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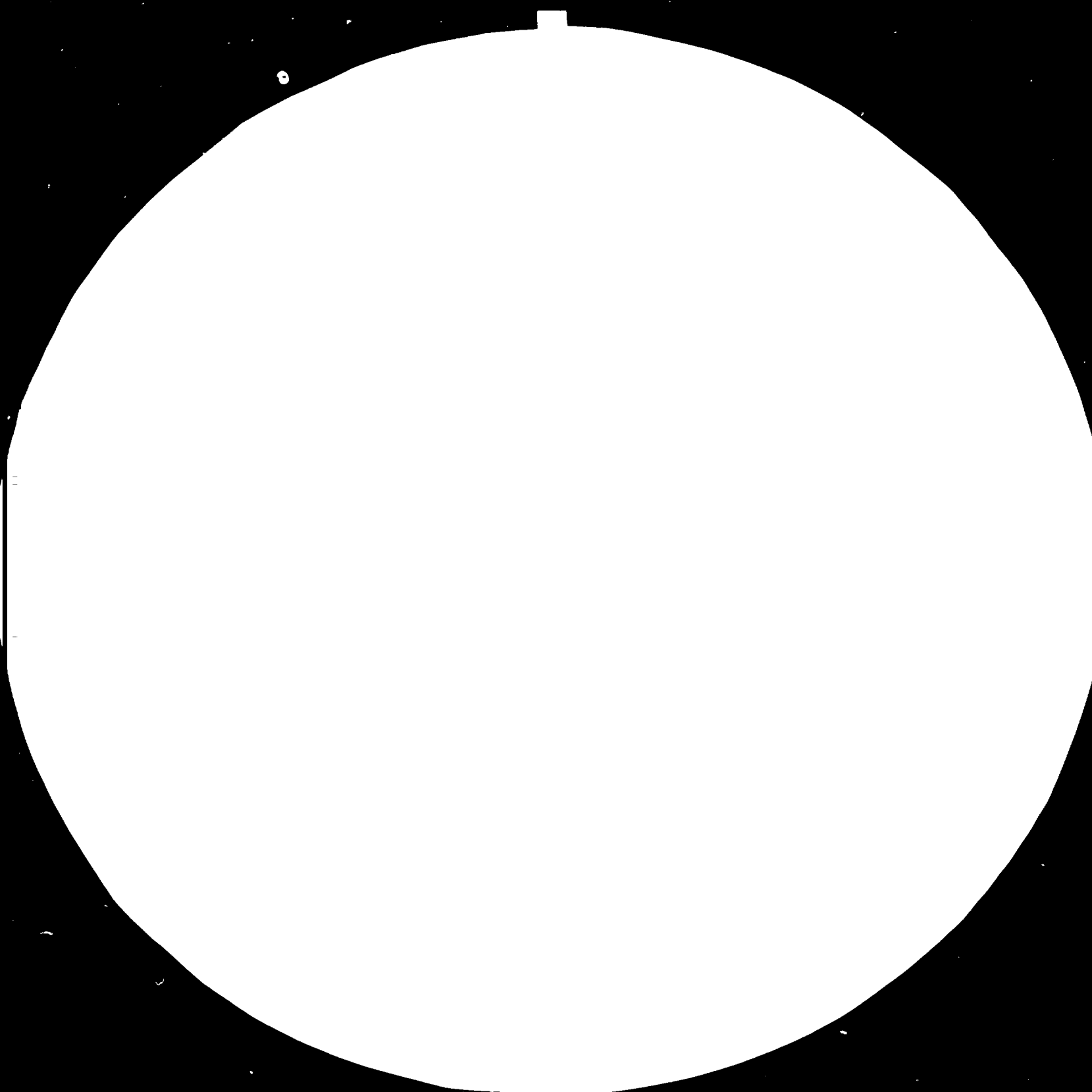

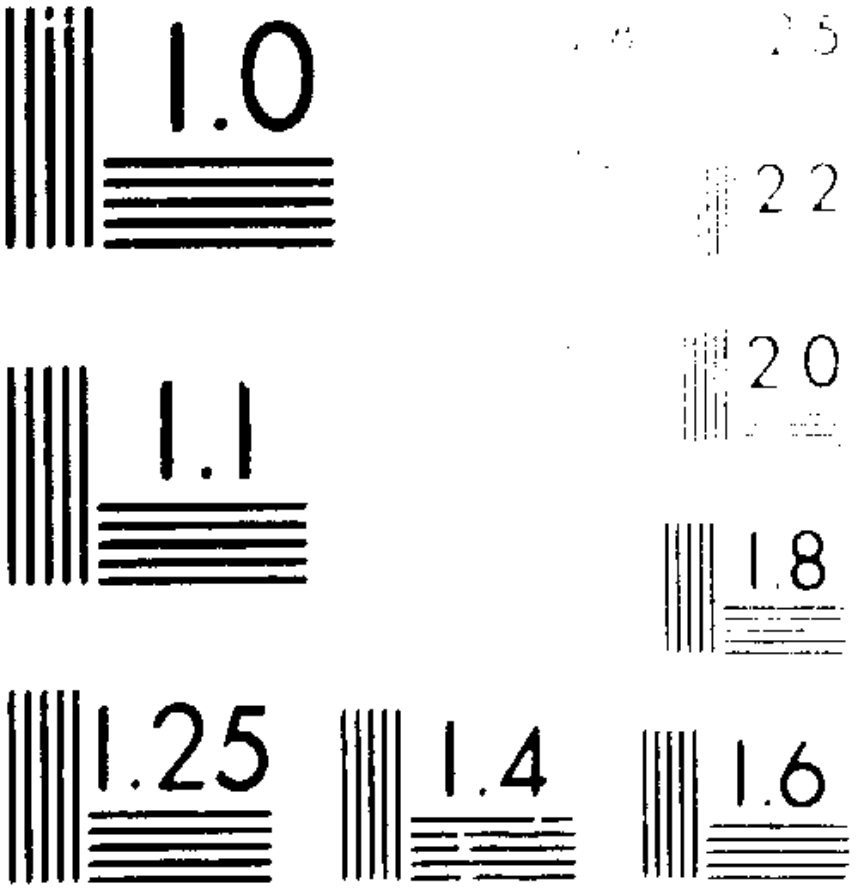
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1 April 1983
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Lesotho

ESTABLISHMENT OF A FOUNDRY WITH MECHANICAL WORKSHOP

AND

STEEL FABRICATION SHOP

SI/LES/82/801/11-01,02, & 03/31.D

LESOTHO

Prefeasibility Report

Prepared for the Government of Lesotho
by the United Nations Industrial Development Organisation
Executing Agency for the United Nations Development Programme

Based on the Work of K. Rao, J. Badowski & G. Lamo,
UNIDO Experts

United Nations Industrial Development Organisation
Vienna

ABBREVIATIONS

BEDCO	Basotho Enterprises Development Corporation
FSSP	Food Self Sufficiency Programme
LNDC	Lesotho National Development Corporation
LDC	Least Developed Country
NSC	National Streering Committee of Lesotho
BASP	Basic Agricultural Service Programme
RSA	Republic of South Africa
SADCC	Southern African Development Co-ordinating Conference
USAID	United States Aid Programme

CURRENCY

1 Loti (Lesotho) = 1 Rand (RSA) = 0.92 US $

ACKNOWLEDGEMENTS

The team is greatly indebted to Miss 'Mapiti Motsatse for considerable assistance over more than 10 weeks in organizing visits and meetings.

Amongst industrial and engineering companies, also traders and wholesalers, the team enjoyed great assistance, however, the effort made and facilities provided by Mr. Ken Meyer and Mr. A.C. Botha of Frasers Stores warrants mention of the highest order.

Considerable assistance and support in every phase of the work was provided by Mr. Henrik Nielson, J.P.O. and all staff members of UNDP; high-level meetings and briefings were arranged by Mr. C-E. Wiberg, Resident Representative.

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I. EXECUTIVE SUMMARY

A. Project Background And History

Project Sponsors and History

On the request of the Government of Lesotho for Special Industrial Services to UNDP/UNIDO, the present Foundry mission, undertook prefeasibility studies for the establishment of an intergrated foundry and machine shop complex at Lesotho. These studies are the follow-up of former UNIDO's Metallurgical Industrial activities in Lesotho.

Background Information

The Government of Lesotho has given the highest priority in their successive five year plans, to the development and expansion of agriculture and resource based industries, rural sanitation, irrigation, and water supply, and diversification of industry, to create/adequate employment in the country. To develop and diversify metals working industry in the country, and to meet the local demand for some of the metal products, and spareparts, the establishment of necessary Foundry complex is an essential prerequisite. However the economic viability of such a project may outweigh the socio-economic benefits, taking into account the guiding geographic and economic factors of the country.

Economic Factors

Surface Area	30,355 - ¼ Low Lands 13% Arable
Population	1.36 million
Growth Rate	2.5%
Rural Population	More than 80%
GDP	M260,620,000
Per Capita GDP	M200 (1979)
GNP	M265,000,000
Per Capita GNP	M340 (1979)

The present industrial structure in Lesotho consists primarily of light consumer goods manufacture. The metals engineering industry is still in the embryonic stage primarily consisting of about a dozen metal fabrication units. The absence of raw materials, lack of technical skills, and managerial capability, added to the heavy competition from the highly industrialised Republic of South Africa immediately accross the boarders, are the main constraints in setting up metals engineering industries in Lesotho.

B. Market And Plant Capacity

The mission undertook an intensive market survey, and analysis of the past and future demand trends for various cast iron, aluminium, and bronze, items for domestic use, and parts for agricultural, transport and industrial machinery/implements.

Market is difficult to assess, statistics bearing on the field of the mission's interest are most sketchy (because hitherto there has not been an incentive to identify and separate such data), and there are few linkages between industries and official bodies.

A pronounced bias was found towards over statement of demand and sales, and upon insisting that evidence be provided in support of written or verbal claims large downward revisions were encountered. Development in Lesotho is proceeding rapidly, so that a fluctuating pattern of demand is presented. Traditional methods of food preparation are being actively discouraged by extensive Government programmes in nutrition and hygene. Farming methods are being revised under the auspices of major agricultural programmes.

The influence of these programmes on the foundry production field is most significant, because fuel utilization and cooking methods may change and approach to agriculture may be revised, the qualitative statements are made because it must remain a conjecture

as to how far a rising generation will be influenced by new technologies in the face of traditional teaching and practices.

In the field of coal fired cooking stoves a very lively trade was observed, but careful analysis discovered strong financial incentives such as hire-purchase coupled to repossession by the seller because of payment default. Although annual sales level of over 650 units per year was established, the team discussed the trends with many traders, householders and aid organizations and has proposed in the analysis a core element of 450 units for the forseeable future.

Similar conflicting data was found for animal drawn agricultural implements, where huge stocks were observed in urban and rural areas, coupled with repeated cases of complaint as to efficiency and performance. Five Government and Bi-lateral organizations were seen to be engaged in research, redesign or evaluation of traditional and modern implements. The mission did not discover a co-ordinating body for these operations. There appears an advantage in coupling the scope of the present work to the local manufacture of ploughs, planters and the like.

Projected Demand and Sales

The demand projections as estimated and given at page 4 are based primarily on secondary data and information obtained from various Government establishments/industries/workshops, private industries, wholesale dealers, and number of bilateral and UN aid programmes/projects visited and persons interviewed. In the absence of basic data, certain rational assumptions have been made to arrive at heuristic but realistic demand projections.

No	Product	Qty	Wt.(T)	Annul Sales (Maluti)
1	Castiron Cooking Pots	2560	34.20	45,726
2	Cooking Ovens	450	37.00	150,740
3	Rawl Bolt Wedges	1,20,000	24.00	41,740
4	Tractor Weights	85(Sets)	18.60	14,192
5	Agricultural Implements Parts	-	10.00	36,525
6	Misc.Parts(Vehicles Biogas Burners,Etc)	-	4.70	22,990
7	Hand Pumps (Castings)	100	5.50	100,000
8	Coffin Handles	10,000	2.00	49,000
9	Trailor Parts	-	4.00	8,696
10	Aluminium Fittings	1,000	1.00	16,550
11	Room Heaters	100	-	17,600
		Total	141.00	463,458
		(Say)		465,000

Plant Capacity

Early in the survey it was established that adequate capacity exists for steel fabrication, structural steel and construction elements.So the fabrication element of the terms of reference was addressed to light fabrication and cold working, with a limited scope for traditional blacksmith's work.

Initial discussions were aimed at establishing a small bronze and aluminium casting facility in support of the greyiron foundry,but the very low volumes made a revision desirable.The bronze element was rejected, but aluminium was retained because the pattren equip-ment foreseen as being aluminium.

Some light steel fabrication work is involved in cooking stoves and pots, and saucepans.

Materiel Inputs

It has been assumed that locally available sand and clay will be suitable for foundry moulding operations.Some further testing may be necessary to confirm that assumption, which is based on data obtained from the Mines and Geological Department.

Melting rawmaterials can be expected to be available within the country as steel and iron scrap for the initial stages of prod -uction, there being some doubt about the true scrap position, since most of the wrecked vehicles have been stripped of the major cast iron components.Fluxes for metallurgical use will be imported.All raw materials for fabrication shop will have to be imported.Prices for such raw materials have been obtained from RSA. The materials envisaged are black steel, flats, rounds, and sheet. Machine Shop inputs are black and bright steel upto 30 mm,in addi -tion to cast raw material from the foundry.

Location And Site

The team recommends that the town of MAPUTSOE, about 70 km. north of the capital Maseru, would be the most favoured choice of location. The site has no special requirement beyond electric service, which has been established as adequate.

Project Engineering

A standard type of site and industrial building is proposed, with scope for expansion.The technology involved, and hence the choice of machinery is standard in every way.

Melting is proposed by coil induction process, with hand and machine moulding.Core making is by hand, with shakeout and fettling of con -ventional methods.Dust and fume extraction is included.

Castings of cooking stoves will pass into an assembly area in the fabrication shop, where drilling operations are also done.

Precision cast components,e.g.,Koyno Pumps, will be transfered by hand trolly to the machine shop.Heat treatment facilitf is included.

The machine shop provides basic orthogonal cutting process and a surface grinder is provided in a tool room area which also serves as a pattern shop for the foundry.Some handling by 1/2 ton bridge crane is proposed in the despatch area, and large units of in-coming raw materials will be handled in the same way.

Maintenance is restricted to a single operator, located in the fab -rication shop.

Fabrication and machine shop layout is essentially jobbing, with little group technology oppertunities.In the foundry a basic melting moulding, fettling flow pattern is proposed.

Plant Organisation

A conventional horizantol management profile answering to a General Manager is proposed.The expectation is that a local appointee would serve as the General Manager with 2 or 3 expatriates operating as managers during the training period. One of the other expatriates would be a technology specialist responsible for training in basic foundry and tooling. Admin -strative, clerical and accounting services are modelled along conventional lines.

