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19355 (1 of 2)

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PRE-FEASIBILITY STUDY FOR THE ESTABLISHMENT

OF A PLANT TO MANUFACTURE

TILES AND SANITARYWARE

SI/UGA/89/802

CONTRACT NO. 90/123

FINAL REPORT

VOLUME 1

SECTIONS I TO X

United Nations Industrial Development Organization
Vienna

This document has not been edited.

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RESTRICTED

SI/UGA/89/802
Contract No. 90/123
10th March 1991
ORIGINAL: ENGLISH

PRE-FEASIBILITY STUDY FOR THE ESTABLISHMENT OF A PLANT TO MANUFACTURE TILES AND SANITARYWARE

FINAL REPORT

VOLUME 1

SECTIONS 1 to X

Prepared for the Government of the Republic of Uganda
by the United Nations Industrial Development Organization,
acting as executing agency for the
United Nations Development Programme

Based on the work of Global Ceramics Limited, U.K.

Backstopping Officer: Mr V. Klykov, Feasibility Studies Branch

United Nations Industrial Development Organization
Vienna

[1]This document has not been edited.

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GLOSSARY

AEF	Africa Enterprise Fund
APDF	Africa Project Development Facility
BEE	Business Expectations Enquiry, Nairobi
CRDC	Ceramic Research and Development Centre in Sri Lanka
DFCU	Development Finance Company of Uganda Ltd
EADB	East African Development Bank
ECU	European Community Unit
KPND	Kenya Pound
KSh	Kenya Shilling
HFCU	Housing Finance Company of Uganda Ltd
HFCK	Housing Finance Company of Kenya Ltd
IFC	International Finance Corporation
LDC	Least Developed Countries
MOHUD	Ministry of Housing and Urban Development
NCC	Nairobi City Council
NHC	National Housing Corporation, Nairobi
NWCPC	National Water Conservation & Pipeline Corporation, Nairobi
NWSC	National Water and Sewage Corporation
PND	U.K. Pound Sterling
SDR	Special Drawing Rights
SWIP	Solid Waste Integrated Programme
UCB	Uganda Commercial Bank
UDB	Uganda Development Bank
UEB	Uganda Electricity Board
UDC	Uganda Development Corporation
UK	United Kingdom
UMA	Uganda Manufacturers Association
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USh	Uganda Shilling

****

Exchange Rates Used:

1 USD	=	USh 720
1 USD	=	KSh 23
1 KPND	=	KSh 20
1 PND	=	2.00 USD
1 USD	=	1.40 SDR
1 USD	=	1.43 ECU

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All import prices are based on CIF Values

ABSTRACT

Title: Ceramic tile and sanitaryware factory

Location: Uganda

Background

A local sponsor company, Sunrise Ceramics Limited, wishes to manufacture ceramic tiles and sanitaryware from local raw materials. All tiles and sanitaryware are currently imported.

Market & plant capacity

A detailed market survey of Uganda and the regional market has been carried out as part of a UNIDO pre-feasibility study and the proposed product range is: Wall tile size 150 x 150 x 5mm, floor tile size 100 x 200 x 10mm, sanitaryware range of medium washbasin, pedestal, small washbasin, close-coupled washdown WC and cistern. The proposed Ugandan retail selling prices, including sales tax are: Wall tile USh 12,000/m2, floor tile USh 24,000/m2, sanitary-ware USh 43,000/pc (exchange rate USh 720/USD). Export price 10% higher due to sales tax differences in region.

Capacity: Wall tile 32,000 m2/yr, floor tile 22,000 m2/yr, sanitaryware 10,350 pc/yr. 50% of production to be sold in Uganda and 50% in regional market.

Materials and inputs

Tile clays, silica sand, feldspar can be of 100% local supply, sanitaryware ceramic raw materials 76% local, 24% imported. Other imported inputs include glazes, packaging, cistern fittings, consumables and spare parts.

Location and site

Alternative sites have been identified at Mbarara in SW Uganda and in Kampala, which are both technically suitable from the required parameters of the tile and sanitaryware project.

Project engineering for new factory

This is based on using basic standard proven technology for tile and bench-cast sanitaryware production, avoiding highly mechanized handling systems to reduce capital expenditure. Electrically heated kilns and dryers will be of intermittent design with high thermal efficiency and fitted with fully automatic programmable temperature controls to ensure high quality.

Manpower

Total 71 personnel, Tile production 24, sanitaryware production 22, general workers 6, sales & distribution (Uganda & Kenya) 16, administration 3.

Implementation scheduling

Implementation period 2 Years prior to commercial production. The promoters will employ a foreign consultant to act as project manager on their behalf during this period of tendering, construction, machine installation and commissioning.

Total initial investment cost for new factory plant

The total cost of buildings, machinery and pre-production expenses is USD 4,859,343, 68.44 % foreign.

Source of finance

Equity from promoters and a foreign partner USD 3,259,676
Equity from DFCU USD 299,667, Foreign Loans USD 1,300,000

Annual operating costs

Production year 5 total production costs USD 1,245,092

Internal Rate of Return on Investment

IRR = 12.75%, Return on Equity plus Reserves 12.72%,
Net Present Value @ 12% USD 211,071.

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SECTION I

EXECUTIVE SUMMARY

I. EXECUTIVE SUMMARY

1.1 Project background and history

Uganda is dependent on aid for a large proportion of its requirements. The country is therefore seeking to diversify its industrial base by establishing local industries, which will use local materials, thereby reducing its dependence on imports. The building materials sector, which is very important for the provision of new housing for the growing population, is importing a very high proportion of its requirements, despite the fact that the country has many of the required raw materials. A local company, Sunrise Ceramics Limited, P.O. Box 1065, Kampala, which has been formed by four Ugandan potential investors, recognized that there was a potential for a factory to manufacture tiles and sanitaryware in Uganda. All tiles and sanitaryware are currently imported into the country but it was known that many of the raw materials for the production of these products are located in Uganda.

As the local sponsor company did not have the capital to carry out the raw material testing or to carry out the necessary pre-feasibility study, they approached the Ministry of Industry and Technology in 1989 for possible UNIDO assistance for this work. The current pre-feasibility study was commissioned in August 1990 and the field work was undertaken from October 1990 to January 1991. The study was implemented based on UNIDO methodological requirements presented in the "Manual for the Preparation of Industrial Feasibility Studies"

A UNIDO mission, including the backstopping officer, Mr V. Klykov and the team leader of the Global Ceramics Limited team of consultants, Mr G. J. Smith, visited Kampala from 18th to 23rd February 1991. The purpose of the mission was to brief the local company, Sunrise Ceramics Limited and the Ministry of Industry and Technology on the results and recommendations of the pre-feasibility study and to discuss all aspects of the project. Based on these discussions this Final Report was then prepared.

1.2 Market and plant capacity

The market for the tile and sanitaryware products from the proposed factory will consist of the local domestic market and the regional market; Kenya in particular. From the field work carried out by the project team in both Uganda and Kenya, the types of products, which were most popular were identified, their normal selling prices determined and their annual volumes assessed. The volumes were assessed by using information from a number of different sources, so that some cross-checking could be carried out. The export statistics to all of the regional countries bordering Uganda from the twelve European Community countries were also examined to cross-check against the information obtained in the field. After assessing the total market demand for tiles and sanitaryware in particular detail for both Uganda and Kenya, estimates were made of the possible market penetration of this market by a new factory located in Uganda. A realistic assessment of the plant capacity was then made with the knowledge that growth rates in the housing sector would not be very high over the next few years.

Estimates were also made of the potential demand for tiles and sanitaryware in Tanzania, Zaire, Burundi and Ruanda. However the Consultants decided not to add this demand into the calculations for the sizing of the factory but to treat this demand as a safety reserve, in case problems occur at any time, which would reduce the exports of products to Kenya. The Consultants feel that this is justified, as policies on imports and exports of products between the regional countries have changed in the recent past and could change again in the future.

Proposed product range for a Ugandan factory

From the field work in both Uganda and Kenya and also the desk work in Europe on the other regional countries, the Consultants believe that the tile range of products should consist initially of:

i) Glazed wall tile, size 150mm x 150mm x 5mm
ii) Glazed floor tile, size 100mm x 200mm x 10mm

Both of the above items are basic products, which would find a market in Uganda, Kenya and the other regional countries but overall wall tiles would be the major product. In Kenya the floor tiles would be a relatively minor product due to the prevalence of the less expensive vinyl tiles. The concentration in Kenya would definitely be on wall tiles.

From the field work it was determined that the sanitaryware range of products should consist of a reasonably modern but basic range of items, including:

i) Medium washbasin
ii) Pedestal to match medium washbasin
iii) Small wall-mounted washbasin
iv) Water closet, close-coupled washdown type
v) Cistern to match close-coupled water closet

All of the above items are in good demand in both Uganda and Kenya.

Also on the market are such sanitaryware items, such as urinals and asian toilets but these are less in demand than the basic range of sanitaryware. As the cost of design, new block moulds and case moulds is quite high for sanitaryware items, we do not feel it is justified to have these items in the initial product range. They could however be introduced at a later date, once the factory is well established with its basic product range.

Proposed selling prices

	Price/m2 (USh)
Wall tiles	12,000
Floor tiles	24,000
Average tile price (based on market proportions)	16,889

	Price/pc (USh)
Medium washbasin	50,000
Pedestal for medium washbasin	30,000
Small washbasin (wall-mounted)	30,000
Water closet (Close-coupled wash-down)	55,000
Cistern (with fittings)	50,000
Average price/piece	43,000

From the detailed market survey, which the team undertook, we would expect a local factory to obtain up to a 50 per cent share of the sanitaryware and ceramic floor tile market in Uganda and approximately 30 per cent of the ceramic wall tile market. The estimated annual market share would be:

Annual Estimated Market Share

	Total Ugandan market	% market	Market share
Floor tile	29,659 m2/yr	50	14,830 m2/yr
Wall tile	48,623 m2/yr	30	14,587 m2/yr
Sanitaryware	10,965 pc/yr	50	5,482 pc/yr

The design of the proposed new factory will therefore be based on this demand together with that from the Kenyan market.

Estimated Regional Market Share

a) Estimated Kenyan market share

A new factory in Uganda entering the Kenyan market would be unlikely to take more than a 10 per cent share of the market on a regular basis, ie: 7,200 pieces per year and initially would be lower, until the distribution system was established. For the first few years we would anticipate that the proposed new factory could sell around:

5,000 pieces/year of sanitaryware in Kenya

This is approximately 7 per cent of the established normal market in Kenya.

In the case of wall tiles, because of the wide range of tiles available on the market, we would not expect a new factory in Uganda to obtain more than 5 per cent of the total market. Ceramic floor tile have to overcome the strong competition from the Kenyan produced vinyl floor tiles, which can be sold for a much lower price. Sales of ceramic floor tile in Kenya are therefore expected to be very low, despite the indicated demand.

For the purposes of this pre-feasibility study, using the average generated figure for wall and floor tile demand, we estimate that potential sales in Kenya would eventually be around:

Wall tile	5% x 350,000 m2	=	17,500 m2/year
Floor tile	3% x 230,000 m2	=	6,900 m2/year

b) Estimated market in other neighbouring regional countries

The regional market for tiles and sanitaryware has been estimated from the detailed export statistics from each of the twelve European Country member states to all of the regional countries, neighbouring Uganda. The 1989 rankings are:

Regional imports of tile from the European Community

Ranking	Country		Tile imports (Tonnes)
1	Kenya		6,028
2	Zaire		3,822
3	Tanzania		694
4	Uganda		248
5	Ruanda		204
6	Burundi		156
		Total	11,152

The total tile imports into the regional countries of Zaire, Tanzania, Ruanda and Burundi from both the European Community and other countries have been estimated as 6,357 tonnes or 683,548 m2 of wall tile equivalents. It is estimated that a 5 per cent market share could be taken by a new factory in Uganda, which equates to a total of approximately 34,000 m2 of wall tile equivalents per year.

Regional imports of sanitaryware from the European Community

Ranking	Country		Annual Sanitaryware imports (pieces)
1	Kenya		40,955
2	Zaire		29,926
3	Tanzania		12,279
4	Ruanda		6,547
5	Uganda		5,220
6	Burundi		1,030
		Total	95,957

The total sanitaryware imports into Zaire, Tanzania, Ruanda and Burundi have been estimated as 77,863 pieces per year. It is estimated that a 5 per cent market share could be taken by a new factory in Uganda, which equates to a total of 3,883 pieces per year.

For the purposes of sizing the factory, the estimated market share, which could be taken in these regional countries, has not been included in the calculation, as this potential market has been treated as a safety reserve in case the exports to Kenya fall short of expectations due to changing Government policies or market conditions in the future.

Estimated plant capacity required for Uganda and Kenya market

From our summaries of the potential market share, which a new factory could reasonably be expected to achieve, we should provide for the following annual capacity.

	Capacity per year		
	Uganda	Kenya	Total
Sanitaryware (pc)	5,462	5,000	10,462
Wall tile (m2)	14,587	17,500	32,087
Floor tile (m2)	14,830	6,900	21,730

On this basis, rounding to the nearest convenient production level, we would design for a net saleable production of 45 pieces of sanitaryware pieces per day, or 10,350 pieces per year. Wall tile will be designed for 32,000 m2 per year and floor tile 22,000 m2 per year with the facility to easily change from one type of tile to the other, so that variations in market demand can easily be met.

Summary of design capacity for factory

Wall tile	32,000 m2 per year
Floor tile	22,000 m2 per year
Sanitaryware	10,350 pieces per year

From the market survey work it is known that there will be some demand for tile and sanitaryware products in the other regional countries, including Zaire, Tanzania, Burundi and Ruanda. This additional demand has not been included in the above design capacity, as it has been treated as a safety reserve, in case any problem occurs with the Kenyan market at any time. Allowing for the normal trade fluctuations the Ugandan market is expected to take 50 per cent of the tile and sanitaryware output from the factory and the total regional market is expected to take, on a consistent basis, 50 per cent of the both the tile and sanitaryware production.

The team have calculated machinery requirements based on a five-day working week, single 8-hour shift working and a 48-week effective working year. Kilns will be expected to operate over six days per week and on a 24 hour basis, most of the firing being during the night, when the likelihood of power cuts is reduced. During the 8-hour shift, allowance has been made for one hour of downtime. All loss ratios throughout the production process have been increased above normal expectations to take account of the learning curve of all personnel.

Estimated revenue

This is based on achieving an export price 10 per cent higher than the domestic price, which from the market survey appears reasonable to expect; due to the 12 per cent differential in the sales tax between Uganda and Kenya.

	Annual Revenue USh (1,000)		
	Uganda	Kenya	Total
Sanitaryware	171,173	188,290	359,463
Wall tiles	147,692	162,461	310,153
Floor tiles	203,077	223,385	426,462
Total net revenue	521,942	574,136	1,096,078
Sales tax	156,583	103,344	259,927
Total gross revenue	678,525	677,480	1,356,005

This is equivalent to: USD 1.52 million (net)
USD 1.88 million (gross)

Distribution System

For the domestic market, irrespective of whether a new site in Mbarara or near Kampala is used for the factory, it is necessary to establish a sales shop and distribution centre in Kampala city. Because the market is so small, the intention is to sell the majority of the products directly from the Kampala shop and factory site. For some of the more remote towns a distributor may be required but the intention would be to keep this to a minimum to maximize returns.

In Kenya, because of the large number of hardware stores, it is necessary to have a salesman stationed in Nairobi to control the distribution of the products in that country. Premises large enough to hold a reasonable stock of products would be necessary, so that the factory could compete more easily with the local producer of tiles and sanitaryware by offering immediate delivery from stock.

Distribution of the sales to the other regional countries would be controlled initially from the Kampala shop, as the level of sales would not justify the establishment of a sales and distribution shop in these countries. Local distributors would therefore be used to develop sales, backed up by regular visits to these countries by the Sales Manager.

Quality of Production

The technology chosen for the factory is traditional and basic, being labour intensive, rather than capital intensive. However in the case of dryers and kilns, these will be provided with automatic programmable temperature control systems, as the quality of production is to be to normal european standards. It is quite possible to achieve these quality standards providing that the training programmes for all personnel are thorough and this has been provided for in the costings of the project. Overseas training for key personnel is vital, so that the quality standards can be maintained consistently at european standards.

1.3 Materials and inputs

The majority of the raw material inputs are available from local deposits, including kaolin, feldspar, silica sand, quartz, plastic clays and talc. Sampling of these materials was undertaken as part of this project by the project team's geologist and the geologist of the Department of Geology and Mines, together with a director of the local sponsor company, Sunrise Ceramics Limited. Initial assessment was made of quality and reserves of deposits and samples of the most likely deposits were air-freighted to Colombo, Sri Lanka for detailed testing at the UNIDO-supported Ceramic Research and Development Centre (CRDC) at Piliyandala.

Raw materials for tiles

It was determined that for wall tile and floor tile production 100 per cent of local materials can be used in their respective body formulations.

A suitable wall tile body formulation was found to be:

	%
Mukwono Ball Clay	33
Buwambo Kaolin	23
Lunya Feldspar	18
Kisinga Talc	14
Diimu Silica Sand	12
Total	100

A suitable floor tile body formulation was found to be:

	%
Mukwono Ball Clay	29
Lunya Feldspar	25
Diimu Silica Sand	24
Buwambo Kaolin	22
Total	100

In addition, it was found that the addition of 2 per cent of Manganese Dioxide to the body with ball clay at 28 per cent and kaolin at 21 per cent gave water absorption results of less than 3 per cent, therefore such tile would be suitable for the severest of climates with freeze-thaw conditions.

Raw materials for sanitaryware

For sanitaryware it was found that the local plastic clays were not suitable as part of the body formulation, as they contained a high percentage of iron bearing compounds. For sanitaryware, therefore, it is necessary to import a proportion of white-firing ball clay, which will amount to approximately 24 per cent of the sanitaryware body mix. This is normal practice on many sanitaryware factories throughout the world, as deposits of high quality white-firing ball clays are relatively few in the world.

A suitable sanitaryware body formulation has been determined as:

	%
Lunya feldspar	30
Buwambo kaolin	25
Diimu silica sand	21
EWVA ball clay	7
Hycast VC ball clay	17
Total	100

Other types of ball clay from different countries may be substituted in the above mix, in which case the proportion necessary may alter slightly from the above formulation.

Other imported inputs will be glazes, Plaster-of-Paris, packaging materials, consumables and cistern fittings. The total annual foreign cost of imported raw materials and inputs will be USD 206,708.

The local costs of all raw materials and inputs will be USD 186,860 which includes 50 per cent of the import duties paid on entry of the foreign inputs to Uganda (50 per cent can be reclaimed, based on exports of 50 per cent of the production).

The sales tax paid on raw materials and inputs amounts to USD 33,374 but this can be reclaimed against the sales tax due to the Government from the sales of the factory.

The factory will obtain its process water from a neighbouring river source and drinking water from the Mbarara municipal supply. Electricity will be a major input, as all kilns must use electricity for firing of the products. Alternative imported fuels, such as kerosene and liquid petroleum gas are expensive and sometimes uncertain in supply. The factory therefore must be provided with an installed capacity of 1,500 KVA.

Summary of raw material and input costs by product

a) Tile raw material and input costs (USD)

Item	Foreign Cost	%	Local Cost	%	Sales Tax	Total Cost
Ceramic raw Material	-		72,220	54.9	7,220	79,442
Tile glaze	41,041	35.9	2,052	1.6	4,514	47,607
Consumables	-		2,000	1.5	200	2,200
Packaging						
- pallets	-		2,200	1.7	228	2,508
- boxes	66,000	57.7	3,300	2.5	7,260	76,560
-polythene	1,254	1.1	63	0.1	137	1,454
Imp. spares	6,000	5.3	300	0.2	660	6,960
Local spares	..		3,000	2.3	300	3,300
Build. Repair	-		1,500	1.1	150	1,650
Water	-		2,000	1.5	-	2,000
Electricity	-		32,981	25.0	-	32,981
Fuel Oil	-		10,000	7.6	-	10,000
Total	114,295	100.0	131,676	100.0	20,871	266,842

The foreign costs of the raw materials and inputs amount to 42.8 per cent (incl. Sales Tax).

b) Sanitaryware raw material and input costs (USD)

Item	Foreign Cost	%	Local Cost	%	Sales Tax	Total Cost
Ceramic raw Material	-		19,498	35.4	1,950	21,448
Imported clay	15,300	16.5	765	1.4	1,683	17,748
Glaze	15,893	17.2	795	1.4	1,748	18,436
Plaster	4,140	4.5	207	0.4	455	4,802
Consumables	4,000	4.3	200	0.4	440	4,640
Packaging						
- pallets	-		1,540	2.8	154	1,694
- polythene	1,540	1.7	77	0.2	169	1,786
Cist. fitting	45,540	49.3	2,277	4.1	4,994	52,811
Imp. spares	6,000	6.5	300	0.5	660	6,960
Local spares	-		3,000	5.4	300	3,300
Build. repair	-		1,500	2.7	150	1,650
Water	-		2,000	3.6	-	2,000
Electricity	-		13,024	23.6	-	13,024
Fuel Oil	-		10,000	18.1	-	10,000
Total	92,413	100.0	55,184	100.0	12,703	160,300

The total foreign costs of the raw materials and inputs amount to 57.7 per cent (including sales tax).

Glaze costs could possibly be reduced in the future by developing fritted glaze bases for the tile and sanitaryware products from local ceramic raw materials but glaze stains would still have to be imported.

Packaging costs could possibly be reduced by sourcing more packaging material from a regional supplier, as the field work determined that there was no domestic manufacturer of cardboard boxes and polythene. The management of the company could also decide to reduce the level of packaging, if they are confident that the consequential damage during transport can be minimized.

Imported items, which are unlikely to be reduced or eliminated by local substitution are the Plaster-of- Paris, Cistern fittings and imported spare parts.

1.4 Location and site

The location of the proposed new project is at Mbarara in south-west Uganda, with an alternative site identified close to Kampala. The basis of this pre-feasibility is based on the Mbarara site for the new factory, as this is the site favoured by the local sponsor company. The Mbarara site is close to a few of the local raw materials, the rest being close to the Kampala area. Mbarara has the advantage that it is in an area designated for additional industrial development and has good water and electricity supplies. The site has good road connections to Kampala, which is the major market area, although the distance from Kampala is a slight disadvantage.

It should be noted that a new factory built in one of the industrial areas of Kampala would have approximately the same Internal Rate of Return, as a new factory sited in Mbarara.

One possible alternative site near Kampala has the advantage of being an existing ceramics factory, African Ceramics Company Limited, which manufactures crockery. This already has much of the site infrastructure and buildings required for tile and sanitaryware production, resulting in capital cost savings. There would also be additional operational cost savings by merging the existing crockery production unit with a tile and sanitaryware unit. This existing factory is currently operated by a Government parastatal and is therefore not attractive for consideration by a private company unless it is privatized. This is under active discussion by the Government, therefore, if a firm decision is made to privatize this company, this site would prove to be more attractive than the Mbarara site.

1.5 Project engineering data for a new plant

The project engineering of the project has been determined by the team on the basis of ensuring that the production process is as simple as possible, using basic standard equipment, which can be easily maintained and repaired in the Ugandan working environment. At the same time the equipment has been chosen to produce high quality products to european standards.

<u>Quality standards</u>

From the market survey work carried out by the team in Uganda and Kenya, it was determined that the majority of purchasers want <u>first quality</u> tile and sanitaryware products to European standards. The designs of the sanitaryware required are modern but not too ornate. The project has therefore been designed on the basis of producing high quality products with as simple a production process as possible, using standard basic equipment raw material and production equipment, which can be easily maintained in Uganda. In the case of the dryers and kilns, these will be provided with <u>automated programmable temperature controllers</u> to ensure that a consistent high quality is achieved in the tile and sanitaryware products.

The factory design includes the following sections:

i) Common raw material storage
ii) Common primary crushing
iii) Common final grinding and mixing

iv) Sanitaryware casting & drying
v) Sanitaryware glazing
vi) Sanitaryware firing

vii) Tiles pressing
viii) Tiles drying
ix) Tiles biscuit firing
x) Tiles glazing
xi) Tiles glost firing

xii) Inspection, testing and reclaiming
xiii) Assembly, packaging and warehouse storage
xiv) Service departments: - mouldmaking for sanitaryware
- common glaze preparation
- common control laboratory

Because of the small size of both the tile production unit and sanitaryware production unit and the need to reduce the capital expenditure to the minimum, it was decided that all tile handling would be manual and that sanitaryware production would be by the <u>traditional bench-casting process</u>, which is labour intensive. Automatic tile handling systems and automatic battery casting systems for sanitaryware are not a viable option for the low volumes of products required by the market in Uganda and the regional countries.

For drying and firing of the products however, the drying and firing systems will be automatically controlled on pre-set programmes, so that the quality of the products can be maintained at a consistent standard. The factory has been designed to manufacture tiles and sanitaryware to european standards, as this is a requirement of the market in both Uganda and the neighbouring countries.

The choice of tile biscuit kilns, tile glost kilns, tile dryers and sanitaryware kiln is dictated primarily by the low production requirements. The only cost effective option is to use modern fibre-lined highly fuel-efficient intermittent kilns with automatic programmable temperature controllers. This will ensure that consistent firing results can be achieved even during the start-up period and that european standards of quality can be maintained. Alternative types of kiln, such as tunnel kilns, roller hearth kilns and skate kilns are only cost effective for much larger volumes of production.

The same argument dictates that tunnel dryers and flat belt dryers cannot be used on this factory for tile and that intermittent chamber dryers are the best cost-effective option for this product. In the case of sanitaryware, because of the low volume of production, the team have decided on traditional in-situ drying in the casting shop, rather than increasing the capital expenditure by incorporating a specialised sanitaryware dryer into the factory.

The building requirements with in-ground mixing and storage arks result in buildings costs of USD 575/m2, which is in the mid-range of current prices in Uganda. The summary of the cost of the land lease premium, building, machinery and equipment capital items is:

	US Dollars		
	Foreign	Local	Total
Land lease premium		5,000	5,000
Site preparation		4,000	4,000
Buildings & civils		1,225,000	1,225,000
Auxiliary service	60,000	170,000	230,000
Plant, machinery	2,773,000		2,773,000
Total	2,833,000	1,404,000	4,237,000

1.6 Plant organization and overhead costs

The proposed new factory is a relatively small production unit with a limited range of two basic products, tiles and sanitaryware. It is therefore proposed that the cost centres for this factory are divided into five main groupings:

i) Tile production cost centre
ii) Sanitaryware production cost centre
iii) Administration and finance cost centre
iv) Sales and distribution cost centre
v) Miscellaneous factory overheads cost centre

It is important to accurately cost both tile and sanitaryware production separately, as each should be assessed as an independent profit centre.

The majority of the overhead costs have been allocated under administrative overhead costs, financial costs and depreciation, according to the requirements of the Manual. However, other overhead costs will be allocated, as follows, under miscellaneous factory overheads:

	Cost (USD)
Leasing costs of Mbarara site	400
Safety items	2,000
Cleaning materials	2,000
Laboratory materials	2,600
Mobile plant running costs	18,400
Maintenance and labour costs (see VIII)	3,100
Total miscellaneous factory overheads	28,500

It should be noted that the administrative overhead cost is high from year 3 to year 7 inclusive due to the costs of a foreign technical manager. A <u>five year</u> term, however, is thought to be absolutely necessary for the technical manager to ensure the success of the factory, due to the high degree of technical knowledge and skills required. This will ensure that the counterpart local General Manager is fully trained in all aspects of operating a ceramics factory before the foreign technical manager leaves the country.

Under the schedule for the working capital for Years 3 - 5, during the period that the factory is building up its production level, the factory overhead costs and the administrative costs must be treated as fixed costs. The 100 per cent capacity in this schedule is the normal feasible capacity, which is realistically achievable on a normal basis in Uganda.

1.7 Manpower

Excluding the board of directors, the total number of local personnel required for the project will be:

	No.
Tile production department	24
Sanitaryware production department	22
General	6
Sales	16
Administration	3
Local total	71

The tile production department requires 2 skilled personnel, 7 semi-skilled and 15 unskilled. The sanitaryware department requires 12 skilled personnel, 7 semi-skilled and 3 unskilled. The general section includes two skilled and 4 unskilled. The sales department, including staff at the factory site, Kampala shop and Nairobi shop requires 2 skilled, 5 semi-skilled and 9 unskilled, the unskilled being the security staff and labourers. The administration department requires 2 skilled and 1 semi-skilled. As the skill level in certain areas of the factory are quite high, it will be necessary for four of the key personnel to have 3 months overseas training, followed by additional training on-site.

Due to the technical nature of ceramics production, a foreign technical manager will be required for a period of five years after the commencement of production to assist the local General Manager in all aspects of operating the factory.

There is an adequate pool of labour for most of the job functions on the factory, both in the Mbarara area and the Kampala area, both of which have a high level of unemployment. However all personnel will have to be trained in their specific duties. A relatively slow build-up to the normal feasible capacity has therefore been estimated with 65 per cent of feasible capacity being achieved in Year 3 of the project, 85 per cent in Year 4 and 100 per cent in Year 5. The feasible capacity is that, which is realistically achievable under Ugandan operating conditions.

Summary of annual costs of labour and administration by product

a) Tiles

	Cost US Dollars		
	Foreign	Local	Total
Direct costs	-	11,850	11,850
50% of Indirect costs	-	1,550	1,550
50% of Administration	43,000	1,858	44,858
Total	43,000	15,258	58,258

b) Sanitaryware

	Foreign	Local	Total
Direct costs	-	11,383	11,383
50% of Indirect costs	-	1,550	1,550
50% of Administration	43,000	1,859	44,859
Total	43,000	14,792	57,792

1.8 Implementation scheduling

The total implementation period for a new site in Mbarara or a new site in Kampala will take a total period of two years before commercial production can commence.

This will include a six month planning and tendering period, followed by a construction period for the civils and building of nine months. During the 3rd six month period machinery and equipment will be installed and tested individually. During the 4th six-month period the final individual testing will be carried out, followed by the process testing. The process testing will be complete by the end of Year 2 of the project.

As the local sponsoring company has no director, who is experienced in the project management or planning of a new industrial enterprise, it is therefore essential that the necessary expertise in these important areas is provided by a foreign consultancy. However, as directors of the sponsoring company would be available for part of the time of the implementation period to assist in the general supervision and local arrangements, this will reduce the time spent on-site in Uganda by the foreign consultants. Continuous contact would be maintained between the consultants and the directors of the company. The estimated costs for the necessary foreign consultants during the two-year implementation period are included in the pre-production capital expenses of the project.

Construction period

The construction, erection and installation supervision will involve the inputs of a foreign kiln engineer for a period of one man-month and two equipment installation engineers for a period of two man-months each. Local supervision by the directors of the sponsor company will be continuous.

Machinery and process commissioning

The supervision of the machinery and process commissioning period will require the services of a foreign project manager for a six-month period and the services of two process engineers for a total of three man-months each. Local supervision by the directors of the sponsor company will be continuous. It is anticipated that the foreign project manager would remain with the company after commissioning has been completed by the end of Year 2, to act as the foreign technical manager, who would assist the local General Manager in the operation of the company.

All other pre-production costs have been identified and costed. These include the labour build-up, arrangements for supplies and marketing, build-up of connections and other preliminary costs. The total pre-production capital expenses amount to :

	USD
Foreign	492,676
Local	129,667
Total	622,343

It should be noted that the implementation period of the project would be reduced by a minimum of one year, if the alternative African Ceramics site near Kampala was used for the project, rather than the undeveloped site at Mbarara. The consequential financing cost savings would be considerable.

The Consultants recommend that the decision on the project should be taken within six months of this report, otherwise many of the financial parameters may have changed to an extent that a complete review of pricing will be necessary and the financial analysis will have to be repeated.

1.9 Financial and economic evaluation of a new plant

1.9.1 Total initial investment costs

	USD
Land and site preparation	9,000
Civil and engineering works	1,455,000
Technology and equipment	2,773,000
Pre-production capital costs	622,343
Total investment costs	4,859,343

1.9.2 Sources of financing

All of the major financing institutions in Uganda and Kenya were visited by the project team to determine, which of the organizations would be prepared to finance the project with local funding and foreign exchange funding, on the assumption that it was viable. The most enthusiastic was the Development Finance Company of Uganda Limited (DFCU), who were willing to finance the project with both equity and loans, subject to meeting strict criteria. The most important was that the project had to have a detailed feasibility study and a proven export potential for its products, otherwise no financing would be given. The East African Development Bank (EADB) also gave loans with the same condition about exports. As we have determined that there is a definite potential for exports to Kenya for approximately half the production of the proposed factory, the project satisfies this criteria of the main sources of finance. Other export potential has also been identified in the other regional markets, including northern Tanzania, Zaire, Ruanda and Burundi, which further improves the chances of funding being arranged by the DFCU.

As all financing institutions require security on the land and buildings, this, in effect, limits the amount of loans, which can be obtained for the project to a maximum of USD 1.4 million. A substantial amount of equity must therefore be placed into the project by the promoters. This has the advantage of reducing the equity-to-debt ratio but leaves the promoters with the problem of raising approximately USD 1.9 million equity in foreign exchange plus USD 1.4 million in local currency. As supplier credits for Uganda are very difficult to obtain, this means that a foreign partner must join the company with the required amount of equity capital.

1.9.3 Project financing

	USD
Equity from promoters	3,259,676
Equity from DFCU	299,667
Total Equity	3,559,343
Loan from DFCU	500,000
Loan from EADB	800,000
Total Loans	1,300,000
Total financing	4,859,343

The impact of the cost of financing and debt servicing on the project proposals is much reduced due to the healthy equity to debt ratio of 63:27, caused by the limits on and the conditions of lending by both the DFCU and the EADB.

The public policy and regulations on the financing of new industrial projects changed in November 1990 with the passing of the new Investment Code. This Code allows all machinery and equipment for new factories to be imported free of sales tax and import duties. Import duties on the inputs required for products, which are exported can be reclaimed and there is a five year tax holiday for Corporation Tax, commencing from the date when commercial production begins.

1.9.4 Total annual operating costs (Year 5)

	USD
Factory costs	435,301
Administration overheads	115,967
Sales and distribution costs	62,813
Operating costs	614,081
Financial costs	164,176
Depreciation	466,834
Total annual production costs	1,245,091

1.9.5 Sales tax and customs duties

All sales tax, which is paid on inputs by the factory, can now be off-set against the sales tax payable to the Government on the sales of products from the factory. This is similar in operation to a value added tax system but the value of sales tax can vary. The sales tax on inputs is currently 10 per cent and the sales tax on sales revenue is 30 per cent. As this is a transfer payment to the Government, the COMFAR analysis uses only the net input cost and the net sales revenue to analyse the financial performance of the project. Under the new Investment Code of November 1990, the import duties on the inputs for exported products can be reclaimed. As 50 per cent of the production is to be exported, only half of the import duties actually paid on foreign inputs are shown in the COMFAR analysis, as part of the local costs. The remaining 50 per cent of duties will be reclaimed from the Customs and Excise Department by the factory.

1.9.6 New Investment Code

a) No customs duties are payable on new capital investment in machinery and equipment.

b) No Corporation Tax for a 5-year period from the commencement of commercial operations.

1.9.7 Inventories

It is necessary to hold three months supply of both imported and local raw materials and spare parts for buffer stock purposes and for testing, in the case of the local raw materials. The technology chosen results in a Work-in-Progress requirements of 7 days and the size of the factory with its chosen product range and sales distribution system will require 7 days of finished stock.

1.9.8 Net Working Capital Requirements

The working capital requirements have been based on the inventory requirements and an average 30 day accounts receivable and 30 days payable. Cash in-hand is estimated at 2.6 per cent of net working capital, operating at 100 per cent normal feasible production capacity.

1.9.9 Depreciation

The current allowable depreciation rates are:

	%
Vehicles	25.0
Machinery & furniture	12.5
Buildings	2.5 - 4.0
Pre-production expenditure	10.0

In the COMFAR analysis we have used a rate of 2.5 per cent for buildings, as buildings in Uganda, once built, are expected to have a useful life of 40 years.

1.9.10 Corporation Tax

Corporation Tax is charged at 40 per cent of taxable profit. Allowances include a one-time allowance of 20 per cent of machinery costs in the first year of production, an Industrial Building Allowance of 4 per cent of the cost of buildings and machinery in the first year and 4 per cent on the residual each succeeding year. Under the new Investment Code there is a five year tax holiday for new companies, commencing from the date of commercial production.

1.9.11 Results of the COMFAR analysis for the new factory

a) Of the total initial investment of USD 4,859,343, USD 3.25 million has to be provided in equity by the promoters, due to the lending limitations and conditions of the DFCU and EADB. Of this USD 3.5 million, USD 2.02 million has to be in foreign exchange.

b) The Net Present Value at 12 per cent is USD 211,071

c) Internal Rate of Return on investment is 12.75 per cent

d) Return on equity plus reserves is 12.72 per cent. As a foreign partner would have to be found by the promoters to provide the foreign equity capital required, this Rate of Return is low but does allow some interest from a potential foreign investor.

e) Despite the very high cash outflows in the early years, however, the project as a whole appears reasonably good, albeit with low returns, with accumulated cashflow becoming positive (ie: payback from cash) in Year 9 of the project (7th production year) and a healthy debt service ratio, even with variations of up to 20 per cent in the Net Cash Flow.

f) Sales prices are the most sensitive variable. A 20 per cent increase in sales prices results in a Rate of Return on investment of 19 per cent and a 20 per cent decrease in sales price would result in a Rate of Return of only 6 per cent.

g) Variations of plus or minus 20 per cent in the initial investment cost and operating costs create IRR ranges of 10 to 17 per cent and 11 to 16 per cent respectively.

h) The breakeven production level is 60 per cent excluding finance and 75 per cent with finance.

i) There is a significant loss, amounting to 60.27 per cent of total sales revenue in the first production year (Year 3), when operating at 65 per cent of normal feasible production capacity. In production year 2, operating at 85 per cent of normal feasible production capacity, there is a small profit, amounting to 5.40 per cent of total sales revenue. In production years 3 - 5 the profitability improves a little to a range of 13.61 - 14.70 per cent of total sales. From production year 6 the profitability becomes respectable, rising from 19.94 - 51.15 per cent of total sales, as the financing costs decline.

It should be noted that for a new site in the Kampala area, the results would be virtually identical, having Rates of Return very slightly lower than that at Mbarara due to the higher cost of land in the Kampala area.

1.9.12 <u>Sensitivity analysis using the African Ceramics Company Limited site near Kampala for the project.</u>

This exercise was carried out by the team, on the hypothetical basis of the promoters utilizing this existing factory, which is located near Kampala, for the tile and sanitaryware instead of building a new factory in either Mbarara or Kampala. Cost savings will be achieved on civil and building costs and machinery costs, due to the merging of the crockery production unit and the proposed tile and sanitaryware project. Capital cost savings of USD 365,000 are achieved, even when the cost of buying all of the crockery production machinery and equipment is included. As the implementation period would be reduced by one year at this alternative site, there would be further savings on foreign supervision during implementation and on finance costs.

There are additional operational cost benefits of merging the two operations to have a three-product factory with tiles, sanitaryware and crockery, rather than a two-product factory with only tiles and sanitaryware. These include savings on operational personnel costs, marketing costs and administration costs. The impact on the Rate of Return would be a significant increase to:

	%
Internal Rate of Return on investment	18.69
Return on Equity plus Reserves	21.33

This alternative is now an attractive proposition, which could interest a foreign company to join with the local promoters and provide the necessary balance of foreign equity for the project. However due to the long time required for the privatization of a company in Uganda, this site will probably not become available for this project.

1.9.13 National economic evaluation for a new factory

The project proposal from the national economic point of view has significant benefits in that it:

i) utilizes local raw materials, which the Government is encouraging and diversifies the industrial base of the country.

ii) produces ceramic tile and sanitaryware products, 50 per cent of which will be sold on the domestic market. All of the tile and sanitaryware sold in Uganda are currently imported. Therefore, the new factory will substitute imports in 100 per cent of its volume of domestic sales, saving foreign exchange for the country at the CIF value of the same volume of imports, thereby assisting the general economy of Uganda.

iii) produces products with considerable added value

iv) earns foreign exchange from the 50 per cent of the production, which is expected to be exported to the regional market, thereby improving the economy of Uganda.

v) acts as an employment generator in an area of high unemployment.

vi) introduces new skills, which do not presently exist in the country, to the labour force.

From the COMFAR Economic Cost Benefit Analysis (ECBA) of the new factory it has been shown that the foreign net cashflow is negative at a discount rate of 12 per cent but the local cashflow is positive. The total net cashflow is positive at USD 285,544.

The economic rate of return of the project is 20.58 per cent, which is quite favourable.

The Absolute Efficiency Test is highly favourable showing a social surplus of USD 10,442,610 over the life of the project. At a 12 per cent discount rate the Present Value (PV) of social surplus is USD 802,644. The new factory is therefore efficient from a national point of view.

The foreign exchange effect of the new factory project is favourable with a net foreign exchange flow of USD 4,756,196, import substitution effect of USD 6,009,249 and an overall foreign exchange effect of USD 10,765,450.

The Net National Value Added for the complete project is determined as USD 11,399,510 from the COMFAR ECBA.

1.10 Conclusions of the Financial and Economic Evaluation

1.10.1 Major advantages of the project

The National economic evaluation from the COMFAR ECBA shows that the new factory is a definite asset for the economy of Uganda, generating and saving foreign exchange, although the financial analysis for the new factory shows that on a strictly commercial basis it is rather marginal, having a rather low IRR on investment and low return on equity.

The export earnings and import substitution savings amount to USD 717,697 per year, or USD 10,108 per employee per year.

It should be stated that there could be some possibility of reducing the local cost of construction by the promoters using their local knowledge and there is also a possibility of reducing the final machinery and equipment cost in an international tender. The rates of return on investment for the new factory would then improve.

In the event that it is found possible for the African Ceramics Company site to be used, the merged project has the added advantage for Uganda that African Ceramics Company Limited itself, which is currently making large losses and which is not really viable with just the single product line of crockery, could be saved and rehabilitated. The proposed tile and sanitaryware project, which would probably find difficulty in obtaining foreign exchange equity funding based on a new site at Mbarara or Kampala, would also be much more attractive. Uganda would then have the opportunity of having a viable ceramics factory producing the three different products of tiles, sanitaryware and crockery on one site.

1.10.2 Major drawbacks of the project

The major drawback of a new factory based at Mbarara or Kampala is that the capital cost is quite high, in relation to the fairly small output, which is required by the Ugandan domestic market and the regional market. Operational unit costs also tend to be high.

The new factory project sited at Mbarara or Kampala appears to be sound from a production viewpoint but is only marginally profitable. The best ways to achieve a higher return are by increasing sales revenues, which is unlikely to be achieved in the current market, or to decrease building and operational costs. The proposed use of the African Ceramics Company Limited site is one option in reducing the capital investment costs of the project and for improving the viability of the project. Other ways would be for the local promoters to use their local knowledge in identifying builders, who would possibly work for the local company at construction rates less than the normal recognized local price.

The international tender of equipment will possibly lead to some reductions in prices, especially if asian and east european suppliers submit tenders, as the prices in this pre-feasibility study are based on western European sources.

1.10.3 Chances of implementing the project and recommendation

On a strict financial assessment, the tile and sanitaryware project established at a new site is profitable on a consistent basis, although the returns are low. Until the local sponsoring company can find the substantial equity requirements in both local and foreign currency, the chances of implementing the project in the near future appear to be poor, especially as the foreign equity will almost certainly have to be provided by a foreign partner.

The chances would improve considerably however, if the capital costs are reduced, by either reducing the local building costs of a new factory, or by using the alternative site of African Ceramics Company Limited, if it were to become available. The latter option would however only be possible, if all interested parties could agree on a suitable package within a reasonable time-frame.

The implementation period would be reduced by one year by using this latter option, as the majority of the buildings already exist, the initial capital expenditure would be lower, even though this would also include all of the plant and equipment for crockery production and the operational unit costs would be lower. However in the meantime, the Consultants recommend that the local promoters should follow up the findings of this pre-feasibility by trying to find building contractors in Uganda, who would build at lower than normal costs, so that the Rate of Return on investment can be improved.

The initial capital investment costs for machinery and equipment could also possibly be reduced at the international competitive tender stage and this would also increase the rate of return to a more acceptable level for a potential foreign investor.

The chances of implementing the project would also improve, if the local promoters could persuade the Government to take into consideration the national economic benefits of having a factory producing tiles and sanitaryware within the country. The large savings on the country's foreign exchange by the direct import substitution of imported tiles and sanitaryware products by locally produced items and also the foreign exchange earnings of the products, which are exported are substantial at a combined total of USD 717,697 per year. This important benefit to the economy of Uganda should be assessed in possible policy decisions that the Government may wish to take.

The chances of the project going ahead would vastly improve, if the level of sales tax on total revenue could be reduced, even if this is for a limited period of, say five years, for the new factory. Any decrease will allow profit margins to be improved and thereby will increase the rate of return to more acceptable levels.

SECTION II

PROJECT BACKGROUND AND HISTORY

II. PROJECT BACKGROUND AND HISTORY

2.1 Project background

The turbulent history of Uganda over much of the past decade has led to a desperate housing situation in the country with few new houses being built up to 1987. It has been estimated that 86 per cent of the population in the urban areas, such as Kampala, Jinja, Entebbe and Kasese live in slums or near-slums. Since 1980 the urban population has been growing at a rate of 5 per cent annually but there has been virtually no new public housing for about twenty years. Whereas construction normally accounts for 3-8 per cent of GDP in developing countries, in Uganda it averages at a mere 0.5 per cent. Several factors have contributed to this situation, one of them being a lack of building materials, such as bricks, roof tiles and roofing sheets, cement, sanitaryware and floor tiles. In keeping with the general tendency to emphasize the role of the private sector in contemporary economics, The Government of Uganda believes that the building materials shortage and the housing problem in general can best be solved by fostering the growth of private sector companies. It has stated that "The Government believes that the most cost effective way of attaining this goal is by encouraging the growth of development and building companies that are locally owned or joint ventures in the private sector and supported by industries producing materials and tools required for the building process"

One field in which both the Government and private sector believe such companies can operate is in the manufacture of tiles and sanitaryware. This belief appears well founded. In the first place, like most construction materials in Uganda, tiles and sanitaryware have to be imported. Being bulky, heavy and fragile commodities, freight costs and breakages are high. Apart from Kenya, none of the countries, which border Uganda, has a viable operation manufacturing tiles and sanitaryware. The factory in Kenya, which is located in Nairobi, is currently still operating under receivership and is producing crockery, sanitaryware and wall tiles for the Kenyan market. Its share of the total market for all products is very small, being no more than 14 per cent for tiles and 10 per cent for sanitaryware. Therefore, not only is there a strong local demand, there is a regional one also, which has now been confirmed by the market study in this pre-feasibility study. Indeed the Ugandans are all too conscious of the need to redress the trade balance with Kenya from where they import much of their requirements but export little. Raw materials for the manufacture of tiles and sanitaryware are available in Uganda and recently good clays have been located close to Kampala. The price of electricity, being mainly generated from hydro sources, is extremely competitive. Finally, it should be noted that the ceramics industry is labour-intensive and a factory can be designed, so that relatively simple machinery and technology can be used for the manufacture of these products to european standards.

UNIDO has always emphasized the building materials industry as one that is well suited to the Least Developed Countries (LDCs). In the case of Uganda, UNIDO has gone further. It has, at the request of the Government, embarked upon a series of complementary projects to assist the industry, including "Pre-investment Study for Industrial Housing Construction Company" and "Assistance in Re-organization of Casements Africa Ltd". This series of projects foreshadows the programming approach recently advocated by the Deputy Director-General of the Department for Programme and Project Development in dealing with industrial development in Africa. The need to urgently implement the housing aspect of the programme is recognized by both the Government and UNIDO.

2.2 Project promotor and/or initiator

The project promotor is a privately owned company, Sunrise Ceramics Limited, P.O. Box 1065, Kampala, which was established in 1989 by four Ugandan citizens, who were extremely interested in developing a ceramics manufacturing facility in Uganda to produce tiles and sanitaryware.

The four founder directors of the company are:

Mr George Kagonyera
Mr Godfrey Nyerwaniire
Mr William Balu-Tabaaro
Mr Jackson Kyrya

Mr Kagonyera is the Minister of Animal Husbandry and Fisheries and is an experienced administrator with many business contacts.

Mr Nyerwaniire is currently employed as a designer in Kampala and is interested in the marketing aspects of the project. Having lived in Kenya for a number of years he is familiar with the Kenyan market practices, in addition to the Ugandan market. While in Kenya Mr Nyerwaniire met Mr Kyrya, another of the directors and discussed the possibility of setting up a production unit in Uganda.

Mr Balu-Tabaaro is a trained geologist and mineral dresser and is familiar with all of the ceramic raw material deposits in Uganda, including Kaolin, quartz, feldspar and ball clays.

Mr Jackson Kyrya is presently working as a production supervisor in Ceramic Industries (East Africa) Limited in Nairobi, Kenya, where he has been employed for some years. This factory produces tableware (crockery), sanitaryware and wall tiles and therefore Mr Kyrya is already familiar with all production aspects of the proposed product range of Sunrise Ceramics Limited. Mr Kyrya has also developed glaze formulations for sanitaryware and tiles from the local ceramic raw materials in Kenya and would therefore be able to assist in the eventual development of glazes from the Ugandan raw materials.

The management team of Sunrise Ceramics Limited therefore has a considerable depth of knowledge about the ceramic raw materials in both Uganda and Kenya and also has actual experience of manufacturing tiles and sanitaryware in the region. This factor is a considerable advantage to Sunrise Ceramics Limited in the establishment of a new ceramics manufacturing facility, as such technical knowledge is extremely important in ensuring a successful operation.

The company has been established with an initial authorized share capital of USh 1.0 million but as of 1st January 1991 none of these shares had been paid-up. The financial resources, which the four directors of Sunrise Ceramics Limited have available themselves for investment is very limited and the intention is to invite other individuals or a perhaps another company to invest in Sunrise Ceramics Limited, so that the company has a sound financial base. At the present time therefore, Sunrise Ceramics Limited is only a shell company with no financial assets and no physical assets, such as buildings or land.

The role of Sunrise Ceramics Limited in this project will be to implement the project, in accordance with the implementation programme detailed in this pre-feasibility study, on the assumption that the project is viable.

2.3 Project history

Mr Godfrey Nyerwaniire, one of the founder directors of Sunrise Ceramics Limited, met another of the founder directors of the company, Mr Jackson Kyrya, some years ago while they were both working in Kenya and it was during this period that they initially discussed the possibilities of establishing a ceramics factory in Uganda to manufacture tiles and sanitaryware. Mr Kyrya had been working in the ceramics factory in Nairobi, Ceramic Industries (East Africa) Limited, for a number of years in a technical and supervisory capacity and had therefore become familiar with the production processes of crockery, sanitaryware and tiles.

On his return to Uganda approximately two years ago, Mr Nyerwaniire discussed the potential of the project with Mr George Kagonyera and Mr William Boro-Tabaaro. Mr Tabaaro confirmed that deposits of the ceramic raw materials required for sanitaryware and tiles did occur in Uganda, although detailed tests had not been carried out on most of them.

The four decided to form a new company, Sunrise Ceramics Limited, all of them becoming directors of the company. The product range of the proposed factory was discussed and because another factory, African Ceramics Limited, which was located near to Kampala was already manufacturing crockery, albeit at a very low rate of capacity utilization, the Sunrise Ceramics Limited group decided not to include that product in the product mix but to investigate the possibilities of manufacturing sanitaryware and tiles in Uganda.

However, Sunrise Ceramics Limited had no precise details of the size of the market, the size of the factory to be established, the technology to be utilized, or the cost of such a project. As the company had no resources to carry out a pre-feasibility study for the project, a request was made to UNIDO in 1989 through the Ministry of Industry and Technology for assistance to be given in carrying out this pre-feasibility study. The feasibility study was carried out by a team of international consultants from Global Ceramics Limited, Northampton, U.K. during the period October 1990 to January 1991.

The pre-feasibility study is based on the UNIDO "Manual for the Preparation of Industrial Feasibility Studies" and the financial and economic analysis has been carried out using the UNIDO "Computer Model for Feasibility Analysis and Reporting" (COMFAR).

Following the completion of the DRAFT FINAL REPORT, a UNIDO mission, including the UNIDO backstopping officer, Mr V. Klykov and the team leader of the Global Ceramics Limited team of consultants, Mr G. J. Smith, visited Kampala from 18th to 23rd February 1991. The purpose of the mission was to brief the local company, Sunrise Ceramics Limited and the Ministry of Industry and Technology on the results and recommendations of the pre-feasibility study and to discuss all aspects of the project. Based on these discussions this Final Report was then prepared.

2.4 Cost of preparatory studies and related investigations

As Sunrise Ceramics Limited had not been able to carry out any pre-investment study of any type, or carry out preparatory investigations, such as site surveys or laboratory tests of the ceramic raw materials, this work forms part of the pre-feasibility study, which is being carried out by UNIDO and the costs of this work are being met by UNIDO. Sunrise Ceramics Limited personnel assisted the contractor's team throughout the field work, working closely with the team members in gathering information and in visiting raw material deposits to make an evaluation and to take samples of the most likely deposits. The subsistence costs for the Department of Geological Survey and Mines' personnel, who accompanied the project team during the field trips for the raw material sampling operation, were met by the Department as a national input to the project.

SECTION III

MARKET AND PLANT CAPACITY

III. MARKET AND PLANT CAPACITY

3.1 Domestic demand and market study

The main generator for the demand of sanitaryware and tiles in the economy is the level of new construction, especially in housing but also in commercial buildings, industrial buildings, hotels and public buildings, such as hospitals and administrative units. The level of refurbishment of existing buildings also affects demand but this is less important in Uganda than in the developed economies of Europe, where refurbishment is often due to a change in fashion, rather than due to damage or defects in the original products. In respect to the demand for sanitaryware, this is also heavily dependent on the supply of piped water to the area where construction takes place, as wash-down water closets demand a reliable water supply and a reliable sewage disposal system. These conditions are normally only met in the main urban centres of Uganda. Some simple sanitaryware designs of squatting pans, which do not require piped water, can however be used in rural areas but while they are healthier than the alternatives of concrete and plastic, the cost of these items in relation to the earnings of the rural population is often the major factor in many countries, which determines whether these items are actually used.

The market survey of the domestic market for tiles and sanitaryware, therefore had to consider all of the above factors and also take into consideration the existing level of imports into Uganda. An estimate as to what extent these imports could be substituted for locally produced tiles and sanitaryware also had to be determined from the field work.

During the early part of the field work, it became apparent from many different sources that many of the authorities, due to the difficulties in the country over the past few years, had incomplete and therefore unreliable information, especially in respect to the imports into the country. The field work therefore concentrated on gathering as much information on the building industry in Uganda and its sources of tiles and sanitaryware from as many different sources as possible, so that the most accurate estimates of demand and potential market from alternative projection methods could be estimated. Interviews were held with:

- private and government employed architects
- private builders
- parastatal building companies
- Government Ministries
- finance institutions
- Customs and Excise
- water and sewage authorities
- city councils
- international agencies
- bi-lateral agencies
- local ceramics factory

The data collected on the local market is as follows:

3.1.1 Local producers of ceramics and potential competitors

Currently there is no local producer of high quality glazed or unglazed ceramic floor tile, glazed ceramic wall tile or ceramic sanitaryware in Uganda. All of these items have to be imported into the country. The main sources for imported tile are from western Europe with small quantities from Sri Lanka. Sanitaryware is imported mainly from western Europe with smaller quantities from eastern Europe, India and China.

a) Uganda Clays

Uganda Clays, a brick factory located at Kijansi, near Entebbe do produce small quantities of pressed red terra-cotta floor tile, sized 150mm x 150mm x 12mm but these are of very poor quality, as they are all underfired and therefore have a low abrasion resistance. Interviews with architects and builders also led to the conclusion that not only was the quality of the product unsatisfactory, the delivery of orders was also poor, so that no-one had any confidence in specifying these tile, even for low-cost housing. These tile were therefore usually purchased by individuals for their own building requirements, when they could not afford imported tiles. The products from this factory cannot be considered to be a significant competitor to high quality glazed tile from the proposed project.

The "white" ceramics sector in Uganda consists of one commercial factory, African Ceramics Company Limited, located close to Kampala, which manufactures crockery and two small studio potteries, which manufacture small quantities of crockery and decorative items.

b) European Community funded potteries

The two small potteries, which have been established with assistance from the European Community under its European Development Fund (EDF) Microprojects unit are located in the Masaka area and the Bushenyi area, both using clays from Rakai in the south-western part of Uganda. A third small pottery may also be established within the next year near Mbale, Tororo under the same scheme. Neither of these two small units, nor the future third unit, can produce tile or sanitaryware, therefore these cannot be considered as competitors of any proposed factory to be established by Sunrise Ceramics Limited.

c) African Ceramics Company Limited

African Ceramics Company Limited was established in 1967 at Kasiyirize, 14 miles east of Kampala on the Jinja road. The factory commenced the production of crockery in 1969 but closed down in 1972, due to the lack of fuel and glazes, technical problems and the political upheaval at that time. The authorized share capital of the company was USh 300,000 but after a revaluation of the assets in September 1989 the share capital was increased to USh 600 million. Bonus shares to the value of USh 399.7 million were issued to the existing shareholders on a no-cash basis, leaving a balance of USh 200 million, which could be sold to new investors.

The factory operates under the Uganda Development Corporation (UDC), which owns 94.6 per cent of the shares, the other shareholders being the Development Finance Company of Uganda Limited (DFCU) with 2.5 per cent and the Industrial Promotional Services (Uganda) Limited (IPS) with 1.2 per cent. The other 1.7 per cent of the shares were originally owned by Interkiln Corporation (USA) but these have since reverted to UDC.

In 1981 a Commonwealth Secretariat team examined the factory and the Uganda Development Bank granted the company a loan of USD 3 million for a rehabilitation scheme. The factory was subsequently commissioned again in July 1985, after the installation of some new kilns and laboratory equipment, 13 years after being closed down. Since 1985 the factory has operated at a very low level of utilization of between 8 and 15 per cent of the nominal potential capacity of 640,000 pieces of tableware (crockery) per year,(or a nominal 574,000 pieces per year with the existing pug-mill capacity).

Consequently the factory has made continuous losses and only survives on Government support. Although the factory has only made crockery since it was established, it was also the intention from the initial design to manufacture sanitaryware at some stage. A few old sanitaryware moulds, which appear in poor condition, are still stored on the factory and in the casting area a small underground slip storage tank, an overhead daily slip delivery tank and a section of a slip casting ring main has been installed. The storage tank and delivery tank are presently being used for the slip storage for crockery.

Even though the factory is not operating well with their single product of crockery, the management of African Ceramics Company Limited would still like to expand into the production of sanitaryware and tiles. However, with a loss of USh 8.0 million showing in the latest accounts for 1988, an accumulated loss to that date of USh 13.5 million and the draft accounts for 1988 showing the company to have a negative net worth and being technically insolvent, the Consultants feel that there is no possibility at all of the company with its present financial structure being able to invest in any new facilities. Although the audited accounts for 1989 and 1990 are not yet available, the unaudited 1989 accounts show a loss of USh 9.1 million.

As of May 1990, the company also had outstanding loans of USh 11.8 million, including an outstanding Uganda Development Bank long-term loan (1984) of USh 7.9 million (including interest) for the initial rehabilitation of the factory, an outstanding Uganda Development Corporation short-term loan of Ush 3.3 million, which is at zero per cent interest and a UGADEV bank short-term loan of USh 0.6 million. Unpaid interest will have since increased the total liabilities.

In addition to these outstanding loans the company has no working capital for salaries, transport, factory consumable materials and normal spare parts. At its present production level the factory will be unable to generate sufficient funds for these items and its debt service requirements and will therefore continue to make losses. Taking all of the above into consideration, the Consultants believe that it is unrealistic for this factory to expand into sanitaryware and tile production with its present lack of resources.

It should be noted, however, that African Ceramics Company Limited is one of the companies, which the Government wishes to privatize. If this takes place, which will obviously require a total financial restructuring of the company to make it attractive for a private company to become interested, a new company could possibly invest in tile and sanitaryware production facilities at some time in the future. The company could therefore compete very well with any new factory established by Sunrise Ceramics Limited, as its unit costs would be lower. It is known that at least one local Ugandan company has shown interest in buying into African Ceramics Company Limited but no definite arrangements had been made up to December 1990.

d) <u>B.K. Enterprises Limited</u>

In addition to the above potential competitor within the ceramics sector, the field work determined that a factory was in the process of being established by a private company, B.K. Enterprises Limited in the industrial area of Kampala for the production of sanitaryware from a resin-bonding process. The factory started production in January 1991. The process utilizes 60 per cent of local raw materials, including sand and clay and 40 per cent of imported resin. A range of coloured stains also has to be imported to colour the resin to the appropriate colour shades for the customers' requirements. The production capacity of the unit was stated by the owners to be 20,000 pieces per year, this being mainly a mix of washbasins, water closets, cisterns, kitchen sinks and drainers, shower trays and baths. It is the intention of the company to sell the products in both Uganda and Kenya and to expand the production facilities in 2-3 years time, if the initial venture proves successful. The proposed selling prices of the products were not disclosed to the Consultants but it was stated that the prices would be lower than the prices of the imported ceramic sanitaryware. However in February 1991, the Consultants were notified that the retail prices of the products were very high, a figure of USh 147,000 being quoted for a wash basin. At this price level, this factory would not be competing against the product range of the proposed ceramic sanitaryware factory.

Approximately half the types of sanitaryware product, which are now being produced by B.K. Enterprises Limited could conceivably compete with the normal range of ceramic sanitaryware products, which this proposed project would produce but only if the prices were reduced to match those of the ceramic products. It is estimated that the annual production of washbasins, water closets and cisterns to be produced by this company could be approximately 3,000 to 4,000 pieces per year. The company therefore should be looked on as a serious potential competitor for this particular sanitaryware product.

However these resin-bonded products do have the disadvantage, when compared with ceramic sanitaryware, of having a slightly softer surface, which can get scratched by many cleaning powders. Where there is a ceramic product available at a similar or lower price, such as in Sri Lanka for instance, market resistance to the resin-bonded type of sanitaryware would be expected to favour the sales of ceramic sanitaryware.

The resin-bonded products have however found a ready market with hotels for the one-piece vanity top and wash basin units, as they have no seal around the basin. Ceramic basins fitted into a vanity top often give problems for hotels, if the seal around the basin fails. In addition, in the event of serious physical damage to the unit, such as large cracks they can be repaired in-situ with coloured resin, whereas a ceramic unit has to be totally replaced.

3.1.2 Data and alternative projection methods

Determination of domestic demand and market size for products

The market survey in Uganda concentrated on obtaining the most up-to-date information on the current state of the building industry in the country and on projections for the market demand next few years from a wide variety of sources. Estimates of the actual realistic market size for the different products were then made, bearing in mind the various constraints in the economy.

a) Tourist-led demand

According to the Ministry of Tourism and Wildlife, the peak year for tourist or business arrivals was in 1971-72 with approximately 85,000 arrivals. At that time the country had up to 3,000 good quality hotel beds available but this has since declined to less than 2,000 beds. The current level of arrivals is 35,000 to 40,000 per year, 90 per cent of which are business arrivals. It is expected that arrivals will gradually increase to approximately 60,000 per year, with 15,000 to 20,000 of this total arriving during the peak period of July and August.

The official plan is for the number of hotel beds to be increased to between 5,000 and 8,000 by 1995 but from our field work this is now accepted, both within the industry and within Government, as being an unrealistic target because of the lack of finance for such projects.

The Government is currently concentrating its resources on the renovation of a number of hotels within the Uganda Hotels Group, the major hotel group in the country and which is controlled by the Ministry of Tourism and Wildlife. Reliance is therefore being placed on the private sector to increase the number of hotel beds in the country. Hotels in the country are typically small, having an average of 50 to 100 rooms but some of those boing built currently are much smaller than this. Reliable estimates of new construction in the private sector are for an increase of no more than 100 beds per year, or two small hotels.

Sanitaryware demand

With an average of 4 pieces of ceramic sanitaryware per room, ie: one water closet, one cistern, one medium washbasin and one pedestal, this equates to a demand for 400 pieces of sanitaryware per year for the guest rooms. In addition would be the sanitaryware requirements for the public areas and staff areas for the equivalent of two small hotels (x 50 rooms). This would be approximately 62 pieces based on the following numbers per small hotel:

Public areas - male:	2 closets, 2 cisterns, 2 medium washbasins, 2 pedestals, 2 urinals
- female:	3 closets, 3 cisterns, 2 medium washbasins, 2 pedestals
Staff areas - male:	1 closet, 1 cistern, 1 washbasin, 1 pedestal, 1 urinal
- female:	2 closets, 2 cisterns, 1 washbasin, 1 pedestal

Total pieces in public areas per hotel = 31

Total pieces of sanitaryware required per year = 462

Tiles demand

In respect to the demand for tiles, assuming that a reasonable standard of finish is to be achieved for the new hotels, the estimated requirements would be approximately:

Floor tiles

	m2
Guest bathrooms 4 m2 x 50 rooms/hotel	200
Public washrooms (2 x 12 m2) + (1 x 8 m2)	32
Kitchen	25
Lobby & terrace	200
Total	457

Total for two hotels (x 50 rooms) per year	914

Wall tiles

Allowing for door spaces and assuming the bathrooms, public washrooms and kitchens are tiled to the ceiling, which is now normal practice in most new hotels, the demand for wall tiles per hotel would be approximately:

	m2
Guest bathrooms 7 x 2.5m x 50 rooms/hotel	875
Public washrooms (13 x 2.5m)2 + (11x 2.5)	92.5
Kitchen 19 x 2.5m	47.5
Lobby & terrace	-
Total	1,015
Total for two hotels (x 50 rooms) per year	2,030

In 1989 the total number of beds on offer in hotels and lodges was stated by the Ministry of Tourism and Wildlife to be 4,128. Of these 1,406 could be regarded as 3 to 5-star category of the standard able to accommodate international visitors without complaint.

The remainder, 2,722 beds in ungraded to 2-star category units, are mainly small guest houses serving district centres and rural towns. These serve domestic and regional business travellers and many of the international back-packers transitting Uganda on their way through Africa.

Public Sector Interests

The Government of Uganda manages 724 beds in 16 units operated by Uganda Hotels Limited, a parastatal company:

No.	Unit name	Location	Bedrooms	Grade
1	Fairway Hotel	Kampala	75	3
2	Crested Crane	Jinja	60	
3	Ripon Falls Hotel	Jinja	38	
4	Mt Elgon Hotel	Mbale	62	
5	White Horse Inn	Kabale	36	
6	Travellers' Rest	Kisoro	16	
7	Mweya Lodge	QE N. Park	76	3
8	Hotel Margherita	Kasese	40	
9	Mountains of the Moon	Fort Portal	30	
10	Masindi Hotel	Masindi	40	
11	White Rhino Hotel	Arua	41	
12	Soroti Hotel	Soroti	38	
13	Lira Hotel	Lira	54	
14	Mt Moroto Hotel	Moroto	44	
15	Rock Hotel	Tororo	50	
16	Acholi	Gulu	24	
		Total	724	

The annual average replacement requirements of the above hotels is very small and is estimated to be approximately:

Sanitaryware	36 pieces
Wall tile	10,700 pieces (150mm x 150mm), or 243 m2
Floor tile	5,300 pieces (150mm x 150mm), or 120 m2

It should be noted that Uganda Hotels Limited does not provide an annual budget for replacement items, therefore it is carried out on an ad-hoc basis, whenever funds are available.

All of the above hotels, except the Fairway and Lira, are listed as potential investment projects by Uganda Tourism Development (UTD) as part of a total package costing USD 35.28 million covering 1,548 beds, ie: a cost per bed of USD 22,790. The Ministry of Tourism and Wildlife expects to produce feasibility studies for all these public investments and to plan investments against the projected market demand, so that Internal Rates of Return clearly exceed the National Discount Rate set by the Ministry of Planning and Economic Development. However none of these projects are imminent, therefore at this time we can only estimate the replacement items as part of the demand for the first year (1991). Assuming that finance for some of the projects is forthcoming from 1992 onwards the following estimated annual potential demand would apply:

<u>Sanitaryware demand</u>

Guest bathrooms	4 pieces x 724 rooms	=	2,986
Public areas	31 pieces x 16 hotels	=	496
	Total	=	3,482

If we assume that this refurbishment takes place over a five year period the potential annual demand would be:

696 pieces/year

However as about 50 per cent of this work would probably be carried out on a supply and fix basis using imported sanitaryware, the actual demand available to a local manufacturer would be:

348 pieces/year

<u>Tile demand</u>

<u>Floor tiles</u>

	m2
Guest bathrooms 4 m2 x 724 rooms	2,896
Public washrooms ((2 x 12 m2) + 8 m2) x 16	512
Kitchen 25 m2 x 16	400
Lobby & terrace 200 m2 x 16	3,200
Total	7,008

Annual potential requirement would therefore be: 1,402 m2

Assuming 50 per cent to be on a supply and fix basis a realistic expectation for a local manufacturer would be:

701 m2 per year

Wall tiles

Allowing for door spaces and assuming the bathrooms, public washrooms and kitchens are tiled to the ceiling, the demand for wall tiles in these hotels would be approximately:

	m2
Guest bathrooms 7 x 2.5m x 724 rooms	12,670
Public washrooms {(13 x 2.5m)2 + (11 x 2.5)} x 16	1,480
Kitchen (19 x 2.5m) x 7	332
Lobby & terrace	-
Total	14,482

The annual potential requirement would therefore be:

2,896 m2 per year

Assuming 50 per cent to be on a supply and fix basis a realistic expectation for a local manufacturer would be:

1,448 m2 per year

The following properties previously managed by Uganda Hotels all require rehabilitation. All were either damaged during the national difficulties during the period 1972-85, or have fallen into such disrepair that they had to be closed. Uganda Hotels Limited is seeking loan finance or joint venture investors for the rehabilitation and re-opening of the following hotels, except for the Imperial and Lake Victoria, which are now in the process of being rehabilitated and should be complete in early 1991:

No.	Unit name	Location	Bedrooms	Grade
1	Imperial Hotel	Kampala	156	3
2	Lake Victoria	Entebbe	150	4
3	Tropic Inn	Masaka	37	
4	Parra Lodge	Murchison	148	4
5	Pakuba Grand Lodge	Murchison	162	4
6	Chobe Lodge	Murchison	62	4
7	Katuram Lodge	Kidepo	100	4
8	Hilltop Hotel	Kitgum	30	
		Total	843	

9	Equatoria Hotel (Operated by UTDC)	Kampala	192
		Grand Total	1,035

Discounting the Imperial and Lake Victoria hotels, which are already being refurbished and therefore require no further sanitaryware or tiles, there are a total of 729 rooms, which require refurbishment plus the public areas of 7 hotels, therefore the potential demand for sanitaryware and tiles for these hotels is estimated at:

Sanitaryware demand

Guest rooms 729 x 4 pieces/room = 2,916 pieces

Public areas (for mean size of 100 beds)
- male: 4 closets, 4 cisterns, 4 medium washbasins, 4 pedestals, 4 urinals
- female: 6 closets, 6 cisterns, 4 medium washbasins, 4 pedestals

Staff areas
- male: 2 closets, 2 cisterns, 2 medium washbasins, 2 pedestals, 2 urinals
- female: 4 closets, 4 cisterns, 2 medium washbasins, 2 pedestals

Total for public & staff areas per hotel = 62 pieces

Total for public & staff areas for seven hotels = 434 pieces.

Total sanitaryware demand = 3,350 pieces

It will take some time for all of this refurbishment to take place and we estimate it could take up to five years from 1992. On this basis the average potential annual sanitaryware demand would be:

670 pieces

However some of these refurbishments would be carried out by contractors on a complete supply and fix contract, in which case the sanitaryware would still tend to be imported, even if a local manufacturer existed. The above potential demand must therefore be reduced to take this factor into consideration and the expectation would be that a local supplier could capture 50 per cent of this market, ie: a total of:

335 pieces per year

Tile demand

Floor tiles

	m2
Guest bathrooms 4 m2 x 729 rooms	2,916
Public washrooms ((4 x 12 m2) + (2 x 8 m2)) x 7	32
Kitchen 50 m2 x 7	350
Lobby & terrace 300 m2 x 7	2,100
Total	5,398

Annual potential requirement would therefore be: 1,080 m2

Assuming 50 per cent to be on a supply and fix basis a realistic expectation for a local manufacturer would be:

540 m2 per year

Wall tiles

Allowing for door spaces and assuming the bathrooms, public washrooms and kitchens are tiled to the ceiling, the demand for wall tiles in these hotels would be approximately:

	m2
Guest bathrooms 7 x 2.5m x 729 rooms	12,757
Public washrooms ((13 x 2.5m)4 + (11x 2.5)2) x 7	1,295
Kitchen (29 x 2.5m) x 7	507
Lobby & terrace	-
Total	14,559

The annual potential requirement would therefore be:

2,912 m2 per year

Assuming 50 per cent to be on a supply and fix basis a realistic expectation for a local manufacturer would be:

1,456 m2 per year

Other Kampala hotel units

No.	Unit name	Single	Double	Suite
1	Kampala Sheraton	-	273	10
2	Nile Hotel	-	24	26
3	Summer Hotel	-	21	1
4	Reste Corner	-	20	5
5	Speke Hotel	15	15	-
6	Silver Springs Hotel	17	11	1
7	Lions Hotel	-	20	1
8	Athina Club House	-	11	1
9	Colline Hotel	-	24	2
10	College Inn	-	20	-
11	Mussy Hotel	-	15	-
12	Lunar Hotel	6	11	1
13	Hotel Rena	-	20	-
14	Tourist Hotel	-	14	-
15	Tourist Motel	2	8	-
16	Antlers Inn	-	21	1
17	Hotel Equatoria	12	10	-
18	Hotel Diplomate	2	13	3
	Totals	54	551	52

Of the above hotels, the Kampala Sheraton and the Nile Hotel have already been fully refurbished over the last 2-3 years, therefore neither hotel will require any further sanitaryware, except for the occasional replacement due to physical damage, which is normally to cisterns. In the case of the Equatoria Hotel, it has a further 90 non-operational rooms to those indicated in the above table, which have to be totally refurbished. This would require a total of 360 pieces of sanitaryware for the rooms plus a further 20 pieces for the public areas, a total of 380 pieces. However, there are no known current plans to carry out this work, therefore we must discount this from the demand at this time. For the above hotels the demand is limited to a small number of replacement items, which is estimated to be no more than 5 per cent per year.

With a total of 657 rooms and an average of 4 pieces of sanitaryware per room, the total pieces in the guest rooms are estimated to be 2,648. In addition there are approximately 31 pieces per hotel in the public areas, a total of 558 pieces

for the 18 hotels. The number of sanitaryware replacements per year will therefore be a maximum of:

5% x 3,206 = 160 pieces

As a proportion of these would still have to be imported to match existing sets, we estimate that no more than 50 per cent would be able to be supplied by a local factory, ie:

80 pieces/year

Replacements of tile are estimated at:

Wall tile 12,000 pieces, or 272 m2
Floor tile 6,000 pieces, or 136 m2

Summary of hotel sector estimated demand

	Sanitary (pcs)	Floor tile (m2)	Wall tile (m2)
New hotels	462	914	2,030
Uganda Hotels (open) replacement	36	120	243
refurbishment	348	701	1,448
Uganda Hotels (closed) refurb.	335	540	1,456
Other Kampala hotels	80	136	272
Total	1,261	2,411	5,449

The above estimates assume that finance for the refurbishment will be provided from 1992 onwards, otherwise the annual totals will be reduced accordingly.

b) Housing-led demand

Kampala City Council area

The field work determined that Kampala City Council did keep accurate records of planning applications in the gazetted areas of Kampala, for which it was responsible. As the figures were not consolidated into categories of different types of building, each planning application for 1989 and 1990 (up to 24th October) was categorized by the Consultants into the groupings shown on Table 3.1 and Table 3.2, so that estimates of tile and sanitaryware demand could be made.

Table 3.1 1989 Building applications to Kampala City Council

Month	Shop	Theatre Church	Extension	House	House & Servants	School	Guest Hse Hotel	W'Hse Factory	Canteen Office	Clinic Hospital	Total
January	-	1	4	48	-	1	1	3	2	2	62
February	1	1	8	65	2	1	-	2	2	-	82
March	4	-	6	63	5	1	-	3	-	-	82
April	4	1	8	100	-	3	-	6	3	-	125
May	-	-	4	84	-	-	-	2	1	-	91
June	3	2	9	106	8	1	1	3	2	-	135
July	1	3	10	121	5	-	1	3	3	-	148
August	5	-	10	134	9	1	1	2	2	2	164
September	4	2	7	101	[illegible]	2	2	7	2	-	131
October	6	2	15	96	2	3	1	5	2	-	133
November	2	1	15	101	10	2	-	5	-	-	136
December	-	2	5	67	1	-	2	-	3	-	80
Totals	30	15	101	1,086	46	15	9	41	22	4	1,369

Table 3.2 1990 Building applications to Kampala City Council

Month	Shop	Theatre Church	Extension	House	House & Servants	School	Guest Hse Hotel	W'Hse Factory	Canteen Office	Clinic Hospital	Total
January	2	3	12	81	-	1	-	4	1		104
February	1	-	6	101	6	1	1	2	-	2	120
March	2	1	11	72	3	5	-	2	2	-	98
April	6	1	10	64	-	-	-	3	1	-	85
May	1	-	13	68	-	-	1	2	1	-	86
June	-	1	1	22	-	-	-	-	1	-	25
July	2	1	9	83	-	-	1	-	-	-	96
August	1	-	5	74	5	-	1	3	1	-	90
September	-	2	8	84	1	1	-	3	-	-	99
October (to 24th)	1	2	1	55	10	-	-	2	-	-	71
Totals	16	11	76	704	25	8	4	21	7	2	874

Information from the planning officers in Kampala City Council and also from architects on the approximate number of pieces of sanitaryware and tiles in different types of building enabled the following potential demand pattern for the gazetted city areas to be established as follows:

Sanitaryware

Building type	Sanitaryware (pcs/unit)	1989 demand	1990 demand
Shop/commercial	4	120	48
Theatre/church/social	8	120	88
Extensions (20% incl S/W)	0.8	80	60
Residential houses	8	8,888	5,632
Res. Hse & servants qtr.	12	552	300
Schools	nil	-	-
Guest house/hotel (small) (16 pc/31 pc, mean 24 pc)	24	216	96
Factory/warehouse	8	328	168
Offices	8	176	56
Clinics/hospital bldgs.	12	48	24
	Totals	10,328	6,472
	Average monthly demand	860	647

Note: the 1990 demand is only for approximately 10 months (to 24th October)

Due to financial constraints school buildings are never fitted with ceramic sanitaryware or tiles in Uganda and this situation is unlikely to change in the near future. For the purposes of this study we can therefore assume that there will be no demand for these products from this sector of the building market.

From the above it appears that the potential demand has decreased quite significantly over the past year by approximately 25 per cent. From conversations with potential private builders visiting the Kampala City Council planning offices, the Consultants were given the impression that many are finding it difficult to raise the necessary finance, especially as prices of building materials have risen rapidly over the past two years in line with inflation, which although it is now lower, was still approximately 28-30 per cent before the latest oil price increases due to the Gulf crisis.

However we must also take account of the fact that the above is only the potential demand from individuals or organizations, who wish to build. Information from the Kampala City Council indicated that up to 40 per cent of building applications, although approved, do not actually go ahead to the stage of building and others take some years to complete. This was stated to be due to financial constraints. The actual realistic market demand under the present conditions is therefore considerably lower than the potential demand and we must therefore reduce the indicated figures accordingly.

A second factor, which must also be taken into account is the fact that, according to the council Building Inspectorate the actual building that goes ahead for residential housing and extensions is actually understated by approximately 30 per cent because many houses are built illegally and are not formally applied for on a building application. This was stated to be due to the high charges of building permits ("Special Application Permits"), which are approximately USh 50,000.

Taking these two factors into consideration therefore, the more realistic demand for sanitaryware in the gazetted Kampala City Council areas, based on planning applications is:

1989	10,328 - 40%	=	6,197
	Plus 30% x (9,320 - 40%)	=	1,678
	Total		7,875
	Average total per month		656
1990	6,472 - 40%	=	3,883
	Plus 30% x (5,992 - 40%)	=	1,079
	Total		4,962
	Average total per month		496

It should be noted that the above only includes the gazetted areas of the city, which are generally more developed in regard to the water and sewage systems infrastructure. The figures do not include the non-gazetted areas of Kampala, where 90 per cent of the population live. While many people in the outlying areas do not have access to piped water and live in slum or semi-slum buildings and therefore have no requirement for sanitaryware or tiles, it is known that some buildings requiring sanitaryware and tiles are built in the better non-gazetted areas and the Consultants attempted to estimate this demand from other sources, including the Ministry of Housing and Urban Development and the Water and Sewage Corporation.

