cupola (1 ton/h)	1	1	
Sand muller	1	2	
Pot muller	1	1	
Sand breaker	0	1	
Sand cleaning machine	0	1	
Air compressor	1	2	
High frequency induction furnace (300 kg)	0	1	
Shot blast machine	0	1	
Grinder	1	1	
Annealing furnace	0	1	
Sand testing equipment	0	1	
Wood pattern section			
Wood lathe	1	1	
Band sawing machine	1	1	
Universal saw bench	0	1	
Single surface planer	0	1	
Chisel machine	0	1	
Spindle sander	0	1	
Disc/belt sander	0	1	
Jigsaw machine	0	1	
Machining section			
Lathe	3	3	
Universal milling machine	1	2	
Shaping machine	1	1	
Surface grinder	1	1	
Cylindrical grinder	1	1	
Drilling machine	2	2	
Universal tool grinder	1	1	
Slotter machine	1	1	
Bender machine	1	1	
Shearing machine	1	1	
Air compressor	1	1	

(cont'd)

Item	Existing Equipment	Equipment for Moshi Phase II (including existing equipment)	Remarks
Forming machine	1	1	
Electric welding machine	1	2	
Vertical lathe	0	1	
Cylinder boring machine	0	1	
Quenching furnace	0	1	
Engineering and design section			
Drafting machine	1	6	
Photocopier (A3 size)	0	1	
Blueprinting machine (A1 size)	0	1	
Map case	0	1	

3-4 Technical Cooperation

As shown in Fig. 2-2 in CHAPTER 2, in KIDC Phase I about 120 persons participated in the OJT which was conducted at KIDC. Thirty-eight Japanese experts were sent to the centre on a long- and short-term basis. Technology transfer was provided through OJT. A counterparts conference and an experts conference were each held once a week. In addition to such daily activities, a total of about 120 trainees from schools, cooperative societies of minor enterprises and private companies have been accepted for one to six-month training courses. Consulting services have been offered to such cooperative societies and private companies, and 22 Tanzanian counterparts were sent to Japan for training.

The organization chart of KIDC Project Phase II is shown in Fig. 3-1. The comparison of the staff number for KIDC between the Phase I and II projects is shown in Table 3-5.

KIDC Phase II activities include 1) dispatch of Japanese experts, 2) conducting of OJT, 3) acceptance of the trainees frm the outside, 4) conducting of consultancy services, and 5) training of Tanzanian counterparts in Japan. It is desirable that the above-mentioned activities be done in the same degree as those of KIDC Phase I, because the above activities will be decreased in the fields in which technology transfer has been completed in KIDC Phase I, while they will be increased in new fields. Consequently there is little difference between KIDC Phases I and II in frequency and scope of activities.

Table 3-5 Comparison of Staff Number for KIDC

Section	KIDC Staff Number for	
	Phase I (1988)	Phase II (Future)
Director	1	1
Deputy Director	0	1
Planning/Administration	34	33
Engineering	1	13
Machining and Metal-working:		
Coordinator	1	1
Machining	8	15
Foundry	14	15
Forging	7	5
Briquette	6	6
Earthenware:		
Ceramics (Moshi)	8	8
Ceramics (Same)		
Chief	0	1
Tableware	35	30
Insulator	-	22
Gypsum		10
Total	115	161

CHAPTER 4

BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Basic Design Policy

The basic design of the Project is conducted in conformity with the following:

(1) On the basis of the request for the Japanese Government grant aid from the Kilimanjaro Regional Government and the contents of the KIDC Phase II Technical Cooperation starting from 1988, facilities and equipment will be provided to Moshi Centre and Same Centre to substantiate the transfer of applied technologies and production management know-how.

The following items are to be transferred:

Applied technologies

- Design and drafting (continued from Phase I Technical Cooperation)
- Low voltage insulator production
- Production of ductile cast iron, cast steel and alloy steel
- Parts repair and assembly
- Production of machines (e.g. pumps).

Production management know-how

- Quality control
- Management of work progress
- Maintenance
- Factory management
- Marketing

(2) The Project aims to improve and strengthen the existing facilities and equipment. The type and specifications of the introduced facilities and equipment will be selected considering

easy maintenance, management and parts compatibility. Design conditions and specifications for the facilities and equipment matching the existing facilities and equipment should be determined.

(3) In determining the layout of the equipment, the processing flow should be studied and the layout of equipment should be so planned as to improve working efficiency and minimize the relocation of the existing equipment.

(4) Water is indispensable to operate the facilities and equipment for both the Moshi and Same Centres, and wells will be provided on both premises.

(5) The design standards and the equipment and materials to be used should conform to Japanese industrial standards and specifications.

(6) The equipment capacity and types of technology to be transferred should be determined considering the following factors:

- Technology transfer useful for promoting local industries in Kilimanjaro Region
- Present and future demand for products
- Production of import substitution products

(7) The Project will be implemented so that more employment opportunities are given to the workers in Kilimanjaro Region and so that local materials are used as much as possible. More specifically, materials (e.g., roof tiles and bricks) produced by KIDC will be used on the condition that the quality and quantity are acceptable.

(8) Facilities will be designed so that the organization of KIDC Phase II functions properly.

4-2 Study of Design Conditions

The design conditions of this Project are determined on the basis of the present conditions and items to be improved in the existing Phase I facilities, the natural environment, the technical level of Tanzanian engineers, and the objective of KIDC Phase II Technical Cooperation. The contents of the basic design are as follows:

4-2-1 Equipment and Materials

(1) Same Centre

In Phase I, tableware manufacturing technology has been successfully transferred and the results have been satisfactory. On consideration of the results of Phase I, low voltage insulator manufacturing technology will be targeted as the applied technology to be transferred in Phase II.

The existing processing line in the tableware manufacturing section will be improved in Phase II and the required equipment will be supplied.

1) Low voltage insulator section

Annual demand of low voltage insulators in Tanzania is estimated to be about 100,000 (approx. 25 tons). The processing capacity of the Same Centre is planned to be 15 tons per year, considering the minimum requirement for this kind of processing line.

The low voltage insulator manufacturing process includes the following five sections.

a) Clay section

In the clay section, raw materials will be milled, iron will be eliminated and water removed, and preparation of bodies will be completed. The capacity of this section will be expanded to accommodate the additional requirements resulting from starting the insulator processing line, because the clay section will be shared with the tableware section.

b) Forming section

A de-airing auger machine and a scrapping machine will be installed in Phase II.

c) Drying section

Natural drying or forced drying of insulators will be done using a hot air generator. In Phase II, a hot air generator and drying room will be provided.

d) Glazing section

Dried insulators are glazed and finished to prevent water absorption. This section will be shared with the tableware section and the processing capacity will be expanded to accommodate the additional requirements resulting from starting the insulator processing line.

e) Firing section

The glaze applied to the insulator will be melted under high temperature and fixed on its surface. A glost firing kiln will be provided in Phase II.

2) Tableware Section

The basic technologies utilized in the tableware section were transferred in Phase I. In Phase II, a few pieces of machinery and equipment will be provided to strengthen the processing line.

a) Forming section

A de-airing auger machine will be provided in Phase II.

b) Drying section

A hot air generator used for forced drying will be provided in Phase II. The existing storage room will be used for forced drying room.

c) Firing section

A biscuit kiln will be provided in Phase II.

3) Water and power supply

a) Water supply system

Same Centre depended on city water in Phase I. However, the well pumps and water supply pumps are considerably deteriorated and the condition of the water supply system in the Same area is poor. The water supply, incidentally, stops in Same Centre. A well will be bored on the premises to afford a constant supply of water and a new water supply system will be constructed to distribute the water to the centre. The new water supply system will be designed to minimize the need for improvement of the water supply pipes.

b) Power supply

A new power supply system will be provided in the new building, independent of the existing electrical power supply system. The power for the new equipment in the existing building will be supplied from the existing electrical power supply system.

(2) Moshi Centre

1) Foundry equipment

The heavy oil furnace and cupola were used for transferring foundry technology in Phase I. Most of the necessary basic technologies were transferred, but the transfer of design and engineering technologies has not been sufficient. The transfer of technology related to wood pattern manufacturing and sand moulding has also been insufficient.

Facilities and equipment required to follow-up on Phase I and for the transfer of applied technologies will be provided in Phase II.

a) High frequency induction furnace
Most of the basic technology in cast iron production was transferred in Phase I. Ductile cast iron, cast steel and alloy steel are in demand for agricultural implements and automobile parts repair. A high frequency induction furnace will be provided to transfer such technologies. The capacity of the furnace will be 300 kg, considering the maximum weight of the targeted compressor and engine parts. The furnace will be capable of producing the parts of the prototype compressor and engine which will be attempted in Phase II.

b) Self-hardening sand processing equipment
In Phase I, cast iron was produced using a green sand mould. The green sand mould has insufficient strength and has not been suitable for ductile cast iron and cast steel. Sand processing equipment will be provided for self-hardening sand in Phase II.

c) Heat treatment equipment

An annealing furnace will be provided to remove the internal residual stress of the products.

d) Shot blast machine

In Phase I, grinders were used to remove the sand adhering to product surfaces and to finish the products. A shot blast machine will be provided for efficient finishing work in Phase II.

e) Wood pattern machine

In Phase I, precise wood patterns could not be produced using a wood lathe and a band sawing machine. Wood pattern machines will be provided in Phase II to make a variety of wood patterns.

f) Sand testing equipment

Sand testing equipment will be provided in Phase II.

g) Air compressor

An 11 kW air compressor was supplied in Phase I. The capacity of that compressor was insufficient. Another air compressor will be provided to increase the type and quantity of products in Phase II.

These new equipment will be installed in the existing and new foundry buildings.

2) Machining equipment

The basic technologies in this field were transferred and the Tanzanian counterpart personnel acquired the ability to understand drawings. However, their level of ability is still insufficient for practical machining work.

In Phase II, machining equipment will be provided considering the following points:

- Follow-up of Phase I Technical Cooperation
- Well-balanced equipment
- Repair of parts for farm implements and automobiles
- Prototype products which will be produced in Phase II

a) Universal milling machine

The universal milling machine supplied in Phase I has been in full operation. Another machine of the same model will be provided in Phase II.

b) Vertical lathe

Moshi Centre has no machinery to machine large diameter parts like flanges. A vertical lathe will be supplied in Phase II. Pump casings will also be machined using this machine.

c) Cylinder boring machine

A cylinder boring machine will be supplied for the following purposes.

- Repair of tractor and automobile engines
- Machining of the cylinders of the engines and compressors which will be produced in Phase II

d) Quenching furnace

A quenching furnace will be provided for surface hardening of gears, shafts, tools, etc.

The quenching furnace will be installed in the existing forging shop, and other machines will be installed in the existing mechanical shop.

3) Design and drafting equipment

Under the same circumstances, design room and drafting equipment will be provided as follows:

a) Drafting machine

Five drafting machines will be provided in Phase II.

b) Copying machines, a map case, etc. will be provided.

4) Water supply and power supply

a) Water supply system

Moshi Centre depended on the city water system in Phase I. In Phase II, a considerable amount of water is required for the cooling tower of the high frequency induction furnace. A well will be bored on the premises and a new water supply system will be provided while improvements of the existing service pipes will be minimized.

The existing service pipes will be utilized as much as possible.

b) Power supply

A new power supply system will be provided for the new foundry equipment.

4-2-2 Facilities

The weather conditions in Kilimanjaro Region are shown in APPENDIX VI. The design wind velocity for both Moshi and Same Centres is 31 m/sec.

Kilimanjaro Region has only very weak earthquakes and usually earthquake load is not taken into account in the region, nor are there earthquake resistance design standards or regulations. According to the earthquake resistance standards in Kenya, no consideration of earthquake load is required for single story buildings in that area adjacent to Kilimanjaro Region. Therefore, no earthquake load is considered in the structural design. The design criteria considering the weather and other local conditions are as follows.

(1) Codes and standards

Japanese Codes and Standards shall be applied to design facilities. Regarding requirements for minimum reinforcement, these criteria shall also govern.

(2) Materials used

Materials to be used in the Project, except cement, aggregate, concrete, concrete blocks and other materials available in Kilimanjaro Region, shall be in accordance with JIS.

(3) Earthquakes

Seismic loads are not considered.

(4) Wind

Max. wind speed = 31 m/sec

(5) Temperature and humidity

Design temperature		Relative humidity
Dry bulb, average Max.	36°C	Max 90% in winter
Min.	15°C	Min 30% in summer
		Mean 48%
Daily range	21°C	

(6) Rainfall intensity 100 mm/hr

(7) Soil bearing capacity

Same	7 tons/m^2 (for permanent loading)	10.5 tons/m^2 (for short-term loading)
Moshi	10 tons/m^2 (for permanent loading)	15 tons/m^2 (for short-term loading)

(8) Design loads

- Live load

Roof	30 kg/m^2 (N.B. Wind loads shall not be superimposed on live loads.)
Workshop floor Machine room	500 kg/m^2

- Machine load — isolated foundation -- As per machine data

- Wind load

V = 31 m/sec	Basic wind speed
V_S = V•S1•S2•S3•	Design wind speed
S_1 = 1.0	Factor for environment
S_2 = 1.03	For roofing or siding sheets
= 0.99	For purlins, cladding rails, beams and framings

S_3 = 1.0	Factor for usage
q = 0.0625Vs (kgf/m)	
F = (Cpe-Cpi)q•A	F: Design and wind load
or	Cpe: External pressure coefficient
	Cpi: Internal pressure coefficient=±0.2
F = Cf•q•Ae	Cf : Force coefficient
	A : Area normal to wind
	Ae: Projected area of building

- Load due to temperature fluctuation: ±20°C shall be considered.

- Soil pressure

Active soil pressure	0.33
Passive soil pressure	3.0
Soil pressure at rest	0.5
Friction coefficient between concrete and soil	0.55

- Vibrating machine: Mass ratio shall be greater than 3.