Manpower

Total plant component is given at Tab.13 including total skilled operators.

Training for the fabrication and machine shops is available local -ly, and is proposed to be supplimented by fellowships to deve -loped plants overseas, with continued training on site from ex- patriate specialists.

The shedule of manpower distribution is given on page

Implementation

A basic shedule is shown on page The detail is limited to to construction phases, since financing, design and procurement details have not been determined.

Financial Evaluation

Tables setting out the basic imputs, output capacity, cash levels, investment and working capital are provided on page et seq.

II. PROJECT BACKGROUND AND HISTORY

A. Project Sponsors

The Government of Lesotho requested UNDP/UNIDO to send a diagnostic mission for the preparation of a prefeasibility study for the establishment of an integrated Foundry and Machine shop complex at Lesotho.

B. Constitution of Team

K.K. Rao - Industrial Engineer, team leader
J. Badowski - Foundry Expert
G.C.B. Lamb - Machine Shop and Fabrication Expert

C. Project History

Former activities of the UNIDO Metallurgical Industrial Section have included :-

1976 Special Assistance to Lesotho
1979 Field Mission
1980 Local Company, Lesotho Steel, requested UNIDO technical assistance.

D. Background Information

Area

The Kingdom of Lesotho, a highland country, is a landlocked enclave situated within the Republic of South Africa. Of a total area of 30,355 square Kilometres only about a quarter in the west

is low land varying in height from 1500 to 1800 metres. The country enjoys temperature climate and has few natural lakes. Below 2,000 metres, the soils are sandstone derived with low fertility, and are severely eroded. Above 2,000 metres, the soils are volcanic fertile black soils of weathered basalt.

Population:

The population according to 1976 census, was 1,216,815. Estimated population 1980-2000 is given below :

Table 1

Lesotho's Estimated Population 1980-2000 1

Year	1980	1985	1990	1995	2000
Population	1,329,600	1,485,300	1,659,300	1,853,600	1,070,700

The 1976 census figures indicate that there were 93.3 males for every 100 females, this imbalance is attributed to large numbers of males finding employment in the Republic of South Africa.

Infrastructure:

Maseru, the capital town, and Maputsoe (81 Km North of Maseru) have industrial areas. A third industrial area at Thetsane, 7Km South of Maseru is now being occupied. There is a railhead at Maseru. The total length of the railway inside Lesotho at Maseru is only 1.5 Km. An international airport is under construction on the outskirts of Maseru.

1 Ministry of Health and Social Welfare, Lesotho, 1979.

Minerals:

There are no minerals of important commercial value in Lesotho: there are minor deposits of coal, lead sulphate, quartz and agate. De Beers Lesotho Mining Company have ceased diamonds mining operations formerly at Lets'eng-la-Terai.

Economic Factors:

Lesotho is an LDC with an approximate average GNP per capita of US $340 (1979). Agriculture and construction are major components of GNP. Major focus is on public works, agriculture, transport, and communications. The major exports apart from diamonds, are mohair and wool. Other exports include beans, peas, asparagus, wheat, handicrafts, etc. Although Lesotho is primarily an agricultural country, with most of the population engaged in subsistance farming and livestock rearing, only about 13% of the land is suitable for crop cultivation. Due to small land holdings, and the prevalent system of land tenure, the methods of farming continue to be primitive using hand implements, and to a limited extend by animal drawn implements. With a view to increasing self-sufficiency in basic foodstuffs and raising incomes, the Government has given high priority and support to mechanized farming, with the assistance of UN and other donor countries. Large quantities of agricultural implements, machinery and tractors, are imported into the country, under various aid programmes.

Technical Knowhow and Technology:

The industry in Lesotho is in its early stages of development. There are two main industrial development institutions:

- Lesotho National Development Corporation - LNDC
- Basotho Enterprises Development Corporation - BEDCO

In the last few years some apparent progress has been achieved in the following manufacturing units: spinning and weaving, leather works, jewellery, brick production, canning, distilling, milling, assembly of umbrellas, as well as handicrafts activities.

In the construction industry, fabrication of metal doors, windows, and other components is well established in a number of privately owned metal fabrication workshops.

There is a significant absence of any appreciable cold forging blacksmithy facilities and knowhow in the country. Lites (Pvt) Ltd. produce small brass castings in a non-ferrous foundry, for production of electric lamp fittings.

Technical/Craftsmen Training:

Lesotho Polytechnic, Maseru, undertakes Diploma courses in Civil, Mechanical and Electrical engineering disciplines. In addition it undertakes craftsmen training for Fitters, Motor Mechanics, Electricians, Carpenters and Plumbers. Technical School of Leribe, and Leloaleng Trade School also undertakes artisan and trades training. Ministry of Education arranges Adult Technical Training at various centres.

At present there are no facilities in the country to train metallurgical engineers and foundry technicians. Due to lack of adequately qualified and experienced engineers, and managers, most of the engineering and industrial establishments are manned by expatriates.

III. MARKET AND PLANT CAPACITY

A. Demand and Market

Size and Capacity of the Industry

The present industrial structure in Lesotho, catering for a small population of approximately 1,3 million, is relatively disconnected without linkages, and primarily consists of light consumer goods manufacturing, such as food processing, textiles, leatherware, etc. Durable consumer goods manufacture, with the exception of furniture has yet to be established, while there appears to be no justification for the establishment of intermediate product industries such as chemicals, fertilisers, and steel.

With the present[1] policy of the Government to afford the highest priority to agriculture and rural water supply and development, it is estimated that the demand for agricultural implements, both animal drawn and tractor drawn; and water pumps and allied fittings, for irrigation and water supply, would gradually increase.

The increases in such demand would largely depend upon the extent, speed and determination with which the present and future development plans are implemented. With the development and availability of more and more sophisticated domestic products, coupled with the high cost of imported coal, and cast iron traditional cooking pots, their usage and demand would gradually decrease making it uneconomical for even batch production. The demand of castings for spare parts production, with increased maintenance knowhow, skills of repairs and allied machining facilities, would limit production capacities to mere jobbing

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1 Third National Development Plan 1980/81 - 1984/85

work, apart from the fact such spareparts could be obtained speedily from equipment suppliers. The production of spareparts for a large number of types and models of transport, machinery, and equipment would not only be uneconomical, but would require expert knowhow, material specifications, limits and tollerences, and other specialised knowledge.

Past Imports

There is a continuous increased flow of imports to Lesotho, most of which could be attributed to consumer goods, like foodstuffs, beverages, tobacco, mineral fuels, animal and vegetable oils, chemicals, manufactured goods, machinery, transport equipment, (about 40% of which are manufactured goods classified by materials and 30% machinery and transport equipment). For the purposes of this market study, only the import figures of metals, and relevant metal products, machinery, transport and transport equipments have been taken into consideration, and the limited data available are given at Appx. 2. Future trends, and demand projections are based purely on detailed market surveys undertaken by the mission, and such other information obtained from past reports and government establishments visited. See Appx. 1.

National Policies and Priorities related to Foundry and Metals Working Industry

Cast finished parts are presently imported mostly from R.S.A. Such products include :-

- spare parts for motor vehicles, tractors, agricultural machinery and implements,
- spare parts for mining and milling equipment/machinery,
- sewage and construction materials, such as manhole covers, gratings, pipes and pipe fittings,
- water supply and irrigation pumps/parts of pumps, and fittings/couplings,
- domestic appliances, such as charcoal fired cooking ranges and room heaters, and cooking pots,

- bronze/brass fittings, bib-cocks, valves, gates, etc., for construction, water supply, and other domestic usages.

After independence the Government has introduced and implemented two national development plans, with some measure of success. The third five year plan, 1980/81 - 1984/85 has the following main objectives:

- to reduce volunerability to external economic pressure, through sustainable economic growth, and diversification.
- to increase domestic employment,
- to protect the land and water resources base and fully exploit it,
- to ensure deeper involvement and fuller participation of the community in national development.

With these objectives in focus, the Government has given the highest priority to the development and expension of agriculture, and resource based industries, rural sanitation, irrigation and employment within the country.

In this context the establishment of foundry and forge facilities, and allied metal fabrication and machine shop facilities, could accelerate the indegenous production of simple agricultural implements, and their spare parts; selected spare parts for tractors and machinery urgently needed: hand operated, and slow speed power operated pumps for water supply and irrigation; cast-iron, bronze fittings and parts for water supply and sewerage disposal: sanitation, etc. Thus, within the framework of the priorities laid down by the government, the establishment of foundry and forge facilities would give the necessary impetus to the expansion and diversification of the metals engineering industry and create other socio-economic benefits: of acquiring new technological skills, increased employment and more importantly an effective local source for essential replacement parts that are required urgently, to cut down machine/transport down-time.

The Present Size of Demand, Growth, and Trends

The market for consumer goods industry, with population around 1.3 million, coupled with low per capita income, is limited. The choice of commodities suitable for consumption in urban areas alone has further restricted the market. The present trend of relatively high consumption of some of the durable consumables could be attributed to the purchasing power of the well paid migrant Basotho labour to the mines of the R.S.A., and the large immegrant population. These market limitations have to be the prime factors in planning new industries in Lesotho. Apart from the limited purchasing power of rural population, which constitutes about 80% of the total population, the traditional pattern of consumption, further restricts the market.

B. Demand Estimates

Supply and Demand of Agricultural Implements

While the agricultural sector is dominated by small holders, the arable area has declined by about 100,000 hectares from 1973/74 to 1977/78, mainly due to unattractiveness of returns from farming, and large percentage of migrant labour to the R.S.A.

By embarking on various projects like Basic Agricultural Service Programme (BASP), Food Self-Sufficiency Programme (FSSP), the Ministry of Agriculture, has been able to service 8,000 hectares in 1979/80, and another 30,000 hectares in 1980/81. The demand and supply of agricultural implements in Lesotho - 1986, is given in Table 2.

TABLE 2

SUPPLY AND DEMAND OF AGRICULTURAL IMPLEMENTS-1986

No.	Equipment	Supply (Tons)	Demand (Tons)
1	Hand Tools	10	715 (Nos.608,000)
2	Oxen Implements	Nil	134
3	Tractor Implements	Nil	350
4	Power Process Equipment	Nil	136
5	Trailor Carts	4	214
6	Other Manual Equipment	Nil	21

- Source: Table I of Report on industry, Vol. Two - SADCC held at Maseru, Lesotho on 27/28 January. 1985.
- SADCC proposes to set up 8 Artisan Units. and one Medium/Small Scale production unit, for hand tools, and animal drawn implements respectively to meet the estimated gap in supply-demand position in Lesotho).

There is no industrial unit undertaking manufacture of hand tools, and agricultural implements in Lesotho. The only production is confined to some prototypes of animal-drawn implements, at Thaba-Tseka [1] and Mokhotlong [2] and the Vocational (agricultural) Training Institute. Presently all tractor/ animal drawn, and hand implements are imported.

The demand projections for agricultural implements. are given in Table 3.

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1 Joint Lesotho, Canadian Government Development Project

2 Renewable Energy Technology Unit

TABLE 3

Annual Demand For Agricultural Implements [1]

Description	1979/1980	1982	1984	1986	1988	1990
1. Tractor Chisel Ploughs	0	25	50	100	200	300
2. Animal Drawn Mouldboard Plough	1700	1800	1800	1500	1200	800
3. Animal Drawn Harrows	730	750	800	800	800	800
4. Animal Drawn Single row Planters	1100	1200	1200	1000	800	600
5. Animal Drawn Inter row Cultivators	790	1200	1300	1400	1400	1400
6. Animal Drawn Ridgers	0	20	25	30	100	100
7. Animal Drawn Trailers	400	500	500	500	400	300
8. Tractor Drawn Trailers	125	100	100	125	150	150

Mr. Kitching and Mr. Dzieciolewki indicated that the local manufacture of animal drawn tillage and seeding implements could be commercially profitable if undertaken on a basis of local manufacture of mild steel cold parts, importation of all hot metal worked parts, and local assembly. In persuance of the above recommendations, in January, 1983, representatives of LNDC, and Lesotho Steel Products (Pvt) Ltd., visited the agricultural implements manufacturing units, and foundries at Zimbabwe, to investigate the feasibility of undertaking assembly and progressive manufacture of animal drawn implements by initially importing CKD's. However, the present mission has learnt that Lesotho Steel

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1 UNIDO Project SI/LES/79/801 (Mr. Kitching and Mr. Dzieciolewski)

Products (Pvt) Ltd., has presumably dropped the above project, due to its economic inviability. It may also be noted in this connection that the SADCC has proposed the establishment of one medium/small scale production unit for animal drawn implements, and eight Artisan Units for production of hand tools in Lesotho (See page). If such an unit for manufacture of agricultural implements could be established, the establishment of foundry and forge facilities could make the project more economically viable. It is recommended that these possibilities are examined in depth.

Trailers-Animal/Tractor Drawn

There is a fairly high demand for animal and tractor trailers. Local manufacture is presently undertaken by Northern Lesotho Steel and Diesel Engineering Co., at Maputsoe. However, the cost of production of such trailers could be considerable reduced, by redesign based on used automobile and truck components.

It is proposed to undertake manufacture of simple castings like Hubs and Spring hanger brackets, etc., estimated at 1 Tonnes per annum, based on the present volume of demand.

Hand Operated Water Pumps

The National Steering Committee of Lesotho (NSC), in collaboration with WHO and UNDP, has drawn up a Sectorial Plan for the Water Supply and Sanitation Sector, which was discussed at a National Workshop, at Maseru, in February, 1983. As an outcome, a Revised Sectorial Plan has estimated that at least 1,400 hand pump projects have to be built over the next 10 years, besides 400 Reticulated Water Supply Systems. It is proposed to establish these Hand Water Pump projects, at the following places in Lesotho:-

Existing and Proposed Hand Pump Projects [1]

District	Existing Projects	Projects in progress	New Projects 1983-92
Maseru	40	20	200
Mafeteng	80	80	800
Mohale's Hoek	0	40	400
Total - Lesotho	120	140	1,400

In mid-1983, the status of installed water supply is shown below:-

Installed Water Supply by Types by Mid-1982 [1]

Type of Supply	Nos.
1. Gravity	373
2. Windmill	59
3. Diesel Engine	14
4. Electric Motor	3
5. Hand Pump (Villages)	17
6. Windmill/Diesel Engine	2
7. Windmill/Electric	2
8. Windmill/Gravity	4
9. Diesel/Gravity	2

There is a preponderance of gravity water supplies as they are easy to maintain, and require no energy. Windmills have proved to be ineffecient due to insufficient wind during most months, and costly in maintenance. Hand-pumps are suitable only in low lands, and there is no other suitable option. the Village Water Section (USAID), has a programmes specifically aimed to avoid installing new windmills, or diesel and electric driven pumps. Further, USAID has agreed to fund 400 US Bowne Hand Pumps, and also expects to fund another 300 of the same pumps, over the next 5 years. Taking the above planned projects, the estimated

1 Revised action plan as proposed by Village Water Supply Section for National Steering Committee of Lesotho.

demand for such pumps over the next 10 years is given below:

Total planned Projects (1983-92)	1,400
No. of Moyono Pumps considered for importation during the above period	700
Nos. still required to meet the planned projects.	700

Three types of water pumps, Moyono, (USA), Mono, (RSA) and Indian Mk. II (India), are under trial, and all the three types of pumps would continue to be used. It is estimated, that there is production possibilities of manufacture of 100 Hand Pumps (of the finally proved and approved type) per annum. Licensing agreement and import of some of the sophisticated components for Moyno/Mono is envisaged.