Floor tile

Building type	Floor tile (m2/unit)	1989 demand	1990 demand
Shop/commercial	4	120	64
Theatre/church/social	8	120	88
Extensions (20% incl tile)	0.8	80	61
Residential houses	22	23,892	15,488
Res. Hse & servants qtr	41	1,886	1,085
Schools	nil	-	-
Guest house/hotel (small) (20 rm/50 rm, mean 35 rm)	389	3,501	1,556
Factory/warehouse	8	328	168
Offices	8	176	56
Clinics/hospital bldgs.	62	248	124
	Totals (m2)	30,351	18,690
	Average monthly demand (m2)	2,529	1,868

As with the sanitaryware, we must make the adjustments to this potential demand for the 40 per cent of the construction which does not go ahead and also for the 30 per cent additional illegal residential and extension building to that which is legally built.

			m2
1989	30,351 - 40%	=	18,210
	Plus 30% x (25,858 - 40%)	=	4,654
	Total		22,864
	Average total per month		1,905
1990	18,690 -40%	=	11,214
	Plus 30% x (16,634 - 40%)	=	2,994
	Total		14,208
	Average total per month		1,421

Wall tile

Building type	Wall tile (m2/unit)	1989 demand	1990 demand
Shop/commercial	17	510	272
Theatre/church/social	34	510	374
Extensions (20% incl tile)	3	303	228
Residential houses	34	36,924	23,936
Res. Hse & servants qtr	52	2,392	1,300
Schools	nil	-	-
Guest house/hotel (small) (20 rm/50 rm, mean 35 rm)	750	6,750	3,000
Factory/warehouse	35	1,435	735
Offices	35	770	245
Clinics/hospital bldgs.	52	208	104
Totals (m2)		49,802	30,194
Average monthly demand (m2)		4,150	3,019

Adjusting this potential demand, as for the sanitaryware and floor tile we have:

			m2
1989	49,802 - 40%	=	29,881
	Plus 30% x (39,619 - 40%)	=	7,131
	Total		37,012
	Average total per month		3,084
1990	30,194 - 40%	=	18,116
	Plus 30% x (25,464 - 40%)	=	4,584
	Total		22,700
	Average total per month		2,270

Summary of Kampala City Council (gazetted areas) demand

	1989/month	1990/month	1990 yearly rate
Sanitaryware	656	496	5,952
Floor tile	1,905	1,421	17,052
Wall tile	3,084	2,270	27,240

The above demand figures are for the major market area of Uganda, where a major proportion of houses are being built, not for owner occupation but for investment purposes. As there is a shortage of rental property, especially for foreigners, this trend will continue in the Kampala area. Rentals are always paid in foreign currency and a typical high quality house, costing USh 40 million to build, would command a rental of USD 12,000 - 15,000 per year, giving a payback period of about four years to the investor at the bureau rate of exchange (USD = USh 720). Finishings in these houses, including sanitaryware and tile fixtures are always to European standard.

Kampala metropolitan area

The Ministry of Housing and Urban Development carried out a housing survey of the Kampala Metropolitan area in 1985, this area covering approximately half the urban population of the country. In 1985 the population of Kampala was estimated at 552,400 with an average urban growth rate of 3.8 per cent per year between 1969 and 1980.

Among the findings of this were the fact that on average 1.15 households occupied each housing unit and that the backlog of housing units in Kampala was estimated at 14,887 (16,039 in January 1987). The lack of building materials, such as bricks, roof tiles, roofing sheets and cement was recognized as a major constraint, as was the lack of suitable building finance for the majority of people. Other factors were the high price of building materials relative to the average salary, high labour costs for construction, high land costs and difficult time consuming regulations concerning building approvals. As the population of the urban area was growing rapidly, both due to the 3 per cent annual population increase and due to the migration of the rural population to the urban areas, there was no hope of reducing the housing backlog. The urban population grew at an average rate of 3.8 per cent between 1969 and 1980. More overcrowding of the existing housing stock was therefore inevitable, as was the growth of the slum areas.

The private sector owned 78.4 per cent of the dwelling units of the sample, the Government 12.2 per cent and parastatals 9.4 per cent. Approximately 75 per cent of the housing stock was found to be occupied by tenants, owners or their relatives occupying approximately 25 per cent.

The age of the buildings showed that 34.7 per cent were built before 1965 and 28.7 per cent from 1965 to 1974, which indicates that there could be some demand for refurbishment requirements of tiles and sanitaryware, subject to the level of the disposable income of the households in these buildings. As the general level of disposable income is known to be low in Uganda, expenditure on relatively luxury items, such as replacement tiles and replacement sanitaryware, must also realistically be expected to be low. It is important to note that the survey determined that only 3.9 per cent of the households made any monthly savings.

In terms of flooring, 73 per cent of the households had cemented floors, 22.7 per cent had rammed earth floors and only 3.5 per cent had floors of brick (includes tile). Floors of wood only accounted for 0.7 per cent. As a large proportion of the houses in Metropolitan Kampala do have cement floors, there is a large potential market for floor tiles of both ceramic and PVC. However, from our field work we know that floor tiles of any sort are looked on as a luxury item in Uganda and as the level of disposable income is low only a small percentage of the households with cement floors can be expected to purchase ceramic floor tiles, which cannot compete in price with the PVC tiles.

Piped water within the housing units, which is one of the main factors affecting the demand for sanitaryware, was available to 23.6 per cent of households, while a further 27.8 per cent had piped water outside their dwelling units. Some of these latter households would be expected to install piped water inside their premises, as they improved their homes. This would be affected by the level of their disposable income. Of the other households 21.2 per cent purchased water from water sellers and 27.3 per cent had access to sources other than piped water. The rate at which more households were connected to piped water supplies depended primarily on the amount of funds available from the Government for general improvements and extensions to the water system infrastructure in the urban areas and also on the capability of individual households to pay for a water connection.

The survey also determined that 41.9 per cent of households had individual bathrooms as their bathing facility, 12.5 per cent had shared bathrooms, 4.4 per cent used individual overhead showers, 0.8 per cent used shared showers and 8.4 per cent used bath tubs.

Only 16.1 per cent of households had access to individual water borne toilet facilities, while a further 1.0 per cent shared water borne toilet facilities. 80.5 per cent of households used pit latrines and 2.4 per cent of households had no toilet facilities at all.

The above findings indicate that there is a huge latent demand for improved toilet facilities and that when piped water is supplied to a household unit, the majority of households (approx. 72 per cent) do install water borne toilet facilities in the unit, ie: a total of 23.6 per cent of households had access to piped water within their unit, while 17.1 per cent of households had access to water borne toilet facilities.

This strong link between the provision of piped water supplies and the provision of water borne toilet facilities is one of the most important factors determining the demand for ceramic sanitaryware and therefore the level of new water connections in the Kampala and other urban areas had to be considered to determine what the current demand for sanitaryware in Uganda is on this basis and also the future expected demand. This is therefore investigated further in this report in the section on the National Water and Sewage Corporation.

The intention to build new houses is an important factor in assessing the demand for sanitaryware and tiles and the survey found that 16.0 per cent of the heads of households were seriously intending to build new houses with a permanent structure, 3.5 per cent with a semi-permanent structure and 4.1 per cent with a traditional structure.

The majority, at the time of the 1985 survey were intending to build for their own accommodation, while only about 10 per cent of those intending to build, intended to rent the accommodation. From our field work during the period October 1990 to January 1991, this situation appears to have changed with the majority of those building permanent houses in the Kampala City area having the intention of renting the property for hard currency. This situation is deliberately encouraged by the lending institutions, as some will only give loans on the condition that the new property is not for owner-occupation but that it will be rented out for hard currency.

At the time of the 1985 survey, only 2.6 per cent of household heads had started actual construction, while those who had acquired land and saved some money for building was 7.9 per cent of households heads. 2.3 per cent had mobilized some building materials. Only 1.6 per cent of household heads had borrowed money from commercial banks, Housing Finance Company of Uganda or relatives and friends. Of 598 households intending to build 124 (20.7 per cent) hoped to employ a building contractor, 428 (71.6 per cent) intended to hire local skilled labour to build for them, while 46 (7.7 per cent) hoped to construct the houses themselves.

The major problems facing the household heads in relation to building new houses was stated to be financial limitations (53.6 per cent), supply and cost of building materials (25.6 per cent), cost of labour (5.6 per cent) and land costs (1.5 per cent). Only 13.7 per cent of households saw no need of building new houses, since they already had one.

Other urban areas

In 1983 the Ministry of Housing and Urban Development carried out a survey of ten urban centres with populations of approximately 10,000 or above, including Gulu, Jinja, Kabale, Kabarole, Kasese, Lira, Lugazi, Mbale, Soroti and Tororo.

a) Population size

The populations of the different urban centres were obtained from the 1980 population census and the number of households was estimated on the basis of 5.0 persons per household as follows:

Town	Population	Estimated number of households	% of households
Gulu	14,958	2,990	2.0
Jinja	45,060	9,010	7.0
Kabale	21,429	4,280	3.0
Kabarole	28,806	5,360	4.0
Kampala	458,423	91,680	70.0
Kasese	9,919	1,980	2.0
Mbale	28,039	5,610	4.0
Lira	9,122	1,820	1.0
Soroti	15,048	3,010	2.0
Tororo	16,707	3,340	3.0
Lugazi	10,439	2,090	2.0
Total	657,950	131,170	100

The survey determined that a proportion of households shared dwelling units and the proportion of households sharing was:

Town	Percentage sharing
Jinja	21.5
Tororo	8.9
Mbale	4.4
Soroti	5.7
Lira	9.1
Gulu	14.7
Lugazi	16.8
Kabale	11.5
Kasese	10.7
Kabarole	1.9

Jinja had the largest number of households sharing dwelling units and as this is the major industrial town in Uganda, it draws a significant number of immigrants from the rural areas, who are searching for employment. These immigrants are more likely to leave their families in the rural areas and are more likely to share a dwelling unit with fellow workers.

Kabarole had the least number of households, which shared dwelling units.

b) Type of tenure

The type of tenure determines to what degree the houses are improved and affects the demand for both tiles sanitaryware. Tenants normally cannot improve their rented quarters and it is the owner-occupiers or investor owners that determine, whether a dwelling will be improved or not. The survey determined that the following proportions of owned, rented, leased and free dwellings in the following towns:

Town	Owned	Rented	Free	Leased
Jinja	17.0	71.8	1.8	9.5
Tororo	64.3	30.8	3.8	1.1
Mbale	30.0	63.1	1.5	5.4
Soroti	28.0	44.1	8.1	19.8
Lira	45.2	46.6	0	8.2
Gulu	26.0	52.7	1.5	19.8
Lugazi	18.5	73.8	7.7	0
Kabale	58.0	28.5	2.5	11.0
Kasese	29.2	68.5	1.5	0.7
Kabarole	81.5	13.1	3.8	1.5

Only in Tororo, Kabale and Kabarole do the majority of residents own the dwellings or plots they live on and it would be expected that in these towns the demand for sanitaryware and tiles would be higher proportionally than in other towns, providing that other factors, such as the type of structure, availability of piped water and disposable income is the same. However the report notes that in these three towns the town boundaries have been extended to the rural areas, therefore this is probably a distortion, as these rural areas, enclosed by the town boundaries would not have piped water supplies and would have a low demand for sanitaryware and tiles.

In the survey report it was noted that generally Ugandans initially go to urban centres to earn a living, not to settle on a permanent basis. Urbanization is a relatively recent phenomenon in Uganda and there are still few people who regard urban living as a permanent way of life. The migrants who do obtain money to build a house, would probably build them in the rural areas, rather than in the urban areas. This factor would tend to lead to fewer tiles and sanitaryware being used, as this is highly dependent on the provision of piped water.

c) Type of dwelling

The type of dwelling affects the number of pieces of sanitaryware and tiles, which might be used in the dwelling and therefore the following breakdown of dwellings by type is interesting as it indicates that towns with a high proportion of rooms, in relation to flats or houses would tend to have proportionately fewer requirements for tiles and sanitaryware.

Town	Room	Flat	House
Jinja	27.1	2.6	70.3
Tororo	15.9	2.2	81.9
Mbale	42.3	16.2	41.5
Soroti	47.1	6.6	46.3
Lira	21.9	12.3	65.8
Gulu	32.1	20.6	47.3
Lugazi	47.7	10.8	41.5
Kabale	8.0	0.5	91.5
Kasese	51.5	0	48.5
Kabarole	8.8	0.4	90.8

From the above, providing that piped water was available, it would seem that Tororo, Kabale and Kabarole with the lowest number of room type dwellings should have the greatest proportional usage of sanitaryware and tiles but other factors, which are discussed later, over-ride this benefit. In all the towns covered by the survey, there are very few flats, most people preferring a house. Other reasons are that persons in the up-country towns with the available capital to build blocks of flats is limited. There are also cultural reasons against the construction of flats.

d) Type of structure

The type of structure of the dwelling also determines, whether tiles or sanitaryware are likely to be used in its construction, permanent structures being the ones, where generally the use of these products would be considered.

Town	Permanent	Semi-permanent	Temporary
Jinja	61.6	20.5	17.8
Tororo	25.5	41.5	33.0
Mbale	20.0	59.6	20.4
Soroti	25.7	66.9	7.5
Lira	24.7	56.1	19.2
Gulu	45.0	35.9	19.1
Lugazi	34.6	46.9	18.5
Kabale	30.5	55.5	14.0
Kasese	45.4	33.1	21.5
Kabarole	4.2	66.5	29.2

On this basis Kaboarole, which only has 4.2 per cent permanent buildings would be expected to have a low requirement of tiles and sanitaryware, even though other factors, such as high individual ownership and low numbers of room dwellings favour the use of these products. Jinja, on the other hand, with the highest permanent type of dwelling percentage, which favours the use of tiles and sanitaryware and a medium number of room type dwellings, which therefore tends to be neutral to the demand, also has a low percentage of individually owned dwellings, which would tend to lower the overall demand for these products.

Most of the towns, except Soroti, have around 20 per cent of temporary accommodation and this can be discounted for demand purposes for tiles and sanitaryware. In the case of the semi-permanent structures, a few of the dwellings may be improved to permanent status, in which case the owners perhaps would install tiles and sanitaryware as part of the improvements. On average though few in this grouping would tend to have these products. In most of the towns this type of structure is the most common.

e) Number of habitable rooms per dwelling unit

The results of the survey indicated that the majority of the urban dwellers in the district towns of Uganda occupy single rooms.

Town	Number of rooms					
	1	2	3	4	5	5+
Jinja	41.6	19.4	17.2	10.8	4.6	6.4
Tororo	21.4	18.1	16.5	19.8	8.2	15.9
Mbale	41.9	13.1	11.2	14.2	11.5	8.1
Soroti	40.4	13.2	14.0	14.0	7.4	11.0
Lira	34.2	16.4	16.4	19.2	6.8	6.8
Gulu	33.6	24.4	14.5	16.8	3.8	6.9
Lugazi	48.5	17.7	18.5	10.8	1.5	3.1
Kabale	10.5	14.0	18.5	24.5	9.5	23.0
Kasese	30.1	28.5	19.2	10.0	3.7	8.5
Kabarole	5.0	22.3	21.5	23.1	11.2	16.9

With the exception of Kabale and Kabarole, the largest percentages of households had single rooms. These two particular towns have a high rural population due to the extension of the town boundaries into the rural areas.

In most of these towns the single room type dwellings tend to be some of the worst in the temporary building category and their use of tiles and sanitaryware is negligible.

f) Sources of water

This factor is one of the most important in relation to sanitaryware demand. It is also important in relation to the number of tiles used in the bathroom and toilet areas. The following is a breakdown of the proportions of households with piped water inside the building and other sources of water.

Town	Piped inside	Piped outside	Water seller	Well	Stream water	Rain water
Jinja	39.0	42.7	8.6	7.0	1.1	1.5
Tororo	11.5	11.2	11.5	31.3	2.7	1.6
Mbale	18.5	49.6	13.5	12.3	4.2	1.9
Soroti	24.2	44.1	18.4	7.4	5.9	0
Lira	16.4	11.0	0	71.2	1.2	0
Gulu	29.0	36.6	0.8	32.1	1.5	0
Lugazi	0.8	4.6	39.2	36.2	19.2	0
Kabale	8.5	25.5	1.0	40.0	25.0	0
Kasese	39.2	47.7	6.2	1.5	5.4	0
Kabarole	5.0	23.1	1.5	66.9	2.7	0.8

The survey showed that the number of households with piped water inside the house is very low in most of the district towns and that only in Jinja and Kasese do these percentages rise above 30 per cent. The least served towns are Lugazi and Kabarole, where virtually none of the people have piped water inside the house. On the basis of the water supply therefore the towns of Jinja and Kasese appear to have the best scope for the use of sanitaryware and tiles. Most of the towns do have a significant number of households with piped water outside the building and some of these households would be expected to change to an internal piped supply, as the owners improved their buildings. This would depend on the disposable income of the owner of the building.

g) Sanitation

The type of sanitation used depends on the availability of water and the type of building structure. Water borne sanitation can generally only be provided where piped water is available in the dwelling or on the premises. It is in the urban centres with a relatively high percentage of households with piped water that we are also likely to have a high percentage of households using ceramic sanitaryware and tiles in their bathrooms and toilets.

Town	Water borne	Pit latrine	Bucket	None
Jinja	49.8	41.9	4.4	3.5
Tororo	6.0	84.6	0	9.3
Mbale	18.1	68.8	6.9	6.2
Soroti	21.3	61.8	0	16.9
Lira	19.2	78.1	0	2.7
Gulu	38.2	44.3	0.8	16.8
Lugazi	0	95.4	0	4.6
Kabale	16.0	83.0	1.0	0
Kasese	42.3	52.3	8.8	4.6
Kabarole	3.1	89.6	1.9	5.4

As could be expected the three towns with the highest percentage of households with piped water inside the dwelling have the highest percentage of water borne sanitation and hence the highest use of ceramic sanitaryware. As tiles are also associated with bathroom and toilet facilities, the demand for tiles would be expected to be the highest in these areas.

It should be noted that it is expensive to install the septic tanks and sanitaryware and many people who have access to piped water, either inside or outside the dwelling, do not install water borne sanitation because of the cost. Pit latrines are the dominant form of sanitation in most of the district towns. The survey did note that one factor, which might be responsible for the availability of water borne sanitation was the inclusion of government pool houses in the town. Most of the Government houses have such facilities. In Luganzi, which is not an administrative centre, there are no government houses and none of the survey sample had water borne sanitation.

It was noted that the standard of many pit latrines was poor and that they could pose a health risk to the users and to other people in the surrounding area. Clearly in all of the district towns there is a great need for better sanitation facilities but for water borne sanitation to increase its share, the Government must provide funds for the expansion of the piped water systems in each of the towns. This is an expensive operation and with the limited resources available to the Government improvements to the water systems can only be done gradually. Even though the latent demand for sanitaryware and associated tiles is huge, this will not translate into vast volumes of additional sales of those products, as the increase in the provision of piped water supplies in these district towns is one of the main determining factors affecting the actual demand of the product.

Estimation of sanitaryware and tile demand in district towns

From the information given in the 1983 survey we will try to estimate the demand for sanitaryware based on one of the most important factors, that of the availability of piped water to the buildings and the percentage of dwellings with water borne sanitation in 1983. From the Ministry of Housing and Urban Development 1985 survey, we know that the urban population has been increasing at the annual rate of 3.8 per cent and that the backlog of housing has been increasing, ie: the increase in housing of all types is less than this 3.8 per cent growth rate in the population. Therefore the expectation is that the average increase in the permanent housing stock with piped water and water borne sanitation is not more than the 3.8 per cent general urban population increase. We must point out that as the number of households in each town was estimated from the 1980 population census figure and the average household size of 5.0, this estimate of sanitaryware demand must be taken as an indication of the order of magnitude, rather than a precise figure. Nevertheless it is a useful estimate and can be compared with the estimates made from other sources of information.

Town	Estimated No. of households	% water sanit	No. water sanit	Increase/yr @ 3.8% rate
Gulu	2,990	38.2	1,142	43
Jinja	9,010	49.8	4,487	170
Kabale	4,280	16.0	685	26
Kabarole	5,360	3.1	166	6
Kampala	91,680	17.1	15,677	596
Kasese	1,980	42.3	838	32
Mbale	5,610	18.1	1,015	39
Lira	1,820	19.2	349	13
Soroti	3,010	21.3	641	24
Tororo	3,340	6.0	200	8
Lugazi	2,090	0	0	0
Total	131,170		25,200	957

On the above basis, with an average of 8 pieces of sanitaryware per house, the annual total demand for sanitaryware in the housing sector for the above towns appears to be in the region of:

957 x 8 pieces = 7,656 pieces per year

Similarly the tile demand on the basis of 22 m2 floor tile and 34 m2 wall tile per residential house appears to be in the region of:

957 x 22 m2 = 21,054 m2 floor tile per year

957 x 34 m2 = 32,538 m2 wall tile per year

The above does not include the requirements for other buildings, such as hotels, commercial property and factories.

Demand in Masaka

The Ministry of Housing and Urban Development carried out a similar housing survey in Masaka in June 1988. The cost of housing construction in June 1988 was found to be:

House type	Cost/m2 USh	US DLR/m2 (@ 380 USh)
High Cost	85,000	223
Medium Cost	60,000	158
Low Cost	40,000	105

A high cost home in the Masaka area is a self contained house with water and electricity connections, roof tiles, some joinery and floor treatment. A medium cost house has the minimum of fittings and uses conventional building materials. A low cost house has no fittings and no electrical and water fittings.

These costs should be compared with the average salary of the low income bracket, which constitutes 80 per cent of the population, of less than USh 42,000 per annum (1988). This is sufficient to build only one square metre of a low cost house and shows the immense difficulty most people have of finding sufficient funds to build even a simple house, which would have no water supply and hence no sanitaryware and tiles.

Building materials and components are the major inputs in house construction accounting for 60 per cent of the total cost of construction. Most of the building materials such as timber based products, cement, galvanized corrugated iron sheets and clay products can be made locally. However some of these materials have a high import content of raw materials, such as galvani sheets (90%) and cement (40%). It was noted that all sanitaryware and electrical fittings were imported.

Brick supplies were stated to be erratic and the quality of the products was poor with most being of irregular sizes, so that more cement had to be used in the construction of the buildings, increasing the cost.

The high interest rates charged by the commercial banks of approximately 40 per cent (in 1988), when compared to the inflation rate of 5.6 per cent per month at that time were still attractive to potential house builders but the banks were unwilling to offer house mortgage loans, preferring to lend short-term only.

The total housing stock in the Masaka area in 1988 totalled 110,027, of which it was estimated that 97,000 required upgrading. 9 villages, 6 urban areas and 3 settlements within the municipality were selected for the survey. From this it was estimated that the actual housing requirements for a population of 1,214,000 in the Masaka District by the end of the Housing Plan 1987-2000 would be 12,000 in the municipality, 12,000 for the other urban areas and 135,000 for the rural areas, a total of 159,000 for the complete district. The increase in housing requirements was therefore 48,973 units over the 14 year period or 3,498 units per year on average.

Although the information on the existing housing stock in the Masaka area was incomplete it was estimated that in 1988 the municipality contained approximately 8,252 households, the other urban areas 8,252 and the rural areas 93,523.

In the municipality 50 percent of households have piped water, while 23 per cent, 11 per cent and 12 per cent obtain their water from natural springs, wells and streams respectively. In the other urban areas of the Masaka area two out of every three households draw water from either natural springs or wells. 18.1 per cent have access to boreholes and 4.0 per cent rely on rivers. An insignificant proportion of 1.2 per cent of the households in the other urban centres of the district depend on piped water. In the rural areas piped water networks and bore holes are rare.

Within the municipality one third of the dwelling units is a high cost house, about 25 per cent medium cost and the traditional houses about 40 per cent. In the other urban centres there are no temporary dwellings, the majority are medium cost with 45 per cent, while the high cost constitute only 17.5 per cent of the total and the low cost constitute 37.5 per cent.

In the rural areas 29 per cent of the dwelling units are temporary or non-upgradable traditional units, an indication of the high need for replacement. The majority of the units are low cost, while the high cost constitute only 10.8 per cent of the total in these areas.

In the municipality 20 per cent of the households did not have any sanitation facility, 55 per cent used pit latrines and 25 per cent had water borne sanitation. In the other urban areas 83 per cent had pit latrines, 3.1 per cent used water borne sanitation facilities and the other 14.1 per cent did not have any sanitation facilities. In the rural areas 70 per cent of the households use pit latrines and 30 per cent do not have any sanitation facilities, which shows the need for the training of rural persons for the necessity of proper sanitation facilities.

From the above information it is possible to assess the approximate sanitaryware and tile requirements for the Masaka area. With an estimated 8,252 households in the municipality and 25 per cent of these having water borne sanitation this equates to 2,063 units with water borne sanitation. In the other urban areas with an estimated 8,252 households and 3.1 per cent having water borne sanitation, this equates to 256 households. The total number of households in the Masaka area having water borne sanitation is therefore estimated at 2,319 units (1988).

Using the same growth rate of 3.8 per cent, the number of new units with water borne sanitation per year would be 88 units. On this basis the annual requirements of products would be approximately:

Sanitaryware	8 pc x 88 units	= 704 pieces
Floor tile	22 m2 x 88 units	= 1,936 m2
Wall tiles	34 m2 x 88 units	= 2,992 m2

Demand in Mbale District

In 1983 Mbale was included in the survey of ten district towns and in this report the population of the town was given as 28,039 with an estimated 5,610 households. We must assume that this survey only covered the municipal area of Mbale, not the entire Mbale District.

In June 1990 the Ministry of Housing and Urban Development undertook a survey in the Mbale District, which had a total population of 557,000 persons in 1980, of which 30,500 (5%)

were in the municipality. Other small trading centres, which have grown into gazetted urban areas such as Manjiya, Sironko and Lwakhakha constitute an estimated 5 per cent of the total population of the district. The rural population has been growing at an average rate of 2.8 per cent to register a population of 639,000 in 1990, while the urban population has been growing at an average growth rate of 3.3 per cent. The population of Mbale municipality is likely to be higher than the projected 42,000 in 1990, as the boundaries of the municipality have been extended to cover a total area of 27 square kilometers from the original 14 square kilometers in 1980. Another estimate from the Ministry of Housing and Urban Development gave a 1990 population of 705,000. The current population growth rates for the area are likely to be maintained up to 2000. By the year 2005 Mbale municipality is projected to have a population of 70,000, while the rural areas will have 1.2 million.

The average household size in the Mbale urban areas is 5.6 persons (1982) and that in the rural areas 6.04 persons. The average housing unit density indicates the status of the household sharing a housing unit, which was built purposely to accommodate a single household. In the Mbale rural areas the density is 1.0 household per housing unit, indicating that in the rural areas, it is not a problem of shortage of housing stock but rather that of the quality. In the municipality the average housing unit density was 1.6 households, giving an occupancy rate of 10 persons per housing unit. On this basis there is a housing deficit of 60 units for every 160 households, or 37 per cent.

The existing housing stock of Mbale municipality is 4,375 units for a population of 42,000, while in the rural areas there is a current housing stock of 113,500 housing units. The housing backlog in the municipality is estimated at 2,625 housing units.

The type of housing in the municipality can be divided as 30 per cent traditional, 25 per cent semi-permanent, 35 per cent low-cost, 7 per cent medium-cost and only 3 per cent high cost.

In the rural areas, out of the total housing stock of 113,000 rural units, approximately 50 per cent are traditional, 30 per cent are semi-permanent units, 10 per cent are low-cost, 9.8 per cent medium-cost and only about 1 per cent are high cost.

The total number of high-cost houses in the district from these estimates is therefore approximately 1,260. This figure is subject to some degree of error, as a precise number of high-cost homes in the rural areas was not stated in the survey. The high-cost home, which has piped water, is the type of house which would have sanitaryware and tiles installed.

In the rural areas of Mbale more than 95 per cent of the households use pit latrines as their sanitation arrangement and virtually all of them serve individual households. However in the municipality a different picture emerged from the survey, as it was found that the majority of the households shared sanitation facilities. Water borne toilet systems were used by 37 per cent of households (approx 1,619), while 59 per cent shared pit latrines. The Vent-improved pits (VIP) are not in common use in this area and the District Health Inspector has a programme of educating the people on the advantages of using VIP latrines.

From the survey it is known that approximately 50,000 persons are served by piped water, compared to 17,000 persons who use water borne sanitation. With an average household size of 5.6 persons in the municipality and 6.04 in the rural areas this equates to approximatély 2,833 households using water borne sanitation.

According to the accounts operated by the National Water and Sewage Corporation (NWSC) there are 2,750 recorded domestic consumers in the municipality. In addition approximately 60 housing units are connected to septic tanks. From this information the total of households which could have water born sanitation is 2,810, although it should be pointed out that not all of these would have both water and sewage connections. Illegal water connections however, which are not recorded by the NWSC would be in addition to these figures.

Sanitaryware and tile demand in Mbale District

Although we do not have a precise figure of households in the Mbale district, which have installed water borne sanitation, we can obtain a reasonable estimate from the various information obtained. In the municipality we know that approximately 1,619 households have water borne sanitation and that in total for the district approximately 2,833 households use water borne sanitation, although some of these may share, which reduces actual installations. As the NWSC recorded connections plus septic tank connection are also around this same figure, at 2,810, we can realistically use this as a maximum figure. Actual installations of water borne sanitation then in the Mbale area are therefore somewhere between 1,619 and 2,810.

It should be noted that, although according to the local office of NWSC there are 2,750 domestic connections as of June 1990, at the NWSC head office in Kampala the recorded figure on the monthly "Total Current Connections" sheet for the same month is only 1,011 domestic connections. As MOHUD accepted the figures of the local office as being correct, after field workers had visited the area, we will do likewise for the purposes of this pre-feasibility study, especially as in 1983 the estimated number of households using water borne sanitation was already 1,015.

For the purposes of estimating the sanitaryware and tile demand we will use 2,000 water borne sanitation installations, as a reasonable current figure. The annual increase on this at the 3.3 per cent (June 1990) growth rate for the Mbale municipality indicates that this district will have an annual requirement of 66 water borne sanitation installations. Sanitaryware and tile requirements would therefore be in the region of:

Sanitaryware	8 pcs x 66 units =	528 pieces
Floor tiles	22 m2 x 66 units =	1,452 m2
Wall tiles	34 m2 x 66 units =	2,244 m2

In this area there is the scope for additional demand, if more connections are made to the water and sewage systems but the relatively high cost of a connection, in relation to the normal monthly salary appears to be greatly restricting new connections. The NWSC charges for water are:

Unmetered	With sewer (USh)	Without sewer (USh)
1 tap	2,187	1,250
2 - 4 taps	6,553	3,745
5 - 8 taps	9,833	5,620
> 8 taps	14,750	8,430

Their new connection charges are:

Pipe diam (in)	Water & sewage (USh)	Pipe diam (in)	Sewage (USh)
0.50	45,000	4.00	36,000
0.75	59,000	6.00	45,000
1.00	74,000	>6.00	60,000
2.00	295,000		
>2.00	590,000		

An averaged sized household may be charged a flat rate of USh 12,000 for domestic use for a three month period. This is slightly higher than what a graduate civil servant earns as his monthly salary. A water rehabilitation scheme financed by the World Bank is in progress but the charges by the National Water and Sewage Corporation are too high to be affordable by the majority of the low income households. The charges are a cause of considerable discontent in the area. The justification given for these charges is that the NWSC must raise sufficient revenues to pay back the World Bank loan. Only the small high income bracket will therefore be able to take advantage of the rehabilitation work in the Mbale area. Growth in the water borne sanitation installations and hence sanitaryware and tile demand will therefore probably not exceed the average 3.3 per cent population growth rate of the municipality.

Demand in Bushenyi District

The Ministry of Housing and Urban Development commenced work on a survey of the Bushyenyi District from June 1990 but most of the information is still being analyzed. The information available in November 1990 concerning the types of the housing stock was as follows:

	Estimate 1 %	Estimate 2 %
Traditional	1	14
Upgradeable traditional	44	11
Semi-permanent	30	45
Low-cost	20	22
Medium-cost	4	5
High-cost	1	3
	100	100

These figures obviously must be regarded as provisional, as there are substantial differences between some types of housing. However we can see that the number of high cost houses, which would be the type most likely to use water borne sanitation are very small.

80 per cent of the population do not have easy access to safe drinking water as the supply system broke down in 1977 and has not been repaired. The estimates of the access to water supplies is that only 10 per cent of housing units are connected to piped water, out of which only 67 housing units receive water because the taps have broken in the remaining housing units. The quality of the water is poor as the water purification system is no longer functioning.

The type of toilet facilities provided in this area is:

	%
Pit latrines (individual)	90
Pit latrines (shared)	9
Water borne sanitation	1

Of the pit latrines only 2 per cent are of the improved VIP type.

No precise figures could be given for either the number of households or the number of households using water borne sanitation but as only 67 housing units are connected to a usable water supply, this must be the maximum number, which are currently using a water born sanitation system and the probability is that it is actually less than this.

Because of the poor state of the water system, it is unlikely that there will be many new connections in the near future, especially as many of those who are already connected do not receive water from the system. This means that the demand for sanitaryware and associated tiles will be negligible in this District. Even on the basis of a 3.8 per cent population growth rate feeding the demand for high quality homes, which normally have a water connection, this equates to 3 connections per year or in terms of pieces of products:

Sanitaryware	8 pcs x 3 units	= 24 pieces
Floor tile	22 m2 x 3 units	= 66 m2
Wall tile	34 m2 x 3 units	= 102 m2

Summary of current demand from field work

The following summary of tiles and sanitaryware annual demand is based on the following:

	Sanware (pc)	Floor tile (m2)	Wall tile (m2)
Hotel-led demand (none in Kampala City Council figures)	1,261	2,411	5,449
Kampala City Council (all building types)	5,952	17,052	27,240
Kampala City Council (housing only)	5,552	15,512	23,621
Kampala City Council (other)	400	1,540	3,619
MOHUD - Kampala (housing only)	4,768	13,112	20,264
MOHUD - 10 districts only	2,888	7,942	12,274
MOHUD - 10 districts & Kampala (housing only)	7,656	21,054	32,538
MOHUD - Masaka	704	1,936	2,992
MOHUD - Mbale	528	1,452	2,244
MOHUD - Bushenyi	24	66	102
Sub-total All MOHUD	8,912	24,508	37,876

We can see from the above that the estimated current demand for sanitaryware, floor tile and wall tile for the Kampala City Council in the housing sector from entirely different sources of information and calculation are in quite close agreement. We can therefore confidently assume that the demand is somewhere between these two figures. Placing the mean figures for the Kampala housing sector in the demand table then we have the following total demand picture:

	Sanware (pc)	Floor tile (m2)	Wall tile (m2)
Hotel-led demand (none in Kampala City Council figures)	1,261	2,411	5,449
Kampala housing demand (mean)	5,160	14,312	21,943
Kampala - other buildings	400	1,540	3,619
MOHUD - 10 districts only	2,888	7,942	12,274
MOHUD - Masaka	704	1,936	2,992
MOHUD - Mbale	528	1,452	2,244
MOHUD - Bushenyi	24	66	102
Total	10,965	29,659	48,623

In addition to the above would be small demand quantities from some of the other communities in Uganda but these would not be expected to be more than 5 - 10 per cent of the above totals.

c) Effect of Water supply

In an attempt to further cross-check this demand from other local sources of information the Consultants obtained information on new connections from the National Water and Sewage Corporation for some of the months up to September 1990. Records of earlier years were not available, as they were not previously recorded monthly by the head office, as they are now. The summary of the records is shown in Table 3.3.

These findings are a little disturbing, as the current level of connections for 1990, when converted to numbers of pieces of sanitaryware, assuming an average of 8 pieces per household, result in a much lower demand figure than those obtained from other sources. We can compare the information from the five towns, for which we have information from different sources:

	No. with water borne sanitation 1983	NWSC local 1990	NWSC (HQ) domestic water connections June 1990
Kampala	15,677		16,144
Jinja	4,487		4,552
Tororo	200		767
Mbale	1,015	2,750	1,011
	1988		
Masaka	2,319		752

From this comparison it can be seen that the number of households with water borne sanitation in 1983 is very similar to the number of domestic connections recorded by the NWSC in 1990. As we know that every household with a water connection does not always have a sewage connection also, the figures recorded by the NWSC appear to be low. This is certainly the case in Mbale, where field work by MOHUD in June 1390 confirmed 2,750 connections, rather than the 1,011 recorded in Kampala head office. It is therefore possible that some under-recording of connections by NWSC could take place, as it is known that some illegal connections do take place.

However we must not discount the new connections figures for 1990 in Table 3.3 entirely, even though they may not give the most accurate picture, as they may be indicating a definite slow-down in actual building completions below the forecast demand rate obtained from other sources, much of which is older information.

The latest export figures from the U.K. to Uganda, which are discussed later, do show a marked fall during 1990 also, which did not occur with some of the other countries of the region and this tends to support the evidence of some slow-down since 1969.

Further evidence of a slow-down in the building rate in 1990 was also indicated by our examination of the building applications of Kampala City Council, which were detailed earlier in this section.

Future demand for sanitaryware and tiles will be affected significantly by the rate at which the piped water systems and sewage systems are extended in the urban areas. The National Water and Sewage Corporation have completed a number of technical studies and detailed designs of a number of schemes and tender documents have been prepared for most of them. The approximate costs of the schemes are detailed below:

Project	Anticipated completion	Estimated cost (US DLR, 1,000)
Kampala waterworks	end 1991	16,044
Kampala water distribution	mid 1992	33,317
Kampala sewage	mid 1992	15,071
Jinja water & sewage	early 1992	11,552
Entebbe water & sewage	early 1992	5,692
Mbale water & sewage	early 1992	3,444
Tororo water & sewage	early 1992	2,306
Masaka water & sewage	mid 1992	5,803
Mbarara water system	mid 1992	8,352

Although the above are all supposed to be complete by the end of 1992, many of the projects have still to find funding from either bi-lateral aid sources or the European Community (EC) and World Bank. The EC have promised assistance for the Kampala waterworks, Japanese assistance for part of the Kampala distribution system may be possible and Italian assistance for the Jinja and Masaka pr jects also may be possible but nothing has yet been definitely arranged. None of the other proposed projects have obtained the promise of any assistance.

In view of this the anticipated 1991/2 completion dates appear too optimistic and the actual completion dates are obviously dependent of obtaining the necessary funding. Any significant increases in piped water supplies and sewage systems in the above towns are therefore more likely to take place after 1992 and the consequent increased demand for sanitaryware and tiles due to the new installations in these areas would probably not take place until 1993 onwards, as increased connections took place.

Table 3.3 National Water and Sewage Connections - 1990 (Part)

Month	Kampala	Jinja	Entebbe	Masaka	Mbarara	Tororo	Mbale	Total
January	19	2	3	2	1	5	2	34
February	28	2	4	2	-	4	1	41
March	28	2	7	2	1	2	-	42
April/May	Not available							
June	51	2	4	1	3	1	1	63
July	20	2	20	1	3	1	-	47
August	28	-	15	-	-	-	-	43
September	25	3	6	-	4	2	-	40
Total (7 months)	199	13	59	8	12	15	4	310
Yearly rate	341	22	101	14	21	26	7	532
Est. Demand Sanware	2,728	176	808	112	168	208	56	4,256
Floor tiles (m2)	7,502	484	2,222	308	462	572	154	11,704
Wall Tiles (m2)	11,594	748	3,434	476	714	884	238	18,088

The actual amount of water production per month by the NWSC in early 1990 for the major urban areas against their designed outputs was determined as follows:

Area	Quoted design (Cu M/day)	January 1990 Cu M/day	%	February 1990 Cu M/day	%
Kampala	72,500	51,926	72	49,411	68
Jinja	31,600	25,930	82	21,982	70
Entebbe	7,600	5,926	78	7,011	92
Masaka	6,100	3,136	51	2,860	47
Mbarara	4,700	1,730	37	-	-
Tororo	7,300	3,187	44	3,142	43
Mbale	14,600	4,838	33	5,271	36
Total	144,400	96,673	67	89,677	62

At first sight the above capacity utilization figures indicate that with the possible exception of Entebbe, which has been as high as 92 per cent of capacity, there appears to be a significant amount of spare capacity in the systems to cope with many additional water connections in the existing water infrastructure systems. This would mean that, even if the new water and sewage projects do not obtain funding immediately, the growth in sanitaryware and tile demand being fed from new connections would not be stifled by a lack of water producing capacity.

However this is not the actual picture, as firstly the NWSC do not believe that they can reach the quoted design outputs and in addition power fluctuations make it extremely difficult to reach even the down-rated targets of the NWSC. As it is known that improvements to the electricity generation and transmission systems are taking place in Uganda, this situation should hopefully improve over the next few years, allowing the NWSC to operate its water producing installations closer to their capacity. This would then allow the growth in the annual water connections, and hence an increase in sanitaryware and tile demand, to take place for a few years within the present infrastructure, with the exception of Entebbe, without being stifled by lack of capacity.

The projected growth in the NWSC water and sewage supply systems in the major urban towns from 1989 to 2000 are detailed in tables 3.4 and 3.5. However, from the information obtained during the field work in Uganda about the difficulties and uncertainties of obtaining the finance for the intended water improvement projects the Consultants are of the opinion that these projections are far too optimistic. The projected increase in the population served by water supply installations from 520,000 to 1,355,000 in the 11 year period equates to an average 14.6 per cent per year increase, based on the 1989 year. This rate of increase did not occur in 1990 and is unlikely to occur in 1991 and 1992 unless large amounts of donor funding can be arranged. It would therefore be unwise to project future sanitaryware and tile demand at this rate.

Table 3.4 WATER SUPPLY INSTALLATIONS IN THE YEARS 1989 AND 2000

	1989					2000				
	Population (1000)			Reservoir Storage	Pipe-lines	Population (1000)			Reservoir Storage	Pipe-lines
	Total	Served	%	Cu M/day	km	Total	Served	%	Cu M/day	km
Kampala	705	308	44	45,000	294	1,217	902	74	78,000	493
Jinja	138	87	63	19,900	137	232	174	75	19,900	211
Entebbe	43	21	49	4,900	60	60	51	85	9,400	81
Mbale	39	24	62	9,100	74	54	54	100	9,200	98
Tororo	32	19	59	5,600	33	43	43	100	5,900	57
Masaka	47	39	83	3,600	37	68	68	100	5,200	68
Mbarara	41	22	54	2,200	41	63	63	100	4,900	71
Totals	1,045	520	50	90,300	676	1,737	1,355	78	132,500	1,079

Table 3.5 SEWAGE AND SEWAGE DISPOSAL INSTALLATIONS IN THE YEARS 1989 AND 2000

	1989					2000				
	Population (1000)			Treatment capacity	Pipe-lines	Population (1000)			Treatment Capacity	Pipe-lines
	Total	Served	%	Cu M/day	km	Total	Served	%	Cu M/day	km
Kampala	705	106	15	16,700	122	1,217	248	20	56,700	156
Jinja	138	28	20	9,900	92	232	76	33	16,300	100
Entebbe	43	2	5	540	2	60	10	17	2,500	4
Mbale	39	17	44	3,760	25	54	21	39	6,140	25
Tororo	32	3	10	180	3	43	9	21	1,180	9
Masaka	47	2	4	600	6	68	6	9	1,060	8
Mbarara	41	0	NOT APPLICABLE			63	0	NOT APPLICABLE		
Totals	1,045	158	15	31,680	250	1,737	370	21	83,880	302

a) Owner-occupied dwellings share of Gross Domestic Product

If we examine the share of the GDP taken by owner occupied dwellings from 1981-89 at constant (1987) prices, the increase in the value has been quite constant at around 2.8 per cent per year.

	1981	1982	1983	1984	1985	1986	1987	1988	1989
USh (million)	4215	4324	4455	4580	4708	4841	4975	5115	5259
% increase/yr	-	2.6	3.0	2.8	2.8	2.8	2.8	2.8	2.8
% increase construction	-	12.4	22.4	-4.0	-10.7	-17.8	37.4	29.5	9.3
% growth GDP	-	5.7	7.4	-8.5	2.0	0.3	6.4	7.2	6.6

Source: Statistical Bulletin No. GDP/2, Gross Domestic Product Uganda 1981-1989, Statistics Department, Ministry of Planning and Economic Development

Although we must acknowledge that the statistics are not too accurate, the trend is for a gradual small increase in the value of owner-occupied dwellings at constant prices. Hence we can only realistically expect that the proportion of these additional dwellings using sanitaryware and tiles will grow at around the same rate of 2.8 per cent per year, unless there is a fundamental change in policy on factors affecting housing. It should be noted that the recent overall growth of the GDP in excess of 6 per cent per year has not led to an equivalent increase in the value of owner-occupied housing. This is quite important, as it indicates that the proposed tile and sanitaryware factory should not be built with too much excess capacity, as the current trend is only for slow growth in the housing sector, which is the major market for these products. The other important factor is that the high percentage growth of the construction industry as a whole in 1987 and 1988, following a decline over three consecutive years, showed a marked fall in 1989, indicating that the market for tiles and sanitaryware in the non-housing sector could be softening.

e) Effect of the availability of housing finance

During the field work in Uganda it became apparent to the Consultants that one of the major problems restricting the growth of the housing market and hence the market for ceramic tiles and sanitaryware was the complete lack of any long-term financing for housing for the owner-occupier.

The Housing Finance Company of Uganda Limited now only has the resources to offer about 100 mortgages per year but these are very restrictive. Their priority is to lend only on rental properties, as rents are usually received in foreign currency and they feel more secure in lending to investors, rather than owner-occupiers. Even so they will only lend up to a maximum of 10 per cent of the value of the property. The owner therefore still has to find 90 per cent of the cost of the property from either his own resources or commercial bank loans. Interest rates are approximately 45 per cent per year.

The Uganda Commercial Bank is willing to offer long-term loans for housing but the interest rate is high at 45 per cent. Again they prefer the investor-owner, rather than the owner occupier.

Persons interested in building a house for their own use therefore have to fund the building out of their own earnings, or from loans obtained from relatives or friends. This has the effect of severely reducing the ability to build houses in Uganda. Unlike Kenya, which has many private building societies and also Government parastatals willing to lend to owner-occupiers over periods as long as 25 years, Uganda has no such facilities. Building Societies were common in Uganda up to 1972 but all quickly closed down at that time and until they can be encouraged to return, no significant increase in the rate of house building for owner-occupiers can be expected. The demand for tiles and sanitaryware, therefore cannot be expected to expand quickly in the near future.

f) Tile and sanitaryware demand in rural areas

We have already discussed the effect of piped water on the demand for sanitaryware. In the rural areas there is rarely piped water and the vast majority of people use pit latrines for sanitation, which can be very unhygienic. However it is possible to install ceramic sanitaryware in pit-latrines, such as the non-flush type of very simple asian pans, or the flushing variety, where an overhead tank can be filled with water (by hand if necessary). The ceramic pans are far more hygienic than concrete, fibre glass or plastic alternatives, as they do not scratch like the alternatives and can easily be kept clean. The question of whether they are used or not, usually depends on availability and price.

From conversations with Government people involved in rural communities and also international agency personnel, the unanimous opinion was that, although such a product would certainly be better from health aspects, the rural population in Uganda generally would be unable to purchase the items, therefore the demand would be very low. For this reason we have excluded this asian-type pan from the proposed initial product range. The majority of the rural population would also be unable to afford ceramic wall and floor tile.

However, it should be noted that UNICEF, under their Solid Waste Integrated Programme (SWIP), is currently providing farmers with subsidized cement to make concrete slabs for Vent-Improved pit latrines. Under the programme the farmer must pay only USh 1,200 for the cement, which costs approximately USh 8,000. UNICEF pays the remainder of the cost. As most of the cement is imported into the country, it may, in the future be more beneficial for UNICEF to subsidize the purchase of locally made ceramic pans, rather than imported cement. This could only be discussed, after a factory is in actual production and therefore this product will not be included in the initial range.

g) Health aspects affecting sanitaryware product design

During the field work, the Consultants visited the Kampala City Council Health and Safety Inspectorate to determine the current public health laws concerning the types of water closet, which are allowed to be installed in buildings in Uganda. These are basically the same as those in the U.K. some years ago. Part IV, section 50 (d) of the Public Health Regulations states:

> "every such water-closet shall be cf the washdown type, self-cleansing and provided with a trap having a water seal not less than 2 inches (50mm) in depth and, except in the case of an approved siphonic closet, the outlet of the trap shall not be less than 3.5 inches (89mm) or more than 4 inches (102mm) internal diameter. The pan and trap of such water closet shall be of porcelain ware or well-glazed stoneware."

The Kampala City Council health officers stated that they also personally favoured the washdown type of water closet, as they gave fewer problems than the siphonic type. In view of this and also as the market in both Uganda and Kenya appeared quite happy with the washdown type, this is the type, which is proposed for the proposed project in Uganda. Of the three types of washdown water closet systems,ie: the high-level, low-level and close-coupled cistern systems, the more modern close-coupled type is proposed for the project, as it is acceptable to the health authorities and is also the preferred type on the market.

3.1.3 Estimated Ugandan market penetration by a new factory

From the information obtained during the field work in Uganda, we know that even if a factory was established in the country a large proportion of both ceramic tile and sanitaryware customers would still continue to buy imported products from western Europe, even if they were much more expensive than a locally produced item, due to:

i) Their attitude concerning locally produced items. They would still tend to suspect the quality of the products, even if they were made to european standards. This attitude may change with time, providing that the new factory consistently delivers first quality products from its start-up.

ii) No local factory could hope to offer the wide range of designs and colours, which are available from all of the imported sources. Although the biggest selling colour for both tiles and sanitaryware in Uganda is white, there is demand for colours at the more expensive range of the market.

A local factory should, however easily displace sanitaryware products from China, India and eastern Europe, as these countries have the reputation of producing inexpensive but basic white coloured sanitaryware with older type designs. These countries do not have the quality reputation of the western european countries, therefore they have no price advantage and no status advantage in the market place, when compared with a locally produced item.

In the case of tiles, these are a much more basic commodity with a huge range of choice on the market. Price is usually the most important factor, when comparing similar types of tile, the source being less important. However a local factory could only offer a relatively small choice of tile sizes and colours, in comparison with imported varieties. The overall penetration of the market therefore would be expected to be quite low in respect to wall tile. Floor tile are much less common and the choice is therefore more restricted. A local factory could therefore reasonably expect to obtain a larger market share of this segment of the market.

From the above we would expect a local factory to obtain up to a 50 per cent share of the sanitaryware and ceramic floor tile market in Uganda and approximately 30 per cent of the ceramic wall tile market.

The estimated value of the total annual Ugandan market based on the average retail selling prices (including Sales Tax) is:

	Total annual Ugandan market	Price (USh)	Value (1,000 USh)	Value (USD)
Wall tile	48,623 m2	12,000/m2	583,476	810,383
Floor tile	29,659 m2	24,000/m2	711,816	988,633
Sanitaryware	10,965 pc	43,000/pc	471,495	654,854
		Total value	1,766,787	2,453,870

From our indicated total market demand, the estimated market share would be:

	Total annual Ugandan market	% market share	Annual Market share	Value (1,000 USh)
Wall tile	48,623 m2	30	14,587 m2	175,044
Floor tile	29,659 m2	50	14,830 m2	355,920
Total tile	78,282 m2		29,417 m2	530,964
Sanitaryware	10,965 pc	50	5,482 pc	235,726
			Total Value	766,690

In terms of value therefore, the market share of the Ugandan market of the new factory is expected to be 43.4 per cent, when operating at 100 per cent of normal feasible capacity, which will be from Production Year 3 onwards.

The design of the proposed new factory will therefore be based on the market share of this domestic demand in Uganda, together with the estimated market share of the regional market. As there is no real evidence of high growth rates in demand being possible on a sustained level in the next few years, it would not be wise to build a factory with a capacity too much in excess of the realistic current demand. However the factory will be designed, so that it can easily be expanded at a future date without affecting operational performance.

3.2 Regional demand and market study

The team has considered the regional demand for tiles and sanitaryware in some detail, especially as the domestic market in Uganda is quite small and an additional regional market would enable both capital costs per unit of production and operating costs per unit of production for any factory in Uganda to be reduced.

The team of Consultants have therefore assessed the market for tiles and sanitaryware in all of the neighbouring countries, including Kenya, Zaire, Tanzania, Ruanda and Burundi. During the initial desk research on these markets in Europe, prior to the arrival of the team in Uganda, it was clearly established that Kenya was the major market of the region for both tiles and sanitaryware and because of this, special emphasis on this important market had to be made during the market survey work.

During the early part of the field work in Uganda interviews were held by team members with all of the financial institutions in the country, which were involved in the funding of new projects. Rather surprisingly all of the major institutions involved in development had a firm policy of not financing a project in Uganda with either loans cr equity unless it could export at least a proportion of its production. Because of this important factor, the team of Consultants decided that it was essential to investigate the regional market in more detail than was originally envisaged, as this had become a crucial factor, in determining whether or not the project could obtain funding.

As Kenya had already been determined as the major regional market for tiles and sanitaryware from the work carried out in Europe, the team decided that this market should be investigated in detail, similar to the work already planned for Uganda.

The statistical information obtained from Europe on the regional market, the statistical information from Kenya and also the information on all other market factors concerning this market, which was obtained by the field work in Kenya, are fully detailed in Appendix B of this report.

A brief summary of these findings is as follows:

3.2.1 Regional producers of ceramics and potential competitors

Of the countries neighbouring Uganda, only Kenya currently has factories manufacturing ceramic wall tiles, ceramic sanitaryware, resin-bonded sanitaryware and PVC floor tiles. A ceramics factory was established in Tanzania about five years ago to produce tiles and sanitaryware but it has not been successful. A lack of working capital from the time the factory began operations has been stated to be one major problem at this factory. Obviously, if this can be corrected and the factory starts to produce tile and sanitaryware products in volume, the opportunities for exporting tiles and sanitaryware from Uganda to Tanzania will be reduced.

Kenya only has one factory producing ceramic tiles, ceramic sanitaryware and crockery, Ceramic Industries (East Africa) Ltd and this has been operating under receivership since 1st August 1988. Again, lack of working capital is stated to be one of the major reasons, why the factory is still operating well below its capacity with a current market share of the Kenyan market of 14 per cent of the tile market and 10 per cent of the sanitaryware market. If the receivers are successful in selling this factory to a private company, this market share is expected to rise significantly, which would reduce the opportunities of exports from a factory in Uganda to Kenya.

The only other existing competitor in Kenya is Hermes Enterprises Limited, a factory producing resin-bonded sanitaryware but the products are highly priced and are targeted primarily at hotels. The company cannot be considered a real competitor to a ceramic sanitaryware factory.

3.2.2 Regional Import-export statistics (summary)

a) Statistics for Tiles

i) U.K. Government Tile Export Statistics

From the U.K. Government statistics, the team obtained details of the recent U.K. exports of tile to the region, the summary being:

Year	Uganda (m2)	Kenya (m2)	Tanzania (m2)
1989	34,983	34,490	3,389
1990 (10 months)	865	28,318	1,707

In all cases, the quantities of tile exported to the regional countries is very small but while the average monthly average for Kenya in 1990 appears to have been maintained at approximately 2,830 m2, very similar to 1989, the exports to Uganda have reduced to an insignificant amount in 1990. To determine whether this is due to reduced building activity in Uganda or simply a replacement of U.K. imports by imports from other countries, it was necessary for the team to obtain the export statistics from the other European countries.

ii) European Community Tile Export Statistics

A summary of tile exported to the region in 1989 from the twelve countries of the European Community (see Appendix B for full details) is as follows:

Country	Tile imports Tonnes	m2	Value ECU 1,000	Mean ECU/tonne
Kenya	6,028	648,172	2,080	345
Zaire	3,822	410,968	1,438	376
Tanzania	694	74,624	398	574
Uganda	248	26,666	352	1,419
Ruanda	204	21,935	136	666
Burundi	156	16,774	82	525
Total	11,152	1,199,139		

The above summary shows clearly that the actual imports of all types of tile into Uganda is very small in comparison to the neighbouring countries and in addition the average price per tonne of tiles is far higher than in any of the other regional countries. This could be due to the fact that most importers in Uganda buy through agents, rather than buying directly from the manufacturer.

The 248 tonnes of wall tile imported into Uganda from the European Community is equivalent to only 26,666 m2 of wall tile. The amount of tile imported from other countries amounts to approximately 25 per cent of this total, therefore the total tiles imported into Uganda in 1989 would amount to no more than:

<u>33,300 m2 equivalent of wall tile</u>

In comparison Kenyan imports from the European Community alone in 1989 amount to:

<u>648,172 m2 equivalent of wall tile</u>

This amounts to 76.7 per cent of the total tile imports into Kenya.

iii) Kenyan Government tile import statistics

The summary of tile imports into Kenya from all countries amounts to:

Year	tonnes	m2 equivalent wall tile
1988	5,661.21	608,732
1989 (6.5 months)	2,157.66	232,006

The monthly average in 1989 of 331,947 kg of tile imports is significantly lower than the imports in 1988, which averaged 471,767 kg/month, an approximate 30 per cent reduction. Field work confirmed that the tile market had weakened and that tile importers still had large unsold stocks in late 1990.

iv) Re-exports of tile from Kenya

These are minimal, no re-exports being recorded for the first

6.5 months of 1989 and only 1,150 kg of tiles being recorded as being re-exported in 1988, equating to 124 m2 of wall tile.

Domestic exports from Kenya to Uganda amounted to only 13 m2 of tile in 1989 with none in 1988.

b) Statistics for Sanitaryware

The summary of the regional imports of sanitaryware, the full details of which are shown in Appendix B, are as follows:

i) U.K. Government sanitaryware export statistics

Country	Pieces exported 1989	1990 (10 months to Oct)
Kenya	29,288	31,112
Uganda	4,139	209
Tanzania	592	2,701
Zaire	-	137
Total for region	34,019	34,159

The above shows that while the U.K. sanitaryware exports to the region have shown an overall increase, exports to Uganda have shown a huge reduction. As other countries also export sanitaryware to Uganda, the team also had to determine, whether this reduced level of exports to Uganda was due to less new building or renovation, or whether the decrease was due to a replacement of Ugandan imports from the U.K. by imports from other countries. The recent Eurostat statistics for all of the twelve European Community countries were therefore examined.

ii) Eurostat 1989 sanitaryware export statistics

The statistics of sanitaryware exports from the European Community States to the region, given in terms of tonnes of product, have been converted to numbers of pieces and are summarised as follows:

Country	Pieces imported from EC12, 1989
Kenya	40,955
Zaire	29,926
Tanzania	12,279
Ruanda	6,547
Uganda	5,220
Burundi	1,030
Total regional imports from EC12	95,957

From the above, it is apparent that the regional market for sanitaryware is dominated by Kenya and Zaire. In addition to the imports from the European Community, all regional countries also import from other countries. Kenya imports from India, Eastern Europe and China and it also has its own sanitaryware production unit, which is presently producing approximately 7,872 pieces per year. The total Kenyan market in 1989 appears to be in the region of 95,000 pieces.

Field work in Uganda indicated that approximately 30 per cent of sanitaryware imports are from countries outside the European Community and a further 20 per cent are imported by individuals, the majority of these being smuggled into the country. From these estimates the total quantity of imports into Uganda in 1989 is approximately:

10,440 pieces

Cross-checking of the export statistics from Europe with the import statistics in Uganda proved to be impossible, as the records are incomplete. However additional information was obtained by the team in Kenya.

iii) Kenyan statistics of sanitaryware imports and exports

The summary of total sanitaryware imports into Kenya since 1984 are as follows:

	Pieces
1984	25,957
1985	82,269
1986	64,943
1987	64,412
1988	64,236
1989	44,497 (in 6.5 months)

This figure for imports for the first 6.5 months of 1989 should be compared with the estimated 40,955 pieces of sanitaryware exported to Kenya from the European Community in 1989. In 1988 36 per cent of total Kenyan imports were from the European Community and in 1989 43.3 per cent were from the European Community. The 1989 imports appear higher than normal and based on the more normal level of imports of around 64,000 pieces per year, together with the local manufacture of 7,000 - 8,000 pieces per year, the total normal Kenyan market appears to be approximately 72,000 pieces per year.

Kenyan re-exports and domestic exports to Uganda are minimal, being 590 pieces in 1988 and 334 pieces for the first 6.5 months of 1989.

3.2.3 Factors affecting tile and sanitaryware demand in Kenya

The team considered the effects of the major factors affecting the demand for tile and sanitaryware in Kenya, which from the statistics is clearly the major regional market for any tile and sanitaryware factory in Uganda. The full details are given in Appendix B but a summary of findings was that the tile and sanitaryware market demand indicated from the level of building and construction in the country was:

Wall tile	373,184 m2 per year
Floor tile	241,472 m2 per year
Total tile	614,656 m2 per year
Sanitaryware	87,808 pieces per year

These figures were in the same order of magnitude as those obtained from the more accurate import-export statistics.

The tile and sanitaryware demand generated from the information on water supplies and population growth indicated a tile and sanitaryware demand of:

Wall tile	340,000 m2 per year
Floor tile	220,000 m2 per year
Total tile	560,000 m2 per year
Sanitaryware	80,000 pieces per year

The ready availability of long-term housing finance for the owner occupier in Kenya is one of the major contributory factors in the consistent regular building of new housing units in the country. Potential owner-occupiers in Uganda, in comparison, have no access to long-term finance and this severely restricts the housing market in Uganda.

Availability of land is also being improved in Kenya, which will tend to further stimulate the housing sector in the next few years.

3.2.4 Estimated level of market penetration in regional market

The estimated level of market penetration in Kenya is:

Wall tile	5% x 350,000 m2	=	17,500 m2/year
Floor tile	3% x 230,000 m2	=	6,900 m2/year
Total tile		=	24,400 m2/year
Sanitaryware	7% x 72,000 pc	=	5,000 pc/year

The estimated level of market penetration, which is possible in the other regional countries is estimated at 5 per cent of the total market for both tiles and sanitaryware, ie:

Country	Total tiles m2/year	5% market share
Zaire	535,806	26,790
Tanzania	97,312	4,866
Ruanda	28,602	1,430
Burundi	21,828	1,091
Total	683,548	34,177

Country	Total sanitaryware pieces/year	5% market share
Zaire	46,686	2,334
Tanzania	19,156	958
Ruanda	10,214	511
Burundi	1,607	80
Total	77,663	3,883

For the purposes of sizing the factory, however the team decided to use only the Ugandan and Kenyan markets, the other regional markets being treated as a safety reserve, in case difficulties arose at any time with the Kenyan market.

3.3 Estimates of sales prices of proposed product range

In order to estimate the sales revenues, which can be realistically achieved by a new production unit manufacturing sanitaryware and tiles in Uganda, it is first necessary to establish the volume of annual production, which is realistic on a long-term basis for each product. This has been determined from studying the demand for these products from all aspects in the earlier section. It is also necessary to determine the realistic prices at which the products can be marketed, both on the local market and on the regional export market.

3.3.1 Domestic retail prices in Uganda

All of the ceramic tiles and sanitaryware used in Uganda are currently imported, as there is no local manufacturer. The domestic prices paid therefore include both the import duties and the sales tax, which are added to the CIF price on entry to the country. The tariff rates as of 5th November 1990 were as follows:

	Import duty(%)	Sales tax (%)
Ceramic sanitaryware	30	30
Ceramic wall tiles	30	30
Ceramic floor tiles	30	30
PVC/Vinyl/rubber floor tiles	10	30

The sales tax is calculated on the total of CIF price and import duty. The high duty and sales tax obviously have to be recovered from higher domestic retail prices and therefore tends to restrict the demand for these items within the country.

During the field work in Uganda from October 1990 to January 1991, the current retail prices of the products and the sources of the products were established. Where possible the normal methods of purchasing used by each retailer were also established. Other organizations, such as parastatal companies involved in the building industry were also visited by the

Consultants to determine the prices and volumes of the tile and sanitaryware products they bought. The method of purchasing was also identified.

a) African Hardware Company

Product	size	Origin	Price/box (USh)	Price/m2 (USh)
Ceramic tile	152 x 152mm	U.K.	25,000 (44pc)	25,000
Vinyl/PVC tile	305 x 305mm	Kenya	32,000 (50pc)	7,040
Vinyl/PVC tile	229 x 229mm	Kenya	35,000 (111pc)	5,991

Purchases of all items are made directly from the manufacturers in U.K. and Kenya.

b) Century Enterprises Company

This company currently only sells the high-level and low-level plastic cisterns, type "Compact" from Derwent MacDee, U.K. The cisterns are complete with all fittings.

Price per unit USh 40,000

The plastic cisterns were purchased directly from the manufacturer in the U.K.

In the past the shop has stocked ceramic sanitaryware and tiles but no longer sells these products.

c) Tusabe Mukame Shop, Kampala

Product	size (mm)	Origin	Price/box (USh)	Price/m2 (USh)
Ceramic wall tile	150 x 150	Yugoslavia	10,000 (45pc)	10,000
Washbasin	small	Yugoslavia	25,000/pc	
Washbasin	medium	Yugoslavia	50-60,000/pc	
Cast iron basin	medium	unknown	70,000/pc	

This retailer sells very few ceramic floor tile and is of the opinion that the market for these is quite small.

d) V. Rogers Enterprises Ltd, Kampala

This retailer is one of the largest in Kampala and holds the widest range of tile and sanitaryware products seen in Uganda. Imports are normally purchased from wholesalers or agents in the different supplier countries.

Product	size (mm)	Origin	Price/box (USh)	Price/m2 USh)
Ceramic wall tile	150 x 150	German	15,000 (66pc)	10,000
	150 x 150	Iran	15,000 (66pc)	10,000
	152 x 152	U.K.	25,000 (75pc)	14,666
	Mosaic	Korea		25,000
Ceramic floor tile	200 x 100	Spain		

	5mm thick		23,000 (50pc)	23,000
	5mm thick		24,000 (50pc)	24,000
	200 x 100	Czech		
	7mm thick		18,000 (25pc)	36,000
	300 x 300	Sri		
	7mm thick	Lanka	31,000 (10pc)	34,100
	419 hexag			
	10mm thick	Italy	3,600 (1pc)	20,520
Vinyl floor tile	300 x 300	Japan	25,000 (50pc)	5,500
	229 x 229	Kenya	40,000 (112pc)	6,786
Washbasin c/w taps	medium	Yugosl	40,000	
Washbasin c/w taps	medium	U.K.	90,000	
Washbasin	small	U.K.	30,000	
Pedestal		U.K.	30,000	
Water closet		Yugosl	70,000	
		China	70,000	
WC & Cistern		Yugosl	95,000	
		China	95,000	
Cistern		China	45,000	

Wall tile sell in larger volumes than ceramic floor tile at this shop and approximately one container is brought in each month containing 300 pieces of sanitaryware,ie: an annual import of approximately 3,600 pieces.

The manager noted that there were four or five importers of sanitaryware of the same, or slightly smaller size than his company in Uganda. On this basis the numbers of pieces of sanitaryware imported into Uganda by the main companies would be in the region of 14,400 - 18,000 pieces, if they were all importing at the same rate. However further field work indicated that this company was selling more than the other companies, therefore the total imports would be lower than this rough estimate. The Consultants also attempted to check the number of import licences issued to this company by the Ministry of Commerce. During the period from 6th November 1989 to 20th June 1990 only two licences were issued, one for glazed floor tile from Germany for a total of USh 594,112 and one for mixed building materials from the UAE for USh 865,513, which indicates that the estimate of the manager for his imports was grossly inflated. On the other hand it is known that the licencing system and records of imports cannot be used as accurate assessments of import quantities, as it is acknowledged that there are shortcomings in the system, which are currently being addressed. In view of these facts, we can place little reliability on the accuracy of the above estimate of sanitaryware imports per year based on the information from the company.

e) Do-it-Yourself Hardware Co, Kampala

Product	size (mm)	Origin	Price/box (USh)	Price/m2 USh)
Ceramic wall tile	150 x 150	Dubai	15,000 (66pc)	10,000

The samples of tiles showed to the Consultants, which were plain blue, plain white and floral decorated,, were all second-quality tiles, although the tile were presented as first quality. The price was identical to other stores selling better quality tile from other countries.

f) National Housing Corporation

This Corporation buys its requirements of wall tiles and sanitaryware by means of a tender and recent purchase prices have been:

Product	size (mm)	Origin	Price/box (USh)	Price/m2 USh)
Ceramic wall tile	150 x 150	E. German	16,000 (55pc)	12,800
Vinyl floor tile	250 x 250 2.5 thick	Kenya	600 (pc)	9,600
Washbasin	medium	U.K.	60,000	
Water closet		U.K.	50,000	
Cistern		U.K.	50,000	

The National Housing Corporation recogni that the local tendering method of purchase has its dangers, as price, not quality appears to be the main criterion. Many tenderers are not regular buyers, have no idea of technical specifications and buy from agents in Europe or the Middle East. Sometimes the items are not first quality and when sanitaryware is delivered, it is frequently not in full sets. Coloured items are then impossible to match. This causes problems in construction, as there is no time to obtain additional items and the Corporation then has to fit odd items in the bathrooms, which do not match the rest of the products.

The Corporation would definitely purchase products from a local supplier, if the products were made to the normal European standard.

Ceramic floor tile would normally only be purchased, if they could compete with the PVC tiles from Kenya.

It should be noted that the National Housing Corporation has only built 32 maisonettes during 1990 and these have required a total of 443 cartons (x 55pc) of wall tile, or 1,523 pc/unit (34 m2/unit).

Vinyl floor tiles are used widely throughout the maisonettes built, approximately 143.75 m2 per maisonette. In the event of ceramic floor tile being available only a proportion of the vinyl tile would be replaced by ceramic tile and this would depend on the price of the ceramic tiles.

The quantities of ceramic sanitaryware used in each maisonette are:

Guest bedroom:	1 WC, 1 cistern, 1 small washbasin
Master bedroom:	1 WC, 1 cistern, 1 medium washbasin, 1 pedestal
Main Bathroom:	1 WC, 1 cistern, 1 medium washbasin, 1 pedestal
Ground floor toilet:	1 WC, 1 cistern, 1 small washbasin

The number of pieces of sanitaryware used in 1990 was therefore:

14 pc x 32 = 448 pieces

During 1991 the NHC hopes to build a total of 50 maisonettes, which will require 1,700 m2 of wall tile and 700 pieces of sanitaryware.

g) Uganda Consolidated Properties Limited (UDC subsidiary)

This company is now mainly concerned with managing rental properties, rather than building new houses and only 16 3-4 bedroom houses have been built in the past three years, an average of 5 houses per year. During 1991, the company hopes to build 4 or 5 houses. They purchase their tiles and sanitaryware requirements from agents in the U.K., not directly from the manufacturer. The purchase prices are:

Product	size (mm)	Origin	Price/box (USh)	Price/m2 (USh)
Ceramic wall tile	150 x 150	Italy	8,000 (44 pc)	8,000
Vinyl floor tile	250 x 250 2.5 thick	Kenya	18,000 (25 pc)	11,520
	300 x 300	Kenya	32,000 (50 pc)	7,040
Washbasin	medium	U.K.	40,000	
	medium c/w taps	U.K.	50,000	
Pedestal		U.K.	25,000	
Water closet		U.K.	50,000	
Cistern		U.K.	50,000	

h) Uganda Hardware Corporation

The retail prices for their imported products are:

Product	size (mm)	Origin	Price/box (USh)	Price/m2 (USh)
Ceramic wall tile	150 x 150	Uruguay	13,000 (44 pc)	13,000
	150 x 150	Hungary	13,000 (44 pc)	13,000
Washbasin	medium	Cuba	13,000	
WC + Cistern		Cuba	30,000	
Washbasin & fittings	medium	German	100,000	
Washbasin	medium	German	70,000	

WC & Cistern		German	137,000
WC & Cistern		Indian	100,000
Washbasin	medium	Indian	35,000

The Corporation sells approximately 1,000 pieces of sanitaryware per year, which it estimates is approximately 10 per cent of the requirements of Uganda.

Similarly it sells approximately 10,000 cartons (X 44 pc) of wall tile and floor tile per year, ie: 10,000 m2, which they believe is also about 10 per cent of the market.

Their method of purchase is rather strange, as they buy about 70 per cent of their requirements on the local market from other retailers and import approximately 30 per cent directly. A profit margin of 20 per cent is expected on locally bought items and 25 per cent on direct imports.

Should a factory be established in Uganda, the Corporation would buy from the factory but would expect the selling price to be around 20 per cent less than the Indian prices.

i) Star Import Enterprises

The retail prices are:

Product	size (mm)	Origin	Price/box (USh)	Price/m2 (USh)
Ceramic wall tile	150 x 150	Various	10,000 (44 pc)	10,000
Suite - complete		Spain	400,000	
Steel bath & shower unit		Spain	200,000	
Washbasin & pedestal		Spain	70,000	
Pedestal		Spain	30,000	
WC & cistern		Spain	150,000	

The company sells approximately 22 sets of sanitaryware per month, ie: approximately 88 pieces per month, or 1,056 pieces per year.

Summary of current retail prices in Uganda

	Price range/m2 (USh)
Ceramic wall tiles 150 x 150 x 5mm	8,000 - 25,000
Normal average selling price	12,000
Ceramic floor tile - light duty (5mm)	23,000 - 24,000
Normal average selling price	24,000
Ceramic floor tile - heavier duty (7mm)	34,000 - 36,000
Normal average selling price	35,000
Vinyl floor tile	5,991 - 11,520
Normal average selling price	7,000
Medium washbasin	13,000 - 70,000
Normal average selling price	50,000
Pedestal	25,000 - 30,000
Normal average selling price	30,000
Small washbasin	25,000 - 30,000
Normal average selling price	30,000
Water closet	15,000 - 75,000
Normal average selling price	55,000
Cistern	15,000 - 75,000
Normal average selling price	50,000

3.3.2 Current retail prices in Kenya

The full details of the market survey results on the current pricing of the major Nairobi retailers are shown in Appendix B. Retail prices for most items in Kenya are more than those in Uganda, even though the Ugandan importers appear to be paying higher prices for the imported products and therefore must be accepting lower profit margins.

3.3.3 Comparison of mid-range selling prices in Uganda and Kenya

The following comparison has been based on the bureau exchange rate of USh 720/USD in Uganda and the normal exchange rate of KSh 23/USD in Kenya. Due to the much wider choice of both tiles and sanitaryware in Kenya, than what is available in Uganda, the price range on products such as water closets is particularly wide. In our assessment of the normal average selling price we have tried to judge from our field work, the price around which a majority of the products are being sold.

Product	Uganda USh/m2	Uganda USD/m2	Kenya KSh/m2	Kenya USD/m2
Wall tile - white	12,000	16.67	374	16.26
- coloured	12,000	16.67	900	39.13
Floor tile - light	24,000	33.33	1,000	43.48
- heavy	35,000	48.61	-	-
Vinyl floor tile	7,000	9.72	200	8.70
Medium washbasin	50,000	69.44	1,600	69.56
Pedestal	30,000	41.67	2,750	119.56
Small washbasin	30,000	41.67	900	39.13
Water closet	55,000	76.39	1,200	52.17
Cistern	50,000	69.44	3,000	130.43

The above comparison shows that the standard white wall tile, which sells in large quantities in both countries, is virtually the same price, as are the washbasins, despite a 30 per cent sales tax in Uganda compared with an 18 per cent VAT in Kenya.

The vinyl tile, which are made in Kenya are slightly more expensive in Uganda but not excessively so, bearing in mind the transportation costs, customs duty and higher sales tax.

Pedestals and cisterns are more expensive in Kenya, which probably reflects the much larger choice of the more expensive european sanitaryware, which is available in Kenya. In the case of water closets, a wide range of expensive european closets is also available in Kenya but in addition there is also a large quantity of plain white water closets from the low-cost producers of India and China on the market. These are not so prevalent in Uganda.

During conversations with the retailers of tiles and sanitaryware in Kenya, the general opinion was that a factory in Uganda would have to produce products for the low to medium price range of the market, as the products, even if made to european standards would not command such a high price as the imported items. Because the imported products have a good reputation for quality, people are still prepared to buy them even though the price is inflated by the 45 or 80 per cent import duty and 18 per cent value added tax. It was pointed out that the local tile and sanitaryware factory in Nairobi had a poor reputation for quality and has never been able to match european standards of quality since it began operations. It was also pointed out that the ceramic tile and sanitaryware factory in Tanzania had never been successful. It will therefore take time for a new factory in Uganda to establish a reputation for producing quality products.

Although the majority of hardware stores in Nairobi stock PVC/rubber floor tiles of various types, very few stock ceramic floor tile. This is probably due to the ready availability of these tiles in Kenya, as there are three factories producing these products in the Nairobi area. The vinyl tiles are well established in the market place and are available at a reasonable price, which ceramic floor tiles could not match. The general opinion was that even if ceramic floor tile were made in Uganda, the demand for them in Kenya would be quite small. Ceramic wall tile, on the other hand, would find a ready market in Kenya, if the price was competitive with the other imported tile and the quality was to european standards.

3.3.4 Effect of Preferential Trade Area (PTA) on prices

The current situation regarding import duties placed on Ugandan exports to Kenya is a little confusing, as each company has to negotiate terms separately. Companies which are 100 per cent Ugandan owned will be currently charged at the lowest rate of 10 -12 per cent. Those companies with foreign shareholdings will be charged a higher rate on a sliding scale dependent on the share of the foreign element but this will still be below the rate charged on imports from outside the PTA area. By 1993 the aim is to have no duties charged between member states of the PTA but there seems some doubt, as to whether this will be achieved. Obviously, if the high protective import rates remain on imports from outside the PTA, it offers the local manufacturers the scope to increase their profitability, or to reduce prices.

3.4 Proposed product range for a Ugandan factory

From the field work in both Uganda and Kenya, the Consultants believe that the tile range of products should consist initially of:

i) Glazed wall tile, size 150mm x 150mm x 5mm
ii) Glazed floor tile, size 100mm x 200mm x 10mm

Both of the above items, which are basic products in any tile market, would find a market in Uganda but wall tiles would be the major product in terms of square meterage sold. In Kenya the floor tiles would be a relatively minor product due to the prevalence of the less expensive vinyl floor tiles in the country. The concentration in Kenya would therefore definitely be on wall tiles.

The range of tiles on the international market today is vast, both in term of size, thickness and shape and also in terms of the decoration applied. Wall tile are always glazed but floor tile can be sold in both the unglazed and glazed forms. Glazing can take many forms, including single colour glazing, or multi-colour glazing, where one or more secondary colours are applied to the base colour coat. The method of application of the secondary colours can also vary to give different effects, such as by spray glazing (intermittent or continuous) or by disc applicators, which throw larger sized glaze particles on to the tile passing beneath the rotating disc unit.

In addition to decoration by glazing are the decoration techniques of applying patterns by either transfers or by the more common method of screen printing.

A range of some typical tiles on the market are shown in Appendix F (pages 480 - 500), including:

a) Sphinx, Holland

The CANYON range in a selection of different sizes is based on a speckle coloured effect with ten different base colours.

b) CCA, Angola

Typical screen printing patterns are shown together with a multi-coloured effect.

c) Villeroy & Boch, Germany

The ASTOR range shows a basic base colour with shading effects caused by a second lighter colour application.

d) CISA, Italy

This company makes single colour and multicolour wall tiles, such as the CISAKER and screen printed tile such as the ATELIER, MERIDIANA, which have a multicolour base.

e) Laufen, Switzerland and Germany

This company manufactures glazed floor tile, such as the OLYMP range, which are based on single colours.

f) Buchtal, Germany

The FERRUM range of floor tiles of this company is based on a selection of single colours. The company also manufactures a wide range of unglazed floor tile. Sizes include 194 x 94mm, 194 x 194mm, 194 x 144mm, 240 x 115mm and 240 x 240mm.

g) Lafaenza, Italy

This company manufactures a range of unglazed floor tile, such as ARROTATO, in a wide range of sizes, such as 100 x 200mm, 200 x 200mm, 75 x 310mm and 500 x 500mm. A glazed floor tile range is also manufactured using primarily single colours.

h) Ceramiche Paola S.p.A, Italy

This company manufactures a wide range of wall tile using single colours, multi-colours and screen printing, such as the RAINBOW range.

From the limited range of tile, which are shown in Appendix F, it can be seen that such a wide variation of tile exists on the international market, that it is quite impossible for a small capacity tile factory to try to manufacture all different types of tile size, shape and decoration. From the field work in Uganda, it was established that the standard white glazed 150 x 150mm wall tile was always in constant demand and the retailers thought that this would remain so. Coloured tile, whether single colour, multi-colour or screen printed would also sell but the determining factor was whether the tile were carried in stock by the retailer.

From the market information obtained from retailers, builders, architects and parastatal purchasers, the team determined that the best product range for the tile plant would be a standard 150 x 150mm size format for the wall tiles and a 100 x 200mm size format for the floor tile. Wall tile would be produced in plain white, other plain colours and a range of multi-coloured tile. The glaze line has therefore been specified with this product range in mind. No screen-printing facility is required for the initial product range. The floor tile will be primarily single colour but, if required by the customers, multi-coloured floor tile could easily be produced. Unglazed floor tile would be produced, when required by customers.

The sanitaryware range of products of the new factory should consist of a reasonably modern but basic range of items, including:

- i) Medium washbasin
- ii) Pedestal to match medium washbasin
- iii) Small wall-mounted washbasin
- iv) Water closet, close-coupled washdown type
- v) Cistern to match close-coupled water closet

All of the above items are in good demand in both Uganda and Kenya.

Some typical European and USA sanitaryware products from a wide range of manufacturers are shown in Appendix F (Pages 501 - 629). The design chosen by the promoters obviously cannot be copied from an existing manufacturer, unless a licencing agreement for a particular range can be arranged. If a new design has to be commissioned, the following comments on the sanitaryware ranges shown in Appendix F would assist the designer to work on a new model range around the designs, which, from the team's market survey work, would be acceptable to the majority of Ugandan customers.

a) <u>Shires Bathrooms Limited, U.K. (see Pages 501 - 511)</u>

The NAIAD II range, consisting of a washdown close coupled water closet with horizontal outlet, together with the medium washbasin (500mm x 410mm) is a basic well established range, which is easy to manufacture and something similar to this design would be perfectly acceptable to the Ugandan market. A small wall mounted cloakroom washbasin similar to the NEWBY basin (510mm x 320mm), or the ASHBY II basin (450mm x 290mm) would be suitable for the Ugandan market.

The SELBY II basin is a corner mounted basin and would have a more limited market, therefore this type is not recommended for the initial sanitaryware product range. Similarly the very small ASHBY II basin (350mm x 275mm) would have a smaller customer base - the 450mm x 290mm size is more preferred in Uganda.

The DENBIGH washdown suite is less favoured, as it is a low-level and high-level design, rather than a close-coupled design. While meeting all the technical requirements of Uganda, customers generally prefer the more modern NAIAD II range. The DENBIGH washbasin and pedestal would, however, be perfectly acceptable.