(9) Factor of safety

Overturning	1.5
Sliding	1.5
Uplift	1.5

(10) Materials

- Concrete

Structural concrete	210 kg/cm^2
Blinding concrete	100 kg/cm^2

- Aggregate

Maximum aggregate size:	
Structural concrete	20 mm
Blinding concrete	20 mm
Mass concrete	40 mm

- Reinforcing bars SD30

- Structural steel SS41

- High strength
  friction grip bolt F10T friction coefficient: 0.45

- Holding down bolt SD30 or simularities

(11) Concrete cover for reinforcement

Members not in contact with soil	30 mm
Columns, beams, and slabs exposed to soil	40 mm
Foundations exposed to soil	50 mm

(12) Limits for deflection

Crane girders	1/800 of span for both horizontal and vertical directions
Girder and beams	1/360 of span
Mainframing	1/150 of storey height

(13) HVAC

- A/C design temperature
  Design room 28°C, 50%RH in summer

(14) Lighting

- Workshop 300 lux (on floor)

- Design room 500 lux (on desk) by roof translucent sheet and lighting

- Lavatory 100 lux

- Outdoor 0

(15) Drainage

1) Soilwater drainage

Soil cover on underground pipes: Min 600 mm

Granular bedding : t = 100 mm

2) Rainwater drainage

$$Q = \frac{1}{3600000} ICA$$

where, Q: Design flow quantity (m^3/sec)

I: Average intensity of rainfall (mm/hr)

A: Catchment area (m^2)

C: Runoff coefficient

paved area, roof: 0.95

unpaved area : 0.4

$$Q = \frac{1}{n} A \cdot R^{2/3} \cdot S^{1/2}$$

where, Q: Flow (m^3/sec)

n: Roughness coefficient

Concrete channel	n=0.0013
Concrete pipe ϕ <600 mm	n=0.0015
Concrete pipe ϕ >600 mm	n=0.0013
Steel pipe	n=0.0013

A: Cross-sectional area of flow (m^2)

R: Hydraulic radius=A/p (m)

P: Water perimeter (m)

S: Slope

Maximum velocity: 3 m/s

Min velocity : 0.6 m/s

(16) Reinforcement

	Min reinforcement		Max. reinforcement	
	Main	Secondary	Main	Secondary
Foundation				
Foundation slab	0.15	0.12%	-	-
Stub column	T12 or more	-	6%	-
	1.0%		(10% at lapped zone)	
Wall	0.4%	0.25%	4%	-
Ground beam	0.15%	-	4%	-
Superstructure				
Column	T12 or more		6%	
	1.0%		(10% at lapped zone)	
Beam	0.15%		4%	
Roof slab	0.15%	0.12%	-	-
		@<5t		
Link				
Column	$\phi \geq \phi max/4$			
	@<12xϕmin			
	Tie @$\leq$150 mm			
Wall	Links are required if main bars greater than 2% of section are provided.			
Beam	If maximum shear stress$\leq$1/2*vc			
	Asv/Sv=0.0012bt			
	@$\leq$0.75d			
Web reinforcement	If h>750 mm, web bars shall be provided over 2/3*h, with spacing of 250 mm or smaller.			
	h: beam depth			

4-3 Basic Design

4-3-1 Same Phase II

(1) Site and layout plan

Same Phase II will be constructed within the existing Same Centre site. The clay section will be shared by the tableware line and the insulator line, while a forming section and other sections exclusively used for the insulator line will be provided. The firing section will also be shared by the tableware line and the insulator line. For this reason, it is advantageous to the creation of an optimum traffic line that a new building for the insulator line be constructed on the spacious site at the south side of the existing building, in parallel with it. The site slopes from north to south. But if the new building is constructed close to the existing building the difference in levels can be minimized. Thus when viewed from the Moshi-Dar es Salaam Road which runs on the south side of the site, arrangement of the new building's facade will give a good impression of the Ceramic Centre in Same District.

An on-site road will be constructed from the front gate to both the east and west gables of the new building. This road will facilitate the incoming of raw materials and the outgoing of finished products. The existing firing section's electric furnace will be relocated to the new building's firing section, where the tableware and insulator sections are integrated. Therefore the current site of the firing section, located on the west side of the existing building, can be used in the future for the gypsum processing section.

It is preferable that a 300-meter-long access road be constructed from the Moshi-Dar es Salaam Road to the site to make the site more easily accessible. However, the road will be outside of the site. For the time being, entry to the site can be made via the existing road, but for better accessibility in the future the construction of the access road should be done by the Tanzanian Government.

(2) Building design

1) Plan

As shown in the basic design drawings (S-1, S-2, S-3) on pages 67 through 71, the insulator forming section, drying section, glazing section, tableware section and insulator firing section will be arranged from the east side of the new building for the insulator section according to the above-mentioned plan. Also three connecting corridors will join respectively the existing clay section and insulator forming section, the existing tableware forming section and insulator forming section, and the existing gypsum forming section and tableware-insulator firing section. These corridors will efficiently connect the old and the new buildings. Sinks, foot wash basin, faucets, and lavatories will be appropriately provided in the new building to improve working efficiency. The space for each of the rooms has been determined considering equipment size and work space as follows:

a) Insulator forming section ..... 140 m^2
b) Aging room ..... 12 m^2
c) Drying room ..... 13 m^2
d) Decoration room ..... 50 m^2

e) Tableware and insulator firing section ... 170 m^2

f) Lavatory ..... 15 m^2

A 10 m x 40 m building to accommodate these rooms will be constructed.

2) Section

The height of the eaves measured up to the beam soffit will be 4.5 m in the new building for the insulator line. In determining this, the height of the equipment, proper clearance, and the working environment have been taken into account. The floor level will be the same as that in the existing building.

A north-to-south slope runs from the existing building to the new building. The foundation will be constructed along this slope. The portion where the floor level differs greatly will be built-up with higher flooring. The height difference between the new on-site road to be constructed on the east and west sides of the building and the floor level of the building will be approximately 1 m. Thus, a truck will be able to park directly next to each gable-end door to easily load and unload raw materials and finished goods.

Considering that the new building will be an impressive symbol of Same District as the Ceramic Centre, roofing with roof tiles will be provided and the exterior walls will be of concrete block or brick construction. The rooms will not be enclosed with ceilings, with the exception of the drying room, which needs to trap hot air.

3) Structural design

Structural steel framing construction is most appropriate considering that the construction period (approx. one year) is short. The main framing will be structural steel portals with bracing placed in the ridge direction. Roof tiles will be placed on top of waterproofed plywood with anti-termite treatment, and a waterproofing layer will be provided underneath the roof tiles. The plywood will be placed on steel purlins. Reinforced concrete pad foundations will be constructed and interconnected with ground beams. The floor will be of the suspended slab type and supported by reinforced concrete beams and plinths. The grade of structural materials is as follows:

a) Structural steel ..... SS41 (JIS G3101)
b) Reinforcing bars ..... SD30 (JIS G3112)
c) Concrete
   Blinding concrete ..... Fc = 100 kg/cm^2
   Structural concrete ..... Fc = 210 kg/cm^2

4) Plumbing and HVAC

a) Plumbing work

The design water demand of the Same Centre is 10 m^3 per day. Half of this is used in the production facilities and the other half as service water.

In Phase II, water will be lifted by a well pump from a new well (approximately 180 m deep) to an underground water reservoir. The water will then be pumped up to the elevated water tank by a lift pump. It will then be fed to each facility by gravity. The volume of the underground water reservoir is 8 m^3 and that of the elevated water tank is 3 m^3.

Service pipes will be of PVC.

Two lift pumps will be installed, and one of the two pumps will be used as a standby.
A dosing device will be installed to sterilize the well water.

b) Sewerage

Lavatories will be provided in the new building. Soil water from the lavatories will flow to a septic tank outside the building. Processed soil water will be drained in the soakway pit.
Waste water as well as industrial waste from the production facilities will be discharged into open ditches constructed between the existing building and the new building as well as on the south side of the new building. Open ditches for drainage will also be constructed on the north side of the existing building.

c) Ventilation facility

Natural ventilation will be primarily utilized, but for areas where natural ventilation is not possible due to the architectural design, power ventilation is planned.

Specifications for the main equipment are as follows:

Deep well submergible pump	:	40ϕ x 135 lit./min x 150 m Motor 3p x 400 V x 7.5 kW
Lift pump	:	40ϕ x 32ϕ x 80 lit./min x 22m Fully enclosed outdoor type motor 3p x 400 V x 1.5 kW
Elevated water tank	:	FRP, single panel water tank Accessories: Inner/outer ladder, outlets, vent hole, electrode for level switch, manhole (600ϕ)

5) Electric facilities

The required electric power for the machinery and equipment provided for Phase II in the Same Centre is planned to be 250kVA considering load factors. The electrical work for the new building is planned to be separate from the existing electrical facility. The Tanzanian Government will be responsible for constructing the 11 kV side, and the construction work of the 400V side, including the transformer, will be in the scope of Phase II work.

The transformer will be of a pole mounted type. The low voltage switchgear will be of the outdoor cubicle type, in which a WH meter will be installed. The Tanzanian Government will be responsible for installing the WH meter. Wiring requirements in the building will be as follows:

Lighting and main power line	3-phase, 4-wire, 400/230V
Power circuit	3-phase, 3-wire, 400V
Lighting and receptacle circuit	single phase, 2-wire, 230V

The power control panel, and lighting distribution panel will be installed to control and monitor each machinery and equipment. 600V CV cables are mainly wired, using metal or vinyl conduits.

Fluorescent lamps will be used as indoor lighting. But natural color lighting will be used for decoration. (Refer to 4-2-2 for the lighting level.)

Specifications for the main equipment are as follows:

Disconnecting switch with fuse	:	11kV, 400A, outdoor type
Disconnecting switch for arrester	:	11kV, 400A, outdoor type
Arrester	:	14kV, 5kA
Transformer	:	oil immersed type, 250kVA Primary 11,000V Secondary 400V/230V
Low voltage cubicle	:	one 180 kW switchgear for equipment one 50 kW switchgear for equipment one 20 kW lighting switchgear The WH meter will be supplied by TANESCO.
Distribution board	:	Lighting circuit, 10 feeders one 180 kW switchgear for equipment one 50 kW switchgear for equipment
Power control panel for lift pumps	:	Outdoor type (alarm panel will be located in the building.)
Lighting fixtures	:	Glow switch type, 230V, 50 Hz

6) Construction materials

Construction materials to be used for this Project are as follows:

Concrete block	:	Locally procured concrete block, 390 x 190 x 200 mm
Roofing	:	Locally procured roof tiles, asphalt roofing and plywood with anti-termite treatment (procured in Japan)
Siding	:	Brick
Ceiling panels	:	9 mm finished plaster board on 9 mm plaster board

Metal joinery : Steel doors, roller shutter doors, aluminum jalousie with mosquito net and burglar bars

Wood joinery : Steel frames and wood, flush doors (40 mm thick, oil-painted) and ironmongery and fixings

(3) Machinery and equipment

The following equipment will be supplied for Phase II.

Machinery and Equipment	Q'ty	Specifications
1) Tableware line		
a) Tableware forming section		
De-airing auger machine	1	Capacity: 1.5 ton/h
Hot air generator	1	Electric heating
2) Insulator line		
a) Clay section		
Ball mill	1	Capacity: 300 kg
Agitator	4	Fixed type, stainless steel
Slip pump	1	Diaphragm type, capacity: 2 m^3/h
Vibration sieve	1	Capacity: 1 ton/h, sieve screen: 150 to 200 mesh
Magnetic ferro filter	1	Wet type, capacity: 1 ton/h
Membrane pump	1	Diaphragm type, capacity: 1.1 m^3/h, pressure: 15 to 20 kg/cm^2
Filter press	1	Number of filter plates: 610 mm x 40 plates
High speed agitator	1	Fixed type, stainless steel
Portable agitator	1	Stainless steel

(cont'd)

Machinery and Equipment	Q'ty	Specifications
b) Insulator forming section		
De-airing auger machine	1	Capacity: 2.5 ton/h
Scrapping machine	2	Finishing diameter: 150 mmφ
c) Drying and firing section		
Hot air generator	1	Electric heating
Biscuit firing kiln (1 m^3)	1	To be shared with tableware section, electric heating, heating temperature: 850°C
Glost firing kiln (3 m^3)	1	Electric heating, heating temperature: 1300°C (existing glost firing kilns with capacity of 1 m^3 and 2 m^3 will be relocated to new firing section).
d) Decoration section		
Glaze tank, agitator	1	Stainless steel, tank capacity: 0.2 m^3
e) Others		
Gypsum plaster mould	1 set	
Wheelbarrow	5	Loading capacity: 300 to 500 kg each
Spare parts	1 set	
3) Vehicles for field survey and transportation		
Dump truck (4-ton)	1	
4-wheel drive jeep (van type)	1	

(4) Basic design drawings

DWG. No.	Title
S-1.	STRUCTURE
	EXTERIOR FINISHING SCHEDULE
	INTERIOR FINISHING SCHEDULE
S-2.	STIE PLAN
S-3.	PLAN
S-3A.	ELEVATION, SECTION
S-4.	ARRANGEMENT OF CERAMIC SHOP
S-5.	OUTDOOR PIPING PLAN
S-6.	WATER FLOW SYSTEM
S-7.	OUTDOOR CABLING PLAN
S-8.	KEY ONELINE DIAGRAM
S-9.	PROCESS FLOW SHEET OF CERAMIC SHOP

STRUCTURE

BUILDING	FOUNDATION	FLOOR	COLUMN	WALL	BEAM
NEW BUILDING	PAD FOUNDATION	REINFORCED CONCRETE	STEEL	CB	STEEL

ABBREVIATION

EP	POLYVINYL ACETATE RESIN EMULSION PAINT
EP-A	ACRYLIC RESIN EMULSION PAINT
VP	VINYL PAINT
SOP	SYNTHETIC RESIN OIL PAINT
GB	GYPSUM BOARD
CB	CONCRETE BLOCK
CH	CEILING HEIGHT

EXTERIOR FINISHING SCHEDULE

BUILDING	ROOF	WALL	WAINSCOT	WINDOWS	DOORS	GLAZING	REMARKS
NEW BUILDING	ROOF TILE	BRICK, STRAIGHT JOINT	———	ALUMINIUM JALOUSIE WITH INSECT NET, AND BURGLAR BARS	STEEL, OP	FIGURED WIRE GLASS	BURGLAR BARS, SOP

ROAD	CRUSHED STONE ON SUB-BASE	UNDERGROUND RESERVOIR	8TONS
WELL	DEPTH=180M	OPEN DITCH	W500xD500 REINFORCED CONCRETE
ELEVATED WATER TANK	3TONS	GUTTER AND DOWNSPOUT	GALVANIZED IRON, OP