Domestic Appliances

Traditional Cast-Iron Cooking Pots with three legs, heated by cowdung are still in use in rural areas, where coal and firewood, are not easily available. From a survey undertaken by the Renewal Energy Project under USAID programme at Lesotho, out of four villages, at Mokhotlong, (in the highlands of Lesotho) there were 135 traditional cooking pots, 23 saucepans, and other 4.

Market surveys by the present mission also indicate that this type are still popular with the present generation, but are likely to be replaced by more modern types by the next generation, as more and more sophisticated types, which can be used in conjuction with all types of cooking ovens, are introduced in the market. The anticipated sales volume of such cooking pots as obtained from M/S Frasers, a wholesale Co. spread throughout the country, are given at page 20

Anticipated Sales for Traditional Cast'Iron Cooking Pots

Size	No. per Year	Unit Price in Maluti
½	160	5.00
1	160	5.29
2	160	7.30
3	160	11.20
4	160	13.37
5	240	15.20
6	240	16.04
8	240	21.50
14	240	40.20
20	80	48.22
25	80	76.50
Total - All Types	1920	

Taking into account retailers importing directly from R.S.A., a total demand of 2,200 pieces of all sizes is forecast. In addition it is estimated from the information obtained from a modern super market, who are marketing some latest type of cast-iron sauce - pans of about 360 pieces per year.

Different types and sizes of Traditional Types of Coal-fired Cooking Stoves are presently being marketed through wholesalers. and retail outlets. Their anticipated sales figures as obtained from the wholesalers and retailers at Maseru are given at Table 4.

It is however foreseen that the demand for such coal-fired ovens would gradually go-down, as in the case of traditional cooking pots, with the future generation of people of Lesotho, and they would be replaced by other modern types of cooking ranges, like

electric and gas. Besides the cooking ranges, presently some coal fired room heaters are also in demand. Therefore taking into account the anticipated reduced demand trend, and the estimated demand of 10% coal-fired room heaters (of the demand for cooking ovens) it is estimated that for the purposes of the annual production capacity of the project a total of 450 cooking ovens and room heaters could be considered.

Table 4

Anticipated/Past Sales of Coal Fired Cooking Ovens

Firm	Type	No. per Year	Unit Price (Maluti)	Remarks
Frasers Wholesale Co., Maseru, Lesotho	-Welcome Dover 602 No.6	15	143	Design being revised
	-Welcome Dover 801 No.8	15	182	
	-Union-735	10	148	
	-Magic, Jewel, Sunglow	14	360	
	-Falkirk No.6 Queen Stove	250	90	Popular Model
Oxford & Town Talk Co.	Coal Fired Cookers (all types)	42	-	
Fairways-Smart Centre	Coal Fired Cookers	137	-	Advanced ground top hot plates
Retail Shop at Manonyane Centre	Coal Fired Stoves (all types)	50	-	
Total - All types		553		

The mission also studied the possibilities of manufacture of a new design of sheet metal cooking oven which could operate on coal, firewood and cowdung, under development by the Renewable Energy Project under UNIAD programme, and has come to the conclusion that these ovens could be manufactured in one of the metal fabrication units of BEDCO, after there user trials, modifications, and acceptance by the users. Cast-iron parts could be introduced in revised designs of the oven, giving a posibility of production in the project under study. For more details see Appx.

Miscellaneous Grey-Iron Castings

These include, frontend rear weights for Massy Ferguson tractors, hubs, spring hanger brackets, and ball bearing houses for trailers and elevators, Rawl bolt-wedges for mining industry, spares for agricultural implements and coffin handles. Their approximate estimated quantity/volume, and tonnage is given below :-

Estimated Demand For Miscellaneous G.I. Castings

Description	Quantity per year	Estimated ton/year
1. Front and Rear weights for Massy Feruson Tractors	85 (sets)	18.60
2. Trailer Parts	-	4.00
3. Rawl Bolt-Wedges	1,20,00	24.00
4. Agricultural Implements parts	-	10.00
5. Miscellaneous parts (vehicles, Biogas burners, etc.)	-	4.70
6. Coffin Handles	10,000	2.00
	Total	44.70

Although a local dealer of Massy Ferguson has indicated his interest in locally produced components the question of a manufacturing licence agreement arises. Similarly Rawlbolt-Wedges are presently cast in the present company of Transequip in the R.S.A., transported to Maputsoe, machined and assembled, and returned to the Republic of South Africa for sale. This is to make use of certain tax and other advantages the parent firm obtains from industrial activity in Lesotho. As the parent company has its own foundry in the R.S.A., and recently closed its Maputsoe foundry, it is doubtful whether this prospect is firm.

Aluminium Couplings & Fittings for Irrigation

Maluti Irrigation, a firm dealing in irrigation pumps, and fittings in Lesotho, has indicated that there is a fair volume of demand for irrigation fittings and couplings made of Aluminium castings. He estimates the present demand at 1,000 pieces per year, and expects that the demand could go up by about 40% in the next three years. The total weight of such fittings is estimated at 1.00 ton per year.

Bronze Fittings For Doors and Windows and Float Valves

Large quantities of bronze door and window fittings are in demand by metal fabrication units manufacturing metal doors and windows. However, there is a prospect that bronze fittings will be replaced by pressed steel and aluminium fittings, being much more economical. Bronze float valves for gravity irrigation systems are sold but the design was considered uneconomical and likely to be superseded because of the limited demand for the above items, the setting up of separate casting facilities for bronze, is not considered economically viable.

Miscellaneous Coldforged Agricultural Implements Parts and Metal Fabricated Items

These include stays fittings, clamps, spindles and axles for agricultural implements, and steel fabricated room heaters. These items do not require foundy facilities, and production volume is estimated at 10 tonnes per year.

Estimated Production Volume - (Foundry Products)

Taking account all the products considered above, the total production volume of the foundry per year is given below :-

Description	Tonnage per year
1. Traditional & Modern Cast Iron Cooking Pots	34.20
2. Coal fired cooking ovens	37.00
3. Rawl Bolt-Wedges	24.00
4. Massey Ferguson Weights	18.60
5. Agricultural Implements Parts	10.00
6. Hand Pumps	5.50
7. Trailor parts	4.00
8. Coffin Handles	2.00
9. Miscellaneous	4.70
10. Total Tonnage of C.I. Castings	140.00
10. Aluminium Courlings & Fittings for Irrigation	1.00
Total Tonnage of all Castings	141.00

Total Estimated Production Volume of Machine and Fabrication Shops

Apart from machining some of the cast components and parts produced in the foundry, it is estimated that the fabrication shop would undertake fabrication and machining of agricultural implements parts and coal fired room heaters. Details are given in Chapter 6 of this report.

IV. MATERIAL INPUTS

A. Raw Materials

Foundry raw materials in the form of scrap steel and cast iron are foreseen to be available, for a period of time, in the initial stages of production. An on the spot survey of discarded vehicle dumps indicates that a large proportion of major cast iron components have been retrieved and sold to scrap merchants in the RSA, at much below the market prices.

Raw materials requirements for foundry operations is given at table

Raw materials required for fabrication include black steel bar, rod, and plate in standard commercial sizes are proposed to be imported from RSA - Bloemfontein, about 2 hrs. distant by road in the RSA. The raw material inputs for machine shop include processed industrial material and components related to a range of axle and spindles, required for the production of agricultural spareparts.

B. Consumables

Foundry consumables primarily consists of crucibles, shorts for shot blasting machine, welding and cutting gasses, etc. Their estimated annual requirement is given at Annexure Consumables for fabrication and machine shop, include replacement parts for hand tools, machine tools, cutting and welding gases, and lubricants, etc. Most of these could be obtained locally, but replacement parts for machines have to be imported from RSA or from overseas.

C. Bought-Out Items

These include simple hardwear items like screws, bolts, nuts and splitpins, which could be bought locally or imported from RSA. For the rotary hand water pump, some of the sophisticated components have to be imported.

D. Tooling

The cheapest form of foundry patterns has been assumed. Considering shortage of wood in the country, cast aluminium patterns, for large and small patterns is contemplated. Patterns for cooking pots and stoves would be copied from sample components.

Jigs and fixtures for fabrication and machine shop would be produced in the tool room.

TABLE 5

Schedule of Raw Materials - Foundry

Item	Description	Quantity T/Y	Price per ton US $		Total Price US $		TOTAL
			Local	Foreign	Local	Foreign	US $
1	2	3	4	5	6	7	8
1	Bought cast iron scrap	75	90	-	6750	-	6750
3	Steel scrap	80	70	-	5600	-	5600
4	Al ingot	3	-	1350	-	4050	4050
							16400

TABLE 6

Schedule of Consumables - Foundry

Item	Description	Quantity T/Y	Price per ton US $		Total Price US $		TOTAL
			Local	Foreign	Local	Foreign	US $
1	2	3	4	5	6	7	8
1	Cast iron fluxes	10	-	40	-	400	400
2	Al fluxes and refines	0,12	-	1000	-	120	120
3	Silica sand	90	-	70	-	6300	6300
4	Natural sand	50	40	-	2000	-	2000
5	Bentonite	9	-	150	-	1350	1350
6	Loam	5	70	-	350	-	350
7	Coal dust	7	-	100	-	700	700
8	Core oil binder	0,4	-	500	-	200	200
9	Sandust	5	50	-	250	-	250
10	Refractory	3	-	125	-	375	375
11	Diesel oil	10	400	-	4000	-	4000
12	Fettling shot	3	-	800	-	2400	2400
13	Crucibles	1	-	640	-	640	640
14	Various auxiliary materials	2	-	700	-	1400	1400
					6600	13885	21000

TABLE 7

STEEL RAW MATERIALS CONSUMPTION

Item	Product	Production Per Year	Specification	Annual Quantity
1	2	3	4	4
1	Cast iron cooking pots	2200	Ø 6	180 m
			Ø 3	200 m
1a	Cast iron saucepans	360	Ø 6	80 m
2	Cast iron stoves	450	25 x 4	270 m
3	Coffin handles	10,000	130 x 0.2	1300 m
4	Agricultural implemts	1000	25 x 6	3250 m
			30 x 8	450 m
			Ø 12	500 m
			Ø 16	2000 m
			Ø 18	280 m
			Ø 25	300 m
			Pl 3.0	40 m^2
5	Hand water pumps	100	Ø 30	40 m
			8 x 8	15 m
			Tube 2"	5000 m
			Ø 12	5000 m
			Hex 20 af	40 m
			25 x 8	400 m
6	Room heaters	100	Ø 12	30 m
			15 x 5	20 m
			30 x 5	60 m
			10 x 10	1500 m
			Pl 2.6	150 m^2
			Pl 3.0	70 m^2
			Pl 4.0	50 m^2

TABLE 8

SCHEDULE OF CONSUMABLES - MACHINE SHOP
(US Dollar)

Item	Allocation	Specification	Quantity	Unit Cost	Total Cost
1	Drills	o.5 x o.5 - 6.0	300	1.6	480
2		6.o x 1.o - 30	150	3.5	525
2	Threading Taps	M6, M8, M10, M12, M16,	50	14.0	700
		UNF, BSW, BSF, BSP.	15	25.0	375
3	Die Heads(Landis)	Metric	20	30.0	600
		BSW	6	40.0	240
		BSF	6	50.0	300
		UNF	6	50.0	300
		BSP	8	40.0	320
4	Boring Bars	10 x 10 x 250 long	6	15.0	900
		16 x 16 x 300 long	3	20.0	600
5	Lathe Tools	Roughing	20	12.0	240
		Screw Cut	20	10.0	200
		LH Nose	10	10.0	100
		RHNose	10	10.0	100
		Round Nose	15	15.0	225
		Part-off	30	18.0	540
6	Drill Accessories	Counterbore	20	26.0	520
		Countersink	60	24.0	140
		Fly Cutter	5	30.0	150
7	Milling Cutters	Side & Face	3	240.0	720
		End Mill	6	85.0	510
		Slitting Cutters	8	45.0	360
8	Cutter Grinding	Cup Wheel	40	6.0	240
		Straight	10	5.0	50
		Vee	10	8.0	80
9	Surface Grinder	Plain Wheel	15	25.0	375
10	Pedestal Grinder	Wheel	10	40.0	400
11	Hacksaw	Machine Blades	40	5.0	200
12	Heat Treatment	Elements	3	20.0	60
		Pyrometer Heads	2	45.0	90
13	Cutting Fluids	Various litres	1000	1.3	1300
14	Lubricants	Machine Tool litres	250	1.8	450
	TOTAL				12390

TABLE 9

SCHEDULE OF CONSUMABLES - FABRICATION SHOP
(US Dollar)

Item	Allocation	Specification		Quantity	Unit Cost	Total Cost
1	Guillotine	Cutting Knife		1	350	350
2	Press Brake	Facing		Set	140	140
3	Bar Cropper	Shear Blade		Set	80	80
		Punch / Die		3	100	300
4	Electric Welder	Elecrtodes	kg	300	14	4200
5	Forge	Coke	kg	200	11	2200
6	Gas Cutting	Oxygen	kg	270	1.3	350
		Propane (equiv)	kg	270	2.1	570
7	Pedestal Grinder	Wheels		10	30	300
	TOTAL					8490

V. LOCATION AND SITE

There are three developed industrial areas in Lesotho: Maseru, Thetsane and Maputsoe, and adequate land is available in all these areas. Plots are obtainable from LNDC on five year renewable lease basis up to a maximum of 60 years period. Necessary industrial infrastructure has been provided and all plots are fully serviced. Goods transportation by road is undertaken by various companies operating in the country.

The Maseru industrial area is approximately 2 Km from the capital's central business district. Rail sidings can be proved at some sites. Thetsane industrial area is about 6 Km from central Maseru. No rail sidings could be provided in this area. The industrial area at Maputsoe is approximately 3 Km from the South African town of Ficksburg, where there is a railhead. Since all raw materials for melting and fabrication will have to be imported from the R.S.A., it would be an obvious advantage to locate the plant near one of the main entry points from the R.S.A.