Of the other designs, the CAROSEL washdown range would also be acceptable in Uganda. In all cases, the smaller of the two types of pedestal washbasin would generally be prefered in Uganda.

The siphonic designs, such as the modern OPUS and more established PRELUDE, find less favour than washdown types with the health authorities in Kampala, although they do not prevent their installation. The siphonic designs are slightly more difficult to manufacture. As the washdown type seems to be acceptable to the majority of purchasers of sanitaryware in Uganda, this would be the type for a new factory to manufacture. At a later date, the range could always be extended to include siphonic designs, if required.

The DUET shampoo basin range is far too specialised for the Ugandan market and it would not be worthwhile for such iters to be made in the initial range of products.

It should be noted that Shires Bathrooms Limited is one company, which is very active in licencing designs to overseas factories, having assisted sanitaryware factories in Trinidad, United Arab Emirates, Nigeria and China.

b) Spring Bathrooms Limited, U.K. (see Pages 512 - 515)

All of the washdown designs of this company, ie: ALEXIS, LOIS and PARIS would be suitable for the Ugandan market.

c) Balterley Bathrooms Limited, U.K. (see Pages 516 - 521)

The majority of the sanitaryware products from this company are too specialist for the Ugandan market, especially the highly decorated designs, which require the application of transfers and a second firing operation during production, such as the ROMANA and SHELL ranges and their hand gilded 22 carat gold range. This company offers a 20 year guarantee on all its products. The less ornate CHARISMA range would however find acceptance in Uganda.

d) Laufen, Switzerland (see Pages 522 - 527)

The modern wall-hung type of sanitaryware such as the AROLLA range would not be suitable for the majority of the market in Uganda, therefore this type should not be considered. The VIENNA and CAPELLA ranges, however would find greater acceptance. In the case of the PACIFIC range, the washbasin is far too large to be acceptable in Uganda but the close-coupled water closet would be acceptable. The ORONTES washbasin with a size of 830mm x 560mm is too large for the Ugandan market.

e) Villeroy and Boch, Germany (see Pages 528 - 531)

The OPERA range is too ornate for the Ugandan market and designs of this type would not be successful there. The TOBOGA range is a modern close-coupled design but is rather too modern for the majority of the market in Uganda. The cost of such a design would also be much more expensive than more established designs. The high-level water closet shown in the top photograph of the Villeroy and Boch brochure on Page 531 would not be acceptable in Uganda but the close-coupled MARINA water closet shown on the same page would be acceptable.

f) Kohler, USA & Canada (see Pages 532 - 541)

The modern one-piece PILLOW TALK, SAN MIGUEL and CABERNET ranges, where the cistern is incorporated into the main water closet unit are too expensive and specialised for the Ugandan market, as are the decorated sanitaryware, such as SERPENTINE, PIC WICKER, NORTHERN LIGHTS and SENTIMENTI. The KOHLER CONSOLE TABLES are also too ornate for the Ugandan market. However, the more traditional CHABLIS pedestal washbasin would be acceptable. The WELLINGTON WATERGUARD TOILET would still be too specialised for the Ugandan market.

The rectangular basins shown on Page 537 would not find great demand in Uganda and similarly, washbasin designs a, b, c, f and g on Page 541 are too specialised. Designs d and e would, however be acceptable.

g) B.C. Sanitan, U.K. (see Pages 542 - 546)

The decorated sanitaryware designs of this manufacturer are aimed at specific niche markets, particularly at the renovation market. The VICTORIAN range with sculptured relief patterns in the surface and additional transfer decoration, using the older high-level and low-level cistern configurations would not find a market in Uganda. Quite apart from the design aspect, the price of the products would be too high for Uganda. The BERKELEY range is less decorated but again is a period design with limited appeal.

h) Heritage Bathrooms, U.K. (see Pages 547 - 550)

Again this is a specialist manufacturer aiming at a specific small sector of the european market, in which the mass production factories are less interested. Neither the undecorated relief patterned sanitaryware, nor the transfer decorated sanitaryware are suitable for the Ugandan market.

i) Vernon Tutbury, U.K. (see Pages 551 - 555)

This manufacturer produces a period range, the VINTAGE, which is not suitable for Uganda but their COTSWOLD range in the undecorated form with the rectangular cistern, not the round cistern, could be acceptable in Uganda. Standard toilet seat would however have to be used.

j) Armitage Shanks, U.K. (see Pages 556 - 569)

This is a high volume manufacturer with a wide range of designs. The CARLTON, WENTWORTH, SANDRIGHAM and UNREGAL washdown designs would all be suitable for Uganda. The BRAEMAR, although a washdown, is wall mounted and therefore would not be suitable for the majority of Ugandan customers. The PROFILE, which is a washdown type with a concealed cistern would find favour in some public buildings, as vandalism to cisterns would be reduced. However, as the largest market for sanitaryware in Uganda is the housing market, the PROFILE type would not be suitable for the initial product range.

While the siphonic designs, such as CLARENDON and KENSINGTON are also acceptable on a visual basis, the views of the health authorities must be taken into consideration, therefore a design based on the washdown types should be chosen for the initial product range. In all cases the washbasin should be of the medium size (approx. 560-590mm x 455-480mm), not the large size (approx. 620-660mm x 530-565mm).

The extremely ornate DOLPHIN range would not be suitable for Uganda but modifications on the COTTAGE range could be suitable.

k) Jacob Delafon, France & Germany (see Pages 570 - 578)

The VENUS range would be suitable for Uganda but the washbasin is rather too large at 670mm x 520 mm and would have to be reduced in size. The RIVELLA range would also be acceptable but the FLEUR is too ornate for the Ugandan market. The general modern shape of the IRIS would find acceptance in Uganda but the price would be higher than for a standard washdown type. The washbasin at 750 x 600mm is too large for the Ugandan market.

Both the BRIVE and ANTARES ranges would be acceptable but the washbasins would have to be reduced in size.

The BENGALI wall hung hand basin is acceptable but none of the inset type would be recommended for the initial range of products for the new factory. Such products can be added at a later date, once the basic products are well established.

l) <u>Ideal Standard Bathrooms, U.K. (see Pages 579 -591)</u>

This manufacturer is also a high volume manufacturer with a wide range of modern designs. The close-coupled ACCENT floor standing range would be acceptable in Uganda with the 540 x 500mm wash basin. The small wall hung basin (458mm x 380mm) would also be suitable as a matching piece. The selling prices would however be higher than more traditional designs.

The MICHELANGELO, TULIP and STUDIO ranges with the close-coupled cistern would be acceptable but the BRASILIA range would tend to be less acceptable to the majority of the Ugandan customers.

The TIARA washdown close-coupled water closet with the smaller of the two basins (500 x 400mm) would be another acceptable range, in preference to the siphonic version.

However decorated sanitaryware such as Casablanca, which is decorated with lines and the KYOTO and GENEVA decorated by means of relief-textured glazes would be too expensive for the general market in Uganda.

The range of countertop washbasins and the wall hung small MAMARA basin are not really suited to the Ugandan market. A more traditional shape than the MARMARA is required for the wall mounted basin. For the initial range it is not recommended to include a countertop basin. This can be added later, if required.

m) <u>Qualcast Ceramics Limited, U.K. (see Pages 592 - 597)</u>

The Qualcast LOTUS range with a close-coupled cistern would be quite suitable for the Ugandan market but their PEARL range is too specialised to cater for the majority of the Ugandan market. Either the curved wall mounted APOLLO cloakroom basin or the standard rectangular type would be suitable as part of the initial sanitaryware range. The corner basin and vanity basin would not be suitable for the initial range, as the volumes used are much smaller than the more standard types of cloakroom basin.

n) <u>Twyfords Bathrooms, U.K. (see Pages 598 - 606)</u>

The NOCTURNE, NORWOOD and JUPITER water closet ranges are all suitable for the Ugandan market but the OLYMPIAN wall-hung or concealed cistern type would not have a large market, therefore this type should be discounted for the initial range. The more up-market DEBUT and VENUS close-coupled water closet designs, while acceptable, would have to be priced higher, therefore the other types would be better for the initial range.

Both the MINA, PARMIS, Jupiter and VENUS wall mounted basins would be acceptable designs for a small basin in Uganda.

o) <u>Vitra, Turkey (see Pages 607 - 609)</u>

The VENUS range from this company, while acceptable for a particular market segment throughout Europe, is not suitable as a basic range for Uganda. A much plainer finish is required.

p) <u>Porcher, France (see Pages 610 - 616)</u>

The CONCORDE range would meet the requirements for the Ugandan market with a smaller basin. However the CALICEA range is a little too up-market with a large basin (0.8m). The double basin version would certainly not be required in Uganda.

The COQUILLE range, although it meets part of the market requirement in France, is too ornate for a standard range in Uganda.

The ODESSA low-level type of water closet is not popular in the current market in Uganda, therefore this type should not be considered for the initial range of products.

The standard small hand basin would be quite acceptable for the initial range but the FEMINA type would have a more limited market.

q) <u>Ariston, Italy (see Pages 617 - 619)</u>

The BRUNELLO, SOVANA, DUCCIO and TUSCIA ranges from Italy are marketed in the U.K. and other European countries but none meet the requirements for the basic range of a new factory in Uganda, all being too up-market with decoration and relief pattern work.

r) <u>American Standard, U.S.A. (see Pages 620 - 629)</u>

The PLAZA one-piece water closet with its large pedestal basin are not suitable for the Ugandan market, although the PLAZA PETITE pedestal basin would be acceptable, especially if the dimensions were reduced a little more. The same comments apply to the ELLISSE range of products.

The more exotic products, such as the WARREN PLATNER COLLECTION meet only a small expensive market in the U.S.A. and would not be suitable for a product range in Uganda.

The wall hung ACADIAN washbasin would be acceptable for use in Uganda, especially if the dimensions were reduced slightly.

As can be seen from the selection of different sanitaryware designs from all countries, a wide range of designs are judged to be suitable for Uganda, while others are clearly for small specialist markets and cannot be considered.

The recommendation of the team is for the promoters to try to licence one of the basic close-coupled washdown water closet designs fr-- an existing manufacturer. Failing this, a new design must be commissioned from an independent modelling company. This design could then incorporate features similar to a number of different manufacturers together with unique features from the ideas of the designer.

Also on the market are such sanitaryware items, such as urinals and asian toilets but these are less in demand than the basic range of sanitaryware. As the cost of design, new block moulds and case moulds is quite high for sanitaryware items, we do not feel it is justified to have these items in the initial product range. They could however be introduced at a later date, once the factory is well established with its basic product range.

3.5 Proposed selling prices in Uganda

	Price (USh)
Wall tiles	12,000/m2
Floor tiles	24,000/m2
Medium washbasin	50,000
Pedestal for medium washbasin	30,000
Small washbasin (wall-mounted)	30,000
Water closet (Close-coupled wash-down)	55,000
Cistern (with fittings)	50,000
Average price/piece	43,000

3.6 Estimated plant capacity required for Uganda and Kenya market

From our summaries of the potential market share, which a new factory could reasonably be expected to achieve, we should provide for the following capacity:

	Uganda	Kenya	Total
Wall tile	14,587	17,500	32,087
Floor tile	14,830	6,900	21,730
Sanitaryware	5,482	5,000	10,482

On this basis, rounding to the nearest convenient production level, we would design for a net saleable production of 45 pieces of sanitaryware pieces per day, or 10,350 pieces per year. Wall tile will be designed for 32,000 m2 per year and floor tile 22,000 m2 per year with the facility to easily change from one type of tile to the other, so that variations in market demand can easily be met.

Summary of feasible normal capacity design

	m2/year
Wall tile	32,000
Floor tile	22,000
Total tile	54,000
	piece/year
Sanitaryware	10,350

The technological requirements for the proposed factory have been assessed on the basis of the above production capacities being the feasible normal capacity. The capacities of machinery, dryers and kilns have therefore been chosen to cope with the normal expected loss levels at each stage of production and allow for normal levels of downtime during a working day. This is outlined in detail in Section VI.

In the previous assessment of the regional market, the team recognized that there was a demand for tiles and sanitaryware in Tanzania, Zaire, Burundi and Ruanda and this demand has been estimated and has been treated as a safety reserve, in case problems arose with the Kenyan market at any time.

Allowing for the normal trade fluctuations in the Ugandan market and all of the regional markets, the Ugandan market is expected to take 50 per cent of the tile and sanitaryware output from the factory and the total regional market, including Kenya, Tanzania, Zaire, Ruanda and Burundi, is expected to take, on a consistent basis, 50 per cent of the both the tile and sanitaryware production of the new factory.

3.7 Estimated revenue

Based on the proposed selling prices in Uganda, we have assessed the estimated revenue on the above saleable annual production levels at the proposed factory:

	Production	Sales Price USh	100% Uganda Revenue USh (1000)
Sanitaryware (pc)	10,350	43,000	445,000
Wall tiles (m2)	32,000	12,000	384,000
Floor tiles (m2)	22,000	24,000	528,000
Total tiles (m2)	54,000	16,900	912,000
		Total Revenue	1,357,000

However, this revenue is based on the current market price, which includes 30 per cent sales tax, payable by registered traders. Although many traders do not appear to be registered and therefore pay no sales tax, their sales prices are not lower, ie: their profit is increased. We must allow for the effect of sales tax on the revenue for the factory, therefore if we first deduct this from the gross figures above we obtain the actual net amount of revenue that the proposed factory can expect, on which the profitability is based.

	100% Uganda Revenue (Net) USh (1,000)
Sanitaryware	342,307
Wall tiles	295,384
Floor tiles	406,153
Total net revenue	1,043,844

This is equivalent to: USD 1,449,783

The rules of sales tax have recently been changed for the 1991 tax year and these aré outlined in Section X. Basically Ugandan sales tax is only for domestic sales, exports being exempt and the sales tax on all raw material inputs (local and export) can be credited against the sales tax payable. However the Kenyan authorities also charge sales tax on goods exported and sold in that country but at a lower rate than in Uganda.

From our market analysis we believe that it would be possible to obtain approximately 10 per cent more for the 50 per cent of products exported, the majority to Kenya, than on the domestic market, due to the 12 per cent difference in the sales taxes; ie: 18 per cent in Kenya versus 30 per cent in Uganda, which affects the final retail prices. We have therefore allowed for this factor in the COMFAR financial analysis.

	Revenue USh (1,000)		
	Uganda	Kenya/region	Total
Sanitaryware	171,173	188,290	359,463
Wall tiles	147,692	162,461	310,153
Floor tiles	203,077	223,385	426,462
Total net revenue	521,942	574,136	1,096,078
Sales Tax	156,583	103,344	259,927
Total gross revenue	678,525	677,480	1,356,005

This is equivalent to: USD 1.52 million (net)
USD 1.88 million (gross)

As the sales tax on exports to Kenya is payable to the Kenyan tax authorities and no sales tax on exports is payable to the Ugandan tax authorities, this factor is taken into consideration in the COMFAR Economic Cost Benefit Analysis (ECBA) for the new factory.

3.8 Selection of sales programme and marketing strategy

The selection of a sales programme and marketing strategy to include both the domestic market in Uganda and the regional export market in Kenya has been necessary because of the following factors:

a) The market in Uganda for both tiles and sanitaryware is very small. To build a new factory based solely on the domestic market would lead to high unit production costs, as many machines and kilns cannot be reduced down in size below a certain practical limit. Even when they can be reduced in size, the cost savings are never in proportion to the to the reduction in size of the equipment and kilns. The capital cost per unit of production, therefore tends to be much higher for a small sanitaryware and tile unit. By designing a unit for both the Ugandan and Kenyan market, while the factory is still a small unit, it does offer a much better scope to utilize the required machinery in a more economic manner.

b) During the field work in Uganda, it was stressed by all of the development banks and other potential funding agencies for the proposed project, that no funds, whether these be loans or capital inputs, would be given, unless the project could export at least a proportion of its output. Because of this very important factor and knowing that the local company, Sunrise Ceramics Limited, would be depending on at least some finance from these funding agencies, it was necessary to investigate the market in Kenya, more thoroughly than was first envisaged to determine the realistic level of exports, which could be achieved by the proposed new factory in Uganda.

3.8.1 Distribution

For the domestic market, irrespective of whether a proposed site near Mbarara, or a second near Kampala is used for the factory, it will be necessary to establish a sales shop and distribution centre in Kampala city for the sanitaryware and tile products. This is the major market in Uganda and even for many of the projects in other district towns the decision makers are often found in Kampala. Because the market is so small, the intention would be to sell the majority of the products directly from either the factory site, or the Kampala city centre shop. Sales to Government parastatals are carried out by tender and it would be the responsibility of the sales manager to tender for all potential sales in this sector. For some of the more remote district towns, a distributor may be required but the intention would be to keep this to a minimum, to maximize returns.

In Kenya, because of the large number of hardware stores, it would be necessary to have a salesman stationed in Nairobi. Premises large enough to hold a reasonable stock of products would be necessary, so that the factory could compete more easily with the local producer of tiles and sanitaryware by offering immediate delivery from stock.

Distribution of the sales to the other regional countries would be controlled initially from the Kampala shop, as the level of sales would not justify the establishment of a sales and distribution shop in these countries. Local distributors would therefore be used to develop sales, backed up by regular visits to these countries by the Sales Manager.

3.8.2 Advertising policy

Expenditure on direct advertising would be limited, as personal contact with the individual hardware traders is judged to be far more important in securing sales.

3.8.3 Regional market

Although the most important regional market for the products of this proposed factory is clearly Kenya from our market study, the other neighbouring countries do have a requirement for tiles and sanitaryware. We have therefore allowed in the sales costings for visits to Tanzania and the other regional countries. There should be definite potential in the northern regions of Tanzania, especially in the towns on Lake Victoria, which have frequent ferry services to Uganda and an established lake trading tradition.

For the purposes of this pre-feasibility study we have sized the factory on only the Uganda and Kenya market potential, as sales to Tanzania, Zaire, Ruanda and Burundi are likely to be quite small, in relation to Kenya. These sales have been treated as an emergency reserve for the factory, in case the exports to Kenya are reduced for any reason, such as by a future change in Government policy or future change in the market situation.

3.9 Estimates of sales and distribution costs

3.9.1 Sales labour requirements and costs

	No.	Monthly cost (USh)	Yearly Cost (USh 1,000)
a) Sales office Kampala			
Sales Manager	1	80,000	960
Sales Clerk	1	29,000	348
Truck driver	1	29,000	348
Forklift driver	1	29,000	348
Labourer	1	29,000	348
Security guards	4	116,000	1,392
Total	9	312,000	3,744
b) Factory site			
Sales clerk	1	29,000	348
c) Sales office Nairobi			
Salesman	1	50,000	600
Sales clerk	1	29,000	348
Security guards	4	116,000	1,392
Total	6	195,000	2,340
Grand total	16	536,000	6,432

3.9.2 Sales - Non-labour costs

	US DLR	USh (1000)
Sales office Kampala - lease	4,000	2,880
Sales office Nairobi - lease	4,000	2,880
Mobile vehicles running costs	8,280	5,962
Promotional literature/office supplies	4,000	2,880
Out of town visits (Uganda)	3,000	2,160
Regional country visits	3,000	2,160
	26,280	18,922
Total sales costs, labour & non-labour	35,214	25,354

3.9.3 Distribution costs

	US DLR	USh (1000)
Delivery truck	27,600	19,872
Landrover - sales	4,600	3,312
Forklift truck - sales	3,680	2,650
Total distribution	35,880	25,834
Total sales and distribution costs	71,094	51,188

3.10 Costs of emissions disposal (environmental cost)

In this type of factory very few emissions require to be disposed. Washings from the floor of the casting area, which contain suspended clay particles are normally fed into a concrete in-ground settling tank system, situated just outside the factory building, so that only clean water is allowed to re-enter the natural water system. The clay, which settles out is periodically removed and placed on a scrap disposal area. The clay is inert and therefore can cause no problems with the environment, when disposed of in this manner. The costs of the settling tank system are included in the civil costs of the building.

SECTION IV

MATERIALS AND INPUTS

IV. MATERIALS AND INPUTS

4.1 Characteristics of materials and inputs

4.1.1 Local ceramic raw materials

The manufacture of ceramic tile and sanitaryware products requires the use of different mixtures of various ceramic raw materials, which include kaolin, ball clays, feldspar, quartz, silica sand and talc. These raw materials are found in many different countries throughout the world but being natural minerals their quality and properties vary, such that some deposits are suitable for tile manufacture but not for sanitaryware manufacture, some are suitable for both products and some are not suitable to be used at all, due to various other contaminating minerals being present in the deposit.

To determine whether a particular deposit of one of these raw materials is suitable for use in a tile body or a sanitaryware body, it is necessary to carry out a series of chemical and physical tests on the individual material. At this stage some deposits can be stated to be of possible use, or they can be eliminated from further consideration. Following the initial tests, materials which appear promising are included in experimental body mixtures for the particular product, which is required. The body mixtures are then tested for physical properties, including the rheological characteristics for sanitaryware bodies and drying and firing characteristics for all products.

It was known that deposits of many of the required ceramic raw materials for tiles and sanitaryware existed in Uganda and while some of the deposits had been exploited by a local company manufacturing crockery, none had been tested for their possible use in tile and sanitaryware manufacture.

Under the terms of reference for this pre-feasibility study, it was therefore necessary for a geologist to visit the raw material deposits in Uganda (see Figure 4.1), assess which were the most likely to be suitable and take samples of these deposits. These samples were then tested for their chemical and physical characteristics. Following this work, body formulations were developed for both tile manufacture and sanitaryware manufacture.

After reviewing the available geological information at the Department of Geological Survey and Mines in Entebbe, the team's geologist, together with personnel from the Geological Survey and the local company, Sunrise Ceramics Limited investigated the following raw material deposits:

Kaolin deposits

i) Buwambo, Migade and Namasera kaolin deposits, approximately 25 miles (40km) from Kampala.
ii) Mutake kaolin deposit in Bushenyi District, western

Uganda.
iii) Kisai kaolin deposit in Koki, Rakai District

Feldspar deposits

i) Lunya Feldspar deposit, approximately 30 miles (48km) from Kampala
ii) Mutaka Feldspar deposit in western Uganda

Quartz deposit

i) Mutaka Quartz deposit in western Uganda

Silica Sand deposits .

i) Diimu glass sand deposit, approximately 10 miles (16km) from Masaka.
ii) Nyeihange sand deposit, approximately 20 miles (32km) from Mbarara.

Ball Clay deposit

i) Mukwono ball clays, approximately 20 miles (32km) from Kampala.

Talc deposit

i) Kisinga talc deposit at Kasesa.

Location and access to the deposits and background information

a) Buwambo Kaolin Deposit

The deposit is situated at the top of Buwambo hill, which can be reached from the 17th milepost on the Kampala to Bombo road and then approximately half a mile (1km) to the east.

The field analysis showed that the kaolin contains muscovite, mica and quartz. The muscovite is scattered throughout the kaolin in tiny flakes. In certain areas the kaolin body is penetrated by red-coloured thread-like iron stains. The rock from which the kaolin has been derived was a feldspar-muscovite-quartz pegmatite.

The extent of the deposit has not been thoroughly defined but it appears to be a lenticular or a pocket shaped deposit, which according to the available unpublished data may contain 100,000 tonnes of usable material.

A representative sample of 30kg was collected during the field visit. Part of this was washed at the laboratories of the Department of Geological Survey and Mines and the kaolin showed excellent plasticity, which is unusual for most kaolins. The preliminary assessment of this deposit was that it could possibly be used for sanitaryware production, therefore 25kg of this material was sent to the Ceramic Research and Development Centre in Sri Lanka for detailed testing.

This deposit is the most accessible deposit around Kampala but if the material is to be used for part of a sanitaryware body formulation, systematic mining must be carried out at the site. All overburden has to be removed before mining commences and the mining personnel must be trained to carry out selective mining, in order to avoid mixing the lateritic clay materials with the kaolin. It would also be necessary to carry out a systematic borehole drilling exercise on a grid pattern to fully evaluate the tonnage, which is available within the deposit. The assessment from the field visit was that the deposit could be economically worked by an open-cast mining system.

b) Migade kaolin deposit

The deposit is reached from the 17th mile-post on the Kampala to Bombo road by a track, which turns off the western side of the road. After a quarter of a mile (0.5km) the deposit is located a further 1 mile (2km) off the track in a forested area with thick vegetation. Local guides were necessary to reach the site.

The field analysis showed that the kaolin is mixed with much lateritic clay. The kaolin is penetrated by thread-like red iron staining lateritic materials and certain areas show large pockets of coloured stains. These veinlets and pockets enlarge and link up with nearly vertical fissures along which more intense weathering and staining in red and brown lateritic clay is seen.

The kaolin was derived from localized pegmatitic material and it has been discoloured by the circulation of ground water. Samples were taken of the deposit but following further examination at the Department of Geological and Mines the sample was rejected as being unsuitable for sanitaryware manufacture duo to the presence of too much iron staining material. The inaccessibility of the deposit was also a disadvantage, in regard to mining the deposit.

c) Namasera kaolin deposit

The deposit is reached from Kampala via Natete and Kabojja village to Kajansi through a rough road northwards for 3.5 miles (6km) curving around the northern end of Namasera Hill. The deposit is located quite high on the side of this hill, which is covered by lateritic materials.

The field assessment showed that the kaolinised materials are associated as thin veins, which are highly penetrated by red-coloured iron staining material. Shallow pits were in evidence, from previous mining and from these it could be seen that the thickness of the clay bed is not great, only averaging 2 - 3 feet (0.6 - 1.0m). Partly weathered rock was found below this clay bed.

The sample taken from this deposit was washed at the Department of Geological Survey and it was found that the kaolin content of the deposit was very low, varying between 5 - 7 per cent. The deposit contained high percentages of siliceous materials. This kaolin was therefore rejected from further consideration due to the following points:

i) The thick layer of lateritic overburden on the deposit.
ii) The thin bed of actual clay.
iii) The kaolin clay is associated with red iron staining lateritic clay, hence the iron oxide (Fe_2O_3) content is very high.
iv) The actual percentage of kaolin within the clay bed is very low.

This deposit could certainly not be used for sanitaryware production and its poor quality was further revealed later in the field work, when it was discovered that a local producer of crockery had tried to use this deposit but found that it was unsuitable for crockery production, due to the high proportion of lateritic materials.

d) Mutake kaolin deposit

The kaolin occurs at the closed beryl and tin mine at Matake in Mbarara and can be reached from Bushenyi town, which is about 30 miles (54km) from Mutake village. The track leading to the deposit is very poor.

The field assessment showed that the kaolin is very white and is a very extensive deposit. The kaolin, which has been derived from the weathering of quartz-feldspar pegmatites is therefore associated with quartz and partly weathered feldspar. The feldspars are highly intergrown with quartz and are partly kaolinised in places.

A representative sample was taken from the deposit and the preliminary analysis, carried out at the Department of Geological Survey and Mines, showed that the kaolin deposit is of high quality and contains approximately 22 - 25 per cent of actual kaolin. It can be confirmed that the majority of the kaolin found in this deposit can be utilized in the ceramic industry.

Further work is necessary to define the exact extent of the deposit but it is apparent that there are probably large reserves. Systematic open-cast mining could be used on this deposit, after removing all overburden to avoid mixing the iron-stained material with the kaolin. Mining personnel will have to be educated on the best method of mining, taking into consideration the amount of material, which would be required per month. This point is stressed because previous mining of this deposit has been very wasteful with many small pits being dug over the entire area in a random manner. This system should be halted and a proper mining plan should be installed, so that the deposit is used efficiently with minimum waste of this valuable resource.

e) Kisai kaolin deposit

The Kisai kaolin deposit is situated in the Gombolola of Sabawali in the Koki country of Rakai District.

The main rock types of the area are shale and mudstones of sedimentary origin. These shales and mudstones are leached, which has produced a pale coloured rock varying from white to buff-coloured shades of clay materials. Iron staining is of frequent occurrence with development of bands, specks and irregular patches of purple, brown. orange, grey and black materials. Clay layers are inter-bedded with coarser quartz bands. Very fine needle-like iron rich bands occur all over the clay deposit.

Estimates of the size of the kaolin deposit from previous work have confirmed the reserves to be approximately 2,314,000 long tons.

Washing of the samples taken from the deposit showed that the clay contains a large amount of fine silt and sand and that it cannot be used for sanitaryware production due to the following reasons:

i) The kaolin deposit contains approximately 70 - 75 per cent by weight of very fine quartz and silty materials (less than 76 micron).
ii) The fine thread-like iron staining material, which is prevalent over all the deposit, gives rise to a cream to light red fired colour.
iii) The access to the deposit is poor with only a rough track for a distance of 5 miles (8km).

f) Kilembe kaolin deposit

This deposit could not be visited at the time of the field trip, due to the bad weather conditions in the area at that time. The track to the deposit was impassable due to the rain.

Unpublished data confirmed that there is a reasonably large deposit of clay at this location and a small wet benefication plant has been installed at the site. Robbialac Paints (Uganda) Limited have used the clay as a filler and it is satisfactory for their purposes. If none of the other, more acceptable deposits prove to be suitable for sanitaryware manufacture, samples could be taken from this site for evaluation, when the deposit is accessible.

Feldspar deposits

a) Lunya feldspar deposit

The deposit is located in the Mabira forest north of Lugazi. The site is reached from the 22nd milepost on the Kampala to Jinja road at the Lugazi junction, the site being approximately 10 miles (16km) north at Lunya village.

Information on this deposit is found in the Geological Survey Report No.2 "The Geology of Southern Mengo) and it is noted that the Lunya feldspar has been mined and a limited amount had been exported to Kenya for porcelain manufacture in 1943.

During the field visit, it was observed that the previous mining area, 40-50 feet (12m - 15m) in width and 20-30 feet (6m - 9m) in width, was filled with water. However some exposed sections of the feldspar deposit were accessible, although most was covered by thick grass.

Samples were taken, which showed that two types of feldspar were present in the deposit, a green Be-feldspar and a white plogioclase feldspar. Examination showed that the white feldspars are badly intergrown with quartz but the green feldspar shows no intergrowths. The previous records state that both types of feldspar have 15 per cent K20 (Potassium Oxide) and 1.75 per cent Na20 (Sodium Oxide). This information has been checked by our laboratory tests in Sri Lanka and these current tests gave a K20 content of 13.84 per cent and a Na20 content of 2.42 per cent.

This feldspar appears to be suitable for sanitaryware production from the initial examination. However, as with the kaolin deposits, systematic mining must be carried out. All overburden has to be removed and the feldspar has to be mined and sorted to avoid mixing the pegmatitic materials and quartz with the feldspar. The top layer of the deposit is partly weathered and this must be removed, so that the unweathered feldspars beneath can be carefully exploited. Some blasting of the unweathered feldspars would probably be required.

b) Mutaka Feldspar deposit

This orthoclase feldspar is associated with the kaolin at the Mutake. It is pegmatitic and is partly weathered to kaolinite. This feldspar is badly intergrown with quartz and has a granite texture. Due to this intergrowth it may be difficult to use in sanitaryware production.

Further exploratory work in this area may find good unweathered feldspars but at present, the poor quality of the material means that no regular and consistent supply could be guaranteed from this locality.

Quartz deposits

a) Mutake quartz deposit

The quartz is associated with feldspar and kaolin at the Mutake location. Large quartzite veins are interbedded with partly weathered feldspars but the quartz can be separated easily. The white transparent variety, which appears to be of high quality with a known silica content of 99 per cent, can be selected from these deposits.

This quartz can possibly be used as a constituent of a sanitaryware glaze, if a locally produced glaze can eventually be developed.

Silica sand deposits

Narrow beaches of white sands formed from the erosion of quartzite occur in several locations along the shore of Lake Victoria. According to the published and unpublished data the silica sand in these areas has a high purity with a silica (SiO_2) content of 99.0 - 99.9 per cent and an iron oxide (Fe_2O_3) content of 0.02 -0.29 per cent. The estimated reserves in the Entebbe area are approximately 100,000 tonnes.

According to the Geological Survey Department Report No.1, glass sand was exported to Kenya from Masaka, where large deposits occur.

a) Masaka silica sand deposits

The sand deposit is located at Diimu in Rakai District, approximately 16 miles (30km) from Kalisizo on the shore of Lake Victoria.

The deposit was investigated by the Geological Survey Department in 1972 (Unpublished Report No. EM/1 by M.E. Mukinda) and 1973 (Unpublished Report No. EM/2 by M.E. Mukinda). Geologically the northern flank of Diimu hill is composed of quartzite rocks, the rest of the area of Diimu Hill being covered by laterites. From the lake up to approximately 0.75 mile (1.3km) inland there is a layer of silica sand, approximately 1m deep, which gradually develops into sandy soils further inland. The shape of the sand grains varies from sub-rounded to angular.

The field visit indicated that this was an extensive silica sand deposit and according to available data, reserves were calculated at 104,373 tonnes in an area of 0.6 sq km. This estimate covered only a 2.5km length of a total 8km of sand beach. The available chemical analysis of the Diimu sands from the Department of Geological Survey and Mines indicated that the sands are of high purity and hence suitable for the ceramic industry. Non-magnetted samples from an area 5m from the lake showed a silica content of 99.48 - 99.75 per cent and an iron oxide content of 0.002 - 0.086 per cent. Non-magnetted samples from an area 30m from the lake showed a silica content of 99.55 - 99.96 per cent and an iron oxide content of 0.027 - 0.054 per cent.

Samples taken in January 1982 by Geoconsult gave a silica content of 99.3 - 99.6 per cent and an iron oxide content of 0.09 -0.10 per cent.

Samples of this sand were taken for detailed testing to confirm, whether this initial assessment is correct.

b) <u>Nyeihange sand deposit</u>

The Nyeihange sand deposit is located approximately 20 miles (36km) from Mbarara town near to Kinoni town on the Mbarara to Kabale Road.

No detailed investigation of this deposit has been carried out but the field inspection showed the deposit to be extensive and the presence of pure white sand. Examination of pits in the area showed that the silica sand was interlayered with illmenite mixed sand, hence the purity of this sand deposit is not as good as the Diimu deposit. However it can still be used for the production of ceramics, if a washing facility with, for instance, a Wilfley table, is installed at the factory to upgrade the quality of this sand.

<u>Ball clay deposits</u>

Clay deposits, which have been used to manufacture poor quality brick, roof tiles floor tiles and water containers, are known to occur widely throughout Uganda.

These clays are derived from gneissoise and granitoid rocks and are usually highly leached. These acid-washed clays with quartz fraction have a low wet-to-dry shrinkage.
A more thoroughly weathered and leached clay of this type is the Kajansi clay, where soil horizons have been developed to a much greater extent, giving a clear clay fraction that is nearly sand free. A similar ball-type clay is found at Mukano.

Both of these clays are used for brick making, the fired colour being light red. The available data indicated that the wet-to-dry shrinkage is 8 per cent and the iron oxide content 3.53 per cent. For sanitaryware production we require a plastic clay, which is white or off-white in its fired colour, therefore neither of these clays is suitable for this product. However a sample of the Mukano clay was taken for detailed testing, as this may be suitable for tile production.

The clay, which is found beneath 2 ft (0.6m) of overburden, extends to a depth of 4-5 feet (1.2 - 1.5m) over a wide area, that has proved to be at least 1 mile (2km) in length. The clay contains at least 20 per cent of sand and grit. Underlying the clay is sand and granite over a bed of granite.

At this site mining was again found to be carried out in a haphazard manner with overburden, including roots of vegetation, being mixed with the clay.

Talc deposit

The talc deposit is located at Kisinge in the Kasese District. It is green in colour and is associated with serpentine granite. No evaluations of this deposit have been carried out and only one trench has been opened for preliminary testing.

The initial field assessment was that it is not good quality but could perhaps be used for tile production. A sample was therefore taken by the geologist for detailed testing.

Raw material testing programme in Sri Lanka

Following the field work at the various raw material deposits in Uganda and initial assessment of these materials at the laboratories of the Department of Geological Survey and Mines, the following bulk samples were sent to the UNIDO-supported Ceramic Research and Development Centre in Piliyandala, Sri Lanka for further detailed testing:

i) Buwambo kaolin
ii) Mutake feldspar
iii) Lunya feldspar
iv) Mutake quartz
v) Diimu silica sand
vi) Kisinge talc (for tiles only)
vii) Mukano ball clay (for tiles only)

Prior to carrying out any physical tests, it was necessary to carry out a detailed chemical analysis of each of the representative samples brought from Uganda. Chemical analysis is used to determine the purity of the mineral and to identify any potentially harmful contaminant, which would cause a problem during the production of the ceramic item. In the case of sanitaryware production, it is necessary to have a white or cream coloured body, which means that the raw materials of the body composition should have a low iron oxide (Fe_2O_3) content. A low titania (TiO_2) content is also required, as a high titania content can result in staining of the final glaze finish. In the case of tiles, the iron oxide content is not so important but the Calcium oxide (CaO) content should be low to avoid lime-blowing problems in the fired product.

Each of the bulk samples were initially prepared by primary and secondary grinding, following which, each individual sample was thoroughly mixed. After quartering the sample in the standard method and re-mixing and quartering three times, a sample for chemical analysis was taken. The results obtained are as follows:

Constituents	Kaolin Buwambo	Ball Clay Mukano	Feldspar Mutake	Feldspar Lunya	Talc Kisinge	S.Sand Diimu
SiO2	53.03	73.68	63.23	61.34	56.55	98.51
Al2O3	31.90	11.31	20.37	19.52	4.06	0.65
Fe2O3	0.30	2.10	0.37	0.07	3.96	0.20
TiO2	0.43	2.32	0	0	0	0
Na2O	0.30	0.31	3.06	2.42	0.30	0.14
K2O	3.05	1.42	10.33	13.84	0.02	0.50
L.O.I.	10.69	8.70	1.40	0.39	3.59	0.08
CaO	traces	traces	traces	0.30	traces	traces
MgO	traces	traces	traces	0.10	29.51	traces

The Buwambo kaolin with a low iron content appears perfectly suitable for use in a sanitaryware body and could also be used in a tile body, if required. The titania content at this level should be acceptable but the deposit should be constantly monitored during production, in case there are areas within the deposit, which have a higher percentage of titania and which have to be rejected. This material was therefore chosen for further physical testing to determine the casting, drying and firing characteristics of the body.

The Mukano "ball" clay, while being very plastic, is not suitable for a sanitaryware body constituent due to the iron oxide content of 2.10 per cent and the titania content of 2.32 per cent but it would be quite suitable for floor tile production, providing that all glazes used, especially the light coloured glazes, are tested prior to use to ensure that there are no adverse effects caused by the titania.

Of the two feldspars, the Lunya deposit is a better in quality than the Mutake deposit, having a higher potassium oxide content. In addition the quartz intergrowths and pegmatite associated with the Mutake deposit, means that the site would be more difficult to mine in a manner to ensure that a consistent quality of feldspar is supplied to the factory. Due to both of these reasons, therefore the Lunya feldspar deposit was chosen for further testing as a constituent of the sanitaryware body formulation.

The Kisinge talc deposit appears suitable for tile production from the chemical analysis and the wall tile body formulation is currently being tested for evaluation. The fairly high iron oxide content is not a problem for a tile body. Talc is not used in a sanitaryware body.

The Diimu silica sand deposit is extremely good and although these current results show a slightly lower silica content than previous tests, which have been carried out over the past few years, the deposit can certainly be used for all ceramic products, including sanitaryware and tiles.

Tile ceramic raw materials

In the case of both wall tiles and floor tiles, no imported cer .aic raw materials will be required, therefore these products will be manufactured using 100 per cent Ugandan materials. The testing of the tile body compositions has been undertaken at the CRDC in Sri Lanka and the following compositions have been found to be satisfactory for the production of good quality wall and floor tiles, which are equivalent to the normal European quality expectations.

Tile body formulations

From the laboratory tests at the CRDC, a suitable wall tile body formulation was found to be:

	%
Mukwono Ball Clay	33
Buwambo Kaolin	23
Lunya Feldspar	18
Kisinga Talc	14
Diimu Silica Sand	12
Total	100

The above body formulation proved to have a suitable biscu: firing temperature of 1,040 deg C, at which temperature the water absorption value was found to be 15 per cent and the shrinkage 0.2 per cent. The properties are therefore quite suitable for good quality wall tile production.

Biscuit-fired samples were then glazed with a Sri Lankan wall tile glaze and fired at a glost firing temperature of 1,03C deg C. The glaze was found to be suitable for the body, none of the samples showing any deterioration after being tested in the standard autoclave test.

A suitable floor tile body formulation for the regional market was found to be:

	%
Mukwono Ball Clay	29
Lunya Feldspar	25
Diimu Silica Sand	24
Buwambo Kaolin	22
Total	100

Samples of this body formulation were fired at a temperature of 1,200 deg C to achieve an acceptable water absorption value of 5 per cent and firing shrinkage rates of 7 per cent. This is perfectly acceptable for good quality floor tile.

In addition, it was found that the addition of 2 per cent of Manganese Dioxide to the body with ball clay at 28 per cent and kaolin at 21 per cent gave water absorption results of less than 3 per cent at 1,200 deg C, therefore such tile would be suitable for the severest of climates with freeze-thaw conditions. Such climatic conditions do not occur in Uganda or the neighbouring regional countries, therefore the addition of Manganese Dioxide can be omitted for this technical reason.

However Manganese Dioxide can be used as a colouring agent for the body in unglazed floor tile to give a range of brown or black coloured tile dependent on the amount of Manganese Dioxide added. For the reason of aesthetic appeal therefore and the widening of the colour range of the floor tile products, the addition of Manganese Dioxide to some of the floor tile products would be advisable. As a consequence, these tile would have lower water absorption values at the same firing temperature, than the floor tile body without any addition.

Sri Lankan floor tile glazes were again found suitable for the Ugandan body formulation. The tile glaze costings have therefore been based on Sri Lankan prices for the purposes of this pre-feasibility study, as European prices would be more expensive.

Sanitaryware body formulation

As the local ball clay is not suitable for sanitaryware production and as this is an essential ingredient of the body formulation, it is necessary to use a proportion of imported ball clay in the sanitaryware body. A good quality ball clay will increase the body strength by 0.3 times the increase in the actual ball clay strength. This factor can rise to 0.5 with a good quality kaolin. The ball clays, which are rich in lignite with about 3 per cent lignite content or 1.8 per cent organo-carbon, tend to give body slips, which have thixotropies much less sensitive to deflocculation and are therefore more easily controlled. The team have therefore chosen to include the U.K. EWVA ball clay and the U.K. Hycast VC ball clay, which has a minimum of 3 per cent lignite content, in the proposed body mix for this operational reason. From our experience better quality casting will be achieved and this is of extreme importance in a new factory with inexperienced personnel. However it is essential to activate this lignite, so that it enters solution, otherwise no benefits occur and this is achieved with an addition of sodium carbonate to the slip, in addition to sodium silicate.

The sanitaryware body formulation, which was found suitable for production is:

	%
Lunya feldspar	30
Bumambo kaolin	25
Diimu silica sand	21
Hycast VC ball clay	17
EWVA ball clay	7
Total	100

The rheological properties of this body formulation were determined as:

Slip density		1.80 g/cc
Deflocculant demand	- Sodium Silicate	0.3 - 0.4 %
	- Sodium Carbonate	0.15 %
Casting rate		460 sec/mm

The physical properties of this body proved to be acceptable for sanitaryware production, being:

Green Strength at 110 deg C (N/mm2)	1.49 +/- 0.05
Total shrinkage, wet-fired at 1,250 deg C	11.0 %
Fired strength at 1,250 deg C (N/mm2)	18.21
Water Absorption at 1,250 deg C	1.06 +/- 0.68

The above sanitaryware body was, in addition, tested for glaze compatibility with an established sanitaryware glaze in Sri Lanka. After glazed samples had been fired, they were checked by means of a standard autoclave test to determine, if they were craze resistant. The glaze proved to be perfectly acceptable and gave excellent results with the Ugandan sanitaryware body formulation. This glaze has therefore been used for costing purposes in the financial analysis, rather than the more expensive glazes from Europe.

It should be noted that the sanitaryware body has been formulated with two specific types of ball clay but it is quite feasible to substitute these ball clays with different types. As the properties of other ball clays may differ, the proportions used in the body composition may have to be adjusted accordingly.

Main conclusions of geological survey and raw material tests

a) Geological survey

The geological survey of the ceramic raw material deposits and the laboratory tests on the samples taken have determined that it is technically possible to manufacture tiles and sanitaryware in Uganda and that the quality is suitable to produce products to a high quality standard (ie: to european standards). The estimated reserves of the local ceramic raw materials in Uganda are well in excess of the raw material requirements for the 15 year life of the new tile and sanitaryware project.

b) Tile ceramic raw materials

The laboratory tests have determined that both wall tile and floor tile can be produced in Uganda, using 100 per cent of local ceramic raw materials and that the quality is equivalent to european standards.

c) Sanitaryware ceramic raw materials

From these laboratory tests the Global Ceramics team are confident that a good sanitaryware body can be produced using 76 per cent local ceramic raw materials and 24 per cent of imported ceramic raw materials. Many factories around the world are operating successfully on this basis, therefore on a technical basis, sanitaryware production in Uganda is a feasible proposition. The market and financial aspects of sanitaryware production are covered in the other sections of this report.

Costs of local ceramic raw materials

At an annual production rate of 32,000 m2 wall tile, 22,000 m2 floor tile and 10,350 pieces of sanitaryware, the estimated cost of the local raw materials, based on mining and transportation costs in December 1990 of USh 30/kg and USh 22/kg respectively, are:

a) Tile production

1,000 tonnes raw material @ USh 52,000/tonne (USD 72.22/tonne @ USh 720/USD)
= USh 52 million (USD 72,220)

Sales Tax = USh 5.2 million (USD 7,222)

b) Sanitaryware production

270 tonnes raw material @ USh 52,000/tonne (USD 72.22/tonne)
= USh 14.04 million (USD 19,499)

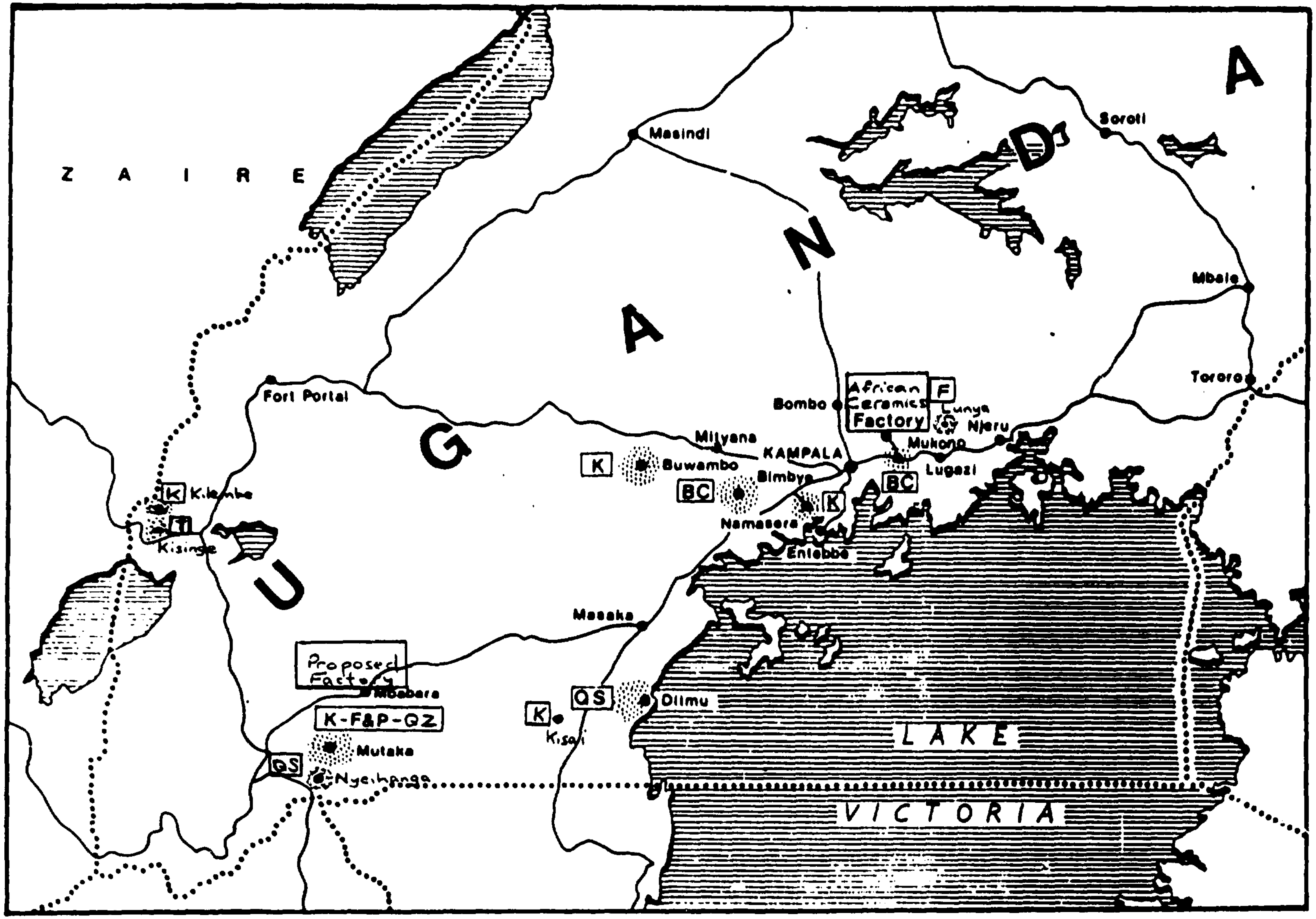
Sales Tax = USh 1.404 million (USD 1,950)

Total cost of local raw materials = USh 66.04 million (USD 91,719)
Total Sales Tax = USh 6.604 million (USD 9,172)

To ensure that the factory always has sufficient stock of raw materials on hand and to allow time for the routine testing of these materials prior to use in production, a three month stock has to be carried. This cost is included in the working capital requirements of the factory.

The locations of the ceramic raw material deposits in Uganda are shown in Figure 4.1 and a diagram showing the Diimu silica sand deposit is shown in Figure 4.2. The location of the most suitable Ugandan ceramic raw material deposits was carefully considered as one of the important factors in respect to determining the most suitable site location of the factory (see Section V). Figure 4.1 shows that the majority of the ceramic raw materials, which have been found suitable for tile and sanitaryware production, are grouped around the Kampala area, while others are grouped around the Mbarara area. The Diimu silica sand deposit is equidistant from both these areas.

Figure 4.1 MAP SHOWING UGANDA RAW MATERIAL SITES

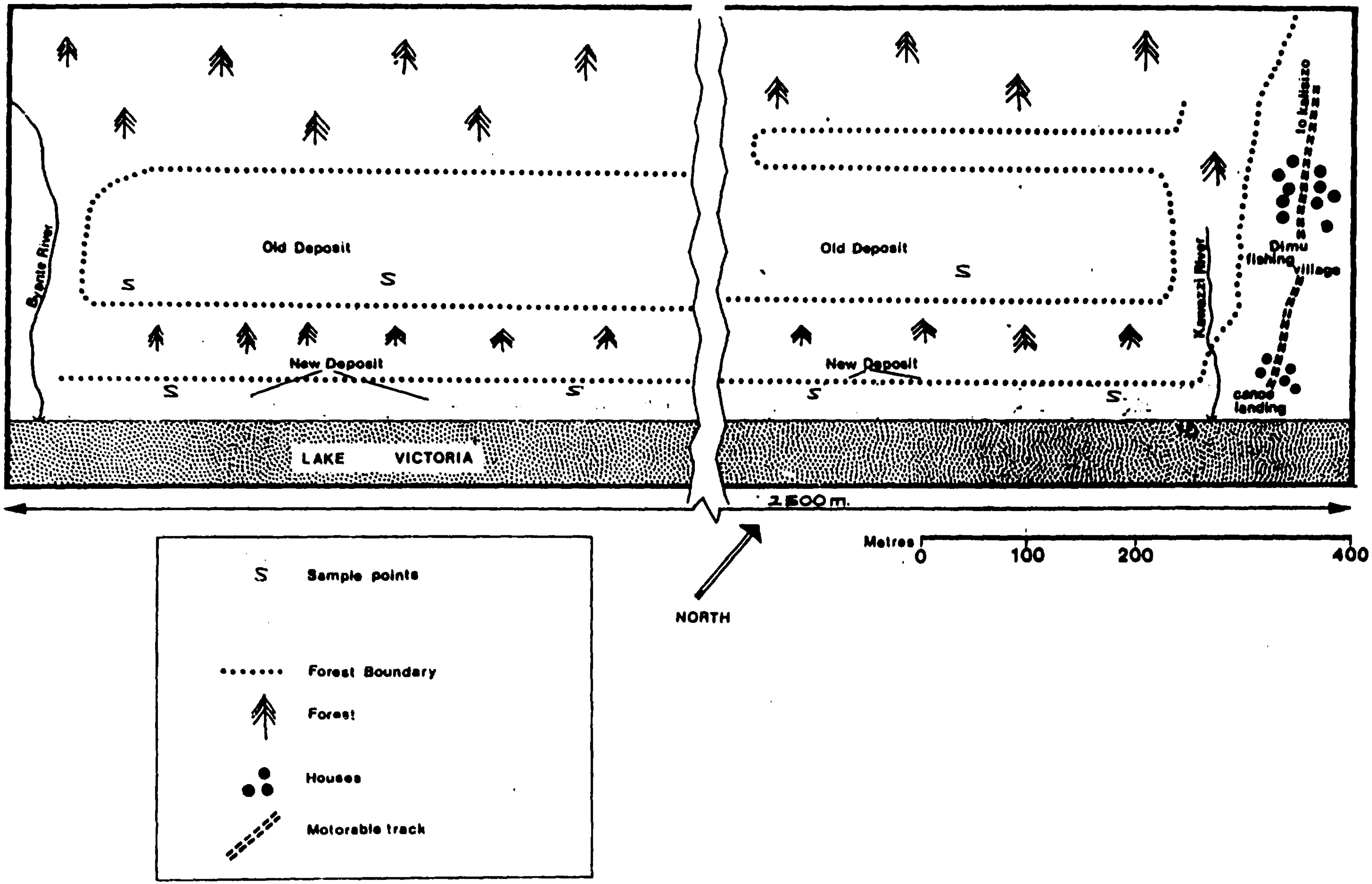


T	Talc
K	Kaolin
BC	Ball Clay
F&P	Feldspar and Pegmatite
QS	Quartz Sand
QZ	Quartz

Kilometres

0 50 100 150 200

Figure 4.2 · DIAGRAM OF DIIMU SILICA SAND DEPOSIT



4.1.2 Imported ceramic raw materials and other inputs

Ball clay

The Department of Geological Survey and Mines knew of no deposits of white firing or off-white firing plastic ball clays in Uganda and although the team was notified of a possible site 14 km from Kampala, the field work could not identify any such clay site. Only light red firing plastic clays could be located, which although suitable for tiles are not suitable for sanitaryware production.

An essential ingredient in any sanitaryware body formulation is a good quality ball clay, which enables the correct rheological properties for the correct casting of sanitaryware products to be achieved in the clay slip.

A prepared ball clay must therefore be imported for the sanitaryware production. The precise percentage of the ball clay in the sanitaryware body mix is dependent on the quality and the characteristics of the other constituents of the body but it is usually in the range of 21 - 25 per cent. The laboratory tests carried out by the team's personnel at the Ceramic Research and Development Centre in Sri Lanka determined that a total of 24 per cent of imported clay would be required. This quantity of imported ball clay together with the Ugandan raw materials of the body composition, enables the correct technical specification to be met for all of the rheological parameters required for good sanitaryware casting. The imported clays include two types, EWVA ball clay (7 per cent) and Hycast VC ball clay (17 per cent).

Typical properties of ball clay (Hycast VC)

Chemical Analysis (weight %)

SiO_2	52
Al_2O_3	31
Fe_2O_3	1.2
TiO_2	1.0
CaO	0.2
MgO	0.4
K_2O	2.1
Na_2O	0.2
Loss on Ignition (LOI)	12.0

Mineralogical Composition (weight %)

Kaolinite	64
Mica	22
Feldspar	0
Quartz	11
Carbonaceous Material	3
Others	0

Particle Size (weight %)

> 53 microns	3.0
> 10 microns	4.0
< 2 microns	80.0

Modulus of Rupture

At 80% Relative Humidity (MPa)	28
Dried at 110 deg C (MPa)	55

Casting Concentration (weight % solids) 66

Fired Properties

% Absorption	1,180 deg C	5.0
	1,280 deg C	2.0
% Contraction	1,180 deg C	12.0
	1,280 deg C	13.8

Cost of imported ball clay for sanitaryware production

For an output of 10,350 pieces of sanitaryware per year a total of 85 tonnes of imported clays are required.

Cost per tonne (CIF) = USD 180

Foreign cost per year	USD 15,300
Local cost per year	
10% Import duty	USD 1,530
10% Sales Tax on CIF & Import Duty	USD 1,683
Total Import Duty + Sales Tax	USD 3,213
less 50% drawback of import duty for exports	765
	USD 2,448
Total cost (Foreign & local), incl Sales Tax	USD 17,748

While this clay is of a consistent and known properties and is readily available from the suppliers on an ex-stock basis, a three month stock must be carried on the factory to allow for delays in shipping, or delays in obtaining foreign exchange. This cost is allowed for in the working capital requirements.

The costs have been based on west European sources. It may be possible to reduce these by using east European or Asian sources.

Adequate storage space has been allowed in the design of the building (Section IV) for all local and imported clays, in addition to the other input items, including plaster, glazes, cisterns and spare parts.

Glazes

During the first few years of the project at least, the prepared glazes for both tiles and sanitaryware must be imported. These amount to approximately 7 per cent by weight of the fired product weight. The specification of the floor tile glaze will be for heavy duty use with high abrasion resistance, so that the products can be used both in the domestic environment and in high traffic pedestrian areas. All glazes will mature between 1,100 - 1,200 deg C and therefore will be totally lead-free, which will avoid the possibility of health problems for the factory personnel.

One of the medium-term development aims of the laboratory would be to try to develop a glaze base from the local ceramic raw materials. For this work a fritting kiln would have to be purchased.

a) Tile glaze

For an annual output of 32,000 m2 wall tile and 22,000 m2 floor tile a total of 53.3 tonnes of glaze per year will be required.

Average cost per tonne (CIF) = USD 770

Foreign cost per year	USD 41,041
Local cost per year	
10% Import duty	USD 4,104
10% Sales Tax on CIF & Import Duty	USD 4,514
Total Import Duty + Sales Tax	USD 8,618
less 50% drawback of import duty for exports	2,052
	USD 6,566
Total cost (Foreign & local), incl Sales Tax	USD 47,607

b) Sanitaryware glaze

For an annual output of 10,350 pieces per year, a total of 12.9 tonnes of glaze will be required.

Cost per tonne (CIF) = USD 1,232

Foreign cost per year	USD 15,893
Local cost per year	
10% Import duty	USD 1,589
10% Sales Tax on CIF & Import Duty	USD 1,748
Total Import Duty + Sales Tax	USD 3,337
less 50% drawback of import duty for exports	794
	USD 2,543
Total cost (Foreign & local), incl Sales Tax	USD 18,436
Total cost of tile and sanitaryware glaze, (including Sales Tax)	USD 66,043

It is necessary to carry a three month stock of all glazes on the factory to allow for shipping delays and delays in obtaining foreign exchange. This cost is allowed for in the working capital requirements.

It should be noted that the above glaze costs are based on obtaining supplies from Asian sources. Glazes from European sources would be at higher costs. Glaze costs could possibly be reduced, if base glazes for tiles and sanitaryware could be developed from local ceramic raw materials. In this case only the glaze stains would have to be imported from Europe or Asia. It is known that an enamel factory operates in Mombassa and it may be possible to purchase a glaze frit from this factory. Detailed tests would have to be made to determine the suitability of any frits from this factory.

Plaster-of-Paris

Plaster-of-Paris is required for the normal replacement of working sanitaryware moulds and also for additional case moulds at longer intervals. As special types of plaster are required for both working moulds and case moulds and this type of plaster is not made in Uganda, it must be imported from a specialist manufacturer in Europe. As the useful shelf-life of Plaster-of-Paris is normally about three months, after which it can start to deteriorate, it is necessary to order supplies in smaller quantities and at more frequent intervals, so that the Plaster-c -Paris remaining on stock is all within the normal use-by date. Correct stock rotation is vital to ensure that all older stock is used before new deliveries.

Cost of Plaster-of-Paris

For an output of 10,350 pieces of sanitaryware per year, the requirement will be 22.5 tonnes per year.

Cost per tonne (CIF) = USD 184

Foreign cost per year	USD	4,140
Local cost per year		
10% Import duty	USD	414
10% Sales Tax on CIF & Import Duty	USD	455
Total Import Duty + Sales Tax	USD	869
less 50% drawback of import duty for exports		207
	USD	662
Total cost (Foreign & local), incl Sales Tax	USD	4,802

A total three month stock of material should be held on the factory, although this must actually be ordered at least every two months to maintain all stocks in fresh condition. The costs of this stock are included in the working capital requirements of the factory.

4.2 Consumable items

4.2.1 Local consumable items

For production consumable items, such as oil, greases, LPG bottles, nuts, bolts and miscellaneous steel sheets, angle iron, pipes etc can be obtained on the local market.

Cost of local consumable items (tiles)

Estimated annual cost is:	USD 2,000
Sales Tax:	USD 200

4.2.2 Imported consumable items

For the production of sanitaryware a number of relatively small but important items are required on a continuous replacement cycle and none of these are available in Uganda. All of the following items must therefore be imported from Europe:

Sodium silicate - 140 deg Twaddle
Sodium carbonate
Dispex
Glaze binder
Barium carbonate
Batt wash
Mould release agent
Placing strips - polystyrene
Bullers Rings (common with tiles) Std green TR27
Large sponges
Natural sponges
Natches for moulds 7/8 inch new style
Screens, 120's and 100's mesh - stainless steel
Flat brushes
Vegetable stain
4% Calgon solution
10% Gum Arabic
Casters' tools (punches, support pad, templates, fettling knives)
Refractories (common with tiles)
Temperature recording charts, ink (common with tiles)
Porcelain balls for glaze mill

Foreign cost per year	USD 4,000
Local cost per year	
10% Import duty	USD 400
10% Sales Tax on CIF & Import Duty	USD 440
Total Import Duty + Sales Tax	USD 840
less 50% drawback of import duty for exports	200
	USD 640
Total cost (Foreign & local), incl Sales Tax	USD 4,640

It is necessary to hold a three month supply of all consumables on the factory and the costs of this are included in the working capital requirements.

4.3 Auxiliary supplies - Packaging materials

4.3.1 Local packaging materials

All tiles and sanitaryware must be packaged properly for transport from the factory to the Kampala shop, or Nairobi distribution point. Wooden pallets, which can be obtained locally, will be required to package either boxes of tiles or items of sanitaryware safely to avoid damage in transit to the distribution centre or customer.

Cost of local packaging materials

Annual cost for tiles - 570 pallets	USD 2,280
Sales Tax	USD 228
Annual cost for sanitaryware - 385 pallets	USD 1,540
Sales Tax	154
Total materials	USD 3,820
Total Sales Tax	382

4.3.2 Imported packaging materials

Sanitaryware items are normally packaged onto wooden pallets with cardboard protective inserts or sleeves and then a shrinkwrap film is placed over the products to give stability to the package.

In the case of tiles, these must be packaged into cardboard boxes, which are then stacked onto wooden pallets and shrinkwrapped.

The cardboard boxes, cardboard protective inserts and polythene must be imported, as these are not available in Uganda.

For purely local sales, it may be possible to dispense with some of this packaging for about 25 per cent of the production, to reduce the cost but the majority should be packaged to avoid losses in transport.

Cost of imported packaging materials

a) The annual cost of cardboard boxes at USD 1.00/box, packaging wall tile in 1.0 m2 boxes and floor tile in 0.5 m2 boxes, ie: 66,000 boxes will be:

Foreign cost per year	USD 66,000
Local cost per year	
10% Import duty	USD 6,600
10% Sales Tax on CIF & Import Duty	USD 7,260

Total Import Duty + Sales Tax	USD 13,860
less 50% drawback of import duty for exports	3,300
	USD 10,560
Total cost (Foreign & local), incl Sales Tax	USD 76,560

b) Allowing for the proportion of local sales, the costs at USD 2.20/pallet for polythene for packaging tile will be:

Foreign cost per year	USD 1,254
Local cost per year	
10% Import duty	USD 125
10% Sales Tax on CIF & Import Duty	USD 137
Total Import Duty + Sales Tax	USD 262
less 50% drawback of import duty for exports	USD 62
	USD 200
Total cost (Foreign & local), incl Sales Tax	USD 1,454

c) Allowing for the proportion of local sales, the costs at USD 1.80/pallet for cardboard and USD 2.20/pallet for polythene; ie: USD 4.00/pallet for packaging sanitaryware, will be:

Foreign cost per year	USD 1,540
Local cost per year	
10% Import duty	USD 154
10% Sales Tax on CIF & Import Duty	USD 169
Total Import Duty + Sales Tax	USD 323
less 50% drawback of import duty for exports	USD 77
	USD 246
Total cost (Foreign & local), incl Sales Tax	USD 1,786

Summary of packaging costs

	Sanitaryware (USD)	Tiles (USD)	Total (USD)
Local cost	1,617	5,643	7,260
Sales Tax	323	7,625	7,948
Foreign cost	1,540	67,254	68,794
Total cost	3,480	80,522	84,002

A three month stock of packaging materials is required on the factory and the costs of this is allowed for in the working capital requirements.

4.4 Auxiliary supplies - Imported cistern fittings

Any sanitaryware factory should be in a position to supply cisterns complete with all fittings. The type of fitting has to be decided at the design stage, as the cistern design must be made with a view of using one particular type of flushing mechanism. No cistern fittings are made in Uganda, therefore these must be imported on a continuous basis to match the production rate of cisterns. The number of cistern fittings required per year is 2,070, based on a total sanitaryware production rate of 10,350 pieces per year.

Cost of imported cistern fittings

The annual cost at USD 22.00 per set is:

Foreign cost per year	USD 45,540
Local cost per year	
10% Import duty	USD 4,554
10% Sales Tax on CIF & Import Duty	USD 4,994
Total Import Duty + Sales Tax	USD 9,534
less 50% drawback of import duty for exports	USD 2,277
	USD 7,257
Total cost (Foreign & local), incl Sales Tax	USD 52,797

It is necessary to carry a three month stock on the factory and the costs of this are allowed for in the working capital requirements.

Other items, which may be advisable for the company to sell to improve revenue are the plastic seats and covers for the water closets and basin sets, including plug chain and stay and the taps. However, as these can be obtained in Kampala at some hardware stores and at almost all Nairobi hardware stores, we have not included these optional items in the cost analysis for working capital requirements.

4.5 Spare parts

4.5.1 Imported spare parts

The annual cost of mechanical and electrical spares and tile die plates is expected to be:

Foreign cost per year	USD 12,000
Local cost per year	
10% Import duty	USD 1,200
10% Sales Tax on CIF & Import Duty	USD 1,320
Total Import Duty + Sales Tax	USD 2,520
less 50% drawback of import duty for exports	USD 600
	USD 1,920
Total cost (Foreign & local), incl Sales Tax	USD 13,920

Tho above are equally divided between tiles and sanitaryware.

4.5.2 Local spare parts

The annual cost of mechanical and electrical spares, which can be obtained from the local suppliers is expected to be:

	USD 6,000
Sales Tax:	USD 600

Summary of spares cost

Foreign cost	USD 12,000
Local cost	USD 6,600
Sales Tax	USD 1,920
Total cost	USD 20,520

4.6 Building repair

Building repairs to the factory, including repainting, masonry repairs and replacement of roof sheets and windows is expected to have an annual cost of:

Local cost	USD 3,000
Sales Tax	USD 300

This cost is divided equally between tiles and sanitaryware.

4.7 Utilities

4.7.1 Water

Process water will be obtained from a river source, while drinking water for the factory personnel will be obtained from the piped supply of the municipality. It is estimated that the total process water requirement could be approximately 900 cubic metres per year, including that for plant cleaning purposes. The expected costs are:

Process water	USD 3,000
Piped water	USD 1,000
Total local cost	USD 4,000

4.7.2 Electricity

As electricity is the only practical means of firing the kilns and heating the dryers and casting areas in Uganda, a site with a stable supply of electricity is essential for the success of the factory. This factor was carefully considered in the choice of location and site and locations with an uncertain electrical supply were eliminated from further consideration.

The electrical installed capacity and the expected consumption in the proposed factory, based on the project engineering parameters (Section IV) are shown in the following tables.

It should be noted that the motor sizes for various similar types of equipment do vary somewhat dependent on the company from which they are purchased. For the purposes of this pre-feasibility study the team has used the heavier motors as a guide, so that the electricity consumption is not under-estimated.

i) Tile section

Item	Installed Motor KW	Days in use	Hrs/ day	KWhr/day @ 65%	KWhr/ week
Ball mill	15	5	7	68.3	342
Blunger	40	5	4	104	520
Storage Ark 1	3	7	24	46.8	328
Storage Ark 2	3	7	24	46.8	328
2 Vib. screen	0.74	5	2	1	5
Pumps	10	5	2	13	65
Mixing tank 1	3	7	24	46.8	328
Mixing tank 2	3	7	24	46.8	328
2 Vib screen	0.74	5	2	1	5
Storage Ark 1	3	7	24	46.8	328
Storage Ark 2	3	7	24	46.8	328
Spray dryer	10	5	7	45.5	228
Tile press	15	5	7	68.3	342
2 Dryers	60	6	24	936	5,616
Biscuit kiln 1	170	6			9,000
Biscuit kiln 2	200	6			10,500
2 Glost kilns	420	5			32,400
Glazing line	25	5	7	113.8	569
Air compressor	8	5	7	36.4	182
Total tiles	992.48				61,742

The electrical consumption of the kilns is based on the following parameters:

Biscuit kiln 1 - 48hr cycle, 3,000 KWhr/firing, 3 firings/week
Biscuit kiln 2 - 48hr cycle, 3,500 KWhr/firing, 3 firings/week
2 Glost kilns - 24 hour cycle, 2,700 KWhr/firing, approx 6 firings/week/kiln

It should be noted that above kiln consumptions are the average of different suppliers of kiln. By carefully selecting the most thermally efficient kiln at the tendering and ordering stage of the project, it may be possible to have lower electricity consumptions.

ii) Support areas

Item	Installed Motor KW	Days in use	Hrs/ day	KWhr/day @ 65%	KWhr/ week
Glaze preparation	4	5	4	10	50
Laboratory	3	5	4	8	40
Total support areas	7				90

iii) Sanitaryware section, including common raw preparation

Item	Installed Motor KW	Days in use	Hrs/ day	KWhr/day @ 65%	KWhr/ week
Jaw crusher	10	5	4	26	130
Ball mill 1	15	5	10	97.5	488
Ball mill 2	15	5	10	97.5	488
Ball mill 3	15	5	7	68.3	341
HS Blunger	40	5	4	104	520
4 Vib. screens	1.48	5	2	2	10
Storage Ark 1	3	7	24	46.8	328
Storage Ark 2	3	7	24	46.8	328
Storage Ark 3	3	7	24	46.8	328
Storage Ark 4	3	7	24	46.8	328
4 Pumps	20	5	2	26	130
Mixing Ark	11	7	24	171.6	1,201
Scrap Blunger	7.5	5	4	19.5	98
Vib screen/mag	0.32	5	4	0.8	4
Holding tank	7.5	7	24	117	819
Vib screen/mag	0.32	5	4	0.8	4
Supply tank 1	5	7	24	78	546
Supply tank 2	5	7	24	78	546
2 Pumps	10	5	3	19.5	98
Mould drying	5	7	24	78	546
Kiln	250	5			16,500
Total sanitaryware	430.12				23,781

It should be noted that by careful selection of the most thermally efficient sanitaryware kiln at the tendering and ordering stage, it may be possible to reduce the electricity consumption of this item.

iv) Office & security

Item	Installed Motor KW	Days in use	Hrs/ day	KWhr/day @ 65%	KWhr/ week
Office	20	6	8	104	624
Security	20	7	12	240 (100%)	1,680
Total office & sec.	40				2,304

Summary of installed KVA and electrical power consumption

	Installed KVA	KWhr /week	KWhr /year
Tile section	992.48	61,742	2,840,132
Glaze preparation & Laboratory	7	90	4,140
Sanitaryware section	430.12	23,781	1,093,926
Office and security	20	2,304	105,984
Totals	1,450	87,917	4,044,182

Cost of electricity

The cost of electricity consists of two elements, the cost of units used and the maximum demand charge. Based on the Uganda Electricity Board industrial tariff rates of December 1990, the electricity costs are:

i) Cost of units at Ush 7.00/unit

	USh/year
Tile section	19,880,924
Glaze preparation & laboratory	28,980
Sanitaryware section	7,657,482
Office & security	741,888
Total cost of units	28,309,274

ii) Cost of maximum demand charge at USh 400/KVA/month

At an estimated maximum demand of 1,000 KVA, based on the estimated peak load, the monthly charge would be USh 400,000. The maximum demand charge is divided in the proportion 72.2 per cent tile and 27.8 per cent sanitaryware.

Cost of maximum demand per year	USh 4,800,000
Total annual electricity cost	USh 33,109,274
or	USD 45,985

This cost is divided as:

tiles	USD 32,961
sanitaryware	USD 13,024

4.7.3 Fuel Oil for Process

The cost of fuel oil for the spray dryer unit is estimated at US Dollar 10,000 per year.

Total annual cost (local) of utilities and energy

Water	USD 4,000
Electricity	USD 45,985
Fuel Oil	USD 10,000
Total	USD 59,985

Summary of raw material and input costs by product

a) Tile raw material and input costs (USD)

Item	Foreign Cost	%	Local Cost	%	Sales Tax	Total Cost
Ceramic raw Material	-		72,220	54.9	7,220	79,442
Tile glaze	41,041	35.9	2,052	1.6	4,514	47,607
Consumables	-		2,000	1.5	200	2,200
Packaging						
- pallets	-		2,280	1.7	228	2,508
- boxes	66,000	57.7	3,300	2.5	7,260	76,560
-polythene	1,254	1.1	63	0.1	137	1,454
Imp. spares	6,000	5.3	300	0.2	660	6,960
Local spares	-		3,000	2.3	300	3,300
Build. Repair	-		1,500	1.1	150	1,650
Water	-		2,000	1.5	-	2,000
Electricity	-		32,961	25.0	-	32,961
Fuel Oil	-		10,000	7.6	-	10,000
Total	114,295	100.0	131,676	100.0	20,671	266,642

The foreign costs of the raw materials and inputs amount to 42.9 per cent (incl. Sales Tax).

b) Sanitaryware raw material and input costs (USD)

Item	Foreign Cost	%	Local Cost	%	Sales Tax	Total Cost
Ceramic raw Material	-		19,499	35.4	1,950	21,449
Imported clay	15,300	16.5	765	1.4	1,683	17,748
Glaze	15,893	17.2	795	1.4	1,748	18,436
Plaster	4,140	4.5	207	0.4	455	4,802
Consumables	4,000	4.3	200	0.4	440	4,640
Packaging						
- pallets	-		1,540	2.8	154	1,694
- polythene	1,540	1.7	77	0.2	169	1,786
Cist. fitting	45,540	49.3	2,277	4.1	4,994	52,811
Imp. spares	6,000	6.5	300	0.5	660	6,960
Local spares	-		3,000	5.4	300	3,300
Build. repair	-		1,500	2.7	150	1,650
Water	-		2,000	3.6	-	2,000
Electricity	-		13,024	23.6	-	13,024
Fuel Oil	-		10,000	18.1	-	10,000
Total	92,413	100.0	55,184	100.0	12,703	160,300

The total foreign costs of the raw materials and inputs amount to 57.7 per cent (including sales tax). It should be noted that the above sales tax is fully reclaimable against the sales tax payable on the sales revenue, therefore it is not an operational expense.

Possibilities of raw material and input cost reductions

a) Imported clay

The percentage of imported clay for sanitaryware could possibly be reduced in the future, if better quality local ball clays are subsequently found by the technical personnel of the factory.

b) Imported glaze

Glaze costs could possibly be reduced in the future by developing fritted glaze bases for the tile and sanitaryware products from local ceramic raw materials but glaze stains would still have to be imported.

c) Imported packaging

Packaging costs could possibly be reduced by sourcing more packaging material from a regional supplier, as the field work determined that there was no domestic manufacturer of cardboard boxes and polythene. The management of the company could also decide to reduce the level of packaging, if they are confident that the consequential damage during transport can be minimi.

Imported items, which are unlikely to be reduced are the Plaster-of-Paris, Cistern fittings and imported spare parts.

SECTION V

LOCATION AND SITE

V. LOCATION AND SITE

5.1 Location

The main industrial areas of Uganda are Kampala, Turoro and Jinja, which are already established industrial centres and Mbarara, which is in the process of being established as an industrial centre. From these possible locations, which were evaluated by the team, two alternative locations were selected by the team as being suitable for the site of the new factory, after considering all aspects of the precise requirements of the project and also the opinion of the local promoters.

The two alternative locations for the proposed new tile and sanitaryware factory in Uganda, one in the Mbarara area and one in the Kampala area (see Figure 5.1), were chosen by the team, as they both met the fundamental requirements determining their suitability. Turoro and Jinja did not meet all of the requirements, therefore these locations were rejected from further consideration.

The fundamental requirements, which determine whether a location is suitable for a tile and sanitaryware factory, include:

a) Distance from the market

Ideally the location of the factory should be fairly close to, or in the major market area for the products being manufactured. In the case of Uganda, Kampala is the major market for ceramic tile and sanitaryware and therefore would be a logical location for such a factory. If this cannot be achieved, then the factory should be located in an area with good road connections to the major market. Mbarara, although about 240 km from Kampala, does have a good paved road to the city. Both Tororo and Jinja also have good paved roads to Kampala, therefore on this point all of the alternative potential locations could be considered.

b) Distance from the local raw materials

This is rather less important than the distance from the market because while it would be ideal to have the factory situated in close proximity to all the raw materials, this is rarely possible in the case of ceramic factories. The tile and sanitaryware products require a number of ceramic raw materials in their manufacture, sanitaryware requiring different raw materials than tiles. In Uganda some of the raw materials are found around the Kampala area and some are located in western Uganda around the Mbarara area. In the case of sanitaryware, the ball clay has to be imported, as clay of a suitable quality is not found in Uganda. On balance, as the majority of the local raw materials are in the Kampala area and the imported materials would come through either Entebbe (air) or Kampala (road/rail), this would be the favoured location on this point. As Tororo is distant from all of the local raw materials, this is a disadvantage of this particular location.

c) Public policies

In the case of the locations under consideration, Mbarara, which was destroyed in the recent wars is being rebuilt. A new University of Science and Technology is to be established in Mbarara and this would be advantageous to a tile and sanitaryware factory due to the technical nature of ceramics manufacture. The Government is actively promoting the establishment of industries in all areas of the country, especially those outside of the Kampala area. The new Investment Code, however, gives no preference to projects based on location, therefore any suitable location chosen for the new factory based on the required parameters would be acceptable under current public policies. In the case of Kampala, projects are still welcomed, therefore sites in this area can be considered, if they meet the requirements of the particular factory.

d) Infrastructure

The general infrastructure of water supplies, power supplies, roads and communications is generally much better in Kampala than Mbarara. Access to back up services for mechanical and electrical engineers and factory spare parts and supplies is also far better in Kampala than in Mbarara. However two of the essential requirements for a tile and sanitaryware factory; water and reliable electrical power, are satisfied by a Mbarara location. Jinja suffers from power shortages for its existing factories and therefore cannot be considered as a location for the project. Although efforts are being made to improve the situation, it will be some time before surplus capacity is available for new factories. The electrical supply situation for Tororo is also judged to be poorer than that in the Kampala and Mbarara areas.

After considering all aspects of the various locations, including distance from the market, distance from the raw materials, public policies and the infrastructure, the team decided that on a technical basis, the new factory could be located either in the Mbarara area or the Kampala area.

5.2 Site

During the field work in Uganda team members visited three alternative sites for the proposed factory, these being the industrial area of Mbarara, the industrial area of Kampala and an existing ceramics factory in the neighbourhood of Kampala. The sites at Mbarara and at the ceramics factory were visited by the team together with Sunrise Ceramics Limited personnel.

a) Mbarara site

Mbarara has a designated industrial area, close to the town centre, which has a suitable site for a tile and sanitaryware factory.

To allow for possible future expansion a total site area of approximately 2 acres would be ideal but the minimum size would be 1 acre. Sites of this size are currently available in the Mbarara industrial area, which are close to the main Uganda Electricity Board transformer and substation and also close to the river, from which the process water for the factory could be pumped. Drinking water for the factory would be taken from the town mains supply but this could not supply a factory with process water.

The cost of land for freehold purchase in Mbarara, if allocated by the municipal council is approximately USh 6 million per acre. From private owners an industrial site of 0.339 hectare (0.837 acre) can be purchased for USh 6 million.

Leasing of sites in the industrial area costs USh 1 - 2 million per acre as an initial premium and an annual ground rent of USh 120,000 - 150,000 per acre. On the 2 acre site, which would be suitable for the factory, the costs are estimated as:

Leasing premium cost	USh 3.6 million (USD 5,000)
Ground rent	USh 288,000 per year (USD 400)

One slight disadvantage of the sites in the industrial area at Mbarara, although not too serious, is that they are not flat but slope towards the river to varying degrees. This can be catered for however in the site preparation for the building.

The cost of site preparation at Mbarara is estimated at USh 2.88 million (USD 4,000).

b) <u>Kampala industrial area site</u>

There are many vacant sites in the Kampala industrial area, which would be suitable for the new factory. The only disadvantage is that the cost of the sites is more than that in the Mbarara industrial area. The leasing premium cost would be in the region of USh 14.4 million (USD 20,000) and the annual ground rent would also be higher than in Mbarara.