INTERIOR FINISHING SCHEDULE

BUILDING / ROOM	FLOOR	SKIRTING	WAINSCOT	WALL	CEILING	REMARKS
FORMING SECTION, FIRING SECTION	CONCRETE TROWELLED	MORTAR TROWELLED, EP H=100	———	MORTAR TROWELLED ON CB, EP-A	EXPOSED ROOF	HAND WASHING, FOOT WASHING, SINK
DECORATION ROOM AGING ROOM, DRYING ROOM	CONCRETE TROWELLED	MORTAR TROWELLED, EP H=100	———	MORTAR TROWELLED ON CB, EP-A	GB, EP-A CH=2,500	
CLAY STORAGE, COVERED WALKWAY	CONCRETE TROWELLED	———	———	MORTAR TROWELLED ON CB, EP-A	EXPOSED ROOF	
LAVATORY	MOSAIC TILE	MORTAR TROWELLED, EP H=100	———	SEMI-PORCELAIN TILE	GB, EP-A CH=2,500	BOOTH SCREEN ; TILE ON CB
					SAME	

NO.	REVISION	DATE	REV'D	CHK'D
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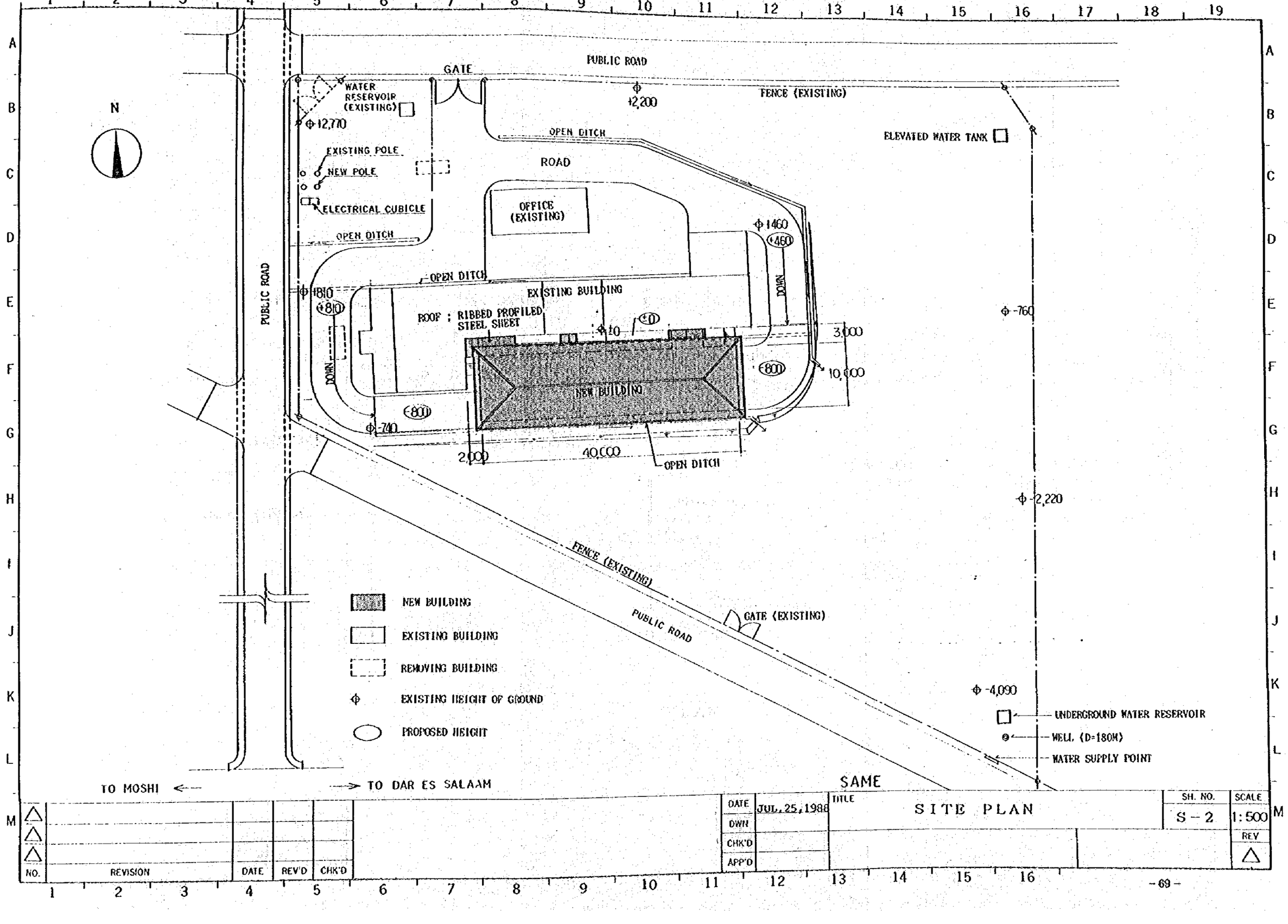
DATE JUL. 25, 1988
DWN
CHK'D
APP'D

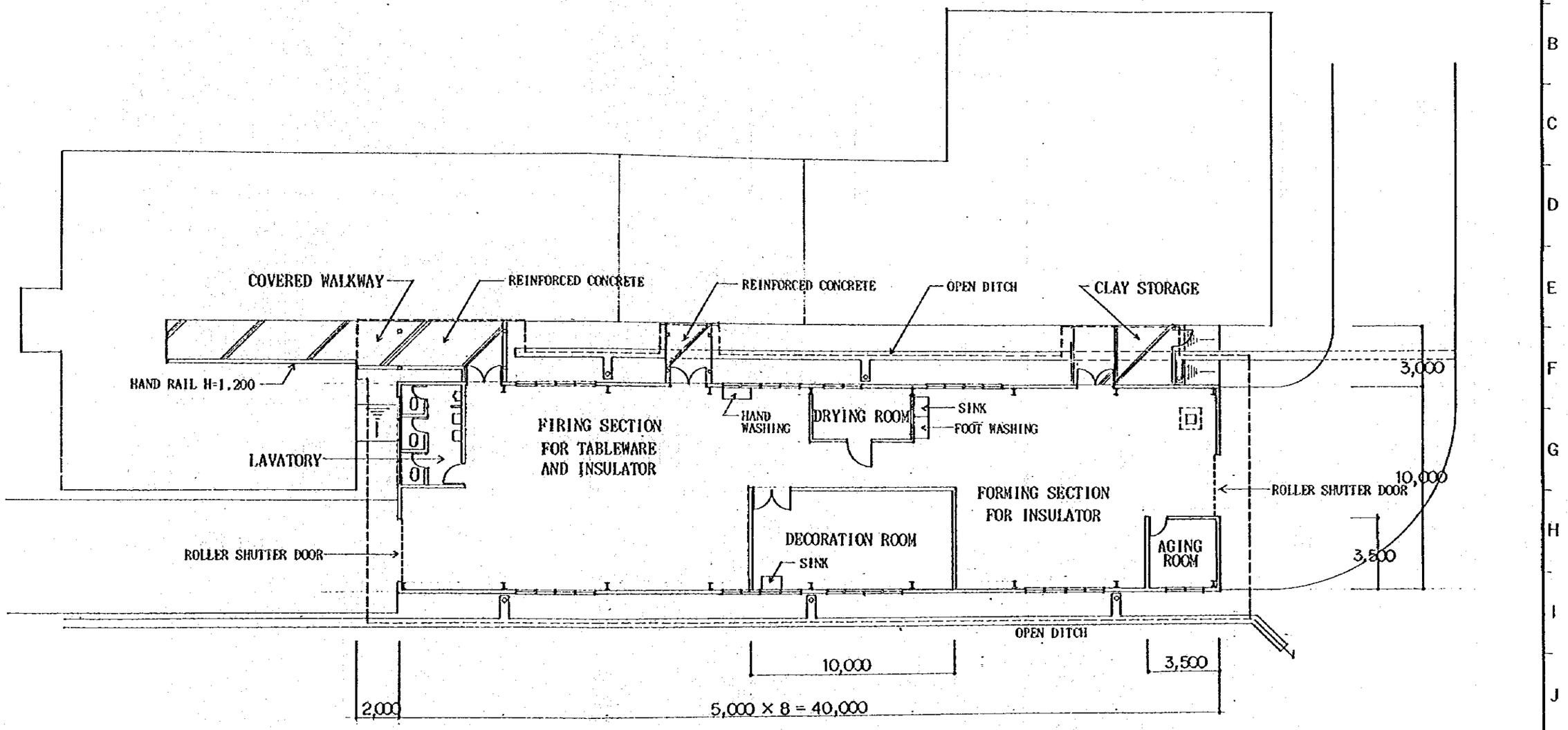
TITLE: STRUCTURE
EXTERIOR FINISHING SCHEDULE
INTERIOR FINISHING SCHEDULE

SH. NO. S-1

SCALE

REV △


PUBLIC ROAD
GATE
WATER RESERVOIR (EXISTING)
Φ12,770
Φ2,200
FENCE (EXISTING)
OPEN DITCH
ELEVATED WATER TANK
EXISTING POLE
NEW POLE
ROAD
ELECTRICAL CUBICLE
OFFICE (EXISTING)
OPEN DITCH
Φ1460
+460
DOWN
OPEN DITCH
PUBLIC ROAD
Φ1810
+810
EXISTING BUILDING
ROOF ; RIBBED PROFILED STEEL SHEET
Φ10
±0
3,000
DOWN
+800
10,000
NEW BUILDING
+800
Φ-740
2,000
40,000
OPEN DITCH
Φ-760
Φ-2,220
FENCE (EXISTING)
PUBLIC ROAD
GATE (EXISTING)
Φ-4,090
UNDERGROUND WATER RESERVOIR
WELL (D=180M)
WATER SUPPLY POINT
NEW BUILDING
EXISTING BUILDING
REMOVING BUILDING
EXISTING HEIGHT OF GROUND
PROPOSED HEIGHT
TO MOSHI
TO DAR ES SALAAM
SAME
NO.
REVISION
DATE
REV'D
CHK'D
DATE
DWN
CHK'D
APP'D
Jul. 25, 1988
TITLE
SITE PLAN
SH. NO.
S-2
SCALE
1:500
REV



PLAN

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DATE	JUL. 25, 1988
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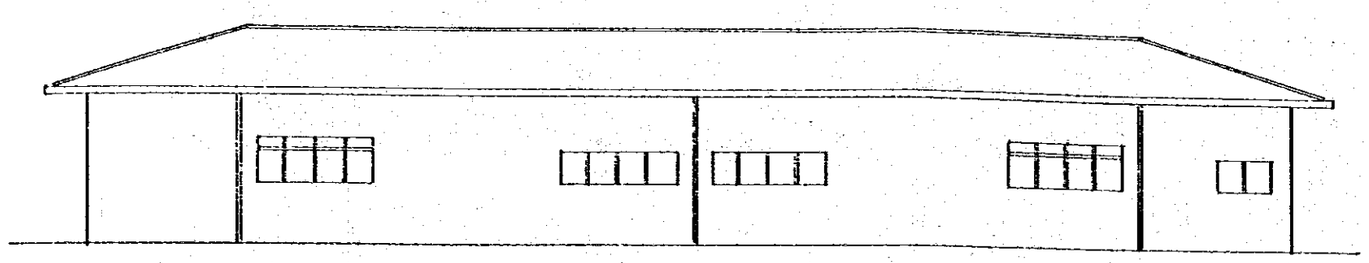
APP'D	