The R.S.A. pursues a policy of directing major and repeat traffic via its railways, and as such industrial units at Maseru and Maputsoe have the advantage of using these transportation facilities. Unless the plant if located at Maseru industrial area, is provided with a railway siding, all the goods imported from and through the R.S.A. will have to be transhipped from the railhead to the factory by road transport. The rail spur at Maseru has been extended to serve the flour mill and passes adjecent to the countries major oil storage depot. It may therefore be unadvisable to locate a foundry in the vicinity of the present railway on account of environmental and safety considerations. Low volume of materials and goods required by the foundry plant does not justify construction of a separate railway siding to the plant.

Thus the choice of locating the Foundry plant at Maseru or Maputsoe being even, Maputsoe has the added advantage of plentiful

supply of industrial labour not influenced by the industrial atmosphere of a well-developed urban area like Maseru. It is understood that there are clay deposits close to Maputsoe at Leribe, that could be utilised by the foundry for making moulds. During the market survey of the mission to Maputsoe, it has been observed, and given to understand that the industrial climate at Maputsoe is better compared to Maseru. Considering the above factors, the mission recommends the location of the foundry plat at Maputsoe industrial area.

VI. PROJECT ENGINEERING

A. Foundry

The foundry consists of melting section, machine and hand moulding section, core making section, fettling section and costing store and despatch. All these sections are situated in one ley 12 m wide and 30 m long. Adjacent to the foundry is a roofed area 6 m wide and 30 m in long, where are located: changing store, sand moulding addition store, foundry miscellaneous materials store, sand drier and compressor room.

Outside the building is situated a scrap yard where steel and cast iron scrap will be stored and prepared for melting in an induction furnace.

A sand testing and small chemical laboratory is located in offices area.

The foundry output is about 140 tons per year of sound grey iron castings with unit weights from 0,1 kg up to 75 kg, and aluminium castings with unit weights from 0,1 kg up to 1,1 kg. The production is planned on a one-shift work basis at 230 days per year, 9 hours per day and 5 days per week.

Cast iron and Al alloy is melted in a small crucible induction furnace with pusher. Molten metal is conveyed by means of an overhead travelling electric hoist to two pouring areas. One is at a machine moulding station and the second at a mannual moulding station.

The machine moulding station is intended for making moulding takes place on two jolt-squeeze moulding machines. The moulding boxes are filled with facing and backing sand mannually from containers. The moulds are placed on the foundry floor where, after being assembled they are poured and later on knocked out. The facing moulding sand is prepared from silica sand in a core sand mixer. The backing sand, after knocking out, is conditioned on the foundry floor ley means of a wheeled sand dressing machine with magnetic separator. The sand conditioning process comprises: screening, separation of ferromagnetic parts, disintegrating, cooling down and aerating.

The mannual moulding station is intended for making larger moulds dimensioned from 550 x 300 up to 100 x 400. The moulding takes place on the foundry floor under a hand bridge crane. The facing sand is

prepared from silica and natural sand in the core sand mixer and transported in containers. The backing sand, after knocking out, is conditioned on the foundry floor in the same way as mentioned earlier, by the wheeled sand dressing machine.

The core making section is intended for making cores mannually on a core making bench or on the foundry floor under the hand bridge crane. The cores are basically made of oil sand and then dried in an electric core drier. Besides it is also foreseen to make cores from natural sand and in CO_2 process. The core sand is conditioned in the core mixer. The sand is dried in a special drying oven.

The fettling and finishing operations on casting surfaces are carried out in a belt short-blasting machine for castings with unit weights up to 40 kg, on double-wheel grinder for smaller castings, and for bigger castings by means of angle and straight hand grinders and pneumatic-operated chipping hammers.

The Al castings are cast in permanent moulds within the melting section and next the castings are fettled and finished on a stationary saw and a back-stand grinder located in fettling and finishing section.

The maintenance, current repairs of equipment and foundry tackle as well the manufacture of new pattern plates and core boxes is secured by Fabrication Shop and Machine Shop.

The sand and chemical laboratory is equipped with a set of apparatus and instruments enabling sand samples to be rapidly tested and metal samples to be determined of carbon and sulphur content. Additionally, the laboratory has been equipped with a Brinell hardness tester and an optical pyrometer.

Technical quality control is the last process operation which is carried out by a foreman for fettling and quality control.

B. FABRICATION SHOP

The fabrication shop is intended to provide a service for ancilliary fittings and furniture used in assembled cooking stoves and cooking pots and saucepans, a further profit centre is proposed in the manufacture of spares for animal-drawn agricultural implements.

The scope of supply for the stoves and pots is limited to cold bending and drilling holes in black round and flats bar in the size range - to 8mm diam and 25 x 6mm. Cold forming only is envisaged, most of which falls readily within the ambit of fly-press. Appropriate tooling is included.

Situated inside the main hall of the fabrication shop is foreseen the assembly area for cooking stoves and fitting of handles to cooking pots. Plant layout is strictly jobbing in concept due to the small output scheduled, and the variation in manufacturing detail does not present any realistic concept of group technology, outside or a group of agricultural brackets and stays. To minimise handling equipment a common bridge crane serves for despatch and incoming raw materials.

It is forseen that cooking stoves will be assembled on mobile pallets and transported to the despatch area for loading on transport. Stores of black bar plate and rod are fenced for security within the workshop area.

Room heaters of fabricated construction will be assembled and transported in the same way as the cast cookers.

Facilities are proposed for heat-treatment and tempering. The equipment is expected to serve tool-making, hard wearing elements of foundry pattern-making and production items. Control of the heat-treatment plant is scheduled as a metallurgical function.

C. MACHINE SHOP

The primary design scope of this shop is the machining of grey iron and aluminium castings from the foundry, due to a low preliminary anticipated loading the opportunity is taken to develop a separate profit centre in production of axles and spindles for animal-drawn agricultural implements, especially planters and seeders.

One section of foundry production is to manufacture handpumps with rotary operating gear, requring precision turning and keyway sinking. This latter makes necessary a slotting or alternative general purpose machine tool, and the choice was made of a shaping machine because of it's wide general purpose application.

Assembly of the rotary handpumps is scheduled for the machine shop area as a function of cleanliness in working conditions.

TABLE 10

SCHEDULE OF BUILDINGS

Item	Description of Building	Area M^2
1	Foundry	360
2	Fabrication	360
3	Machine Shop	360
4	Security Office	28
5	Time Keeper's Office	28
6	Electric Substation	16
7	Dangerous Stores	16
8	Lavatory	27
9	Showers	72
10	Canteen and Food Store	100
11	Foundry Roofed Area	180
12	Steel stockyard	200
13	Offices, Staff and Management	96
14	Sand Quality Control	9
15	Despatch	18

Item	Description	Capacity	No.
1	Induction furnace pusher type for melting cast iron and non-ferrous metal of mains frequency	300 kg x 400 kVa	1
2	Hand ladle complete		6
3	Ladle drying stand	oil fired	1
4	Scales	30 kg	1
5	Stove scales	500 kg	1
6	Hand truck	500 kg	1
7	Chain block with monorail	2 T	1
8	Electric hoist with monorail	0,5 T	1
9	Sizzer's lift for molten metal	500 kg	1
10	Jolt, squeeze moulding machine	500 x 400	2
11	Roller conveyor	B=500 mm; L=3m; H=600	1
12	Maquetics and dressing machine	6 m^3/h	1
13	Sand rammer	-	2
14	Hand bridge crane with electric hoist	0,5 T span 4 m L=11m	1
15	Moulding boxes	various dimensions	135 sets
16	Core sand mixer	2 m^3/h	
17	Core making bench	1500 x 600 x 700	1
18	Core drier	drying temp. 220 °C	1
19	Silica sand drier	180 kg/h	1
20	Belt shot-blasting machine with the impeller	Volume 350 kg of castings	1
21	Wet dust collector with radial fan and ducts	10000 m^3/h	set
22	Stationary double-wheel grinder	400 mm dia.	1
23	Fettling bench	1000 x 600 x 600	1
24	Pneumatic-operated chipping hammer	-	2
25	Electric angle grinder	180 mm dia.	2
26	" straight grinder	-	2
27	Stationary saw for Al casting	-	1
28	Back-stand grinder for Al castings	-	1
29	Laboratory rammer	-	1
30	Sand strenght tester	-	1
31	Laboratory drier	-	1
32	Sand granulation tester	-	1
33	Sand moisture teller	-	1
34	Hardness tester	-	1
35	Permeability tester	-	1
36	Elutriator	-	1
37	Laboratory balance	500 g	1
38	Laboratory balance	10 kg	1
39	Apparatus for determination of carbon and sulphur content	-	1
40	Silit tubular furnace with control panel	-	1
41	Brinell harness tester	-	1
42	Optical pirometer	-	1
43	Piston type compressor, operated pressure 0,8 Mn/m^2	6 m^3/h	1
44	End cooler, air pressure tank cap. 5 m^3, water fan cooler, pumps, valves, pipes	-	1 set
45	Set of hoses, reducing valves and torches for gas cutting	-	1 set
46	Lifting pallet truck	1200 kg	3
47	Core racks, containers	-	1 set
48	Guillotine	2300 x 6 mm	1
49	Bar cropper	25 dia; 76 x 76 angle	1
50	Hacksaw	400 stroke	1
51	Press brake	2300 x 6 mm	1
52	Fly press	25 kg ball	1
53	Pipe bender	manual to 3" dia	1
54	Electric welder	200 A	1
55	Radial drill	24 dia chuck	1
56	Bench drill	12 dia chuck	2
57	Forge hearth	800 dia with blower	1
58	Anvil	600 long, with base	1
59	Fuller block	600 x 600 x 250	1
60	Oxy-gas burner	1.0 nozzle	3
61	Pedestal grinder	400 x 30 x 120 wheel	1
62	Work bench	1500 x 600	4
63	Electric angle grinder	180 dia	2
64	Electric straight grinder	-	1
65	Hand Bridge crane with electric horst	-	1
	Machine Shop		
66	Centre lathe	300 dia x 1200	1
67	Centre lathe	120 dia x 600	1
68	Milling machine	Universal; 1200 x 250	1
69	Power hacksaw	400 stroke	1
70	Surface grinder	500 x 200 table x 125 dia wheel	1
71	Bench drill	12 dia chuck	2
72	Pedestal drill	24 dia chuck	1
73	Shaper	600 stroke, with knee	1
74	Cutter grinder	Universal	1
75	Pedestal grinder	400 x 30 x 120 wheel	1
76	Heat treatment unit	Muffle furnace 400 x 400 x 200	1
77	Tempering furnace	to 750°C with controls	1
78	Tool room benches	1500 x 600	4
79	Assembly benches	1500 x 600	2
80	Set of measuring equipment		1
81	Ancilliary equipment for machine tools, steadies, carriers drivers, dividing head, machines etc.		
82	Tipper truck	8-ton; 4 x 2	1
83	Pick-up truck	1-ton	1
84	Passenger car	1600 cc	1
85	Delivery pallets	1200 x 800	20
86	Work container	400 x 250 x 200	100

VII PLANT ORGANIZATION AND OVERHEAD COSTS

A Plant Managerial Organization

Since the principal object of the project is to provide a foundry facility, a separate management administration is proposed. To further assist the foundry section, the day-to-day production responsibility for pattern equipment is transferred to the foreman of the toolroom. Separate technical support is available from the process designer, with the supervision of the foundry manager being operative over both. It is foreseen that the foundry manager should be a metallurgical engineer, and that training in metal control will be the responsibility of the manager during start-up and until a sufficient competence is manifest in local staff.

The related functions of fabrication and machine shops is proposed as the responsibility of a single manager, with a separate foreman in each shop.

Maintenance engineering is considered to be the full-time responsibility of 1-operator, supported in technology by the foundry and mechanical managers.

A separate administrative group is proposed to co-ordinate personnel, buying, sales, despatch, time-keeping and accounts matters.

A recommendation for the organization is presented in appendix IV

B Overhead Costs

Basic wage and salary costs are given in table , from which the direct element is extracted and presented in line 7 of schedule 10-3/1 with the indirect portion included as part of line 12. The administrative and sales costs are summarized in lines 14 and 15 of schedule 10-3/1. An element is included for distribution costs, based on the assumption that incoming raw material supply will have to augmented by the project's indigenous transport, which thereby becomes available for finished goods delivery. There appears little prospect of maintaining a good level of operating efficiency on account of the geographical locations of likely raw material and customer centres.

TABLE 12

WAGES AND SALARIES

Item	Category	No.	Monthly Rate maluti	Annual Cost maluti	Allocation	
					Labour maluti	Administn maluti
1	2	3	4	5	6	7
1	Un-skilled	11	100	13,200	13,200	-
2	Semi-skilled	17	250	51,000	51,000	-
3	Skilled	31	320	119,040	119,040	-
4	Foreman & Personnel Ofr.	6	500	36,000	-	36,000
5	Technologist	2	600	14,400	-	14,400
6	Clerk	8	250	24,000	-	24,000
7	Manager	3	750	27,000	-	27,000
8	General Manager	1	1200	14,400	-	14,400
	TOTAL			299,040		

VIII MANPOWER

A Proposed Sources of Recriutment

Ther is a sufficient fund of labour, coupled with training facilities to provide an adequate supply of potential workforce in maseru and Maputsoe . In the report it is suggested that Maputsoe is to be preferred, and many discussions with well established employers have confirmed the skill, adaptability and reliability of local workers. There is alsc an acceptance of shift working in the area.

B Training Availability

The prospect is different for the foundry and mechanical workshops. There is no significant foundry or related training facilities at present, although the National University of Lesotho, in Roma is prepared to assist in formulating supporting courses. Furthermore, the Lesotho Training Institute, which already operates City and Guilds of London courses in technology subjects: at a discussion there was a preparedness to consider adding the Foundry and Patternmaking sections to the present curriculum. Initially, some teaching would be furnished by the expatriate staff at the foundry.

C Manning Requirements

Estimated labour allocation is presented in table which also gives a breakdown by skills.

The assumption is made that the expatriate staff during the start-up period will provide on-the-job skill and administrative training. An expatriate appointment is proposed for the position of process designer to aviod costly impcrtation of tooling designs as well as a means of training.

D Training

Altogether 9 Fellowships are foreseen. The aim is to give overseas experience to 1-skilled operator in fabrication, machining and toolroom sections: similar experience to3-foremen and 1-metallurgist and craft training in foundry operating skills to 2-moulding operators.

E Administrative Build-up

In the detail planning of the pre-production expenditure it is proposed that security staff is recruited at an early stage, the General Manager and a secretary about 12-months prior to start-up, also 2-foremen and the accounts clerk at approximately 6-months before production starts.