Water supplies could be provided from the city supply and adequate power supplies could be installed by Uganda Electricity Board.

As far as a new factory is concerned the additional cost of the site would only affect the financial analysis slightly, as the site cost is a very small proportion of the total capital costs.

c) <u>Existing site at African Ceramics Company Limited</u>

A possible alternative site for the tile and sanitaryware factory is at the existing African Ceramics Company Limited factory, which is located at Kasiyirize, 14 miles east of Kampala on the Jinja road. While this site also is not perfect, as the access road is not paved for a few kilometers, the building requirements are minimal, as much of the existing factory building space is not utilized. The building costs related to the project could therefore be reduced very significantly. Additional transformers for 1,500 KVA would however still be necessary at this site, as the existing 500 KVA transformer plus a new additional 500 KVA transformer to be delivered shortly are only adequate for the existing factory, when operating at full capacity.

<u>Local conditions</u>

The local conditions at both sites are very similar. Uganda has a blend of equatorial and tropical climates ranging from that of the warm lowlands to the cool uplands. Much of Uganda, including that at both proposed sites, has a mean average temperature of 22 deg C with an annual rainfall of about 125 cm evenly distributed throughout most of the year. The wettest season is from March to May and the weather is moderate between August and November. The factor of local conditions does not favour one site against the other, in the case of this new project.

The waste disposal system at either site would be identical, with waste clay slurry being fed first into settling tanks, so that clean water is discharged from the factory. Sewage would be fed into the Mbarara municipal system, or in the case of the African Ceramics site, into a cess-pit system.

Manpower for the project is not a problem in either of the proposed alternative locations, as there are many unemployed people capable of being trained for all production functions. Senior management and marketing personnel are available in Kampala and would relocate as required. All production personnel would live fairly close to the factory and the company would provide transport for these personnel at all shift times.

Transportation facilities at both sites are limited to road transportation for the delivery of raw materials and the products from the factory. While the site at Mbarara has better access to a paved road, the African Ceramics marram site access road does not, in practice, cause any problems.

In respect to the easy availability of maintenance facilities, the Mbarara site is at a slight disadvantage, as it is more distant from Kampala.

Final site selection

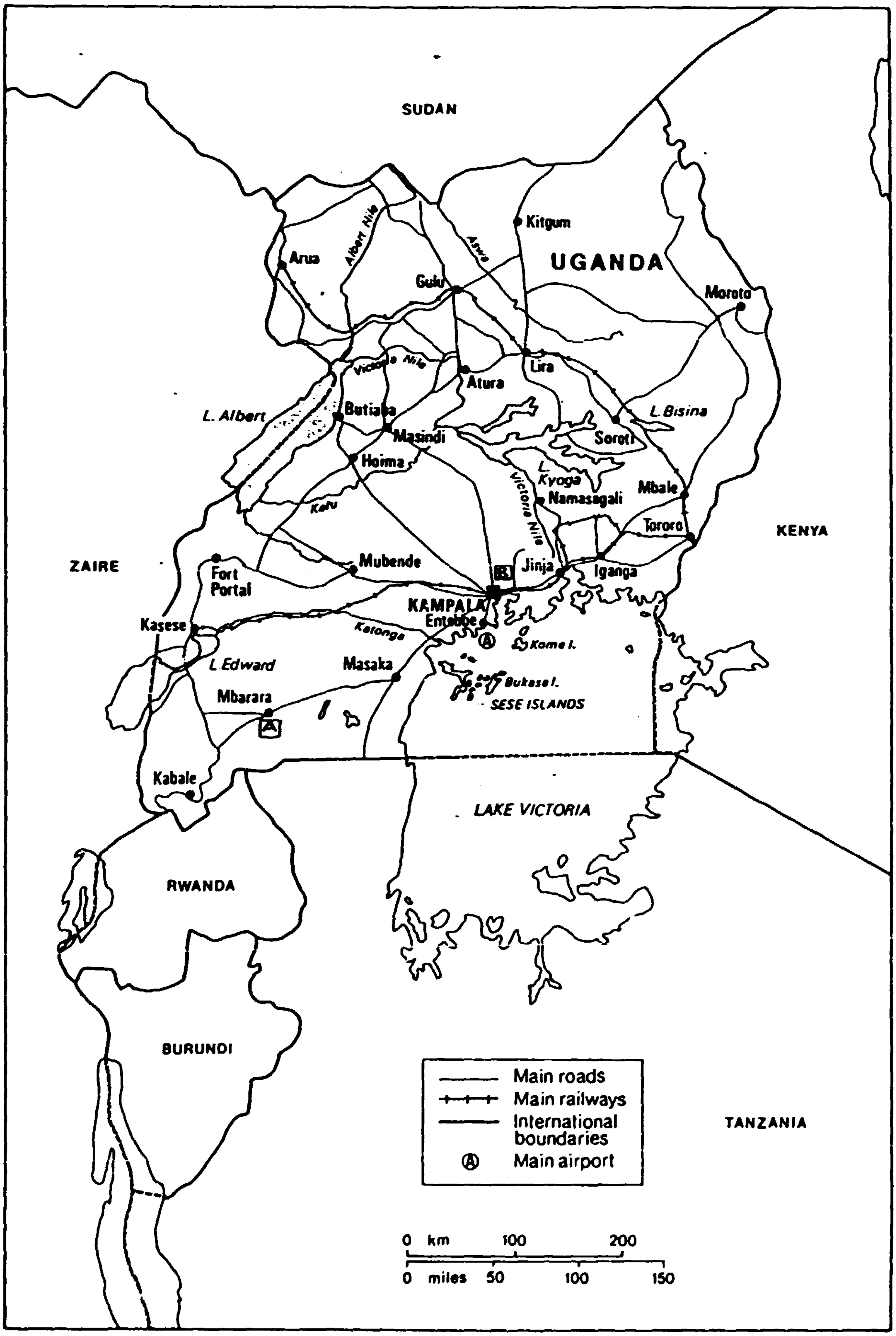
Following discussions with the team, the local promoter of the project, at the time of the final fieldwork in January 1991, still favoured the proposed site at Mbarara for the project, although on a technical basis a new site in Kampala would be equally suitable for the factory.

The possibility of siting the project at the existing African Ceramics Company Limited site at Kasiyirize was examined as this site would have much lower building costs and lower operational costs than either a new site at Mbarara or a new site at Kampala. The use of this site for the new project is felt to be very doubtful however, as the process of privatization of this company is expected to be too slow to be of benefit to this particular project.

The main financial analysis has therefore concentrated on the Mbarara site as a basis for the project. The results of this site would also to apply to a new site in Kampala, as the additional site costs would make no material change in the viability of the project. The alternative site of African Ceramics Company Limited has therefore been treated in the form of a sensitivity analysis for comparison purposes.

Figure 5.1 LOCATION OF PROPOSED FACTORY SITE

Uganda



A - MBARARA SITE
B - AFRICAN CERAMICS

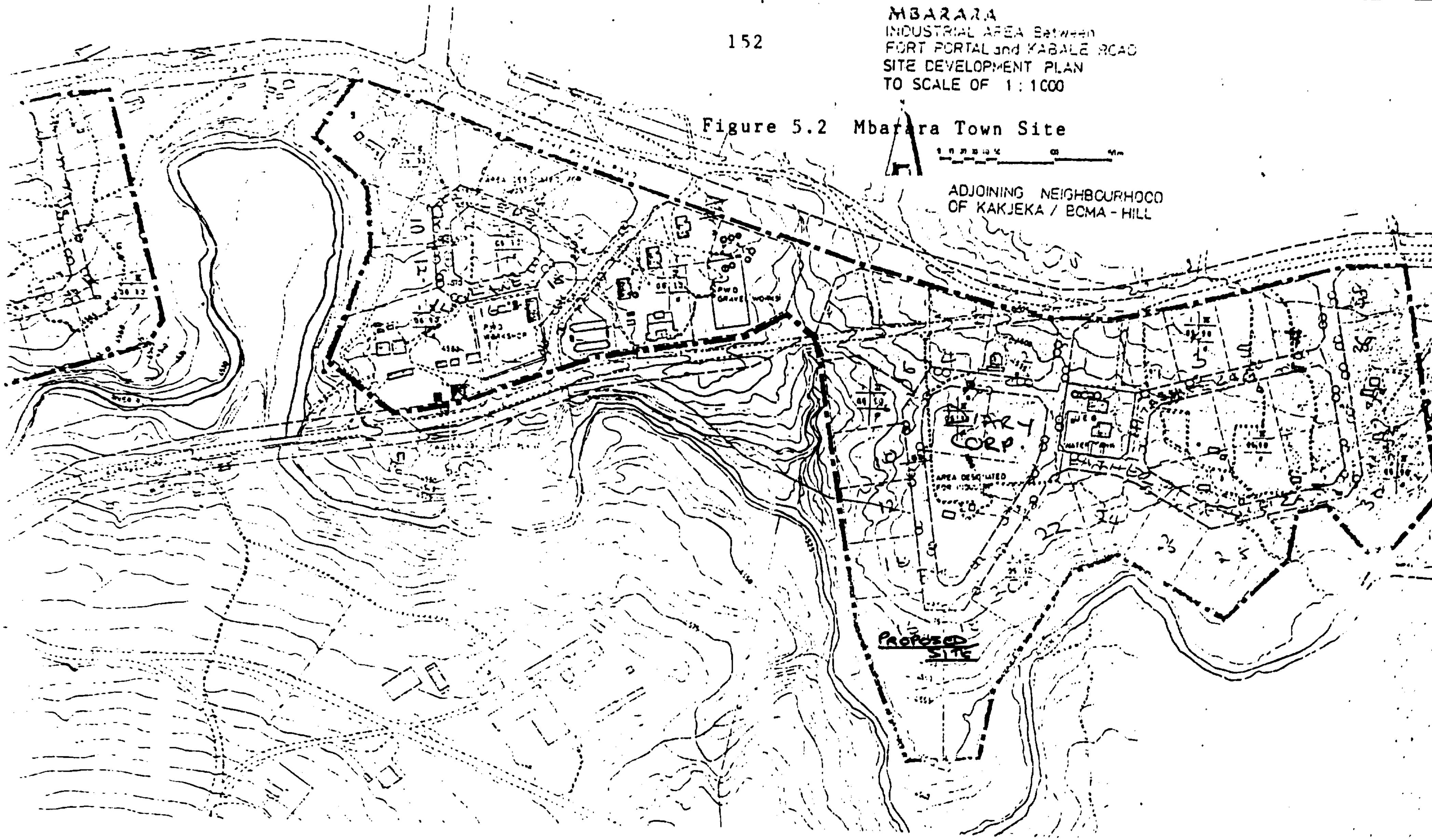


Figure 5.2 Mbarara Town Site

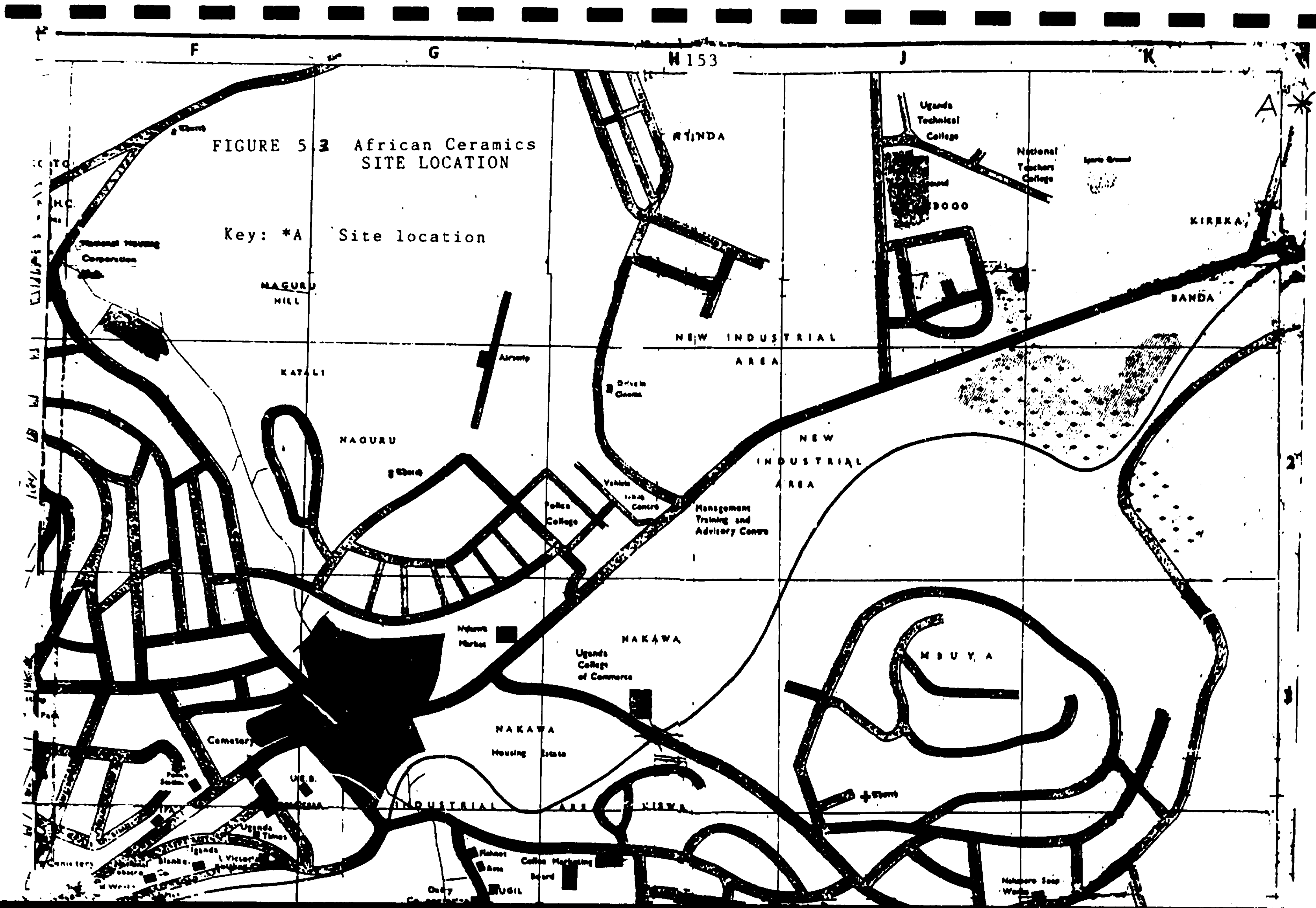
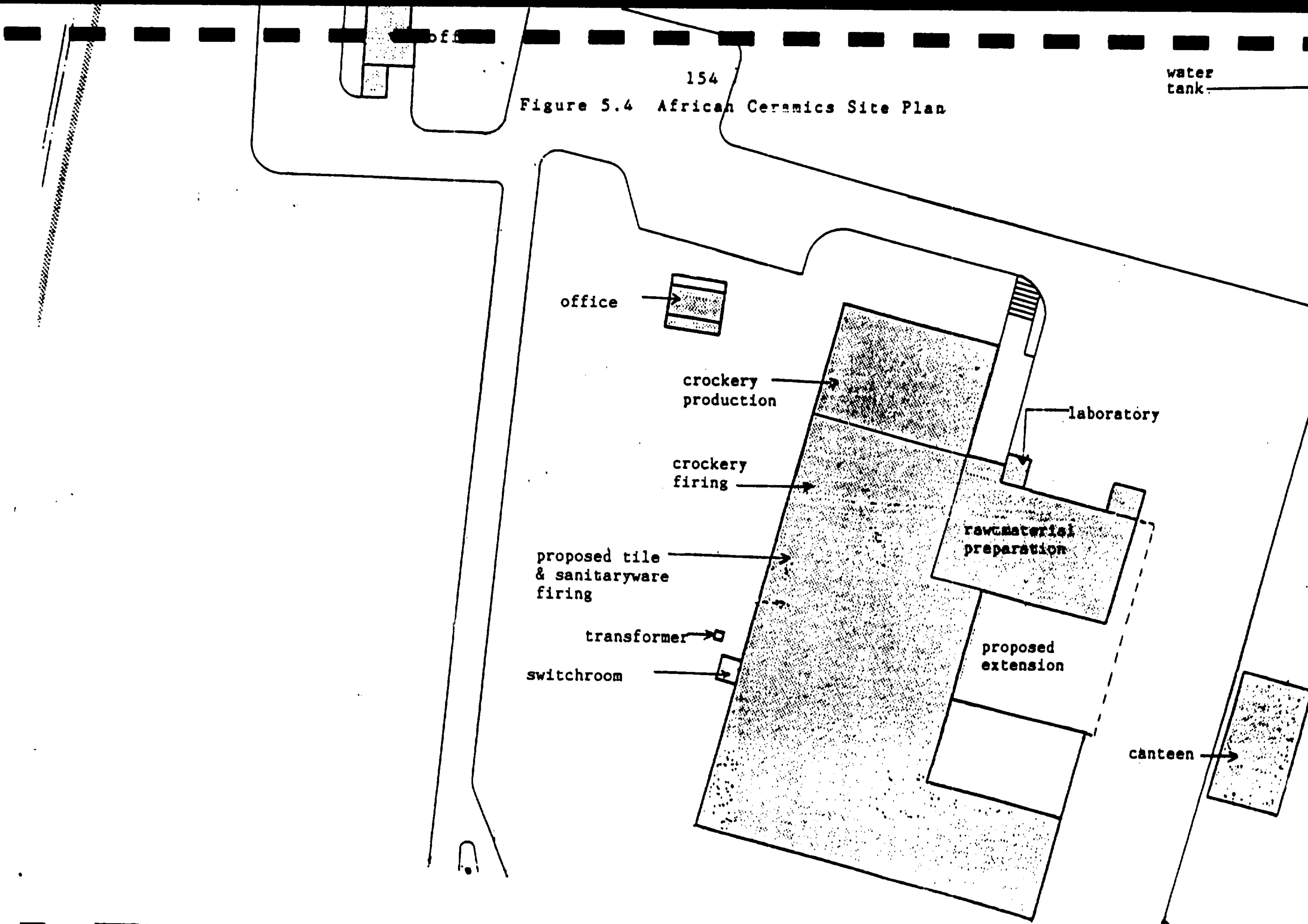


FIGURE 5.3 African Ceramics
SITE LOCATION

Key: *A Site location

Figure 5.4 African Ceramics Site Plan



SECTION VI

PROJECT ENGINEERING

VI. PROJECT ENGINEERING

6.1 Scope of the project

The proposed new ceramics factory is planned to produce glazed wall tile, glazed floor tile and glazed vitreous china sanitaryware products with the following annual saleable production levels, which have been based on the expected market share of these products in Uganda and Kenya.

Wall tile, 150mm x 150mm x 5mm	32,000 m2/year
Floor tile, 200mm x 100mm x 10mm	22,000 m2/year
Total tile production	54,000 m2/year
Sanitaryware	10,350 pieces/year

Quality standards

From the market survey work carried out by the team in Uganda and Kenya, it was determined that the majority of purchasers want first quality tile and sanitaryware products to European standards. The designs of the sanitaryware required are modern but not too ornate. The project has therefore been designed on the basis of producing high quality products with as simple a production process as possible, using standard basic equipment raw material and production equipment, which can be easily maintained in Uganda. In the case of the dryers and kilns, these will be provided with automated programmable temperature controllers to ensure a consistent high quality is achieved in the tile and sanitaryware products.

The project has been based on:

a) Single-shift of 8 hours per day for normal production with allowance for 1 hour per day downtime (87.5% efficiency).
b) Five-day work week for normal production.
c) 46-week effective work year to allow for normal holidays and occasional power cuts.

The exceptions to the above will be the drying and firing operations, which will be carried out over six days per week, 24 hours per day. Sales staff will be expected to work on Saturdays, as is normal in Uganda.

An effective 46-week work year has been used for the project to take account both holiday periods and interruptions due to power cuts.

The sanitaryware range will consist of:

i) Washdown close coupled water closet with covered trap & horizontal outlet
ii) Cistern with lid to match water closet
iii) Medium washbasin
iv) Pedestal for medium washbasin

v) Small washbasin - wall mounted

These will be produced in equal proportions, ie:

2,070 pieces/item/year

Production of sanitaryware will initially be in a white glaze but colours could easily be introduced into the range at a later date, as required by the market.

The above feasible normal annual production capacity has been based on the realistic assessment of the market share of these products that a new factory could take in Uganda and Kenya.

Although the factory has been designed for a specific level of production, the basic concept of the project has considered that an expansion of facilities may be required at some future date. The site has been chosen with this in mind, so that the building can easily be extended and the production facilities increased with no disruption to the initial facilities.

The volume of both tile production and sanitaryware production, which is dictated by the market analysis, is quite small for a commercial factory. In small ceramics factories in Europe, no provision is normally made for the primary and secondary crushing of raw materials at the factory site because high quality prepared material and complete pre-prepared body formulations can be obtained easily and more economically from specialist clay and clay body suppliers. The high capital investment cost and operational costs of raw material preparation equipment is only normally justifiable for the large volume producers of ceramic products.

However in countries such as Uganda, where there are no specialist raw material suppliers, a ceramics factory has to be provided with all necessary raw material grinding and clay body preparation facilities, irrespective of its size. Some of the grinding machinery cannot be reduced in size in proportion to the low output requirements and where reductions can be made, the cost of these machines are not reduced in proportion. The initial capital costs per unit of production therefore tend to be high and the operational costs per unit of production also tend to be high. For a small factory in Uganda this has to be accepted.

The alternative to the above is to design the factory on the basis of using prepared ceramic raw materials but this would mean that all ceramic raw materials would have to be imported on a permanent basis. Some small ceramic factories, such as one in Trinidad, have been successfully established on this basis. However, the team have recognized that one of the main aims of this project is to utilize where possible, the local ceramic raw materials in Uganda to develop the ceramic industry in Uganda and to improve the technical skills of the employees of the factory. Maximizing the use of the local ceramic raw materials has been a basic factor in designing the production facilities.

The factory design therefore includes the following sections:

i) Common raw material storage
ii) Common primary crushing
iii) Common final grinding and mixing
iv) Sanitaryware casting & drying
v) Sanitaryware glazing
vi) Sanitaryware firing
vii) Tiles pressing
viii) Tiles drying
ix) Tiles biscuit firing
x) Tiles glazing
xi) Tiles glost firing
xii) Inspection, testing and reclaiming
xiii) Common assembly, packaging and warehouse storage
xiv) Service departments:
- mouldmaking for sanitaryware
- common glaze preparation
- common quality control laboratory

6.2 Description of production process

6.2.1 Production processes common to tiles and sanitaryware

a) Mining of local raw materials

The local raw materials, consisting of kaolin, silica sand, feldspar, talc and plastic clay are all mined by hand by unskilled workers and are loaded into 10 tonne trucks for delivery to the factory. A total of 1,000 tonnes of local raw materials are required per year for tile production and 270 tonnes for sanitaryware production. This equates to an average of 27.6 tonnes of material per week, or approximately 1.5 truck loads per week. In practice the mining for these small amounts of material will only be carried out intermittently, to maintain the stocks at the factory to a level of three months production requirements. A truck will be hired, whenever raw materials have to be delivered.

Whenever mining or deliveries of raw materials take place, this will be under the supervision of the technical department, to ensure that correct mining procedures are followed and that only the materials required are delivered in an uncontaminated state.

b) Primary crushing

All hard materials, which are obtained in large lump form, such as feldspar, talc and quartz rock (quartzite) must first be crushed in a jaw crusher to reduce them to a size suitable for feeding into the ball mills. The normal primary crushed material is sized from 15-25mm down. After crushing the raw materials are transported in skips to the bunker storage facility by the forklift driver.

A suitable size of jaw crusher (roller bearing type) would be one with a feed opening size of 250mm x 405mm, fitted with a motor of approximately 10 KW, a drive pulley of 878mm and operating at an RPM of 350. A detailed specification sheet is shown in the Appendix G, which gives details of a typical machine on which the costs have been based. A number of manufacturers in Europe, North America and Asia manufacture similar machines.

It should be noted that this machine is well oversize for the throughput required for this factory but smaller machines (see Appendix G) would not cope on a long-term basis with the larger pieces of the harder materials.

c) Bunker storage

All soft materials, such as local plastic clay and kaolin are transferred directly to individual covered storage bunkers, which have reinforced concrete walls. Hard materials are transferred to storage after primary crushing. Imported material delivered in bags on pallets, such as ball clay, glaze and Plaster-of-Paris is also stored in an individual covered bunker. To cater for a three-month supply of these raw materials plus additional storage capacity for recycled clay and recycled waste fired tiles ("pitchers") a common bunker storage area for tile and sanitaryware production of 130 m2 has been provided.

d) Final grinding and mixing

This common raw material preparation area is provided with a series of ball mills, blungers, storage tanks and mixing tanks, some of which will be used solely for tile materials, some solely for sanitaryware materials and some for both. This achieves some capital cost savings.

Four silex-lined 1,000 kg capacity ball mills, complete with the initial charges of flint/silica grinding media, are provided for the secondary grinding of the hard materials; feldspar, quartz rock and talc, and the primary grinding of kaolin and silica sand. Each mill is provided with a pressure release valve. Individual ball mills will be reserved for a particular raw material except in the case of silica sand and quartzite, which will use a common ball mill, as both these materials can supply the silica content of the body composition. Under normal circumstances the silica sand will be utilized, rather than quartzite, as it requires one less grinding stage.

Materials are weighed on a platform scale and are then loaded into the mills. The correct amount of water for each charge is then added. Each material is then ground for the appropriate time to achieve the required particle size. The silex-lined ball mills are fitted with revolution counters, so that operators know that the correct grinding period has been achieved, even if the grinding has been interrupted by a power cut.

Suitable silex-lined ball mills are shown in Appendix G. A suitable standard machine would be 1,829mm x 1,829mm diameter, which has a total capacity of 2,682 litres (2.662 cu m) and has an operating capacity of 1,348 litres (wet) and 1,091 kg (dry). The machine has a grinding media load of 2,364 kg of flint pebbles and is driven by a 15 KW motor at 25 RPM. The machine is oversized, so that it can easily cater for future anticipated expansion during the life of the project.

After the quality control department has checked that the particle size is correct, the ground material is passed over a vibrating screen with permanent magnet, which removes any oversize particles and iron-bearing materials, into the appropriate in-ground storage ark. The double-deck vibrating screens have a top deck aperture of 420 micron and a bottom deck aperture of 250 micron.

Imported ball clay and the local plastic clay does not require ball milling, as it already has a fine particle size. (Imported ball clay is 80 per cent < 2 micron). These materials are therefore blunged with water in a high speed blunger and is passed over a vibrating screen into an in-ground storage ark.

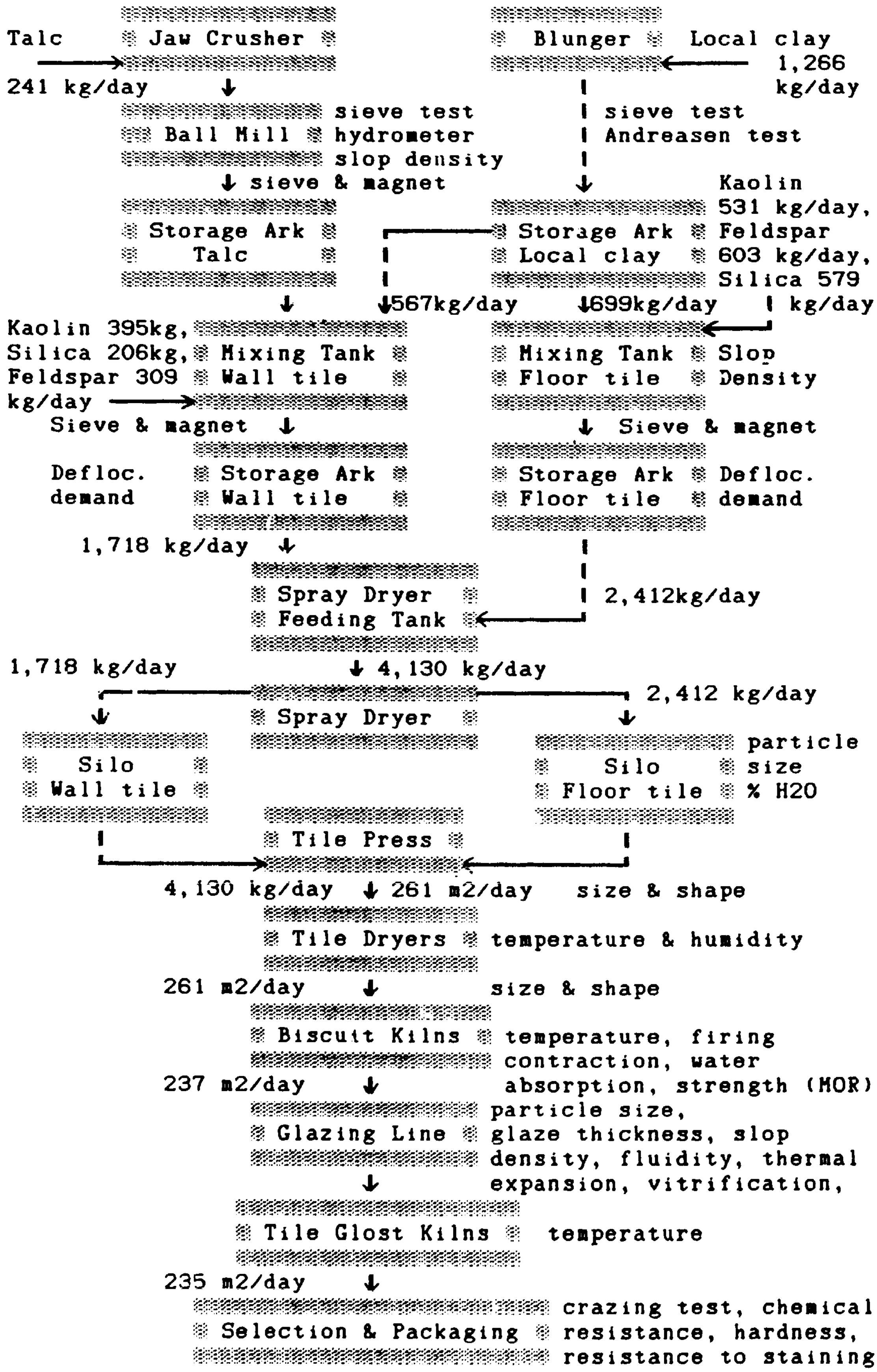
The blungers will have a working capacity of 1,400 - 1,500 litres (1.22m x 1.22m diameter) and will produce slips in the range of specific gravity 1.25 - 1.60 at 10 - 100 Poise. Each will be provided with side discharge and a 100 -150 mm valve with clearing device. The blunger is provided with a motor of 35-40 KW. Details of the range of standard blungers are shown in Appendix G.

The storage arks will each have a capacity of 3,000 - 4,000 litres. They will be fitted with a drive motor of 2-3KW and will operate at approximately 12 RPM. Details of standard storage arks are shown in Appendix G. The storage arks will be built in-ground with reinforced concrete walls and base at the time of the civils construction of the factory. The drive units, mixing unit and covers for all storage arks will be imported.

Materials from the storage arks are then pumped into one of three mixing tanks of 5,000 - 6,000 litre capacity, one being for the sanitaryware mix, one for the wall tile mix and one for the floor tile mix. The mixing tanks are fitted with 2-3 KW motors and operate at approximately 12 RPM.

To the sanitaryware tank is added a proportion of scrap recycled clay, which has been separately blunged in a scrap blunger with a capacity of 500-600 litres, producing a slip of 1.6 g/cc. The scrap blunger is fitted with a 5 - 7.5 KW motor. Electrolytes, sodium silicate and sodium carbonate, are added to the mixing tanks and the specific gravity is adjusted to 1.8 g/cc.

Figure 6.1 TILE PRODUCTION FLOWLINE



6.2.2 Tile production

a) Storage and spray drying

From the wall tile and floor tile mixing tanks, the clay slip is transferred over sieves and magnets to individual storage arks. Slip from these storage arks is then pumped to the spray dryer feeding tank. The spray dryer has a capacity of 550 kg per hour at approximately 6 per cent moisture for the clay dust. This machine will work over six shifts. The spray dryer is to spray dry both wall tile and floor tile body and is capable of rapid change from one body to another. Heating will be by diesel oil. Output from the spray dryer will be passed over a vibrating screen with a sieve size of 1.0mm into a system of conveyor belts and bucket elevator to transport the material to individual storage silos. Each silo will hold 20 m3 of product. Photographs of a typical spray dryer installation for a tile manufacturing unit are shown in Appendix G.

b) Tile pressing

Material from the silos, at a moisture content of approximately 7 per cent, is fed as required to the feed hoppers above a standard automatic friction press or hydraulic press, with an operating cycle of 18 cycles (x 2 tile) per minute. The press is provided with sets of dies and die boxes to produce 150 x 150 x 5mm wall tiles and 200 x 100 x 10mm floor tiles. Photographs of typical double-tile press head and associated tile die-set, showing the panelled bottom dies and cushion edge tops of the tile, are shown in Appendix G. Photographs of a three-press tile production installation are also shown in Appendix G but in the case of this new project only one press will be required.

After pressing the tile pass over the tile fettling unit of the press and are then stacked by hand onto the kiln cars. No automatic handling system is required for the small output required.

c) Tile drying

Drying is carried out in two chamber dryers, one with a capacity of 14,600 wall tiles and one with a capacity of 11,000 floor tiles to match the size of the biscuit kilns. Drying is carried out over a period of 48 hours. Humidity drying is carried out on an automated cycle from approximately 7 per cent moisture to less than 0.5 per cent. Waste heat from the biscuit kilns and glost kilns is utilized in conjunction with supplementary electrical heating.

A suitable specification for the electrically heated chamber dryers would be as follows:

Design: Single-track intermittent chamber dryer, designed to accommodate two kiln cars each with a capacity of 7,300 pieces for wall tiles and 5,500 pieces for floor tiles. An additional two dryer cars are provided for each tile dryer, which are loaded for the next drying cycle. The design must cater for a dry clay requirement of 0.227 kg/piece for wall tile and 0.409 kg/piece for floor tile with a pressing moisture content of approximately 7 per cent in the pressed tile sent to the dryers.

Power: 440 V, 50Hz, 3 Ph, 60 amp 4-wire supply with a maximum demand of 30KVA.

Supply: For each dryer the supplier should provide:
1 off pre-fabricated insulated dryer roof and walls. Insulation standard all to 0.23 watts/m2.
2 off insulated swing doors. Insulation Standard to 0.23 watts/m2.
1 off air circulation system incorporating:
1 off 425 cu m/min @ 25mm w.g. 230 deg C 4KW fan
2 off motorised (0.125 KW, 2 rpm) aluminium cone type air distributers.
1 off galvanized mild steel mixing box complete with interconnecting ductwork.
1 off multi-leaf motorised fresh air damper.
1 off exhaust port incorporating an axial flow fan and motorised multi-leaf damper.
1 off exhaust damper drip tray.
1 off control panel incorporating:
- Eurotherm 818 programme controller (or similar).
- Eurotherm 808 over-temperature trip (or similar).
- Heater battery thyristor drive unit.
- Timer and potentiometric humidity control.
- all necessary fuses, starters and switchgear.

2 off Type K thermocouples with compensating cable.
1 lot of necessary car trackage.
4 dryer/kiln cars to match tile biscuit kiln design.

Typical tile chamber dryer cross-sections with air distribution system are shown in Figures 6.2 and 6.3 with a plan view of a tile chamber dryer being shown in Appendix G.

Figure 6.2 Typical tile dryer cross-section (width)

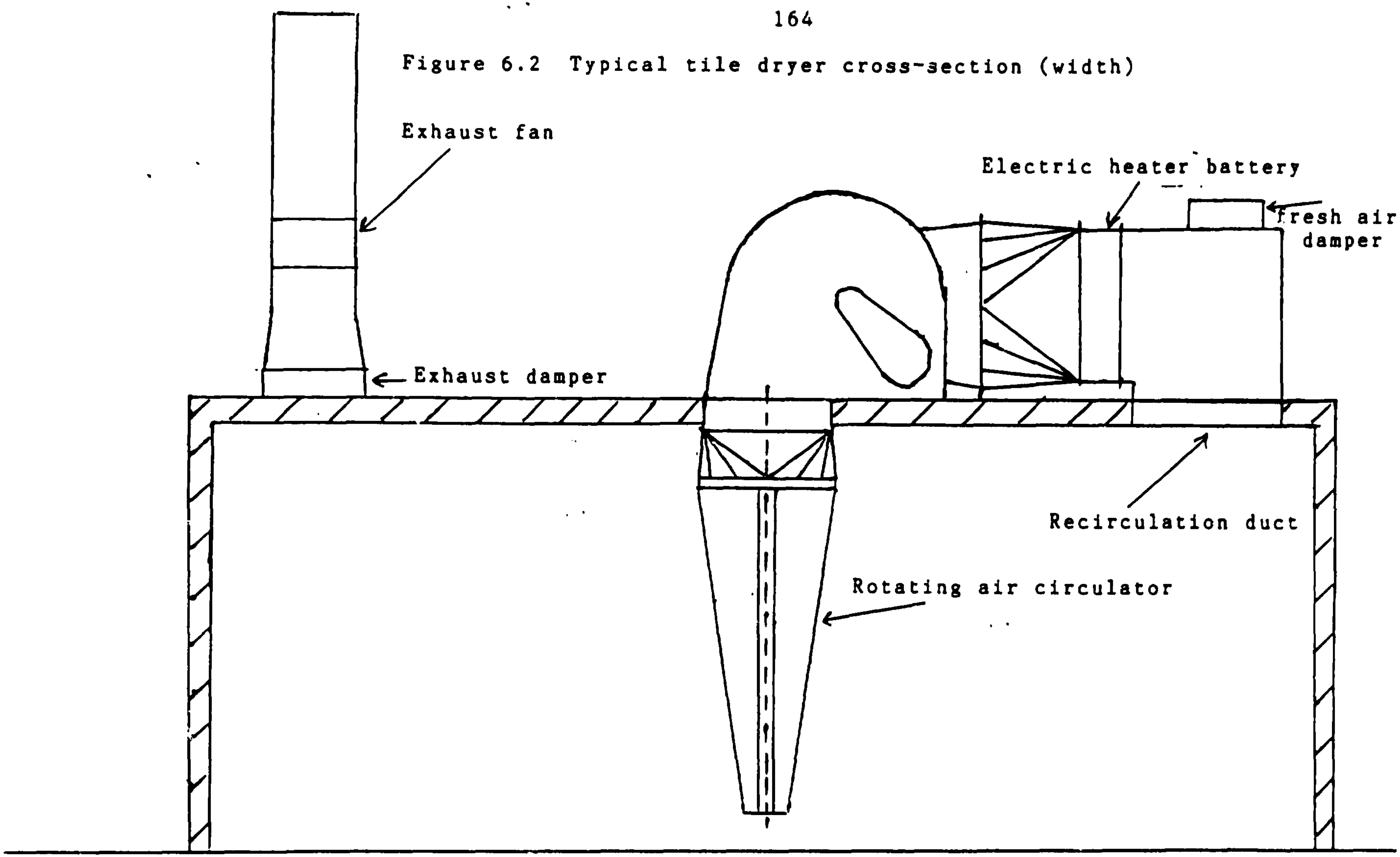
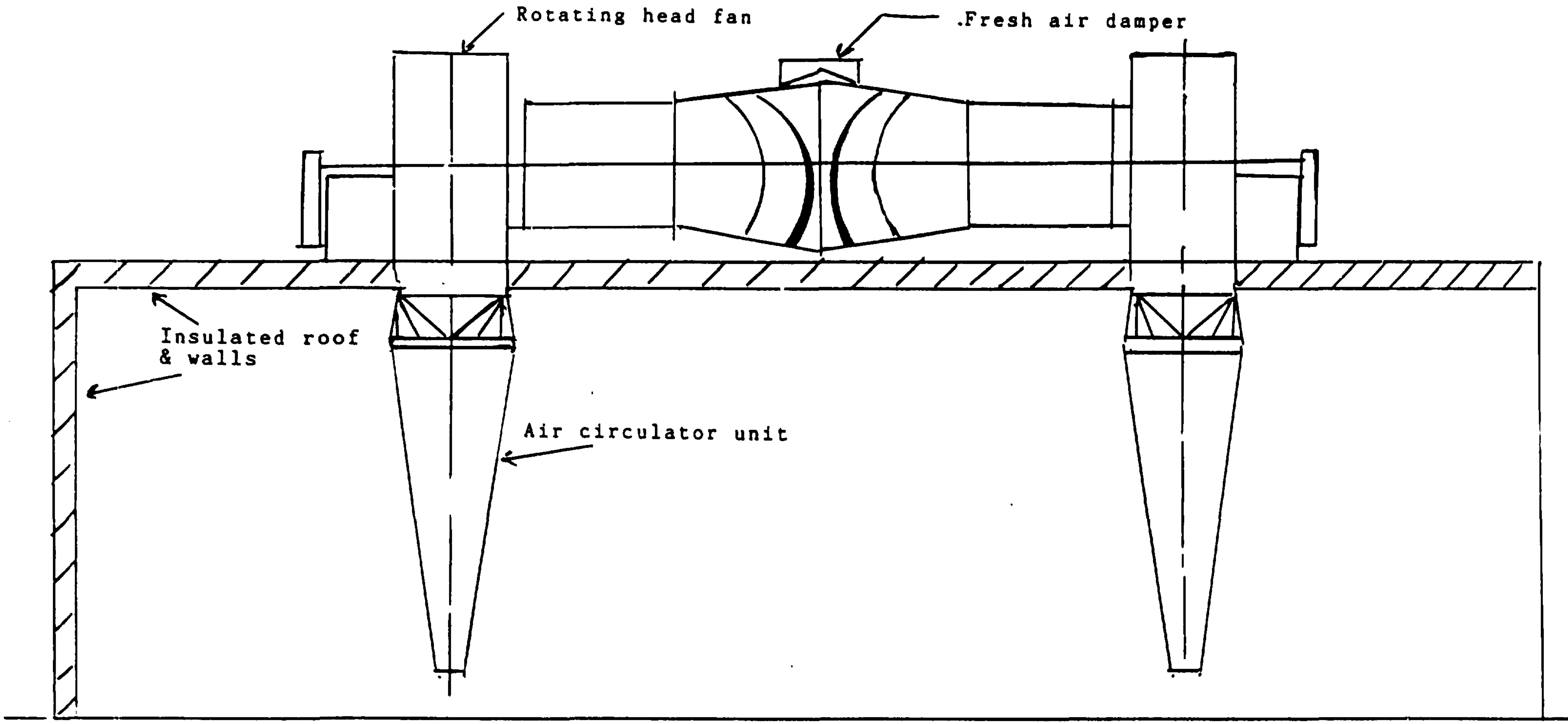


Figure 6.3 Typical tile dryer cross-section (length)



d) Tile biscuit firing

Because the Ugandan and regional market only requires a relatively low volume of tile per year, the tile production unit has to be designed on a small-scale basis. For this reason small electrically-heated intermittent biscuit and glost kilns have been chosen for the new factory, as these are more economic in terms of capital expenditure for small-scale production of tiles. The kilns will be of modern steel-clad fibre-lined construction for maximum fuel efficiency with automatic programmable temperature controllers to ensue consistent high quality results from the firing process.

Other types of kiln, such as tunnel kilns and roller hearth kilns are much more expensive but are designed and used for high volume production of tiles. These types of kiln were initially considered by the Consultants but were quickly eliminated from further consideration. The high initial capital cost of both tunnel kilns and roller hearth kilns can only be justified, if high volumes of tile are to be produced, leading to lower operational unit costs. The Consultants therefore do not recommend that these types of kiln be specified for the new factory, as the volume levels will never be sufficiently high to consider the high capital investment.

After drying has been completed in the chamber dryers, the dryer cars of tile products are transferred by a manual transfer car into the biscuit kilns, the wall tile biscuit kiln having a capacity of 14,600 tiles and the floor tile biscuit kiln having a capacity of 11,000 tiles per firing, matching the capacity of the tile dryers. Both biscuit kilns have the capability of firing up to 1,300 deg C. Normal operational temperatures will be approximately 1,040 deg C for wall tiles and 1,200 deg C for floor tiles, dependent on body formulation, over a maximum 48 hour cold-to-cold firing cycle.

Each biscuit kiln will have two sets of kiln cars, one to be in use in the kiln and one set to be used for loading the next kiln charge. Although we have specified the use of one kiln for floor tile and one for wall tile, both can be used for either type of tile, so that if the market requirements change, the kiln loadings can be adjusted for any proportion from 100 per cent of wall tile to 100 per cent of floor tile according to the market.

All kiln cars of the tile dryers, tile biscuit kilns and tile glost kilns will be designed to be completely interchangeable and a single manually operated transfer car will be common to all kilns.

A suitable specification for the electrically heated biscuit tile and glost tile kilns would be:

Design: Single-track intermittent truck kiln, designed to accommodate two kiln cars each with a capacity of 7,300 pieces for wall tiles and 5,500 pieces for floor tiles. An additional two kiln cars are provided for each biscuit kiln and glost kiln. The design must cater for a biscuit firing cycle, cold-to-cold of a maximum 48 hours and a firing temperature of 1,200 deg C for all biscuit tile kilns. Wall tile will only be biscuit fired to approximately 1,040 deg C but the factory must have the flexibility to fire floor tile also in the wall tile kiln, if required.

Power: 440V, 50Hz, 3 Ph, 170 KVA for wall tile biscuit kiln and 200 KVA for floor tile.

Kiln Chamber: This will consist of a welded and plated steel frame structure, consisted of rolled steel sections, equipped with a single self aligning hinged door at one end of the chamber. The kiln chamber will be fitted with a metallic heat shield, mounted on the outer walls of the chamber.

The hot-faced lining of the chamber, with the exception of the bench walls, roof seal and door seal areas, will be constructed of vacuum formed ceramic fibre modules, mechanically attached to the casing of the chamber.

The roof of the chamber will be constructed from folded ceramic fibre modules, whilst the bench walls and door seal will be constructed of high quality insulating brickwork, all mechanically attached to the chamber.

The above lining should be specifically designed to provide the optimum fuel efficiency, coupled with minimum maintenance in this application.

Cooling Dampers: Two automatic motorised dampers, activated by the kiln programme controller, will be fitted in the roof of the kiln.

Kiln Cars: Four kiln cars will be supplied for each kiln, allowing two to be loaded/unloaded whilst the other two are being fired. Each kiln car will be constructed of a rigid steel chassis, mounted on heavy duty axles. The kiln cars will be built up on a Low Thermal Mass (LTM) design, incorporating fibre in non-load-bearing areas. The hot face lining of the bases will be constructed in high grade, bonded, insulating refractory brickwork, suitably reinforced with high alumina material in load bearing areas. A positive sealing arrangement between the kiln chamber and the kiln cars is achieved by a suitable sand-seal arrangement.

Heating Elements: The elements will be in the form of spiral wound Kanthal A1 wire, specifically designed to give a low wattage output per unit area and thereby, a prolonged service life.

To provide a high degree of temperature uniformity, the elements will be fitted on all four walls of the kiln, as well as the base and will be divided over the height of the kiln into three independent zones, each having its own temperature and electrical control gear.

The wall elements will be supported in grooves formed in the face of the lining and the base elements will be laid in similar grooves in the surface of the base refractories.

Lead-out wires and element connections will all be housed in well ventilated closures on the outside of the kiln.

Electrical Safety: The kiln will be fitted with key-operated electrical interlocks to prevent power being supplied to the elements, whenever the kiln door is opened.

Control Panel: A totally enclosed, fan cooled, folded steel cabinet will be supplied, mounted on the kiln, completely wired and tested prior to despatch and incorporating the following instrumentation and control gear:

- One FGH P856 multiramp 10 programme electonic programme controller (or similar).
- One FGH S500 over-temperature protection instrument (or similar).
- One Honeywell Miniprint chart recorder (or similar).
- Three phase mains contactors.
- Sequence switches and panel lights.
- Mains isolator.

Thermo-couples: The following thermocouples will be provided, fitted and complete with all necessary compensating cables:

- One duplex Pt/Pt13 Ph thermocouple, mounted in the roof of the kiln.
- Three single Pt/Pt13Rh thermocouples mounted top, middle and bottom of the kiln side wall.

Duct-work: Canopies and ductwork in galvanised 3mm plate will be provided for the extraction of waste heat to the tile dryers.

Tracks: Sufficient trackage for kilns and spare car storage will be provided.

A typical Low Thermal Mass kiln car is shown in Appendix G. The same principle is used for both tile and sanitaryware kiln cars. Photographs of typical shuttle (truck) kilns, which are also very similar to those used for crockery production, are shown in Appendix G. This type of kiln would be suitable for both the tile biscuit firing and the tile glost firing at the new factory in Uganda.

e) Tile glazing

Glazing of the biscuit tile will be carried out on a standard tile glazing line, capable of glazing 12,000 tiles per day (in 7 operational hours). The line will include the following features:

- automatic tile gauging unit, comprising variable speed feed belt, "dunting" or tile breaking device, concavity/convexity testing unit, size testing unit and taking-off belt. The "dunting" or tile breaking device checks the strength of the biscuit tiles and any weak tile are broken and discarded. The concavity/convexity unit checks the face of each tile for any departure from perfect flatness. If a tile is either convex or concave, the back is stamped. The size testing unit has up to six sizes and each tile, as it passes through, is stamped with an indication of its size. Following the checking of the biscuit tile the tile to be glazed are passed on to the glaze line, consisting of:
- brushing and grinding section.
- waterfall glazing unit, complete with portable feed tank, pump and glaze recirculation pipework.
- disc spray unit, complete with portable fed tank, pump and glaze recirculation pipework.
- tungsten carbide edge scraping unit and final dedusting.
- take-off belt.

A photograph of a typical tile glaze line gauging machine, which would be necessary for this project is shown in Appendix G and photographs of typical glaze line installations are also shown in Appendix G.

f) Tile glost firing

From the take-off belt of the glaze line, the glazed tile will then be loaded by hand into refractory tile cassettes or cranks, each containing 15 wall tiles or floor tiles, which are then loaded onto the kiln cars of the glost kilns. Photographs of refractory cassettes and cranks are shown in Appendix G and also photographs of a typical kiln.

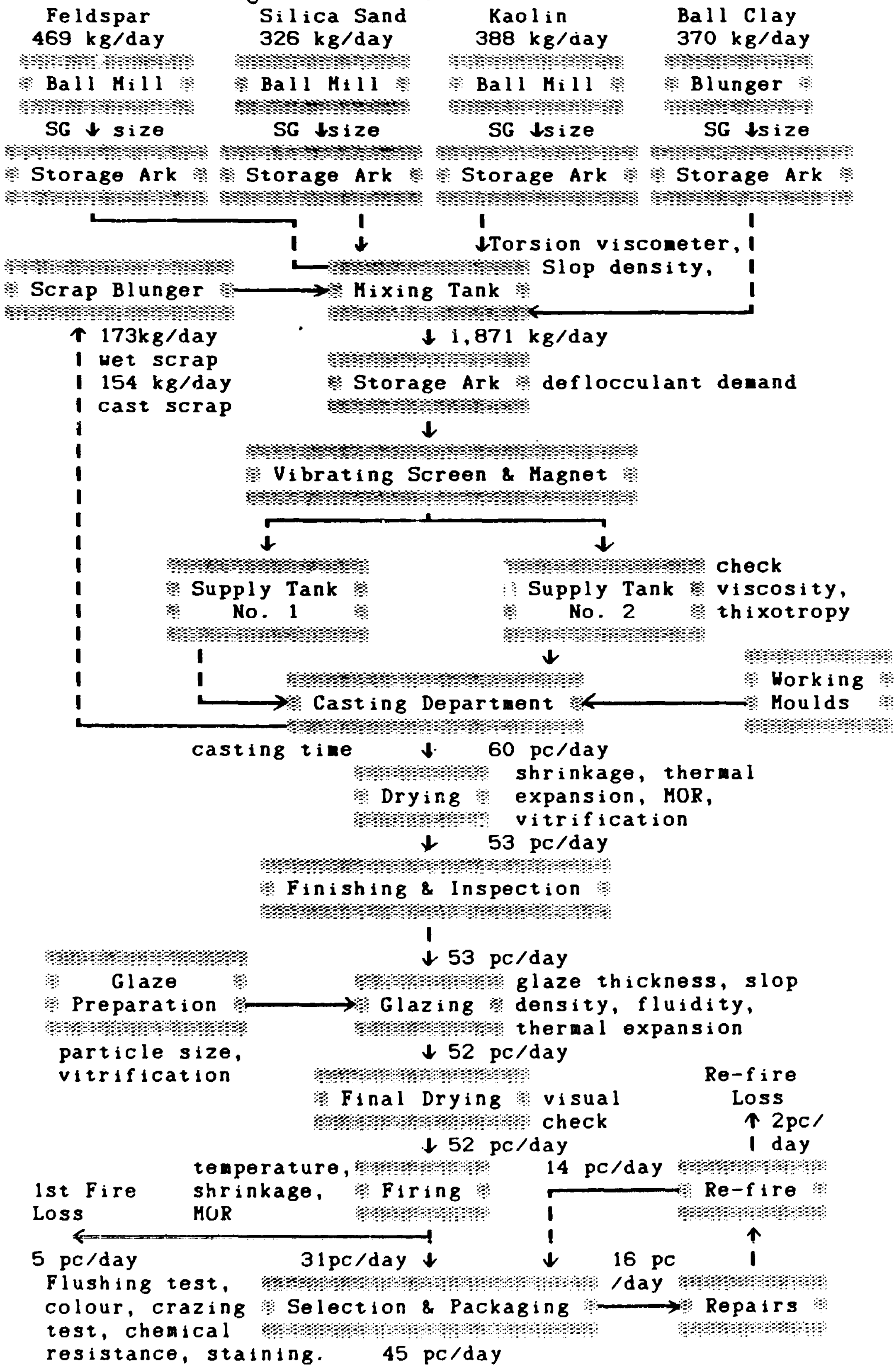
Each of the two glost kilns will have a capacity of 5,280 wall tile or floor tile. Firing will take place over a maximum 24 hour cycle with a glost firing temperature up to 1,030 for wall tiles and 1,150 deg C for floor tiles. The capability of both the kilns will be up to a maximum of 1,300 deg C, so that either wall tile or floor tile can be fired in either kiln dependent on the market situation. Each kiln will have a set of four kiln cars, two to be in use in the kiln and two to be available for loading the next kiln charge.

The specification and structure of the tile glost kilns will be identical to that for the tile biscuit kilns outlined previously, except that each of the kilns will require 210 KVA capacity due to the shorter firing cycle.

g) Tile sorting and packaging

After glost firing the tiles will be sorted by hand and packaged into cardboard boxes. These will then be shrink wrapped on to wooden pallets for transport to Kampala or Nairobi using a hand operated shrink-gun.

Figure 6.4 SANITARYWARE FLOW LINE



6.2.3 Sanitaryware production

a) Storage and ageing

From the mixing tank the prepared slip is passed over a vibrating screen and magnet into a storage tank with a capacity of 12,000 litres. Adjustments are made to the density, thixotropy and viscosity of the clay slip by the addition of water and/or deflocculants. Viscosity is the measurement of the consistency of a slip, which gives a numerical value to its resistance to flow. The units used are "Poise". Thixotropy is the tendency of a slip to increase in viscosity when left undisturbed, due to the build-up of structure within it and which can be destroyed by agitation. Thixotropy is measured as a viscosity change over a known period of time.

There is sufficient storage capacity in the storage tank to allow ageing of the slip to take place. The slip is the passed over a vibrating screen and magnet to one of two supply tanks in the casting area. Each of the tanks has a capacity of 4,000 litres. One of the tanks is used for daily operation and the second is used for ageing and any final adjustments to density, viscosity and thixotropy.

b) Sanitaryware casting

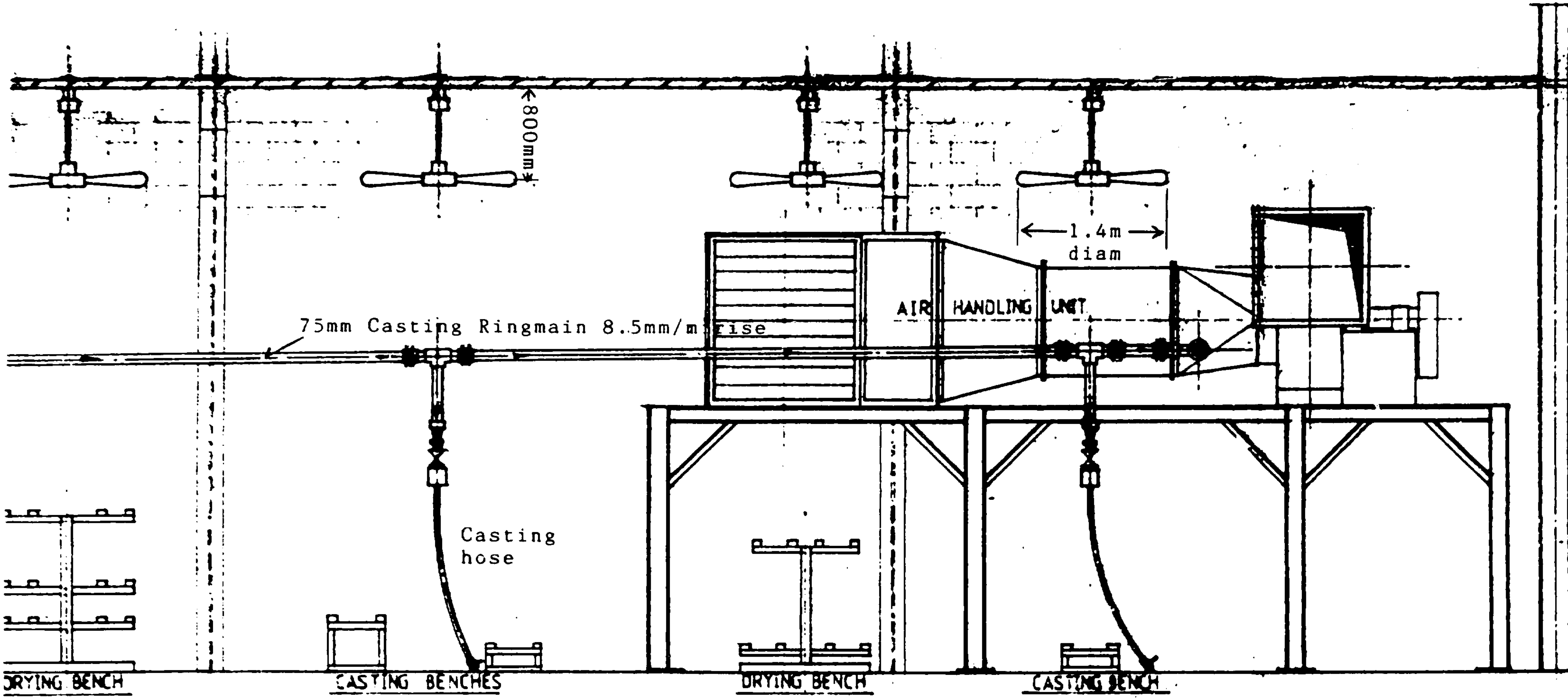
The casting slip from the supply tanks is pumped into a ring main which services the sanitaryware casting department. The slip is distributed to the work stations on the casting benches by supply hoses, which are fitted with manual valves. The ring main returns the unused slip to the casting slip supply tanks.

For the small quantity of production involved, the technology used will be the established bench casting technique. Photographs of typical sanitaryware bench casting are shown in Appendix G. More modern techniques such as battery casting and pressure casting are only viable for large scale production units (see Appendix G).

Bench casting requires trained and skilled manual operatives to perform a range of well established specialist tasks. The bench casting and drying benches will be designed to suit the product range of sanitaryware, identified by the market survey as being required for the Ugandan and regional market.

Figure 6.5 shows a typical layout of a sanitaryware casting shop arranged for bench casting with the inclined (8.5mm/m rise) 75mm casting ring main located above the operators in the casting area. The air-handling unit is normally positioned on a raised platform to aid the efficiency of air circulation in the casting area. This type of arrangement would be used for the new factory in Uganda.

Figure 6.5 Typical layout of sanitaryware bench casting shop



c) Sanitaryware drying

The casting department will be provided with a heating and conditioning system, which allows for the control of the temperature and humidity levels during the casting process. This will be suitable for a production level of 10,350 pieces per annum. The heating and conditioning is achieved by means of an effective air replacement technique and air movement to facilitate the firming-up of the cast pieces of sanitaryware will be provided by adjustable speed ceiling fans. The drying is achieved by elevation of the casting department temperatures during the evening and night, when the operatives are not present. After the temperature has been satisfactorily raised, humidity levels are lowered to increase the rate of drying. The casting and drying cycle would be expected to follow the following parameters:

Phase 1	08.00 hrs - 10.00 hrs	Cast-up period
Phase 2	10.00 hrs - 16.00 hrs	Demould, dry, fettle
Phase 3	16.00 hrs - 22.00 hrs	No occupancy, temperature increase
Phase 4	22.00 hrs - 06.00 hrs	Drying period
Phase 5	06.00 hrs - 08.00 hrs	Cooling period

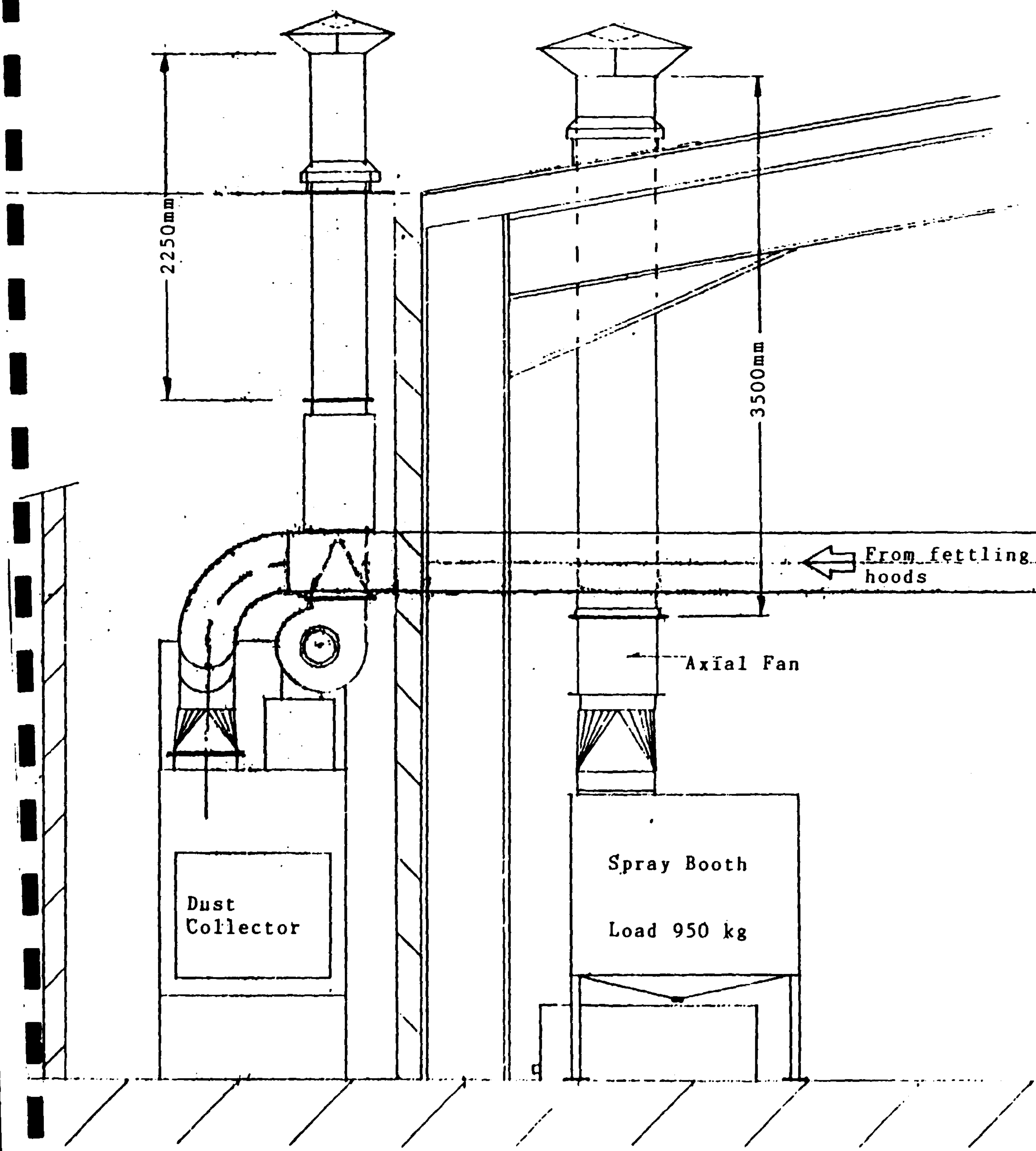
d) Sanitaryware glazing

The dried product will be removed from the casting department by means of stillage trucks and the pieces will be fettled, sponged and inspected for drying cracks prior to being sprayed with glaze in glazing cabinets. The fettling and glazing cabinets will be fitted with dust collector, so that dust particles are collected by the equipment prior to exhausting to atmosphere. Bench turntables with 400mm diameter aluminium head will be fitted in all booths. Glaze spray guns will be provided with glaze tanks of 45 litre capacity.

Figure 6.6 shows a typical arrangement for a sanitaryware glazing booth and photographs of sanitaryware glazing are shown in Appendix G.

After spraying, the items will be allowed to dry for a few hours and will then be set on kiln cars using specially designed refractory setters.

Figure 6.6 Arrangement for sanitaryware glaze booth



e) Sanitaryware firing

There is a wide choice of sanitaryware kilns available on the international market, including such types as:

i) Continuous kilns

	Typical output (pc/wk)
- skate tunnel kiln 8 hr cycle	31,668
- skate tunnel kiln 10.5 hr cycle	24,150
- in-situ tunnel kiln	15,158
- portakiln tunnel kiln	14,742
- roller hearth kiln	10,000

ii) Intermittent kilns

	Typical output	
	pc/firing	pc/week
- triple-track shuttle kiln	506	3,036
- skate shuttle kiln	420	2,520
- twin-track shuttle kiln	260	1,560
- single-track shuttle kiln	150	900
- moving hood kiln	150	900
- top-hat kiln (lift-up cover kiln)	150	900

However, the choice of the sanitaryware kiln in the case of the new factory, as with the tile kilns, is limited, both due to the low volume of sanitaryware production, which is required by the Ugandan and regional market and also due to the type of fuel for the kilns.

All of the different types of continuous sanitaryware kiln are designed for high volume production and can produce the annual requirements of the new factory in Uganda in as little as 2 days for a modern skate kiln to approximately one week for a modern roller hearth kiln. These types of kiln cannot economically be reduced down in size to the requirements of the new Ugandan factory, therefore the alternative types of intermittent kiln had to be considered by the Consultants.

Quite apart from this factor is the question of the method of heating the kiln. In Uganda, the only practical fuel is electricity. While this method of heating is perfectly acceptable to relatively small ki , it is not a good heating method for the larger kilns, as e ical energy is transmitted primarily by radiatior Sanitaryware tunnel kilns are normally fired by gas or kerosene with open-flame burners, normally high velocity, which transfer energy by both convection and radiation. Gas or oil-fired continuous kilns can therefore be much wider, which is necessary if the higher production capacities are to be achieved. On this basis therefore; the fact that electricity has to be used, the Consultants also recommend an intermittent sanitaryware kiln for the new factory.

Although the sizes and capacities of the intermittent kilns are normal for small European factories, this type of kiln can easily be reduced in size for even smaller requirements. The reduction in the price however, is far from proportional to the reduction in capacity, therefore the smaller kilns do have a higher capital cost per unit of production and also a slightly higher operational cost per unit of production.

Of the different types of intermittent kiln, the Consultants recommend that an 8.0 cu m. moving hood kiln be specified for the new factory in Uganda. This kiln will have a capacity of 68 mixed pieces of sanitaryware of the particular items chosen for the initial range of products. The kiln will therefore be large enough to carry out all first fires and all re-fires for the 10,350 saleable pieces per year output of the factory. An 8.0 cu m. single-track type of intermittent kiln would also be suitable for this volume of production but, on balance, the Consultants would recommend a moving hood kiln, as it eliminates ware breakage due to the movement of these heavy items.

A typical specification for a modern electrically heated moving hood kiln is as follows:

Design: double-base intermittent moving hood kiln, designed for a capacity of 68 mixed pieces of sanitaryware. The design must cater for a firing cycle, cold-to-cold of a maximum 24 hours, preferably 18 hours and a firing temperature of 1,250 deg C. Both wall tile and floor tile could also be fired in this kiln, if required.

Capacity:

Setting width	1,120 mm
Setting height	1,980 mm
Setting length	3,610 mm
Total usable capacity	8.0 cu.m.
Setting density	8.5 pc/cu.m.

Power: 440V, 50Hz, 3 Ph, 410 amp, rating 250 KW, maximum demand 250 KVA

Consumption: 1,950 KWh/firing (efficient types)
3,300 KWh/firing (less efficient types)

Size:

Overall length of kiln	4,520 mm
Overall width of kiln	1,980 mm
Overall height	3,110 mm

Floor area:

Length	14.4 m
Width	4.4 m

Kiln Chamber: This will consist of a welded and plated steel frame structure, consisted of rolled steel sections, equipped with a single self aligning hinged door at each end of the chamber. The kiln chamber will be fitted with a metallic heat shield, mounted on the outer walls of the chamber.

The chamber will be mounted on machined steel wheels, equipped with a roller bearing movement and a geared drive system will be provided to allow easy movement of the kiln between the two bases. Lateral stability during movement will be provided by guide wheels attached to the steelwork of the chamber.

The hot-faced lining of the chamber, with the exception of the bench walls, roof seal and door seal areas, will be constructed of vacuum formed ceramic fibre modules, mechanically attached to the casing of the chamber.

The roof of the chamber will be constructed from folded ceramic fibre modules, whilst the bench walls and door seal will be constructed of high quality insulating brickwork, all mechanically attached to the chamber.

The above lining should be specifically designed to provide the optimum fuel efficiency, coupled with minimum maintenance in this application.

Cooling Dampers: Three automatic motorised dampers, activated by the kiln programme controller, will be fitted in the roof of the kiln.

Kiln Cars: Two kiln bases will be supplied for the kiln, allowing one to be loaded/unloaded whilst the other one is being fired. Each base will consist of a rigid steel chassis, mounted on a sub-frame incorporating the rails for the purpose of the movement of the hood.

The hot face lining of the bases will be constructed in high grade, bonded, insulating refractory brickwork, suitably reinforced with high alumina material in load bearing areas.

Lift-up seals: To provide a positive sealing arrangement between the bases and kiln chamber, coupled with an enhanced cooling facility, the kiln will be equipped with a specially designed, manually operated under-bench sealing system, suitably interlocked to prevent the operation of the kiln until the seals are in place.

Heating Elements: The elements will be in the form of spiral wound Kanthal A1 wire, specifically designed to give a low wattage output per unit area and thereby, a prolonged service life.

To provide a high degree of temperature uniformity, the elements will be fitted on all four walls of the kiln, as well as the base, and will be divided over the height of the kiln into three independent zones, each having its own temperature and electrical control gear.

The wall elements will be supported in grooves formed in the face of the lining and the base elements will be laid in similar grooves in the surface of the base refractories.

Lead-out wires and element connections will all be housed in well ventilated closures on the outside of the kiln.

<u>Electrical Safety</u>: The kiln will be fitted with key-operated electrical interlocks to prevent power being supplied to the elements, whenever the kiln door is opened.

<u>Control Panel</u>: A totally enclosed, fan cooled, folded steel cabinet will be supplied, mounted on the kiln, completely wired and tested prior to despatch and incorporating the following instrumentation and control gear:

- One FGH P958 multiramp 10 programme electonic programme controller (or similar).
- One FGH S500 over-temperature protection instrument (or similar).
- One Honeywell Miniprint chart recorder (or similar).
- Three phase mains contactors.
- Sequence switches and panel lights.
- Mains isolator.

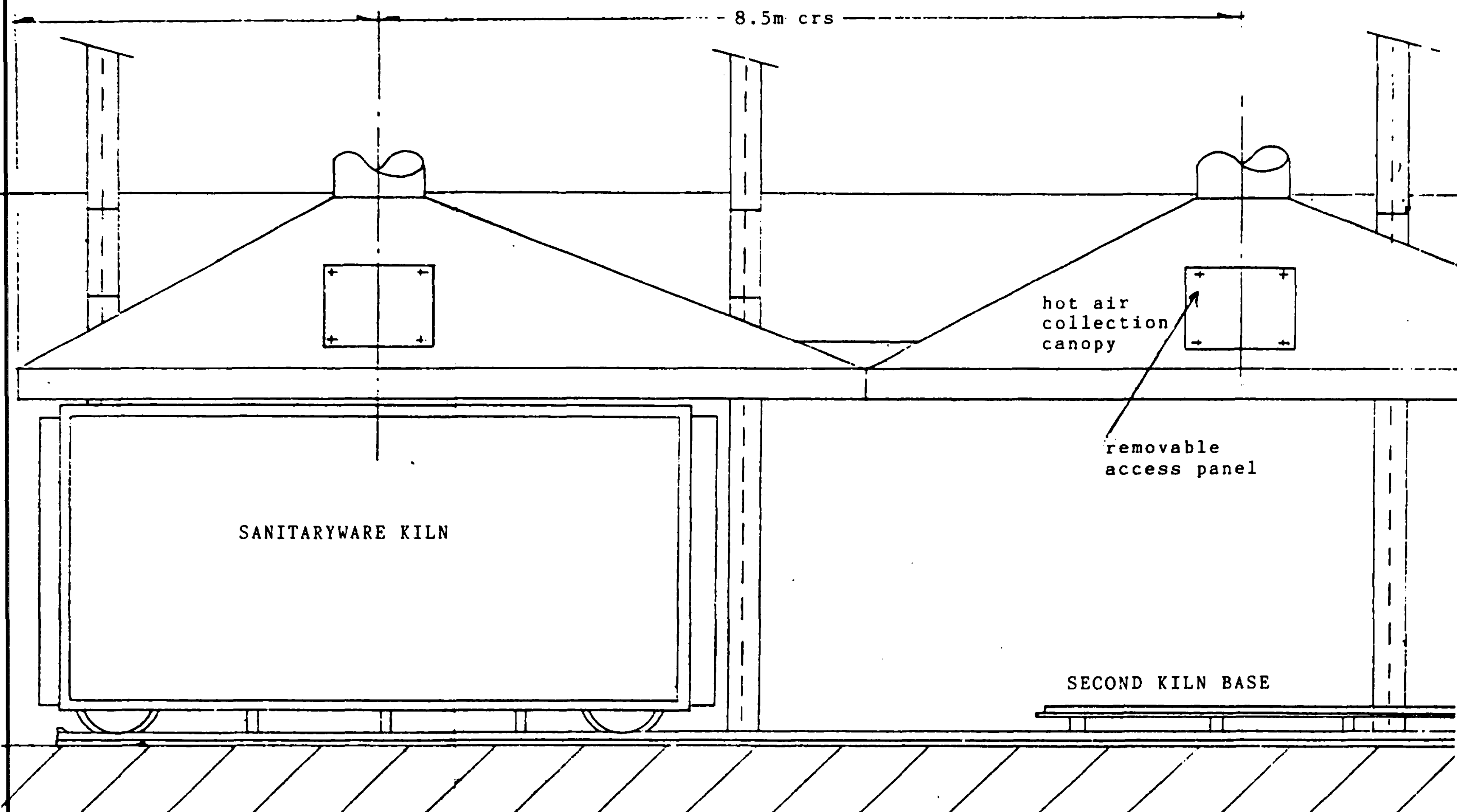
<u>Thermo-couples</u>: The following thermocouples will be provided, fitted and complete with all necessary compensating cables:

- One duplex Pt/Pt13 Ph thermocouple, mounted in the roof of the kiln.
- Three single Pt/Pt13Rh thermocouples mounted top, middle and bottom of the kiln side wall.

<u>Duct-work</u>: Canopies and ductwork in galvanised 3mm plate will be provided for the extraction of waste heat to the tile dryers.

<u>Tracks</u>: Approximately 12m of track will be provided, sufficient to permit easy movement of the chamber between the bases.

Figure 6.7 Typical cross-section of a sanitaryware moving hood kiln



A typical cross-section of a sanitaryware moving-hood kiln, of the type recommended for the new factory in Uganda, is shown in Figure 6.7. Manufacturer's photographs and specification sheets for various types of sanitaryware kiln are shown in Appendix G for comparison purposes and a typical Low Thermal Mass (LTM) kiln car for an intermittent truck type kiln or tunnel kiln is also shown in Appendix G. The same LTM principle is used for both tile and sanitaryware kiln cars.

After the glazed sanitaryware articles are thoroughly dry, firing of the products will therefore be carried out in an 8.0 cu m capacity electrically heated intermittent moving hood kiln or intermittent single-track shuttle kiln, which has a capacity of 68 pieces of mixed sanitaryware. The automatically programmed and controlled firing schedule will be 18 hours (maximum 24 hours) and the maximum temperature will be 1,250 deg C.

f) Sanitaryware inspection and packaging

After firing the items are inspected and any glaze imperfections are removed by cone grinding units. Repair work is carried out on a proportion of these items and they are then re-fired. Sufficient kiln capacity has been allowed for to cope with the expected level of re-fires. The inspection department is also provided with a hydraulic test unit for the routine testing of the flushing characteristics of the water closet items.

After final inspection the sanitaryware items are packaged on to wooden pallets, cardboard inserts being used between each item to prevent damage in transport. Each pallet load is then shrinkwrapped for protection and stability during transport and the pallets are loaded on to trucks by forklift truck.

6.2.4 Service departments for tile and sanitaryware production

a) Glaze preparation and storage

Imported prepared dry glaze is prepared for use in a porcelain lined ball mill, complete with porcelain grinding media. THe required amount of water and glaze powder are fed into the ball mill, together with a small amount of glaze binder, if this is necessary. The ball mill has a capacity of 500 litres. Following the preparation of a glaze slip to a specific gravity of approximately 1.7 g/cc, the slip is passed over a single deck vibrating sieve complete with screen and permanent magnet and into one of two 1,500 litre capacity glaze storage tanks. The tank is of fibre glass construction and is complete with support frame and slow speed agitator.

Deflocculant or flocculant is added to the tank to adjust the fluidity of the glaze and the specific gravity is adjusted to the required 1.7 g/cc value.

A mobile stillage complete with two framed plastic containers of 200 litre capacity is provided to transport the production glaze to the tile and sanitaryware glazing departments.

Figure 6.8 shows the flow-line of the glaze preparation sub-routine

b) Mouldmaking department

For sanitaryware production it is necessary to replace the plaster working moulds on a continuous basis. Each mould normally has a life of 80 casts. The factory therefore has the facility to make the necessary number of working moulds from imported Plaster-of-Paris. The equipment consists of:

- 1 Set of platform scales, 500kg capacity
- 1 Non-deairing plaster blender
- 2 90 litre heavy duty polythene plaster blending containers
- 2 25 litre heavy duty polythene plaster blending containers
- 1 Electrically heated mould drying unit, complete with air circulation unit and extractor
- 2 Mould makers benches

Specialised Plaster-of-Paris is used for the production of the working moulds. A different type of harder plaster is used for the replacement of plaster case moulds.

Having assembled together the plaster or resin case parts, which make up each mould part of any one total mould, the mould parts are then ready for filling. Plaster is mixed with water in the plaster blender in the ratio 100:75 by weight.

Blended plaster is then poured into the case mould and depending on the size and design, the working moulds will be ready for release from the case mould after about 10 - 15 minutes. After release, the mould parts are fettled and the case assemblies prepared for the next pouring. It should be noted that for each item the mouldmaker has to follow from 21 to 26 steps in the mouldmaking cycle.

The plaster mould parts are then ready for assembly together to give a complete mould ready for the casting process.

Prior to use in production, the plaster moulds must first be dried out at a low temperature of less than 50 deg C to avoid damaging the plaster, therefore they are transferred to the mould drying room, where drying takes place overnight.

Figure 6.9 shows the flowline for the mouldmaking sub-routine.