TITLE: PLAN

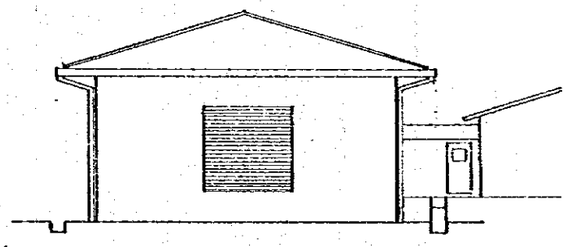
SH. NO.: S-3

SCALE: 1:200

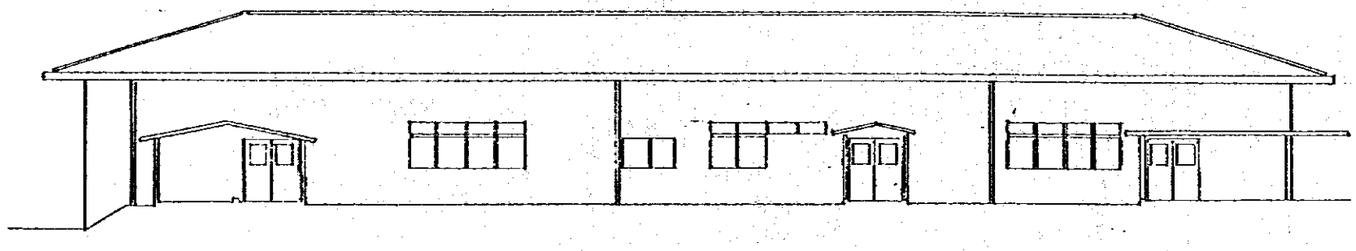
REV: △



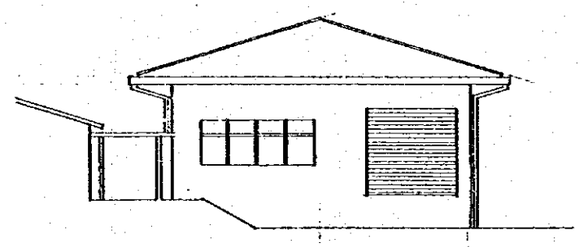
SOUTH ELEVATION



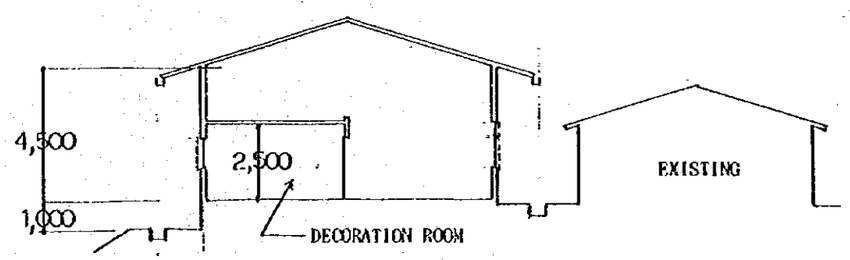
EAST ELEVATION



NORTH ELEVATION



WEST ELEVATION



SECTION

SAME

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DATE	JUL. 25, 1988
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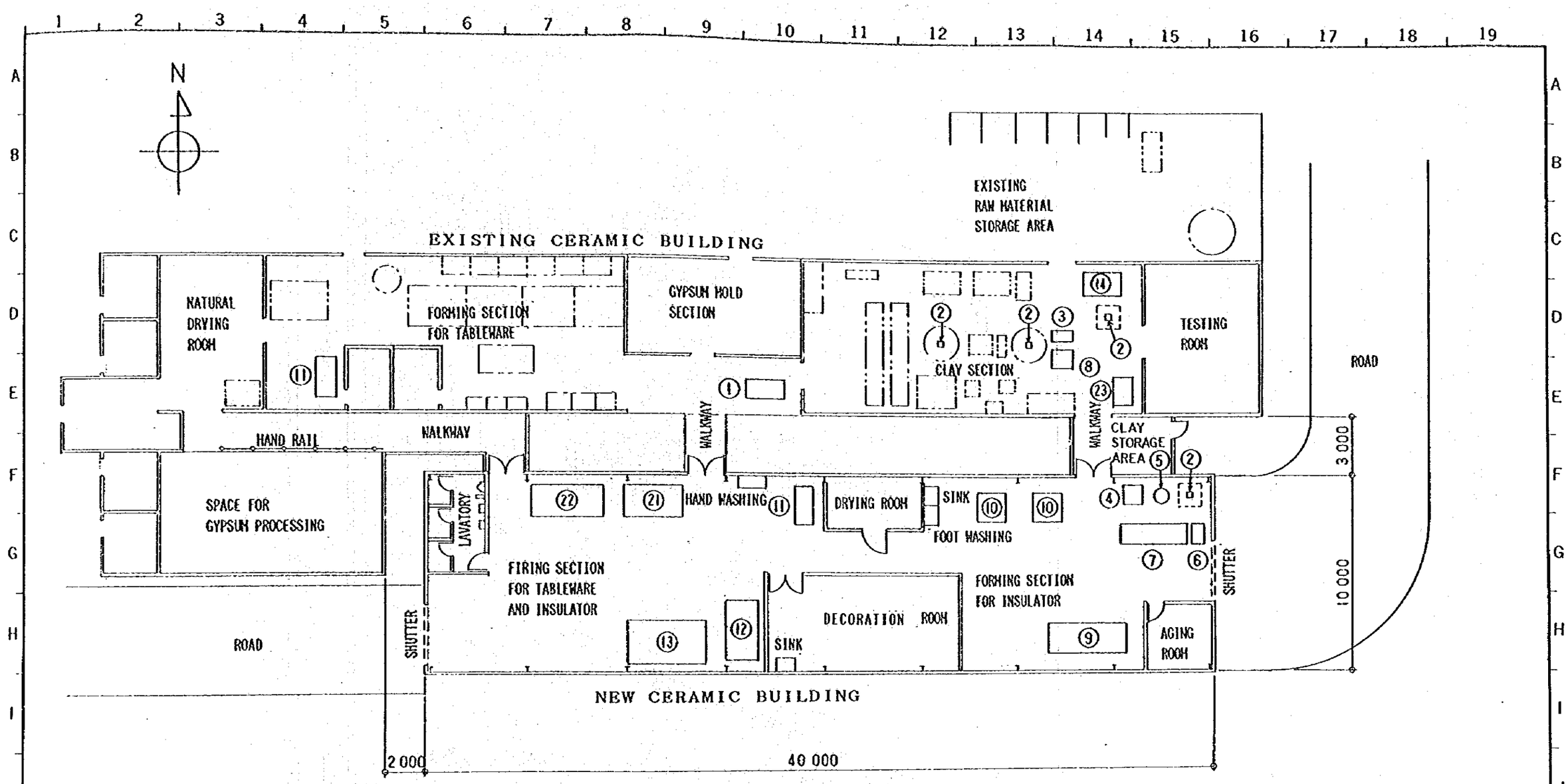
CHK'D	
APP'D	

TITLE: ELEVATION, SECTION

SH. NO.	SCALE
S-3A	1:200

REV △



I. EQUIPMENT SUPPLIED BY PHASE II

1. DE-AIRING AUGER MACHINE
2. AGITATOR
3. SLIP PUMP
4. VIBRATION SIEVE
5. MAGNETIC FERRO FILTER
6. HEMBRANE PUMP
7. FILTER PRESS
8. HIGH SPEED AGITATOR
9. DE-AIRING AUGER MACHINE
10. SCRAPPING MACHINE
11. HOT AIR GENERATOR
12. BISCUIT FIRING KILN (1 m³)
13. GLOST FIRING KILN (3 m³)
14. BALL MILL

II. EQUIPMENT SUPPLIED BY PHASE I (POSITION CHANGED)

21. BISCUIT FIRING KILN
22. GLOST FIRING KILN
23. POT MILL

SAME

NO.	REVISION	DATE	REV'D	CHK'D
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DATE	JUL. 25, 1988
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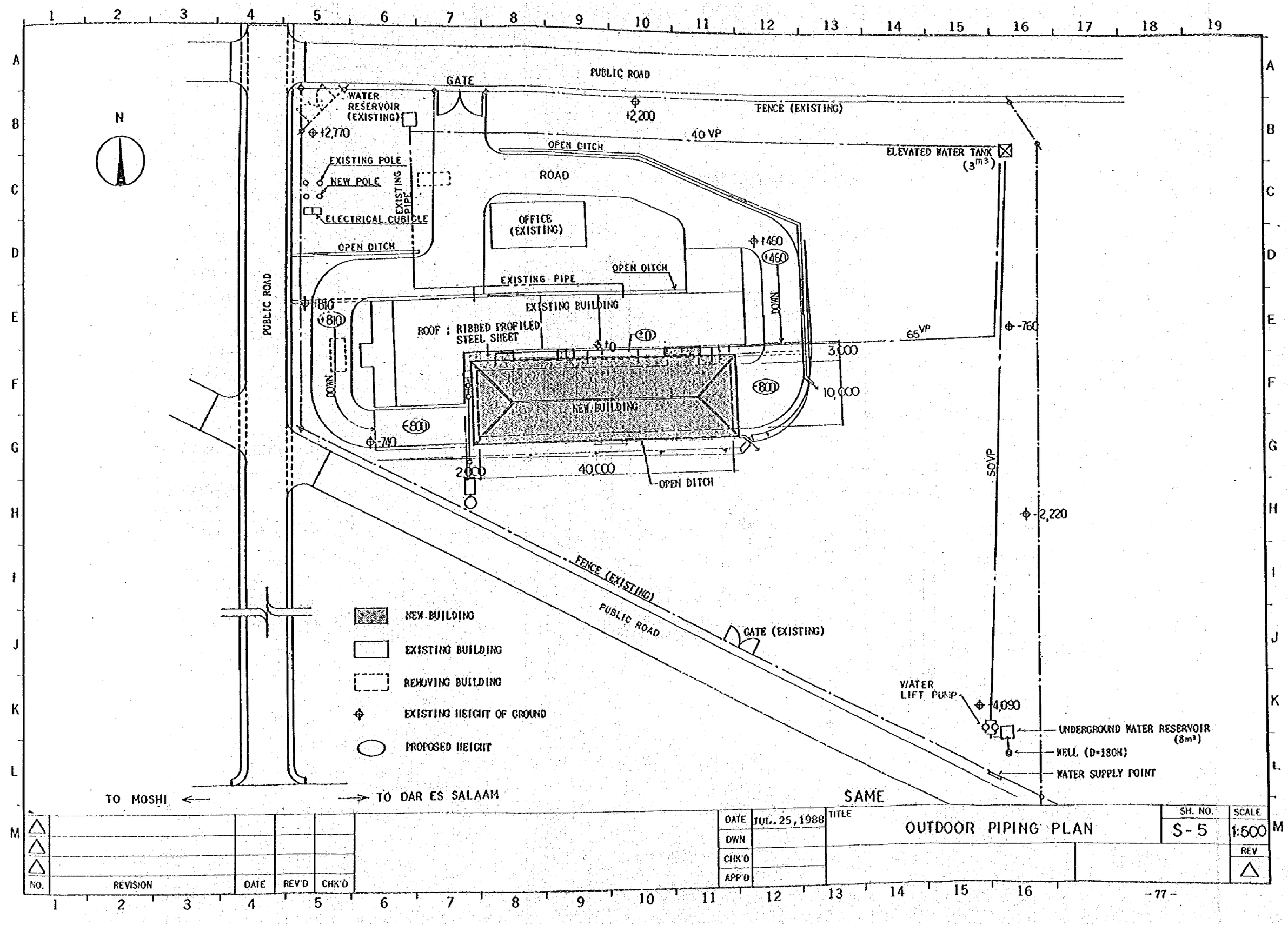
CHK'D	
APP'D	

TITLE: ARRANGEMENT OF CERAMIC SHOP

SH. NO.	SCALE
S-4	1:200

REV △



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DATE	JUL. 25, 1988
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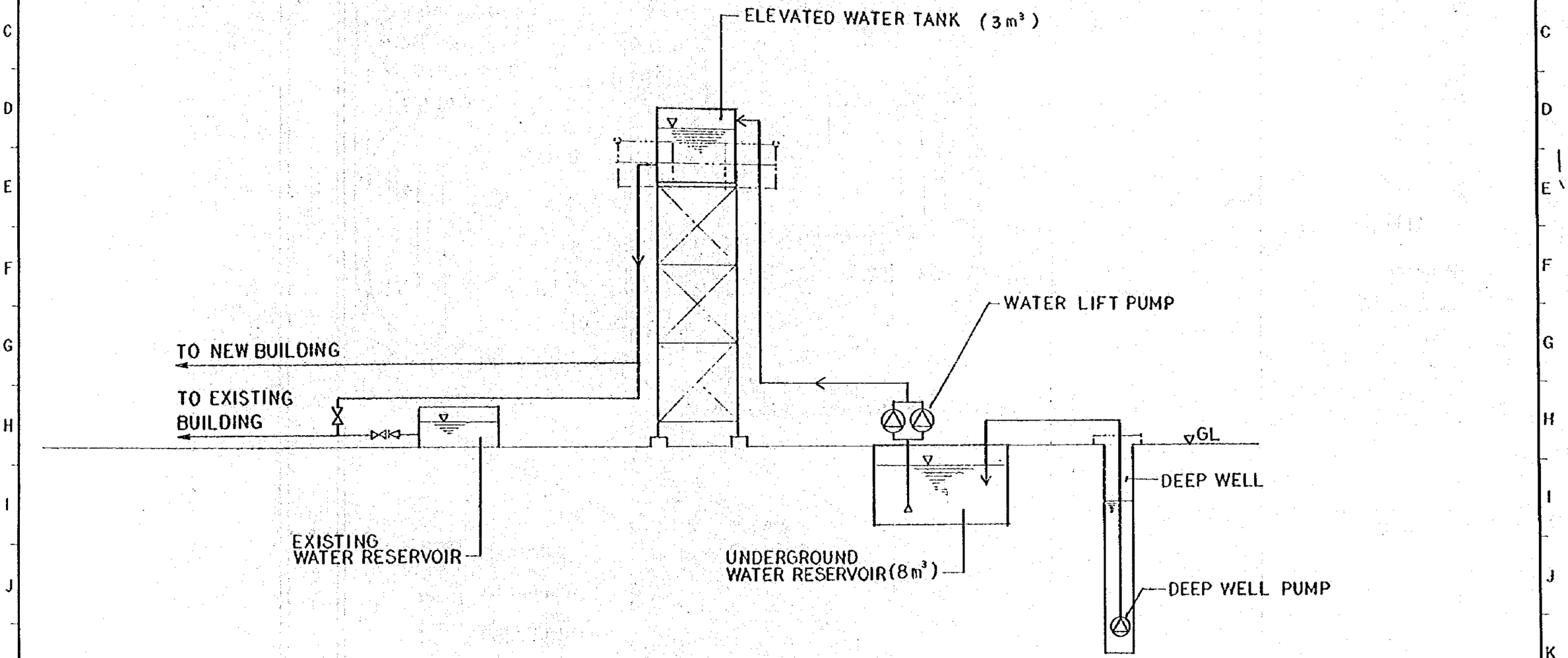
APP'D	

TITLE: OUTDOOR PIPING PLAN

SH. NO.	SCALE
S-5	1:500

REV △



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DATE	JUL. 25, 1988
DWN	
CHK'D	
APP'D	

TITLE: WATER FLOW SYSTEM

SH. NO.: S-6

SCALE: —

REV: △

N

EXISTING

PHASE II WORK

PUBLIC ROAD

GATE

PUBLIC ROAD

WATER RESERVOIR (EXISTING)

+12,770

+2,200

FENCE (EXISTING)

OPEN DITCH

ELEVATED WATER TANK

EXISTING POLE

NEW POLE

OUTDOOR CUBICLE

ROAD

OFFICE (EXISTING)

OPEN DITCH

+1460

+460

DOWN

OPEN DITCH

+810

+810

EXISTING BUILDING

ROOF : RIBBED PROFILED STEEL SHEET

+10

±0

3,000

10,000

DOWN

+800

NEW BUILDING

HAND HALE

-800

-740

2,000

40,000

OPEN DITCH

LIGHTING PANEL BOARD, POWER SWITCHING BOARD

-760

-2,220

FENCE (EXISTING)

PUBLIC ROAD

GATE (EXISTING)

-4,090

POWER CONTROL PANEL

UNDERGROUND WATER RESERVOIR

WELL (D=180M)

WATER SUPPLY POINT

NEW BUILDING

EXISTING BUILDING

REMOVING BUILDING

EXISTING HEIGHT OF GROUND

PROPOSED HEIGHT

TO MOSHI ←

→ TO DAR ES SALAAM

SAME

LEGEND

OVERHEAD WIRING

UNDERGROUD WIRING

NO.	REVISION	DATE	REV'D	CHK'D
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△				
△				