TABLE 13

ESTIMATED LABOUR - BY SKILLS

AREA	ITEM	MACHINE, TRADE OR OCCUPATION	UNSKILLED	SKILLED	SEMI-SKILLED	FOREMAN	TECHNOLOGST	CLERK	MANAGER		
FABRICATION SHOP	1	GUILLOTINE									
	2	BAR CROPPER		1	1				1		
	3	HACKSAW									
	4	PRESS BRAKE									
	5	FLY PRESS		1							
	6	PIPE BENDER									
	7	PEDESTAL GRINDER				1					
	8	RADIAL DRILL		2							
	9	BENCH DRILL									
	10	FORGE HEARTH									
	11	ANVIL		1							
	12	FULLER BLOCK									
	13	OXY GAS BURNER		1							
	14	LECTRIC WELDER									
	15	WORK BENCH		2							
	16	PAINT		-							
	17	STOVE ASSEMBLY ETC	1	2							
	18	TRANSPORT			1						
	19	TOOL ROOM		6		1					
MACHINE SHOP	1	CENTRE LATHE		1							
	2	CENTRE LATHE		1							
	3	MILLING MACHINE		1							
	4	POWER HACKSAW			1						
	5	SURFACE GRINDER		1		1					
	6	BENCH DRILL		1							
	7	PEDESTAL DRILL									
	8	SHAPER		1							
	9	CUTTER GRINDER		1							
	10	PEDESTAL GRINDER		-							
	11	HEAT TREATMENT		-	1						
	12	TEMPERING FURNACE		-							
	13	TRANSPORT (by Oper.		-							
	14	STOREKEEPER						1			
	15	PUMP ETC ASSEMBLY		1							

TABLE 13 (Contd)
ESTIMATED LABOUR - BY SKILLS

AREA	ITEM	MACHINE, TRADE OR OCCUPATION	UNSKILLED	SKILLED	SEMI-SKILLED	FOREMAN	TECHNOLOGIST	CLERK	MANAGER	ADMIN.	TYPIST
FOUNDRY	1	MELTING	1	1		1			1		1
	2	MOULDING	2	3	1						
	3	COREMAKING	1	2	2						
	4	FETTLING		1	1	1					
	5	LABORATORY					1				
	6	STOCKYARD	1		1						
ADMINISTRATION	1	ADMIN. OFFICER							1		
	2	PERSONNEL OFFICER								1	
	3	A/C CLERK								1	1
	4	BUYER								1	
	5	SALES								1	
	6	DESPATCH						1			
	7	TIME KEEPER						1			
	8	SECURITY/WEIGHBRIDGE			6			1			
	9	PLANNING						1			
	10	PROCESS DESIGNER					1				
AMENITIES	1	LAVATORY CLEANER	1								
	2	CANTEEN WOMAN			1						
	3	YARD LABOURER	1								
	4	GARDENER	1								
	5	SHAWER ATTEND.	1								
	6	OFFICE CLEANER	1								
DIRECTION	1	GENERAL MANAGER							1+		
	2	SECRETARY/TYPIST									1

+ Special Grade

TABLE 14

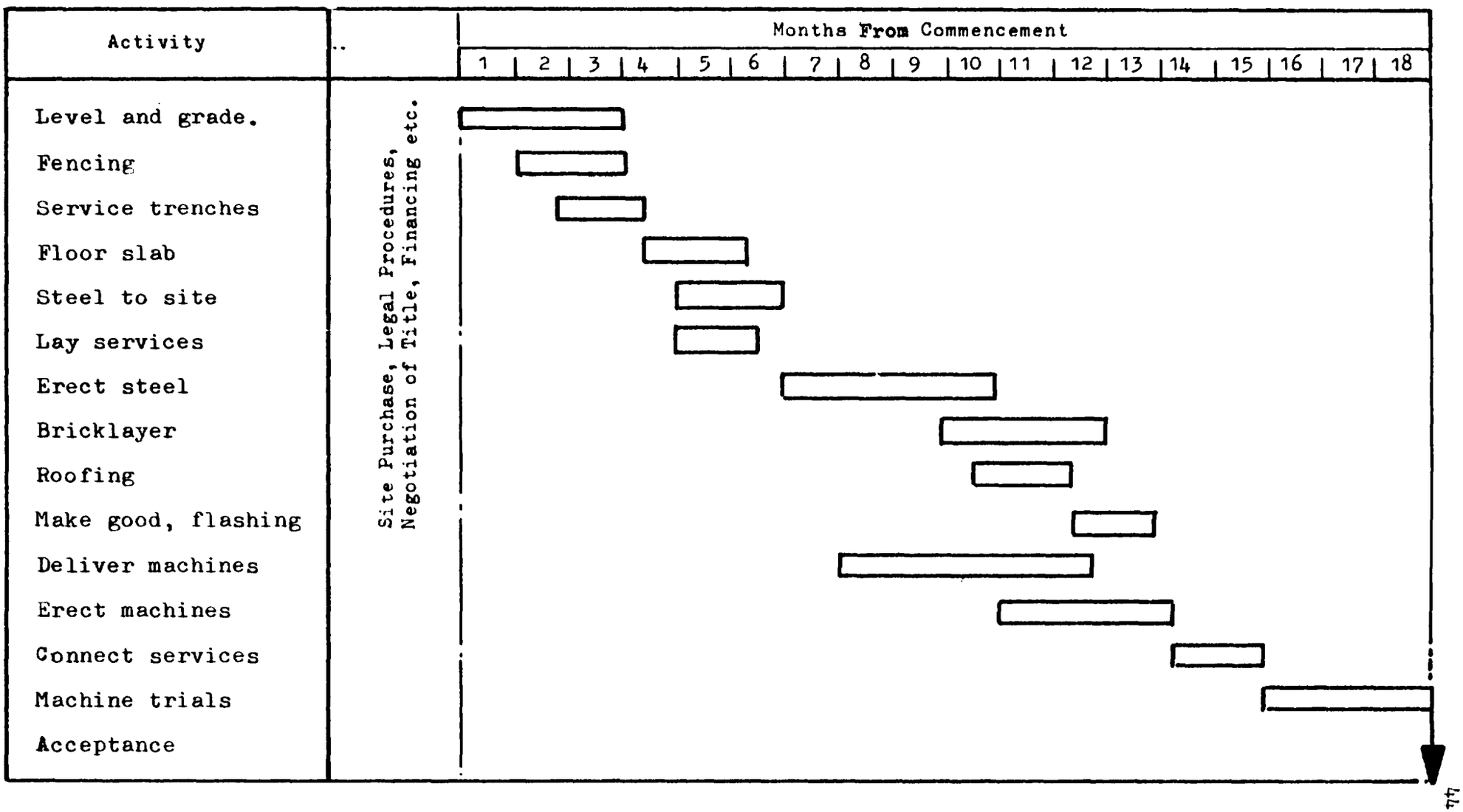
TRAINING

ITEM	CATEGORY	FELLOW-SHIP ✖	LOCAL ✖✖ TRAINING	SITE TRAINING	COST
1	2	3	4	5	6
1	SKILLED MACHINIST M/C	1	7		5750
2	SKILLED M/C OPR-FAB SHOP	1	8		6400
3	TOOL ROOM	1	6		5100
4	DRIVER - CDR TRUCK		2		1300
5	FOREMEN	3	5		6850
6	BLACKSMITH		1		650
7	MELTING	1		2	1200
8	MOULDING (1-Hand, 1 M/C)	2		3	2400
9	COREMAKING			2	-
10	FETTLING (incl S'blast)			2	-
11	LABORATORY (only 1 x Opr.)		1	1	650
12	PROCESS DESIGNER			1	-
13	ADMIN. OFFICER		1		650
14	PLANNING CLERK			1	-
15	A/C CLERK		1		650
	TOTAL				$31,600

✖ Assume US ∅ 1200

✖✖ Assume LNDC to pay 75% local training taken at $1300 p.a.(based on Mrs. Motsatse comments). Training period assumed 2 Years.

IX. IMPLEMENTATION SCHEDULE



X FINANCIAL ANALYSIS

While preparing the financial analysis of the project the various schedules were prepared in accordance with the UNIDO "Manual For The Preparation of Industrial Feasibility Studies." Detailed workings and supporting data, connected with these schedules are also included in the report, to enable any further analysis, and check back.

Taking into account the Negative Rate of Return as worked out at Table No. the project is considered economically not feasible. The various schedules and tables are listed below for ease of reference.

	Schedule Table No. Page
Initial Fixed Investment Costs	10-1/1

X FINANCIAL ANALYSIS

In the preparation of the financial analysis of the project various schedules and tables have been prepared in accordance with the UNIDO "Manual for the preparation of industrial feas -ibility studies"; as far as practicable.Detailed workings and supporting data, connected with these schedules are also incl -uded, to enable further analysis and check back.

The project is found to be not economically viable, considering the high NEGATIVE rate of return, throughout its operation for 6 years.

List of various schedules and tables is given below for ease of reference.

Description	Schedule/ Table No.	Page
Initial Fixed Investment Costs	10-1/1	46
Summary of plant machinery and equipment	10-1/1	46
Fixed investment costs	10-1/2	47
Pre Production Expenses	10-2/1	48
Estimate of Pre Production Expense	Table 14(a)	49
Pre Production Capital Expenditure	10-2/2	50
Estimate of Payment	10-4	50
Licence Cost	Table 15	51
Annual Cost of Purchases By Group	Table 16	52
Schedule of Bought-in Items	Table 17	53
Summary of Utilities Cost At 100% Production	Table 18	54
Repair And Maintenance	Table 19	55
Depreciation	Table 20	55

Description	Schedule/ Table No.	Page
Calculation of Depreciation	Table 21	56
Working Capital Costs	10-3/1	57
Working Capital Requirements	10-3/2	58
Production Forecast	Table 22	60
Estimated Annual Sales At Full Capacity	Table 23	61
Sales Values for Fab.& M/s Production of Non-Foundry Items	Table 24	62
Accounts Receivable	Table 25	63
Estimated Monthly Receipts & Payments	10-5	64
Total Initial Investment Costs	10-6/1	65
Simple Rate Of Return	-	66

SCHEDULE 10-1/1

INITIAL FIXED INVESTMENT COSTS

		$ THOUSAND		
ITEM	INVESTMENT CATEGORY	FOREIGN	LOCAL	TOTAL COST
1	2	3	4	5
1	LAND	GRATIS	GRATIS	0
2	SITE PREPARATION	0	22.0	22.0
3	STRUCTURES AND CIVILS			
(a)	BUILDINGS AND CIVILS	223.0	223.0	446.0
(b)	AUX. AND SERVICE	34.4	60.0	94.4
4	INCORP.FIXED ASSETS	0	0	0
5	PLANT M/C AND EQUIPMENT	400	120	520
6	TOTAL	914.8	708	1622.4

SCHEDULE 10-1/1 (a)

SUMMARY OF PLANT, MACHINERY AND EQUIPMENT

CURRENCY		US $ ' 000		
ITEM	DEPARTMENT	FOREIGN	LOCAL	TOTAL
1	FOUNDRY	234	38	272
2	FABRICATION	59	15	74
3	MACHINE	102	12	114
4	GENERAL	5	55	60
5	TOTALS	400	120	520

SCHEDULE 10 - 1/2 FIXED INVESTMENT COSTS

	CONSTRUCTION						START UP AND FULL CAPACITY UTILIZATION															TOTAL		
YEAR	1			2			3			4			5			6			7					
	F	L	T	F	L	T	F	L	T	F	L	T	F	L	T	F	L	T	F	L	T	F	L	T
Fixed Investment														1.3			1.4			1.48			4.18	4.18
Land-Rent		1.1			1.16			1.2			1.28												4.74	5.74
Site Preparation & Development	0	22	22																				22	22
Structure & Civil Works	100	220	370	157.4	63	220.4																257.4	283	540.4
Incorporated Fixed Assets							7.5			7.5			7.5			7.5			7.5			37.5		37.5
Plant and Machinery				400	120	520																294.8	313.9	608.8

*Licence cost for M.F. Tractor Wts
Hand Pumps and all Fittings

Currency - US $,000

SCHEDULE 10 - 2/1

PRE-PRODUCTION EXPENSES

ITEM	CATEGORY	$ FORN	M LOCAL	TOTAL	
1	PREINVEST. STUDIES	100.0	8.8	108.8	
2	PREPARATORY INVESTIGATIONS	34.0	27.0	61.0	
3	MANAGEMENT OF PROJECT	240.0	-	240.0	
4	PLANNING & TENDER	122.0	-	122.0	
5	START-UP & SITE SUPERVISION	26.0	-	26.0	
6	RECRUITMENT	-	36.0	36.0	
	TRAINING	11.0	21.0	32.0	
7	OBTAIN SUPPLIES			-	Manager &
8	ORGANIZE MARKETING			-	ex-pat.
9	CONNECTIONS			-	contacts
10	CAPITAL ISSUE COSTS		10.0	10.0	
		53.3	102.8	635.8	

TABLE 14(c.)