Figure 6.8 SUB-ROUTINE FOR GLAZE PREPARATION

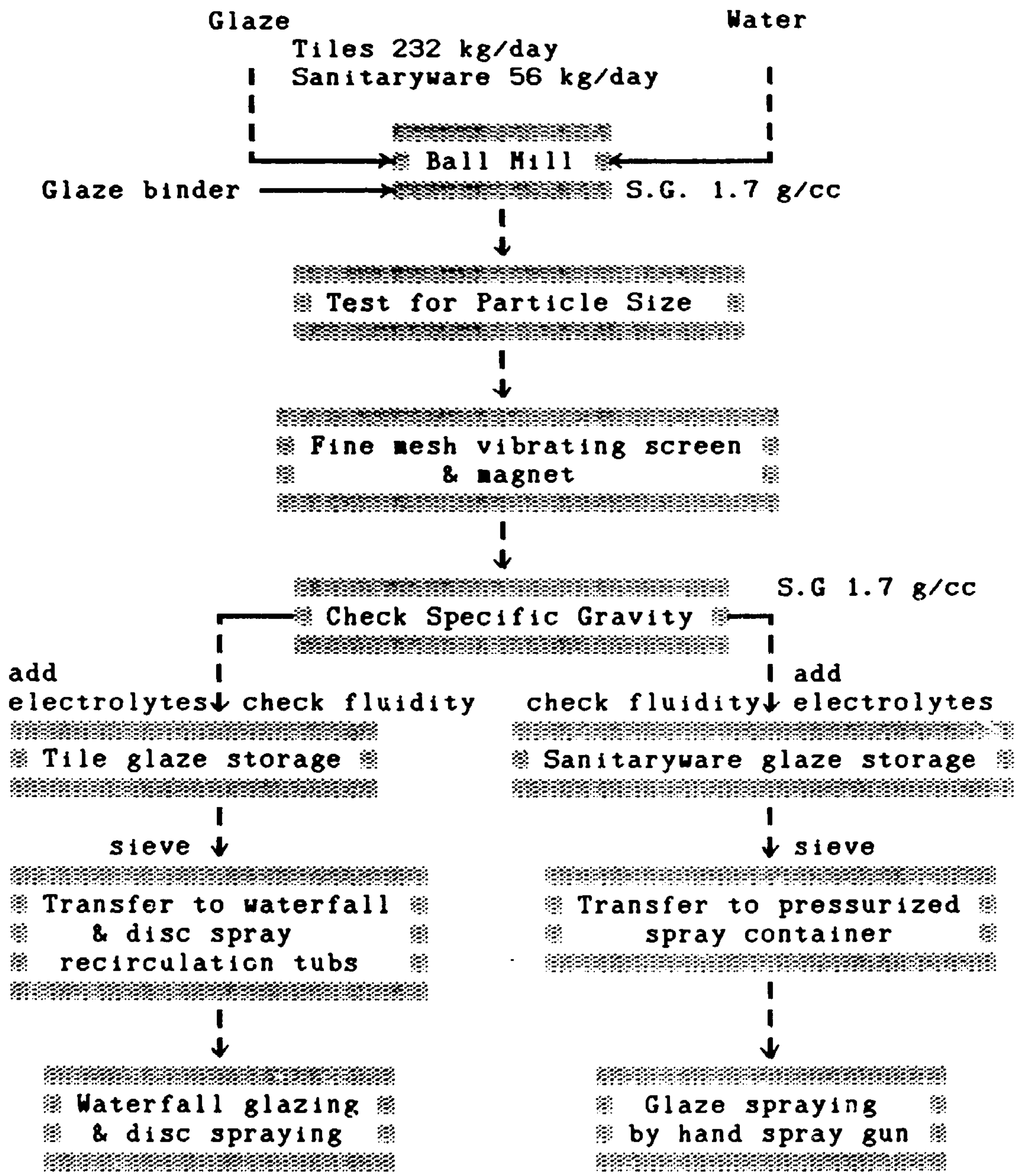


Figure 6.9 SUB-ROUTINE FOR WORKING MOULDS

Plaster-of-Paris
Working mould grade

Water

98 kg/day

73.5kg/day

Mix in Plaster Blender

Pour into Case Moulds

Re-assemble Cases

Plaster Setting Period

10-15 min

Record Mould Number

Remove from Case Moulds

Clean Cases

Transport Moulds to Mould Dryer

check temperature
check humidity

Mould Storage

Transport Moulds to Casting Hall

Casting of production items

Record number of casts for each mould

Figure 6.10 Typical Mould Pieces for Cistern & Lid

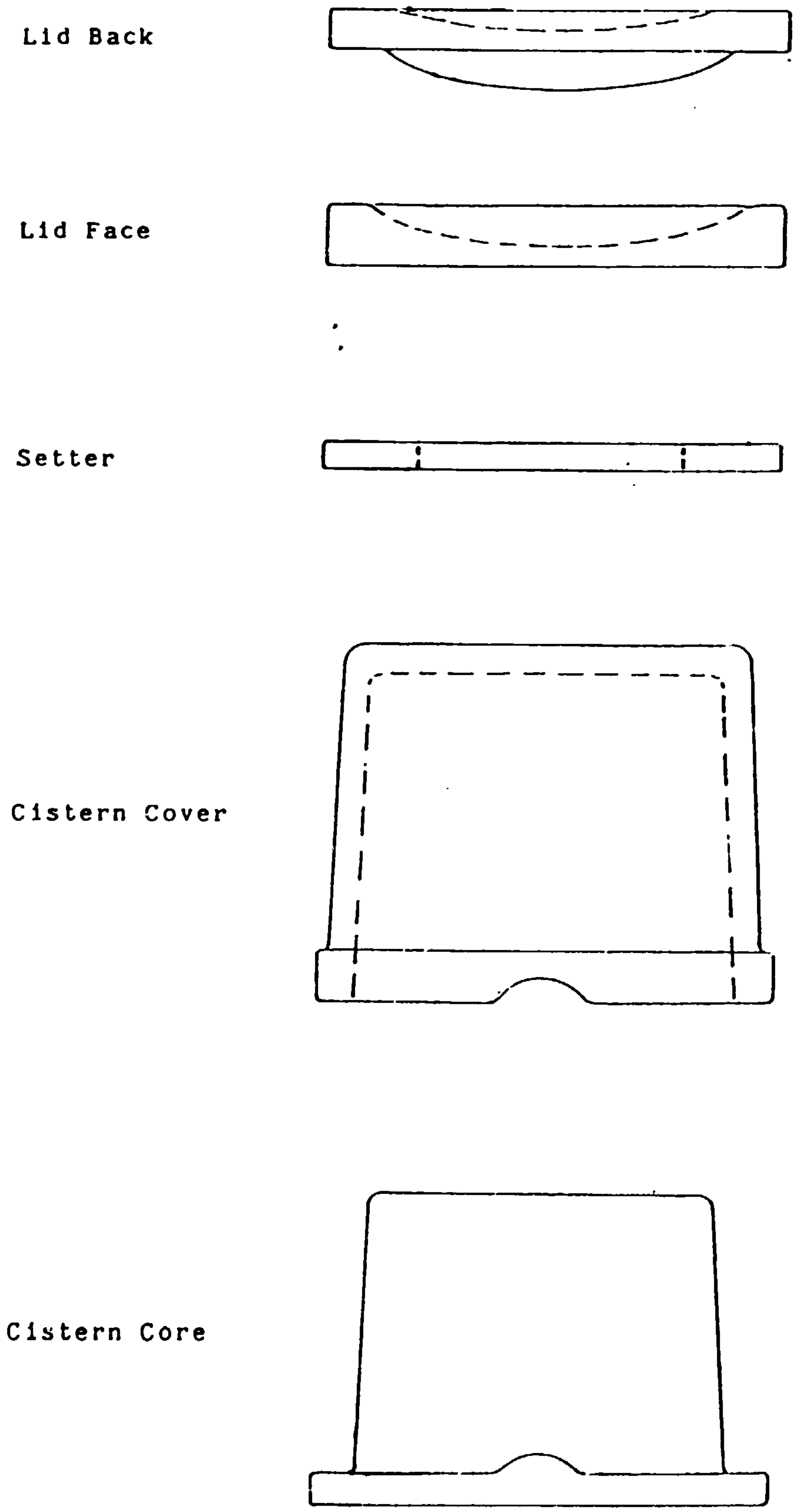


Figure 6.11 Typical mould parts for a washdown close-coupled W.C.

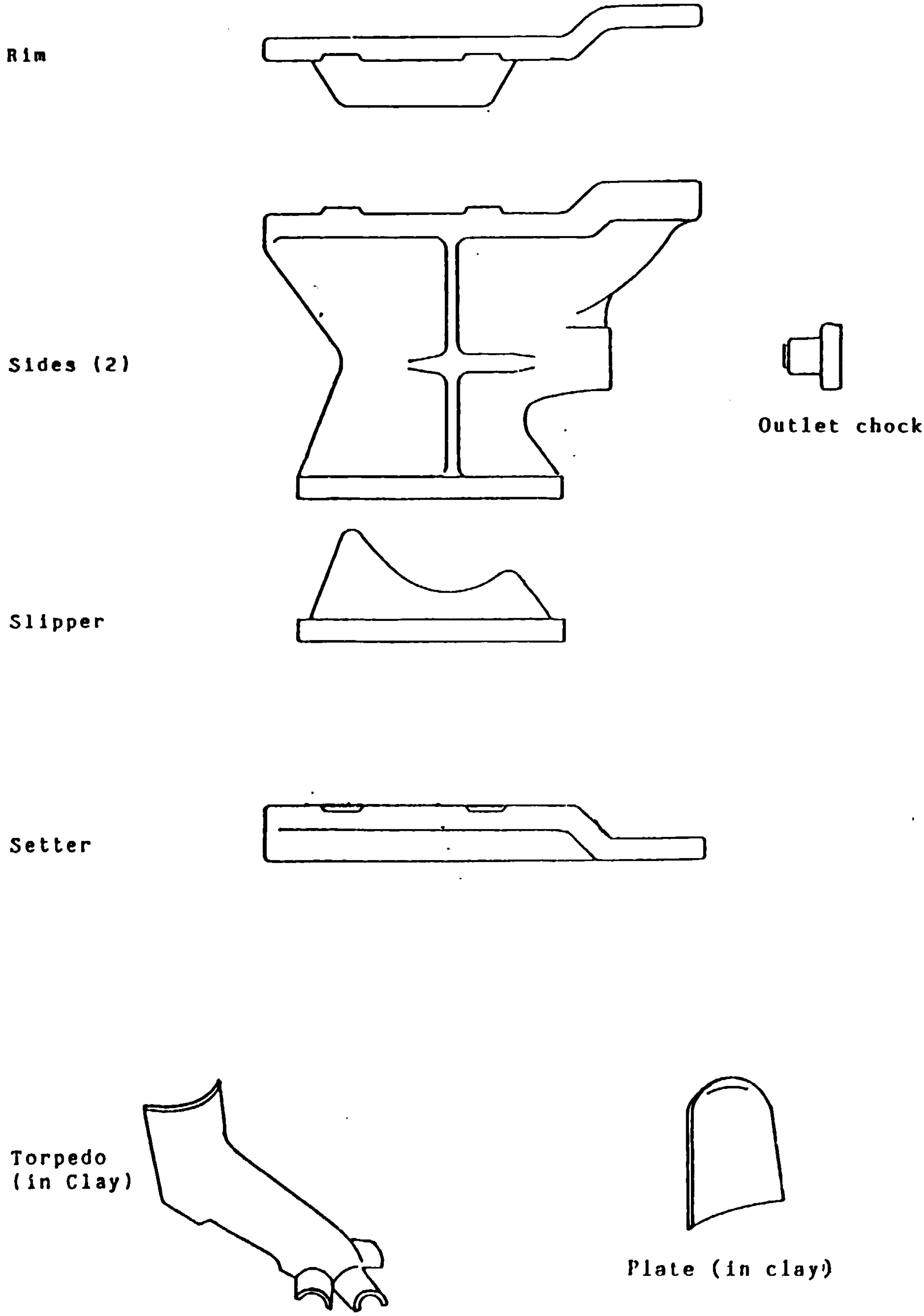
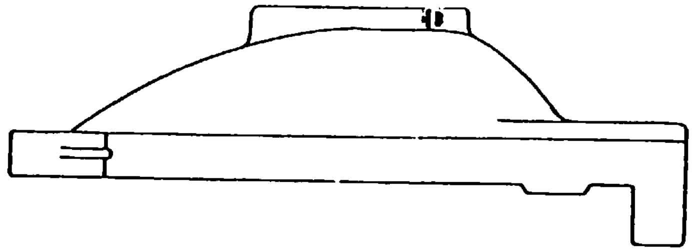
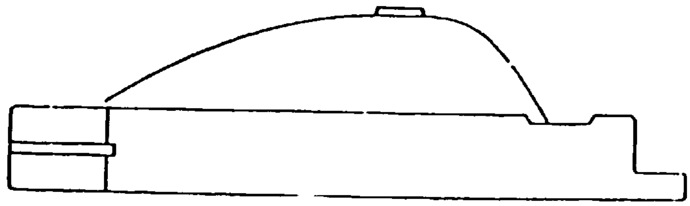


Figure 6.12 Typical mould parts for a wash basin

Back



Face



Setter

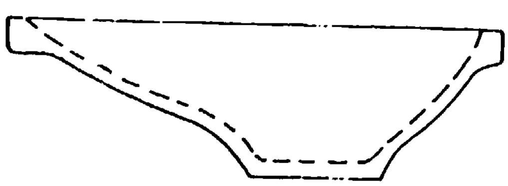


Figure 6.13 Typical mould parts for a pedestal

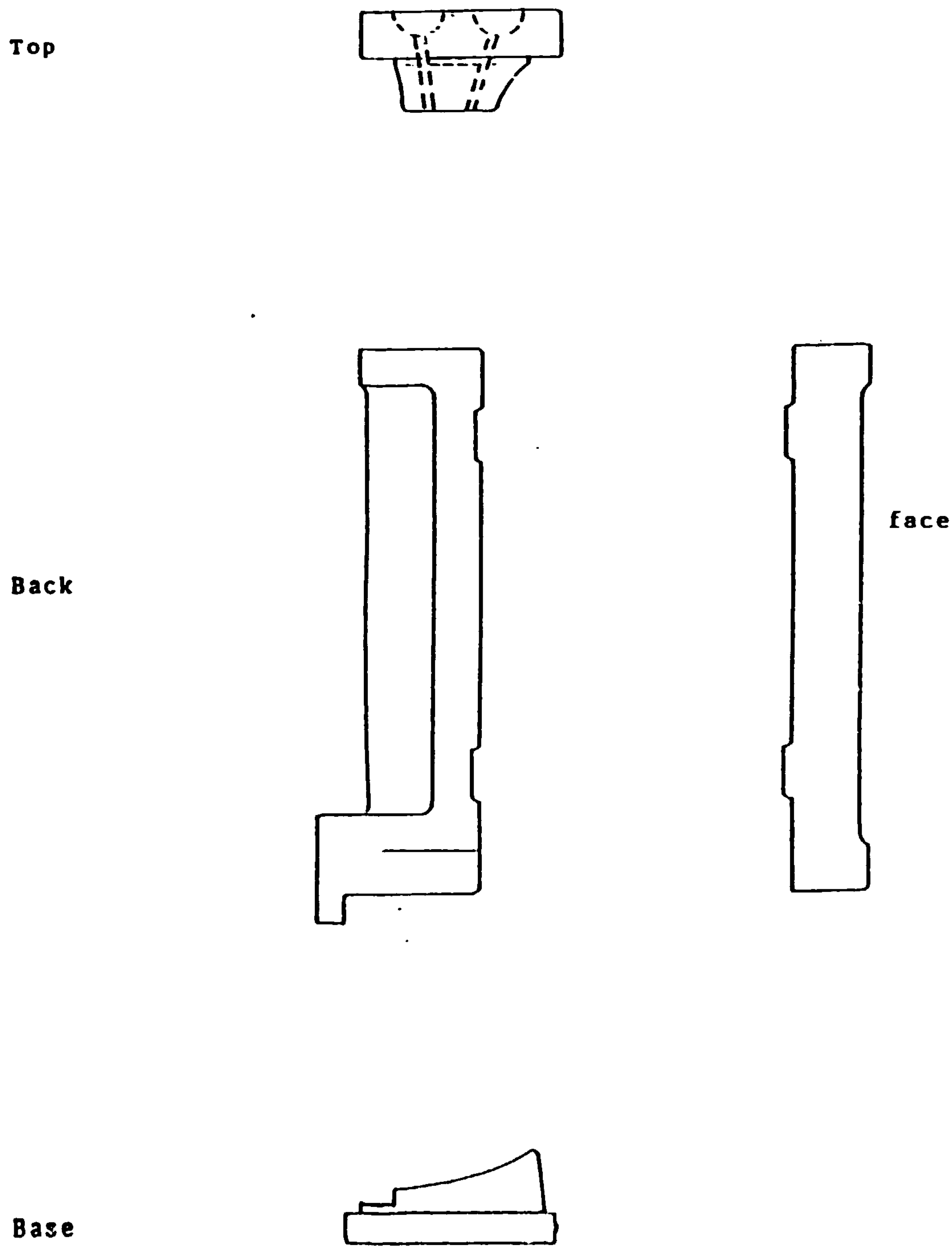
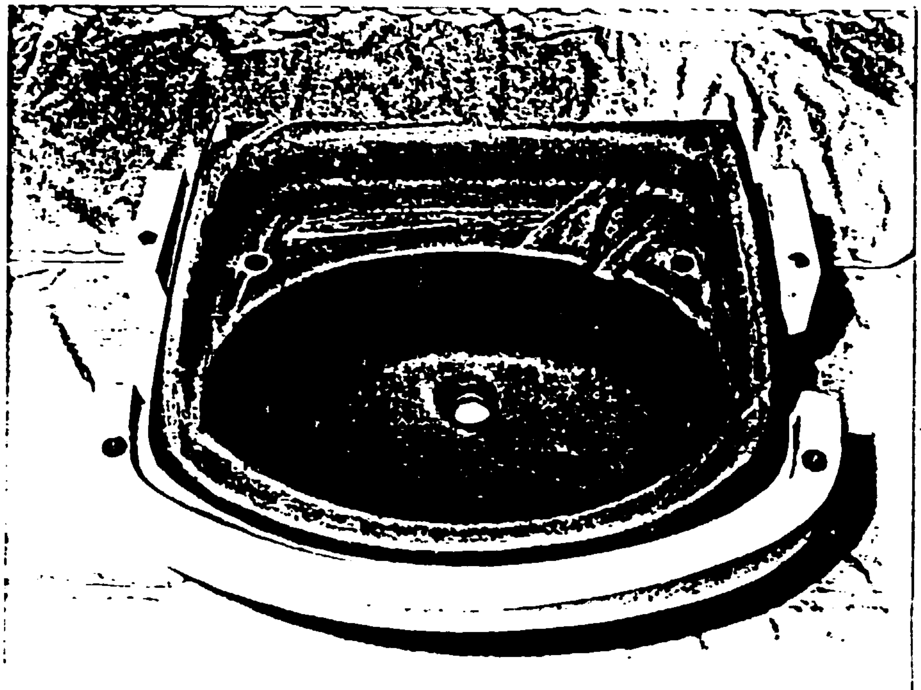


Figure 6.14 Typical washbasin mould in use

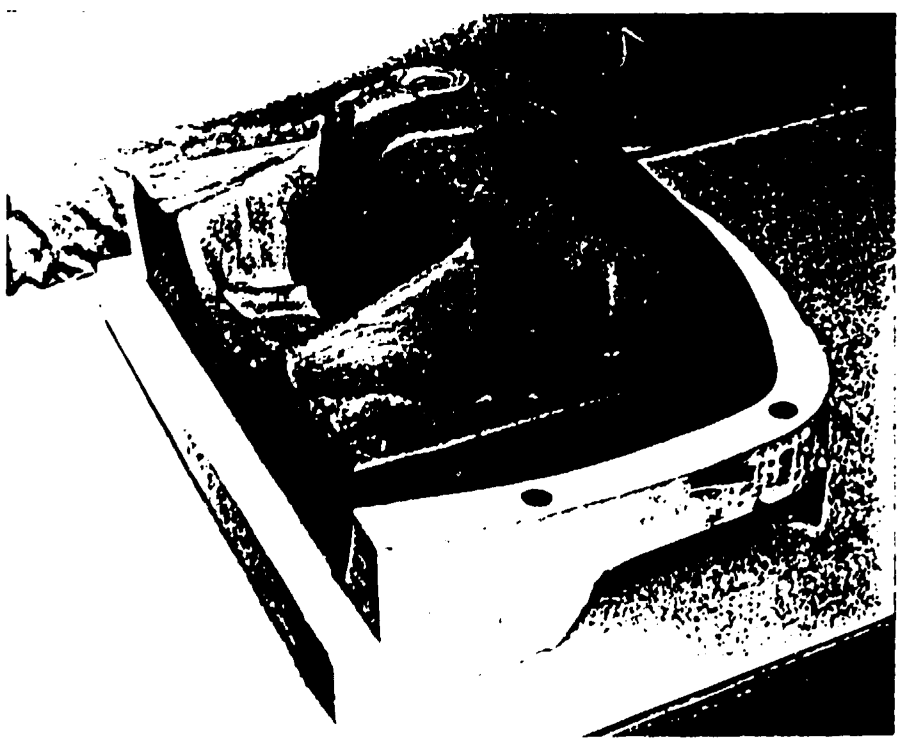
FRONT

VIEW



Cast Basin in one half of Mould

BACK VIEW



Cast Basin in one half of Mould

c) Laboratory

For the normal routine quality control of the sanitaryware and tile production processes a small laboratory is provided as a common service centre with the following equipment:

1 Modulus of Rupture testing machine
1 Electrically operated autoclave for craze resistance testing
1 Thermal gradient kiln for the test firing of bodies and glazes
1 Small test kiln
1 Bullers ring gauge for temperature measurement checks
1 Modulus of rupture machine
1 Set of laboratory glassware
1 Single pan balance, 2.0 kg capacity
1 Single pan balance, 0.5 kg capacity
1 Single pan balance, 0.25 kg capacity
1 200mm diam desiccator
1 Stereoscope microscope
1 Laboratory drying oven, 200 deg C rating
1 Universal torsion viscometer, complete with torsion wires and bobbin
1 Glaze thickness tester
1 Portable wet and dry bulb thermometer
1 Bench stirrer
1 Double jar rolling mill complete with two 5 litre porcelain jars and grinding media
1 Single deck vibrating screen, complete with polypropylene receiving containers

Photographs of some of the major items of laboratory equipment are shown in Appendix G.

Quality control procedures

The following tests are the normal routine quality control tests carried out on tile and sanitaryware factories and by ceramic raw material suppliers in their laboratories. As the Ugandan market requires good quality tile and sanitaryware products to european standards, good quality control procedures must be installed on the factory and maintained.

a) Sampling techniques

From the quarry sites or from factory stockpiles bulk samples should be taken from the area in a uniform manner, so that the samples are representative of the deposit or stockpile. The bulk samples should contain a minimum of 100kg for each 100 tonnes of the stockpile. This sample can then be coned and quartered to a maximum quantity of 50 kg before transporting from the stock site.

If a representative sample from a single bag of clay is required, it can be accurately obtained by passing the whole quantity through a sample divider or by coning and quartering.

Where a large number of bags have to be sampled to provide an overall representative sample, the use of a probe, which can be inserted to withdraw a single small sample, which is a reasonable representation of each bag's contents will be acceptable.

b) Particle size by decantation

Coarse granular materials are usually analyzed for particle size distribution using sieving techniques. Dry sieving is normally used for materials in the size range down to 150 micron and wet sieving is the standard procedure in the next finer range down to 50 micron. This latter technique is used for residue checks on ceramic clays. The finer size ranges which have important effects on the physical properties of clays are normally measured by methods based on sedimentation according to the "Stokes" formula for the rate of sedimentation of spherical particles, ie:

$$V = \frac{gD2\ (\triangle d)}{18n}$$

V = sedimentation velocity (cm.sec -1)
g = gravitational constant (981 cm.sec -2)
D = particle diameter (micron)
$\triangle$d = difference in density between the solid and the fluid (g.cm-3)
n = viscosity of the fluid (poise)

In its simplest for the sedimentation analysis can be carried out by a repeated decantation procedure. This is suitable for clay testing where the content of the clay particles down to a size of 5 microns is required. This is used for the routine quality control of china clay at the 10 micron level.

The procedure is to disperse 20g clay, 20 ml water, 20 ml deflocculant containing 1.0wt% of sodium carbonate and 0.5wt% sodium hexametaphosphate. Distilled or deionised water is then added followed by the weighed amount of dry clay (or equivalent, if the clay is not dry). The mixture is then homogenised for 1 minute at maximum speed of the mixer. The mixture is transferred to a glass cylinder, 50-60mu diameter, 700ml capacity, with a graduation mark 200 mm above its internal base and the liquid level is made up to that mark by adding water. The cylinder is then closed with a rubber bung and shaken vigorously for 30 seconds. THe vessel containing the dispersed sample is allowed to stand undisturbed for the calculated length of time. At the end of the sedimentation time, the liquid is syphoned off down to a depth of 10mm using a specially designed syphon tube. The residue is redispersed, diluted and sedimentated at least 5 times to ensure complete removal of fine particles. The sediment is then transferred to an evaporating dish, dried and weighed. The result is calculated as the percentage weight coarser than the specified diameter (EG 10 micron equivalent spherical diameter).

c) Particle size by Andreasen

The principle is as for the decantation method but where particles finer than 5 micron are to be measured, the precise temperature control and accurate sampling techniques provided by the Andreasen Pipette measurement are required. This method is used by major European raw material suppliers and factories for the routine quality control of clays at the 2 micron level.

The method is to disperse 5g dry clay, 35ml water, 5ml deflocculating solution (as previously). The mixture is transferred to a glass cylinder of 400ml capacity and diluted to the 250ml level with water. After vigorous agitation a 20ml pipette sample is taken immediately to determine accurately the initial solids concentration. Sedimentation is allowed to take place in a temperature controlled water bath for the required time (eg: at 25 deg C and a sampling depth of 50mm

e.s.d (micron)	time (min)
5	34
2	213
1	852
0.5	3,408

At the end of the sedimentation period a 20ml pipette sample is taken at a depth of 50mm below the surface. The sample is dried and weighed. The result is calculated as the weight percentage finer than the specified e.s.d.

$$= \frac{\text{Initial Solids} - \text{Final Solids}}{\text{Initial Solids}} \times 100$$

d) Defocculation behaviour

This testing system is used for the routine testing of china clays (kaolins) and ball clays in the ceramic industry.

The clay sample is pre-dried at 60 deg C to less than 1 per cent moisture content. It is then crushed to pass an BSS sieve)2mm diameter aperture) to aid dispersion. The amount of water required is calculated from the expected casting concentration of the sample being tested. As energetic stirring will alter the properties of china clay, as they disperse quite easily, gentle hand stirring is satisfactory. A high speed mixer is preferred for ball clays. During the initial dispersion the additions of clay to water will result in the viscosity rising to an "unstirrable" level. At this stage a deflocculant addition will be necessary to restore fluidity. The amount added should be kept to the minimum, which allows completion of the dispersion. Suitable deflocculants are P84 sodium silicate, diluted to 50 per cent wt/vol to aid the flow from the burette for china clay deflocculation and a mixture of M75 sodium silicate and sodium carbonate for ball clays (silicate:carbonate ratio 3.2:1). The viscosity is then measured using a torsion viscometer.

Increments of deflocculants normally used are 0.2ml of dilute P84 for china clay and 0.5ml of each of the electrolytes in the case of ball clays. The time interval between successive deflocculant additions and viscosity readings is usually 5 minutes. When a minimum viscosity has been reached, which should be above 5 poise, water is added until the viscosity is 5 poise. This equates to an overswing of 320 degrees on the torsion viscometer (the Fluidity value). A sample is taken, weighed, dried and reweighed to determine the Casting Concentration (wt % solids).

The 5 poise slip is cast in standard Plaster-of-Paris moulds for different lengths of time. The resultant dry clay thicknesses are plotted against time of casting and should fall on a straight line, the slope of which, in units of mm2/min, is a measure of casting rate.

For sanitaryware slips the thixotropy is important. Thixotropy is obtained from the difference of two readings on the torsion viscometer, one taken immediately after stirring and a second reading after a known resting time, which is usually 1,2 or 5 minutes. The first reading minus the second reading is then taken as the one, two or five minute thixotropy and is expressed in degrees. Typical values for sanitaryware casting slips are:

Fluidity	300 - 330 degrees
Thixotropy (one minute)	30 - 60 degrees
S.G. of slip	1.80 - 1.85

The Specific Gravity (S.G.) of the slip is calculated from the results of weighing a known volume of slip.

$$\text{Specific Gravity} = \frac{\text{Weight of slip in grams}}{\text{Volume of slip in mls}}$$

Slips can adjusted in three possible ways to obtain acceptable values for production purposes, ie: by adjusting water, deflocculant and the body. The effects are as follows:

Addition	Fluidity	Affect on Thixotropy	Slip S.G.
Deflocculant	Increase	Decrease	Slight decrease
Water	Increase	Slight decrease	Decrease
Body	Decrease	Increase	Increase

More that one addition may be required to give the slip within acceptable limits, eg: If the fluidity figure is acceptable but the thixotropy is too high, it may be necessary to add both deflocculant and plastic body.

e) Drying and Firing Shrinkages

i) Wet-to-Dry Shrinkage

This is important, as it affects the drying characteristics of a clay or body. Fine particle plastic clays, although showing high dry strengths, also show high wet-to-dry shrinkages. If this is too great, there will be a tendency to warp or crack during the production process. The tests are normally carried out both laboratory samples, in the form of rods or bars and on production tile and sanitaryware products.

The value can be reported either on the wet basis or on the dry basis, depending on whether the wet or dry size is used as comparison. The wet basis calculation is:

$$\text{Wet-to-dry shrinkage} = \frac{\text{wet length} - \text{dry length}}{\text{wet length}} \times 100$$

The wet-to-dry shrinkage (dry basis) is given by:

$$\text{Wet-to-dry shrinkage} = \frac{\text{wet length} - \text{dry length}}{\text{dry length}} \times 100$$

It is always important to specify, which method is being used, when results are reported.

ii) Dry-to-fired shrinkage

Fired shrinkage rates at different temperatures are determined on both clay deliveries and on a routine basis on the tile and sanitaryware body compositions. They are carried out both on laboratory samples and also on the tile and sanitaryware products.

On clays, firing shrinkage results together with the corresponding water absorption results, give a useful indication on variations in the composition of the clay. In particular, increase in alkali content (Na_2O and K_2O) or alkali earth content (CaO, MgO) will show as an increase in firing shrinkage and a decrease in the water absorption of the fired samples.

On the different tile and sanitaryware bodies, the results will act as a check on the firing process itself and also on variations of the composition of the body, caused either variations in materials or of mixing.

Fired shrinkage is normally expressed on the dry basis, ie:

$$\frac{\text{dry length} - \text{fired length}}{\text{dry length}}$$

However it can also be expressed on the fired basis, ie:

$$\frac{\text{dry length - fired length}}{\text{fired length}}$$

The method should be clearly noted on any results to avoid misunderstandings.

For each firing temperature, the value of the water absorption should be determined. This is found by using three pieces broken from the fired article, each having a total area of approximately 100 cm2. At least one major surface should be a glazed surface.

THe test pieces are dried to constant weight at a temperature of 110 deg C, cooled to room temperature in a desiccator and weighed to an accuracy of not less than 0.01g. The samples are then boiled in water (distilled) for 5 hours, after which the pieces are allowed to cool overnight. The pieces are then wiped with a damp cloth to remove surface water only and are weighed. The water absorption value is obtained from:

$$\text{Water Absorption} = \frac{\text{Wet weight - Dry fired weight}}{\text{Dry fired weight}} \times 100$$

iii) Total wet-to-fired shrinkage

This value can easily be obtained from the wet length and the fired length. The value will reflect the variables, which affect both wet-to-dry and dry-to-fired shrinkages. In addition this overall value of shrinkage will determine the size of the fired tile and sanitaryware articles, since the wet size of the product will be fixed by the size of the tile dies on the press and, in the case of sanitaryware, by the size of the working moulds, case moulds and master block mould. Any variations in value will indicate a variation in the size of the finished product, which can lead to serious quality complaints from tile and sanitaryware customers, if products of the incorrect size are produced and sold.

The overall wet-to-fired shrinkage is usually quoted on the basis of the wet size, ie:

$$\frac{\text{wet length - fired length}}{\text{wet length}} \times 100$$

However, it can be reported sometimes on the fired basis, ie:

$$\frac{\text{wet length - fired length}}{\text{fired length}} \times 100$$

f) Modulus of Rupture (MOR)

For both tile and sanitaryware production, it is necessary to monitor the strength of the dry body and the fired body, to ensure that the products are meeting the correct specifications. Round bars or rectangular bars are normally made for laboratory tests and in the case of tiles, the production pieces can also be tested directly. The modulus of rupture machine, which has a variable span, loads test pieces at a standard rate until the test piece breaks. The Modulus of Rupture value, which is normally used as a quality control value for the consistency of the strength of tile and sanitaryware bodies, is calculated from the formula:

$$\text{Modulus of Rupture (MOR)} = \frac{8PL}{d3} \quad N/mm2$$

P = Breaking load (kg)
L = Span (mm)
d = diameter of bar

g) Thermal Expansion tests

In order to ensure that the tile glaze and the tile body "fit", or match each other and similarly with the sanitaryware glaze and body, it is necessary to carry out tests to check the thermal expansion characteristics of both the glazes and the bodies. Common glaze faults such as "Peeling" or "Crazing" of the glaze, are caused by the different contractions of body and glaze during cooling after firing.

If a glaze contracts more than the underlying body, the glaze will tend to craze due to the resultant tensile stress. If a glaze contracts far less than the body and is put under a high compressive stress, the glaze may peel from the body. However, contrary to what may seem ideal, a body and glaze, which match exactly is not the perfect system, as ceramic bodies are subject to a "moisture expansion" after firing. In this case a perfect fit would eventually change into a state of tension, when the tile or sanitaryware would craze. This would normally occur after installation in the customers building and dependent on the porosity value of the body could occur after a short period with a hign porosity body, or after many years with a low porosity body.

To combat this moisture expansion, therefore, the best solution is to adjust the glaze composition and/or body composition, such that the glaze is under compression after cooling but not sufficiently under compression that the peeling fault occurs. Once a compatible body and glaze have been formulated, then it is only necessary to monitor the thermal expansions occasionally. An outside laboratory can carry out this work for the new factory in Uganda.

A simple factory method of checking, whether the glaze-body fit is changing adversely due to variations in the thermal expansion or moisture expansion values, is to carry out an autoclave test on the tiles or sanitaryware products as a normal routine quality control test.

The autoclave test consists of taking three pieces broken from widely separated parts of the fired article, each piece having a total surface area of approximately 250 cm2. At least one major surface shall be a glazed surface. Surfaces other than major surfaces shall be unglazed and freshly broken. Care should be taken not to produce cracks, either in the body or in the glaze, any such pieces should be discarded.

The test pieces are placed for 10 hours in a vessel in which saturated steam is maintained at a pressure of between 0.33 MN/m2 and 0.35 MN/m2 (50 lb/in2).

The pieces should then be allowed to cool to room temperature and afterwards they should be soaked for several hours in a solution of dye, to which a small quantity of wetting agent has been added. The pieces are then examined for any signs of crazing. To comply with normal quality standards, none of the pieces should show any sign of crazing.

A photograph of a typical small autoclave is shown in Appendix G.

h) Inclined flow test for glazes

For the routine quality control of the glazes, the glaze under test is compared with the flow of a glaze, which has already been designated the standard for quality control purposes. The flow is measured down a double grooved inclined plane, normally a 45 degree angle. The plane can be produced on the factory from the sanitaryware body in use on the factory (unglazed). The double grooved flow plane allows both the new batch of glaze under test and a "standard" sample of glaze, which is known to have given satisfactory production results, to be fired together. A weighed quantity of 10 grams of each glaze are used and the temperature and distance of glaze flow are recorded for control purposes.

i) Glaze thickness

Glaze thickness on the biscuit tiles and the unfired sanitaryware body must be measured and controlled on a regular basis during daily production operations, to ensure that the quality of glaze cover and final colour of the finished product is consistent. A simple penetrometer is used to measure the unfired glaze thickness, which is typically in the range 0.020 to 0.030 inches (0.51 - 0.76mm).

j) Vitrification comparisons with temperature gradient kiln

Samples fired in the temperature gradient test kiln (see Appendix G) can used for the routine quality control of both the tile and sanitaryware bodies and their respective glazes.

The kiln is also useful for on-going body and glaze development work.

The samples can be either a number of small test slabs or rods, or a continuous strip of the material, which covers the complete length of the firing zone. There are usually nine positions in the kiln, where the temperature is monitored by thermocouples.

With glaze tests it is more usual to produce a long thin bar of either tile or sanitaryware body, glaze one side and fire the bar in the temperature gradient kiln. The manner of the rate of maturing of the glaze can easily be identified with increasing temperature.and therefore this can be used as a routine quality control test. Any change in the tile or sanitaryware bodies or glaze compositions should be monitored closely using the temperature gradient kiln.

It is usual to use a temperature rise of 6 deg C per minute and to soak at the peak temperature for one hour. Once established on the factory, the firing curve should be maintained constant for all subsequent tests, to ensure that all results can be compared properly.

k) Temperature/Time control with Bullers Rings

The use of Bullers Rings are a pyroscopic method of monitoring the heat-work done in various parts of the tile and sanitaryware kilns. Other types of pyroscope are cones or bars. Bullers Rings have the advantage over cones, in that a precise numerical measurement is obtained each time and can form the basis of an excellent quality control system for the firing process. Cones indicate the temperature range over, which the correct firing has been achieved but this is subjective and cannot give as accurate indication as a series of Bullers Rings.

The Bullers Rings are simply placed within the tile setting or sanitaryware setting and the rings are then measured with a standard gauge after firing. The results can be tabulated and compared with the recorded temperatures from the thermocouples. If variations in the Bullers Ring values are recorded across the kiln section from side to side, or from top to bottom, then action can be taken to even-up the firing by adjusting the temperatures in the required areas and also sometimes by adjusting the setting pattern of products within the kiln. This inexpensive quality control aid is indispensable in accurately controlling the firing of the products.

l) Tests for chemical resistance & resistance to staining

In use tiles and sanitaryware must be able to withstand attack from various cleaning materials, both acidic and alkaline, which may be applied to its glazed surface. In addition there is the possibility of spillage of staining liquids or solutions and of damage caused by cigarettes being left on a glazed surface.

To ensure that the surface of the product will not be affected, tests should be carried out, in which the fired, glazed surface is subjected to various chemicals, which might attack or stain the surface. After the test has been carried out under the prescribed conditions the surface is compare with a fresh untested surface. To pass the tests the glaze must show no stain or evidence of attack.

a) Chemical resistance

For chemical resistance the test sample consists of eight pieces, each not smaller than 75mm x 25mm x 6mm, taken from the glazed part of the appliance. One piece is placed in a desiccator and is used as a control test piece. The other seven test pieces are partially immersed, one in each of the seven solutions for the time periods as listed below:

Name of chemical	strength of solution %	time hours	temperature deg C
Acetic acid	10	16	100
Citric acid	10	16	100
Detergent	Note 1	48	60
Hydrochloric acid	Note 2	48	15 to 20
Sodium Hydroxide	5	0.5	60
Sodium stearate	0.15	48	60
Sulphuric acid	3	16	100

Note 1: This consists of an aqueous solution containing 0.04 per cent (wt/vol) of a condensation product of nonylphenol with 8-10 molecules of ethylene oxide. A suitable solution which contains 0.15 per cent (wt/vol) of the product is obtainable commercially under the trade name "Lasapol N".

Note 2: This solution consists of equal volumes of water and hydrochloric acid of specific gravity 1.8.

To comply with the test, when tested by the above method, none of the test pieces should appear to the unaided eye of a trained observer to have suffered any loss of reflectivity on the glaze, when compared with the control sample.

b) Resistance to staining and burning

The test sample consists of two pieces, each not smaller than 75mm x 25mm x 6mm, taken from the glazed part of the appliance. One of the test pieces is placed at room temperature with a clean and dry glazed surface uppermost. One spot, not less than 10mm in diameter, of each of the six chemicals listed below is then placed on the glazed surface and allowed to dry. Any residue is then removed with a clean cloth, which has been moistened with distilled water only.

The six chemicals used for the test are:

i) 0.5 per cent aqueous solution of methylene blue
ii) 10 per cent aqueous solution of sodium hypochlorite
iii) 3 per cent aqueous solution of hydrogen peroxide
iv) Anyl acetate
v) Carbon Tetrachloride
vi) 13g of iodine in 1 litre of ethyl alcohol

The other test piece is placed, at room temperature, with a clean and dry glazed surface level and uppermost. A lighted cigarette is placed on the glazed surface, allowed to remain for 15 minutes and is then removed. The stained area is wiped with a clean cloth, which has been moistened with distilled water only. The sample is then observed for damage. Any damage means that the glaze sample has failed.

m) Abrasion resistance

For floor tiles, it is important for floor tiles to be tested for abrasion resistance. The test consists of a simple test, where the tile are placed under a rotating grinding wheel of known characteristics. As this test is only required at infrequent intervals, it is more economic for an independent laboratory to carry out the test. Some customers would insist on independent testing in any case before placing orders.

6.3 Sanitaryware model range

For a new factory there are two choices open to the promoters of the project, in respect to obtaining a suitable sanitaryware design for the products identified. Either a new range must be commissioned from an independent modelling service company, or a range must be purchased or licenced from an existing sanitaryware manufacturer.

A new range takes a considerable time to bring in to operation; approximately nine months in most cases because the following procedure must be followed for each item of the range:

i) Determination of exact shape from drawings, photographs and individual new ideas
ii) Make engineering drawings, taking into consideration shrinkage and distortion rates on firing
iii) Carry out modelling in plaster of each item
iv) Make master moulds (block mould) from plaster model
v) Carry out casting, drying and firing trials on pieces made from the new master mould using the proposed body formulation
vi) Amend the shape of the master mould, dependent on the fired results of the trials
vii) Produce case moulds from the amended master mould (plaster or resin)
viii) Produce working moulds from the case moulds

Addresses of independent modelling companies are noted in Appendix H. Typical mould shapes of a basic range of sanitaryware are shown in Figures 6.10 to 6.14.

Buying or licencing a range, such as the one shown, from an existing manufacturer (see Appendix H), has the advantage that it can reduce the time frame substantially, so that a new factory can enter production earlier with a well proven design. However some modifications would still probably have to be made because the Ugandan factory would be using a different body formulation to the foreign factory and the shrinkage and distortion could be different. The cost of purchasing or licencing a design would however be approximately the same as developing a new one on based on the current pricing trends by companies, who are willing to licence their designs in some areas of the world.

To assist the promoters in choosing a suitable design the Consultants have already commented in Section III on a wide range of designs from Europe and North America, which are shown in Appendix F and the mould shapes shown in this section should further assist the type of design choice for the promoters.

6.4 Basic calculations for factory capacity

6.4.1 Tile production ratios

For an annual saleable production of 32,000 m2 150 x 150 x 5mm wall tile and 22,000 m2 100 x 200 x 10mm floor tile the raw material requirements are based on the following parameters.

Wall tile 150 x 150 x 5mm fired weight	= 0.21 kg/piece
Weight per m2 with 44 piece/m2	= 9.3 kg/m2
Floor tile 100 x 200 x 10mm fired weight	= 0.38 kg/piece
Weight per m2 with 50 piece/m2	= 19.0 kg/m2

Assuming an average loss on ignition of 7 per cent, the dry weight of clay will therefore be:

Wall tile	10.00 kg/m2
Floor tile	20.43 kg/m2

Assuming a natural water content in the raw clays, the raw clay requirement will be:

Wall tile	11.11 kg/m2
Floor tile	22.70 kg/m2

Assuming an overall production loss ratio of 10 per cent from pressing to saleable product, the tile pressed must equate to:

Wall tile	35,556 m2
Floor tile	24,444 m2

The total raw material requirement for this pressed quantity is therefore:

Wall tile	35,556 x 11.11 kg	= 395.03 tonnes
Floor tile	24,444 x 22.70	= 554.88 tonnes
	Total	= 950 tonnes

Allowing for a 5 per cent transportation loss, the total raw material requirement for tile production is:

1,000 tonnes per year

To obtain the daily pressing and glazing capacities and also the weekly firing capacities in terms of pieces, we must allow for the loss from pressing to biscuit stage and from the biscuit stage to saleable product. The overall loss ratio of 10 per cent is estimated at 9 per cent press to biscuit and 1 per cent biscuit to saleable product. On this basis the production requirements in terms of pieces are:

	Saleable m2	From biscuit m2	From press m2
Wall tile	32,000	32,323	35,556
Floor tile	22,000	22,222	24,444
Total	54,000	54,545	60,000

	Saleable pc/yr	From biscuit pc/yr	From press pc/yr
Wall tile	1,408,000	1,422,212	1,564,464
Floor tile	1,100,000	1,111,100	1,222,200
Total	2,508,000	2,533,312	2,786,664

	Saleable pc/wk	From biscuit pc/wk	From press pc/wk
Wall tile	30,609	30,918	34,010
Floor tile	23,913	24,154	26,570
Total	54,522	55,072	60,580

	Saleable pc/dy	From biscuit pc/dy	From press pc/dy
Wall tile	6,122	6,184	6,802
Floor tile	4,783	4,831	5,314
Total	10,905	11,015	12,116

Press capacity

The press capacity must be capable of producing an average of 12,116 tile per day. On this basis a double tile press operating at the rate of 18 cycles per minute would be suitable, producing 15,120 tiles in a single 8-hour shift, allowing for 1 hour downtime (87.5 per cent efficiency). There will therefore be sufficient time to cope with the changeovers from one tile format to the other, which are necessary throughout the week.

Dryer and biscuit kiln capacity

The dryer capacity must match the biscuit kiln capacity and the wall tile biscuit kiln capacity must be sufficient to fire 30,010 wall tile per week. As the firing cycle is 48 hours and we must allow some time for maintenance, a realistic number of firings would be three firings per week. Each firing must therefore fire a minimum of 10,306 wall tile. A 3.5 cu m kiln with a capacity of 11,000 wall tile is therefore provided.

In the case of the floor tiles, the biscuit kiln capacity must be a minimum of 8,857 tile on the basis of three firings per week. A 5.7 cu m kiln would provide a capacity of 8,957 floor tile.

Glazing line

The glazing line must have a capacity of a minimum of 11,015 tile per day, therefore a line which can cope with 12,000 tile per day, operating at 87.5 per cent efficiency, has been allowed for in the project.

Glaze requirements

The consumption of glaze is based on a normal amount of 7 per cent by weight of fired product. The weight of fired product per year is:

Wall tile	32,000 m2 x 9.3 kg/m2	=	297.6 tonnes/year
Floor tile	22,000 m2 x 19.0 kg/m2	=	418.0 tonnes/year
	Total fired weight	=	715.6 tonnes/year

Allowing for a 1.0 per cent glost fired loss, the total glost fired weight, including glost waste is:

722.8 tonnes/year

At 7 per cent consumption rate, the glaze consumption is:

50.6 tonnes/year

Allowing for 5 per cent transport and handling waste, the total glaze requirement will be:

53.3 tonnes/year

Glost kiln capacity

The tile glost kilns must provide for firing 30,918 pieces of wall tile and 24,154 pieces of floor tile per week. With a 24hr firing cycle a 3.5 cu m kiln with a capacity of 5,280 glazed tile (either wall tile or floor tile), the wall tile requirements can be achieved in 6 firings per week and the floor tile requirements in 5 firings per week.

6.4.2 Sanitaryware production ratios

The basic parameters of sanitaryware production requirements with the five piece product range are:

	Saleable pc/day	Saleable pc/week	Saleable pc/year
Close coupled washdown WC	9	45	2,070
Cistern & lid	9	45	2,070
Medium washbasin	9	45	2,070
Pedestal for medium washbasin	9	45	2,070
Small wall mounted washbasin	9	45	2,070
Total	45	225	10,350

To achieve a total of 45 saleable pieces per day a 75 per cent yield from the casting requirement has been assumed, ie: an overall loss of 25 per cent. This has deliberately been assumed to be at a high level, in comparison to a normal expectation of around 15-17 per cent in a European factory, because personnel will not be fully trained during the early years of the project.

This assumption therefore results in a casting total of 60 pieces per day being required.

The production schedule at various departments of the manufacturing process will apply as follows. This schedule takes into consideration the expected loss ratios at each stage of production for a new factory.

	No.
Pieces cast per day	60
Assume 11% casting loss (damaged)	7
Pieces available for spraying	53
Assume approx 1.5% spray loss	1
Pieces available for firing	52
Saleable ware after first fire (60%)	31
Pieces available for re-fire after first fire (85%)	16
Loss from first fire (10%)	5
Total	52
Recovered ware from re-fires (85%)	14
Loss from re-fires (15%)	2
Total	16

Therefore the total saleable ware is:

Saleable ware from first fire	31
Saleable ware from re-fire	14
Total saleable ware	45

Raw material and slip requirements

For a daily casting total of 60 pieces, the following data has been used:

Volume of slip to fill one mould, on average = 32 litres

Of this amount, the following is a breakdown of the actual slip usage:

		litres
Volume of slip to form article (36%)		11.52
Volume of slip returned to sliphouse (57%)		18.24
Volume of slip returned as wet scrap (5%)		1.60
Volume of waste slip - spillage (2%)		0.64
	Total	32.00

Therefore the quantities involved in casting 60 pieces are:

		litres
Volume of slip to form article (36%)		691
Volume of slip returned to sliphouse (57%)		1,095
Volume of slip returned as wet scrap (5%)		96
Volume of waste slip - spillage (2%)		38
	Total	1,920

Based on the above data the volume of slip, which is in circulation per day, including the clay scrap from the casting process, as a result of damaged casts (7pc x 11.52 litre, or 81 litre, when remixed) is:

1,920 + 81 = 2,001 litres

This is the minimum amount of slip required in the system prior to casting each day. However it is not practical to operate with this minimum quantity, as mixing of materials must be carried out and we must allow for unforseen breakdowns. Additional storage must also be provided to allow the clay slip to be aged properly and to allow it to be checked by laboratory personnel prior to use, so that any necessary adjustments can be made. As an approximate practical guide, the volume of slip storage capacity required should be at least five times the daily requirement, including fresh slip and slip in recirculation. On this basis we have provided for at least 10,000 litres holding capacity.

If the casting slip is prepared at a normal density of 1.80 g/cc, then the total weight of new casting slip required per day will be:

Volume of slip to form 60 articles (691 litres) plus volume to replace waste slip spillage (38 litres), ie: a total of 729 litres.

Total dry weight of clay body = 729 x 1.80

= 1,312 kg dry clay body/day

In their natural state the materials are not dry, therefore assuming an average 10 per cent moisture loss and an additional 5 per cent to cover losses in transport, storage and sieving, the project will require:

1,544 kg raw materials/day
7,720 kg raw materials/week
355 tonnes raw material/year

Based on the composition for vitreous sanitaryware, which has been developed from the laboratory tests on the raw materials at the Ceramic Research and Development Centre in Sri Lanka, the ratios and tonnage requirements are as follows:

	%	Tonnes/wk	Tonnes/yr
Ball Clay (imported) 7% EWVA, 17% Hycast VC	24	1.85	85
Buwambo Kaolin	25	1.94	89
Lunya Feldspar	30	2.30	106
Diimu Silica Sand	21	1.63	75
Totals	100	7.72	355

Glaze requirement calculation

It is necessary, in the early years of the project, to allow for the importation of white fritted sanitaryware glaze. The approximate consumption of glaze material is based on 7 per cent by weight of the fired product weight. The average fired weights of the proposed range are as follows:

	kg/piece
Close coupled washdown WC	15.5
Cistern & lid	13.5
Medium washbasin	15.0
Pedestal for medium washbasin	11.0
Small washbasin - wall mounted	13.0
Average weight/piece	13.6

The expected glaze requirement is therefore:

13.6 per cent x 7 per cent = 0.95 kg/piece

After casting losses of 11 per cent, the number of pieces per day available for spraying is 53 pieces, therefore the daily glaze consumption will be:

53 pieces x 0.95kg = 50.35 kg/day
= 252 kg/week
= 11.6 tonnes/year

Allowing for 5 per cent shipping and storage loss and a further 5 per cent additional consumption for the operatives being trained in the early years of the project, we must allow for a requirement of:

12.9 tonnes of sanitaryware glaze per year

Plaster-of-Paris requirement calculation

There is no manufacturer of Plaster-of-Paris in Uganda, of either the hard case mould plaster grade, or the softer working mould plaster grade, which is required for the continuous replacement of working moulds, as they deteriorate in use.

Good quality moulds made from the correct grade of Plaster-of-Paris can be expected to have a useful working life of 80 casts, providing that the mouldmaking practice follows the correct guidelines on the plaster/water ratio and temperature.

With the range of items and numbers of articles to be cast per day, the Plaster-of-Paris requirements are as follows, on the basis of a 5-day week and 46 work-weeks per year, which gives a replacement cycle of 2.9 times per year:

Item	No. cast per day	New moulds per year	Mould weight(kg)	Plaster per year (tonne)
WC	12	34.8	135	4.70
Cistern	12	34.8	105	3.65
Med washbasin	12	34.8	100	3.48
Pedestal	12	34.8	60	2.09
Sm washbasin	12	34.8	84	2.92
Total	60	174		16.84

From the above table we can estimate that 174 replacement moulds will have to be made each year, or approximately 4 per week and this will require 16.84 tonnes of Plaster-of-Paris.

Allowing for 25 per cent losses due to shipping, mixing and moisture degradation on storage, it is necessary to allow for a yearly consumption of:

22.5 tonnes/year

This is the normal replacement requirement. In addition to this, in the first year will be the Plaster-of-Paris requirement for a complete series of moulds required to start production. Twelve moulds of each item are required and this would require 5.8 tonnes of Plaster-of-Paris. Allowing for 7 per cent shipping losses and mixing losses but no degradation losses, as it will be used immediately on arrival, the initial

Plaster-of-Paris requirement is 6.3 tonnes. The costs of this have been included in the capital cost for the sanitaryware range.

6.5 Spare parts

In the initial capital expenditure requirements for the tile and sanitaryware equipment we have allowed for a minimum two to three year requirement for all items.

6.6 Shipping of machinery and equipment

The shipping of all the machinery would be in containerized loads, shipped by sea to Mombasa and then delivered by road directly to the factory site. Rail transport to Kampala is possible but shipping agents in Kampala did suggest that road transport from Mombasa would be the best option.

The organization of the shipping programme for the items of equipment and machinery would be carried out by the Consultant employed by the promoters.

6.7 Cost estimates for investment

Under the new investment code, which was passed in November 1990, all imported equipment for new projects can be imported free of all customs duties and sales taxes. None of these costs have therefore been added to the imported CIF costs. Adequate reserve in the transport costs have been allowed for the delivery to site.

The cost estimates for the foreign machinery and equipment in this pre-feasibility study have been obtained from similar tile and sanitaryware project proposals with which the Consultants have recently been involved. Current budget prices from European manufacturers for machinery, dryers and kilns and new sanitaryware model ranges etc were also obtained to check prices obtained previously. All prices are based on those current in Europe and should be accurate to +/- 10 - 15 per cent.

Tendering for equipment

During the tendering stage of the project, it may be possible to reduce the capital expenditure in some areas by utilizing some equipment from Eastern Europe or Asia. Each item would have to be chosen at that time on the basis of both price and technical capability.

For the purchase of the equipment, the promoters have two alternatives. The first is to tender on a "turn-key" basis, in which one supplier will bid to supply the entire factory requirements and will also be responsible for erection of machinery, commissioning of all the individual machinery and commissioning of the process. This method is simpler for the promoters of the project but this does tend to be significantly more expensive, as the turnkey supplier will invariably have to buy items of equipment from other suppliers and will place his own profit margin on these items.

The alternative method is to tender on the basis of individual items of equipment, rather than on a turnkey basis. The advantage of this system is that it is easier to obtain lower prices, as the promoters are dealing always with the actual manufacturers of the equipment. The disadvantage, is that more organizational control is required in terms of deliveries, installation and commissioning. However, as this would be part of the terms of reference for the Consultants working on behalf of the promoters, the promoters themselves would find very little difference in terms of additional work. The prices in this pre-feasibility study are based on purchasing machinery and equipment directly from the suppliers.

Photographs and company specification sheets of major items of equipment are shown in Appendix G. A list of potential machinery and equipment manufacturers, modelling companies, glaze and consumable suppliers is attached in Appendix H of this Final Report.

6.7.1 Technology costing

The sanitaryware mould range, whether a new design, or an existing design, which is purchased or licenced from a foreign manufacturer, will cost approximately the same at:

USD 154,000

This price is based on that quoted by an experienced and reliable U.K. modelling company for a new design and also on estimates of licencing costs from a U.K. sanitaryware manufacturer, which has licenced designs to a number of overseas companies in the past few years.

6.7.2 Equipment costings

The budget prices for the machinery and equipment described earlier in this section are as follows:

a) Tile production equipment

		Cost (USD)
1	Ball mill - talc	50,000
1	Blunger - local clay	30,000
1	Storage ark - talc	10,000
1	Storage ark - local clay	10,000
2	Vibratory screens & pumps	6,000
1	Mixing tank - wall tile body	10,000
1	Mixing tank - floor tile body	10,000
2	Sieves/magnets/pumps	32,000
1	Storage ark - wall tile body	10,000
1	Storage ark - floor tile body	10,000
1	Spray dryer unit c/w silos	90,000
1	Press c/w fettling/cleaning unit	100,000
2	Chamber dryers for wall tile & floor tile	144,000
1	Wall tile biscuit kiln	116,000
1	Lot kiln furniture for wall tile biscuit	12,000
1	Floor tile biscuit kiln	130,000
1	Lot kiln furniture for floor tile biscuit	12,000
2	Glost kilns for wall & floor tile	208,000
2	Lots kiln furniture for glost kilns	24,000
1	Tile glazing line	60,000
1	Air compressor and tank	10,000
	Total equipment	1,084,000
	Spares (at 10%)	108,000
	Total equipment & spares	1,192,000
	CIF cost provision	120,000
	Total tile equipment & spares, CIF	1,312,000

b) Sanitaryware production equipment

i) Common preparation equipment with tile production

		Cost (USD)
1	Jaw crusher	30,000
1	Hopper, portable by forklift	2,000
1	Platform scale, capacity 500 kg	4,000
1	Ball mill - quartz or silica sand	50,000
1	Ball mill - feldspar	50,000
2	Vibrating screens	4,000
1	Ball mill - kaolin	50,000
1	Blunger - ball clay	14,000
2	Vibrating screens	4,000
1	Storage ark - quartz/silica sand	10,000
1	Storage ark - feldspar	10,000
1	Storage ark - kaolin	10,000
1	Storage ark - ball clay	10,000
4	Pumps	12,000
1	Lot piping to interconnect process equipt, c/w valves and cleaning points	6,000
	Total	266,000

ii) Sanitaryware raw material preparation equipment

		Cost (USD)
1	Medium speed mixing ark	10,000
1	Holding tank	14,000
2	Vibrating screens/magnets/pumps	32,000
2	Supply tanks	14,000
2	Supply pumps	8,000
1	Scrap blunger	2,000
	Total	80,000

iii) Sanitaryware casting department equipment

		Cost (USD)
6	Run off valves, hoses and casting guns	2,000
1	Heating and conditioning system, c/w electric heater, air replacement unit, air ducting & circulation fans	90,000
12	Three tier clayware storage trucks	8,000
1	Slip returns truck (stainless steel)	1,000
5	Mobile topping benches for cast fettling	5,000
50	10 litre polypropylene slip return buckets	500
1	Clay scrap wheelbarrow	1,000
5	Casting benches in box section steel, epoxy painted	6,000
5	Drying benches in box section steel, epoxy painted	6,000
5	Sets of casters tools for planned products	1,000

1	Lot ABS plastic piping for casting dept. ring main, c/w valves, clearing points & suspenders	7,500
	Total	128,000

iv) Sanitaryware inspection and glazing department

		Cost (USD)
2	Inspection and finishing hoods, c/w 400mm turntables & extraction	12,000
2	Glaze booths c/w extraction, 400mm turntable, removable steel baffles	16,000
2	Glaze spray guns and pressure tanks, 45 litre capacity	6,000
1	Wet type dust collector, c/w silencer fan & sediment tank	6,000
	Total	40,000

v) Sanitaryware kiln department

		Cost (USD)
1	Electrically heated 8 cu m moving hood kiln, c/w two bases. Rating 250 KVA, Cycle max 24 hr, Maximum temperature 1,300 deg C Capacity 68 mixed pieces	124,000
1	Lot kiln furniture sufficient for 3 bases	14,000
	Total	138,000

vi) Sanitaryware inspection, testing & assembly department

		Cost (USD)
1	Hydraulic test unit for routine tests on flushing characteristics of water closet production	
2	Inspection benches for individual piece examination (2m x 1m)	
2	Cone grinding units for glaze imperfection grinding	
	Total cost	20,000

vii) Glaze preparation and storage (common with tile)

		Cost (USD)
1	Porcelain lined ball mill complete with porcelain grinding media, 500 litre cap.	
1	Single deck vibrating sieve c/w screen & permanent magnet	
2	Glaze storage tanks in fibre glass, c/w support frames and slow speed agitators.	

Capacity 1,500 litres
1 Mobile stillage complete with two framed plastic containers of 180 litre capacity

Total cost	28,000

viii) Mould making department

	Cost (USD)
Equipment as listed in Section 6.2.7	
Total cost	30,000

ix) Laboratory equipment

	Cost (USD)
Equipment as listed in Section 6.2.7	
Total cost	44,000

x) Packaging department

	Cost (USD)
Shrinkwrap gun	2,000

Summary of sanitaryware and common department investment

This summary includes the costs of the sanitaryware range (Section 6.6.1).

	Cost (USD)
Common raw material preparation	266,000
Sanitaryware raw material equipment	80,000
Sanitaryware casting department	128,000
Inspection and glazing department	40,000
Sanitaryware kiln department	138,000
Inspection, testing and assembly dept.	20,000
Glaze preparation & storage department	28,000
Mouldmaking department	30,000
Laboratory	44,000
Packaging department	2,000
Total	776,000
Sanitaryware mould range	154,000
Spare parts	60,000
Total equipment & spares	990,000
CIF cost provision	99,000
Total cost equipment & spares, CIF	1,089,000

Mobile equipment costs

		Cost (USD)
1	Forklift truck for factory, 1.5 tonne capacity	36,000
1	Forklift truck for sales, 1.5 tonne capacity	36,000
1	Landrover - factory	32,000
1	Landrover - sales	32,000
1	Dumper	10,000
1	Delivery truck	60,000
1	Minibus	100,000
	Total mobile equipment	306,000

Maintenance equipment costs

		Cost (USD)
1	Full set of tools for mechanic	
1	Full set of tools for electrician	
1	Vice	
1	Grinding wheel & safety glasses	
1	Pedestal drill	
1	Small lathe	
1	Small shaper	
1	Welding machine c/w safety gloves, welding apron & visored helmet	
1	Hand drill & set of drills	
1	Clip-on ammeter	
1	Multi-purpose ammeter/voltmeter	
1	Soldering iron	50,000

Office equipment costs

	Cost (USD)
For telephone, facsimile machine, filing cabinets, desks, chairs, typewriter, pc computer with printer	
Total cost	16,000

Summary of plant, machinery and equipment

	Cost (USD)
Tile equipment	1,312,000
Sanitaryware and common service equipment	1,089,000
Mobile equipment	306,000
Maintenance equipment	50,000
Office equipment	16,000
Grand total	2,773,000

6.8 Civil Engineering works

6.8.1 Site preparation and development

The site preparation for a new factory at Mbarara is limited to levelling of the area required for the building. The cost for a new site in Kampala or the existing site would be similar.

The local costs of this is estimated at: USD 4,000

6.8.2 Structures and civil works

Buildings and civil work

The building areas required for the proposed tile and sanitaryware factory are:

Tiles	800 m2
Sanitaryware and raw material preparation	1,000 m2
Offices & service facilities	200 m2
Total	2,000 m2

It should be noted that these are the minimum areas required. Due to the high civil and building costs, we have tried to minimize the amount it is necessary to spend on the buildings, in order to improve the profitability of the project. Initial COMFAR analyses carried out by the team in the field using larger buildings, which is more normal in these projects, indicated the project would not be attractive. No suitable buildings were available in the Mbarara area, which could be leased to reduce the capital cost of the project. Consequently a decision was made to reduce the size of the buildings to the absolute minimum.

From our field interviews with both architects and builders, it was determined that the current building costs in Uganda in December 1990 varied from USD 357/m2 for a very simple industrial building to USD 750/m2 for a very high quality industrial building. Because of the complications of the in-ground storage tanks in the raw material preparation area, the building for the proposed factory could not be built by independent contractors at the lower building cost. However it is not necessary to build to the highest quality levels, therefore we have assumed a realistic building cost to be USD 575/m2. It should be noted that the majority of builders always quote building prices in US dollars or U.K. Pounds on the basis of the bureau rate, not the bank rate.

On this basis the cost of the building will be approximately:

USD 1,150,000

Other costs associated with the building will be:

Architect/surveyors fees	USD 69,000
Legal fees	USD 6,000

The total cost of the civils and building, all of which are local costs will therefore be:

USD 1,225,000

It should be noted that this is an area, where considerable savings could possibly be made by the promoters of the project, if through their local contacts, they could identify a builder who would either work at lower rates than the standard market price, or who perhaps could join the venture as a partner.

6.8.3 Auxiliary services

a) Foreign

It is necessary to supply a 500 KVA back-up generator for essential areas of the factory, which have to be kept in use at a time of power failure.

Cost: USD 60,000

b) Local

For the power supply to the factory, it is necessary to provide for 1,500 KVA transformers, on-site cabling and distribution.

For the water supply it is necessary to provide for piping costs from the river, pumping station, storage and internal distribution.

The estimated cost is:

	Cost (USD)
1,500KVA transformers	80,000
On-site cabling/distribution	50,000
Water pumping & pipework system	40,000
Total local cost	170,000
Total foreign & local cost	230,000

6.9 Production cost - repair

The annual maintenance cost of the buildings is expected to be:

USD 3,000

Figure 6.15 Layout of Proposed Factory at Mbarara

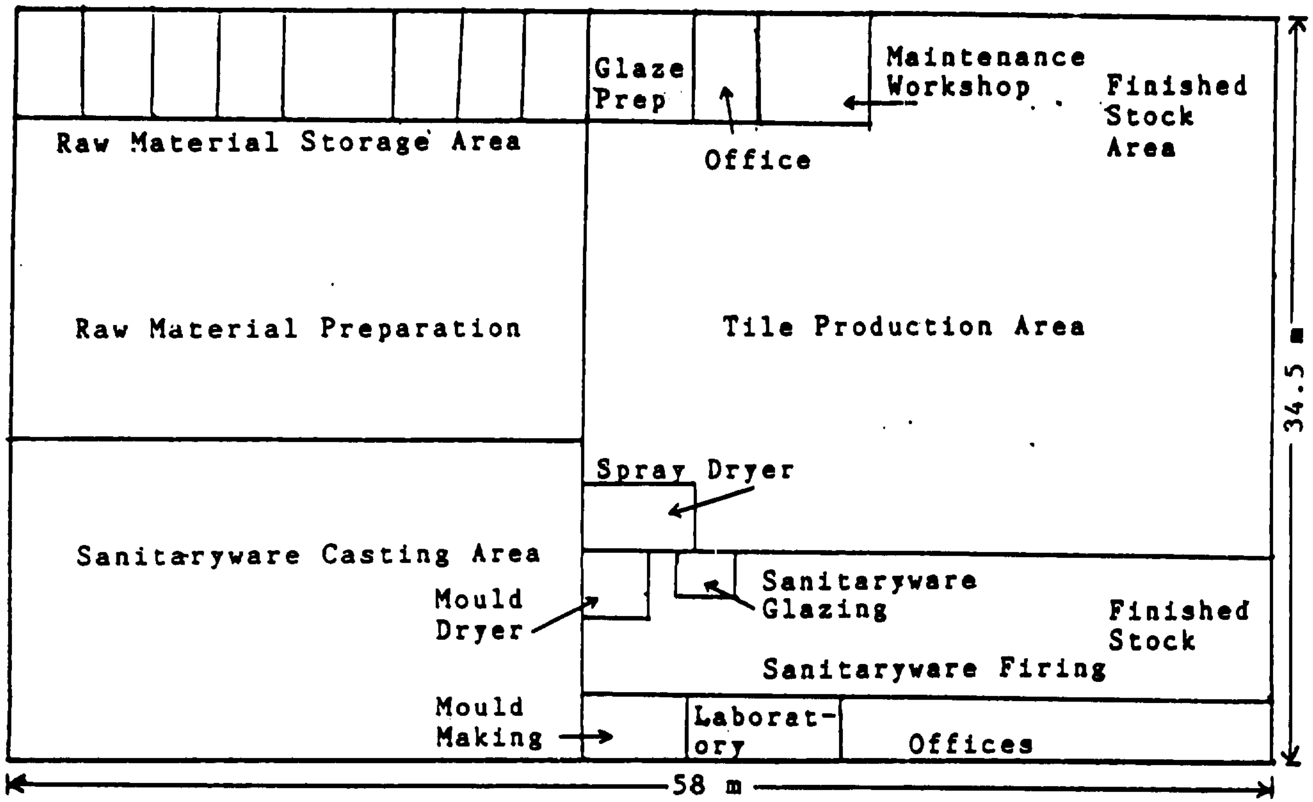
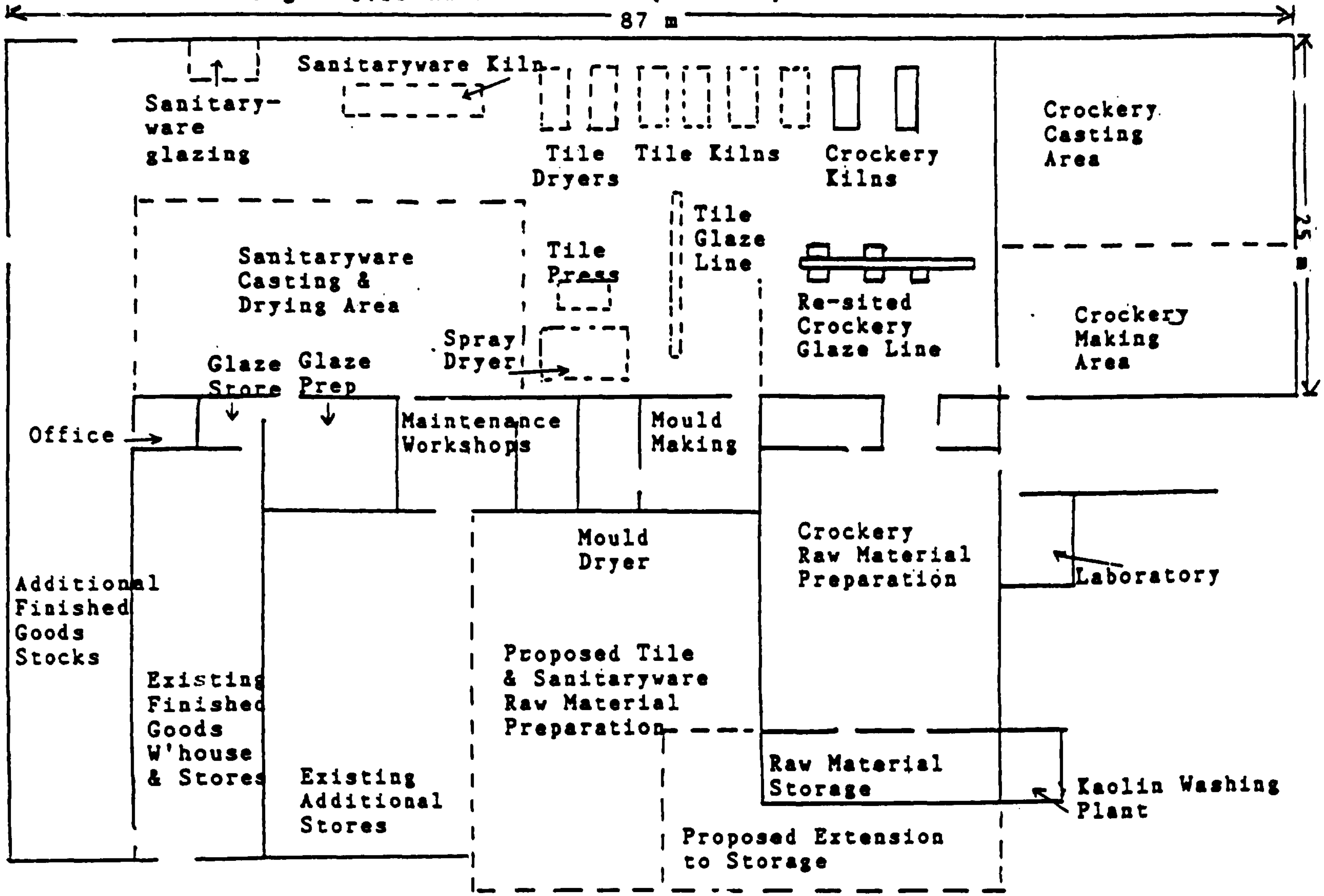


Figure 6.16 Alternative Proposed Layout at African Ceramics Site



SECTION VII

PLANT ORGANIZATION AND OVERHEAD COSTS

VII. PLANT ORGANIZATION AND OVERHEAD COSTS

7.1 Plant organization

The proposed factory is a relatively small production unit with a limited range of two basic products, tiles and sanitaryware. It is therefore proposed that the cost centres for this factory are divided into five main groupings:

i) Tile production cost centre
ii) Sanitaryware production cost centre
iii) Administration and finance cost centre
iv) Sales and distribution cost centre
v) Miscellaneous factory overheads cost centre

It is important to accurately cost both tile and sanitaryware production separately, as each should be assessed as an independent profit centre.

Each of these main groupings will then be sub-divided into their main divisions, which have already been detailed in earlier sections (Section IV). For any manufacturing business, whether it is small or large, it is essential to monitor and control costs, sales revenue, stock levels, working capital requirements and profitability on a continuous basis, so that necessary changes can be made, so that the factory remains profitable.

The tile production cost centre will be divided into raw materials, glaze, consumables, packaging, labour, utilities, maintenance and laboratory.

The sanitaryware production cost centre will be divided into raw materials, plaster, glaze, consumables, packaging, labour, utilities, mouldmaking, maintenance and laboratory.

We have not, in this case allocated any costs to a specific service cost centre, as we feel that it is extremely important to allocate the service cost elements of maintenance, laboratory and mouldmaking accurately to the specific product lines, so that the most accurate product costing can be achieved.

The administration and finance cost centre will be divided into personnel costs, general costs and finance costs.

The sales and distribution cost centre will be divided into Uganda personnel, Uganda general, Kenya personnel, Kenya general and distribution.

The miscellaneous factory overheads cost centre will be for items, which cannot be specifically allocated to either of the production units, administration and finance, or sales and distribution. These costs will be divided into mobile plant running costs, security and general.

While the number of cost centres, at first sight, may appear too large for a small factory, maintaining all of these separate cost centres under strict management control will enable the factory to have the best chance of success. For this purpose a pc computer has been specified for the factory. One of its uses will be to enable all of the stated cost centres to be updated on a weekly basis, so that the analysis of working capital requirements and profitability can be updated regularly by the management.

7.2 Overhead costs

The majority of the overhead costs have been allocated elsewhere under administrative overhead costs, financial costs and depreciation, according to the requirements of the Manual. However, other overhead costs will be allocated, as follows, under miscellaneous factory overheads:

Mobile plant running costs

		Cost (USD)
Minibus for factory workers		9,200
Forklift for factory		3,680
Landrover for factory		4,600
Dumper for factory		920
	Total	18,400

Summary of miscellaneous factory overheads

	Cost (USD)
Leasing costs of Mbarara site	400
Safety items	2,000
Cleaning materials	2,000
Laboratory materials	2,600
Mobile plant running costs	18,400
Maintenance and labour costs (see VIII)	3,100
Total miscellaneous factory overheads	28,500

It should be noted that the administrative overhead cost is high from year 3 to year 7 inclusive due to the costs of a foreign technical manager. A five year term, however, is thought to be absolutely necessary for the technical manager to ensure the success of the factory, due to the high degree of technical knowledge and skills required.

Under the schedule for the working capital for Years 3 - 5, during the period that the factory is building up its production level, the factory overhead costs and the administrative costs must be treated as fixed costs. The 100 per cent capacity in this schedule is the normal feasible capacity, which is realistically achievable on a normal basis in Uganda.

SECTION VIII

MANPOWER

VIII. Manpower

8.1 Company organization

The company organization chart is shown in Schedule 8.1, which outlines the arrangement of the staff and labour by department. As this is a small factory there is no engineering department and the two maintenance staff will report directly to the tile section production supervisor.

The manufacture of sanitaryware requires a high proportion of skilled and semi-skilled personnel to ensure high quality production. In particular, the mouldmaker, casting personnel and laboratory personnel must have lengthy training, in addition to all supervisors. Although the basic skills can be obtained in a few months, these have to be refined and improved over a period of years. Fewer skilled personnel are required for tile production on this particular factory, as many of the handling operations have been chosen to be manual, rather than automatic because of the low outputs involved. fewer highly trained maintenance personnel are therefore required.

Because of the highly technical nature of the production of ceramic products, it is necessary to have a foreign technical manager at the factory for a period of five years after commercial production starts in Year 3. This technical manager would also be involved in the foreign technical inputs during the construction and commissioning phase in Year 2.

The labour and staff requirements for each department of the company are as follows:

Tile production department

Position	Skilled	Semi-skilled	Unskilled	Total
Supervisor	1	-	-	1
Press operator	1	-	-	1
Kiln car loader (pressed tile)	-	-	4	4
Kiln car unloader (biscuit tile)	-	-	3	3
Glazing operator	-	2	-	2
Kiln car loader (glazed tile)	-	-	4	4
Kiln car unloader (glost)/packaging	-	2	3	5
General labourer	-	-	1	1
Forklift driver	-	1	-	1
Relief personnel	-	2	-	2
Totals	2	7	15	24

Sanitaryware production department

Position	Skilled	Semi-skilled	Unskilled	Total
Supervisor	1	-	-	1
Sliphouse operator	1	1	-	2
Casting operator	4	-	-	4
Finishing	-	2	-	2
Glazing	2	-	-	2
Kiln loader/unloader	-	-	2	2
Selection/packaging	-	2	-	2
General labourer	-	-	1	1
Finished goods supervisor	1	-	-	1
Mouldmaker	1	-	-	1
Laboratory	1	1	-	2
Relief personnel	1	1	-	2
Totals	12	7	3	22

General

Position	Skilled	Semi-skilled	Unskilled	Total
Maintenance				
mechanic	1	-	-	1
electrician	1	-	-	1
Security personnel	-	-	4	4
Totals	2	-	4	6

The mechanic and electrician will both report to the tile production supervisor and the security personnel will report to the accountant/office manager.

Sales Department

Position	Skilled	Semi-skilled	Unskilled	Total
Kampala				
Sales Manager	1	-	-	1
Sales clerk	-	1	-	1
Truck driver	-	1	-	1
Forklift driver	-	1	-	1
Labourer	-	-	1	1
Security	-	-	4	4
Factory site				
Sales clerk	-	1	-	1
Nairobi				
Salesman	1	-	-	1
Sales clerk	-	1	-	1
Security	-	-	4	4
Totals	2	5	9	16

Administration department

Position	Skilled	Semi-skilled	Unskilled	Total
General Manager	1	-	-	1
Accountant/office manager	1	-	-	1
Typist	-	1	-	1
Totals	2	1	-	3

In addition to the local personnel will be one foreign technical manager.

Summary of personnel

Excluding the board of directors, the total number of local personnel required will be:

	No.
Tile production department	24
Sanitaryware production department	22
General	6
Sales	16
Administration	3
Local total	71
Foreign technical manager	1
Grand total	72

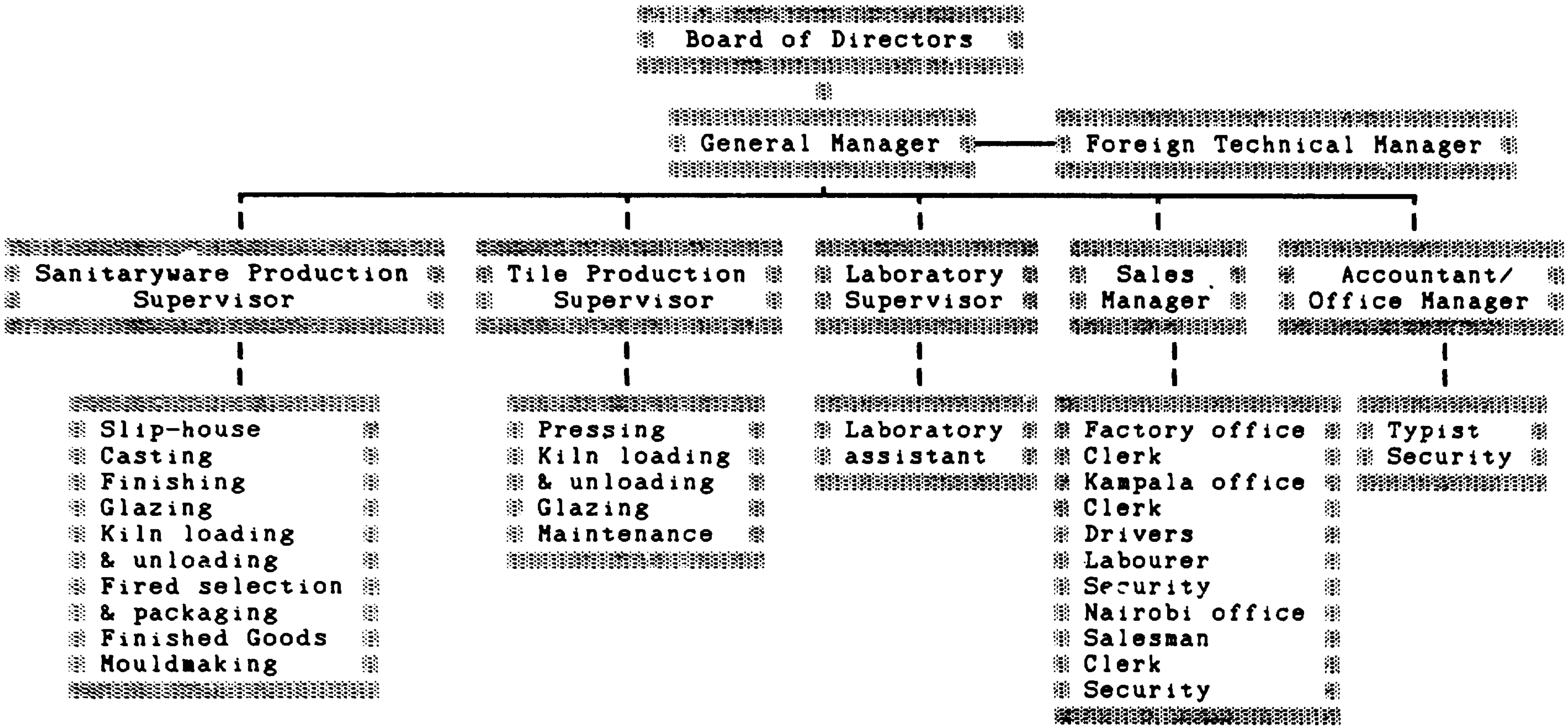
8.2 Costs of personnel

The costs of the personnel are based on the normal payments and benefits, which were currently being paid by industrial units in December 1990. The costs stated include housing, transport and medical costs for the senior staff. Medical costs for all personnel will be covered and transport is provided in the project, so that personnel can be transported to and from the factory.