DATE JUL. 25, 1988

DWN

CHK'D

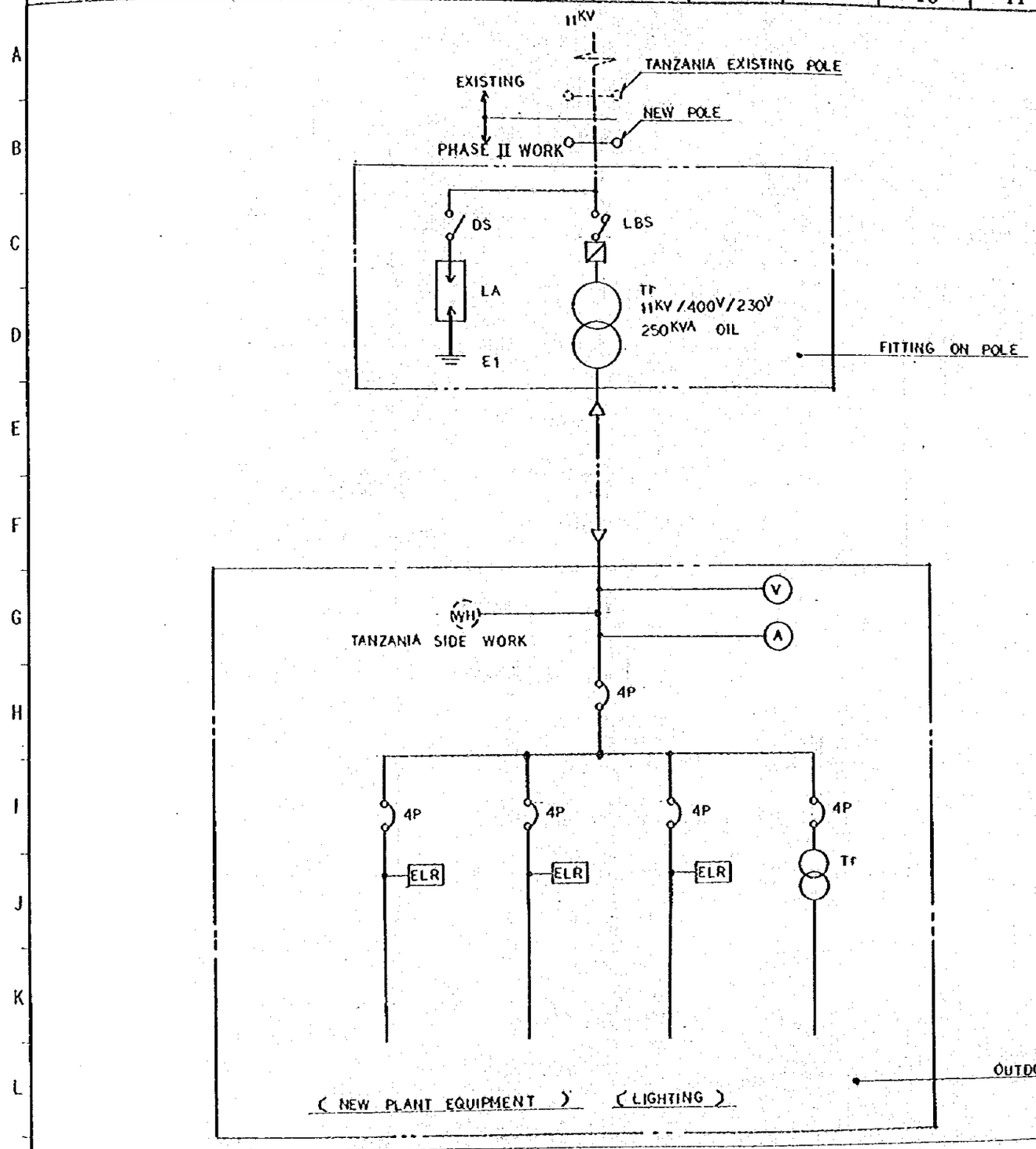
APP'D

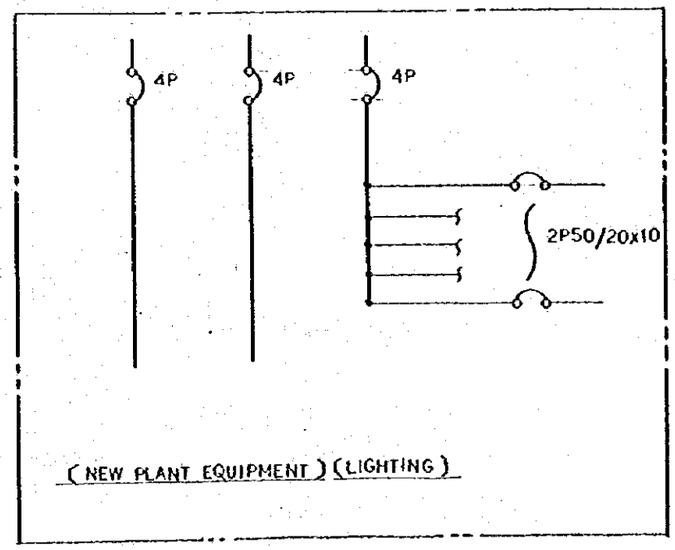
TITLE: OUTDOOR CABLING PLAN

SH. NO. S-7

SCALE 1:500

REV △





LIGHTING PANEL BOARD, POWER SWITCH BOARD

SAME

NO.	REVISION	DATE	REV'D	CHK'D
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DATE	JUL. 25, 1988
DWN	
CHK'D	
APP'D	

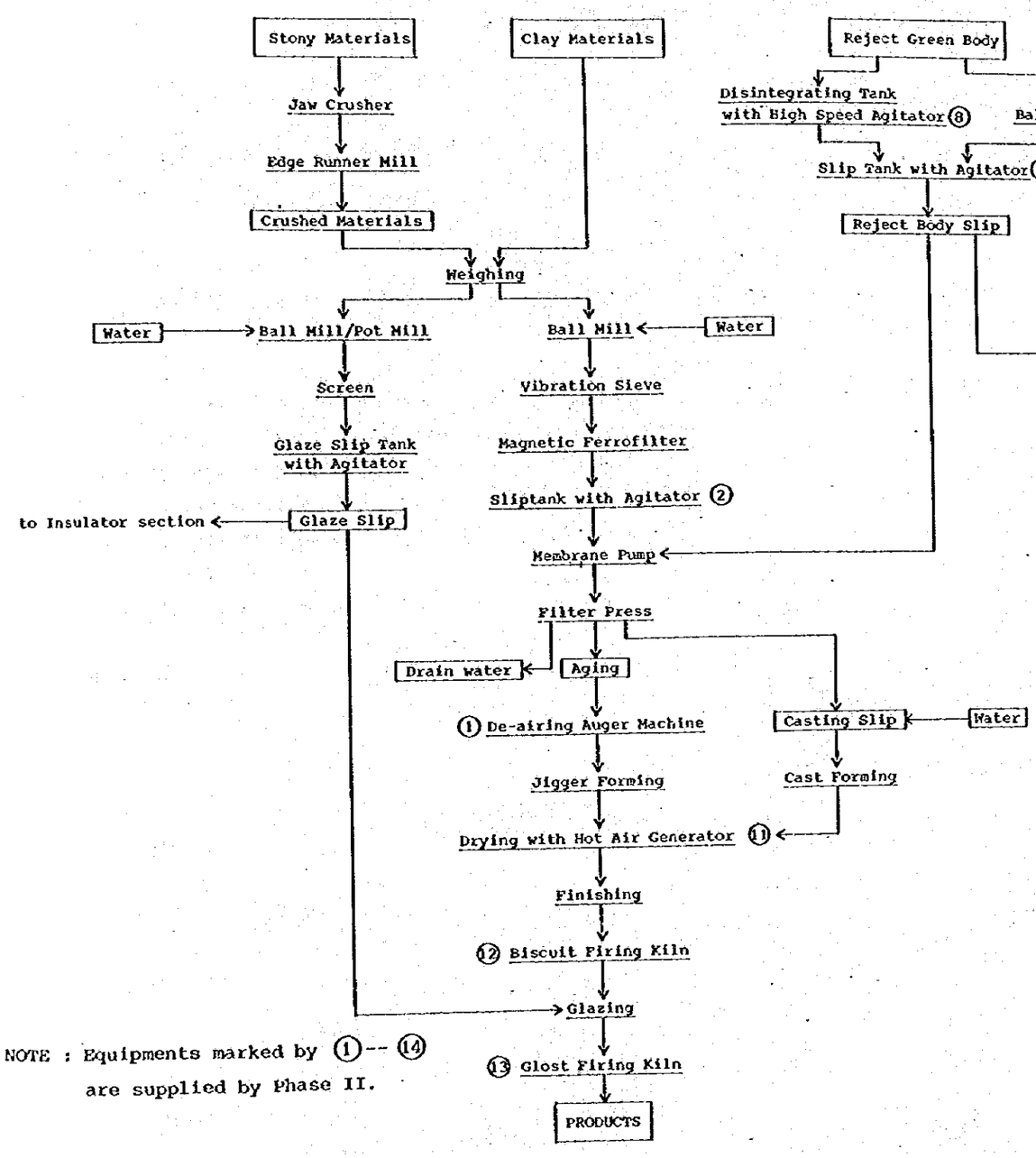
TITLE: KEY ONELINE DIAGRAM

SH. NO. S-8

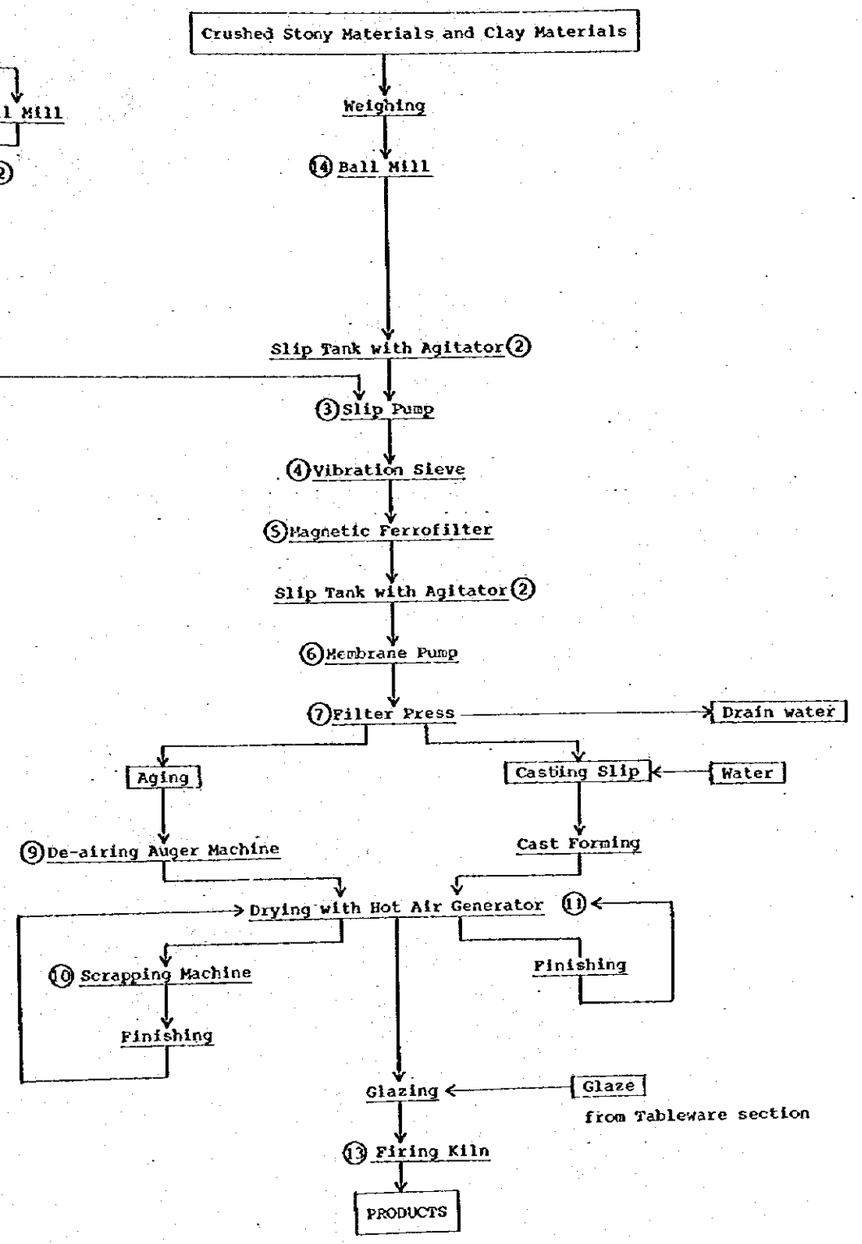
SCALE

REV △

PROCESS FLOW FOR TABLEWARE



PROCESS FLOW FOR ELECTRIC INSULATOR



NOTE : Equipments marked by (1) -- (14) are supplied by Phase II.

SAME

NO.	REVISION	DATE	REV'D	CHK'D
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DATE	JUL. 25, 1988
DWN	
CHK'D	
APP'D	

TITLE: PROCESS FLOW SHEET OF CERAMIC SHOP

SH. NO.: S - 9

SCALE:

REV: △

4-3-2 Moshi Phase II

(1) Site and layout plan

Moshi Phase II will be constructed in the existing KIDC Moshi Centre site. The new building for the foundry section will be expanded onto the backside of the existing foundry section building. If this building is expanded, the existing cupola, heavy oil furnace and newly installed high frequency induction furnace will be closely arranged, and will be easy to use.

Machine tools to be newly supplied to strengthen the machining section will be installed in the existing machining section building where there is sufficient space. The existing testing room space will be used as the assembly shop. The existing tool storage and office will be remodeled into the design room. Two containers will be provided in the existing machine storage to store high-grade tools.

(2) Building design

1) Plan

As shown in the basic design drawings (M-1, M-2, M-3) on pages 99 through 103, the new foundry section building will be extended onto the backside of the existing foundry section building to install the high frequency induction furnace's auxiliary equipment and provide a scrap sorting yard. A 2-ton overhead travelling crane will be installed in the new building. A scrap yard will be provided at the rear side of the new foundry section building. The high frequency induction furnace will be installed in the moulding and casting section in the existing building. Molten iron from the high frequency induction furnace,

existing heavy oil furnace and existing cupola will be ladled and transferred by a truck to the new foundry section. The casting process will be done using the overhead travelling crane. The required area for the following sections is determined considering the size of each equipment and working efficiency.

a) Sand processing, moulding and casting .. 300 m^2
b) Heat treatment, quenching, finishing, and products storage ..... 75 m^2
c) Scrap cutting, sorting and truck entry space ..... 150 m^2

To accommodate these spaces, a 15 m x 35 m building will be expanded.

2) Section plan

The existing columns on the backside of the existing foundry section will be shared with the new building. The height of the eaves of the new building will be determined considering the hoisting height (3.5 m) of the overhead travelling crane. The floor level of the new building will be flush with that of the existing building. The existing walls between the new and old buildings will be removed, and a bracing bay will be shifted in order to facilitate the free and smooth flow of workers, trucks, etc. Gable roofing will be provided to match the existing building. Roofing and siding materials will be of rib-profiled steel sheets with the same corrugation as that of the existing sheeting.