ESTIMATE OF PREPRODUCTION EXPENSES

Item	Description	Nature of Study/Consultancy	Agency	Man Months	Rate US $	Cost	Totals Cost
1	Pre-investment Studies	Prefeasibility Study	UNIDO Study Team	9	8 400 10 000	75 000 10 000	
		Feasibility Study	"	4	8 700	18 800	
		Staff Supervisory Visit	"	-	5 000	5 000	108 800
2	Previous Investigations	Site	Consultants Govt. + Local	3	8 700	26 100	
		Sand	"	2	"	17 400	
		Steel & Iron Scrap	"	1	"	8 700	
		Water	"	1/2	"	4 350	
		Electricity	"	1/2	"	4 350	61 000
3	Project Implementation	Project Management	Aid	24	8 700+	208 800	
		Vehicle 18000 purchase, 2-yrs operating				28 000	240 000
4	Detailed Planning	Design-Quantities	Consultants	12	"	104 400	
		Tendering, Vienna	UNIDO	2	"	17 400	122 000
5	Start up & Site Supervision	Commission furnace sand plant, shot blast	Supplier	3		26 000	26 000
6	Admin.build-up	General Manager (1)		12	1 200	14 400	
		Typist (2)		12	400	9 600	
		Foreman (2)		6	400	4 800	
		Accounts Clerk (1)		6	300	1 800	
		Security (4)		12	100	4 800	
		Training, see schedule				32 000	68 000
7	Supplies			2	General Manager		-
8	Marketing				Manager and expatriate contacts		-
9	Connections						-
10	Capital Issue						-

SCHEDULE 10 - 2/2 PRE PRODUCTION CAPITAL EXPENDITURE

PERIOD	CONSTRUCTION									
YEAR	1			2				Total		
CURRENCY US 000	F	L	T	F	L	T		F	L	T
PRE-PRODN EXPENDITURE	376	45.8	421.8	157	57	214		333	102.8	635.8

SCHEDULE 10 - 4 ESTIMATE OF PAYMENT

ITEM	MONTH	SALARY WAGES	BASIC RAW MATLS	OTHER MATLS	TAXES & DIV.	OTHER+ PAYMTS	LICENCE	TOTAL
1	2	3	4	5	6	7	8	9
		$ 000	$ 000	$ 000	$ 000	$ 000		$ 000
1	May	25,000	10,866	40,150	6 YEARS TAX HOLIDAY	4,250		80,266
2	June	25,000	1,366	750		4,250		31,366
3	July	25,000	7,366	8,250		4,250		44,866
4	Aug	25,000	4,866	11,750		4,250		45,866
5	Sept	25,000	7,366	8,250		4,250		44,866
6	Oct	25,000	1,366	750		4,250		31,366
7	Nov	25,000	10,866	24,750		3,750		39,616
8	Dec	25,000	1,366	750		3,750		30,866
9	Jan	25,000	7,366	8,250		3,750		44,366
10	Feb	25,000	4,866	11,750		3,750		45,366
11	Mar.	25,000	7,366	8,250		3,750		44,366
12	Apr	25,000	1,422	750		3,750	7,500	38,432

+Electricity
Water Utilities
Stationery, G4 Supply

TABLE 15

LICENCE COST

Item	Licence Product	Rate of Licence Charge	Total Sales (M)	Licence Cost (M)
1	Massey Ferguson Weights	6%	14192	852.0
2	Hand Pumps	6%	100000	6000.0
3	Al. Fittings & Couplings	6%	16550	993.0
	Total Licence Costs			7845.0
			US $	7220.0
		Rounded	"	7500.0

TABLE 16

ANNUAL COST OF PURCHASES BY GROUP (US Dollar)

ITEM		YEAR / DEPARTMENT	3 / 1985	4 / 1986	5 / 1987	6 / 1988	7 / 1989	8 / 1990
1	RAW MATERIAL	FOUNDRY	7,000	10,000	13,000	15,000	16,400	16,400
2		FABRICATION	8,000	11,000	12,000	14,000	14,000	14,000
3		MACHINE	18,000	27,000	32,000	36,000	36,000	36,000
4	CONSUMA-BLES	FOUNDRY	8,000	12,000	16,000	18,000	21,000	21,000
5		FABRICATION	13,200	17,600	19,800	22,000	22,000	22,000
6		MACHINE	17,500	26,250	31,500	35,000	35,000	35,000
7	TOOLS PATTERNS	FOUNDRY	31,000	31,000	31,000	31,000	6,000	6,000
8		FABRICATION	3,000	3,000	1,000	1,000	1,000	1,000
9		MACHINE	2,000	3,000	1,000	1,000	1,000	1,000
10	BOUGHT IN	FOUNDRY	-	-	-	-	-	-
11		FABRICATION	1,260	1,680	1,980	2,100	2,100	2,100
12		MACHINE	24,000	36,000	43,000	47,900	47,900	47,900

TABLE 17

SCHEDULE OF BOUGHT-IN ITEMS

	Product	Item	Production per year	Items per unit	Items per year	Est'd cost	Annual cost	Annual cost	Group annual cost
						R	R	¢	¢
1	2	3	4	5	6	7	8	9	10
1	Cast iron cook'g pots	-	-	-	-	-	-	-	-
1a	Cast iron saucepans	Wooden handles	360	1	360	0.45	162	150	150
2	Stoves small	Countersunk	250	12	3000	0.02	72	66	
	medium	steel screws	30	16	480	0.02	12	11	1000
	large		170	24	4080	0.02	100	92	
3	Coffin handles	Split pins	10,000	2	20,000	0.03	600	550	
		Back plates		1	10,000	0.29	2900	2670	4220
		Packaging		1/6	1,667	0.65	1084	1000	
4	Agricultural impl'ts	-	-	-	-	-	-		
5	Hand water pumps	Bearings	100	4	400	2.60	1040	960	
		Seals		3	300	3.50	1050	970	
		Bevel gears		2	200	12.30	2460	2260	34000
		Pump unit		1	100	250.00	25,000	23000	
		Non retn valve		1	100	7.50	7,500	6900	
6	Room heaters	-	-	-	-	-	-		450
7	Irrigation fittings	Polymer seal	1000	1/2	500	2.20	1100	1010	1010
8	Packing frames for cooking stoves and room heaters	Wood battens	450	1	450	2.00	900	830	
			100	1	100	4.50	450	420	
	TOTAL								40,830

Addition of 20% to cover CIF mainly on hand pump items. Use rounded value of ¢ 50,000 in calculations.

TABLE 18

SUMMARY OF UTILITIES COST AT 100% PRODUCTION

1.	Electrical Consumption			
1.1	Foundry	509,944		
1.2	Fabrication	17,802		
1.3	Machine Shop	37,593	kWH per year at R0.04 =	R25,800
1.4	Lighting	79,440		
	Total	645,000		
2.	Electrical Maximum Demand			
2.1	Foundry	480.0		
2.2	Fabrication	16.3		
2.3	Machine Shop	43.3	kW at R7.0	R3,920
2.4	Lighting	26.7		
		560		
3.	Forecast Total Electrical Cost			R29,720
4.	Water Consumption			
4.1	Water use by estimate - 20,000 m^3 per year			
4.2	Cost, at R0.05 per m^3 = R1,000			
4.3	Add service charges for water and sewerage e.g.			R2,000
5.	Projected cost of utilities			R32,720
			or	$30,102

TABLE 19

REPAIR AND MAINTENANCE

Item	Element	Annual Rate	Asset Value	Annual Cost
		Per Cent	US Dollar	US Dollar
1	2	3	4	5
1	Buildings	2.5	540,000	13,500
2	Plant and Machinery	5.0	520,000	26,000
3	Vehicles and transport	10.0	60,000	6,000
	TOTAL			45,500

TABLE 20

DEPRECIATION

Item	Element	Annual Rate	Asset Value	Annual Depreciation
		Per Cent	US Dollar	US Dollar
1	2	3	4	5
1	Buildings	5.0	540,000	27,000
2	Machinery and equipment	20.0	520.000	104.000
3	Office Eqpt. & Furniture	10.0	20,000	2,000
4	Value of Vechicles	20.0	60,000	12,000
5	Jigs and Fixtures	20.0	135,000	27,000
6	Start-up Expenses	20.0	635,800	127,160
	TOTAL			298,160

TABLE 21

CALCULATION OF DEPRECIATION

(US $) '000

Asset	Value	Dep. %	Year 1	Res.	Year 2	Res.	Year 3	Res.	Year 4	Res	Year 5	Res	Year 6	Res
Builds	540.4	5	27	513	25.8	487	24.4	462.6	23.13	439.5	22	417.5	20.8	
Mach/ Eqpt.	520.0	20	104	416	83.2	333	66.6	266.4	53.28	213.1	42.6	170.5	34.1	
Office Eqpt.	20	10	2.0	18	1.8	16.2	1.6	14.6	1.46	13.4	1.34	12.0	1.2	
Veh.	60	20	12	48	9.6	38.4	7.8	30.6	6.12	24.5	4.9	19.6	3.9	
Jigs & Fixtures	35	20	7	28	5.6	22.4	4.4	18.0	3.60	14.4	2.9	11.5	2.5	
Start up Expenses	635	20	127.2	508	102	406	81.2	324.6	64.22	260	52	208	41.6	
Yearly Depreciation			279.2		228		185		152.5		125.7		104.0	

SCHEDULE 10-3/1 WORKING CAPITAL

COSTS - US$ '000

ITEM	PERIOD	CONSTR'N		START UP & FULL PRODUCTION					
	YEAR	1	2	3	4	5	6	7	8
	PROD'N PROG.	-	-	40%	60%	80%	90%	100%	100%
1	RAW MAT'L A			7.000	10.000	13.0	15.0	16.4	16.4
2	B			8.000	11.0	12.0	14.0	14.0	14.0
3	C			18.000	27.0	32.0	36.0	36.0	36.0
4	CONSUMABLE A			8.0	12.0	16.0	18.0	21.0	21.0
5	BOUGHT-IN B			14.46	19.28	21.78	24.1	24.1	24.1
6	C			44.5	62.25	74.5	82.9	82.9	82.9
7	LABOUR			100	100	102.5	102.5	105	105
8	UTILITIES			16.0	18.5	22.0	25.5	30.0	30.0
9	REPAIR			26.0	29.0	32.0	36.0	36.0	36.0
10	MAINT. SPARE			12.0	14.0	15.0	17.0	19.0	19.0
11	TOOLING ETC.			36.0	39.0	33.0	33.0	8.0	8.0
12	FACTORY O' HEADS			102	102	102	102	102	102
13	FACTORY COST			391.96	458.5	475.28	507.5	498.4	498.4
14	ADMIN HEADS			140	140	144	144	147	147
15	SALES COSTS			12	12	13	13	16	16
16	DISTRIBUTION			25	25	27	27	30	30
17	OPERATING COSTS			568.96	635.5	659.28	689.5	691.4	691.4
18	FINANCIAL COSTS			-	-	-	-	-	-
19	DEPRECIATION			279	228	185	153	126	104
20	TOTAL PROD AND MANF. COSTS			848	864	844	843	817	795

* LOANS NOT FORSEEN CAPITAL IS EXPECTED AS GRANTS-IN-AID, OR FROM LNDC PARTICIPATION IN FORM OF GRANT.

SCHEDULE 10-3/2 WORKING CAPITAL

REQUIREMENTS

ITEM	ACCOUNTING ITEM	X MIN DAYS COVER	Y COEFF. OF T.O.	REQUIREMENTS $ '000					
				START-UP				FULL CAPACITY	
				3	4	5	6	7	8
1	ACCOUNTS RECEIVABLE	30	12	15.5	23.3	31.0	34.8	38.8	38.8
2	RAW MATERIAL	90	4	1.75	2.5	3.3	3.8	4.1	4.1
3	B	90	4	2.0	2.75	3.0	3.5	3.5	3.5
4	C	60	6	3.0	9.0	5.3	6.0	6.0	6.0
5	CONSUMABLE A	180	2	4.0	6.0	8.0	9.0	10.5	10.5
6	AND B	90	6	2.4	3.2	3.6	4.0	4.0	4.0
7	BOUGHT-IN C	90	6	7.4	10.4	12.4	13.8	13.8	13.8
8	SPARES	180	2	6.0	7.0	7.5	8.5	9.5	9.5
9	WORK IN PROG.	9	40	15.4	17.9	18.6	19.9	19.5	19.5
10	FINISHED PRODUCTS	15	24	34.7	39.0	40.4	42.5	42.1	42.1
11	CASH IN HAND			18.9	19.8	19.5	19.6	19.4	17.8
12	CURRENT ASSETS			111	141	153	165.8	171	170
13	ACCOUNTS PAYABLE	30	12	9.6	13.3	15.9	17.9	18.7	18.7
14	NETT WORKING CAPITAL			101	128	137	148	152	151
15	INCREASE IN ITEM 14				27	9	11	-3	-2
16	TOTAL PROD. COSTS			848	864	844	843	817	755
17	LESS RAW MAT'L, UTILITY, DEPRN.			395	388	376	372	350	328
18		15	24	453	476	468	472	467	477
19	CASH BALANCE			18.9	19.8	19.5	19.6	19.4	17.8

TABLE 22

PRODUCTION FORECAST

YEAR		3	4	5.	6	7	8
ITEM	DEPARTMENT	%	%	%	%	%	%
1	FOUNDRY	40	60	80	90	100	100
2	FABRICATION	60	60	90	100	100	100
3	MACHINE	50	75	90	100	100	100

TABLE 23

ESTIMATED ANNUAL SALES AT FULL CAPACITY

Item	Description	Pcs/kg Per Year	Average Price-Pc/kg (Maluti)	Total Annual Sales (Maluti)
1	Cooking Pots			
	-Traditional	2200 pcs	19.64	43 206
	- Modern	360 "	7.00	2 520
2	Stoves(Different Types)	250 "	90.00	22 500
		40 "	160.00	6 400
		14 "	360.00	5 040
		146 "	800.00	116 800
3	Trailor Parts	4000 kg	2.17	8 696
4	Massy Ferguson Wts	18600 "	0.76	14 192
5	Rawl Bolt Wedges	24000 "	1.74	41 740
6	Coffin Handles	10000 pcs	4.9	49 000
7	Hand Pumps	100 "	1000	100 000
8	Agricaltural Implements parts M/C	4000 kg	3.65	14 580
	Fab	6000 "	3.66	21 945
9	Room Heaters "	100 pcs	176.0	17 600
10	Miscellaneous Parts M/C	4700 kg	4.89	22 990
11	Aluminium Fittings and Couplings M/C & Fab	1000 "	16.55	16 550
	Total Annual Sales			503 759
			US $	463 458
			Rounded "	465 000

TABLE 24

SALES VALUES
for
Fabrication & Machine Shop Production
of
Non-Foundry Items

(US Dollar)

Item	Dept	Product	Departmt Total	Annual Volume	Unit Cost	Total of Sample		Annual Sales
1	2	3		4	5	6	7	8
1		Room Heaters	17600	100	176	17600	1	17600
2		Spreader Bar	14580	1000	0.97	970		1455
3		Cross Brace		1000	1.67	1670		2505
4		Short Brace		1000	0.73	730		1095
5		Stay Beam		1000	0.61	610		915
6		Adjusting Bar		1000	1.64	1640		2460
7		Draw Bar		1000	3.74	3740		5610
8		Mould Board Stay		1000	0.81	881		1322
9		Agitator Spindle	21945	1000	1.92	1920		4140
10		Fertilizer Bar		1000	2.80	2800		6040
11		Drive gear Shaft		1000	2.50	2500		5390
12		Traction Axle		1000	2.50	2500		5390

TABLE 25

ACCOUNTS RECEIVABLE

CURRENCY	US $ '000					
YEAR	3	4	5	6	7	8
PERFORMANCE	40%	60%	80%	90%	100%	100%
GROSS SALES	186	279	372	419	465	465
ACCOUNTS RECEIVABLE	15.5	23.3	31.0	34.8	38.8	38.8

SCHEDULE 10 - 5 EST'D MONTHLY RECEIPTS & PAYMENTS

ITEM	MONTH	RECEIPTS	PAYMENT	DEFICIT	SURPLUS	DEFICIT AGGREGATE	
1	2	3	4	5	6	7	8
			Currency	US $	000		
1	May	37,600	80,266	42,666	-	42,666	
2	June	45,620	31,366	-	14,254	28,412	
3	July	49,320	44,866	-	4,454	23,958	
4	August	31,620	45,866	14,246	-	38,204	
5	September	24,220	44,866	20,646	-	58,850	
6	October	28,220	31,366	3,146	-	61,996	
7	November	27,720	39,616	11,896	-	73,892	Max
8	December	35,720	30,866	-	4,854	69,038	
9	January	56,920	44,366	-	12,554	56,484	
10	February	49,680	45,366	-	4,314	52,170	
11	March	58,020	44,366	-	13,654	38,516	
12	April	59,540	38,432	-	21,108	17,408	Min