The sanitaryware and tile labour costs are charged to production labour costs, the general labour costs are charged to miscellaneous factory overheads, the sales labour costs to sales costs and the administration labour costs to administration overheads.

The following cost breakdown is based on the labour and staff requirements for 100 per cent of normal feasible capacity, which will be achieved in Production Year 3. The proportion of labour and staff, which will be required during the implementation phase are detailed in Implementation, Section IX.

Schedule 8.1 COMPANY ORGANIZATION CHART



8.2.1 Local labour costs

		Cost/month (USh 1,000)	Cost/yr (USh 1,000)	Cost/yr USD
Direct Costs				
Sanitaryware				
Supervisors	3 x 44,000	132	1,584	
Operators	19 x 29,000	551	6,612	
	22	683	8,196	11,383
Tiles				
Supervisor	1 x 44,000	44	528	
Operators	22 x 29,000	638	7,656	
Forklift	1 x 29,000	29	348	
	24	711	8,532	11,850
Total production	48	1,394	16,728	23,233
Indirect Costs				
General				
Maintenance	2 x 35,000	70	840	
Security	4 x 29,000	116	1,392	
	6	186	2,232	3,100
Sales				
Kampala				
Manager	1 x 80,000	80	960	
Others	8 x 29,000	232	2,784	
Factory clerk	1 x 29,000	29	348	
Nairobi				
Salesman	1 x 50,000	50	600	
Others	5 x 29,000	145	1,740	
	16	536	6,432	8,933
Adminis-tration				
Gen Manager	1 x 130,000	130	1,560	
Accountant	1 x 64,000	64	768	
Typist	1 x 29,000	29	348	
	3	223	2,676	3,717
Grand Total	71	2,339	28,068	38,983

8.2.2 Foreign labour costs

The costs for one foreign technical manager, which are included under administrative overheads, are estimated to be:

	USD/yr
Fees	60,000
Housing	14,400
Subsistence	9,600
Travel	2,000
Total	86,000

8.2.3 Summary of annual costs of labour and administration by product

a) Tiles

	Cost US Dollars		
	Foreign	Local	Total
Direct costs	-	11,850	11,850
50% of Indirect costs	-	1,550	1,550
50% of Administration	43,000	1,858	44,858
Total	43,000	15,258	58,258

b) Sanitaryware

	Foreign	Local	Total
Direct costs	-	11,383	11,383
50% of Indirect costs	-	1,550	1,550
50% of Administration	43,000	1,859	44,859
Total	43,000	14,792	57,792

8.3 Work schedule

The labour requirements have been based on a normal working shift of 8 hours per day, a 5-day work week for the normal production and an effective 46-week year. Drying and firing will operate over six days per week on a 24 hour day basis. Maintenance personnel will be expected to carry out their work at the time periods convenient for the production programme, therefore this will involve some shift work and weekend work.

Sales personnel will be expected to work on a Saturday, in line with normal practice in Uganda. Security personnel are expected to work on a shift rota system on a 7-day week basis, so that 24 hour per coverage is achieved.

Employees will be given annual leave of two weeks after one year's service and statutory holidays amount to a further two weeks.

Although there are high levels of unemployment in the Mbarara area, some absenteeism is still expected, therefore four permanent relief workers will be employed to cover this eventuality.

8.4 Training

It is very important that special emphasis is placed on a long-term training programme, which must include a three month period of overseas training for four key personnel during the construction phase of the factory. These four personnel would be the tile production supervisor, sanitaryware production supervisor, the mouldmaker and one caster.

The tile and sanitaryware production supervisors will carry out a specially designed course of study at a European ceramics college. This course will encompass all production aspects of tiles and sanitaryware, both on a theoretical basis at the college and on a practical basis at selected tile and sanitaryware factories.

The mouldmaker and caster will be given some theoretical background to mouldmaking and casting but the majority of the overseas training period will be in a selected factory, carrying out this work under the supervision of highly trained mouldmakers and casters, so that they are thoroughly trained in the basic techniques before they return to Uganda.

Training will then continue on-site under the supervision of the foreign technical manager and the foreign installation and commissioning engineers during the implementation phase of the project.

During the field visit the facilities of the ceramics department at Makerere University were examined to determine, whether any training could be carried out at the University. Unfortunately this is not possible, as the ceramics department is concentrating more on artistic ceramics, rather than industrial ceramics. The ceramics department, would however be a suitable source of personnel for the tile and sanitaryware factory, as the students are familiar with ceramic raw materials, glazes and firing techniques. This would substantially reduce the training period on the factory for sliphouse, glazing and laboratory personnel.

8.5 Responsibilities and qualifications of personnel

a) General Manager

The General Manager, as chief executive, reports directly to the board of directors. He is totally responsible for the production, personnel, marketing and general administrative functions, so that the factory can operate efficiently and profitably. The General Manager will be recruited by the board in Year 2 of the implementation period (Period 3), so that he is fully familiar with all aspects of the plant prior to production commencing.

Qualification: A minimum 10 years experience in a manufacturing company at a senior level with profit responsibility.

b) Sanitaryware section production supervisor

The sanitaryware section supervisor is directly responsible to the General Manager for the efficient operation of the sanitaryware production unit. He will also be responsible for the raw material preparation of both the sanitaryware and tile sections, as much of the equipment is common. He will control the production personnel within his section and will be responsible for achieving the budgeted outputs of each product of the range in an efficient manner and to the correct quality standard. The supervisor will be personally responsible for the sanitaryware drying and firing programmes.

Qualification: The supervisor should have good secondary or university level education with 5 years experience as a line manager in a manufacturing company and preferably with ceramics experience gained at Makerere University.

c) <u>Tile section production supervisor</u>

The tile section supervisor is directly responsible to the General Manager for the efficient operation of the tile production unit. He will also be responsible for the maintenance personnel of the factory. He will control the production personnel within his section and will be responsible for achieving the budgeted outputs of wall tile and floor tile in an efficient manner and to the correct quality standard. The production supervisor will be personally responsible for the dryer and kiln firing schedules.

Qualification: The supervisor should have good secondary or university level education with 5 years experience as a line manager in a manufacturing company and preferably with ceramics experience gained at Makerere University.

d) <u>Laboratory supervisor</u>

The laboratory supervisor is directly responsible to the General Manager for all raw material and product quality control aspects of the production of tiles and sanitaryware. This involves the testing of the raw materials from the raw material deposits and supervision of the mining from these deposits to ensure that the correct materials are extracted in an efficient manner to avoid waste. Routine quality control of all aspects of production are his responsibility, including the grinding of the materials, casting slip production and tile "dust" production, pressing, casting, glazing, drying and firing processes.

Qualification: The supervisor should have good secondary or university level education in a technical subject with 5 years experience as a line manager in a manufacturing company and preferably with ceramics experience gained at Makerere University.

e) <u>Sales Manager</u>

The Sales Manager is directly responsible to the General Manager for all aspects of sales, marketing and distribution of the tile and sanitaryware products of the factory. The Sales Manager is responsible for all sales personnel at the factory site, Kampala sales office and Nairobi sales office. Other responsibilities include maintaining and expanding the customer base in both Uganda and Kenya in particular by personal visits and, if necessary, advertising. Visits will be made to other neighbouring countries also. It will be the responsibility of the Sales Manager to market all of the products of the factory to achieve sufficient market penetration, so that the factory can operate at its normal feasible output by production Year 3. It is the responsibility of the Sales Manager to provide all necessary market information on developing trends, so that the factory can introduce new products to meet the changing market requirements.

Qualifications: The Sales Manager should have degree-level education with 5 years experience at a senior level in the sales of manufactured products, preferably within the building industry.

f) <u>Accountant/Office Manager</u>

The accountant is directly responsible to the General Manager for all aspects of accounting, including the provision of cost figures for each section, calculation of working capital requirements, preparation of profit and loss accounts and balance sheets. As this is a small factory the accountant will also take responsibility for the typist and security staff.

Qualifications: The accountant must have appropriate formal accountancy qualifications, be familiar with a standard pc computer for cost accounting, payroll control, control of debtors and creditors.

g) <u>Sliphouse operator</u>

The sliphouse operator is directly responsible to the sanitaryware section production supervisor. He is responsible for grinding all of the individual raw materials in ball mills or blungers. He is responsible for mixing the ground materials and additive chemicals into the correct body formulations for wall tile floor tile and sanitaryware to meet the requirements of the production programme given by the supervisor. He will also be required to assist in the maintenance of the machinery in the sliphouse.

Qualification: Good secondary education of a technical nature with a mechanical aptitude. Ceramics course from Makerere University would be advantageous.

h) <u>Casting operator</u>

The casting operator is directly responsible to the sanitaryware section production supervisor. He is responsible for casting the required number of sanitaryware article per day, according to the production programme given to him by the supervisor. The duties involve casting, demoulding, mould cleaning, wet fettling of product and keeping records of each mould use, to enable them to be changed according to the correct cycle of use to maintain quality standards.

Qualifications: Good secondary education with a practical manner. Good physical fitness is required.

i) Finishing operator

The finishing operator is directly responsible to the sanitaryware section production supervisor for the inspection, fettling and cleaning (under dust extraction) of sanitaryware pieces prior to glazing. Any minor imperfections are removed with a sponge and clean water. Pieces are checked for drying cracks with kerosene. A compressed air blow gun is used to remove dust from the article. The finishing operator is responsible for reporting recurring faults from any particular caster, so that corrective action can be taken. He is responsible for returning rejected ware to the casting department for refinishing or to the slip preparation area for scrap processing. A daily record is kept of all ware inspected.

Qualifications: Good secondary education with a practical manner. Good physical fitness is required.

j) Glazing operator

The glazing operator is directly responsible to the sanitaryware section production supervisor for the glazing of all sanitaryware articles, according to the production programme requirements.
Dried pieces of sanitaryware are glazed on a turntable in a glaze booth using a manually operated spray gun.

Qualifications: Good secondary education with a practical manner. Good physical fitness is required.

k) Kiln car loader and unloader

The kiln car loader and unloader are directly responsible to the sanitaryware section production supervisor for the loading of kiln cars with the glazed sanitaryware pieces required by the production programme. After firing is completed the cars are unloaded and the pieces taken to the fired selection and packaging section. Records of all items with notes of any damage are reported daily for each kiln car.

Qualifications: Good secondary education with a practical manner. Good physical fitness is required.

l) Fired selection and packaging

The operator is responsible to the sanitaryware section production supervisor for the inspection of all fired articles and the packaging of good quality items for transport to the sales offices or direct to customers. He is responsible for returning pieces for repair and refire back to the glazing department. Daily records are kept of the quality standard of all products.

Qualification: Good secondary or university education with a practical manner. Good physical fitness is required.

m) <u>General labourer</u>

The general labourer is responsible to the sanitaryware section production supervisor to carry out miscellaneous duties in the production area, including cleaning of the factory and acting as a relief worker, as required.

Qualification: Good secondary education with a practical manner. Good physical fitness is required.

n) <u>Finished Goods Supervisor</u>

The finished goods supervisor is responsible to the sanitaryware section production supervisor for the storage of both the packaged sanitaryware and packaged tile. He is responsible for maintaining daily records of finished stock at the factory and for its transfer to the sales shop, as requested by the sales department.

Qualification: University education with some years experience in controlling stocks and/or sales in the building materials industry.

o) <u>Mouldmaker</u>

The mouldmaker is responsible to the sanitaryware section production supervisor for the production of sanitaryware working moulds made out of Plaster-of-Paris. At less frequent intervals additional case moulds will have to be made. The mouldmaker is responsible for maintaining the master moulds and case moulds in good condition by ensuring that they are always properly stored after use. The mouldmaker must maintain records of the life of all moulds from the information supplied by the casting department and adjust his working technique, if the life reduces.

Qualification: Good secondary education with a practical manner. Good physical fitness is required.

p) <u>Tile press operator</u>

The press operator is responsible to the tile section production supervisor for the efficient operation of the tile press. He is responsible for producing wall tile and floor tile according to the requirements of the production programme. He is expected to assist the mechanic, whenever the press has to be changed from wall tile to floor tile production.

Qualification: Good secondary education with some experience of working as a machine operator in manufacturing industry.

q) Tile kiln car loader and unloader

The operator is responsible to the tile section production supervisor for the loading of pressed tile onto kiln cars, unloading biscuit tile after the biscuit fire, loading the glazed tile after spraying and unloading the glazed tile after the glost fire.

Qualifications: Good secondary education with good physical fitness.

r) Tile glazing operator

The glazing operator is responsible to the tile section production supervisor for the operation of the tile glaze line. Responsibilities include feeding tile on to the feed conveyor, ensuring that the glaze mixing tanks are filled regularly by the laboratory personnel and that the glaze waterfall and glaze disc spray are operating correctly.

Qualifications: Good secondary education, preferably with a course in ceramics from Makerere University.

s) Mechanic

The mechanic is responsible to the tile section production supervisor for routine mechanical maintenance throughout the factory. He is responsible for preparing a detailed maintenance schedule for each machine or item of equipment in the factory. Records of all maintenance carried out will be kept on a daily basis.

Qualification: Good secondary education with formal qualification in engineering and 5 years experience in a mechanical engineering or maintenance environment.

t) Electrician

The electrician is responsible to the tile section production supervisor for routine electrical maintenance throughout the factory. He is responsible for preparing a detailed maintenance schedule for each machine or item of equipment in the factory. Records of all maintenance carried out will be kept on a daily basis.

Qualifications: Good secondary education with formal qualification in electrical engineering. Knowledge of all electrical safety laws. 5 years experience as an electrician in an industrial environment.

u) Laboratory assistant

The assistant reports directly to the laboratory supervisor and carries out routine quality control tests on the raw materials and at each stage of the production process.

Qualification: Good secondary education, preferably with a ceramics course from Makerere University.

v) Sales clerk

The sales clerk reports to the Sales Manager in Kampala, or in the case of the Nairobi office, to the Salesman. The responsibility includes, contact with customers, taking of sales orders, issuing sales tickets and for cash customers, issuing receipts. Good liaison must be maintained between the drivers and the sales offices.

Qualification: Good secondary education with previous sales experience. Pleasant personality.

w) Salesman - Nairobi

The salesman is responsible to the Sales Manager for the sales operation in Nairobi. His responsibility is to market the tile and sanitaryware products to customers in the Nairobi area efficiently and to generate more sales in Kenya generally. He is responsible for the sales clerk and security personnel at the Nairobi shop.

Qualification: Good secondary or university education with previous sales experience in a position of some responsibility. Previous experience in the Kenyan or regional building materials industry would be advantageous.

x) Security

Security personnel at the factory are responsible to the Accountant/Office Manager, those at the Kampala sales office are responsible to the Sales Manager and those in Nairobi to the Salesman. The responsibility is for the security of the relevant premises on a 24 hour basis by working a 3-shift, or 2-shift system, as required.

Qualifications: Good secondary education, physically fit and honesty.

y) Typist

The typist reports to the Accountant/Office Manager and is responsible for receptionist duties and typing duties, as required by the office needs.

Qualifications: Good secondary education with a high standard of written and spoken english. A typing speed of 40 wpm is required. Knowledge of Pc computer operation would be an added advantage.

z) Foreign Technical Manager

The technical manager will report to the board of directors and will assist the General Manager in all his duties, including all technical aspects of the operation, training of personnel, installation of management information systems and cost controls. Assistance will also be given on marketing, if required. Achieving and maintaining the quality of the products to normal european standards, as quickly as possible will be a prime objective. Training of the local General Manager in all aspects of ceramic manufacture will be a prime objective, so that he is fully trained by the time the foreign technical manager leaves the country.

Qualifications: Degree in Ceramic Technology and at least 10 years experience in senior management of ceramics factories in developing countries.

8.6 Considerations of manpower for alternative Kampala site

There are considerable labour and staff cost savings to be made overall, if the proposed project is carried out at the African Ceramics Company Limited site near Kampala. By merging the existing operation with the new project, the advantages of true synergy is achieved, as the product lines are complementary and not competitive, although the production processes in many areas are very similar. Therefore, the personnel now involved in raw material preparation and processing for only one product; crockery, could also cope with the preparation of the raw materials for wall tile, floor tile and sanitaryware. No additional personnel would be involved, as the department appeared under-utilized and overmanned.

Similarly in the kiln loading and unloading section, the personnel are under-utilized and some of these personnel could be transferred to tile or sanitaryware loading and unloading. Fewer additional personnel will therefore be required for the additional product lines.

The service departments, such as the laboratory, maintenance department and mouldmaking would also service the additional product lines of tile and sanitaryware. Of these departments only the laboratory requires to be strengthened by the employment of a supervisor. As the existing mouldmaker is already experienced in the making of crockery moulds, the training of this man in the skills of sanitaryware mouldmaking would be more effective than training a man with no experience. Similarly the existing laboratory personnel would also be more effective after training in the quality control aspects of tile and sanitaryware, as they are already familiar with an industrial ceramics process.

In administration and sales there would be additional savings, as the office clerks and sales staff would be common for all product lines. A Sales Manager and Accountant would, however, be required, as African Ceramics Company Limited currently has no personnel for these positions, the General Manager carrying out these duties, as best as he is able.

In summary, we can state that there would be considerable unit cost labour savings, not only on the new project for tiles and sanitaryware but also on the existing crockery production operation, as many of the existing costs could be divided among all the different product lines, instead of having to be allocated to the single product of crockery. Overall profitability would therefore be improved.

In the event that the option of merging operations is not a practical proposition in the near future and that only a new factory could be considered, there would be no difference in manpower requirements or manpower costs between the alternatives of a new factory in Mbarara or a new factory in Kampala.

SECTION IX

IMPLEMENTATION SCHEDULING FOR THE ESTABLISHMENT OF A NEW PLANT

IX. IMPLEMENTATION SCHEDULING FOR THE ESTABLISHMENT OF A NEW PLANT

9.1 Introduction

Following this pre-feasibility study, it is recommended that the local promoters investigate in depth the possibilities of reducing the capital investment costs of the project, particularly in regard to the local building costs. Reducing these costs below the current normal accepted price levels, by perhaps using small local builders with whom the promoters can agree lower rates, would increase the attractiveness of the project.

This implementation period therefore commences after the decision is made by the promoters to proceed and also after a basic financing package has been agreed and the foreign Consultant has been contracted.

9.2 Data and activities

9.2.1 Project implementation management & detailed planning

As the local sponsoring company has no director, who is experienced in the project management or planning of a new industrial enterprise, it is therefore essential that the necessary expertise in these important areas is provided by a foreign consultancy for this six-month period, which commences immediately the decision to proceed is made by the promoters and the Consultants are mobilized.

However, as directors of the sponsoring company would be available for part of the time of the implementation period to assist in the general supervision and local arrangements, this will reduce the time spent on-site in Uganda by the foreign consultants. Continuous contact would be maintained between the consultants and the directors of the company.

During this first six-month period the consultant project manager and engineer would visit Uganda for approximately one month to finalize all aspects of the project, including:

i) Site and building requirements, arrangement of tenders for civils and building work and also arrangements for power and water supplies, evaluation of bids with local sponsor, allowing the award of the contract to be given by the end of the field visit by the consultants.
ii) Arrangements of financing both the local inputs and the foreign inputs with the financing institutions.
iii) Arrangements for the technology supply, in respect to sanitaryware design and moulds will be decided with the promoters and initiated. The consultants would then follow up these arrangements throughout the six month planning period, on their return to Europe.
iv) Arrangements for the employment of labour and staff according to the requirements of the implementation

schedule.

v) Arrangements for the tendering of all necessary foreign equipment and supplies will be agreed with the local sponsor and will then be implemented by the consultants in Europe.

During the early part of the initial six month period the Consultants recommend that the promoters visit at least one small-scale tile and sanitaryware factory to become personally familiar with the entire production process and management requirements of such a factory. Suitable factories to visit would be the Zambia Ceramics Company in Zambia, the Lanka Ceramics Company in Sri Lanka, or Vernon Tutbury Bathrooms Limited, U.K. (see Appendix H for contact addresses).

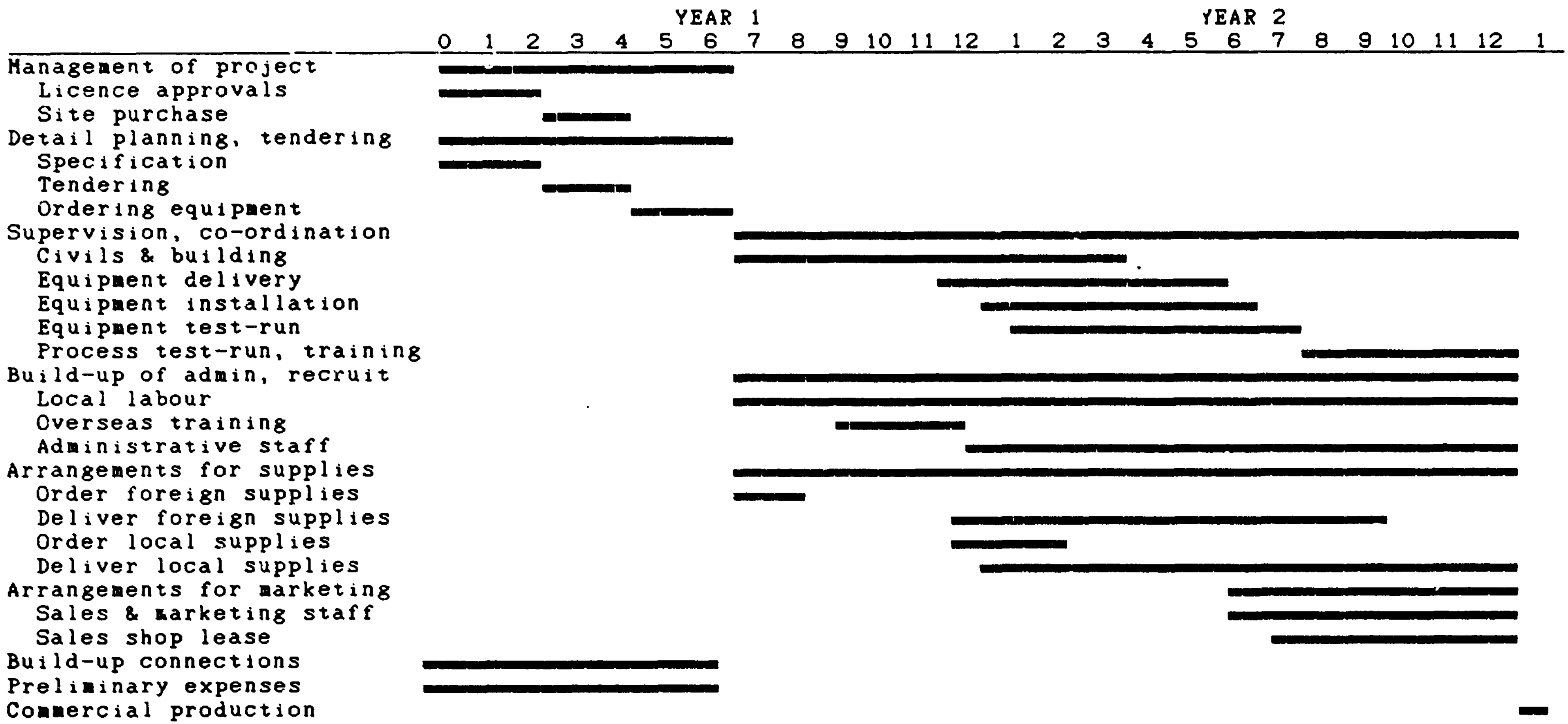
Costs of project implementation management

	USD
Foreign costs, including fees, travel & hotel	24,000
Local costs	4,000
Total costs	28,000

Costs of detailed engineering and planning

Foreign costs, including fees, travel & hotel	24,000
Local costs	nil
Total costs	24,000

Schedule 9.1 BAR CHART OF IMPLEMENTATION



9.2.2 Supervision and co-ordination

During the construction and start-up period, which will require a total period of 18 months, the foreign consultants will supervise and co-ordinate all aspects of the civil and building construction, machinery purchase, delivery, erection and commissioning on site. The directors of the local company would be responsible for the purchase of the lease on the chosen factory site. They would also assist in the day-to-day supervision of the building and machine erection work on site and would arrange the clearance of all imported items. Any necessary Government approvals, in respect to the project, would be arranged by the directors of the local sponsoring company, so that no delays occur to the implementation of the project.

The foreign consultants will be responsible for co-ordinating the supply of equipment to the site, according to the agreed implementation programme. Inspection of machinery and equipment will be undertaken by the consultants prior to shipment, where this is necessary and arrangements for its erection and commissioning by foreign engineers will be co-ordinated with the requirements on site. The consultants will provide an engineer to supervise the erection and commissioning of all of the machines by the individual suppliers' engineers, so that all inputs are co-ordinated properly. The local directors of the sponsoring company would be responsible for providing any local labour for this work at the correct time.

As each of the machines is delivered and erected they will be tested individually, to ensure that they are operationally serviceable. Once the entire equipment and machinery has been installed, the complete process will then be tested by carrying out a series of test runs. Any problems, which occur with any of the equipment or machines will be corrected before they are formally handed over to the company at the end of Year 2 for normal operations to commence.

The construction, erection and installation supervision will involve the inputs of a foreign kiln engineer for a period of one man-month and equipment installation engineers for a period of four man-months. Local supervision by the directors of the sponsor company will be continuous.

The supervision of the machinery and process commissioning period will require the services of a foreign project manager for a six-month period and the services of process engineers for a total of six man-months. Local supervision by the directors of the sponsor company will be continuous. It is anticipated that the foreign project manager would remain with the company after commissioning has been completed by the end of Year 2, to act as the foreign technical manager, who would assist the local General Manager in the operation of the company.

Costs of supervision, co-ordination, test run & take over

	USD
Foreign costs of construction, erection and installation supervision & liaison	94,000
Commissioning and supervision services	210,000
Total foreign costs	304,000
Local supervision costs	6,000
Total foreign & local costs	310,000

9.2.3 Build-up of administration and labour

Period 1 (1st six-months Year 1)

During this planning period, the directors of the local sponsor company will carry out all the necessary groundwork to prepare for the employment of local personnel from the start of construction in Period 2. Interviews will be held with suitable candidates and agreement made on the starting date of their employment, salaries and in-kind benefits.

Period 2 (2nd six-months Year 1)

As outlined in Section VIII, it is necessary for some key personnel to undergo overseas training for a period of three months and this must be carried out at an early stage of the project, so that the training programme can be continued on site, prior to the production start-up, under the supervision of the foreign engineers. In period 2 the four key personnel will be sent to Europe for training in their respective fields. These personnel will be the tile production supervisor, the sanitaryware supervisor, the mouldmaker and one sanitaryware caster.

As construction begins in this period, it is necessary to employ the 4 security personnel for the factory site, the 2 maintenance staff, 3 tile section personnel and 4 sanitaryware personnel, including a supervisor. These personnel would work directly under the foreign technical management team, to initially assist construction, as and where required.

Period 3 (1st six-months Year 2)

In this period the administration team of General Manager, Accountant and Typist would be employed and the production personnel would be strengthened by personnel returning from their overseas training to a total of 4 personnel in the tile section and six personnel in the sanitaryware section. Training of all of these personnel would be progressively be carried out, as more equipment was delivered to site.

Period 4 (2nd six months Year 2)

During this period of machinery testing and process commissioning the production labour will be increased to a total of 12 personnel, including supervisors and laboratory personnel. The tile section will be increased to 10 personnel, including the supervisor.

Costs of pre-production labour and staff

Period 2 costs

Foreign costs of training Ugandan personnel

	Cost (USD)
Tuition costs	64,000
Travel costs	8,000
Living costs	10,000
Total foreign costs Period 2	82,000

Local costs

	Cost (USD)
Salaries of Ugandan overseas trainees	
4 x USh 44,000/month x 3 months = USh 528,000	733
4 security + 2 maintenance	
(4 x USh 29,000/month) + (2 x 35,000) x 6 months	
= USh 1,116,000	1,550
Tiles section (3 x USh 29,000 x 6 month)	
= USh 522,000	725
Sanitaryware 1 x USh 44,000 x 6 month	
3 x USh 29,000 x 6 month	
= USh 786,000	1,092
Total local costs Period 2	2,700

Total foreign & local labour costs Period 2 USD 84,700

Period 3 costs

		Cost USh	Cost (USD)
Administration			
General Manager	USh 130,000 x 6 month	780,000	
Accountant	USh 64,000 x 6 month	384,000	
Typist	USh 29,000 x 6 month	174,000	
	Total	1,338,000	1,858
General			
4 Security & 2 maintenance		1,116,000	
Tiles			
1 x USh 44,000 x 6 month		264,000	
3 x USh 29,000 x 6 month		522,000	
Sanitaryware			
3 x USh 44,000 x 6 month		792,000	
3 x USh 29,000 x 6 month		522,000	
	Total	3,216,000	4,467
	Total local costs Period 3	4,554,000	6,325

Period 4 costs	Cost (USh)	Cost (USD)
Administration	1,338,000	
General	1,116,000	
Tiles		
1 x USh 44,000 x 6 month	264,000	
9 x USh 29,000 x 6 month	1,566,000	
Sanitaryware		
3 x USh 44,000 x 6 month	792,000	
1 x USh 25,000 x 6 month	150,000	
8 x USh 29,000 x 6 month	1,392,000	
Total local costs Period 4	6,618,000	9,191

9.2.4 Build-up of Supplies

Certain supplies for the factory must be imported and to ensure that they are on site well before the test running of the machines and process commissioning takes place, they must be imported at an early date, making allowance for any possible delays. Therefore imported ball clay, glazes, consumables will be ordered in Period 2 and imported Plaster-of-Paris, packaging materials and cistern fittings will be imported in Period 3. Local raw material supplies will be arranged in Period 3. Local supplies such as oils, grease and cleaning materials will be required on a continuous basis from Period 2. Imported materials will be arranged, so that three months stock will be provided for.

Schedule 9.2 Pre-production Supplies (USD)

	PERIOD 2			PERIOD 3			PERIOD 4			TOTAL COST		
Item	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
Sanitary -ware												
Clay	3,825	-	3,825	-	5,066	5,066	-	-	-	3,825	5,066	8,891
Plaster	-	-	-	1,035	-	1,035	-	52	52	1,035	52	1,087
Glaze	3,973	-	3,973	-	199	199	-	-	-	3,973	199	4,172
Consumable	1,000	-	1,000	-	50	50	-	-	-	1,000	50	1,050
Packaging	-	-	-	385	385	770	-	19	19	385	404	789
Cistern ftg	-	-	-	11,385	-	11,385	-	569	569	11,385	569	11,954
Totals	8,798	-	8,798	12,805	5,700	18,505	-	640	640	21,603	6,340	27,943
Total Sales Tax	-	-	-	-	1,494	1,494	-	1,404	1,404	-	2,898	2,898
Tiles												
Clay	-	-	-	-	18,055	18,055	-	-	-	-	18,055	18,055
Glaze	10,260	-	10,260	-	513	513	-	-	-	10,260	513	10,773
Consumable	-	-	-	-	500	500	-	-	-	-	500	500
Packaging	-	-	-	16,813	570	17,383	-	840	840	16,813	1,410	18,223
Totals	10,260	-	10,260	16,813	19,638	36,451	-	840	840	27,073	20,478	47,551
Total Sales Tax	-	-	-	-	3,040	3,040	-	1,849	1,849	-	4,889	4,889
Grand Total	19,058	-	19,058	29,618	25,338	54,956	-	1,480	1,480	48,676	26,818	75,494
Grand Total Sales Tax	-	-	-	-	4,534	4,534	-	3,253	3,253	-	7.787	7,787

The above schedule assumes that the local costs of imported items, ie: import duty and sales tax are paid on delivery, which will be in the period following the order and payment by Letter of Credit on shipment. These local costs are based on the assumption that under the new investment code of November 1990, import duties for the inputs of exported items are reclaimed. As approximately 50 per cent of the production is to be exported, only 50 per cent of the import duties have been put in the above schedule.

9.2.5 Pre-production marketing

During Period 4 the Kampala sales personnel will be recruited, including Sales Manager, sales clerk, forklift driver and truck driver. This will enable the shop lease to be arranged and the initial sales and marketing tasks to be arranged, prior to commercial production commencing.

Costs of pre-production marketing

		USh	USD
Labour costs	1 x USh 80,000 x 6 month	480,000	
	4 x USh 29,000 x 6 month	696,000	
	Total	1,176,000	1,633
Shop lease			2,000
Office equipment			8,000
	Total sales pre-production costs		11,633

9.2.6 Arrangements for connections with local authorities

The local directors of the sponsor company will arrange for all Government approvals and payment of the necessary fees during Period 1 of the project.

Cost USD 2,000

9.2.7 Preliminary and capital-issue expenses

The legal fees for incorporation, initial printing and advertisement requirements and incidental start-up expenses during Period 1 are estimated to cost:

USD 6,000

Schedule 9.3 Pre-production Capital Expenditure by Period and Year (USD)

	YEAR 1						YEAR 2					
	PERIOD 1			PERIOD 2			PERIOD 3			PERIOD 4		
Item	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
1. Management project	24,000	1,000	25,000	-	1,000	1,000	-	1,000	1,000	-	1,000	1,000
2. Detail Engineering	24,000	-	24,000	-	-	-	-	-	-	-	-	-
3. Supervision co-ordination	-	-	-	50,000	2,000	52,000	50,000	2,000	52,000	204,000	2,000	206,000
4. Build-up admin & staff	-	-	-	82,000	2,700	84,700	-	6,325	6,325	-	9,191	9,191
5. Arrangement of supplies	-	-	-	19,058	-	19,058	29,618	25,338	54,956	-	1,480	1,480
6 Arrangement of marketing	-	-	-	-	-	-	-	-	-	-	11,633	11,633
7. Build-up connections	-	2,000	2,000	-	-	-	-	-	-	-	-	-
8. Prelim. & capital issue	-	6,000	6,000	10,000	55,000	65,000	-	-	-	-	-	-
Totals	48,000	9,000	57,000	161,058	60,700	221,758	79,618	34,663	114,281	204,000	25,304	229,304
Sales Tax Total	-	-	-	-	-	-	-	4,543	4,543	-	3,253	3,253

Note: Local costs include import tax of imported items less 50 per cent drawback for 50 per cent exports.

Schedule 9.4 Summary of Pre-production capital expenses (USD)

		Foreign	Local	Total
1.	Management of project implementation	24,000	4,000	28,000
2.	Detail planing & tendering	24,000	-	24,000
3.	Supervision, co-ordination, test run, take-over of civil works & equipment	304,000	6,000	310,000
4.	Build-up of administration, recruitment & training of staff & labour	82,000	18,216	100,216
5.	Arrangements for supplies	48,676	26,818	75,494
6.	Arrangements for marketing	-	11,633	11,633
7.	Build-up of connections	-	2,000	2,000
8.	Preliminary & capital issue expenses	10,000	61,000	71,000
	Totals	492,676	129,667	622,343
	Sales Tax	-	7,796	7,796

SECTION X

FINANCIAL AND ECONOMIC EVALUATION

X. FINANCIAL AND ECONOMIC EVALUATION

The results of the financial analysis are shown in the accompanying tables created by the COMFAR model. In all cases, due to the uncertainty of trying to estimate inflation over such a long period and the potentially misleading results this could produce, constant prices have been used. These are shown in US Dollars. As all builders and retailers are operating their businesses based on the bureau rate of exchange, ie: the free market exchange rate and not the bank rate of exchange, which is currently (February 1991) USh 614 per USD, we have used the bureau rate in all conversions from the local currency, in order to be totally realistic. The bureau rate of exchange used in this financial analysis is that, which was current during the period October 1990 to January 1991, ie: USh 720 per US Dollar and this is the effective and accepted Shadow Price for this pre-feasibility study.

We are made to understand that the policy aim of the Government is to move the exchange rates much closer to each other and eventually hope to equalize them. On this basis the exchange rate of USh 720 per USD, which the Consultants have used for this pre-feasibility, was deemed to be an acceptable and realistic rate over the next few months.

10.1 Financial assessment of investment and production cost of a new plant

10.1.1 Total initial investment costs

From the previous sections the summary of total investment costs is:

	USD
Land and site preparation	9,000
Civil and engineering works	1,455,000
Technology and equipment	2,773,000
Pre-production capital costs	622,343
Total investment costs	4,859,343

10.1.2 Inventories and Net Working Capital requirements

a) Inventories

It is necessary to hold three months supply of both imported raw materials and local raw materials at the factory, to ensure that, in the event of transportation delays of the imported materials, the factory has sufficient reserve to maintain production. In the case of the local raw materials, where advance testing will be necessary prior to use, sufficient stock is required, so that only pre-tested material is used for production.

As most spare parts are imported, a three month supply of normal spares must be kept on stock to avoid a situation, where the production is halted for a considerable period due to the lack of a relatively small spare part.

As this is a small factory, it is realistic to work with a finished inventory of 7 days with good organization of the production schedule, so that it accurately meets the requirements of the sales department. The finished stock has been costed at the factory cost plus administrative overhead cost, divided by the coefficient of turnover.

In addition to the finished products, held at the factory and the sales shops in Kampala and Nairobi, the factory will always have approximately 7 days production in various stages of the production process, due to the type of technology used. This work-in-progress is costed at 60 per cent of the finished goods cost, divided by the coefficient of turnover.

b) Net working capital requirements

The working capital requirements have been based on the above inventory requirements and an average 30 days accounts receivable and 30 days payable. This takes into consideration that a proportion of the sales and purchases will be in cash.

Cash-in-hand requirements has been estimated at approximately 2.6 per cent of net working capital in Production Year 3 (100 per cent normal feasible production).

10.1.3 Annual production costs at 100% of feasible plant capacity

Summary of raw material and input costs by product

a) Tile raw material and input costs (USD)

Item	Foreign Cost	%	Local Cost	%	Sales Tax	Total Cost
Ceramic raw Material	-		72,220	54.9	7,220	79,442
Tile glaze	41,041	35.9	2,052	1.6	4,514	47,607
Consumables	-		2,000	1.5	200	2,200
Packaging						
- pallets	-		2,280	1.7	228	2,508
- boxes	66,000	57.7	3,300	2.5	7,260	76,560
-polythene	1,254	1.1	63	0.1	137	1,454
Imp. spares	6,000	5.3	300	0.2	660	6,960
Local spares	-		3,000	2.3	300	3,300
Build. Repair	-		1,500	1.1	150	1,650
Water	-		2,000	1.5	-	2,000
Electricity	-		32,961	25.0		32,961
Fuel Oil	-		10,000	7.6	-	10,000
Total	114,295	100.0	131,676	100.0	20,671	266,642

The foreign costs of the raw materials and inputs amount to 42.9 per cent (incl. Sales Tax).

b) Sanitaryware raw material and input costs (USD)

Item	Foreign Cost	%	Local Cost	%	Sales Tax	Total Cost
Ceramic raw Material	-		19,499	35.4	1,950	21,449
Imported clay	15,300	16.5	765	1.4	1,683	17,748
Glaze	15,893	17.9m	795	1.4	1,748	18,436
Plaster	4,140	4.5	207	0.4	455	4,802
Consumables	4,000	4.3	200	0.4	440	4,640
Packaging						
- pallets	-		1,540	2.8	154	1,694
- polythene	1,540	1.7	77	0.2	169	1,786
Cist. fitting	45,540	49.3	2,277	4.1	4,994	52,811
Imp. spares	6,000	6.5	300	0.5	660	6,960
Local spares	-		3,000	5.4	300	3,300
Build. repair	-		1,500	2.7	150	1,650
Water	-		2,000	3.6	-	2,000
Electricity	-		13,024	23.6	-	13,024
Fuel Oil	-		10,000	18.1	-	10,000
Total	92,413	100.0	55,184	100.0	12,703	160,300

The total foreign costs of the raw materials and inputs amount to 57.7 per cent (including Sales Tax).

Summary of annual costs of labour and administration by product

a) Tiles

	Cost US Dollars Foreign	Local	Total
Direct costs	-	11,850	11,850
50% of Indirect costs	-	1,550	1,550
50% of Administration	43,000	1,858	44,858
Total	43,000	15,258	58,258

b) Sanitaryware

	Foreign	Local	Total
Direct costs	-	11,383	11,383
50% of Indirect costs	-	1,550	1,550
50% of Administration	43,000	1,859	44,859
Total	43,000	14,792	57,792

Summary of miscellaneous factory overheads

	Cost (USD)
Leasing costs of Mbarara site	400
Safety items	2,000
Cleaning materials	2,000
Laboratory materials	2,600
Mobile plant running costs	18,400
Maintenance and labour costs (see VIII)	3,100
Total miscellaneous factory overheads	28,500

10.1.4 Project financing and available financial sources

A. Investment environment

a) New Investment Code, November 1990

The parts of the new investment code, which are important to the proposed tile and sanitaryware project are:

i) Exemption from import duties and sales tax on imported plant and machinery.
ii) If the investment is carried out in phases, all phases apply for the exemption.
iii) A Ugandan investor must import machinery valued at least USD 200,000 to be eligible for the incentives, or
iv) The project must earn at least 25 per cent of total earnings in foreign exchange from exports.
v) An eligible project, for a period of five years from the commencement of operations, will be entitled to exemption from corporation tax, withholding tax and tax on dividends.
vi) A foreign investor and his expatriate staff are exempt from payment of import duty and sales tax on one motor car for personal use and personnel and household effects within 12 months of arrival.
vii) A drawback of duties and sales tax payable on imported inputs used in producing goods for export.

b) Existing taxation system affecting investments in Uganda

i) Sales Tax and Customs Duties

The operation of sales tax is to be altered for the 1991 tax year, so that it operates on the lines of a Value Added Tax (Source: Uganda Manufacturers' Association "The Manufacturer", December 1990). A tax credit equivalent to the amount of sales tax paid on the raw materials in any tax period will be allowed to the tax payer against the sales tax liability on the finished goods he sells in any period. For tile and sanitaryware production the sales tax charged on inputs is currently 10 per cent. The sales tax on finished goods, such as tiles and sanitaryware is currently 30 per cent.

The tax credit includes the sales tax paid on raw materials used in the manufacture of goods, which are exported.

In making the sales tax return for any period a tax payer will show the tax paid on his purchase of raw materials in that period and subtract that amount from the gross sales tax due on his sales in the period.

Under the existing tax legislation exports are exempted in any case from sales tax. Under the new investment code exporters can claim a draw-back of customs duties and sales tax for all raw material inputs for the exported products. As all sales tax paid on raw materials, whether for local sale or for export can now be credited against the sales tax due on goods sold locally, the main effect of the new investment code is on the additional draw-back of the customs duties. The draw-back should be deducted from the ex-factory price in determining the export price.

Since approximately 50 per cent of production is for the export market, only half of the customs import duties actually paid in a year are shown in the COMFAR analysis, as a local expense for the factory, the remaining 50 per cent will be reclaimed by the company.

Under the new Investment Code, no import duties or sales tax are payable on imported machinery and equipment for a new factory.

ii) Corporation Tax

Corporation Tax is charged at 40 per cent of the taxable profit. However certain investment allowances can be set against tax. These include a one-time allowance of 20 per cent of machinery costs in the first year of production, an Industrial Building Allowance of 4 per cent of the cost of buildings and machinery in the first year and 4 per cent on the residual in each succeeding year. Under the new Investment Code there is also a five-year tax holiday.

iii) Depreciation

The current allowable depreciation rates for taxation purposes are:

	%
Vehicles	25
Machinery and Furniture	12.5
Buildings	2.5 - 4.0
Pre-production Expenditure	10

B. Sources of finance

a) East African Development Bank, Kampala

This bank has a policy of lending in foreign currencies for the plant and equipment of a project.

Their current interest rate is 14 per cent for loans of over 5 - 10 year term. There is a maximum three year grace period and then repayments are semi-annually. The client takes the exchange rate risk on all loans. Normal security is required for the loan in the form of land and buildings.

The minimum size of a loan is SDR 100,000 (exchange rate SDR 1.4/USD) and the maximum is SDR 2.5 million (USD 1.78 million).

Due to the shortage of foreign exchange in East Africa generally and also due to the large exchange rate movements, the bank is now very hesitant to lend to projects, which are:

a) dependent on imported raw materials and
b) do not export

This is based on the fact that the Ugandan Shilling had an exchange rate of USh 60/USD in 1987 and had fallen to USh 480 at the official rate in December 1990. In the opinion of the EADB, local prices would be difficult to raise by the same factor and companies could not then service their foreign currency debts.

b) Uganda Commercial Bank, Kampala

In partnership with The World Bank, under its small-scale industry terms, the bank is prepared to loan up to USD 300,000 in local currency for a five year period with a one year moratorium on repayments. The current interest rate is 36 per cent per year, except for coffee rehabilitation related projects, which have an interest rate of 25 per cent. Interest is payable quarterly or monthly.

As security the bank normally takes debentures with a mortgage on the land, buildings and machinery. The bank does not normally like dividing loans among different banks, due to the problems of maintaining sufficient security and splitting of mortgages.

c) Uganda Development Bank, Kampala

The bank has two sections, one lending to small enterprises with requirements up to a maximum of USD 300,000 and an industrial section, which can lend amounts from USD 300,000 to over USD 3.0 million.

The bank finances the foreign cost of a project, including machinery, equipment, vehicles, technical assistance, technical management and up to six months supply of imported raw materials. The bank can only finance the cost of buildings, if these are special structures with a high import content.

The normal loan is arranged over a five year term with a one year or two year grace period, with quarterly repayments thereafter. The maximum loan period, which can be negotiated is ten years. The loan is fixed in terms of Uganda Shillings at the date of disbursement at the bank rate and the company repays the bank in Shillings. From 1991 the bank is to change to the bureau rate. The current interest rate is 35 per cent.

Security is required for any loan and this would normally be the land and buildings. To give the bank more confidence in a project, it normally requires the sponsors to have an equity participation of up to 40 per cent of the total project cost and to have the building erected prior to giving a loan.

Foreign currency loans are theoretically available at a rate of 14 per cent but these are only for companies, which export. Companies repay these loans in foreign exchange. In practice these loans are normally reserved for "proven exporters", such as coffee projects, which already have a proven record of exports. A new company for tiles and sanitaryware would have no such record, therefore would be unlikely to qualify for such a loan.

Certain expenses related to loans must be noted, as they involve substantial costs. These are:

a) 1 per cent commission on the total loan for the appraisal
b) 1 per cent commitment fee for a line of credit
c) USD 5,000 (max) for opening Letters of Credit, amending Letters of Credit in the event of suspension of lines of credit (quite common).
d) 6 per cent, payable in Shillings, for an independent valuation report for the buildings. A valuer from the bank's approved short-list must be used for the valuation.

Legal fees, which are involved in such loans, are very low.

It was noted by the bank that delays in obtaining loans are quite normal.

d) Development Finance Company of Uganda, Kampala

The DFCU is actively seeking viable investment projects in Uganda, in which it can both invest equity and give loans. Equity is given in local currency, whereas any loan would be for all or part of the foreign exchange requirements, dependent on the project meeting its criteria.

DFCU require that the sponsors include a cash equity input, in addition to land and buildings, of approximately 15 per cent of the total cost of the project.

The decision of whether to take an equity participation depends on when dividends occur and the equity stake must be disposable on a buy-back agreement, or an agreement to sell to third-parties. They normally expect to keep their equity stake for 10 dividend years, which normally means up to a 15 year period before they expect to have the buy-back effected.

Foreign exchange loans are for periods up to 10 years, with a moratorium of up to 3 years and repayments bi-annually thereafter. The interest rates are currently 15 per cent per year, the interest being billed half-yearly. Interest is payable on all arrears.

Expenses associated with the loans are:

a) 2 per cent commitment fee on the full loan, payable in foreign exchange.
b) 3 per cent negotiation fee & commission, payable in Shillings.

For security DFCU would take the mortgage title on land and buildings and would require personal guarantees or housing plots, if the security of the buildings was not sufficient for the total loan. The loan can be converted to equity but never to an extent that amounts to majority control of the company.

If the company wishes to accelerate payment of the loan, there would be a 25 per cent premium on the interest saved, calculated from the last payment back to the first. The premium would be payable in advance.

Loans would normally be in the range USD 500,000 to 700,000, USD 700,000 being a maximum.

In the case of equity investment, DFCU would appoint a director to the board and any marketing or management agreements lasting longer than three months must be approved by them. Subsequent borrowing conditions are restricted and all capital expenditure must be approved by the DFCU board member. The normal equity stake in a company would be 10 - 20 per cent. With an equity stake, the dividend policy must be that 50 per cent of net profit after tax is distributed, once all loans have been repaid.

One very important condition was that DFCU would not give equity or loans to a company, which did not export at least a proportion of its products. Because of this condition, which was identical to that of the East African Development Bank, the regional market, especially the important Kenyan market becomes crucial to the success of the project. Without a regional market, the project would be unable to attract financing in Uganda.

In the case of a foreign management team, DFCU would prefer that the team was closely involved in the company by an initial equity investment, or alternatively by charging basic fees at cost with a performance related scale.

e) European Commission Micro-projects Unit, Kampala

As already outlined earlier, the micro-project unit is already involved in the ceramics industry and has set up two small units with European Development Fund finance to manufacture crockery and gift items. Approximately USD 18,000 in the form of equipment, was given to each of the units as a grant.

Under Lome IV, the micro-projects policy will be to fund up to 75 per cent of a project, up to a maximum of ECU 250,000. While this is normally for very small units, some funds could be utilized for larger units, such as the proposed tile and sanitaryware unit, providing that the project had a development impact. The project should have an impact on income generation, training and the local community. As the proposed project would meet all of these aims, there is a possibility of obtaining some assistance from this unit. However, this would not be on a grant basis but would be on an interest free loan basis, so that the funds could eventually return to a revolving fund and be re-used on other projects.

f) The Africa Project Development Facility, Nairobi

This organization does not provide actual financing for projects but does offer consultancy services to assist companies in the arrangement of finance. The Nairobi office of APDF, which was visited by the team, is familiar with all of the financing institutions in Uganda and would be prepared to assist the local sponsor company in the arrangement of suitable financing.

The APDF work on a cost-sharing basis and a guide of costs would be:

i) A front-end payment of 0.5 per cent of the estimated capital cost, or USD 3,000, whichever is higher, payable upon signing of the Letter of Understanding.
ii) A project report payment, being the difference between 1.0 per cent of the estimated total project cost and the amount paid as the front-end payment, payable upon approval by the sponsor of the draft project report.
iii) Final payment of 1.0 per cent of the total estimated project costs, payable on completion of the project financial plan, ie: all funds required from non-sponsor investors and from lenders have been committed.

Where a substantial amount of the work outlined above has been completed, as in the case of this proposed project, the above percentages would be reduced.

g) The Africa Enterprise Fund, Nairobi

For viable projects the AEF can provide up to 40 per cent of project financing, mainly in the form of foreign exchange loans and equity capital. Its investments are made on commercial terms. Equity investments seldom exceed 30 per cent of share capital but AEF is never the largest shareholder in a project.

AEF normally invests between USD 100,000 - 750,000 but projects requiring larger investments can be referred to IFC.

AEF's funds may be used for most types of project-related expenditures, including fixed assets, working capital and pre-production costs.

C. Project financing

a) Equity and loans

The following applies to a new factory, whether this is in Mbarara or Kampala.

	USD
Equity from promoters - foreign & local	3,259,676
Equity from DFCU - local	299,667
Total Equity	3,559,343
Loan from DFCU - foreign	500,000
Loan from EADB - foreign	800,000
Total Loans	1,300,000
Total financing	4,859,343

It should be noted that the DFCU equity is so low because it has to be in local currency under their normal terms of equity participation.

b) Overdraft financing

We have not included an overdraft facility from a commercial bank for the initial financing, as this would be almost impossible to arrange for a new company. Once the factory is in operation, a small overdraft facility could probably be arranged, if required for short-term needs. Overdrafts in Uganda are however, very expensive, being 10 - 15 per cent above the normal lending rate of 34 - 35 per cent, ie: the current (January 1991) overdraft interest rate is 44 - 50 per cent.

If the project is properly funded from the outset with sufficient equity and long-term loans, then an overdraft facility should not be required.

c) Effect of potential African Enterprise Fund financing

If the AEF is prepared to place their maximum allocation of USD 750,000 in equity into the project, then the promoters' share of the equity would fall to USD 2,509,676 (71.5 per cent).

d) Financing possibilities by overseas forfaiting arrangements

The team investigated the possibility of forfaiting being used by the supplier companies of tile and sanitaryware equipment, so that credit terms could be used in the purchase of the foreign machinery and equipment for the project. Unfortunately it was found that it was extremely unlikely that exports to Uganda would be eligible at the present time. The Hungarian International Bank Limited (U.K. office) and the National Westminster Bank Plc, U.K., were contacted. Their forfaiting country lists, which are shown in Appendix E of this Report do not include Uganda, showing that it is considered relatively high risk. In comparison, exports to Kenya can obtain a 3 year credit period from both banks.

10.2 Financial analysis for the establishment of a new factory

The detailed results of the COMFAR analysis for a new factory, sited in either Mbarara or Kampala, can be found in Appendix B but the main results are outlined in this section. COMFAR allowed the following input tables to be produced:

- Total initial investment
- Total investment during production
- Total production costs
- Working capital requirements
- Source of finance

Sub-division of the input costings into foreign and local costs could be made. From the input tables arranged in the COMFAR format, the programme generates the following output tables:

- Cashflow tables
- Net income statement
- Projected balance sheets

Total initial investment

The total initial investment is USD 4,859,343, of which just over USD 3.5 million has to be provided in equity, due to the lending limits and conditions of the DFCU and EADB. USD 3,259,676 has to be provided by the promoters themselves, of which USD 1,234,000 can be provided in local currency for the land and buildings but USD 2,025,676 must be provided in foreign currency. The DFCU equity of USD 299,667 can only be in local currency.

Production costs and revenue

The chart of the production costs structure (Appendix C, page 390) shows that depreciation, at 37.49 per cent, is the major cost, followed by overheads and raw materials. Depreciation is determined by the level of initial investment. It follows that, if the level of initial investment can be reduced by lower building costs for the extension to the factory, or lower machinery costs due to competitive tendering, then the depreciation charge would be reduced. Raw material costs could only be reduced by trying to find local or regional suppliers for some of the imported materials. In regard to overheads, these have already been minimized in the project design of the factory.

From the graph of Total Sales and Production costs, it can be seen that sales rise from USD 1.0 million to USD 1.5 million per year and that from production year 3, production costs start to fall slowly until year 6 and then continue to fall more rapidly, even though sales are maintained at USD 1.5 million, indicating that profitability is improving as the loans are repaid.

10.2.1 Net Working Capital Requirements

The initial Net Working Capital requirement in the first production year is USD 105,509, which rises to a maximum of USD 149,292 by the 3rd production year before falling to a stable level of USD 140,453 from the 5th production year for the remaining years of the project's life.

The level of working capital is affected by the simple but flexible design of the factory, which allows changes in the market requirements to be implemented quickly. This means that the work-in-hand and the finished stocks can be minimized, thereby reducing the working capital requirements.

The inventory and raw material stock proportion of the working capital is a significant item, being 37.5 per cent of Total Current Assets in the 1st production year and 42.8 per cent from the 8th production year onwards. However, in the Consultant's opinion, these stock levels of raw materials are absolutely essential to both the efficient operational purposes of the factory and are also essential to maintain a high quality of production. It must always be remembered that all incoming raw materials must always be tested prior to use.

The other major item of working capital is the level of accounts receivable, which amounts to 45.0 per cent of the Total Current Assets in the 1st production year and 41.9 per cent from the 8th production year onwards. The level of accounts receivable is however based on tight management control of the customer accounts and with the knowledge that many customers will be paying in cash for their purchases.

10.2.2 Cashflow analysis

The COMFAR analysis shows that from the first production year the cashflow, including investment inflows, is positive and remains positive throughout the life of the project (see COMFAR graph in Appendix C, page 369). From the graphs it can be seen that the accumulated cashflow from operations becomes positive in production year 5 for local funds and in production year 7 for foreign funds.

The preferred dividend payment procedure of the DFCU with companies that this institution finances is that the company should only pay out dividends once all the loans have been fully repaid. At this stage 50 per cent of the net profits should be distributed. On this basis therefore, the dividend payments to equity shareholders will be paid from production year 13 onwards in this analysis.

Foreign investors would probably not find this procedure attractive and may insist that dividend payments, albeit at a much lower level, should commence much earlier in the project. With the positive cash flow of the project, the loans could be repaid earlier, or the initial loan term could be reduced from 10 years to say, 8 years.

Internal Rate of Return on investment

It should be noted that we have used the same discount rate of 12 per cent, as that used by the Ministry of Planning and Economic Development in this analysis.

At this discount rate of 12 per cent the Internal Rate of Return on total investment is 12.75 per cent, the Return on Equity is 4.49 per cent and the Rate of Return on Equity plus Reserves is 12.72 per cent. The Discounted Cashflow, Investment graph in Appendix C, page 375 shows that the new project has positive values with discounting rates of less than 12.72 per cent.

At these Rates of Return, the project would possibly not be very attractive to a foreign investor, who may wish to join the company. At the time of the field work in October 1990 to January 1991 US Dollar term deposit accounts were earning 7 - 8 per cent, which is risk free and the project did not match this return. Currently (May 1991) the US dollar deposit rates have fallen to a range of 4.875 per cent (1 month) to 6.125 per cent (6 months), which does make the project a little more attractive. The Discounted Cashflow, Investment graph (Appendix C, page 376) shows that if the initial investment costs could be reduced by 20 per cent the IRR on investment would increase to approximately 17 per cent. A 20 per cent over-run on the capital expenditure requirements would reduce the IRR on investment to 10 per cent.

It must be remembered, however, that the above value of Internal Rate of Return on investment has been obtained using provisional costings for the capital investment costs, production costs and sales prices.

If the promoters could find a local company to build the factory at a price lower than the current recogni rate by using their local connections, then the capital cost of the project would be reduced and the Internal Rate of Return on investment would consequently then improve.

In respect to the machinery supplies, it is the intention to have an international tender, so that for all major items of equipment, at least three competitive quotations are received. This will ensure that the promoters achieve the lowest price for comparable equipment machinery. All the prices in this pre-feasibility study have been based on current western European prices. In the event that equipment could be purchased from a low-cost area such as eastern Europe or Asia, then again the capital cost would be lower and the Internal Rate of Return on investment would improve.

Variation of the sales price of the products (see Appendix C, page 375), which is dependent on the quality of the product, is shown to be critical to the project, being the most sensitive variable. If the sales price falls by 10 per cent, the IRR on investment falls to 10 per cent and the if the sales price falls by 20 per cent the IRR on investment then falls to only 6 per cent. This critical fact means that maintaining good quality standards is therefore absolutely essential to the success of the project. The management must avoid producing second-quality items, which can only be sold at much lower prices than the first quality products.

Variations in operating costs is less significant, the IRR on investment falling to 11 per cent with a 20 per cent increase in operating costs (Appendix C, page 377).

The Discounted Return on Net Worth (App ndix C, page 378) again shows the sensitivity to sales prices, falling to a Rate of Return of 4 per cent with a reduction of 20 per cent in sales price but increasing to a more reasonable 21 per cent with a sales price increase of 20 per cent.

Debt Service Ratio

The graphs show that the Debt Service Ratio (Appendix C, page 372), varying from 2.2 to 4.0 is healthy throughout the project and even with variations in the Net Cashflow of up to 40 per cent, the Debt Service Ratio does not fall below 1.4. With variations in total interest of up to 40 per cent the Debt Service Ratio does not fall below 1.7.

Debt-Equity Ratio

The Debt-Equity Ratio by year graph (Appendix C, Page 374) clearly shows that the project is well capitalised throughout its life and the level of debt is quite low, which gives a measure of security to the project. The project is debt-free from production year 12 on this analysis but the strong cashflow means that the loan payments could be accelerated slightly without liquidity problems occurring.

Net Cashflow - Total Sales Ratio

The Net Cashflow/Total Sales Ratio (Appendix C, page 391) varies from 42-66 per cent and even with a reduction in sales price of 10 per cent, the Ratio varies from 35-66 per cent.

10.2.3 Net Income Statement analysis

The Net Income Statement (Appendix C, pages 355 - 357) shows that in the 1st production year the project makes a substantial loss of USD 737,685 but becomes profitable in production year 2 and is able to commence building up reserves of accumulated undistributed profit in production year 5, when all previous losses have been covered.

The Gross Profit, as a percentage of total sales, is low at 5.40 per cent in production year 2 but improves to 14.70 per cent in production year 5, after which the percentage rises to a maximum of 51.15 per cent by production year 13.

The Fixed Costs Coverage Ratio (Appendix C, page 381) is initially negative in production year 1, then rises to 1.3 up to production year 5. From production year 6 onwards, the ratio increases rapidly to a maximum of 7.2 in production year 13. Variations in sales price, the most sensitive variable, show that the project cannot cover its fixed costs until production year 3 with a sales price reduction of 10 per cent.

The Net Profit/Total Sales Ratio (Appendix C, page 393) is negative until production year 2, due to the initial operational loss of the factory but from production year 2 the ratio rises to a level of 40 per cent, which is very attractive. Decrease of sales price by 10 per cent decreases the ratio to a maximum of 33 per cent, while an increase of 10 per cent in sales price leads to an excellent ratio of 45 per cent.

Breakeven point

The Fixed Costs Coverage Ratio graph for the 5th production year (Appendix C, page 384) shows that costs are fully covered at a capacity utilization of 75 per cent, which is the breakeven point for the project. If sales prices, the variable showing sensitivity, are reduced by 10 per cent, the breakeven point is raised to 85 per cent of feasible capacity and if sales prices are raised by 10 per cent, the breakeven point falls to 65 per cent of feasible capacity (Page 387).

If the capacity is not realized for any reason, then the company will not be profitable and the company would ultimately fail. The management must therefore be very careful to monitor costs and revenue and ensure that the daily production and sales targets are met, as per the programme. The management must also ensure that the training of all personnel is carried out strictly as required by the training programme arranged by the foreign consultants, so that their operational skills improve as quickly as possible.

Profits

The profitability analysis shows that in the first production year, operating at 65 per cent of normal feasible capacity, there is a significant loss amounting to 60.27 per cent of total sales but that in production year 2, operating at 85 per cent of normal feasible capacity there is a small profit of USD 86,445, amounting to 5.40 per cent of total sales. In production years 3 - 5 the profitability improves a little to a range of 13.61 - 14.70 per cent of total sales, then from production year 6 on the profitability becomes respectable rising from 19.94 - 51.15 per cent of total sales, as the financing costs decline. The maximum gross profit is achieved from the 13th production year with a profit of USD 963,187.

During the initial COMFAR evaluation carried out in the field in Uganda, the project team realized that the high civils and building cost of the project, in relation to other costs was making the project unattractive. The later field work therefore concentrated on sizing the factory, in line with the current realistic market requirements in both Uganda and Kenya and arranging the process flow to minimize the area of buildings required. It is therefore not realistic to reduce the space requirements even further to reduce the capital costs but emphasis could be placed, as previously outlined, on trying to reduce the building cost per square metre.

Conclusions from the financial analysis for a new plant

While the new tile and sanitaryware factory has been shown to be consistently profitable from the second year of production, the Internal Rate of Return on investment of 12.75 per cent and Return on Equity plus Reserves of 12.72 per cent are rather low but may still attract investment from a private foreign company.

If the total capital investment could be further reduced by using local builders willing to work at rates lower than the normal rates for the construction of the building and by using an international tender for the purchase of equipment for the factory, then the IRR on investment and Return on Equity would increase. The chances of the promoters obtaining a foreign partner willing to invest in the project would then improve.

Because of this basic problem of having relatively high capital costs in relation to the small capacity required for both product lines of tile and sanitaryware, the project team came to the conclusion that in addition to the main task of the pre-feasibility study the team of Consultants should examine the possibility, however hypothetically, of improving the Rate of Return on the project by siting the project at the African Ceramics Company Limited site close to Kampala.

It is fully recognised by the Consultants that the site may never actually become available, as the process of any privatization in Uganda takes a long time and there is no certainty that the company will even be privatized. However, the many advantages of the African Ceramics site should not be discounted altogether because of this fact. The following comparison can be used as a sensitivity analysis for the project.

10.3 Combination of tile and sanitaryware with crockery production at the existing African Ceramics Company Limited

10.3.1 Assessment of the investment and production costs

During the field work and during the subsequent European-based work a series of three COMFAR sensitivity analyses were made, so that a detailed comparison could be made by the team of Consultants of the effects on the project of:

i) the reduced capital, which is necessary with the consequent reduced loan requirement.

ii) the reduction of the implementation period by one year, as the majority of the buildings are already existing. This is a significant advantage of this alternative site, as the large reduction in the time required for implementation from two years to one year, will then bring forward the date by which the capital expenditure starts to produce revenue. This reduces the costs of foreign personnel during the implementation period and also the overall financing costs even further.

iii) the addition of crockery to the project product range with the further improvement in Rates of Return by taking into consideration the net earnings from the crockery production unit and the further savings on production, administration and marketing costs by merging the operations.

The final results of this work have been incorporated into the following analysis of the project.

10.3.1.1 Investment costs

a) Considerations of cost savings in buildings and equipment and the consequent reduction in loan facility

A complete valuation of the African Ceramics Company Limited factory was undertaken in September 1989:

	USh (1,000)
Land and buildings	325,000
Machinery & Equipment	102,389
Total	427,389

The above was valued, when the bureau exchange rate was USh 600/USD and the current (November 1990) exchange rate is USh 720/USD, a 20 per cent devaluation. Inflation during the same period has been approximately 26 per cent.

For a realistic up-to-date valuation we must therefore increase the value by 25 per cent, taking into consideration the additional depreciation of equipment. On this basis the value of the buildings only is now approximately USh 406,250,000. The area of the buildings amounts to a total of 4,109 m2, the main factory building being 3,403 m2. At a exchange rate of USh 720/USD, the value is equivalent to USD 564,236, or USD 137/m2. This is clearly a far less expensive option than building a brand new building.

However, although these buildings would provide the majority of the space requirements for tile and sanitaryware production (1,812 m2), in addition to the existing crockery production, the raw material preparation and storage areas must be extended. This would require an area of approximately 500 m2.

The cost of this extension would be:

500 m2 x USD 575/m2 = USD 287,500

The total cost of the original buildings plus the extension would therefore be:

USD 851,736

This should be compared with the cost of a brand new but smaller building in Mbarara, which is USD 1,225,000.

Inside the existing surplus African Ceramics Company Limited buildings are two brick-built tunnel kilns and an old decorating kiln, which were all designed for oil-firing. As there is no possibility of these kilns being used again, they must be demolished. This can be carried out with the existing labour force, during periods, when they are idle. There will therefore be no additional cost involved for this work.

In any sale of this factory however, not just the buildings must be purchased but also the crockery production machinery, whether they are used or not. Taking this practical situation into account therefore, the current cost of the buildings and machinery together, allowing for a 25 per cent increase on the September 1939 valuation, would be:

USh 534,236 @ USh 720/USD = USD 741,994

Adding the cost of the 500 m2 extension brings the total cost to:

USD 1,029,494

This is still USD 200,506 less than the cost of a new building but this also includes all of the production equipment for the additional product line of crockery.

Additional equipment savings for the new tile and sanitaryware project will also be made in the following areas, as much of the required equipment for the new project already exists at the African Ceramics site. The savings in equipment amount to:

	Savings (USD)
Maintenance equipment	27,000
Laboratory equipment	32,000
Office equipment	8,000
Clay preparation equipment	70,000
Glaze preparation equipment	28,000
Total machinery savings	165,000

The total machinery requirements would therefore be:

USD 2,773,000 - 165,000 = USD 2,608,000

These cost savings amount to a total of USD 365,506 for buildings and machinery.

b) Considerations of the effect of the one-year reduction in the implementation period and consequent further reduction in the initial capital investment requirement

The choice of the African Ceramic Company Limited site would mean that the overall implementation period could be reduced from two years to one year. This results in further savings in the investment cost of:

a) cost of foreign supervision during implementation.
b) cost of finance, as the cash flow from operations commences one year earlier.

The savings in the cost of foreign and local supervision during the pre-production period amount to:

USD 49,000

The summary of foreign and local supervision for a one-year implementation period is:

	USD
Foreign costs of construction, erection & installation supervision and liaison	47,000
Commissioning & supervision services	210,000
Total foreign cost	257,000
Total local cost	4,000
Total foreign & local costs	261,000

The reduction of USD 49,000 in the initial capital investment costs, the corresponding reduction in the promoters' equity capital and the one-year reduction in the time period for implementation have therefore also been included in the COMAR analysis titled "African Ceramic".

The summary of the total initial investment costs for this site is:

	USD
Land, site preparation	4,000
Buildings & civil work	1,029,494
Auxiliary machinery	230,000
Plant equipment and machinery	2,608,000
Total fixed investment costs	3,871,494
Pre-production capital expenses	564,993
Total initial investment costs	4,336,487

10.3.1.2 Inventories and Net Working Capital

These parameters are all based on those used for the "New Factory" analysis.

10.3.1.3 Investment environment

The financing of the investment and the available financing sources are all as per the "New Factory" analysis but the effects of crockery production, the ockery production costs and the crockery sales revenue have be analysed.

a) Considerations of the effect of crockery production on the project

The cost of all the crockery machinery and equipment has already been included within the buildings costs for the initial investment, as it is only practical for the African Ceramics Company Limited to sell all of these assets together. We have therefore considered it worthwhile to include in this sensitivity analysis the effect of producing on a three-product basis with crockery, tiles and sanitaryware, rather than a two-product basis with just tiles and sanitaryware. The team does not have the extremely detailed factory costings for each element of crockery production, which are most useful for such an analysis but from the consolidated sectional costings of the factory we can show the approximate effect of producing on a three-product basis.

The company is currently only operating at around 10 per cent of its realistic capacity, producing approximately 58,936 pieces (gross) in 1989 against a current capacity of 574,000, which is well below its breakeven point of 78,000, although this is very low breakeven volume. The factory therefore made a loss of USh 9.2 million in 1989 and will make a further loss in 1990. In addition, the factory has made no provision for payment of the Government Sales Tax (30 per cent of sales revenue), which is steadily increasing its liabilities.

However, if we examine exactly why the company is operating so inefficiently, the following are clear weaknesses:

a) Poor quality control at every stage of production from raw material mining to firing and selection of the finished product, despite the provision of laboratory equipment. This was stated to have improved since the factory was provided with a production manager on a short-term assignment, funded from the Commonwealth Fund for Technical Co-operation (CFTC). However final selection and grading of all products appeared to be carried out at the sales shop together with the customers.
b) Lack of transport for personnel, raw materials and finished products.
c) Lack of a Marketing/Sales Manager
d) Lack of an Accountant/Bookkeeper
e) Lack of a personal computer for production cost control, production and sales scheduling, determination of up-to-date working capital requirements, profit/loss statements and balance sheets.
f) Lack of a Stand-by generator.
g) No account is taken of the Sales Tax in product costings, the <u>inclusive</u> retail price being used as the basis of revenue for profitability, not the sales price net of Sales Tax.

For the current level of production the factory is well overmanned and the level of administrative staff, administration expenses and management fees is also very high.

As the tile and sanitaryware project will address all of the above deficiencies in any case within its stated costings, there will be an immediate and beneficial effect on the crockery production unit, as the provision of technical expertise, transport, Marketing/Sales Manager, Accountant/ Bookkeeper, personal computer and generator for the project will be common for all products, including crockery. The overmanning will be totally eliminated by absorbing the excess crockery personnel into the tile and sanitaryware production units and the foreign technical manager will assist the General Manager to examine the high level of administration expenses for the crockery unit and reduce them to a more normal level. The foreign technical manager would also cost each item properly, on the basis of costs and revenues net of Sales Tax, so that the Sales Tax can be properly catered for by the company and paid to the Government on a regular basis, in accordance with the Sales Tax regulations.

b) Production costs and revenue

In order to assess the potential additional costs and revenue on the project we have used the most up-to-date financial information available, which is based on the 1989 unaudited accounts of the company and the January 1991 sales prices. Adjustments have then been made for both the inflation of the costs since 1989 and a realistic reduction in labour.

The 1989 (unaudited) income statement of African Ceramics Company Limited is:

	Year 1989 (USh)
Turnover	21,957,585
Direct Production Costs	
Materials	2,499,439
Electricity	1,600,000
Fuel & Lubricants	1,873,293
Packing Materials	4,700
Repairs & Maintenance	1,729,890
Total Direct Production Costs	7,707,322
Administrative & Other Expenses	
Audit & Accountancy Fees	10,000
Directors' Fees & Expenses	233,760
Management Fees - UDC	805,434
Motor Vehicle Expenses	2,316,615
Office Expenses	1,079,230
Rent & Rates	175,400
Sales Promotion	282,950
Salaries & Wages	2,356,325
Staff Costs: Allowances	3,570,269
: Canteen/Welfare	2,594,025
: Housing	1,800,000
: Medical	1,157,820
: Sundries	1,181,945
Sundries	1,576,992
Transport & Travel	441,890
Total Administration Expenses	19,582,655

Financial & Other Charges	
Interest & Bank Charges	2,867,730
Taxation	301,864
Depreciation	600,000
Total Financial & Other Charges	3,769,594
Operating Profit/(Loss)	(9,101,986)
Stock Adjustment	nil
Sundry Income	nil
Profit/(Loss) for 1989	(9,101,986)

Note: In the accounts the team were given, the total administration expenses were stated to be USh 19,652,655 but the individual items only add up to USh 19,582,655, therefore we have used this latter figure for our calculations.

In a merged operation some of these costs will disappear, such as the UDC management charge, or they have already been accounted for in the tile and sanitaryware project, these being:

- audit and accountancy fees
- motor vehicle expenses
- office expenses
- rent & rates
- sales promotion
- transport & travel
- depreciation

These savings at 1989 rates amount to USh 5,111,519, plus depreciation of USh 600,000. If these savings are deducted from the 1989 costs and the remaining costs are then increased by 26 per cent for 1990 inflation, an approximate value for the current costings of a merged crockery unit can be obtained. This would obviously have to be done in much more detail at a later stage of the project to refine the costings in each section of the crockery operation.

A reduction in the labour force of 15 personnel is realistic, these personnel being transferred to the tile and sanitaryware sections. At an average 1989 salary (including all benefits) of USh 161,030 per person based on a total of 78 personnel, this reduction at 1989 rates is USh 2,515,450.

The total annual savings at 1989 rates are therefore:

USh 7,626,969

The amended summary of 1989 approximate costs with a merged operation is:

	1989 (USh)	Jan 1991 equivalent (USh)
Direct production costs	7,707,322	9,711,226
Administration Costs	11,955,686	15,064,164
Interest/Taxation	3,169,594	3,993,688
Totals	22,832,602	28,769,078

The above direct (variable) production costs were for a production of 58,936 pieces but of these only 46,414 pieces were sold. As there was no stock adjustment in the accounts, we must assume there was a wastage of 12,522 pieces, or 21.2 per cent of production.

This is extremely high and would have to be corrected by the foreign technical manager to be employed by the project. We must however base the 1989 production cost on the 1989 saleable pieces, which equates to USh 166/saleable piece. The equivalent January 1991 cost would be USh 209/saleable piece at the same wastage level of 21.2 per cent. At a more reasonable un-recyclable wastage level of 10 per cent the cost would be USh 145/piece (1989), or USh 183/saleable piece in January 1991. As we are confident that this wastage level could very quickly be reduced to a more normal level, the variable production cost will be taken as USh 183/saleable piece for the purpose of this sensitivity analysis.

Many of the immediate problems restricting production of crockery will be removed, as soon as the tile and sanitaryware project is in the process of being implemented. As the vehicles and equipment would arrive during the second six-month period, it is estimated that the crockery section of the factory could produce at an overall 20 per cent of capacity during the first production year, then at 50 per cent in Year 2, 65 per cent in Year 3 and 80 per cent in Year 4 onwards.

Estimated crockery revenue

The current price list (wholesale), inclusive of Sales Tax, of African Ceramics Company Limited, effective since 18th October 1990 is:

Item		Transfer	Banded	Plain	(Seconds)
1	Tea/coffee cup	500	450	400	390
2	Beer Mugs	700	600	550	500
3	Mini-mugs/Tumblers	650	600	550	500
4	Soup Plates	600	550	500	450
5	Dinner Plates	600	550	500	450
6	Dinner Plates SHR	650	600	550	500
7	Side Plates	400	350	300	250
8	Medium Plates	450	400	350	300
9	Fruit Bowls	400	350	300	250
10	Tea/coffee pot-large	1,600	1,500	1,300	1,200

	Item	Transfer	Banded	Plain	(Seconds)
11	Tea/coffee pot-medium	1,300	1,200	1,000	800
12	Coffee pot-small	600	550	500	450
13	Tea pot-small	700	650	550	500
14	Oval/round dish	1,600	1,500	1,300	1,200
15	Vegetable dish	1,300	1,200	1,000	800
16	Conical bowls	1,100	1,000	900	800
17	Rice bowls	500	450	400	350
18	Water jar	800	750	700	650
19	Large water jar	1,300	1,200	1,000	800
20	Milk jar	400	350	300	250
21	Sugar bowl	400	350	300	250
22	Ash tray	550	500	450	400
23	Flower vase-small	700	600	550	500
24	Flower vase-large	900	800	700	600
25	Flower bud	500	450	400	350
26	Deep bowl	500	450	400	350
27	Ample Mugs	650	600	550	500
28	Small tumbler	450	400	350	300

The normal product mix for the main items produced consists of:

	%	1990 price (USh)	USh in 100pcs
Cups & saucers	19	450	85.5
Plates & bowls	50	450	225.0
Mugs	16	600	96.0
Teapots & dish	15	600	90.0
Total	100	Mean price/pc	497

Allowing for 1990 inflation, the average gross sales price per piece, inclusive of Sales Tax is therefore USh 626/piece. Deducting the 30 per cent Sales Tax gives a net sales price of USh 482/piece for costing the profitability of the factory.

We appreciate that African Ceramics Company Limited is not currently paying any Sales Tax and neither are many retailers but we cannot ignore the fact that it should be paid to the Government, therefore we must allow for it by using the appropriate net sales price for our revenue estimates for profitability calculations. On this basis the actual net revenue applicable to the factory for the crockery production would be:

	Year 1	Year 2	Year 3	Year 4 on
Capacity Utilization (%)	20	50	65	80
Pieces crockery (saleable)	114,800	287,000	373,100	459,200
Revenue (net) USh (1,000)	55,334	138,334	179,834	221,334
Revenue (net) USD (@ USh 720/USD)	76,873	192,131	249,769	307,408
Production Cost USh (1,000)	21,008	52,521	68,277	84,034
Production Cost USD (@ USh 720/USD)	29,178	72,946	94,829	116,714
Administration Costs USh (1,000)	18,322	18,322	18,322	18,322
Administration Costs USD	25,447	25,447	25,447	25,447
Interest/Tax Costs USh (1,000)	3,994	3,994	3,994	3,994
Interest/Tax Costs USD	5,547	5,547	5,547	5,547
Total Costs Crockery USh (1,000)	43,324	74,837	90,593	106,350
USD	60,172	103,940	125,823	147,708

The above additional costs, additional revenue and appropriate sales taxes were included in this sensitivity analysis titled "African Ceramic" , which shows the effect of producing crockery together with tiles and sanitaryware on a single factory.

10.3.1.4 Sources of finance

As the proposed DFCU and EADB loans have to be secured against assets such as land and buildings, we must adjust the COMFAR analysis to take account of the reduced loan facilities, based on the lower building costs at the African Ceramics Company Limited site.

10.3.1.5 Project financing

In the COMFAR analysis titled "African Ceramic", which is shown in Appendix D of this Final Report, we have used a possible maximum DFCU foreign loan of USD 533,000 and a maximum EADB loan of USD 600,000, as the basis of the loan capital, which could be made available for the project.

	USD
Equity from promoters -foreign & local (ord)	3,059,487
Equity from DFCU (pref)	244,000
Total equity	3,303,487
DFCU loan	533,000
EADB loan	600,000
Total loans	1,133,000
Total financing	4,436,487

Of the USD 3.1 million promoters' equity, which is then required, USD 2.03 million must be in foreign exchange and USD 1.1 million must be in local currency. In this analysis we have also included in the pre-production costs, the costs of arranging the DFCU and EADB loans; a total of USD 10,660 in foreign currency and USD 45,990 in local currency.

It should be noted that the interest costs of existing African Ceramics Company Limited loans have also been included in the overheads, although if the company is privatized, these loans may well be repaid in the financial restructuring that will take place and this cost would then reduce.

It should also be noted that DFCU is already a minor shareholder of the African Ceramics Company Limited.

10.3.2 Financial analysis of tile, sanitaryware and crockery production

The detailed results of the COMFAR financial analysis are attached to this Final Report in Appendix D. The main findings are as follows:

10.3.2.1 Net Working Capital requirements

The initial Net Working Capital requirement in the first production year is USD 119,119, which rises to a maximum of USD 187,605 by the 5th production year, before falling to a stable level of USD 178,766 for the remaining years of the project's life.

The level of working capital is affected by the simple but flexible design of the factory, which allows changes in the market requirements to be implemented quickly. This means that the work-in-hand and the finished stocks can be minimized, thereby reducing the working capital requirements.

The inventory and raw material stock proportion of the working capital is a significant item, being 35.6 per cent of Total Current Assets in the 1st production year and 40.7 per cent from the 6th production year onwards. However, in the Consultant's opinion, these stock levels of raw materials are absolutely essential to both the efficient operational purposes of the factory and are also essential to maintain a high quality of production. Incoming raw materials must always be tested prior to use.

The other major item is the level of accounts receivable, which amounts to 44.0 per cent of the Total Current Assets in the 1st production year and 41.4 per cent from the 6th production year onwards. The level of accounts receivable is however based on tight management control of the customer accounts and with the knowledge that many customers will be paying in cash for their purchases.