3) Structural design

Structural steel framing construction is most appropriate considering that the construction period (approx. one year) is short. The main framing will be structural steel portals with bracing placed in the ridge direction. The pad foundations will be provided with consideration given to the relatively stiff formation of the soil (10 ton/m^2) and the light superstructure. A part of the existing pad foundations will be modified and enlarged to support the added weight of a new roof, walls and cranes. The floor will be of a ground floor slab type and the imposed load will be supported by a subgrade.

The grades of the main structural materials are as follows:

a) Structural steel ..... SS41 (JIS G3101)
b) Reinforcing bars ..... SD30 (JIS G3112)
c) Concrete
   Blinding concrete ..... Fc = 100 kg/cm^2
   Structural concrete ..... Fc = 210 kg/cm^2

4) Plumbing and HVAC

a) Plumbing work

The design water demand of the Moshi Centre is 15 m^3 per day. 5 m^3/day will be used for cleaning water for the high frequency induction furnace and the rest of this for service water. A well (80m deep) will be bored on the premises of the Moshi Centre. The water will be pumped up from the well, stored in the underground water reservoir, again pumped up to the elevated water tank and then supplied to each equipment and facility by gravity. The capacity of the underground water reservoir and

elevated water tank will be 8 m^3 and 3m^3, respectively. Service pipes will be of PVC. Two lift pumps will be installed, and one of the two pumps will be used as a standby.

b) Sewerage

The existing open ditches on the north side of the existing foundry building will be modified to accommodate a new foundry building. Waste water from the high frequency induction furnace will be discharged to the open ditches.

c) Ventilation facility

Roof fans will be installed on top of the new foundry building for forced ventilation.

Specifications for the main equipment are as follows:

Deep well submergible pump	:	40ϕ x 135 lit./min x 80m Motor 3p x 400V x 3.7kW
Lift pump	:	40ϕ x 32ϕ x 80 lit./min x 22m Fully enclosed outdoor type motor 3p x 400V x 1.5kW
Elevated water tank	:	FRP, single panel water tank Accessories: Inner/outer ladder, outlets, vent hole, electrode for level switch, manhole (600ϕ)
Roof fan	:	80m^3/min x 5mmAg Motor 3p x 400V x 0.4kW, bird netting

5) Electric facilities

The required electric power for the machinery and equipment provided for the Moshi Centre is planned to be 800kVA considering load factors. The electrical work for the new building is planned to be separate from the existing electrical facility. The Tanzanian Government will be responsible for constructing the 11 kV side, and the construction work of the 6600V side, including the transformer, will be in the scope of Phase II work.

Both the transformer and the low voltage switchgear will be of the outdoor cubicle type, in which a WH meter will be installed.
Wiring requirements in the building will be as follows:

Main power line for high frequency induction furnace	3-phase, 3-wire, 6600V
Lighting and main power line	3-phase, 4-wire, 400/230V
Power circuit	3-phase, 3-wire, 400V
Lighting and receptacle circuit	single phase, 2-wire, 230V

The power control panel and lighting distribution panel will be installed to control and monitor each machinery and equipment. 600V CV cables are mainly wired using metal or vinyl conduits.

Fluorescent lamps will be used as indoor lighting.
(Refer to 4-2-2 for the lighting level.)

Specifications for the main equipment are as follows:

Outdoor cubicle	:	VCB, arrester, WH meter, switchgears, disconnecting switch, one 6.6kV (450kVA) switchgear for equipment two 400/230V (250kVA) switchgear for equipment, one 20kW lighting switchgear
Transformer	:	one unit -- oil immersed type, 500kVA, primary 11,000V secondary 6,600V the other unit -- oil immersed type, 300kVA, primary 11,000V secondary 400/230V
Distribution board	:	Lighting circuit, 10 feeders one 300 kW switchgear for equipment two 100 kW switchgears for equipment
Power control panel for lift pumps	:	Outdoor type (alarm panel will be located in the building.)
Lighting fixtures	:	Glow switch type, 230V, 50 Hz

6) Construction materials

Construction materials to be used for this Project are as follows:

Concrete block	:	Locally procured concrete block, 390 x 190 x 200 mm
Roofing	:	Rib-profiled steel sheets
Siding	:	Rib-profiled steel sheets
Ceiling panels	:	9 mm finished plaster board on 9 mm plaster board

Metal joinery : Steel doors, roller shutter doors, aluminum jalousie with mosquito net

Wood joinery : Steel frames and wood, flush doors (40 mm thick, oil-painted) and ironmongery and fixings

(3) Machinery and equipment plan

Machinery and Equipment	Q'ty	Specifications
a) Metalworking section		
High frequency induction furnace	1	Maximum capacity: 300kg cooling tower, pump, CE meter, thermometer, accessories
Weighing machine	1	Capacity: 500kg
Ladle	3	Capacity: 50kg
Ladle	1	Capacity: 100kg
Ladle	1	Capacity: 300kg
Transferring carriage	1	Motor driven
Annealing furnace	1	Effective dimensions: 800 x 800 x 1,500mm Temperature range: 500 to 1100°C, batch type, programmable temperature control, thrister, thermometer, temperature recorder, accessories
Shot blast machine	1	Turntable type Effective dimensions: 1200 dia. x 600 mm (H)
Air compressor	1	Suction capacity: 3.3m^3/min. Delivery pressure: 7kg/cm^3

(cont'd)

Machinery and Equipment	Q'ty	Specifications
Hand grinder	1	For sprue cutting
Welding machine	1	For product finishing
Gas cutter	3	For scrap cutting
Propane burner	1	
Sand breaker	1	Capacity: 1.5t/h
Hand magnet catch	1	Capacity: 50kg
Sand cleaning machine	1	Capacity: 1.5 t/h
Sand mixing muller	1	Capacity: 120kg/batch
Sand container	3	Steel with lid
Wheelbarrow	3	For sand
Balance	1	10kg
Balance	1	20kg
Hand mixer	1	
Testing equipment:		
Sieve shaker	1	
Sand rammer	1	
Permeability tester	1	
Universal sand strength machine	1	
Humidity tester	1	
Sand mould hardness tester	1	
Scrap sparkling tester (with test piece)	1 set	For checking materials
Wood pattern machine:		
Universal saw bench	1	
Single surface planer	1	
Chisel machine	1	
Spindle sander	1	
Disk/belt sander	1	
Jigsaw machine	1	
Spare parts	1 set	

(cont'd)

Machinery and Equipment	Q'ty	Specifications
b) Machining section		
Vertical lathe	1	
Universal milling machine	1	
Cylinder boring machine	1	
Electrical welder	1	
Hand drill	5	Electrically powered type
Electrical furnace for quenching	1 set	Effective dimensions: 300 x 250 x 600mm 1 x 1 x 1m oil tank, 1 x 1 x 1m water tank, cooling fan
Spare parts	1 set	
c) Vehicles for field survey and transportation		
Crane truck	1	Hoisting capacity: 2-ton
Pickup	1	
Forklift	1	1 ton
d) Drafting equipment		
Drafting machine	5	Arm type
Photocopier	1	For A3 size
Blue printing machine	1	For A1 size
Map case	1	

(4) Basic design drawings

DWG. No.	Title
M-1.	STRUCTURE
	EXTERIOR FINISHING SCHEDULE
	INTERIOR FINISHING SCHEDULE
M-2.	SITE PLAN
M-3.	PLAN
M-3A.	ELEVATION, SECTION
M-4.	ARRANGEMENT OF FOUNDRY SHOP
M-5.	ARRANGEMENT OF MECHANICAL SHOP
M-6.	OUTDOOR PIPING PLAN
M-7.	WATER FLOW SYSTEM
M-8.	OUTDOOR CABLING PLAN
M-9.	KEY ONELINE DIAGRAM

STRUCTURE

BUILDING	FOUNDATION	FLOOR	COLUMN	WALL	BEAM
NEW BUILDING	PAD FOUNDATION	REINFORCED CONCRETE	STEEL	CB IRON SHEET	STEEL

EP	POLYVINYL ACETATE RESIN EMULSION PAINT
EP-A	ACRYLIC RESIN EMULSION PAINT
VP	VINYL PAINT
SOP	SYNTHETIC RESIN OIL PAINT
GB	GYPSUM BOARD
CB	CONCRETE BLOCK
CH	CEILING HEIGHT

EXTERIOR FINISHING SCHEDULE

BUILDING	ROOF	WALL	WAINSCOT	WINDOWS	DOORS	GLAZING	REMARKS
NEW BUILDING	GALVANIZED AND POLYESTER COATED RIB-PROFILED STEEL ROOFING LINING WITH THERMAL INSULATION MATERIAL	GALVANIZED AND POLYESTER COATED RIB-PROFILED STEEL SIDING LINING WITH THERMAL INSULATION MATERIAL	MORTAR TROWELLED ON CB, MASTIC FINISH H=1,200	ALUMINIUM JALOUSIE WITH INSECT NET	STEEL,OP	FIGURED WIRE GLASS	POWER ROOF FAN OPENING WITH CRIMP NET

ROAD	CRUSHED STONE ON SUB-BASE	ELEVATED WATER TANK		OPEN DITCH	W500xD500 REINFORCED CONCRETE
SCRAP YARD	GRADING	UNDERGROUND RESERVOIR	8TONS	GUTTER AND DOWNSPOUT	GALVANIZED IRON SHEET,OP
WELL	DEPTH=80M	COOLING TOWER			

INTERIOR FINISHING SCHEDULE

BUILDING / ROOM	FLOOR	SKIRTING	WAINSCOT	WALL	CEILING	REMARKS
NEW BUILDING	CONCRETE TROWELLED WITH HARDENER	MORTAR TROWELLED, EP H=100	MORTAR TROWELLED, EP H=1,100	EXPOSED EXTERIOR WALL	EXPOSED ROOF	GROUPED SCRAP YARD PARTITION; CB H=2.500 OVERHEAD TRAVELLING CRANE; CAP.2TONS, LOWHEAD TYPE
TEST ROOM, WOOD PATTERN WORKSHOP	REPAIRING; (CONCRETE TROWELLED WITH HARDENER)	MORTAR TROWELLED, EP H=100	REPAIRING; (MORTAR TROWELLED, EP H=1,100)	MORTAR TROWELLED ON CB, EP	GB,T=919,EP-A CH=4,500	
FOUNDRY	REPAIRING; (CONCRETE TROWELLED WITH HARDENER			(REMOVING SOME PART OF EXTERIOR WALL AND WAINSCOT, (SHIFTING ONE PAIR OF BRACES		
DESIGN ROOM IN MECHANICAL SHOP	REPAIRING; (CONCRETE TROWELLED WITH HARDENER)	REPAIRING; (MORTAR TROWELLED, EP H=100)	REPAIRING; (MORTAR TROWELLED, EP H=1,100)	EXPOSED EXTERIOR WALL	GB,EP-A CH=2,500	

MOSHI

NO.	REVISION	DATE	REV'D	CHK'D
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DATE JUL.25,1988
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TITLE STRUCTURE
EXTERIOR FINISHING SCHEDULE
INTERIOR FINISHING SCHEDULE

SH. NO. M-1
SCALE
REV △

N

SCRAP YARD

35,000

ROAD

NEW FOUNDRY BUILDING

15,000

EXISTING FOUNDRY AND FORGING BUILDING

ELECTRICAL CUBICLE

COOLING TOWER

ELEVATED WATER TANK

UNDERGROUND RESERVOIR

WELL (D=80m)

OFFICE BUILDING

PARKING

MATERIAL STORAGE ROOM

DESIGN ROOM

MECHANICAL SHOP

±0

+1,380

-380

ASSEMBLY SHOP

GATE

PUBLIC ROAD

PARKING

BOUNDARY LINE

MOSHI PHASE II

EXISTING BUILDING

EXISTING HEIGHT OF GROUND

BOUNDARY LINE

MOSHI

NO.	REVISION	DATE	REV'D	CHK'D
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DATE JUL. 25, 1988
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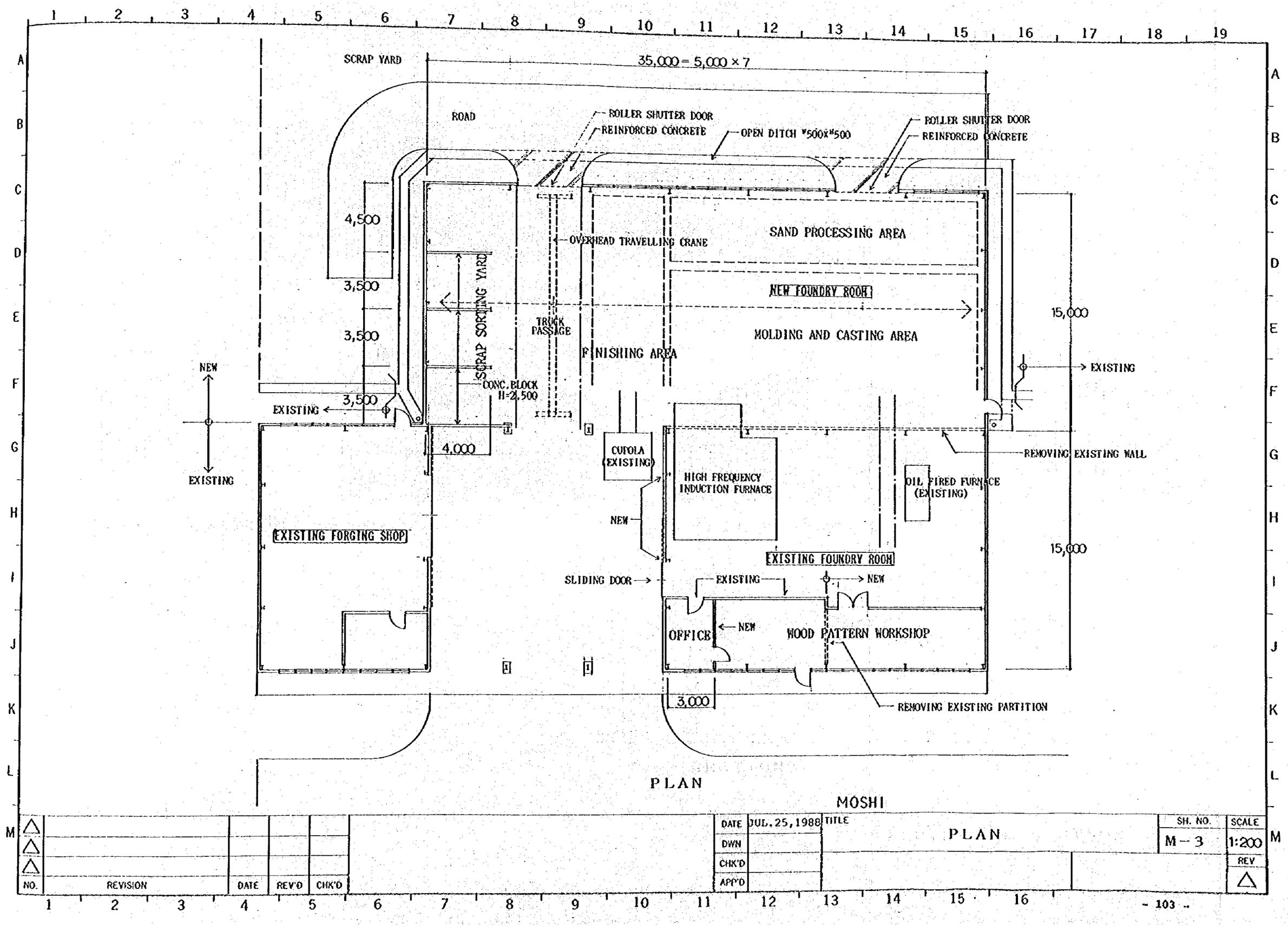
TITLE: SITE PLAN