SCHEDULE 10 - 6/1 TOTAL INITIAL INVESTMENT COSTS

ITEM	INVESTMENT CATEGORY	FOREIGN	LOCAL	TOTAL
	Currency US $,000			
1	INITIAL FIXED INVESTMENTS	914.8	708	1622.4
2	PRE-PRODUCTION CAPITAL	533	102.8	635.8
3	WORKING CAPITAL	-	152	152
4	TOTALS	1447.8	962.8	2409.6

Simple Rate of Return

(US $)

Item	Year 3	4	5	6	7	8
Sales Revenue	186	279	372	419	465	465
Operating Cost	568.96	635.5	659.2	689.5	691.4	691.4
Depreciation	279.00	228.0	185.0	153.0	126.0	104.0
Operating Loss	661.96	584.5	472.28	423.5	352.4	330.4
Negative Rate of Return (%)	35.39	31.25	25.25	22.6	18.8	16.5

APPENDIX I

ESTABLISHMENTS VISITED AND PERSONS MET

Date	Establishment	Persons
17.1.83	Lesotho National Development Corporation	Mr. Mark Gomar Mr. Bakuena Scott Moahloli
"	Plant & Vehicle Pool Service (Govt. Workshop)	Mr. M. Mots'oane
"	Ministry of Trade, Industry & Tourism	Mr. K.M. Manyeli (Permanent Secretary)
"	Department of Trade and Industry	Mr. J.R. 'Moleli
19.1.83	Lesotho Steel Products (Pvt) Ltd.	Mr. J.R. Bothma Mr. A.C. Bothma
"	Basotho Enterprises Dev. Corporation, (Pvt) Ltd, Workshops	Mr. Marcel Tremblay Mr. Brommel
21.1.83	Tranelquip (Pvt) Ltd.	Mr. P. Coetzee
"	Lesotho Clothing Industries (Pvt) Ltd.	Mr. P. Holden
"	Lesotho Shoes (Pvt) Ltd.	Mr. J. Lyon
"	Lesotho Umbrella Manufacturers (Pvt)Ltd.	Manager
"	Lites (Pvt) Ltd. (Domolux)	Mr. G.H. Reynolds
25.1.83	Lesotho Flour Mills (Maseru)	Mr. Ben Hayes Mr. Wally Hayes
27.1.83	Hardware Centre & Agencies (Pvt) Ltd.	Mr. K. Basin
28.1.83	USAID Programme	Mr. Zobirist
31.1.83	Lesotho Tractor and Construction Machining Co. Ltd. (Msu), Massey Ferguson	Mr. W. Pretorious
2.2.83	Leyland Motor Garage	George Tebobo Jessie
"	Ministry of Agriculture & Marketing	Mr. M. Mochebelele

3.2.83	Basotho Enterprises Development Corp.	Mr. Ben Sebatane Mr. Mattoo
"	Lesotho Electricity Corporation (LEC)	Mr. C. Dunne
"	Ministry of Agriculture (Farm Machinery Section)	Mr. Motoboli Mr. Molise
"	Frasers Wholesalers	Mr. P. Ken Mayer Mr. A.C. Bothma
4.2.83	Ministry of Co-operatives & Rural Dev.	Mr. S.T. 'Nota (Permanent Secretary)
"	Thaba-Tseka Rural Development Programme (Canadian Aid), Maseru.	Mr. Tsepane
"	Clifford Trading (Pvt) Ltd.	Mr. Monaheng
8-9.3.83	Thaba-Tseka Rural Development Project, (Thaba-Tseka)	Mr. Loeffler
11.2.83	Maseru Steel and Wood Works	Mr. Lethale
14.2.83	Ministry of Trade, Industry and Tourism	Mrs. M. Sixishe (Permanent Secretary)
15.2.83	Ministry of Planning, Employment and Economic Affairs.	Mrs. Moji
"	Lesotho Polytechnic Institute	Mr. Rantofi
16.2.83	Bureau of Statistics	Mr. Tuoane
"	Ministry of Works (Roads Division)	Mr. G.V. Sobba Rao
"	National Manpower Development Secretariat	Mr. Makhele
17.2.83	Maluti Irrigation Co. (Pvt) Ltd.	Mr. Terry Frenkel
"	Ministry of Co-operatives and Rural Dev. (Village Water Supply)	Mr. Lesaoana Mr. Wadsworth Mr. Vinich Graf
"	Department of Mines and Geology	Mr. P.M.Lerotholi Mr. J. Evans

18.2.83	Lesotho Milling Co. (Pvt) Ltd.	Mr. Collin Lowe Mr. Deve Steward
"	Kolonyama Pottery (Pvt) Ltd.	Mr. Graham Taylor
"	Nothern Lesotho Steel & Diesel Engineering (Pvt) Ltd.	Mr. P.C. Bender
22.2.83	Department of Mines and Geology - Clay Lab.	Mr. Paul Mohale
2.3.83	Town Talk Wholesalers	Manager
3.3.83	Lesotho Chamber of Commerce and Industry	Mr. J.T. Khoabane Mr. R. Matji MR. J.M. Nthongoa
4.3.83	Solar Energy Development & Biogas Production, Renewable Energy Technology (Roma), UNESCO Project.	Mr. Gustav Gailard
8.3.83	National University of Lesotho.	Dr. Maruping Mr. S. Pule
10.3.83	Gold Dollar Furnitures	Mr. Chas Van Vollenhoven
11.3.83	Renewable Energy Technology Project, Ministry of Co-ops & Rural Development.	Mr. J.T. Stryker Dr. J. Gay Mr. P. Kanetsi
17.3.83	Ministry of Commerce and Industry	Hon. M.V. Molapo

UNDP STAFF

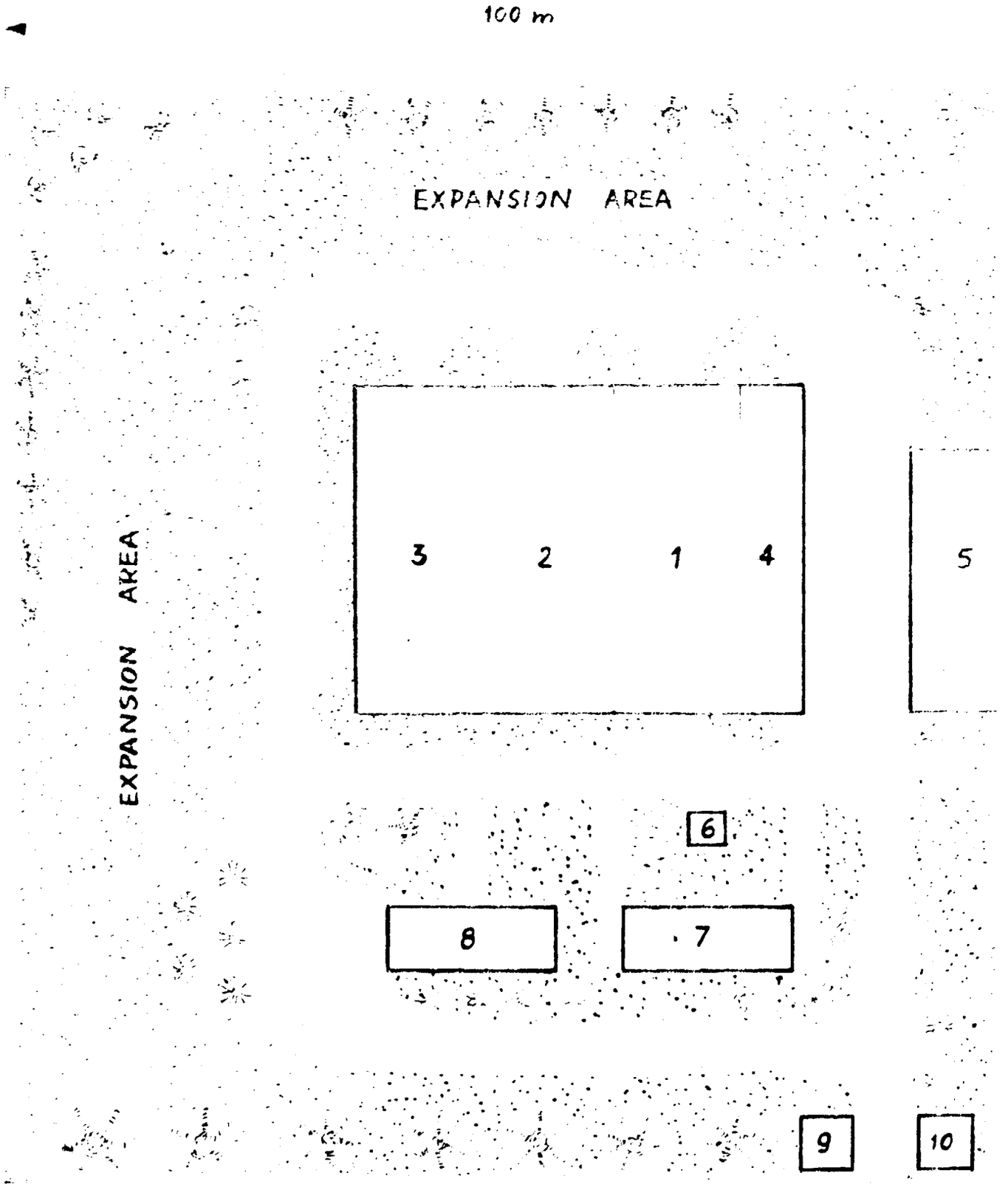
Resident Representative	Mr. C-E. Wiberg
J.P.O. (UNIDO)	Mr. Henrick Nielson
J.P.O.(FAO)	Mr. Lenart Hognert
Administrative Officer	Mr. Abdul Qader
Documentist (UNV)	Mrs. C.R. Bevis.

APPENDIX II

Imports of Iron and Steel and Non-ferrous Metal Products

No	Type	VALUE, MALOTI ,000			
		1976	1977	1978	1980
1	Iron & Steel Products				
	- Bars, Angles	1646	426	643	1265
	- Plates & Sheets	974	1008	2023	2893
	- Tubes, Pipes	730	1127	1861	2740
2	Non-Ferrous Metal	-	-	196	403
3	Manufactures of Metal-Nes				
	- Building Structures	2854	520	2587	6091
	- Metal Containers	387	342	281	609
	- Wire Products	340	598	602	1236
	- Nails, Screws, Nuts, Bolts etc	211	246	380	516
	- Tools-Hand/Machine	387	416	626	1440
	- Domestic Stoves & Heaters (Non-Elec.)	1484	953	1190	1692
	- Plates, Dishes, Pans, etc	1182	1701	1703	3369
4	Agricultural Implements		1978		1980
	- Ploughs and their parts		446		458
	- Planters and Fertilizer Distributors		71		297
	- Cultivators and Harrows		82		148
	- Machinery for Harvesting		20		58
	- Tractors and Parts		1104		1678
	- Agricultural Machinery		186		835
5	Pumps (air or liquids)		-		420
6	Road Vehicles				
	- Motor Cars		3075		5591
	- Trucks, Vans, etc.		6894		10428
	- Buses, Combis, etc		2183		2233
	- Motor Vehicles parts		8221		12355
	- Motorcycles & Scooters		60		137
	- Bicycles		93		96
	- Invalid Carriers		35		79
	- Parts of Motor Cycles and Cycles		497		76
	- Trailers		482		928