10.3.2.2 Cashflow analysis

The COMFAR analysis shows that from the first production year the cashflow is positive and remains positive throughout the life of the project (see COMFAR graph in Appendix D). From the graphs it can be seen that the accumulated cashflow from operations becomes positive in production year 4 for local funds and in production year 7 for foreign funds.

The prefered dividend payment procedure of the DFCU with companies that this institution finances is that the company should only pay out dividends once all the loans have been fully repaid. At this stage 50 per cent of the net profits should be distributed. On this basis therefore, the dividend payments to equity shareholders will be paid from production year 13 onwards in this analysis.

Foreign investors would probably not find this procedure attractive and may insist that dividend payments, albeit at a much lower level, should commence much earlier in the project. With the healthy positive cash flow of the project, the loans could be repaid earlier, or the initial loan term could be reduced from 10 years to say, 5 years.

Internal Rate of Return

At a discount rate of 12 per cent the Internal Rate of Return on total investment is 18.69 per cent, the Return on Equity is 10.41 per cent and the Rate of Return on Equity plus Reserves is 21.33 per cent. The Discounted Cashflow, Investment graph in Appendix D shows that the project sited at the African Ceramics Company Limited shows positive values with discounting rates of less than 18.69 per cent.

At these Rates of Return, the project would possibly be attractive to any foreign investor company, who may wish to join the company. With current (May 1991) US Dollar accounts earning 4.875 - 6.0 per cent, the project does offer some premium for the risk element, which is essential to attract a foreign investor to a overseas project. The Discounted Cashflow, Investment graph shows that if the initial investment costs could be reduced by 20 per cent the IRR would increase to approximately 25 per cent. A 20 per cent over-run on the capital expenditure requirements would reduce the IRR to 15 per cent.

Variation of the sales price of the products, which is dependent on the quality of the product, is shown to be critical to the project. If the sales price falls by 10 per cent, the IRR falls to 14 per cent and the if the sales price falls by 20 per cent the IRR then falls to only 9 per cent. This critical fact means that maintaining good quality standards is therefore absolutely essential to the success of the project. The management must avoid producing second-quality items, which can only be sold at much lower prices than the first quality products.

Variations in operating costs is less significant, the IRR falling to 15 per cent with a 20 per cent increase in operating costs.

The Discounted Return on Net Worth again shows the sensitivity to sales prices, falling to a Rate of Return of 8 per cent with a reduction of 20 per cent in sales price but increasing to a very attractive 33 per cent with a sales price increase of 20 per cent.

Debt Service Ratio

The graphs show that the Debt Service Ratio, varying from 3.5 to 5.4 is extremely healthy throughout the project and even with variations in the Net Cashflow of up to 40 per cent, the Debt Service Ratio does not fall below 2.0. With variations in total interest of up to 40 per cent the Debt Service Ratio does not fall below 3.2.

Debt-Equity Ratio

The Debt-Equity Ratio by year graph clearly shows that the project is well capitalised throughout its life and the level of debt is quite low, which gives a measure of security to the project. The project is debt-free from production year 12 on this analysis but the strong cashflow means that the loan payments could actually be accelerated without liquidity problems occurring.

10.3.2.3 Net Income Statement analysis

The Net Income Statement shows that in the 1st production year the project makes a substantial loss of USD 471,397 but becomes profitable in production year 2 and is able to commence building up reserves in production year 3, when all previous losses have been covered.

The Gross Profit, as a percentage of total sales, is healthy at approximately 21 per cent from production year 2 to production year 5, after which the percentage rises to a maximum of 49.5 per cent by production year 13.

The Fixed Costs Coverage Ratio is good, rising from an adequate 1.5 in the early years of the project up to production year 5, to 6.9 in production year 13 onwards. Variations in sales price, the most sensitive variable, show that the project is still secure with a sales price reduction of 10 per cent.

Breakeven point

The Fixed Costs/Variable Margin graph for the 5th production year shows that costs are fully covered at a capacity utilization of 62 per cent, which is the breakeven point for the project. If sales prices, the variable showing the most sensitivity, are reduced by 10 per cent, the breakeven point is raised to 73 per cent of capacity and if sales prices are raised by 10 per cent, the breakeven point falls to 55 per cent of capacity.

Production costs

The chart of production costs shows that depreciation is the major cost, followed by raw materials. Depreciation is determined by the level of initial investment. It follows that, if the level of initial investment can be reduced by lower building costs for the extension to the factory, or lower machinery costs due to competitive tendering, then the depreciation charge would be reduced. Raw material costs could only be reduced by trying to find local or regional suppliers for some of the imported materials.

The Net Cashflow/Total Sales Ratio varies from 39-63 per cent and even with a reduction in sales price of 10 per cent, the Ratio varies from 32-58 per cent.

The Net Profit/Total Sales Ratio is negative until production year 2, due to the operational loss of the factory but from production year 2 the ratio rises to a level of 38 per cent, which is very attractive. Decrease of sales price by 10 per cent decreases the ratio to a maximum of 30 per cent, while an increase of 10 per cent in sales price leads to an excellent ratio of 45 per cent.

From the graph of Total Sales and Production costs on Page 472, it can be seen that sales rise from USD 1.1 million to USD 1.8 million per year and that from production year 3, production costs continue to fall, even though sales are maintained at USD 1.8 million, indicating that profitability is improving as the loans are repaid.

Profits

The project with tiles, sanitaryware and crockery shows a gross operational profit of USD 392,362 in the 2nd production year, rising to a maximum annual profit of USD 1,129,618, as the loans are paid off.

Conclusion from the sensitivity analysis for a tile, sanitaryware and crockery project at the African Ceramics Company Limited site.

The combined project at the African Ceramics Company Limited site is a very viable industrial enterprise. The main difficulty is in finding a foreign partner, who is prepared to place substantial capital into the project during the planning and construction phase. The increased Rate of Return at this site with a three-product factory, as shown by the comparison in Schedule 10.1, would make it much easier for the promoters to find a suitable foreign investor, than for the new site with a two-product factory at either Mbarara or Kampala.

Schedule 10.1 COMPARISON OF COMFAR RESULTS FOR A NEW SITE AT MBARARA OR KAMPALA WITH THE RESULTS FOR THE EXISTING KAMPALA SITE

	A New Factory	B African Ceramic
Total Initial Investment	4,859,343	4,436,487
Net Present Value (USD) @ 12 % Discount Rate	211,071	1,620,349
Internal Rate of Return on Investment	12.75	18.69
Return on Equity plus Reserves	12.72	21.33
Positive Accumulated Cash Flow (Year achieved)	7	5
Breakeven Point, Year 5 - excluding finance (% cap)	60	50
Breakeven Point, Year 5 - including finance (% cap)	75	62
Profit begins (Project Year)	4	3
Gross Profit - USD (Year 5)	256,309	489,849
Gross Profit - USD (Year 16)	963,187	1,129,618

Key: A: New site at Mbarara or Kampala, 2 year implementation period

B: Existing site near Kampala, 1 year implementation period & consequent reduced capital and loans with crockery production costs and revenue.

10.4 National economic evaluation for a new factory

The project proposal from the national economic point of view has significant benefits in that it:

i) utilizes local raw materials, which the Government is encouraging and diversifies the industrial base of the country.
ii) produces ceramic tile and sanitaryware products, 50 per cent of which will be sold on the domestic market. All of the tile and sanitaryware sold in Uganda are currently imported. Therefore, the new factory will substitute imports in 100 per cent of its volume of domestic sales, saving foreign exchange for the country to the CIF value of the same volume of imports, thereby assisting the general economy of Uganda.
iii) produces products with considerable added value
iv) earns foreign exchange from the 50 per cent of the production, which is expected to be exported to the regional market, thereby improving the economy of Uganda.
v) acts as an employment generator in an area of high unemployment.
vi) introduces new skills, which do not presently exist in the country, to the labour force.

a) Project Exchange Rate

The project exchange rate used is USh 720/USD, which is a realistic exchange rate between the current market rate of USh 800 and the bank rate of USh 614. If the official Uganda Bank exchange rate of USh 614/USD is used, then the project becomes much more profitable. However, it would not be realistic to base the project on this rate, which is not market related.

b) Effective protection

The protection for a new tile and sanitaryware factory against international competition is offered by the high import duty tariff rate of 30 per cent of CIF value on tile and sanitaryware imports. Within the PTA area, protection will be increasingly on a regional basis, as imports within the PTA from member states are supposed to be gradually reduced and be tariff-free by 1993.

A Ugandan factory would then have no protection from any factory in the PTA area and tile and sanitaryware factories in Kenya, Tanzania and Zimbabwe could then export more competitively to Uganda. Conversely it will be of also be of benefit to a factory in Uganda, as it will be more competitive in price in a wider market area. On balance, as the Ugandan tile and sanitaryware market is small, this change in protective tariffs will benefit a tile and sanitaryware factory in Uganda rather more than it benefits a tile and sanitaryware factory in Kenya, as the Ugandan "regional" market, in effect becomes a much larger "domestic" market for the purpose of commercial trade.

The protection from tariffs is however partially off-set against the high sales tax of 30 per cent on the products sold, which tends to benefit high volume low unit cost factories against low volume high unit cost factories. The maximum retail price, which is inclusive of the sales tax, is the one dictated by the willingness of consumers to pay, irrespective of the profit margin available to the factory on the product.

Consequently a high sales tax will reduce the actual net sales price, which is possible for the factory to achieve and hence reduce its profitability. This effect is particularly important on a small-scale factory, such as the tile and sanitaryware factory in Uganda, as operating costs per unit of production tend to be higher than the large-scale factories of Europe, India and China with lower profit margins per unit.

In a scenario, where the Government decided to increase the sales tax by another 10 per cent, the factory could not merely pass all of this on to the customer, if he wished to maintain the same volumes of sales. If a particular product sales price was already at its maximum level, as judged by the customer's willingness to buy, the factory has no choice but to accept reduced profit margins. A large volume producer is more able to do this than a small volume producer. The financial analysis has shown that the sales price is the most significant variable affecting the rate of return on the project. Therefore, some additional effective protection could actually be given to a local producer by reducing the level of sales tax on the production, thereby immediately allowing an increased profit margin to be possible and higher returns to the equity shareholders.

If, for instance, new factories did not have to pay sales tax for say, the first five years of production, the rate of return of the tile and sanitaryware factory would then probably be sufficiently attractive for a foreign investor to join the local promoters in the project.

c) Economic Cashflows (excluding indirect effects)

From the COMFAR Economic Cost Benefit Analysis (ECBA) of the new factory, shown in Appendix C (pages 397 - 411), it can be seen that using a discount rate of 12 per cent the foreign net cashflow - operation is negative (-USD 388,352) but the local net cashflow is positive (USD 673,895), the total net cashflow being positive at USD 285,544 (see Page 399). This indicates that efforts must be made to reduce the capital expenditure on imported machinery and equipment by the use of an international tender. As local building costs contain a foreign exchange element, reduction in the local building costs would also lead to an improvement in the foreign net cashflow.

The financial rate of return (market prices) of the new factory project is 12.99 per cent. The economic rate of return is 20.58 per cent. The economic rate of return of the new factory is therefore quite favourable.

d) Absolute efficiency test

The Absolute Efficiency Test at Market Prices, shown in the COMFAR schedules in Appendix C, pages 400 - 403, shows a social surplus of USD 10,442,610 over the life of the project. Only during the two-year construction period is there a social deficit. The Present Value (PV) of social surplus at a 12 per cent discount rate is positive at USD 802,644. The new factory is therefore efficient from the national point of view.

The relative efficiency of capital invested, E(C), is 0.29, while the relative efficiency of foreign exchange, E(FE) is 0.33. These relative efficiency factors could possibly be improved by reducing the cost of imported machinery and equipment by purchasing these items in an international tender. The relative efficiency of skilled labour, E(L), at 2.65 is reasonable.

e) Foreign exchange effect (excluding indirect effects)

The following calculation from the COMFAR schedules for the project for the new factory, sited at either Mbarara or Kampala shows the extent to which the economy of Uganda gains, both from the import substitution of all of the domestic sales and from the foreign exchange earnings from the exports of the project to the neighbouring regional market.

Local Ugandan sales, all of which directly substitute imports, amount to:

Tiles	27,000 m2/year
Sanitaryware	5,175 pc/year

The average foreign exchange import substitution savings and foreign exchange export earnings of a new factory from the COMFAR ECBA amount to:

USD 717,697 per year

An alternative method of assessing the benefit is in the terms of foreign exchange savings and earnings per employee and with 71 employees, this amounts to:

USD 10,108 per employee per year

The COMFAR generated foreign exchange effect schedules (excluding indirect effects), shown in Appendix C, pages 404 - 407, deal with the foreign exchange factor in detail, including the analysis of total foreign inflows and outflows throughout both the two-year construction period and 15 year production period. The effect of loan repayments and interest are also included in the analysis. The net foreign exchange flow including all these factors is shown to be positive at USD 4,756,196 and the overall net foreign exchange effect of the new factory is:

USD 10,765,450

This includes:

	USD
Net Foreign Exchange Flow from Export	4,756,196
Import Substitution effect	6,009,249

At a discount rate of 12 per cent the present value of foreign exchange flow is positive at USD 1,506,857 and the net foreign exchange effect is USD 3,867,188.

f) Net Value added for the 15 year operational life of project

The Net National Value Added for a particular period is obtained from the formula:

Net National Value Added = Output (Sales revenue), Less Material Inputs, 15 years' Depreciation and Foreign salaries & dividends

The Net National Value Added for the complete project, including the two-year construction period and the allowances for the salvage value of assets at the end of the project, is determined as USD 11,399,510 from the COMFAR ECBA generated absolute efficiency schedule in Appendix C, page 400. This shows that the new factory would have a positive wealth-creating effect on the Ugandan economy.

g) Employment creation

The specific capital requirements for the creation of each of the 71 new jobs to be created by the project is:

Total $\frac{\text{USD } 4{,}859{,}343}{71}$ = USD 68,441 per job

Foreign exchange $\frac{\text{USD } 3{,}325{,}685}{71}$ = USD 46,841 per job

These foreign exchange capital requirements for each job, should however be compared with the foreign exchange earnings for each employee, which amount to USD 10,108 per employee per year (see import substitution and export earnings section, page 286). This means that in approximately 4.6 years each employee has earned back the foreign exchange to create his job.

In addition to the direct employment of personnel for the factory and sales department there will additional indirect employment creation, such as part-time employment for local labourers and truck owners in the areas of the local raw materials, whenever mining takes place. Other employment will be created in companies supplying other local inputs, such as spare parts for the factory.

h) Assessment of other social impacts of the project

The project will create employment for 71 personnel and both the areas of the alternative sites for the new factory have high levels of unemployment. There will consequently be an increase in the income distributed in the area of the factory, benefitting the local economy.

The skills of the personnel will be improved and the factory will offer a place of employment for ceramic students graduating from Makerere University and the planned new University of Science and Technology in Mbarara.

As the project will utilize local ceramic raw materials, this will benefit the local economy of all of the areas, from where the ceramic raw materials are mined.

In respect to the environment, there will be little, if any, negative impact at the factory site. Careful mining procedures will minimize the damage in the quarry areas and after an area has been worked out, planting of trees and vegetation will restore the site to an acceptable natural state.

10.5 Conclusions of Financial and Economic Evaluation

i) Major advantages of the project

The National economic evaluation shows that the new factory is a definite asset for the economy of Uganda generating and saving considerable foreign exchange, although the financial analysis for the new factory shows that on a strictly commercial basis it is rather marginal, having a rather low IRR on investment and low return on equity.

However, it should be stated that there could be some possibility of reducing the local cost of construction by the promoters using their local knowledge and there is also a possibility of reducing the final machinery and equipment cost in an international tender. The rates of return would then improve.

In the event that it is found possible for the African Ceramics Company site to be used, the merged project has the added advantage for Uganda that African Ceramics Company Limited itself, which is currently making large losses and which is not really viable with just the single product line of crockery, could be saved and rehabilitated. The proposed tile and sanitaryware project, which would probably find difficulty in obtaining foreign exchange equity funding based on a new site at Mbarara or Kampala, would also be much more attractive. Uganda would then have the opportunity of having a viable ceramics factory producing the three different products of tiles, sanitaryware and crockery on one site.

ii) Major drawbacks of the project

The major drawback of a new factory based at Mbarara or Kampala is that the capital cost is quite high, in relation to the fairly small output, which is required by the Ugandan domestic market and the regional market. Operational unit costs, also tend to be high.

The new factory project sited at Mbarara or Kampala appears to be sound from a production viewpoint but is only marginally profitable and would probably have problems to find a foreign investor unless a higher return could be foreseen.

The best ways to achieve a higher return are by increasing sales revenues, which is unlikely to be achieved in the current market, or to decrease building and operational costs. The proposed use of the African Ceramics Company Limited site is one option in reducing the capital investment costs of the project and for improving the viability of the project. Other ways would be for the local promoters to use their local knowledge in identifying builders, who would possibly work for the local company at construction rates less than the normal recognised local price.

The international tender of equipment will possibly lead to some reductions in prices, especially if asian and east european suppliers submit tenders, as the prices in this pre-feasibility study are based on western European sources.

iii) Chances of implementing the project and recommendation

On a strict financial assessment, the tile and sanitaryware project established at a new site is marginal but it is profitable on a consistent basis, although the returns are low. Until the local sponsoring company can find the substantial equity requirements in both local and foreign currency, the chances of implementing the project in the near future appear to be poor, especially as the foreign equity will almost certainly have to be provided by a foreign partner.

The chances would improve considerably however, if the capital costs are reduced, by either reducing the local building costs of a new factory, or by using the alternative site of African Ceramics Company Limited, if it were to become available. The latter option would however only be possible, if all interested parties could agree on a suitable package within a reasonable time-frame.

The implementation period would be reduced by one year by using this latter option, as the majority of the buildings already exist, the initial capital expenditure would be lower, even though this would also include all of the plant and equipment for crockery production and the operational unit costs would be lower. However in the meantime, the Consultants recommend that the local promoters should follow up the findings of this pre-feasibility by trying to find building contractors in Uganda, who would build at lower than normal costs.

The initial capital investment costs for machinery and equipment could also possibly be reduced at the international competitive tender stage and this would also increase the rate of return to a more acceptable level for a potential foreign investor.

The chances of implementing the project would also improve, if the local promoters could persuade the Government to take into consideration the national economic benefits of having a factory producing tiles and sanitaryware within the country. The large savings on the country's foreign exchange by the direct import substitution of imported tiles and sanitaryware products by locally produced items and also the foreign exchange earnings of the products, which are exported are substantial at a combined total of USD 799,505 per year. This important benefit to the economy of Uganda should be assessed in possible policy decisions that the Government may wish to take.

The chances of the project going ahead would vastly improve, if the level of sales tax on total revenue could be reduced, even if this is for a limited period of, say five years, for the new factory. Any decrease will allow profit margins to be improved and thereby will increase the rate of return to more acceptable levels.

This Final Report is hereby submitted to UNIDO, Vienna by:

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Original Dated: 10th March 1991
First Amendment: 10th May 1991
Second Amendment: 9th July 1991

PAGE FOR NOTES

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PRE-FEASIBILITY STUDY FOR THE ESTABLISHMENT OF A PLANT TO MANUFACTURE TILES AND SANITARYWARE

SI/UGA/89/802

CONTRACT NO. 90/123

FINAL REPORT

VOLUME 2

APPENDICES A TO H

United Nations Industrial Development Organization
Vienna

This document has not been edited.

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RESTRICTED

SI/UGA/89/802
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10th March 1991
ORIGINAL: ENGLISH

PRE-FEASIBILITY STUDY FOR THE ESTABLISHMENT
OF A PLANT TO MANUFACTURE
TILES AND SANITARYWARE

FINAL REPORT

VOLUME 2

APPENDICES A to H

Prepared for the Government of the Republic of Uganda
by the United Nations Industrial Development Organization,
acting as executing agency for the
United Nations Development Programme

Based on the work of Global Ceramics Limited, U.K.

Backstopping Officer: Mr V. Klykov, Feasibility Studies Branch

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Vienna

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[1]This document has not been edited

APPENDIX A

ORGANIZATIONS VISITED DURING THE FIELD WORK

OCTOBER 1990 - JANUARY 1991

APPENDIX A

Organizations visited during the field work
October 1990 - January 1991

a) Uganda

1 Department of Geological Survey and Mines, Entebbe
2 Uganda Commercial Bank, Kampala
3 Uganda Development Bank, Kampala
4 East African Development Bank, Kampala
5 Development Finance Company of Uganda Limited, Kampala
6 Uganda Development Corporation, Kampala
7 U.K. Overseas Development Agency (ODA), Kampala
8 Danish International Development Agency (DANIDA), Kampala
9 European Commission Delegation, Kampala
10 European Commission Micro-Projects Unit, Kampala
11 Ministry of Industry and Technology
12 Ministry of Planning and Economic Development
13 Ministry of Housing and Urban Development
14 Ministry of Commerce
15 Ministry of Tourism and Wildlife
16 Ministry of Local Government
17 National Housing and Construction Corporation
18 Uganda Manufacturers Association
19 National Water and Sewage Corporation
20 Technoplan Architects and Planning Consultants
21 Gauff Ingenieure, Water Engineering Department
22 Kampala City Council, Planning Department, Building Inspectorate Department and Health Department
23 Mbarara Municipal Council
24 KK Partnership Architects
25 B&K Enterprises (Africa) Limited
26 Uganda Consolidated Properties Limited
27 Roko Construction Limited
28 V. Rogers Enterprises Limited
29 Waladyeki Interplan Associates - Architects
30 Peatfield and Bodgner Architects
31 Housing Finance Company of Uganda Limited
32 Century Enterprises - Builders Merchant
33 African Hardware Company
34 Tusabe Mukame Hardware Shop
35 Uganda Clays Limited - brick and tile factory
36 Uganda Electricity Board - Engineering Department
37 Do-it-Yourself Hardware
38 Makerere University - School of Fine Arts Ceramics Department
39 African Ceramics Company Limited
40 Uganda Customs and Excise Statistics Department
41 Statistics Department, Ministry of Planning
42 Sales Tax Office
43 Uganda Hardware Corporation Limited
44 UNICEF
45 French Embassy
46 Sembule Investment Company Limited
47 Star Import Enterprises Limited
48 Dominion Cargo Systems Limited

49 Sciphogen Limited
50 UNDP/UNIDO, Kampala

In addition to the above a number of private individuals, who were in the process of building new houses in Uganda were interviewed at the Kampala City Council Planning offices.

b) Kenya

1 Ceramic Industries (East Africa) Limited
2 Price Waterhouse Accountants
3 Industrial & Commercial Development Corporation
4 Hermes Enterprises Limited
5 Porcelain Products Limited
6 The Africa Project Development Facility
7 Kenya Customs and Excise Department, Ministry of Finance
8 Ministry of Lands and Housing
9 Housing Finance Company of Kenya Limited
10 National Housing Corporation
11 Cabro Building Products Limited
12 Statistics Department, Ministry of Planning and National Development
13 Doshi Ceramics Company Limited
14 African Hardware Limited
15 Avon Floor Tile Company
16 Savings and Loan Kenya Limited
17 Investment and Mortgages Limited
18 The Africa Enterprise Fund, International Finance Corporation
19 Sonic Importers and Exporters
20 Ageca (East Africa) Limited
21 Atlas Hardware
22 Serco Hardware
23 Alibha Shariff and Sons Limited - Hardware Dealers
24 Barco (Kenya) Hardware
25 Buildware Supplies
26 H & H Services Hardware
27 Ramco Hardware
28 UNDP/UNIDO, Nairobi

c) U.K.

1 Department of Trade Export Information Library, London
2 Northampton Borough Central Library, Northampton
3 Shires Bathrooms Limited, Stoke-on-Trent
4 Great Mills Tile & Bathroom Retail Centre, Northampton
5 Ceramic Tiles Northampton, Northampton

d) Switzerland

1 International Trade Centre, Geneva

e) Sri Lanka

1 Ceramic Research and Development Centre, Piliyandala

APPENDIX B

REGIONAL MARKET STUDY

APPENDIX B Regional Market Study

1 Regional producers of ceramics and potential competitors

Of the countries neighbouring Uganda, only Kenya has factories currently manufacturing ceramic wall tiles, ceramic sanitaryware, resin-bonded sanitaryware and PVC floor tiles. Tanzania does have quite a modern tile and sanitaryware factory but this is not operational.

a) Ceramic Industries (East Africa) Limited, Nairobi

This factory, which was examined in detail by the Consultants in January - February 1990 as part of a UNIDO Regional and Country Studies mission, is still operating under receivership manufacturing ceramic crockery, sanitaryware and wall tiles. The factory supplies only a very small proportion of the Kenyan market and its current production levels during 1990, compared with 1989 have been:

	Pieces per month (Jan to July 90)	Pieces per month (July - Dec 1989)
Crockery	40,000	40,600
Wall tiles	218,540 (4,967 m2)	160,000
Sanitaryware	656	654

The wall tile production should be compared with the 331,947 kg/month of tile imports, or 35,925 m2 (150 x 150mm equivalent @ 9.24 kg/m2) per month on average, which were imported in 1989 (latest figures up to 15th June 1989). The wall tile production is therefore only about 14 per cent of the tile imports.

The sanitaryware production should be compared with the 6,845 pieces per month on average, which were imported in 1989 (up to 15th June 1989). The sanitaryware production is therefore only about 10 per cent of the sanitaryware imports.

However the factory is producing well under its capacity due to lack of spare parts for essential repairs to machinery and kilns. If the working capital for these parts can be found the Consultants estimate that the annual capacity of the factory could be increased to:

	pc/week	pc/month	pc/46 wk yr
Wall tiles	174,000	667,000	8,004,000
Sanitaryware	1,294	4,960	59,524

At 667,000 pieces of tiles per month, or 15,159 m2/month, this would equate to 42 per cent of the 1989 (to 15th June) import level. In the case of sanitaryware 4,960 pieces per month would equate to 72 per cent of 1989 imports(to 15th June). However in neither case could this level of market penetration be realistically achieved unless both the quality of the products was substantially improved above the present quality levels and the product range widened.

Under the present conditions there is good scope for a production unit located in Uganda to sell tiles and sanitaryware products in Kenya but it must be borne in mind that if the Ceramic Industries (East Africa) Limited factory is fully rehabilitated, the opportunities would be reduced, although not eliminated.

b) <u>Porcelain Products Limited, Nairobi</u>

This factory currently only manufactures a small quantity of crockery but has in the past produced the Asian type toilets. One mould is still on stock at the factory but as the factory is still operating under receivership and only one of the two kilns is operational, there seems little likelihood of the factory attempting to produce this type of sanitaryware, while under receivership. If the factory is sold to a private company or individual, this situation could change. However the volumes, which could be produced would be very small.

The factory also possesses a tile glazing line, which was used for the glazing of imported biscuit tile some years ago. The equipment is no longer in use and is unlikely to be re-commissioned.

c) <u>Hermes Enterprises Limited, Nairobi</u>

This company manufactures a range of sanitaryware, wall panels, baths and shower units from a resin-bonded mix of clays, sand, resin, accelerators, hardeners and colour pigments. Of the raw materials, only the accelerator and hardeners are imported. The initial range was only of a marble finish but this has since been extended to include a wide range of solid colours. The shapes comprise an entire sanitaryware range, including various counter-top basins, wall-mounted basins, basin with pedestal, water closet, cistern, bidet and asian toilet.

The company is competing at the top of the range against the imported ceramic sanitaryware products and it has had some success in obtaining substantial contracts from hotels, which previously used imported ceramic sanitaryware. Hermes Enterprises Limited does not consider itself a competitor to Ceramic Industries (East Africa) Limited, as the management consider that their products are of poor quality and can only supply the bottom of the market, which Hermes are not interested in.

Hermes Enterprises are operating on quite a small scale with about 20 employees and are happy to remain at the present size. They have no expansion plans for the next few years but would be interested in joint ventures to establish similar industries in other countries. The number of sanitaryware pieces made, which compete directly against ceramic sanitaryware is estimated at up to 20 per day, or 4,600 pieces per year. This is very approximate as the factory manufactures many other items, which may take precedence over the basic sanitaryware items, dependent on the order situation.

d) Tanzanian tile and sanitaryware factory

A ceramics factory was built in Tanzania by a Czechoslovakian company a few years ago but this apparently has not been successful and has virtually ceased operations. One of the problems was a lack of working capital, therefore if this problem were rectified, the factory could possibly restart production. This would then obviously reduce the opportunity for exports from Uganda to Tanzania.

e) Possible additional competition in Kenya

During the visit to Kenya in February 1991, the Consultants noted a newspaper article (Sunday Nation 17th February 1991), which stated that a Czechoslovakian company was seeking a joint venture to establish a new floor tile and wall tile factory in Kenya. The cost was stated to be Approximately US Dollar 15 million for machinery and technical know-how. This indicates that the capacity would be much larger than the existing ceramics company in Nairobi. Although this new factory may not even be built, it does indicate that there could be a possible threat to exports from Uganda to Kenya, if such a factory is built.

Estimated level of market penetration of Kenyan market.

From the estimates of the total Kenyan market for ceramic sanitaryware, which in 1989 is in the region of 95,000 pieces, we must acknowledge that this level is considerably higher than in previous years, which was approximately 72,000 pieces (64,000 pieces imports and 7,000 - 8,000 pieces local production. We therefore must base our estimate on this more normal level. From our field work we know that products from a factory in Uganda would not displace many of the products presently imported from western Europe but could displace products, which are presently imported from China, India and eastern Europe. The factory would also be competing against the local sanitaryware and wall tile factory in Nairobi, which has poor quality products now but this could change rapidly under a change of ownership. The local factory with low-quality sanitaryware products has approximately 10 per cent of the market.

A new factory in Uganda entering the Kenyan market would be unlikely to take more than a 10 per cent share of the market, ie: 7,200 pieces per year, on a regular basis and initially would be lower, until the distribution system was established. For the first few years we would anticipate that the proposed new factory could sell around 5,000 pieces of sanitaryware in

Kenya. ie: approximately 7 per cent of the established normal market in Kenya.

In the case of wall tiles, because of the wide range of tiles available on the market, we would not expect a new factory in Uganda to obtain more than 5 per cent of the total market. Ceramic floor tile have to overcome the strong competition from the Kenyan produced vinyl floor tiles, which can be sold for a much lower price. Sales of ceramic floor tile in Kenya are therefore expected to be very low at around 3 - 4 per cent, despite the indicated demand.

For the purposes of this pre-feasibility study, using the average generated figure for wall and floor tile demand, we estimate that the initial potential sales in Kenya would be around a minimum of:

Wall tile	5% x 350,000 m2	=	17,500 m2/year
Floor tile	3% x 230,000 m2	=	6,900 m2/year

2. Regional Import-export Statistics

A great deal of information on the current regional market for ceramic tiles and sanitaryware was obtained from the desk research carried out by the Consultants in Europe, which established the current levels of exports from the twelve European Community countries to the countries of the East African and Central African region, which border Uganda, ie: Kenya, Tanzania, Zaire, Ruanda and Burundi.

Separate sources of information were checked, such as the U.K. Government Trade Statistics and the Eurostat records of the European Community. Information was obtained for the following product categories, which are of direct relevance to the pre-feasibility study for tiles and sanitaryware:

S.I.T.C.	Commodity Code	Product description
662.44	690710 00 0	Unglazed tiles, cubes < 7cm2 or 7 cm2
	690790 10 0	Unglazed double tiles ("spaltplatten")
	690790 91 0	Unglazed tile - stoneware
	690790 93 0	Unglazed tile - earthenware/fine pottery
	690790 99 0	Unglazed tile - other
662.45	690810 00 0	Glazed tiles, cubes < 7cm2 or 7 cm2
	690890 11 0	Glazed double tiles ("spaltplatten")
	690890 19 0	Glazed tile - other
	690890 31 0	Glazed double tiles ("spaltplatten")
	690890 51 0	Glazed tiles < 90 cm2
	690890 91 0	Glazed tiles - stoneware, earthenware or fine pottery
	690890 93 1	Glazed tile - white

	690890 93 3	Glazed tile - 6.5mm or < 6.5mm thick
	690890 93 9	Glazed tile - > 6.5mm thick
	690890 99 0	Glazed tile - other
812.21	691010 00 0	Sanitaryware - porcelain or china
812.29	691090 00 0	Sanitaryware - other ceramic

a) U.K. export statistics for ceramic tile in 1989 and 1990 (10 months to October)

The following export statistics for each product category were obtained from the U.K. Department of Trade and Industry Export Library, London:

6907100 00 0 Unglazed tiles, cubes < 7cm2 or 7 cm2

	1989				1990 (10 months to Oct)			
Country	m2	kg	PND	PND/m2	m2	kg	PND	PND/m2
Kenya	669	5,870	3,347	5.00	-	-	-	-

690790 10 0 Unglazed double tiles ("Spaltplatten")

Nil in 1989 and 1990

Note: in the Eurostat records 3 tonnes of tile were recorded as being sent to Uganda in this category.

690790 91 0 Unglazed setts, flags, hearth and wall tiles - stoneware

	1989				1990 (10 months to Oct)			
Country	m2	kg	PND	PND/m2	m2	kg	PND	PND/m2
Tanzania	-	-	-	-	4	3,000	2,182	545.50

690790 93 0 Unglazed setts flags, hearth and wall tiles - e/ware

Nil in 1989 and 1990

690790 99 0 Unglazed setts, flags, hearth and wall tiles - other

	1989				1990 (10 months to Oct)			
Country	m2	kg	PND	PND/m2	m2	kg	PND	PND/m2
Uganda	2,630	14,192	10,515	4.00	865	8,617	4,890	5.65
Kenya	33,776	571,436	127,559	3.78	6,118	128,452	44,947	7.35
Tanzania	1,983	22,125	9,152	4.62	1,600	20,680	6,400	4.00
Totals	38,389	607,753	147,226	3.84	8,583	157,749	56,237	6.55

690810 00 0 Glazed tiles, cubes 7cm2 or < 7cm2

	1989				1990 (10 months to Oct)			
Country	m2	kg	PND	PND/m2	m2	kg	PND	PND/m2
Uganda	28,201	52,500	145,669	5.17	-	-	-	-
Tanzania	800	4,600	4,600	5.75	-	-	-	-
Totals	29,001	57,100	150,269	5.18	-	-	-	-

690890 11 0 Glazed double tiles ("spaltplatten") - common

Nil in 1989 and 1990

690890 19 0 Glazed tiles. common pottery - other

Country	1989 m2	1989 kg	1989 PND	1989 PND/m2	1990 (10 months to Oct) m2	1990 kg	1990 PND	1990 PND/m2
Uganda	1,600	13,288	7,445	4.65	-	-	-	-
Kenya	-	-	-	-	1,308	11,445	9,040	6.91
Tanzania	-	-	-	-	103	1,985	1,830	17.77
Totals	1,600	13,288	7,445	4.65	1,411	13,430	10,870	7.70

690890 31 0 Glazed double tiles ("spaltplatten") common pottery

Nil in 1989 and 1990

690890 51 0 Glazed setts, flags, double tiles 90 cm2 or < 90 cm2

Country	1989 m2	1989 kg	1989 PND	1989 PND/m2	1990 (10 months to Oct) m2	1990 kg	1990 PND	1990 PND/m2
Kenya	-	-	-	-	111	889	1,672	15.06

690890 91 0 Glazed setts, flags. tiles 90 cm2 or < 90 cm2

Nil in 1989 and 1990

690890 93 1 Glazed white setts, flags. til

Country	1989 m2	1989 kg	1989 PND	1989 PND/m2	1990 (10 months to Oct) m2	1990 kg	1990 PND	1990 PND/m2
Kenya	-	-	-	-	1,820	26,615	7,494	4.11
Tanzania	556	2,310	1,668	3.00	-	-	-	-
Totals	556	2,310	1,668	3.00	1,820	26,615	7,494	4.11

690890 93 3 Glazed setts, flags, tiles 6.5 mm or < 6.5mm thick

Country	1989 m2	1989 kg	1989 PND	1989 PND/m2	1990 (10 months to Oct) m2	1990 kg	1990 PND	1990 PND/m2
Kenya	-	-	-	-	14,899	248,173	44,762	3.00

690890 93 9 Glazed setts, flags. tiles > 6.5 mm

Country	1989 m2	1989 kg	1989 PND	1989 PND/m2	1990 (10 months to Oct) m2	1990 kg	1990 PND	1990 PND/m2
Kenya	-	-	-	-	1,812	19,572	14,490	8.00

690890 99 0 Glazed setts, flags, tiles - stoneware, e/ware, other

Country	1989 m2	1989 kg	1989 PND	1989 PND/m2	1990 (10 months to Oct) m2	1990 kg	1990 PND	1990 PND/m2
Uganda	2,552	2,112	12,758	5.00	-	-	-	-
Kenya	445	5,112	3,187	7.16	2,250	74,780	44,625	19.83
Totals	2,997	7,224	15,945	5.32	2,250	74,780	44,625	19.83

The summary of the totals of all the different types of tile is:

Year	Uganda (m2)	Kenya (m2)	Tanzania (m2)
1989	34,983	34,490	3,389
1990 (10 month)	865	28,318	1,707

In all cases, the quantities of tile exported to the countries is very small but while the average monthly total for Kenya in 1990 appears to have been maintained at approximately 2,830 m2, very similar to 1989, the exports to Uganda have reduced to an insignificant amount in 1990. To determine whether this is due to reduced building activity in Uganda or simply a replacement of U.K. imports by imports from other countries, it was necessary to obtain the export statistics from the other European Community countries.

b) Eurostat 1989 Statistics of Tile Exports

The 1989 statistics for tile exports were obtained from the records of Eurostat at the U.K. Department of Trade and Industry Export Library, London.

Tonnes of tile (Value - ECU 1,000)

690710 00 0 Unglazed tiles, cubes 7 cm2 or < 7cm2

	EC12	UK	France
Zaire	1(1)		1(1)
Kenya	6(4)	6(4)	
Total	7(5)	6(4)	

690790 10 0 Unglazed double tiles ("spaltplatten")

	EC12	Germany	Denmark	UK
Zaire	33(23)	33(23)		
Ruanda	10(6)	10(6)		
Burundi	15(8)	15(8)		
Kenya	2(2)		2(2)	
Uganda	3(1)			3(1)
Total	63(40)	58(37)	2(2)	3(1)

690790 91 0 Unglazed setts, flags, tiles - stoneware

	EC12	Bel/Lux	Germany	France	Neth
Zaire	41(29)	4(2)	16(12)	21(15)	-
Tanzania	13(6)	-	-	-	13(6)
Total	54(35)	4(2)	16(12)	21(15)	13(6)

690790 93 0 Unglazed setts, flags, tiles - e/ware

	EC12	Bel/Lux	France	Denmark	Italy
Zaire	5(4)	5(4)			
Ruanda	15(10)		15(10)		
Kenya	53(22)			47(18)	6(4)
Total	73(36)	5(4)	15(10)	47(18)	6(4)

690790 99 0 Unglazed setts, flags, tiles - other

	EC12	Bel/Lux	Italy	UK
Zaire	718(224)	31(37)	687(187)	
Burundi	- (1)	- (1)		
Kenya	731(225)		159(36)	572(189)
Uganda	36(33)		22(18)	14(15)
Tanzania	43(25)		21(12)	22(13)
Total	1,528(508)	31(38)	889(253)	608(217)

690810 00 0 Glazed tiles, cubes 7 cm2 or < 7cm2

	EC12	B/Lux	Den	Germ	Fran	Italy	UK
Zaire	156(129)	68(89)		1(1)		87(39)	
Ruanda	43(16)					43(16)	
Burundi	1(1)				1(1)		
Kenya	1,060(465)					1,060(465)	
Uganda	134(256)					81(39)	53(217)
Tanzania	130(64)		2(1)			123(56)	5(7)
Total	1,524(931)	68(89)	2(1)	1(1)	1(1)	1,394(615)	58(224)

690890 19 0 Glazed setts, flags, tiles - common pottery

	EC12	B/Lux	Germ	Spain	Italy	UK
Zaire	547(179)	26(39)		521(140)		
Ruanda	3(3)	3(3)				
Burundi	33(24)			21(10)	12(14)	
Kenya	993(328)		3(3)	509(207)	481(118)	
Uganda	13(10)					13(10)
Tanzania	31(15)		10(7)	21(8)		
Total	1,620(559)	29(42)	13(10)	1,072(365)	493(132)	13(10)

690890 11 0 Glazed double tile ("spaltplatten") - common

No exports were made to this region

690890 31 Glazed double tiles

	EC12	Germany
Zaire	1(3)	1(3)
Tanzania	38(71)	38(71
Total	39(74)	39(74)

690890 51 Glazed setts, flags, tile < 90cm2

	EC12	Germany
Uganda	6(7)	6(7)

690890 91 Glazed setts, flags, tiles - stoneware

	EC12	B/Lux	Port	Germ	Spain	Fran	Italy
Zaire	764(197)	6(5)		25(29)	667(138)	53(19)	13(6)
Burundi	21(7)		21(7)				
Kenya	856(211)			1(1)	836(207)		19(3)
Tanzania	21(14)			9(6)			12(8)
Total	1,662(429)	6(5)	21(7)	35(36)	1,503(345)	53(19)	14(17)

690890 93 Glazed setts, flags, tiles - e/ware & fine pottery

	EC12	B/Lx	Germ	Spain	France	Italy	Neth	Port	UK
Zaire	823 (318)	71 (64)	7 (7)	529 (141)	2 (2)	51 (17)	32 (38)	131 (49)	
Ruanda	8 (4)	8 (4)							
Burundi	41 (17)					41 (17)			
Kenya	1,253 (350)		118 (51)	227 (78)		512 (121)			396 (100)
Uganda	30 (10)		9 (3)			21 (7)			
Tanzania	23 (14)				4 (4)	17 (7)			2 (3)
Total	2,178 (713)	79 (68)	134 (61)	756 (219)	6 (6)	642 (169)	32 (38)	131 (49)	398 (103)

690890 99 Glazed setts, flags, tiles - other

	EC12	B/Lx	Germ	France	Italy	Neth	Port	UK
Zaire	733	106		13	512		102	
	(331)	(88)		(35)	(181)		(27)	
Ruanda	104	11			84	9		
	(90)	(8)			(69)	(13)		
Burundi	66	3			63			
	(31)	(3)			(28)			
Kenya	1,074				1.069			5
	(473)				(469)			(4)
Uganda	26				22	2		2
	(35)				(15)	(1)		(19)
Tanzania	395	1	8		386			
	(189)	(1)	(2)		(186)			
Total	2,398	121	8	13	2,136	11	102	7
	(1,149)	(100)	(2)	(35)	(948)	(14)	(27)	(23)

Summary of tile exported into the region in 1989 from European Community

Country	Tonnes	ECU 1,000	Mean ECU/tonne
Zaire	3,822	1,438	376
Ruanda	204	136	666
Burundi	156	82	525
Kenya	6,028	2,080	345
Uganda	248	352	1,419
Tanzania	694	398	574

The above summary shows clearly that the actual imports of all types of tile, including glazed and unglazed wall and floor tiles, into Uganda is very small in comparison to the neighbouring countries and in addition the average price per tonne of product is far higher than in any of the other regional countries. While there are many different types of tile, of different thicknesses, which makes it very difficult to assess the exact square meterage from the above tonnage figures, one would expect a similar type of floor tile to wall tile proportions throughout the region and the average price per tonne should therefore not vary too much.

From the team's field work in Uganda and Kenya we do know that similar tile are used in both of these countries, therefore it appears that the normal process in Uganda of buying through agents in Europe, rather than directly from the manufacturers, is resulting in much higher prices being charged to the importers. Higher prices would obviously tend to depress the sales of ceramic tiles in Uganda, as the product is price sensitive and fewer people will be able to afford such items on the low salaries in Uganda. From our field work, some retailers in Kampala are willing to operate on lower profit margins than others and this probably accounts for the fact that prices of some types of tile are not too different in

Kampala than in Nairobi, despite the apparent higher import prices.

The European Community is the largest source of tiles for Uganda but from the field work carried out in the country, it is known that some tile are also purchased from the Middle East, Japan, Switzerland, Sri Lanka and Yugoslavia.

Standard wall tile, 150mm x 150mm x 5mm from Holland weigh 4.50kg per 22 tile, ie: 0.20 kg/tile and standard 152mm x 152mm x 5mm tile from the U.K. weigh 4.00kg per 18 tile, ie: 0.22kg per tile. If we therefore assume an average weight of 0.21kg per tile, this equates to approximately 9.3kg/m2 of wall tile. On this basis the 248 tonnes of wall tile imported into Uganda from the European Community in 1989 was equivalent to only:

<u>26,666 m2 of wall tile</u>

The amount imported from other countries would not amount to more than 25 per cent of this amount, ie: the total usage in Uganda in 1989 would be no more than:

<u>33,300 m2 equivalent of wall tiles</u>.

While it is accepted that the actual square meterage in this actual tonnage (of 248 tonnes) was quite different to this, as it included both lightweight mosaic tiles and heavy pavers in addition to the standard tiles, it does indicate quite clearly that the overall square meterage of standard wall tile equivalents used in Uganda is currently very small. It should be noted that the UK tonnage of imports in 1989 apparently comprised of a significant amount of lightweight tiles, which effectively increased the square meterage imported in relation to the actual tonnage imported, ie: 34,983 m2 for 82.092 tonnes.

This recent tile demand in Uganda, based on these import statistics is lower than that, which is indicated by the demand indicated from the building statistics within Uganda over the past few years and this must be considered by any potential investor in a new factory.

Using the same conversion factor of 9.3 kg/m2 to obtain standard wall tile equivalents for all the Kenyan imports from the European Community, we obtain a 1989 figure of:

<u>648,172 m2 equivalent of wall tile</u>

c) <u>Kenyan Government tile import statistics</u>

The latest published figures of tile imports were obtained from the Customs and Excise Department in December 1990 in Nairobi and cover the period to 15th June 1989 in the latest Annual Trade Report. The import, re-export and domestic export statistics for 1988 and the period from 1st January to 15th

June 1989 are as follows:

662440 Unglazed setts, flags and paving, hearth and wall tiles

Country	1989 (to 15th June) kg	1989 (to 15th June) Value (KSh)	1988 kg	1988 Value (KSh)
Spain	-	-	15,458	42,589
Germany FRG	-	-	3,000	3,523
Italy	227,990	937,146	65,000	270,415
U.K.	420,041	1,695,314	20,920	150,208
Germany DR	-	-	100,110	620,591
USA	300	1,460	-	-
China	-	-	16,313	44,040
Japan	-	-	272	40,155
Total	648,331	2,633,920	221,113	1,171,521

662450 Glazed setts, flags and paving, hearth and wall tiles

Country	1989 (to 15th June) kg	1989 (to 15th June) Value (KSh)	1988 kg	1988 Value (KSh)
Spain	10[illegible],400	456,162	615,863	2,660,187
Switzerland	873	15,000	-	-
Denmark	50,000	273,491	1,640	8,310
Germany FRG	105,599	814,601	771,821	4,286,854
Italy	714,651	2,590,915	1,288,850	3,809,055
Netherlands	-	-	37,840	248,788
U.K.	31,001	252,217	593,880	1,883,706
Czechoslovak	331,485	1,066,822	155,897	1,046,624
Germany DK	-	-	60,066	374,928
Rumania	-	-	1,162,728	3,604,050
UAE	3,520	48,969	1,000	5,188
China	166,800	872,700	498,407	2,124,958
India	-	-	129,000	445,000
Pakistan	-	-	123,105	994,426
Total	1,509,329	6,390,877	5,440,097	21,492,074
Total all tile	2,157,660	9,024,797	5,661,210	22,663,595
m2 equiv of wall tile	232,006		608,732	

On these figures the monthly average of 331,947 kg of all types of tile imports (floor and wall tile) is significantly lower than the imports in 1988, which averaged 471,767 kg/month, an approximate 30 per cent reduction. This fact was also confirmed by the field work in Kenya. Ceramic Industries (EA) Limited, the sole tile manufacturer in Kenya stated that due to the current building recession in Kenya, their sales of tile had fallen by 50 per cent in the last three months of 1990 and they expect this to continue into at least early 1991. They also noted that all tile importers had large unsold stocks and that the prices of imported tile were being reduced to try to increase sales. The current level of low sales for tiles at this factory was expected to continue for some time.

This fact must be considered in relation to the possible market for Ugandan produced tile in Kenya.

However we must compare the above figures with the Eurostat records, which for 1989 show a total of 6,028 tonnes being exported to Kenya in the full year from the Economic Community. From the Kenyan records, the amount imported from the European Community during the first 6.5 months of 1989 was only 1,654.7 tonnes, which means that a large volume must have been apparently imported during the latter half of the year, when building activity reduced. This may also explain the reports of high stocks being held by importers and the consequent reductions in tile prices in 1990.

d) <u>Re-exports of tile from Kenya</u>

These are minimal, no re-exports being recorded for the first 6.5 months of 1989 and 1,150 kg of tiles (Value KSh 26.754) being recorded as being re-exported to Uganda in 1988.

In terms of pieces, if we assume an average weight of a standard 150mm x 150mm wall tile to be 0.21 kg (9.3 kg/m2), the re-exports to Uganda in 1988 would amount to 5,476 pieces, or 124 m2 of wall tile.

In the first 6.5 months of 1989 120 kg of domestic tile exports were recorded as being sent to Uganda (Value KSh 6,000) with none recorded during 1988. In terms of pieces the 1989 domestic exports amount to 571 pieces, or 13 m2 of wall tile.

e) U.K. export statistics for ceramic sanitaryware in 1989 and 1990 (10 months to October)

691010 00 0 Ceramic sinks, washbasins, bidets, water closets, urinals, baths of porcelain & china

	1989			1990 (10 months to Oct)		
Country	kg	UK PND	PD/kg	kg	UK PND	PD/kg
Uganda	26,868	47,830	1.78	2,342	9,767	4.17
Kenya	367,746	571,059	1.55	367,830	838,826	2.28
Tanzania	1,606	12,906	8.04	4,537	17,760	3.91
Zaire	-	-	-	1,869	4,338	2.32
Totals	396,220	631.795	1.59	376,578	870,691	2.31

691090 00 0 Ceramic sinks, washbasins, bidets, water closets, urinals, baths of other ceramic

	1989			1990 (10 months to Oct)		
Country	kg	UK PND	PD/kg	kg	UK PND	PD/kg
Uganda	29,424	65,719	2.23	509	3,027	5.95
Kenya	30,579	81,450	2.66	55,295	138,454	2.50
Tanzania	6,444	24,208	3.76	32,208	59,227	1.84
Totals	66,447	171,377	2.58	88,012	200,708	2.28
Total all sanitary	462,667	803,172	1.73	464,590	1,071,399	2.31

The price per kilogram of product, which has been computed from the U.K. Government statistics is interesting, as it shows that the Ugandan importers are now paying much higher prices for most all the sanitaryware products than the importers in the neighbouring countries. In 1989 the types of ceramic sanitaryware, other than porcelain and fine china were cheaper in Uganda but currently are more expensive. The small consignment to Tanzania in 1989 has an unusually high price, which indicates that it was a special type of sanitaryware. The higher prices paid in Uganda are probably due to the fact that Ugandan importers often buy from wholesalers or agents in the U.K., rather than buying directly from the U.K. manufacturers. The mark-up of the intermediary is therefore included in the purchase price paid by the Ugandan importer. The resulting higher retail prices in Uganda will have the effect of reducing sales to a certain extent, although from our field work, this product tends to be less price-sensitive than for tiles because the purchaser is normally the builder of a new house and he specifies the design, the colour and frequently the actual manufacturer of the product he wishes to install in the house.

The average amount of sanitaryware imported from the U.K. per month in 1990 into the region has shown a significant increase over 1989 both in volume and value but there has been a sharp decrease in exports to Uganda. As other countries also export sanitaryware to Uganda we must also determine the imports from the .her countries to try to determine, whether this decrease is due to less new building or renovation. or whether this decrease is due to a replacement of U.K. imports by imports from other countries.

The U.K. Government statistics are in terms of weight of product imported rather than pieces of sanitaryware, which would be of more use in our pre-feasibility study. From our field work we identified the normal types of sanitaryware pieces on the market in the region and the average weight of each piece was estimated at 13.6 kg/piece. If we therefore convert the imports of sanitaryware into number of pieces using this conversion figure we have the following estimates:

691010 00 0 Ceramic sinks, washbasins, bidets, water closets, urinals, baths of porcelain & china

Country	1989 Pcs	1990 pcs (10 months to Oct)
Uganda	1,976	172
Kenya	27,040	27,046
Tanzania	118	333
Zaire	-	137
Total	29,134	27,688

691090 00 0 Ceramic sinks, washbasins, bidets, water closets, urinals, baths of other ceramic

Country	1989 Pcs	1990 pcs (10 months to Oct)
Uganda	2,163	37
Kenya	2,248	4,066
Tanzania	474	2,368
Total	4,885	6,471
Total sanitaryware from U.K.		
- region	34,019	34,159
- Uganda	4,139	209

f) Eurostat 1989 sanitaryware exports

Examination of the Eurostat records for 1989 gave the following import statistics into the region from the twelve countries of the European Community:

Eurostat 1989 - Tonnes of sanitaryware (Value ECU - 1,000)

691010 00 0 Sanitaryware of porcelain or fine china

Country	EC12	Bel/Lx	Spain	Denmk	France	Germany	Neth	Italy	Port	UK
Zaire	225(358)	42(103)	138(191)	-	5(28)	-	-	10(10)	30(26)	-
Ruanda	75(95)	22(40)	47(48)	-	-	6(7)	-	-	-	-
Burundi	11(31)	11(28)		-	-(3)	-	-	-	-	-
Kenya	457(1,065)	-	-	-	-	50(95)	-	39(120)	-	368(850)
Uganda	40(109)	-	-	-	-	-	-(1)	13(35)	-	27(73)
Tanzania	95(263)	36(47)	-	11(44)	-	24(63)	-	22(90)	-	2(19)
Totals	903(1,921)	111(218)	185(239)	11(44)	5(31)	80(165)	-(1)	84(255)	30(26)	397(942)

691090 00 0 Sanitaryware of other ceramic

Country	EC12	Bel/Lx	Spain	France	Germany	Greece	Italy	Port	UK
Zaire	182(407)	67(245)	-	9(60)	-	1(2)	53(69)	52(31)	-
Ruanda	14(59)	12(45)	-	-	-	-	2(14)	-	-
Burundi	3(11)	-(1)	-	-(1)	-	-	3(9)	-	-
Kenya	100(366)	-	-	-	-	-	69(244)	-	31(122)
Uganda	31(101)	-	1(2)	-	-(1)	-	1(3)	-	29(95)
Tanzania	72(147)	3(7)	-	-(2)	6(18)	-	36(69)	20(17)	7(34)
Totals	402(1,091)	82(298)	1(2)	9(63)	6(19)	1(2)	164(408)	72(48)	67(251)

Total sanitaryware from European Community 12 - region 1,305 tonnes (value ECU 3,012,000)
- Uganda 71 tonnes (value ECU 210,000)

On the basis of the normal sanitaryware range sold on the market in Uganda and Kenya, which was identified from the field work, the average weight per piece of sanitaryware is estimated at 13.6 kg.

Converting the tonnage figures from the 1989 Eurostat records we have the following breakdown of imports in terms of pieces of sanitaryware:

691010 00 0 Sanitaryware of porcelain or fine china

Country	Pieces 1989
Zaire	16,544
Ruanda	5,518
Burundi	809
Kenya	33,602
Uganda	2,941
Tanzania	6,985
Total	66,399

691010 00 0 Sanitaryware of other ceramic

Country	Pieces 1989
Zaire	13,382
Ruanda	1,029
Burundi	221
Kenya	7,353
Uganda	2,279
Tanzania	5,294
Total	29,558

Total sanitaryware imports into the region from the European Community - 1989

Country	Pieces 1989
Zaire	29,926
Ruanda	6,547
Burundi	1,030
Kenya	40,955
Uganda	5,220
Tanzania	12,279
Total	95,957

From the above, it is apparent that the regional market for sanitaryware is dominated by Kenya and Zaire. In addition to the imports from the European Community, Kenya imports from other countries and also has its own sanitaryware production unit, which is presently producing approximately 7,872 pieces per year. Together with sanitaryware imports from India, Eastern Europe and China, Kenya's total market appears to be in the region of 95,000 pieces per year. The details of the Kenyan market are discussed later in this section.

Uganda has the smallest market of the region apart from Burundi. Uganda imported 5.4 per cent of the total European Community exports to the region. From the statistics outlined previously and also from the fieldwork it is clear that the U.K. is the major supplier of sanitaryware to Uganda and it is known that the imports from the U.K. have shown a sharp decrease in 1990 from the 1989 figures. This indicates that the overall demand in Uganda has declined over the past year and this was confirmed by conversations with private builders in Uganda, who were finding it increasingly difficult to finance the construction of their houses due to constant price increases of all building materials.

g) Additional sanitaryware imports

From the field work we do know that some pieces of sanitaryware are imported into Uganda from China and Yugoslavia by retailers and these are estimated to be around 30 per cent of the total imports. It is also known that some sanitaryware is also imported by individuals and these are not normally recorded at the customs. This quantity is extremely difficult to estimate accurately but from conversations with many people during the field work we would estimate this quantity to be approximately 20 per cent of the total imports. On this basis the total quantity of imports into Uganda in 1989 may be assessed approximately as:

5,220/ 50% = 10,440 pieces

The Consultants did visit the Customs and Excise Statistics Department at the Ministry of Finance in Kampala to try to cross-check the export figures from Europe and elsewhere with the recorded import figures in Uganda. Unfortunately the records in Kampala are incomplete and are just in the process of being loaded on to a computer system. No records of 1989 or earlier years were available. The only records available for inspection were for a few months in 1990 and these indicated the following imports of sanitaryware:

Month	Pieces	Value (USh)		Source
Kampala office				
January	-	164,448		Italy
February	-	10,991		U.K.
March	-	109,735		Kenya
April	not available			
May	no sanitaryware imports			
Mbala office				
May	20 cisterns	1,037,496		Kenya
		207,500	(Import duty)	
		497,999	(Sales tax)	
		1,742,995		
	20 w/cs	229,446		Kenya
		45,890	(Import duty)	

$\underline{110,135}$ (Sales tax)
385,027

The above information unfortunately is of little use in estimating the demand of sanitaryware, as it is acknowledged by the Customs and Excise Statistics Department that the records are incomplete and under-record the level of imports by a significant amount, as smuggling is widespread. It is significant that the Ministry of Planning does not currently use the Customs and Excise import-export information in its assessment of the economy.

Because of this fact of being unable to cross-check external export figures with the domestic import figures, we must treat the estimated 1989 Ugandan sanitaryware import figure of 10,440 pieces with some reserve, as the estimated figure of imports from countries outside the European Community of thirty per cent of total imports is subjective. However, the Consultants feel that it will be in the right order of magnitude, as a number of builders and retailers quoted estimates around this figure. Similarly with the twenty per cent estimate of unrecorded imports from Kenya by the Ugandan authorities, this is a subjective estimate but is of the right order of magnitude.

The price of cisterns from the above Ugandan Customs and Excise figures appears to be USh 87,150 per piece and the price of water closets USh 19,251 per piece. These do not appear to be realistic, as the price of a water closet is normally higher than a cistern. The Consultants can therefore not rely on any of these figures to estimate demand or prices and must rely on other sources for this information.

h) <u>Kenyan statistics of sanitaryware imports and exports</u>

In order to try to cross-check the figures of the level imports from Europe and elsewhere, the Consultants visited the Customs and Excise Department at the Office of the Vice-President and Ministry of Finance in Nairobi to obtain the most up-to-date information on sanitaryware imports and exports. Other statistical information had also been obtained in Europe. The Kenyan statistical information is broken down on a slightly different basis as that in Europe and therefore is not directly comparable to the Commodity Code Numbers in use in the European Community.

SITC No. 812201 Lavatory Cisterns without toilet bowls
Direct imports

	1989 (to 15th June)			1988		
Country	Quantity (kg)	Value (KSh)	KSh/kg	Quantity (kg)	Value (KSh)	KSh/kg
Germany	-	-	-	20	815	40.75
Italy	9,485	944,409	99.57	150	4,866	32.44
U.K.	-	-	-	54,039	557,568	10.32
Czech	42,627	187,787	4.41	8,525	33,201	3.89
Rumania	-	-	-	43,550	424,173	9.74
Totals	52,112	1,132,196	21.73	106,284	1,421,023	13.37

SITC No. 812209 Other ceramic sanitaryware
Direct Imports

	1989 (to 15th June)			1988		
Country	Quantity (kg)	Value (KSh)	KSh/kg	Quantity (kg)	Value (KSh)	KSh/kg
Finland	-	-	-	10	8,201	820.10
Spain	1,182	125,167	105.89	-	-	-
Switzer	-	-	-	141	45,655	323.79
Germany	114	14,531	127.46	780	70,835	90.81
Italy	6,102	460,211	75.42	1,553	33,248	21.41
U.K.	245,425	8,648,554	35.24	258,203	12,114,758	46.92
Czech	57,333	314,095	5.48	55,325	292,517	5.29
Rumania	-	-	-	119,025	1,065,340	8.95
China	14,980	215,681	14.40	76,509	590,597	7.72
H Kong	-	-	-	2,160	297,837	137,89
India	227,910	3,008,121	13.20	253,621	2,397,793	9.45
Totals	553,046	12,787,160	23.12	767,327	16,516,615	21.52

The total sanitaryware imports into Kenya for 1988 and 1989 (to 15th June), which show a significant increase during 1989 at the current rates of imports are as follows:

1989 (to 15th June)		1988	
Kg	Value (KSh)	Kg	Value (KSh)
605,158	13,919,356	873,611	17,937,638

These can be compared to the Kenyan imports for 1986 and 1987, which were very similar to those in 1988:

1987		1986	
Kg	Value (KSh)	Kg	Value (KSh)
875,995	19,734,622	883,228	14,532,377

Earlier years were more erratic:

1985		1984	
Kg	Value (KSh)	Kg	Value (KSh)
1,118,863	20,021,851	353,016	6,282,438

If we convert these weight figures into units at an average estimated weight per piece of 13.6 kg, these statistics from Kenya give an estimated import figure of:

	Pieces
1984	25,957
1985	82,269
1986	64,943
1987	64,412
1988	64,236
1989	44,497 (in 6.5 months)

This figure for imports for the first 6.5 months of 1989 should be compared with the estimated 40,955 pieces of sanitaryware exported to Kenya from the European Community according to the Eurostat statistics for the 1989 year.

The Kenyan statistics give a total of 314,745 kg of sanitaryware from the European Community in 1988, which would equate to 23,140 pieces of sanitaryware or 36.0 per cent of the total imports of 64,236 recorded as being imported to Kenya (based on 13.6 kg/piece).

In the first 6.5 months of 1989 262,308 kg, or 19,287 pieces of sanitaryware have been imported by European Community countries, or 43.3 per cent of the total imports.

In the Kenyan Annual Trade Report for 1989 (1st January to 15th June) a note has been made in the explanatory notes that figures appearing in the report were compiled from documents received by the Statistical Branch and may not necessarily agree with the actual yearly trade, as some documents and/or adjustments may not have been received in the Branch by the time the report went for publication.

In view of this published statement, the Consultants feel that some under-recording of the figures is probable and the figure of 44,497 pieces for 1989 (6.5 months) should be looked on as a minimum figure, rather than an absolute figure.

The information we have for 1989 from the two sources is:

	Pieces	Pc/month
Exports to Kenya from European Community recorded by 12 Community countries	40,955	3,413
Imports recorded from European Community by Kenya in 6.5 months (262,308 kg)	19,287	2,967

As this information has been compiled from completely different sources and the average monthly import rate is comparable, bearing in mind the reservations that the Kenyans themselves have placed on their import figures, we can be reasonably confident that the figures from the European Community are fairly accurate.

The estimated 1989 Kenyan imports from other countries, based on a monthly average is:

342,850 kg/13.6 kg/pc x 12/6.5 = 46,554 pieces

The estimated 1989 Kenyan total sanitaryware imports from all sources is therefore:

46,554 + (3,413 x 12) = 87,510 pieces

However, this estimate is a substantial increase over 1988 (36.2%) and also the previous two years and assumes that imports in the second half of 1989 were at the same monthly rate as in the first 6.5 months of the year. This increase is probably not sustainable and the level of import could perhaps be expected to fall back closer towards the previous years' totals.

i) Kenyan re-exports

812201 Lavatory cisterns without toilet bowls

	1989 (to 15th June)			1988		
Country	Quantity (kg)	Value (KSh)	KSh/kg	Quantity (kg)	Value (KSh)	KSh/kg
Uganda	50	3,666	73.32	1,334	114,600	85.90

812209 Other ceramic sanitaryware

	1989 (to 15th June)			1988		
Country	Quantity (kg)	Value (KSh)	KSh/kg	Quantity (kg)	Value (KSh)	KSh/kg
Tanzania	20,747	137,937	6.65	1,404	141,817	101.01
Uganda	586	75,530	128.89	1,218	90,844	74.58
Total	21,383	213,467	9.98	2,622	232,661	88.73

j) Kenyan domestic exports

Although there are entries in the Annual Trade Report under this heading, we know from our field work in Kenya, that the sole manufacturer of sanitaryware in Kenya, Ceramic Industries (East Africa) Limited, does not export any of its products directly. The items under this heading must therefore actually be re-exports or exports of Ceramic Industries products by persons who have purchased the items from retail outlets.

812201 Lavatory cisterns without toilet bowls

	1989 (to 15th June)			1988		
Country	Quantity (kg)	Value (KSh)	KSh/kg	Quantity (kg)	Value (KSh)	KSh/kg
Ethiopia	-	-	-	45	8,000	177.78
Tanzania	50	1,500	30.00	20	970	48.50
Uganda	701	75,794	108.12	287	23,900	83.28
Zaire	-	-	-	144	19,200	133.33
Total	751	77,294	102.92	446	50,070	112.26

812209 Other ceramic sanitaryware

	1989 (to 15th June)			1988		
Country	Quantity (kg)	Value (KSh)	KSh/kg	Quantity (kg)	Value (KSh)	KSh/kg
Central Afr Rep	130	5,500	42.31	-	-	-
Ethiopia	640	43,600	68.13	33	1,860	56.36
Sudan	-	-	-	300	83,723	279.08
Tanzania	608	14,519	23.88	1,075	125,480	116.73
Uganda	3,203	139,275	43.48	5,187	221,217	42.65
Zaire	320	12,600	39.38	636	26,520	41.70
U.K.	-	-	-	3,200	119,800	37.43
Total	4,901	215,794	44.03	10,431	578,600	55.47

Grand totals re-exports and domestic exports to Uganda are:

	Kg	Pieces	Pc/month
1988	8,026	590	49
1989 (to 15th June)	4,540	334	51

From our field work in Uganda and Kenya, we know that some private builders do smuggle sanitaryware items into Uganda and these are not recorded in the Uganda statistics. The Uganda Customs and Excise accept that the majority are smuggled into the country. Although the Customs and Excise figures of Kenya are far better than those in Uganda, it would be expected that some of the people who do not declare items to the Ugandan authorities, do not declare them to the Kenyan customs either, in which case the Kenya re-export and domestic export figures would tend to be low.

As much of this cross-border trade by individuals is accepted as being unrecorded, we feel that our estimate of approximately 20 per cent of the total Ugandan sanitaryware imports being brought from Kenya (legally and illegally) in 1989, is a reasonable estimate, ie: approximately 2,088 pieces per year against a recorded figure of 612 based on the latest average of 51 pieces per month.

3 Factors affecting tile and sanitaryware demand in Kenya

a) Building and construction

The Building and Construction sector continued to perform well in Kenya in 1989, as indicated by increase in the sector's major indicators, including employment, total receipts for work completed by private contractors, plans approved by major towns and estimated cement consumption. The continued growth in the sector's activities was attributable to a 34 per cent increase in credit extended by commercial banks to private sector building and construction in 1989.

Real Trends in Building Construction 1985 - 1989

1982 = 100

	1985	1986	1987	1988	1989
Index reported private building	59.8	64.3	72.2	77.9	-
Index reported public building	31.7	12.1	16.3	14.6	-
Cement consumption (1,000 tonnes)	610.1	702.4	890.3	854.0	1,014.5
Cement index	105.3	121.2	149.3	147.3	175.0
Employment (1,000)	49.9	55.9	58.1	62.6	67.4
Employment index	82.6	92.2	96.2	103.6	111.6

The provisional data from the Business Expectations Enquiry (BEE) show that the sector recorded a growth of 11 per cent in total receipts for work done by private contractors in 1989. Total receipts increased from KPND 238 million in 1988 to KPND 264 million in 1989 with building construction recording a growth of 27 per cent in receipts from KPND 111 million in 1988 to KPND million in 1989.

The total value of plans approved by Nairobi City Council (NCC) and other major towns recorded a growth of 7 per cent in 1989 as compared with 22 per cent in 1988. The slower growth in total value of plans was partly attributable to a decline in the value of reported plans by other towns.

Value of building plans approved 1985 - 1989

KPND million

Year	Nairobi	Other towns	Total
1985	57.60	54.53	112.13
1986	78.44	65.38	143.82
1987	111.82	90.81	202.63
1988	148.38	98.93	247.31
1989 (provis)	198.36	65.63	263.99

Nairobi continued to show strong growth of 34 per cent in 1989 and therefore remains the main market for tile and sanitaryware products.

A comparison of value of private plans approved and building completions in the main urban centres is interesting in that it shows that the value of reported approvals completed was about 24 per cent of the approvals in 1985 but this has now declined to about 16 per cent during the 1986-89 years.

Year	Plans approved	KPND million Building work completed
1985	110.70	26.57
1986	141.82	21.80
1987	202.15	33.49
1988	247.31	40.74
1989	263.99	40.38

The amount of work completed in 1989 was slightly less than that in 1988. although the level of plans approved was higher but this indicates that the demand for tiles and sanitaryware could be stabilizing or falling. if this trend continues.

The trend analysis of the value of reported completions by five main towns for the past five years shows that Nairobi accounts for over 50 per cent of the total value and Mombasa about 25 per cent.

				KPND million		
Year	Nairobi	Mombasa	Kisumu	Nakuru	Eldoret	Total
1985	13.2[illegible]	14.04	-	1.73	0.93	29.90
1986	14.30	7.61	0.18	2.38	0.38	24.85
1987	21.78	11.73	0.23	2.77	-	36.51
1988	26.24	14.35	1.10	3.85	0.38	45.92
1989	26.50	11.89	2.54	3.87	-	44.80

The above clearly indicates that any marketing effort for sanitaryware and tile products from a factory in Uganda should be concentrated in Nairobi and Mombasa, which together account for over 80 per cent of the building activity.

If we analyse the type of buildings being completed in the private and public sectors, it is apparent that the vast majority are residential. Since 1985 a total of over 5,500 units were completed by private developers, of which 93 per cent were residential units.

Completions of new private buildings 1985 -1989

	Number		Estimated cost KPND million		
Year	Residential	Non-res	Residential	Non-res	Total
1985	578	76	10.66	15.91	26.57
1986	1,078	67	16.83	4.97	21.80
1987	1,042	82	18.01	15.48	33.49
1988	1,466	85	27.10	13.64	40.74
1989	1,019	92	26.13	14.25	40.38

Completions of new public buildings 1985 -1989

Year	Number		Estimated cost KPND million		
	Residential	Non-res	Residential	Non-res	Total
1985	116	34	0.33	0.76	1.09
1986	184	18	2.97	0.82	3.79
1987	150	26	1.65	0.79	2.44
1988	167	22	2.31	0.81	3.12
1989	158	24	1.98	0.80	2.78

The above shows that the building sector is dominated by the private sector and that the public sector houses are less expensive, which indicates that they are concentrating on the low cost housing, while the private sector is concentrating more on the high cost housing, which is the housing more likely to use sanitaryware and tiles.

Approved and actual Central Government expenditure on housing development is outlined below:

Year	KPND million		Approved Expenditure as % of Development Expenditure
	Approved	Actual	
1985/6	9.03	8.46	2.30
1986/7	8.41	7.16	2.20
1987/8	7.33	7.48	1.20
1988/9	19.18	19.18	2.00
1989/90	12.42	-	1.30

Although the expenditure approved has been higher in the past two years than in previous years, it only accounts for 1.30 per cent of the total development expenditure of the budget. This indicates that the Government is placing a low priority on supplying the housing needs of the country through the public sector and is relying on the private sector to generate the numbers of housing units required. As the private sector is apparently succeeding to do this from the information outlined, it indicates that there should be a continuous and strong demand for sanitaryware and tiles in Kenya.

The National Housing Corporation, in its effort to alleviate the housing problem in most of the urban centres, completed a total of 1,005 units in 1989, an increase of 776 units over 1988, reversing a downward trend discernible since 1985.

Housing units completed by the National Housing Corporation

Province	1985	1986	1987	1988	1989
Nairobi	-	-	85	-	367
Coast	50	-	50	-	-
North-Eastern	-	-	-	-	-
Eastern	-	253	248	-	-
Central	45	95	111	166	149
Rift valley	745	115	41	63	105
Nyanza	169	152	40	-	384
Total	1,009	615	575	229	1,005

Source: National Housing Corporation

In addition to the schemes completed 15 housing schemes are under construction in 13 towns.

Through "the Rural Housing Loans Scheme", which has been in existence for over 20 years, NHC has advanced loans amounting to KPND 12.4 million to 7,263 beneficiaries for the construction of rural residential houses. The amount advanced since 1985/6 shows a downward trend from KPND 1.8 million to KPND 0.3 million in 1988/9, with the corresponding number of beneficiaries declining from 731 to 96 during the period. The decline was attributable to limited funds being allocated to the scheme. This decline in the number of rural houses being built will not, however affect the demand for tiles and sanitaryware, as this type of house does not normally have piped water and the people cannot afford these products.

Housing units constructed by Ministry of Works and Housing

	1983/4	1984/5	1985/6	1986/7	1987/8	1988/9
Institutional Units built	596	457	621	453	383	438
Cost/unit (KPND 1,000)	82.9	13.8	12.5	18.3	6.1	15.0
Pool Housing Units built	372	-	5	14	-	8
Cost/unit (KPND 1,000)	4.9	-	17.7	18.0	-	43.1

Source: Ministry of Works and Housing

Overall, from the information available on the building industry over the past five years, it would seem that the private housing sector is continuing to show growth in the Nairobi area, although the rate of growth has declined recently. However the number of completions in Nairobi has actually doubled in the five year period, while Mombasa has declined by 15 per cent in the same period. Although Ceramic Industries (East Africa) Limited, the local tile and sanitaryware has noticed a slow-down in tile orders in 1990, which they attribute to a building recession, it is apparent that much building is still taking place and demand for sanitaryware is particularly strong. The local company is still selling all of its sanitaryware production, which indicates that the recession is not severe.

The summary of the numbers of buildings recorded as being completed in 1989 is:

Private buildings	1,111
Public buildings	182
National Housing Corporation	1,005
Ministry of Works & Housing	446
Total	2,744

Unfortunately we do not have the details of how many individual dwelling units or flats are included in the above buildings. In Nairobi many apartment buildings are being built, which will considerably increase the number of individual living units.

In terms of sanitaryware and tile requirements for the above buildings, it is not possible to estimate them with any degree of accuracy from this information but for absolute minimum quantities, if all of the buildings only have one living unit, this would equate to:

Sanitaryware	21,952 pieces per year
Wall tiles	93,296 m2/year
Floor tiles	60,368 m2/year

With an estimated average of two or three dwelling units per building, the requirements of sanitaryware and tiles would increase by approximately the same factor. However this cannot be an accurate estimation, as the breakdown of the precise building types and quantities of each type were not available.

The average floor area of the 1,042 private residential buildings completed in 1987 amounted to 153 m2, which indicates at least two family dwellings per building. In 1988 the average floor area of private residential buildings amounted to 140 m2.

The number of habitable rooms per building can also be used as an approximate indicator of the number of the number of family dwellings per building and the following information was obtained for Nairobi for the period 1984-88.

Analysis of reported new residential buildings. Nairobi

Habitable rooms	1984	1985	1986	1987	1988
1	12	47	1	-	48
2	120	4	53	83	78
3	256	76	95	66	242
4	110	77	103	172	140
5	84	45	19	75	78
6 or more	56	41	219	150	288
Total	638	290	490	546	874

Source: Central Bureau of Statistics

A habitable room is defined to mean a room used for the purpose of working, living or sleeping other than kitchen, bathroom, lavatory, laundry room etc.

For the purpose of this indicated demand we will assume that from 1 - 3 habitable rooms will be occupied by a single family unit, 4 - 5 habitable rooms by two family units and 6 or more by three family units. Very approximately, therefore, on this basis, the number of family units would be of the order of:

Estimated number of family units based on habitable rooms

Habitable rooms	1984	1985	1986	1987	1988
1	12	47	1	-	48
2	120	4	53	83	78
3	256	76	95	66	242
4	220	154	206	344	280
5	168	90	38	150	156
6 or more	168	123	657	450	864
Total	944	494	1,050	1,093	1,668
Ratio of family units: building	1.5	1.7	2.1	2.0	1.9

On this, what must be admitted is a very approximate indicator, we can obtain a general idea of possible sanitaryware and tile requirements by using the generated ratio of family units to buildings as a guide. Based on the 1989 figures the annual requirements would therefore be at least:

Sanitaryware	43,904	pieces per year
Wall tiles	186,592	m2/yr
Floor tiles	120,736	m2/yr

Information on the costs of the private residential building plans approved by Nairobi City Commission, compared to the number of plans involved gave the following:

	1984	1985	1986	1987	1988
No. residential plans	859	876	611	743	751
Estimated cost (KPND 1,000)	16,000	31,973	26,657	49,853	65,853
Cost per plan (KPND 1,000)	18,600	35,500	43,600	67,100	87,700

If we compare these costs per plan for the private sector with those for the costs per house built by the National Housing Corporation in Nairobi we can try to determine the possible number of individual living units per plan. The National Housing Corporation built 284 houses in Nairobi in 1984 costing over KPND 3,000 per unit and a further 85 in 1987 costing KPND 15,900 per unit. In 1989 367 NHC units were built at a cost of KPND 11,700 per unit. The private sector cost per plan in 1984 was approximately six times the comparable NHC cost and in 1987 was four times the NHC cost. Comparing the 1989 NHC cost of KPND 11,700 per unit with the 1988 figure for private plans, which are the latest available, the cost ratio is over seven.

This indicates that the number of family units per private residential completion could be somewhere in the ratio from four to seven, dependent on the level of finish given to the private units, compared with the NHC units.

If we take this further factor into consideration, the estimated demand of sanitaryware and tiles generated from the number of habitable rooms per building is probably conservative. Taking the lower ratio of 4 family units per dwelling gives an indicated demand of:

Sanitaryware	87,808	pieces per year
Wall tile	373,184	m2 per year
Floor tile	241,472	m2 per year

This estimated demand however can only be taken as an order of magnitude, as we have no actual precise figure of the number of family units and have had to generate an estimate from other related information, which was available.

b) Water supplies

In 1974 the Kenyan Government launched the National Master Water Plan with the aim of ensuring that every household had potable water within a distance of 4 km by the year 2000. In order to achieve this objective the Government, through the Ministry of Water Development and donor agencies, embarked upon the establishment of water supply projects, sinking of boreholes and construction of catchment dams. By the first quarter of 1990 330 water projects were operational, out of which 220 were rural. A further 665 projects are at various stages of implementation. In the 1989 -1993 Development Plan however, it is noted that the original target has proved difficult to achieve due to scarcity of qualified manpower, financial resources and problems related to the implementation of projects.

To supplement the Ministry's efforts the National Water Conservation and Pipeline Corporation (NWCPC) was established in 1988 with the ultimate aim of taking over the construction and operation of major water projects in the country. Their current projects are the two Greater Nakuru Water projects and the Kilimanjaro-Machakos project.

The task of providing water requires substantial amounts of investment and given the limited resources at its disposal the Ministry of Water Development has had to reallocate funds to projects yielding higher returns. The development expenditure on water and related services has shown a downward trend since 1986/7:

Development expenditure on water supplies and related services

KPND 1,000

	1985/6	1986/7	1987/8	1988/9	1989/90
Water development	247	5,027	1,543	86	131
Training of staff	144	599	25	10	93
Rural water supplies	10,972	13,637	8,646	8,155	7,063
Self-help water	8,028	5,045	1,363	767	404
County Council & urban water	11,536	11,396	3,041	4,715	692
Misc. & special programmes	4,394	4;173	3,684	3,656	1,896
Total	35,321	39,877	18,302	17,389	10,279

Source: Ministry of Water Development, Nairobi

This sharp decline in development expenditure has been extremely severe in the urban areas, so that the majority of the funding could be allocated to the rural areas. No new projects are to be initiated until on-going projects are completed.

The effects of this policy on the future demand of sanitaryware and tiles will be to reduce the potential growth in demand, as fewer housing units in the urban areas will be able to connect to the water and sewage systems. We must therefore bear this fact in mind, when estimating future demand for these products.

c) Population growth

The projected urban and rural population in Kenya is expected to be:

	1988	1989	1990	1991	1992	1993 (million)
Urban	4.0	4.3	4.6	4.9	5.2	5.6
Rural	18.7	19.2	19.8	20.4	21.0	21.6
Total	22.7	23.5	24.4	25.3	26.2	27.2
% Urban	17.6	18.3	18.9	19.4	19.8	20.6

The continued flow of people from the rural to urban areas will place a high demand for the provision of water and sewage systems and increased housing but this demand is well in excess of the local authorities' ability to provide them.
An increase in the level of overcrowding and in the numbers of slum houses is therefore expected over the next few years. The actual rise in demand for sanitaryware and tiles generally is linked more to the provision of water supply systems, rather than the overall increase in the urban population.