SH. NO. M-2

SCALE 1:750

REV △



PLAN

MOSHI

NO.	REVISION	DATE	REV'D	CHK'D
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DATE	JUL. 25, 1988
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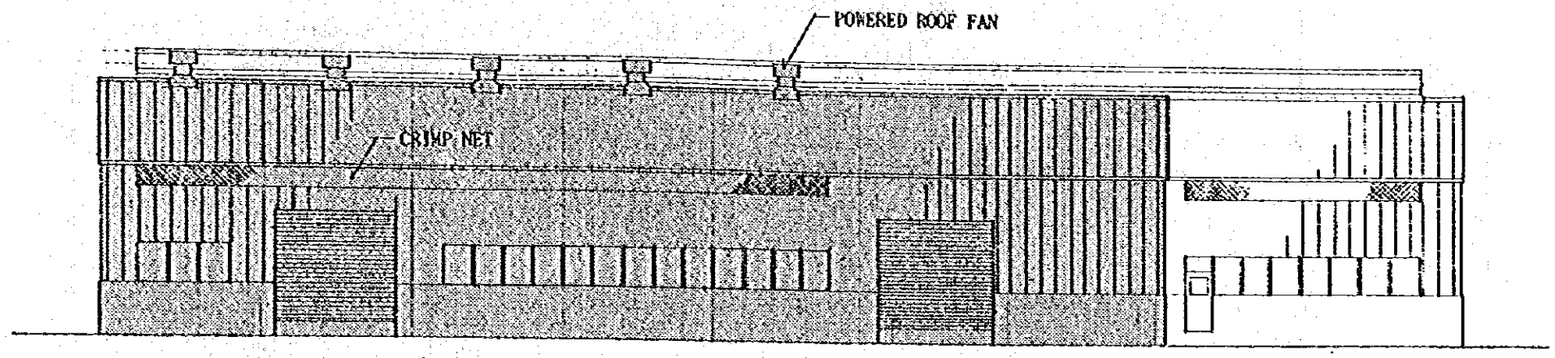
TITLE: PLAN

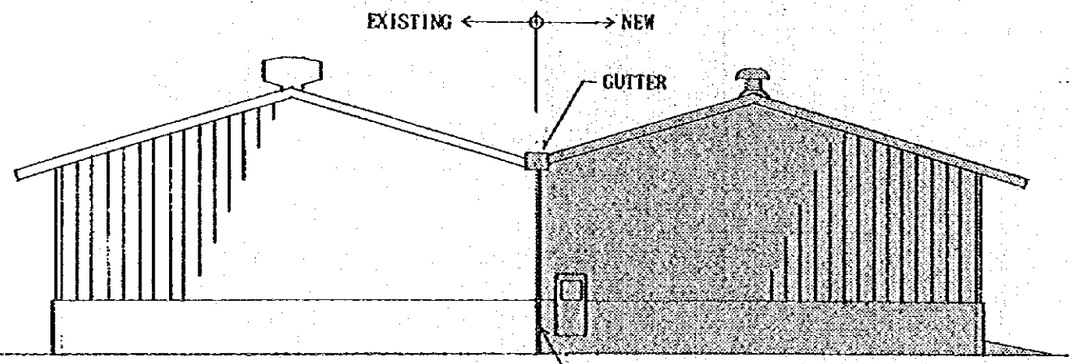
SH. NO.: M – 3

SCALE: 1:200

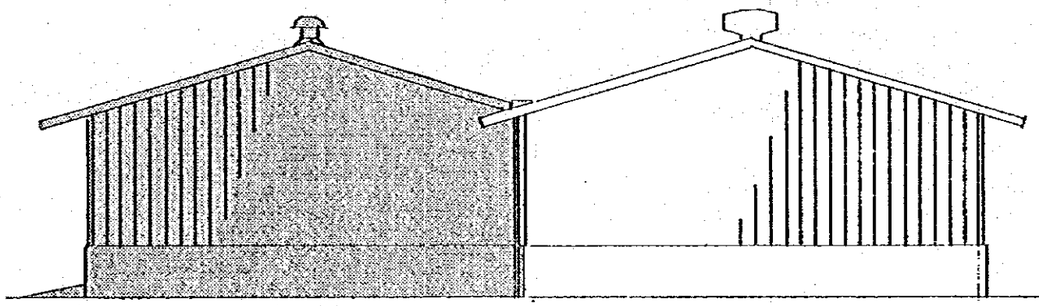
REV: △



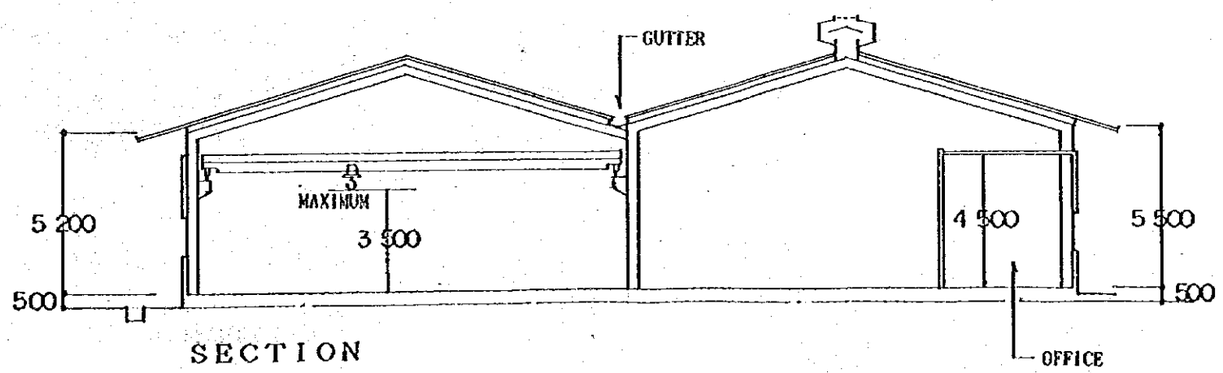
NORTH ELEVATION



EAST ELEVATION



WEST ELEVATION



SECTION

MOSHI

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DATE	JUL. 25, 1988
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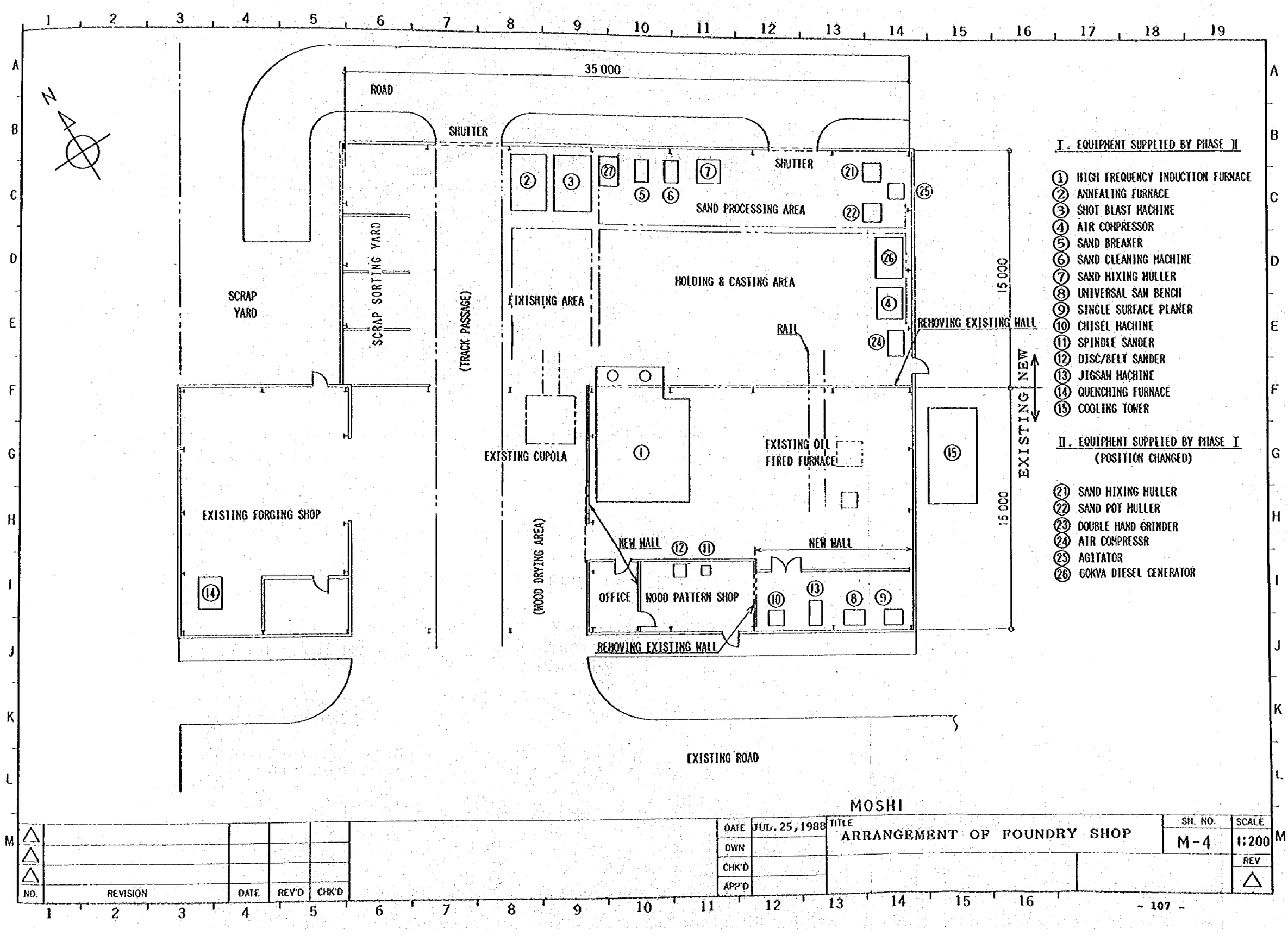
TITLE: ELEVATION, SECTION

SH. NO.	SCALE
M-3A	1:200

REV: △



MOSHI

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DATE	JUL. 25, 1988
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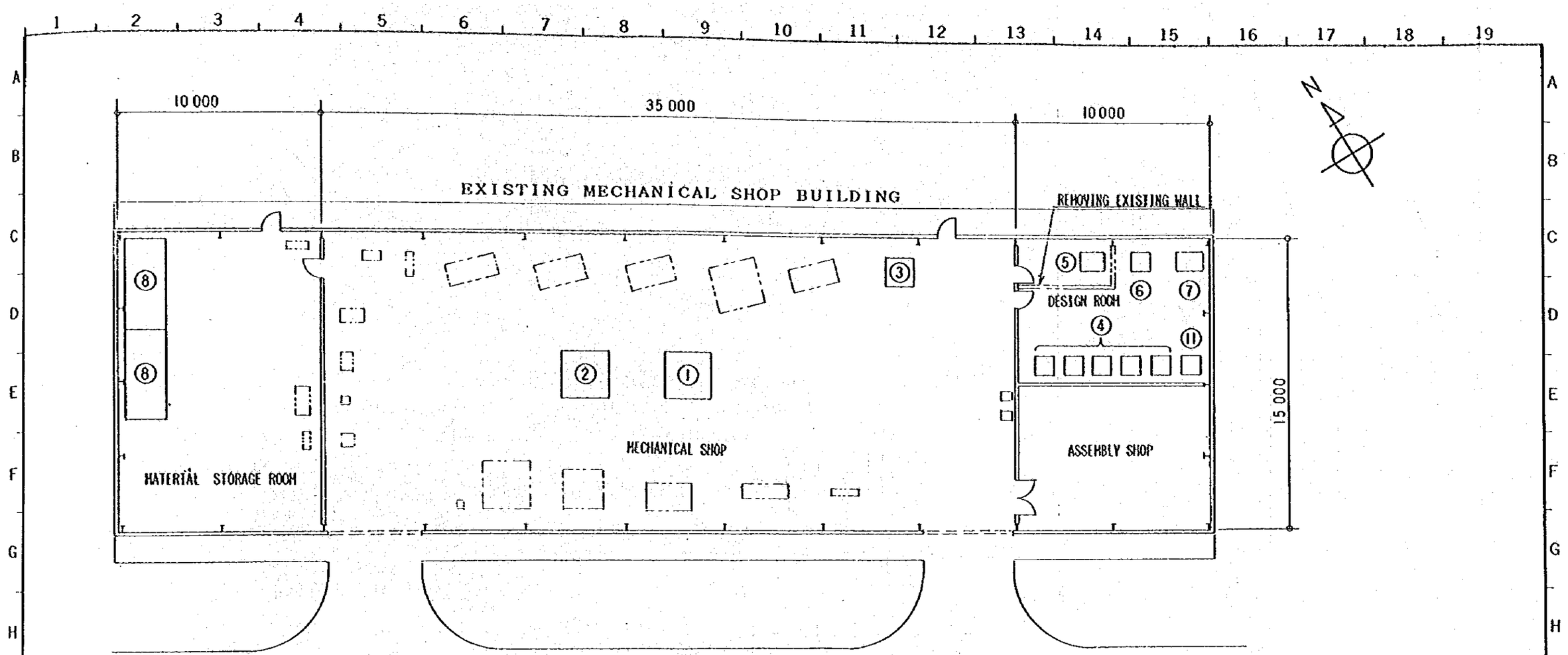
APP'D	