1979 figures not available



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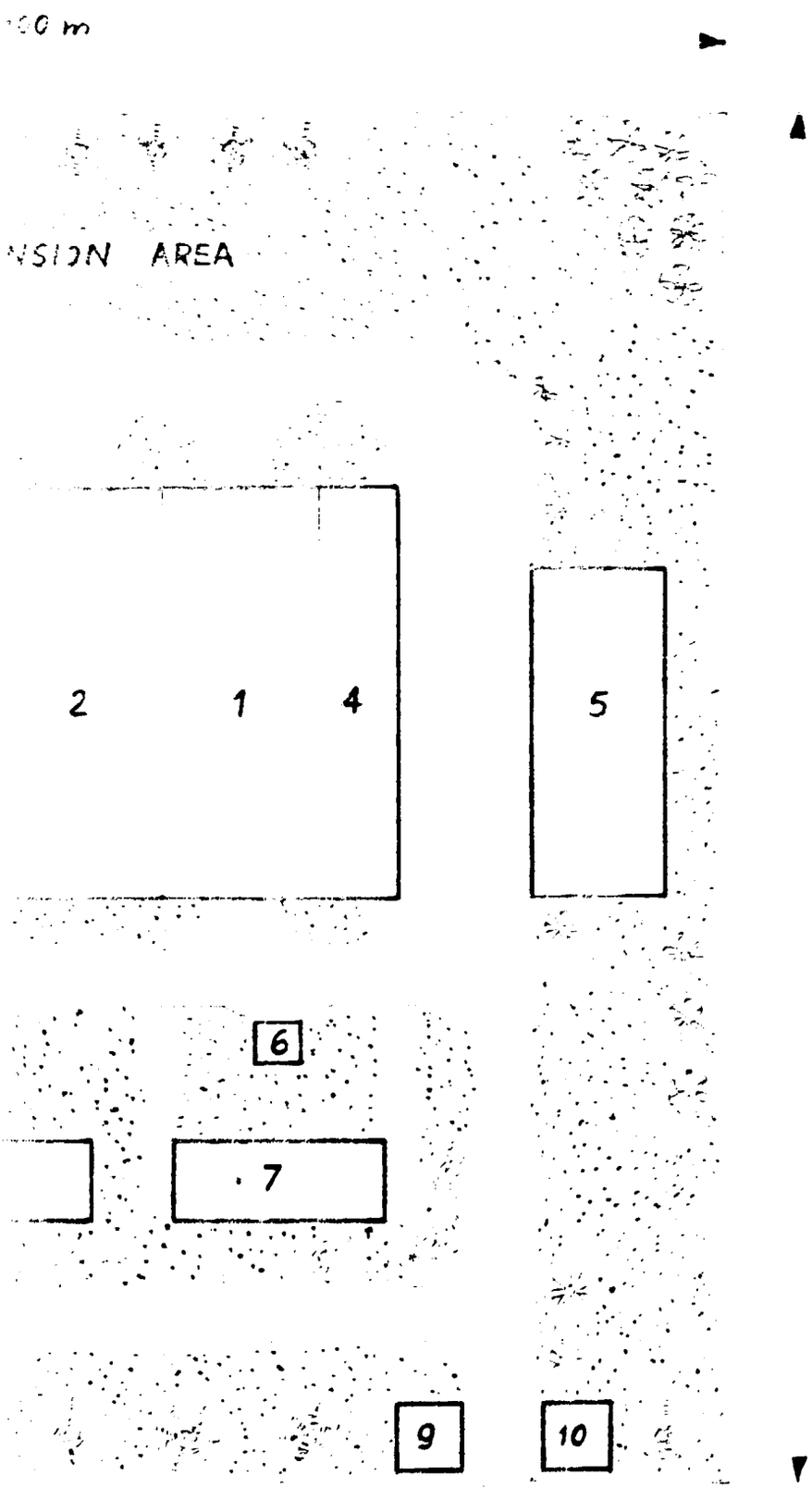
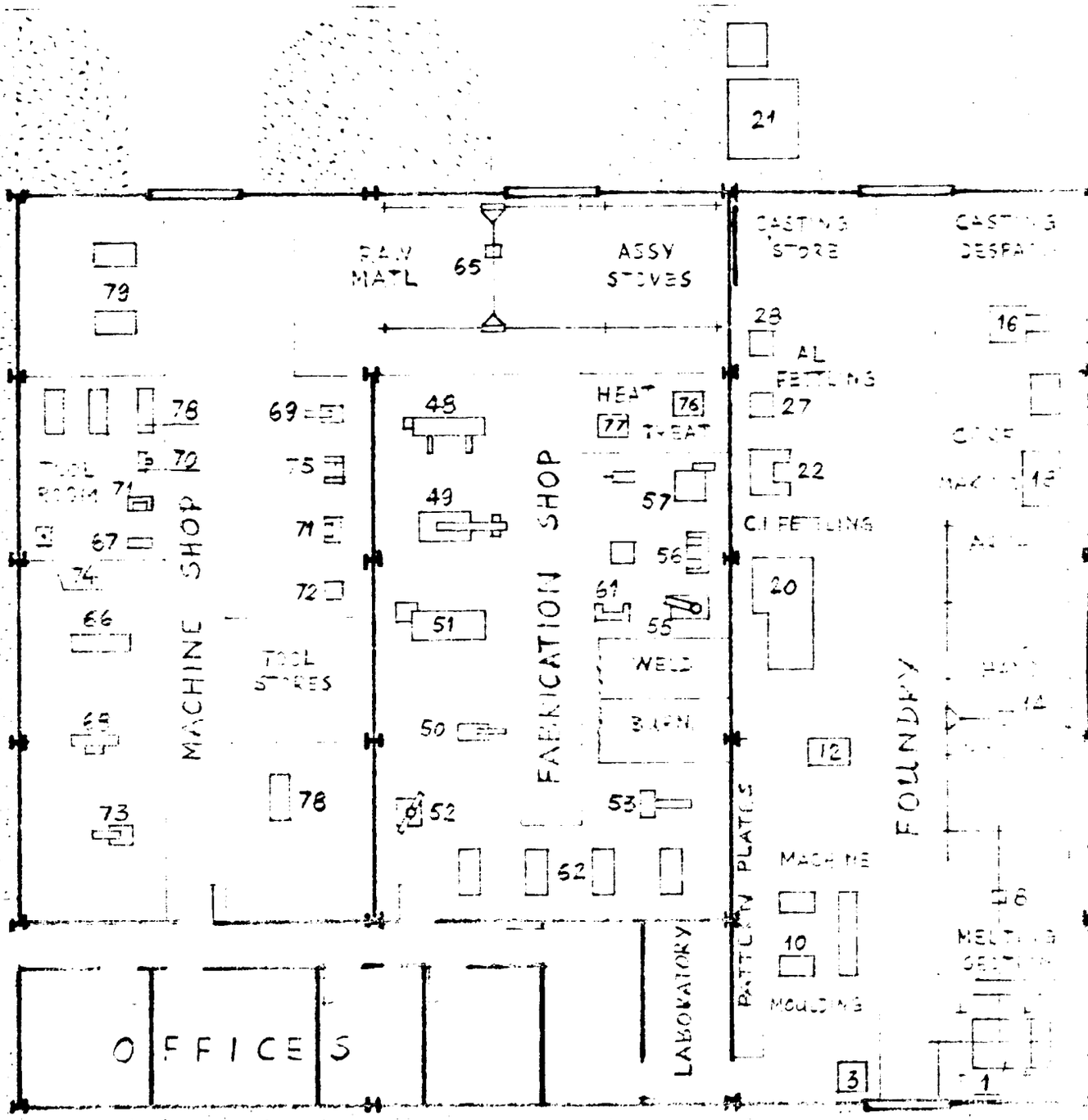


1 FOUNDRY
2 FABRICATION SHOP
3 MACHINE SHOP
4 ROOFED STORES
5 ROOFED SCRAP YARD & DANGEROUS STORE
6 ELECTRIC SUBSTATION
7 LAVATORY & SHOVERS
8 CANTEEN
9 TIME KEEPING
10 SECURITY

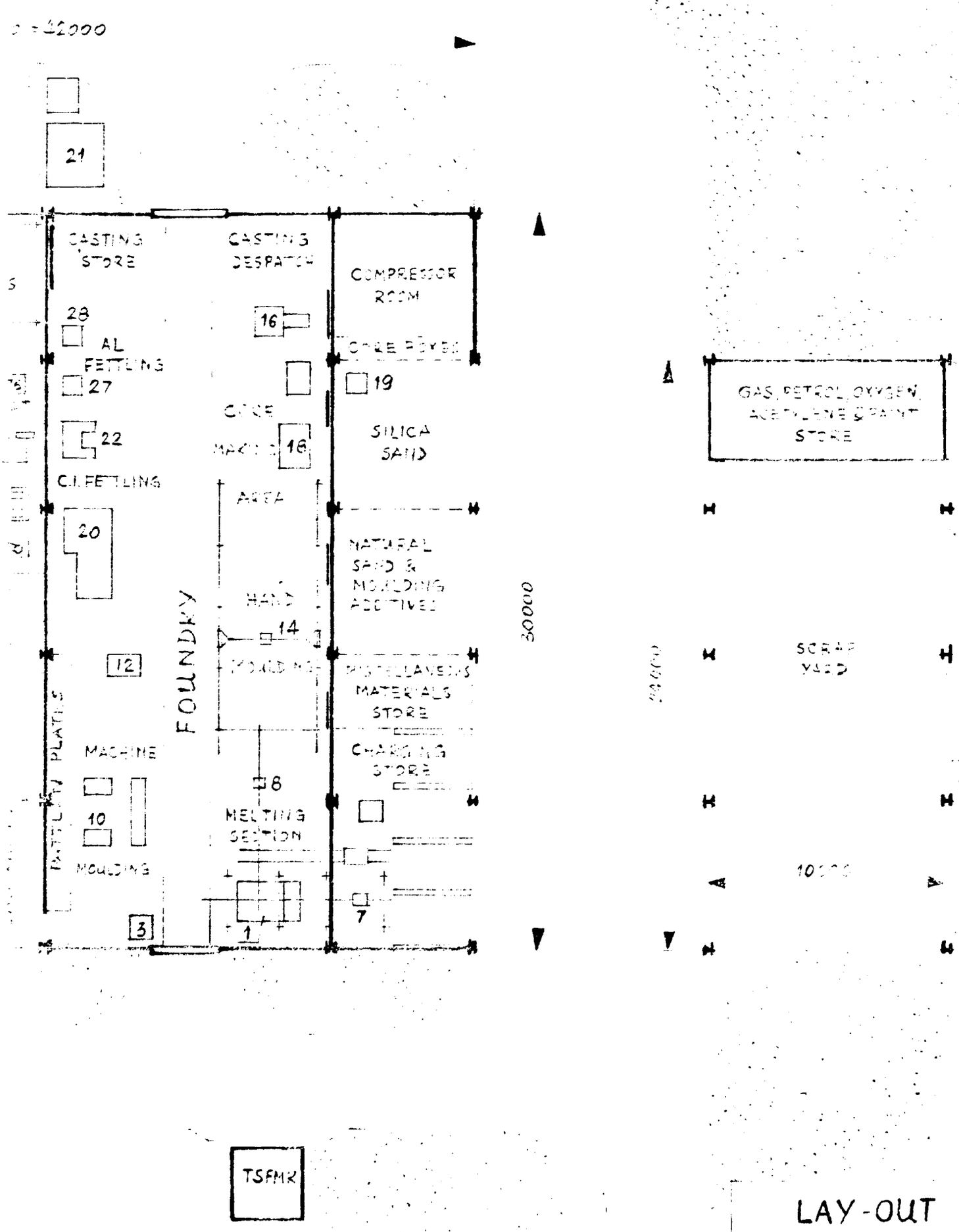
SECTION 2

SITE PLAN

3×12000 + 600 = 42000



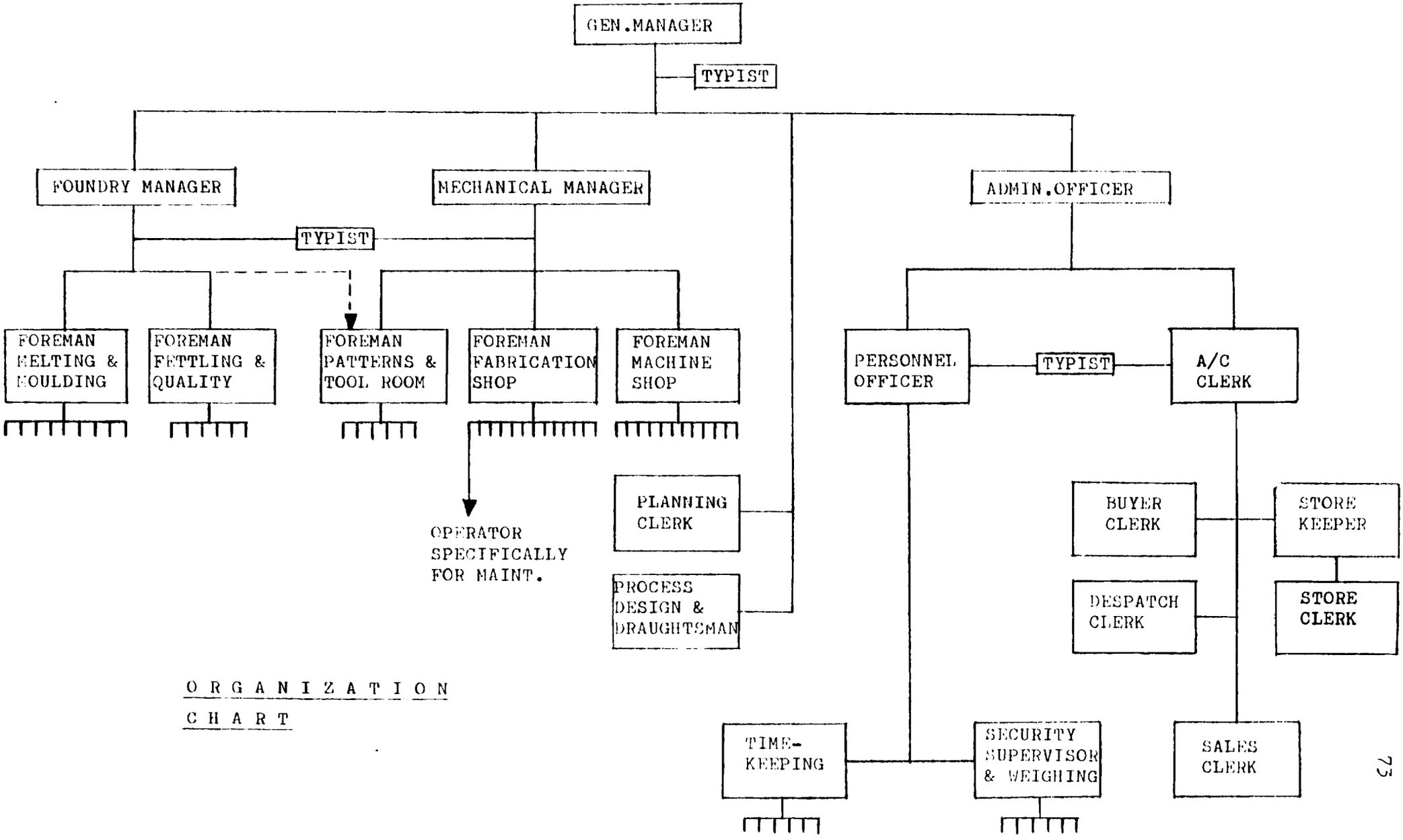
SECTION 1



LAY-OUT OF WORKSHOPS

SECTION 2

APPENDIX IV - ORGANIZATION CHART



O R G A N I Z A T I O N

C H A R T

APPENDIX V

Metals Engineering Products Indentified for Manufacture In Small Scale Industrial Units

In the course of extensive market survey undertaken by the Foundry mission, it has been observed that there is scope for local manufacture of many hardwear, construction, and household metal products in the country, in the small scale sector. Although materials for such products have to be imported, the value added, and the volume of demand for such products could result in appreciable foreign exchange savings.

It is understood that the management of BEDCO, and a few metal fabrication units in the country are actively considering setting up some such industries. The mission recommends that there is requirement to set up such industries in the country, to enlarge the base of metal working industries. The products considered are given below:

Item	Industry or Product
1	Nails for wood working
2	Woodscrews
3	Bolts and nuts
4	Metal fittings for window frames
5	Hinges for doors
6	Dimond mesh wire fencing
7	Wheel barrows
8	Farm trailers based on automobile components
9	Containers for garbage disposal
10	Domestic steel furniture, cupboards, tables
11	Link chain for bedsteads
12	Beer and drinks cans collection and processing
13	Scrap metal collection for export
14	General purpose hand tools
15	Agricultural implements spares

APPENDIX VI RENEWABLE ENERGY TECHNOLOGY COOKING STOVE

The mission visited the headquarters and an operating site of the Renewable Energy Technology Project; the full designation of this unit is :

Renewable Energy Technology Project
Appropriate Technology Section

Ministry of Co-operatives and Rural Development
P.O. Box 686,
Maseru, LESOTHO.

The unit is supported by it's United States base organization:

Associates in Rural Technology
362, Main Street
Burlington, Vt. 05401 USA.

The proposed design of stove is of profound significance to the work of the mission because it represents a large volume of fabricated and engineering capacity which would alter the whole concept of the present work. The discovery of the RET stove and contact with members of the project team places the foundry mission members in a difficult position, because, by excluding the work content from the potential workload of the fabrication shop, a most important manufacturing component is lost. On the other hand, there is positively no production of the stove taking place at the moment.

All the officers of the RET project are quietly confident of the potential value of their design to rural housewives, and a significant saving in the effort of gathering fuel. The foundry mission is convinced that suitable redesign on a moderate scale would admit of a significant content of castings, coupled with a reduction of cost from that of the fabricated design now being considered: (it must be recognized that no casting facilities are at present available, therefore the proposed design would not foresee the use of castings).

The team recommends that the work of the RET project is monitored to determine it's significance to the establishment of the extension of the industrial base in Lesotho.

RET MODEL 3
(Scale 1:5)
(in centimeters)