TITLE: ARRANGEMENT OF FOUNDRY SHOP

SH. NO.: M-4

SCALE: 1:200

REV: △



I. EQUIPMENT SUPPLIED BY PHASE II

① VERTICAL LATHE
② UNIVERSAL MILLING MACHINE
③ CYLINDER BORING MACHINE
④ DRAFTING MACHINE
⑤ BLUE PRINTING MACHINE (A1 SIZE)
⑥ PHOTO COPY MACHINE (A3 SIZE)
⑦ DRAWING CASE
⑧ CONTAINER

II. EQUIPMENT SUPPLIED BY PHASE I
(PISITION CHANGED)

⑪ DRAFTING MACHINE

MOSHI

NO.	REVISION	DATE	REV'D	CHK'D
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DATE	JUL. 25, 1988
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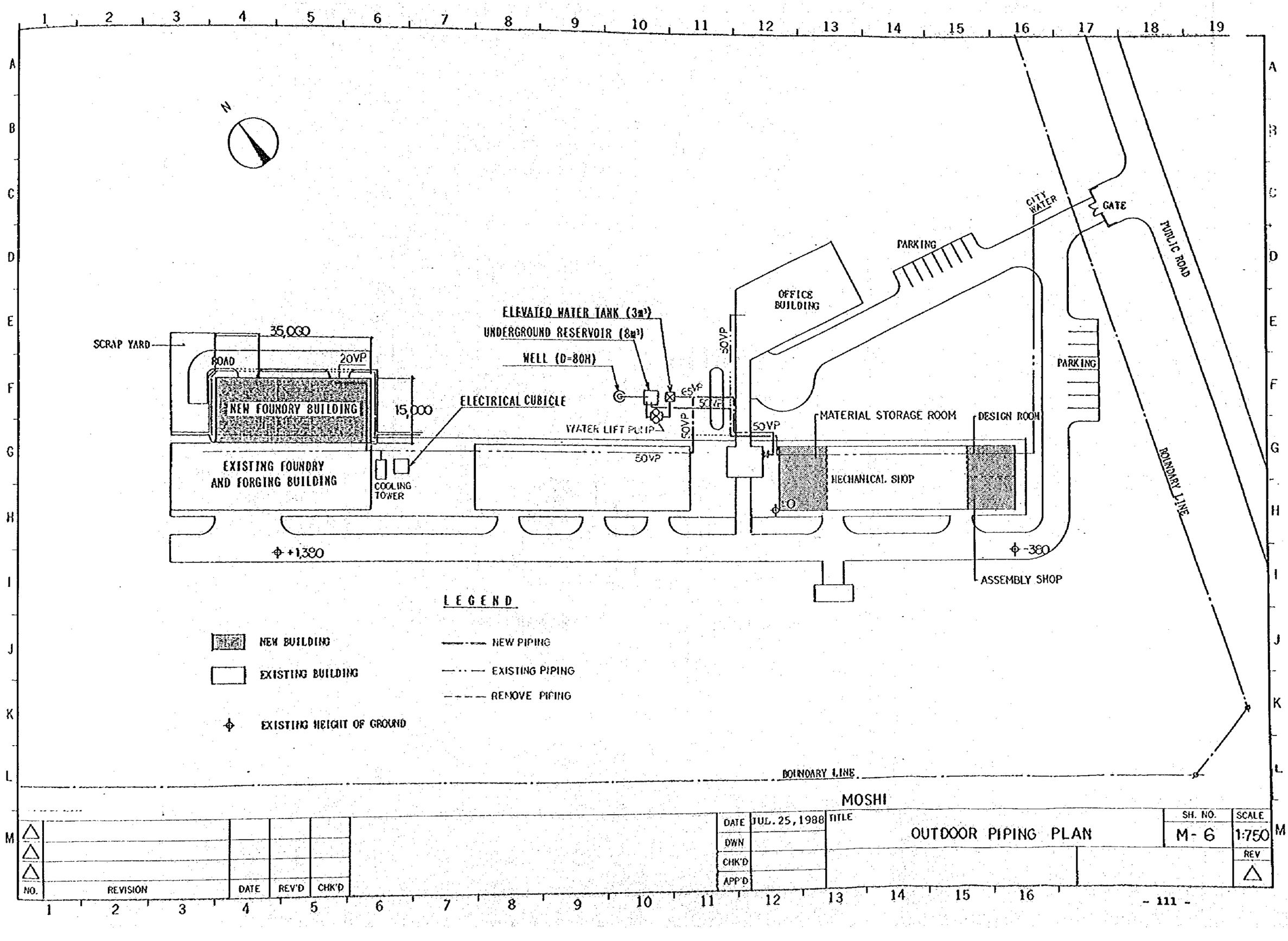
TITLE: ARRANGEMENT OF MECHANICAL SHOP

SH. NO.: M-5

SCALE: 1:200

REV: △



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DATE	JUL. 25, 1988
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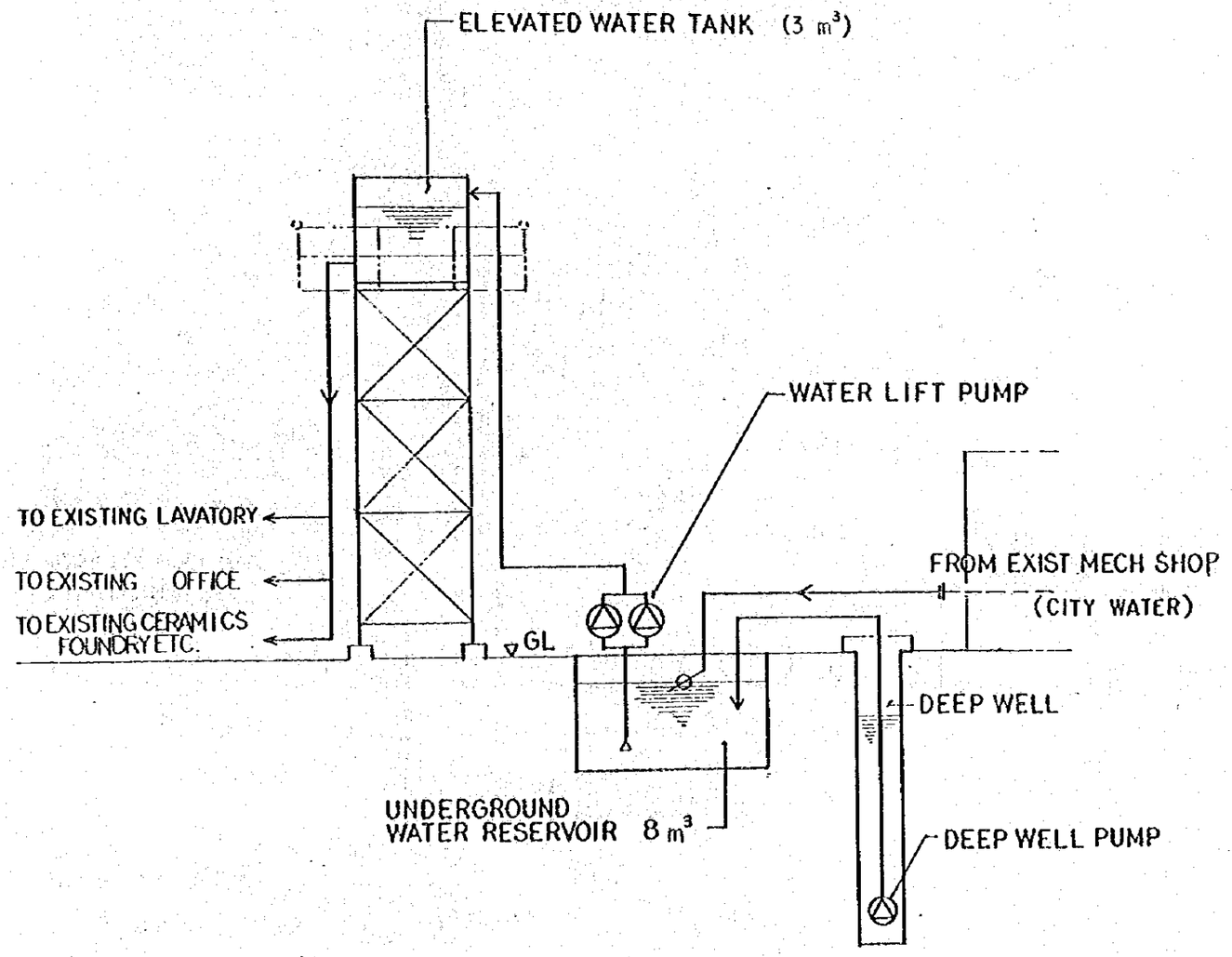
APP'D	

TITLE: OUTDOOR PIPING PLAN

SH. NO.: M-6

SCALE: 1:750

REV: △



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DATE	JUL. 25, 1988
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CHK'D	
APP'D	

TITLE: WATER FLOW SYSTEM

SH. NO.: M-7

SCALE: —

REV: △

LEGEND

OVERHEAD WIRING

UNDERGROUND WIRING

N

LIGHTING POWER BOARD, POWER SWITCH BOARD

ELEVATED WATER TANK

ELECTRICAL CUBICLE

UNDERGROUND RESERVOIR

WELL (D=80H)

SCRAP YARD

35,000

ROAD

NEW FOUNDRY BUILDING

15,000

POWER CONTROL BOARD

POWER BOARD FOR PLANT EQUIPMENT

EXISTING FOUNDRY AND FORGING BUILDING

COOLING TOWER

OFFICE BUILDING

PARKING

GATE

PUBLIC ROAD

PARKING

MATERIAL STORAGE ROOM

DESIGN ROOM

MECHANICAL SHOP

±0

BOUNDARY LINE

+1,390

-380

ASSEMBLY SHOP

NEW BUILDING

EXISTING BUILDING

EXISTING HEIGHT OF GROUND

NEW POLE

NEW POLE

EXISTING POLE

PHASE II WORK

EXISTING

BOUNDARY LINE

MOSHI

NO.	REVISION	DATE	REV'D	CHK'D
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DATE	JUL. 25, 1988
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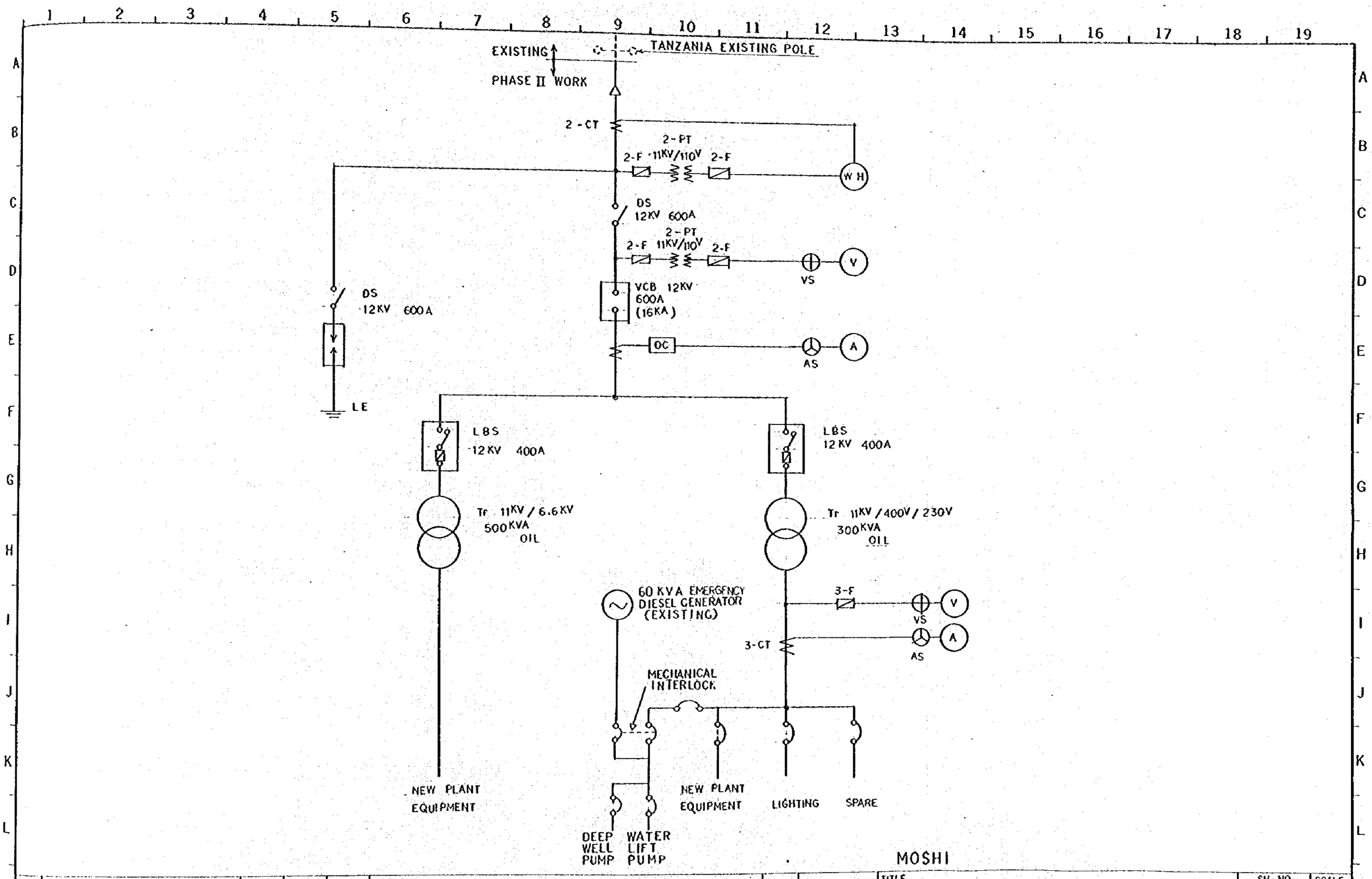
APP'D	

TITLE: OUTDOOR CABLING PLAN

SH. NO.	SCALE
M-8	1:750

REV △



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DATE	JUL. 25, 1988
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TITLE: KEY ONELINE DIAGRAM

SH. NO.: M - 9

SCALE:

REV: △