Approximately 38,000 new households are added to the urban areas each year increasing the demand for housing to over 60,000 units per annum, compared with the 1986 supply of approximately 40,000 units (Source: Development Plan 1989 - 1993). With only 3 per cent of GDP being invested annually in housing, of which less than half is in modern dwellings, the financial burden of closing the gap becomes considerably heavy for the Government.

From these figures we know that less than 20,000 of the urban units built are modern dwellings and some of these will not have access to piped water supplies. If half of these, ie: approximately 10,000 have access to piped water and install water borne sewage systems, the demand for sanitaryware would be in the region of:

80,000 pieces per year

The tile demand, based on this estimate would be approximately:

Wall tile	340,000 m2/year
Floor tile	220,000 m2/year

This sanitaryware estimate is higher than the estimate based on the import figures and local production (72,000) but is lower than that estimated from other housing statistics (87,000). Like the latter, the estimate cannot be considered as an accurate figure, only an order of magnitude, as the prime data is not accurate enough. We will therefore use the more accurate figure generated from the import statistics for determining the size of the proposed new factory.

d) Housing Finance

One of the constraints to housing development in Kenya has been the shortage of and inaccessibility to funding for the middle and low income groups even where funds are actually available. However the number of institutions involved in housing finance has increased considerably over the past ten years. Apart from finances through the National Housing Corporation, the Housing Finance Company of Kenya (HFCK) and Savings and Loans Limited, which are the major parastatals in the field, the number of private building societies had increased to over 30 by 1987. These have provided long-term mortgage lending over 5-25 years with interest rates between 13-19 per cent.

The current (January 1991) interest rate charged by HFCK is 19 per cent calculated on a monthly reducing balance method. HFCK first obtains a valuation fee, amounting to KSh 2,500 on the first KSh 300,000 of the purchase price and an additional KSh 350 per every KSh 100,000 thereafter. It is prepared to lend up to 90 per cent of the valuation price over a maximum period of 18 years. Loans cannot exceed three times annual gross income of the borrower. It should be noted that Government Stamp Duty of 6 per cent of purchase price and 0.5 per cent duty on the mortgage are payable by the borrower. Providing the borrower can meet all of the normal conditions, loans are normally approved within 30 days. HFCK currently has 8,639 mortgages.

The Savings and Loan Kenya Limited currently (January 1991) charges 19.5 per cent interest and lends up to a maximum of 70 per cent of the property valuation over a period up to 25 years for loans up to KSh 350,000. Loans above KSh 350,000 have a maximum 20 year repayment period. A 1.0 per cent appraisal fee is charged to the borrower.

In order to increase the funds for housing loans, the Kenya Government introduced Housing Development Bonds in 1981. The main attraction is that interest on these bonds is tax free (except for withholding tax).

The situation in Kenya, in regard to the availability of long-term housing finance at realistic rates, is therefore far better than in Uganda, where there are no building societies and where the Housing Finance Corporation only lends to investor-builders, never to owner-occupiers. The Kenyan new house market is therefore expected to continue to grow on a long-term basis. Hence the market for sanitaryware and tiles should also grow, as only permanent houses are given mortgage financing and these are the types of houses, which have wate borne sanitation installed, if piped water is available.

The Government will continue to build houses for civil servants in difficult rural areas but Government policy in enabling civil servants to have access to housing will generally be geared to providing housing loans. This will therefore also assist in the development of the housing market.

e) Availability of land

Scarcity of land in urban areas has been recognized as a constraint to the development of housing. Where available. its ever increasing cost has adversely affected initiatives on the part of individuals and private developers to invest in more housing. Insecurity of land tenure has proved to be one of the key causes of slum creation. These problems are being addressed by the Land Commission

4. Current retail prices in Kenya

As in Uganda, Kenya has high import duties on ceramic tile and sanitaryware products, which have the effect of reducing demand. The current duty rates January 1991) are:

	Duty %	VAT %
Ceramic tiles, unglazed % glazed	80	18
Vinyl tiles & plastic tiles	80	18
Ceramic lavatory cisterns, with or without toilet bowls	75	18
Ceramic sanitaryware - other	45	18
Plastic cisterns	80	18

The surprise about the above rates is that apart from the lavatory cisterns, which have a duty of 80 per cent, all other ceramic sanitaryware products have a much lower duty of 45 per cent. This is still a deterrent rate however and would give some protection to the local producer. It is interesting to note that, although imported tiles have a duty of 80 per cent in addition to transport charges, the local producer charges a price only just below the imported price. As tile sales of the factory have slumped by 50 per cent, the local producer with only 10 per cent of the market, cannot reduce prices to maintain volume. This indicates high production costs per unit. In the event of the duty rate being reduced in Kenya, the factory would probably not be able to compete with the lower import prices. The question of high tariff rates must therefore be considered by any potential investor in Kenya or Uganda, as retail prices would certainly fall in these countries, if tariff rates were reduced, even if retailers took the opportunity to increase profit margins a little at this time.

For most sanitaryware items, the combination of a 45 per cent import duty plus 18 per cent VAT leads to approximately the same total surcharge on the product as in Uganda.

A wide range of retailers selling tiles and sanitaryware were visited in the Nairobi area to obtain the current retail prices (November 1990 to January 1991), the most important of the shops being:

a) Sonic Importers & Exporters

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Ceramic wall tile	150 x 150	Germany	8.50	374
		Rumania	8.50	374
		China	8.50	374
Washbasin	small	India	500	
Corner washbasin	small	India	600	
Washbasin	medium	India	750	
Asian toilet		India	550	
Water closet		India	750	
Plastic seat		India	300	
Urinal	small	India	550	
Cistern - plastic		U.K.	1,500	
Cistern - ceramic		Kenya	2,500	
Cistern - marble		Kenya	2,500	

Only white sanitaryware and white tiles are sold normally because of the difficulty of obtaining matching colours for replacements. Ceramic floor tile are not stocked, as there is no demand for them, according to the management.

The locally made ceramic cisterns in the shop were of poor quality, all having serious glaze finish defects. Approximately 50 per cent of all cisterns delivered were normally returned to the factory, despite previous complaints because of defects even more serious than those evident in the units on show in the store.

b) Ceramic Industries (East Africa) Limited

The factory sells its products to both individuals, as a retailer and to retailers, as a wholesaler. Current prices are:

	Price (KSh)
Water closet (P trap & S trap)	380 (was 400 in 1990)
Medium washbasin	420
Small washbasin	380
Cistern & lid (without fittings)	650
Wall tiles 150 x 150mm	6.30, (277/m2)

Only white sanitaryware is manufactured and the quality of the glaze finish is poor, which was also stressed by retailers in Nairobi. The current products can only compete at the bottom segment of the market against the products from India and China, which generally are of a better quality than the locally made products.

c) Hermes Enterprises Limited

The cultured marble, resin-bonded sanitaryware wholesale prices from this local manufacturer are:

	Price (KSh)
Counter-top basins - small	1,940
- medium	2,800
- large	3,390
Wall mounted basins	2,000
fleur-de-lys with pedestal	4,530
monarch with pedestal	5,700
Vanity basin - small	4.920
- medium	6,170
Water closet & cistern c/w toilet seat & cover	7,920
Bidet	5,660
Asian toilet (bowl & trap)	1,030

All of the above prices for resin-bonded sanitaryware are well above the prices for the ceramic products from Ceramic Industries (East Africa) Limited but the quality is far better, the designs more modern and the company has a wide choice of shapes and colours. The company only sells at the top segment of the market, which is dominated by the imported sanitaryware.

d) H & H Services Hardware

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Ceramic wall tile	150 x 150	Various	12.50	550
coloured	150 x 150	Italian	18.50	814
Ceramic floor tile	100 x 200	Italian	28	1,400
Ceramic floor tile	200 x 200 10mm thick	Italian	48	1.200
Ceramic floor tile	240 x 240	Italian	60	960
Asian toilet		Chinese	650	
Water closet		Chinese	750	
Water closet		U.K.	2,050	
Washbasin	medium	Chinese	800	
Plastic cistern		Taiwan	600	
Plastic cistern		U.K.	1,500	
Suite c/w bath & 4 pc		U.K.	38,000	

e) Buildware Supplies

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Vinyl floor tile	300 x 300	Kenya		
	2mm thick		22.22	244
	1.5mm thick		16	176
Washbasin	small	India	500	
Washbasin	small	U.K.	1,300	

f) Barco (Kenya) Hardware

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Vinyl floor tile	200 x 200	Kenya		
	1.6mm thick		7.16	179
	2.0mm thick		14.00	350
Ceramic wall tile	150 x 150	Germany	8.50	374
Washbasin	small	U.K.	1,500	
Washbasin	small	U.K.	1,100	
Ceramic cistern		U.K.	3,800	
Plastic cistern		U.K.	1,700	
Water closet		U.K.	1,800	

g) Alibha Shariff & Sons Ltd

Product	size (mm)	Origin	Price/pc (KSh)
Washbasin	medium	U.K.	1,595
Water Closet, Cistern & seat		U.K.	5,900

h) Serco Hardware

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Vinyl floor tile	300 x 300	Kenya	17	187
Ceramic wall tile	150 x 150	Various	7.50	330
Washbasin	small	Czech	970	
Washbasin	small	India	550	
Washbasin	small	Kenya	650	
Washbasin	medium	U.K.	5,500	
Washbasin	medium	Kenya	950	
Ceramic cistern & fittings		U.K.	3,200	
Plastic cistern		U.K.	1,400	
Water closet		Kenya	650	
Water closet		U.K.	1,250	
Asian toilet		India	550	
Urinal		India	650	

i) Atlas Hardware

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Vinyl floor tile	300 x 300	Kenya	18.00	198
-light	250 x 250	Kenya	14.73	236
- dark	250 x 250	Kenya	14.15	226
Ceramic wall tile	150 x 150	Turkey	8.50	374
Washbasin	12 x 18in	Indian	480	
Washbasin	12 x 18in	U.K.	1,400	
Washbasin	22 x 16in	Indian	650	
Washbasin	22 x 16in	U.K.	1,950	
Pedestal		U.K.	1,550	
Ceramic cistern & fittings		Indian	2,600	
Plastic cistern		U.K.	1.350	
Water closet		Indian	700	
Water closet & complete cistern		U.K.	8,500	
Asian toilet		India	480	
AT plastic cistern		India	1,470	
Urinal		India	550	
Urinal, cistern & fittings		India	3,900	

j) Doshi Ceramics Limited (Doshi Hardware Group)

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Ceramic wall tile	150 x 150	Spain	17	748
	150 x 150	E. German	12	528
-coloured	150 x 150	Spain	24	1,056
-coloured	100 x 100	Spain	10	1,000
-plain	150 x 200	Spain	26	858
-coloured	150 x 200	Spain	34	1,122
Ceramic floor tile	300 x 300	Spain	92	1,012
	300 x 300	Czech	92	1,012
	200 x 200	Spain	37	925
Wentworth range				
Water Closet		U.K.	6,275	
Cistern & fittings		U.K.	7,000	
Plastic seat/cover		U.K.	1,320	
Washbasin	590 x 475	U.K.	3,500	
Pedestal		U.K.	2,750	
Tabletop basin		U.K.	8,800	
Tabletop basin		U.K.	6,275	
Bidet		U.K.	9,600	
Concept range				
Water closet		U.K.	19,800	
Cistern & fittings		U.K.	11,000	
Plastic seat/cover		U.K.	5,900	
Washbasin	680 x 525	U.K.	17,000	
Pedestal		U.K.	5,500	
Bidet		U.K.	13,200	

Galerie range

Water closet		U.K.	6,275
Cistern & fittings		U.K.	7,000
Plastic seat/cover		U.K.	1,320
Washbasin	600 x 440	U.K.	3,500
Pedestal		U.K.	2,750
Tabletop basin	610 x 510	U.K.	8,800
Tabletop basin	585 x 420	U.K.	6,275
Bidet		U.K.	9,600

k) Ageca (East Africa) Limited

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Ceramic wall tile	150 x 150	Italy	8.50	374
-coloured	200 x 200	Italy	36	900
-coloured	100 x 200	Italy	18	900
-coloured	100 x 100	Italy	12	1,200
-hexagonal	150 x 150	Italy	18	792
Resin water closet		Kenya	11,000	
Resin washbasin & pedestal, fittings		Kenya	8,500	

l) Avon Rubber

Product	size (mm)	Origin	Price/pc (KSh)	Price/m2 (KSh)
Vinyl Floor tile	300 x 300	Kenya		
-black	2.7 thick		68	748
-brown	2.7 thick		68	748
-neutral	2.7 thick		71	781
-red	2.7 thick		76	836
-black	4.0 thick		75	825
-brown	4.0 thick		75	825
-neutral	4.0 thick		84	924
-red	4.0 thick		90	990

<u>Summary of tile and sanitaryware prices in Kenya</u>

a) <u>Tile prices</u>

	Price range (KSh/m2)
Ceramic wall tiles 150 x 150mm white	277 - 528
Normal average selling price	374
Ceramic wall tiles - coloured	374 - 1,200
Normal average selling price	900
Ceramic floor tile	925 - 1,400
Normal average selling price	1,000
Vinyl floor tile	179 - 925
Normal average selling price	200

b) Sanitaryware prices

	Price range (KSh/pc)
Medium washbasin	420 - 17.000
Normal average selling price	1.600
Pedestal	1.550 - 5.500
Normal average selling price	2,750
Small washbasin	480 - 4.920
Normal average selling price	900
Water closet	380 - 19.800
Normal average selling price	1,20
Cistern	650 - 11.000
Normal average selling price	3,000
Plastic cistern	1.350 - 1.700
Normal average selling price	1,500
Asian toilet	480 - 650
Normal average selling price	550
Urinal	550 - 650
Normal average selling price	550
Bidet	5.660 - 13.200
Normal average selling price	9.600

5. Estimated level of market share in regional countries

The estimated level of market share in Kenya is:

Wall tile	5% x 350.000 m2	=	17,500 m2/year
Floor tile	3% x 230,000 m2	=	6,900 m2/year
Total tile		=	24,400 m2/year
Sanitaryware	7% x 72,000 pc	=	5,000 pc/year

The estimated level of market penetration, which is possible in the other regional countries is estimated at 5 per cent of the total market for both tiles and sanitaryware, ie:

Country	Total tiles m2/year	5% market share
Zaire	535,806	26,790
Tanzania	97,312	4,866
Ruanda	28,602	1,430
Burundi	21,828	1,091
Total	683,548	34,177

Country	Total sanitayware pieces/year	5% market share
Zaire	46,686	2,334
Tanzania	19,156	958
Ruanda	10,214	511
Burundi	1,607	80
Total	77,663	3,883

For the purposes of sizing the factory, however the team decided to use only the Ugandan and Kenyan markets, the other regional markets being treated as a safety reserve, in case difficulties arose at any time with the Kenyan market.

The team therefore estimates that 50 per cent of both the tile and sanitaryware production of the new factory could be exported into the region on a consistent basis, as any shortfall in exports to Kenya can be made up by exporting to the other regional countries.

APPENDIX C

COMFAR FINANCIAL AND ECONOMIC COST BENEFIT ANALYSES FOR NEW FACTORY AT MBARARA OR KAMPALA

APPENDIX C FINANCIAL AND ECONOMIC ANALYSES FOR NEW FACTORY

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COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Uganda Tiles and Sanitaryware
March 1991
New Factory in Mbarara or Kampala

2 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: US dollars

Total initial investment during construction phase

fixed assets:	4859343.00	68.439 % foreign
current assets:	0.00	0.000 % foreign
total assets:	4859343.00	68.439 % foreign

Source of funds during construction phase

equity & grants:	3559343.00	56.912 % foreign
foreign loans :	1300000.00	
local loans :	0.00	
total funds :	4859343.00	68.439 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	472569.60	553437.40	614081.00
depreciation :	466834.30	466834.30	466834.30
interest :	187000.00	187000.00	184768.00
production costs	1126404.00	1207272.00	1265683.00
thereof foreign	73.05 %	71.42 %	70.23 %
total sales :	1224062.00	1600687.00	1883126.00
gross income :	-737685.40	86445.50	256309.40
net income :	-737685.40	86445.50	256309.40
cash balance :	224239.90	528253.50	640027.90
net cashflow :	411239.90	715253.50	889148.80

Net Present Value at: 12.00 % = 211071.50
Internal Rate of Return: 12.75 %
Return on equity1: 4.43 %
Return on equity2: 12.72 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in US dollars

Year	1991.1	1991.2	1992.1	1992.2
Fixed investment costs				
Land, site preparation, development	9000.000	0.000	0.000	0.000
Buildings and civil works	0.000	930000.000	295000.000	0.000
Auxiliary and service facilities	0.000	0.000	230000.000	0.000
Incorporated fixed assets	0.000	0.000	0.000	0.000
Plant machinery and equipment	693000.000	2080000.000	0.000	0.000
Total fixed investment costs	702000.000	3010000.000	525000.000	0.000
Pre-production capital expenditures	57000.000	221758.000	114281.000	229304.000
Net working capital	0.000	0.000	0.000	0.000
Total initial investment costs	759000.000	3231758.000	639281.000	229304.000
Of it foreign, in %	97.628	69.345	21.840	68.965

COMFAR 21 UNIDO

Total Current Investment in US dollars

Year	1993	1994	1995	1996-97	1998
Fixed investment costs					
Land, site preparation, development	0.000	0.000	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000	0.000	0.000
Auxiliary and service facilities .	0.000	0.000	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000	0.000	0.000
Plant, machinery and equipment . .	0.000	0.000	0.000	0.000	0.000
Total fixed investment costs	0.000	0.000	0.000	0.000	0.000
Preproduction capitals expenditures.	0.000	0.000	0.000	0.000	0.000
Working capital	105503.000	25020.360	18763.020	0.000	-6638.831
Total current investment costs . . .	105503.000	25020.360	18763.020	0.000	-6638.831
Of it foreign, %	54.426	54.683	54.682	0.000	0.000

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Total Production Costs in US dollars

Year	1993	1994	1995	1996	1997
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	111745.500	146127.900	171312.000	171312.000	171312.000
Other raw materials	84548.810	110563.000	130071.000	130071.000	130071.000
Utilities	2740.067	3460.067	4000.000	4000.000	4000.000
Energy	33330.000	48847.450	55965.000	55365.000	55385.000
Labour, direct	17134.750	20613.700	23233.000	23233.000	23233.000
Repair, maintenance	2737.518	2887.518	3000.000	3000.000	3000.000
Spares	18022.540	18352.540	18600.000	18600.000	18600.000
Factory overheads	28500.000	28500.000	28500.000	28500.000	28500.000
Factory costs	304753.300	373358.300	435301.000	435301.000	435301.000
Administrative overheads	115048.300	115573.300	115967.000	115967.000	115967.000
Indir. costs, sales and distribution	52762.040	58505.840	62813.000	62813.000	62813.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	466834.300	466834.300	466834.300	466834.300	466834.300
Financial costs	187000.000	187000.000	184768.000	175186.400	164176.300
Total production costs	1126404.000	1207272.000	1265683.000	1256102.000	1245092.000
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	73.051	71.424	70.288	70.061	69.736
Of it variable,%	23.333	28.463	31.346	32.130	32.475
Total labour	113337.200	118478.000	121883.000	121883.000	121883.000

Total Production Costs in US dollars

Year	1998	1999	2000	2001	2002
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	171312.000	171312.000	171312.000	171312.000	171312.000
Other raw materials	130071.000	130071.000	130071.000	130071.000	130071.000
Utilities	4000.000	4000.000	4000.000	4000.000	4000.000
Energy	55985.000	55985.000	55985.000	55985.000	55985.000
Labour, direct	23233.000	23233.000	23233.000	23233.000	23233.000
Repair, maintenance	3000.000	3000.000	3000.000	3000.000	3000.000
Spares	18600.000	18600.000	18600.000	18600.000	18600.000
Factory overheads	28500.000	28500.000	28500.000	28500.000	28500.000
Factory costs	435301.000	435301.000	435301.000	435301.000	435301.000
Administrative overheads	29967.000	29967.000	29967.000	29967.000	29967.000
Indir. costs, sales and distribution	62813.000	62813.000	62813.000	62813.000	62813.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	466834.300	258853.300	120203.300	38359.300	38359.330
Financial costs	151524.800	136986.500	120280.000	101061.400	79018.500
Total production costs	1146440.000	923926.900	768570.300	728121.800	706058.800
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	67.197	59.237	51.070	51.270	49.747
Of it variable,%	35.269	43.763	52.609	55.532	57.267
Total labour	35883.000	35883.000	35883.000	35883.000	35883.000

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Total Production Costs in US dollars

Year	2003	2004	2005- 7
% of nom. capacity (single product).	0.000	0.000	0.000
Raw material 1	171312.000	171312.000	171312.000
Other raw materials	130071.000	130071.000	130071.000
Utilities	4000.000	4000.000	4000.000
Energy	55385.000	55385.000	55385.000
Labour, direct	23233.000	23233.000	23233.000
Repair, maintenance	3000.000	3000.000	3000.000
Spares	18600.000	18600.000	18600.000
Factory overheads	28500.000	28500.000	28500.000
Factory costs	435301.000	435301.000	435301.000
Administrative overheads	29967.000	29967.000	29967.000
Indir. costs, sales and distribution	62813.000	62813.000	62813.000
Direct costs, sales and distribution	0.000	0.000	0.000
Depreciation	30725.000	30725.000	30725.000
Financial costs	53663.440	24524.360	0.000
Total production costs	612469.400	583330.400	558806.000
Costs per unit (single product)	0.000	0.000	0.000
Of it foreign, %	44.185	41.337	38.825
Of it variable,%	66.018	69.316	72.358
Total labour	35883.000	35883.000	35883.000

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-- COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA -----

Net Working Capital in US dollars

Year	mdc	coto	1993	1994	1995	1996-97	1998
Coverage	mdc	coto					
Current assets &							
Accounts receivable . . .	30	12.0	58342.750	71700.610	81267.680	81267.660	74101.210
Inventory and materials	83	4.0	43126.870	64240.020	75573.530	75573.530	75573.530
Energy	7	51.4	764.750	943.811	1088.537	1088.537	1088.597
Spares	90	4.0	4505.635	4588.135	4650.000	4650.000	4650.000
Work in progress	7	51.4	5325.874	7376.410	8464.187	8464.167	8464.167
Finished products . . .	7	51.4	8162.325	9623.670	10719.100	10719.100	9046.878
Cash in hand	15	24.0	3476.736	3663.873	3804.167	3804.167	3804.167
Total current assets			130905.600	162142.500	185567.500	185567.500	176728.600
Current liabilities and							
Accounts payable	30	12.0	25336.600	31613.130	36275.080	36275.080	36275.080
Net working capital			105503.000	130529.300	149292.400	149292.400	140453.500
Increase in working capital			105509.000	25020.350	18763.030	0.000	-8838.875
Net working capital, local			48085.120	59423.680	67926.800	67926.800	67926.800
Net working capital, foreign			57423.880	71105.670	81365.580	81365.580	72526.630

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Uganda Tiles and Sanitaryware --- March 1991

-- COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA -----

Net Working Capital in US dollars

Year	mdc	coto	1999-2007
Coverage	mdc	coto	
Current assets &			
Accounts receivable . . .	30	12.0	74101.210
Inventory and materials .	83	4.0	75573.530
Energy	7	51.4	1088.537
Spares	90	4.0	4650.000
Work in progress	7	51.4	8464.187
Finished products . . .	7	51.4	3046.878
Cash in hand	15	24.0	3804.167
Total current assets			176728.600
Current liabilities and			
Accounts payable	30	12.0	36275.080
Net working capital			140453.500
Increase in working capital			0.000
Net working capital, local			67326.800
Net working capital, foreign			72526.630

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in US dollars

Year	1991.1	1991.2	1992.1	1992.2
Equity, ordinary ..	750000.000	1871058.000	434618.000	204000.000
Equity, preference.	3000.000	60700.000	204663.000	25304.000
Subsidies, grants .	0.000	0.000	0.000	0.000
Loan A, foreign .	500000.000	0.000	0.000	0.000
Loan B, foreign..	800000.000	0.000	0.000	0.000
Loan C, foreign .	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000
Total loan	1300000.000	0.000	0.000	0.000
Current liabilities	0.000	0.000	0.000	0.000
Bank overdraft	0.000	0.000	0.000	0.000
Total funds	2053000.000	1931758.000	639281.000	229304.000

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Source of Finance, production in US dollars

Year	1993	1994	1995	1996	1997	1998
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	0.000	0.000	-23958.140	-27686.620	-31935.340	-36974.620
Loan B, foreign..	0.000	0.000	-40394.610	-46247.730	-52349.100	-60621.420
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	0.000	0.000	-64352.750	-73934.410	-84344.440	-97536.030
Current liabilities	25336.600	6216.583	4661.836	0.000	0.000	0.000
Bank overdraft	0.000	0.000	0.000	0.000	0.000	0.000
Total funds	25336.600	6216.583	-59690.850	-73934.410	-84344.440	-97536.030

Uganda Tiles and Sanitaryware --- March 1991

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Source of Finance, production in US dollars

Year	1999	2000	2001	2002	2003	2004
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	-42728.730	-49378.460	-57062.380	-65343.410	-76205.860	-88065.810
Loan B, foreign..	-69405.450	-79462.300	-90376.330	-104158.300	-119251.500	-136532.600
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	-112134.300	-128840.800	-148033.400	-170102.300	-195457.300	-224538.400
Current liabilities	0.000	0.000	0.000	0.000	0.000	0.000
Bank overdraft	0.000	0.000	0.000	0.000	0.000	0.000
Total funds	-112134.300	-128840.800	-148033.400	-170102.300	-195457.300	-224538.400

Uganda Tiles and Sanitaryware --- March 1991

Cashflow Tables, construction in US dollars

Year	1991.1	1991.2	1992.1	1992.2
Total cash inflow . .	2059000.000	1331758.000	639281.000	229304.000
Financial resources .	2059000.000	1331758.000	639281.000	229304.000
Sales, net of tax . .	0.000	0.000	0.000	0.000
Total cash outflow . .	759000.000	3231758.000	639281.000	229304.000
Total assets	759000.000	3231758.000	639281.000	229304.000
Operating costs . . .	0.000	0.000	0.000	0.000
Cost of finance . . .	0.000	0.000	0.000	0.000
Repayment	0.000	0.000	0.000	0.000
Corporate tax . . .	0.000	0.000	0.000	0.000
Dividends paid . . .	0.000	0.000	0.000	0.000
Surplus (deficit) .	1300000.000	-1300000.000	0.000	0.000
Cumulated cash balance	1300000.000	0.000	0.000	0.000
Inflow, local	18000.000	390700.000	499663.000	25304.000
Outflow, local	18000.000	390700.000	499663.000	25304.000
Surplus (deficit) .	0.000	0.000	0.000	0.000
Inflow, foreign . . .	2041000.000	941058.000	139618.000	204000.000
Outflow, foreign . . .	741000.000	2241058.000	139618.000	204000.000
Surplus (deficit) .	1300000.000	-1300000.000	0.000	0.000
Net cashflow	-759000.000	-3231758.000	-639281.000	-229304.000
Cumulated net cashflow	-759000.000	-3990758.000	-4630039.000	-4859343.000

Cashflow tables, production in US dollars

Year	1993	1994	1995	1996	1997	1998
Total cash inflow . .	1014715.000	1299334.000	1526655.000	1521993.000	1521993.000	1521993.000
Financial resources .	25336.600	6216.583	4661.836	0.000	0.000	0.000
Sales, net of tax . .	989318.500	1293717.000	1521993.000	1521993.000	1521993.000	1521993.000
Total cash outflow . .	790475.100	771674.300	866626.800	863201.800	863201.800	768362.900
Total assets	130305.600	31236.340	23424.320	0.000	0.000	-8838.889
Operating costs . . .	472569.600	553437.400	614081.000	614081.000	614081.000	528081.000
Cost of finance . . .	187000.000	187000.000	184768.000	175186.400	164176.300	151524.800
Repayment	0.000	0.000	64352.750	73934.410	84944.440	97596.630
Corporate tax . . .	0.000	0.000	0.000	0.000	0.000	0.000
Dividends paid . . .	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	224240.000	528259.600	640027.300	658791.000	658790.300	753629.900
Cumulated cash balance	224240.000	752499.600	1392528.000	2051319.000	2710110.000	3463740.000
Inflow, local	484993.600	613079.700	727048.400	724820.000	724820.000	724820.000
Outflow, local	300542.900	294357.000	321854.500	311123.000	311123.000	311123.000
Surplus (deficit) .	184450.700	324722.700	405193.900	413697.000	413697.000	413697.000
Inflow, foreign . . .	529721.500	680854.100	799606.300	797172.800	797172.800	797172.800
Outflow, foreign . . .	489932.200	477317.300	564772.200	552078.800	552078.800	457239.300
Surplus (deficit) .	39789.280	203536.800	234834.100	245094.000	245094.000	339932.900
Net cashflow	411233.900	715253.400	883148.800	907911.800	907911.800	1002751.000
Cumulated net cashflow	-4448103.000	-3732844.000	-2849695.000	-1935783.000	-1027871.000	-25120.630

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COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Cashflow tables, production in US dollars

Year	1999	2000	2001	2002	2003	2004
Total cash inflow . .	1521993.000	1521993.000	1521993.000	1521993.000	1521993.000	1521993.000
Financial resources .	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax . .	1521993.000	1521993.000	1521993.000	1521993.000	1521993.000	1521993.000
Total cash outflow . .	777201.800	915367.400	1045846.000	1056627.000	1095341.000	1109401.000
Total assets	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs . . .	528081.000	528081.000	528081.000	528081.000	528081.000	528081.000
Cost of finance . . .	136986.500	120280.000	101081.400	79018.500	53663.440	24524.360
Repayment	112134.300	128840.800	148039.400	170102.300	195457.300	224598.400
Corporate tax . . .	0.000	138165.700	268644.000	279425.200	318738.900	332197.400
Dividends paid . . .	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	744790.300	606625.300	476146.300	465365.800	426052.100	412591.600
Cumulated cash balance	4208531.000	4815156.000	5291303.000	5756669.000	6182721.000	6595313.000
Inflow, local	724820.000	724820.000	724820.000	724820.000	724820.000	724820.000
Outflow, local	311123.000	449288.700	579767.000	590548.200	629861.900	643320.400
Surplus (deficit) .	413697.000	275531.300	145053.000	134271.800	94958.130	81499.630
Inflow, foreign . . .	797172.800	797172.800	797172.800	797172.800	797172.800	797172.800
Outflow, foreign . . .	466078.800	466078.800	466078.800	466078.800	466078.800	466080.800
Surplus (deficit) .	331093.300	331094.000	331094.000	331094.000	331094.000	331092.000
Net cashflow	933311.800	855746.100	725267.800	714486.600	675172.500	661714.400
Cumulated net cashflow	968731.100	1824537.000	2549805.000	3264292.000	3939465.000	4601179.000

Uganda Tiles and Sanitaryware --- March 1991

COMFAR

Cashflow tables, production in US dollars

Year	2005	2006	2007
Total cash inflow . .	1521333.000	1521333.000	1521333.000
Financial resources .	0.000	0.000	0.000
Sales, net of tax . .	1521333.000	1521333.000	1521333.000
Total cash outflow . .	1181543.000	1182374.000	1183172.000
Total assets	0.000	0.000	0.000
Operating costs . . .	528081.000	528081.000	528081.000
Cost of finance . . .	0.000	0.000	0.000
Repayment	0.000	0.000	0.000
Corporate tax . . .	343737.300	345333.500	346334.300
Dividends paid . . .	309724.500	308895.700	308036.200
Surplus (deficit) .	340443.400	333618.600	338821.300
Cumulated cash balance	6935762.000	7275381.000	7614202.000
Inflow, local	724820.000	724820.000	724820.000
Outflow, local	964585.400	965416.100	966213.500
Surplus (deficit) .	-233765.400	-240596.100	-241393.500
Inflow, foreign . . .	797172.800	797172.800	797172.800
Outflow, foreign . . .	216958.000	216958.000	216958.000
Surplus (deficit) .	580214.800	580214.800	580214.800
Net cashflow	650173.300	648512.300	646317.400
Cumulated net cashflow	5251353.000	5899865.000	6546183.000

Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value ....-1633683.00 at 12.00 %

Internal Rate of Return (IRRE1) .. 4.49 %

b) Net Worth versus Net cash return:

Net present value .... 155383.80 at 12.00 %

Internal Rate of Return (IRRE2) .. 12.72 %

c) Internal Rate of Return on total investment:

Net present value .... 211071.50 at 12.00 %

Internal Rate of Return (IRR) .. 12.75 %

Net Worth = Equity paid plus reserves

Net Income Statement in US dollars

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	1224062.000	1600687.000	1883126.000	1883126.000	1883126.000
Less: variable costs, incl. sales tax.	497571.000	650665.300	765472.500	765472.500	765472.500
Variable margin	726490.300	950021.900	1117654.000	1117654.000	1117654.000
As % of total sales	59.351	59.351	59.351	59.351	59.351
Non-variable costs, incl. depreciation	1277176.000	676576.400	676576.300	676576.400	676576.400
Operational margin	-550685.400	273445.500	441077.400	441077.400	441077.400
As % of total sales	-44.988	17.083	23.423	23.423	23.423
Cost of finance	187000.000	187000.000	184768.000	175186.400	164176.300
Gross profit	-737685.400	86445.500	256309.400	265891.000	276901.000
Allowances	163460.000	162701.000	156133.000	149945.000	143347.000
Taxable profit	0.000	0.000	100116.400	115946.000	132354.000
Tax	0.000	0.000	0.000	0.000	0.000
Net profit	-737685.400	86445.500	256309.400	265891.000	276501.000
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-737685.400	86445.500	256309.400	265891.000	276301.000
Accumulated undistributed profit	-737685.400	-651239.900	-394930.500	-129039.500	147861.500
Gross profit, % of total sales	-60.265	5.401	13.611	14.120	14.704
Net profit, % of total sales	-60.265	5.401	13.611	14.120	14.704
ROE, Net profit, % of equity	-20.725	2.429	7.201	7.470	7.780
ROI, Net profit+interest, % of invest.	-11.032	5.480	8.806	8.806	8.806

COMFAR

------ COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA -----

Net Income Statement in US dollars

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	1883126.000	1883126.000	1883126.000	1883126.000	1883126.000
Less: variable costs, incl. sales tax.	765472.500	765472.500	765472.500	765472.500	765472.500
Variable margin	1117654.000	1117654.000	1117654.000	1117654.000	1117654.000
As % of total sales	59.351	59.351	59.351	59.351	59.351
Non-variable costs, incl. depreciation	590576.300	382601.300	243951.300	222701.300	222701.300
Operational margin	527077.500	735052.500	873702.500	894952.500	894952.400
As % of total sales	27.989	39.034	46.396	47.525	47.525
Cost of finance	151524.800	136966.500	120280.000	101081.400	79018.500
Gross profit	375552.800	598065.900	753422.400	793871.100	815933.900
Allowances	138183.000	132662.000	127355.000	122261.000	117371.000
Taxable profit	0.000	0.000	345414.300	671610.100	698562.900
Tax	0.000	0.000	138165.700	268644.000	279425.200
Net profit	375552.800	598065.300	615256.800	525227.000	536508.800
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	375552.800	598065.300	615256.800	525227.000	536508.800
Accumulated undistributed profit . . .	523414.300	1121480.000	1736737.000	2261964.000	2798473.000
Gross profit, % of total sales	19.943	31.759	40.009	42.157	43.329
Net profit, % of total sales	19.943	31.759	32.672	27.891	28.490
ROE, Net profit, % of equity	10.551	16.803	17.286	14.756	15.073
ROI, Net profit+interest, % of invest.	10.542	14.702	14.711	12.527	12.311

COMFAR

Net Income Statement in US dollars

Year	2003	2004	2005	2006	2007
Total sales, incl. sales tax	1883126.000	1883126.000	1883126.000	1883126.000	1883126.000
Less: variable costs, incl. sales tax.	765472.500	765472.500	765472.500	765472.500	765472.500
Variable margin	1117654.000	1117654.000	1117654.000	1117654.000	1117654.000
As % of total sales	59.351	59.351	59.351	59.351	59.351
Non-variable costs, incl. depreciation	154467.000	154467.000	154467.000	154467.000	154467.000
Operational margin	963186.800	963186.800	963186.800	963186.800	963186.800
As % of total sales	51.148	51.148	51.148	51.148	51.148
Cost of finance	53663.440	24524.360	0.000	0.000	0.000
Gross profit	909523.300	938662.400	963186.800	963186.800	963186.800
Allowances	112676.000	108169.000	103842.000	99688.000	95701.000
Taxable profit	796847.300	830493.400	859344.800	863498.800	867485.800
Tax	318738.300	332197.400	343737.900	345399.500	346994.300
Net profit	590784.400	606465.000	619448.900	617787.300	616192.400
Dividends paid	0.000	0.000	309724.500	308893.700	308096.200
Undistributed profit	590784.400	606465.000	309724.400	308893.600	308096.300
Accumulated undistributed profit	3389257.000	3995722.000	4305447.000	4614340.000	4922436.000
Gross profit, % of total sales	48.299	49.846	51.148	51.148	51.148
Net profit, % of total sales	31.373	32.205	32.895	32.806	32.722
ROE, Net profit, % of equity	16.538	17.039	17.403	17.357	17.312
ROI, Net profit+interest, % of invest.	12.889	12.620	12.389	12.356	12.324

COMFAR (c)

Projected Balance Sheets, construction in US dollars

Year	1991.1	1991.2	1992.1	1992.2
Total assets	2059000.000	3990758.000	4630039.000	4853343.000
Fixed assets, net of depreciation	0.000	759000.000	3990758.000	4630039.000
Construction in progress	759000.000	3231758.000	639281.000	223304.000
Current assets	0.000	0.000	0.000	0.000
Cash, bank	0.000	0.000	0.000	0.000
Cash surplus, finance available	1300000.000	0.000	0.000	0.000
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	2059000.000	3990758.000	4630039.000	4853343.000
Equity capital	759000.000	2690758.000	3330039.000	3553343.000
Reserves, retained profit	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.000	0.000
Long and medium term debt	1300000.000	1300000.000	1300000.000	1300000.000
Current liabilities	0.000	0.000	0.000	0.000
Bank overdraft, finance required.	0.000	0.000	0.000	0.000
Total debt	1300000.000	1300000.000	1300000.000	1300000.000
Equity, % of liabilities	36.863	67.425	71.922	73.247

Projected Balance Sheets, Production in US dollars

Year	1993	1994	1995	1996	1997
Total assets	4884740.000	4377402.000	5087575.000	5023222.000	4949288.000
Fixed assets, net of depreciation	3791909.000	3325074.000	2858240.000	2331406.000	1924572.000
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	127426.800	158478.700	181763.300	181763.300	181763.300
Cash, bank	3476.796	3663.879	3804.167	3804.167	3804.167
Cash surplus, finance available	224240.000	752499.000	1392528.000	2051318.000	2710103.000
Loss carried forward	0.000	737685.400	651239.900	394930.500	129039.500
Loss	737685.400	0.000	0.000	0.000	0.000
Total liabilities	4884740.000	4977402.000	5087575.000	5023222.000	4949288.000
Equity capital	3559343.000	3559343.000	3559343.000	3559343.000	3559343.000
Reserves, retained profit	0.000	0.000	0.000	0.000	0.000
Profit	0.000	86445.500	256309.400	265891.000	276901.000
Long and medium term debt	1300000.000	1300000.000	1235647.000	1161713.000	1076768.000
Current liabilities	25396.600	31613.160	36275.080	36275.080	36275.080
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	1325397.000	1331613.000	1271922.000	1197988.000	1113044.000
Equity, % of liabilities	72.867	71.510	69.961	70.858	71.316

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Projected Balance Sheets, Production in US dollars

Year	1998	1999	2000	2001	2002
Total assets	5038205.000	5584136.000	6070552.000	6447740.000	6814147.000
Fixed assets, net of depreciation	1457737.000	1198878.000	1078669.000	979709.400	880750.100
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	172924.400	172924.400	172924.400	172924.400	172924.400
Cash, bank	3804.167	3804.167	3804.167	3804.167	3804.167
Cash surplus, finance available	3463739.000	4208530.000	4815155.000	5291302.000	5756668.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	5038205.000	5584136.000	6070552.000	6447740.000	6814147.000
Equity capital	3559343.000	3559343.000	3559343.000	3559343.000	3559343.000
Reserves, retained profit	147861.500	523414.300	1121480.000	1736737.000	2261964.000
Profit	375552.800	598065.900	615256.800	525227.000	536508.800
Long and medium term debt	979172.300	867038.100	738197.300	590157.300	420055.600
Current liabilities	36275.080	36275.080	36275.080	36275.080	36275.080
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	1015447.000	903313.100	774472.300	626433.000	456330.700
Equity, % of liabilities	69.816	63.740	58.633	55.203	52.235

COMFAR

Projected Balance Sheets, Production in US dollars

Year	2003	2004	2005	2006	2007
Total assets	7203474.000	7531340.000	8210783.000	8518852.000	8826151.000
Fixed assets, net of depreciation	850025.100	813300.100	788575.100	757850.100	727125.100
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	172324.400	172324.400	172324.400	172324.400	172324.400
Cash, bank	3804.167	3804.167	3804.167	3804.167	3804.167
Cash surplus, finance available	6182721.000	6595312.000	7245486.000	7584274.000	7922238.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	7209474.000	7591340.000	8210783.000	8518852.000	8826151.000
Equity capital	3553343.000	3559343.000	3553343.000	3559343.000	3559343.000
Reserves, retained profit	2798473.000	3389257.000	3995722.000	4305447.000	4614341.000
Profit	590784.400	606465.000	619448.300	617787.300	616192.400
Long and medium term debt	224598.300	-0.103	-0.103	-0.103	-0.103
Current liabilities	36275.080	36275.080	36275.080	36275.080	36275.080
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	260873.300	36274.970	36274.970	36274.970	36274.970
Equity, % of liabilities	49.370	46.867	43.350	41.782	40.327

COMFAR

----- COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA -----

Production costs for productTiles, foreign

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	26676.650	34884.850	41041.000	41041.000	41041.000	41041.000
raw material (other)	43715.100	57165.900	67254.000	67254.000	67254.000	67254.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	76391.750	98050.750	114295.000	114295.000	114295.000	114295.000
thereof variable	70391.750	92050.750	108295.000	108295.000	108295.000	108295.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect ..	4698.438	4942.188	5125.000	5125.000	5125.000	5125.000
thereof variable	792.188	1035.938	1218.750	1218.750	1218.750	1218.750
total before depr. and interests ..	124090.200	145992.900	162420.000	162420.000	162420.000	162420.000
total before interests	341112.200	363014.900	379442.000	379442.000	379442.000	379442.000
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	341112.200	363014.900	379442.000	379442.000	379442.000	379442.000
thereof variable	71183.940	93086.690	109513.800	109513.800	109513.800	109513.800
total labour (of tot. prod. cost) .	44198.440	44442.190	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	217022.000	217022.000	217022.000	217022.000	217022.000	217022.000

	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	41041.000	41041.000	41041.000	41041.000	41041.000	41041.000
raw material (other)	67254.000	67254.000	67254.000	67254.000	67254.000	67254.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	114295.000	114295.000	114295.000	114295.000	114295.000	114295.000
thereof variable	108295.000	108295.000	108295.000	108295.000	108295.000	108295.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect ..	5125.000	5125.000	5125.000	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750	1218.750	1218.750	1218.750
total before depr. and interests ..	162420.000	162420.000	162420.000	162420.000	162420.000	162420.000
total before interests	267135.500	192264.500	192264.500	192264.500	162420.000	162420.000
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	267135.500	192264.500	192264.500	192264.500	162420.000	162420.000
thereof variable	109513.800	109513.800	109513.800	109513.800	109513.800	109513.800
total labour (of tot. prod. cost) .	44625.000	44625.000	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	104715.500	29844.510	29844.510	29844.530	0.000	0.000

COMFAR

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Production costs for productTiles, foreign

	Year:13	Year:14	Year:15
raw material (first)	41041.000	41041.000	41041.000
raw material (other)	67254.000	67254.000	67254.000
utilities	0.000	0.000	0.000
energy	0.000	0.000	0.000
labour	0.000	0.000	0.000
maintenance	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000
subtotal factory costs	114295.000	114295.000	114295.000
thereof variable	108295.000	108295.000	108295.000
administration	43000.000	43000.000	43000.000
marketing, distribution indirect ..	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750
total before depr. and interests ..	162420.000	162420.000	162420.000
total before interests	162420.000	162420.000	162420.000
interests	0.000	0.000	0.000
total production cost	162420.000	162420.000	162420.000
thereof variable	109513.800	109513.800	109513.800
total labour (of tot. prod. cost) .	44625.000	44625.000	44625.000
depreciation borne by product	0.000	0.000	0.000

COMFAR

------ COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA -----

Production costs for productTiles, local

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	48276.800	63131.200	74272.000	74272.000	74272.000	74272.000
raw material (other)	4967.950	6496.550	7643.000	7643.000	7643.000	7643.000
utilities	1370.000	1730.000	2000.000	2000.000	2000.000	2000.000
energy	30189.100	37483.470	42961.000	42961.000	42961.000	42961.000
labour	8739.375	10516.880	11850.000	11850.000	11850.000	11850.000
maintenance	1368.750	1443.750	1500.000	1500.000	1500.000	1500.000
spares	3011.250	3176.250	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	112164.200	138228.100	157776.000	157776.000	157776.000	157776.000
thereof variable	84707.580	110771.500	130319.400	130319.400	130319.400	130319.400
administration	14524.130	14786.630	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect ..	21682.240	24310.390	26281.500	26281.500	26281.500	26281.500
thereof variable	9394.612	12285.260	14453.250	14453.250	14453.250	14453.250
total before depr. and interests ..	148370.600	177325.100	199041.000	199041.000	199041.000	199041.000
total before interests	180841.400	209796.000	231511.800	231511.800	231511.800	231511.800
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	180841.400	209796.000	231511.800	231511.800	231511.800	231511.800
thereof variable	94102.190	123056.700	144772.600	144772.600	144772.600	144772.600
total labour (of tot. prod. cost) .	12942.110	15003.760	16550.000	16550.000	16550.000	16550.000
depreciation borne by product	32470.850	32470.850	32470.850	32470.850	32470.850	32470.850

	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	74272.000	74272.000	74272.000	74272.000	74272.000	74272.000
raw material (other)	7643.000	7643.000	7643.000	7643.000	7643.000	7643.000
utilities	2000.000	2000.000	2000.000	2000.000	2000.000	2000.000
energy	42961.000	42961.000	42961.000	42961.000	42961.000	42961.000
labour	11850.000	11850.000	11850.000	11850.000	11850.000	11850.000
maintenance	1500.000	1500.000	1500.000	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	157776.000	157776.000	157776.000	157776.000	157776.000	157776.000
thereof variable	130319.400	130319.400	130319.400	130319.400	130319.400	130319.400
administration	14983.500	14983.500	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect ..	26281.500	26281.500	26281.500	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250	14453.250	14453.250	14453.250
total before depr. and interests ..	199041.000	199041.000	199041.000	199041.000	199041.000	199041.000
total before interests	231511.800	231511.800	220886.800	220886.800	214403.500	214403.500
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	231511.800	231511.800	220886.800	220886.800	214403.500	214403.500
thereof variable	144772.600	144772.600	144772.600	144772.600	144772.600	144772.600
total labour (of tot. prod. cost) .	16550.000	16550.000	16550.000	16550.000	16550.000	16550.000
depreciation borne by product	32470.850	32470.850	21845.850	21845.850	15362.500	15362.500

Production costs for productTiles, local

	Year:13	Year:14	Year:15
raw material (first)	74272.000	74272.000	74272.000
raw material (other)	7643.000	7643.000	7643.000
utilities	2000.000	2000.000	2000.000
energy	42961.000	42961.000	42961.000
labour	11850.000	11850.000	11850.000
maintenance	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000
subtotal factory costs	157776.000	157776.000	157776.000
thereof variable	130319.400	130319.400	130319.400
administration	14983.500	14983.500	14983.500
marketing, distribution indirect ..	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250
total before depr. and interests ..	199041.000	199041.000	199041.000
total before interests	214403.500	214403.500	214403.500
interests	0.000	0.000	0.000
total production cost	214403.500	214403.500	214403.500
thereof variable	144772.600	144772.600	144772.600
total labour (of tot. prod. cost) .	16550.000	16550.000	16550.000
depreciation borne by product	15362.500	15362.500	15362.500

Production costs for product Sanitaryware, foreign

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (irst)	22968.160	30034.760	35333.000	35333.000	35333.000	35333.000
raw material (other)	33204.470	43420.470	51080.000	51080.000	51080.000	51080.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	62172.630	79455.230	92413.000	92413.000	92413.000	92413.000
thereof variable	56172.630	73455.230	86413.000	86413.000	86413.000	86413.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect	4698.496	4942.246	5125.000	5125.000	5125.000	5125.000
thereof variable	792.246	1035.996	1218.750	1218.750	1218.750	1218.750
total before depr. and interests	109871.100	127397.500	140538.000	140538.000	140538.000	140538.000
total before interests	294741.700	312268.100	325408.600	325408.600	325408.600	325408.600
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	294741.700	312268.100	325408.600	325408.600	325408.600	325408.600
thereof variable	56964.870	74491.230	87631.750	87631.750	87631.750	87631.750
total labour (of tot. prod. cost)	44198.500	44442.250	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	184870.600	184870.600	184870.600	184870.600	184870.600	184870.600

	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	35333.000	35333.000	35333.000	35333.000	35333.000	35333.000
raw material (other)	51080.000	51080.000	51080.000	51080.000	51080.000	51080.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	5000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	92413.000	92413.000	[illegible]413.000	92413.000	92413.000	92413.000
thereof variable	86413.000	86413.000	86413.000	86413.000	86413.000	86413.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect	5125.000	5125.000	5125.000	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750	1218.750	1218.750	1218.750
total before depr. and interests	140538.000	140538.000	140538.000	140538.000	140538.000	140538.000
total before interests	229740.100	165961.100	165961.100	165961.100	140538.000	140538.000
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	229740.100	165961.100	165961.100	165961.100	140538.000	140538.000
thereof variable	87631.750	87631.750	87631.750	87631.750	87631.75[illegible]	87631.750
total labour (of tot. prod. cost)	44625.000	44625.000	44625.000	44625[illegible]	[illegible]	44625.000
depreciation borne by product	89202.000	25423.100	25423.100	2542[illegible]	[illegible]	0.000

Production costs for productSanitaryware, foreign

	Year:13	Year:14	Year:15
raw material (first)	35333.000	35333.000	35333.000
raw material (other)	51080.000	51080.000	51080.000
utilities	0.000	0.000	0.000
energy	0.000	0.000	0.000
labour	0.000	0.000	0.000
maintenance	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000
subtotal factory costs	92413.000	92413.000	92413.000
thereof variable	86413.000	86413.000	86413.000
administration	43000.000	43000.000	43000.000
marketing, distribution indirect ..	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750
total before depr. and interests ..	140538.000	140538.000	140538.000
total before interests	140538.000	140538.000	140538.000
interests	0.000	0.000	0.000
total production cost	140538.000	140538.000	140538.000
thereof variable	87631.750	87631.750	87631.750
total labour (of tot. prod. cost) .	44625.000	44625.000	44625.000
depreciation borne by product	0.000	0.000	0.000

COMFAR

Production costs for product Sanitaryware, local

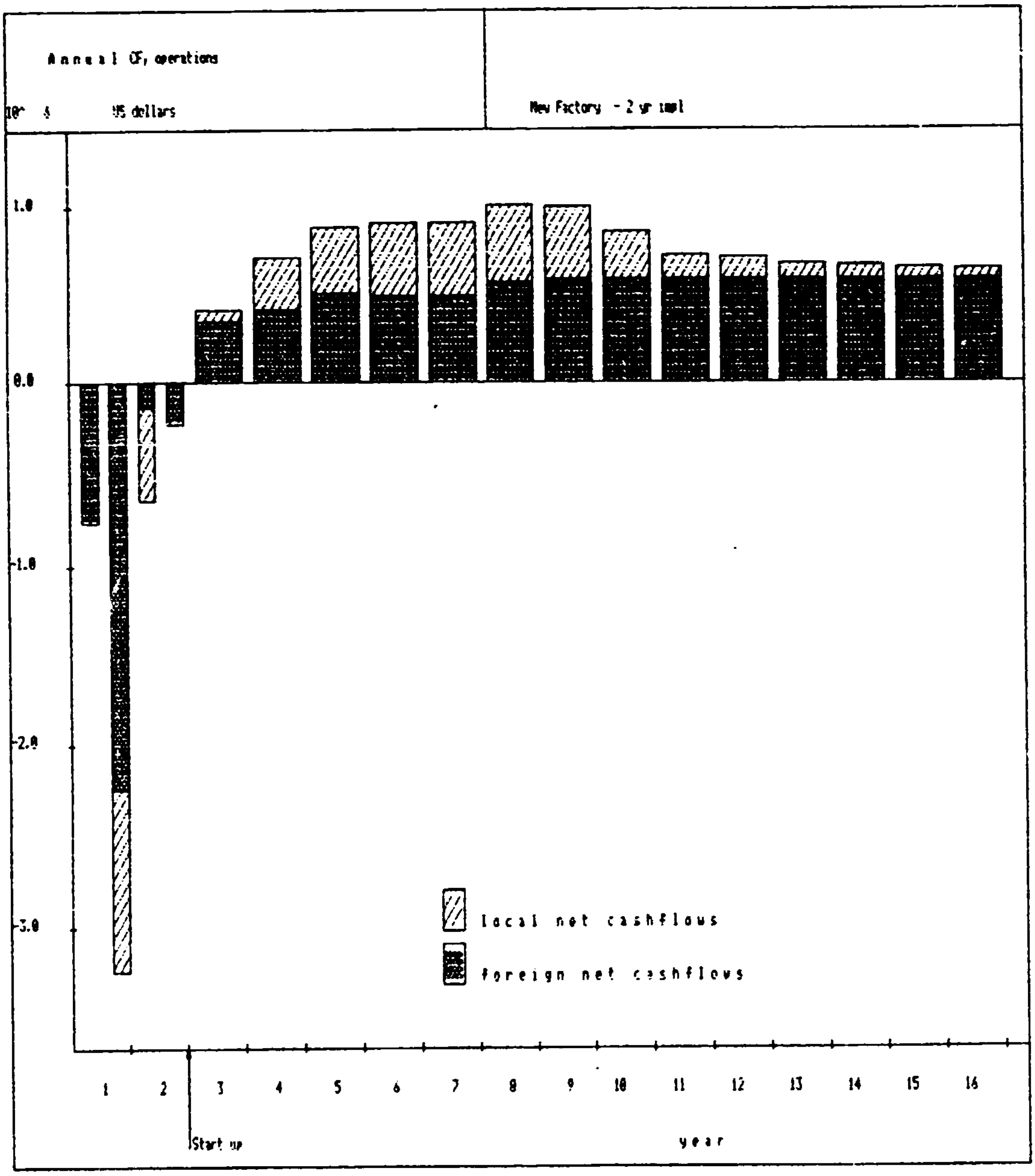
	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	13823.930	18077.130	21266.000	21266.000	21266.000	21266.000
raw material (other)	2661.298	3480.098	4094.000	4094.000	4094.000	4094.000
utilities	1370.087	1730.087	2000.000	2000.000	2000.000	2000.000
energy	9143.895	11363.370	13024.000	13024.000	13024.000	13024.000
labour	8395.375	10102.820	11383.000	11383.000	11383.000	11383.000
maintenance	1368.768	1443.768	1500.000	1500.000	1500.000	1500.000
spares	3011.290	3175.290	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	54030.640	63624.170	70817.000	70817.000	70817.000	70817.000
thereof variable	31181.290	40774.820	47967.650	47967.650	47967.650	47967.650
administration	14524.190	14786.690	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect ..	21682.870	24311.020	26281.500	26281.500	26281.500	26281.500
thereof variable	9395.311	12285.960	14453.250	14453.250	14453.250	14453.250
total before depr. and interests ..	90237.700	102721.900	112082.000	112082.000	112082.000	112082.000
total before interests	122708.600	135192.700	144552.800	144552.800	144552.800	144552.800
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	122708.600	135192.700	144552.800	144552.800	144552.800	144552.800
thereof variable	40576.600	53060.780	62420.900	62420.900	62420.900	62420.900
total labour (of tot. prod. cost) .	12598.180	14589.780	16083.000	16083.000	16083.000	16083.000
depreciation borne by product	32470.850	32470.850	32470.850	32470.850	32470.850	32470.850

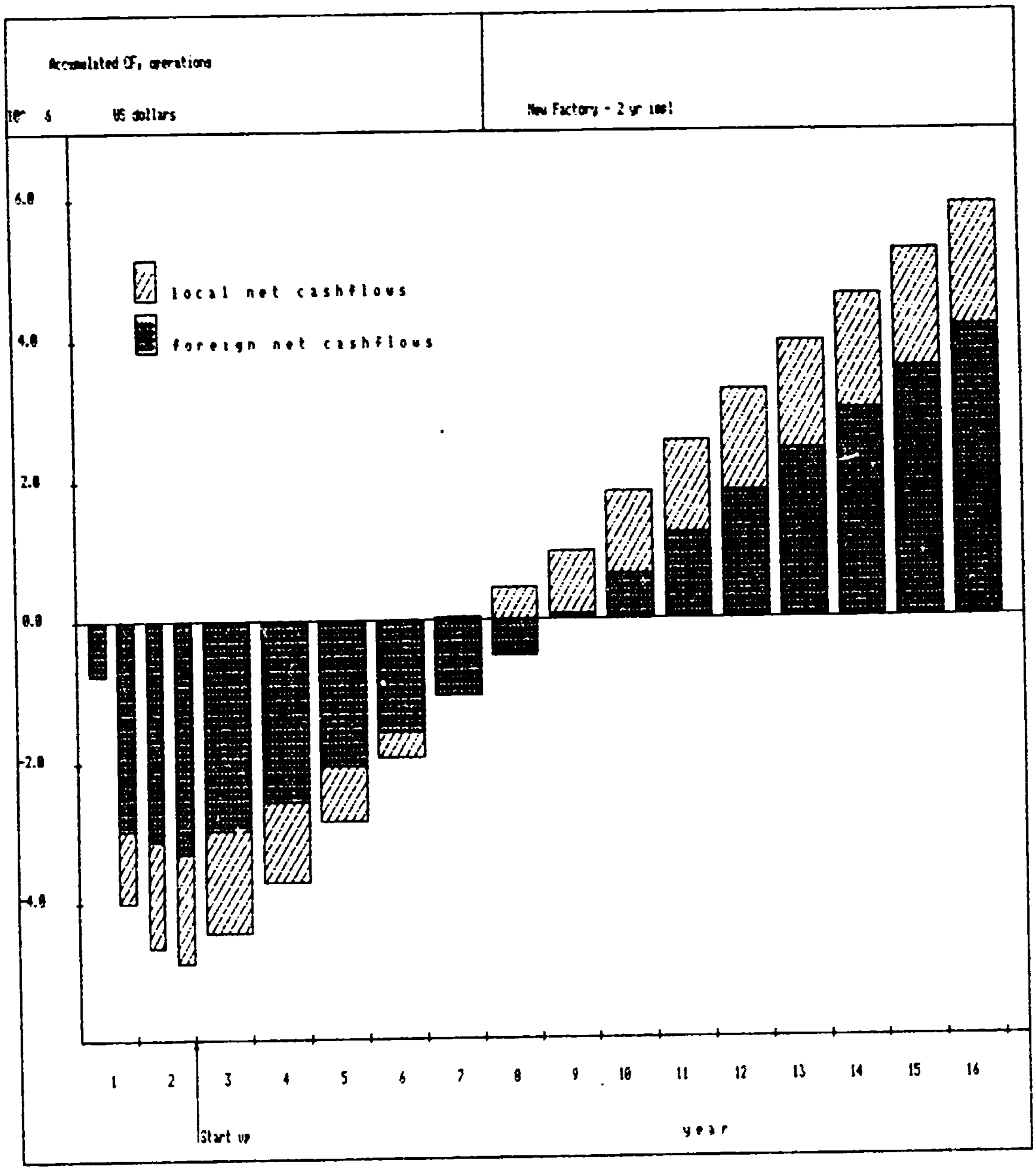
	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	21266.000	21266.000	21266.000	21266.000	21266.000	21266.000
raw material (other)	4094.000	4094.000	4094.000	4094.000	4094.000	4094.000
utilities	2000.000	2000.000	2000.000	2000.000	2000.000	2000.000
energy	13024.000	13024.000	13024.000	13024.000	13024.000	13024.000
labour	11383.000	11383.000	11383.000	11383.000	11383.000	11383.000
maintenance	1500.000	1500.000	1500.000	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	70817.000	70817.000	70817.000	70817.000	70817.000	70817.000
thereof variable	47967.650	47967.650	47967.650	47967.650	47967.650	47967.650
administration	14983.500	14983.500	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect ..	26281.500	26281.500	26281.500	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250	14453.250	14453.250	14453.250
total before depr. and interests ..	112082.000	112082.000	112082.000	112082.000	112082.000	112082.000
total before interests	144552.800	144552.800	133927.800	133927.800	127444.500	127444.500
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	144552.800	144552.800	133927.800	133927.800	127444.500	127444.500
thereof variable	62420.900	62420.900	62420.900	62420.900	62420.900	62420.900
total labour (of tot. prod. cost) .	16083.000	16083.000	16083.000	16083.000	16083.000	16083.000
depreciation borne by product	32470.850	32470.850	21845.850	21845.850	15362.500	15362.500

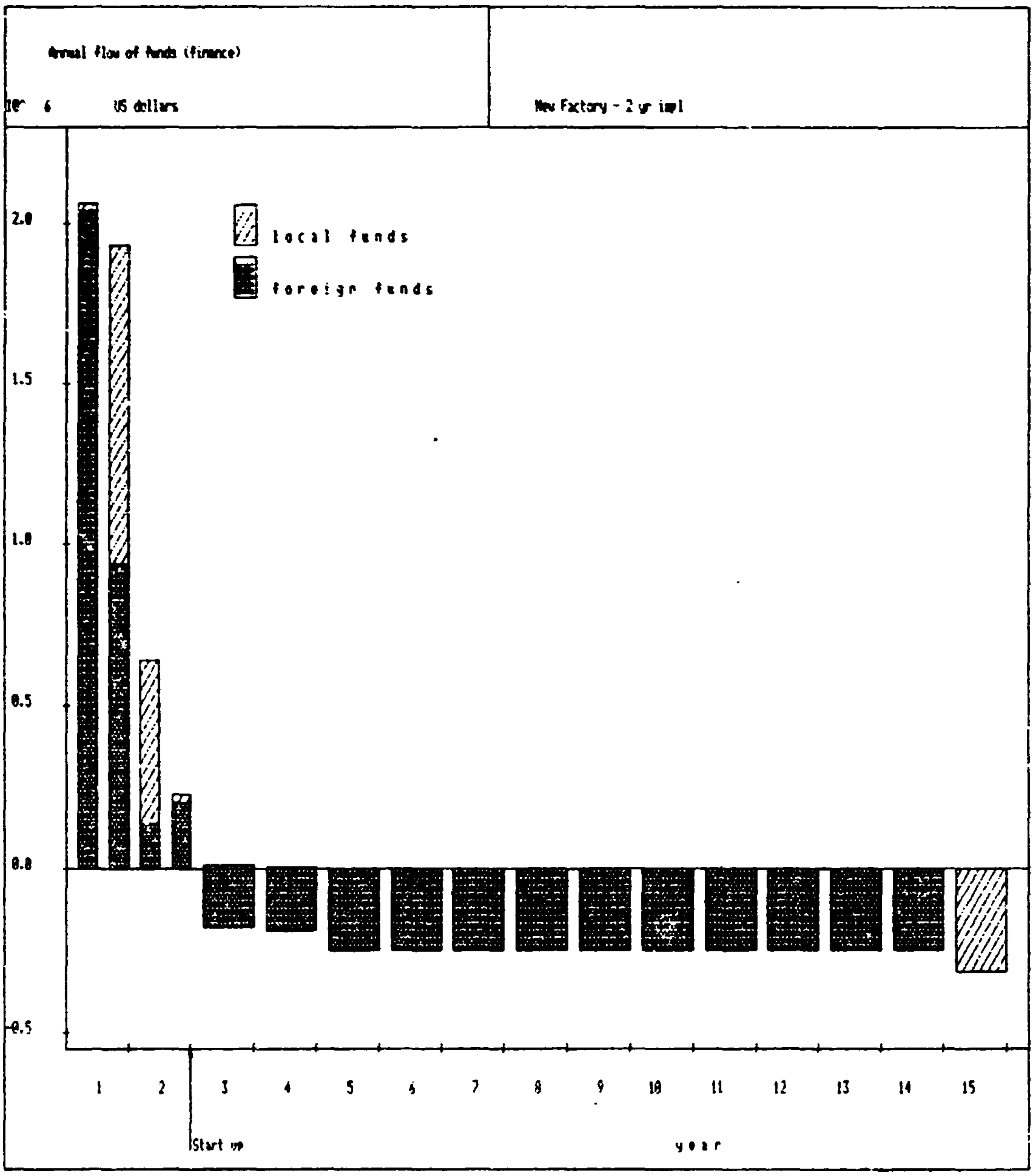
COMFAR

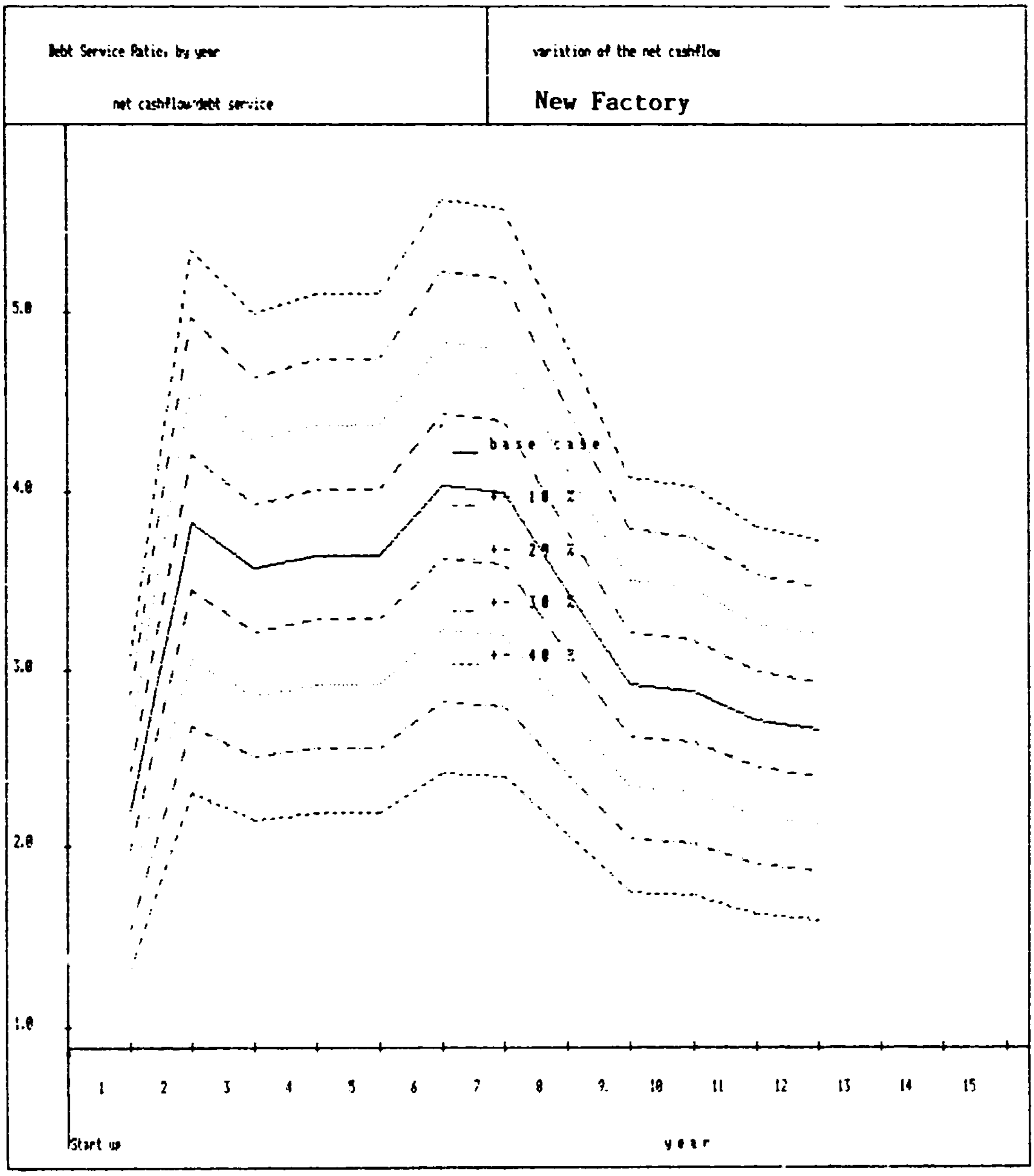
Production costs for product Sanitaryware, local

	Year:13	Year:14	Year:15
raw material (first)	21266.000	21266.000	21266.000
raw material (other)	4094.000	4094.000	4094.000
utilities	2000.000	2000.000	2000.000
energy	13024.000	13024.000	13024.000
labour	11383.000	11383.000	11383.000
maintenance	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000
subtotal factory costs	70817.000	70817.000	70817.000
thereof variable	47967.650	47967.650	47967.650
administration	14983.500	14983.500	14983.500
marketing, distribution indirect ..	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250
total before depr. and interests ..	112082.000	112082.000	112082.000
total before interests	127444.500	127444.500	127444.500
interests	0.000	0.000	0.000
total production cost	127444.500	127444.500	127444.500
thereof variable	62420.900	62420.900	62420.900
total labour (of tot. prod. cost) .	16083.000	16083.000	16083.000
depreciation borne by product	15362.500	15362.500	15362.500


Annual CF, operations
10^6 $ US dollars
New Factory - 2 yr impl
1.0
0.0
-1.0
-2.0
-3.0
local net cashflows
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Start up
year


Accumulated CF, operations
10^ 6 US dollars
New Factory - 2 yr idel
6.0
4.0
2.0
0.0
-2.0
-4.0
local net cashflows
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Start up
year


Annual flow of funds (finance)
10^ 6 US dollars
New Factory - 2 yr impl
local funds
foreign funds
2.0
1.5
1.0
0.5
0.0
-0.5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

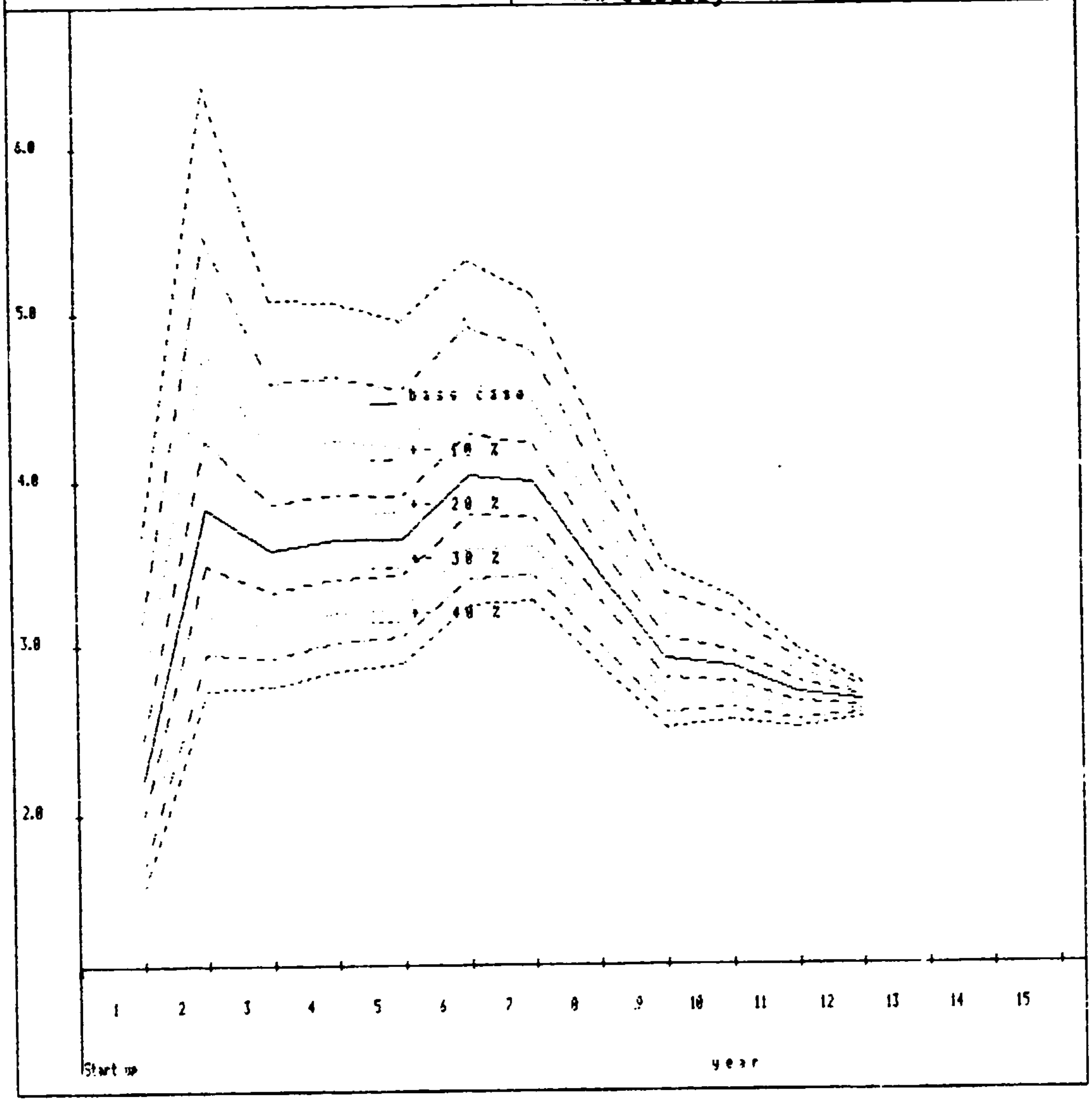

Debt Service Ratio, by year
net cashflow/debt service
variation of the net cashflow
New Factory
5.0
4.0
3.0
2.0
1.0
base case
+- 10 %
+- 20 %
+- 30 %
+- 40 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

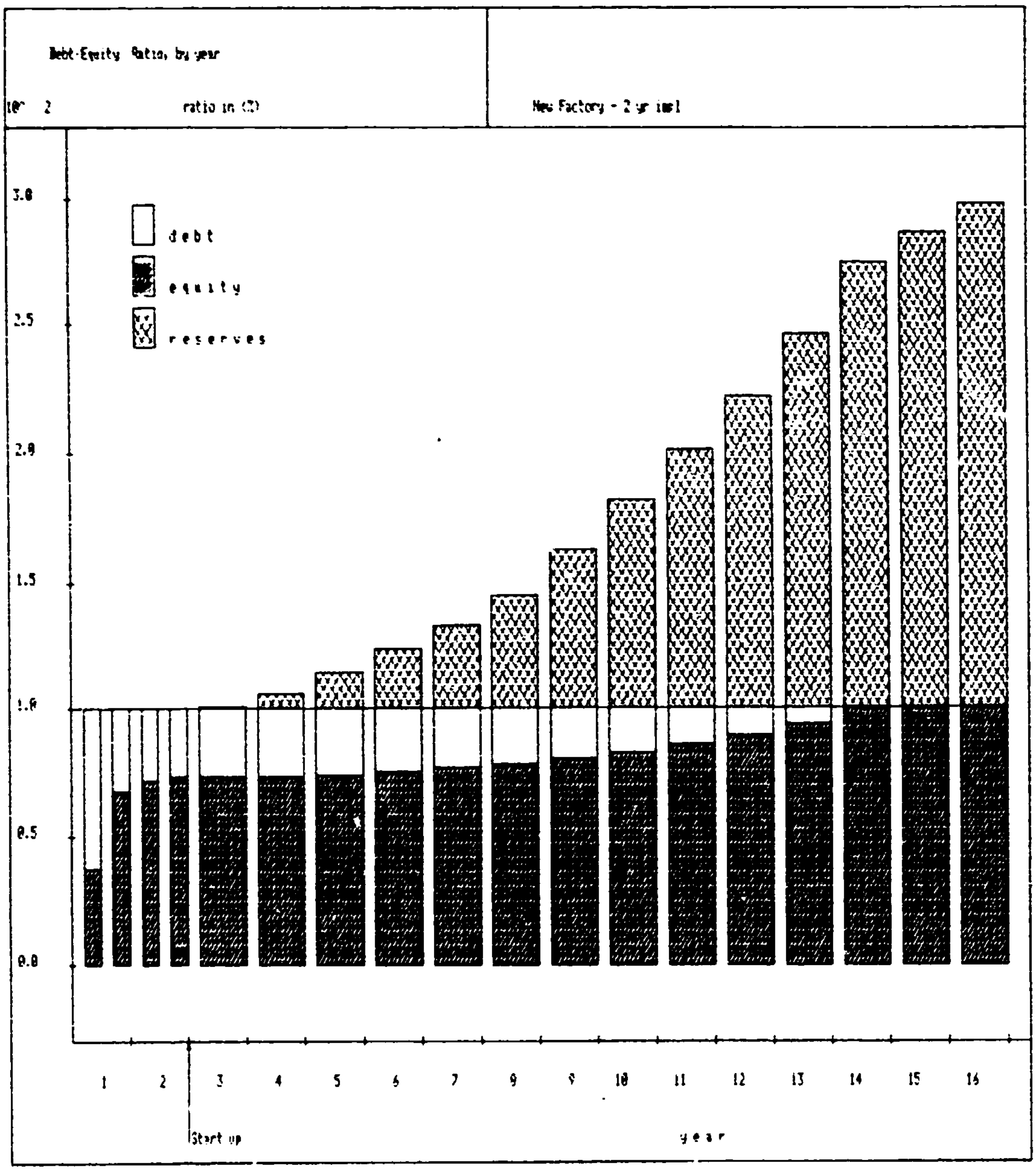
Debt Service Ratio, by year

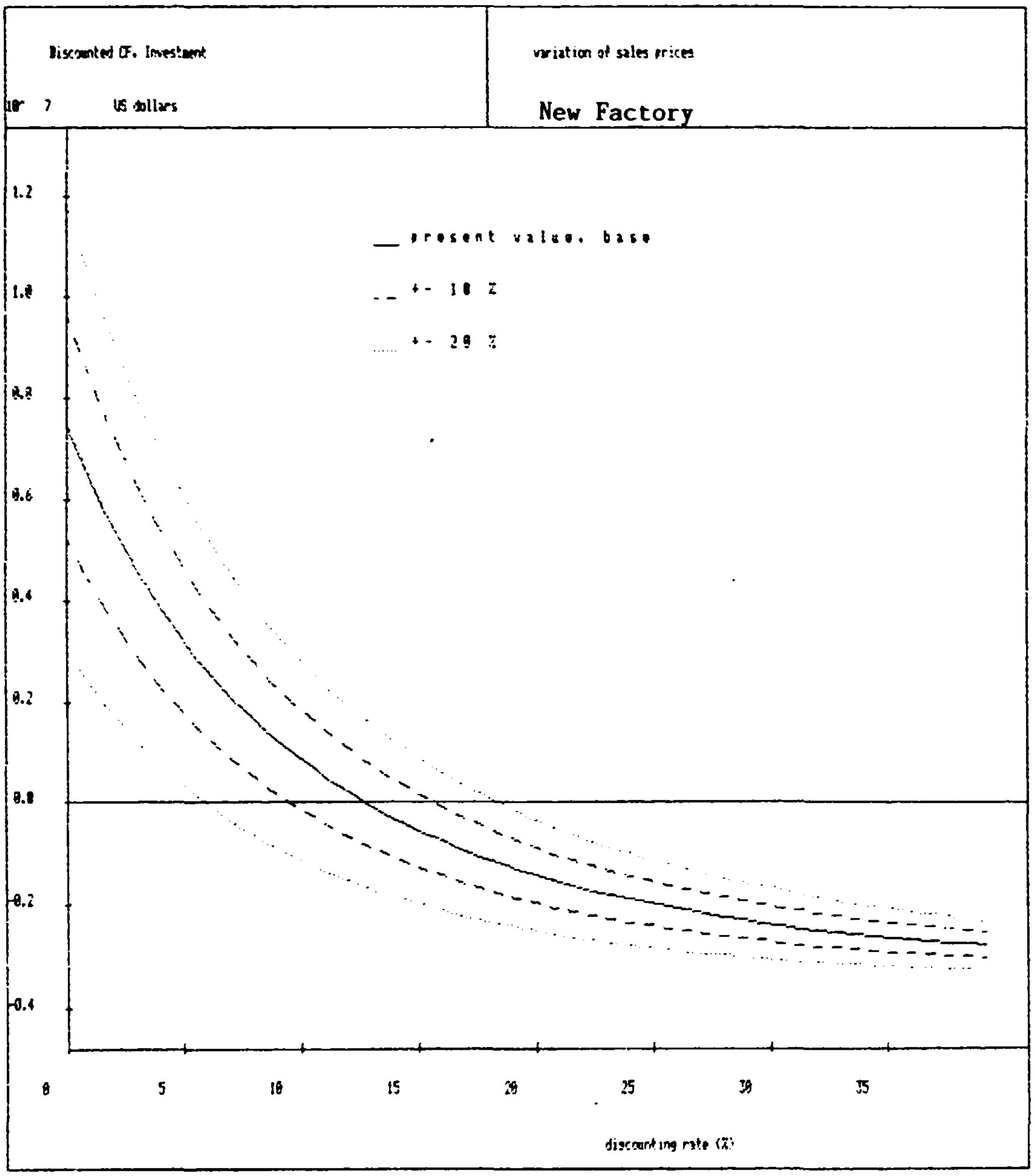
net cashflow/debt service

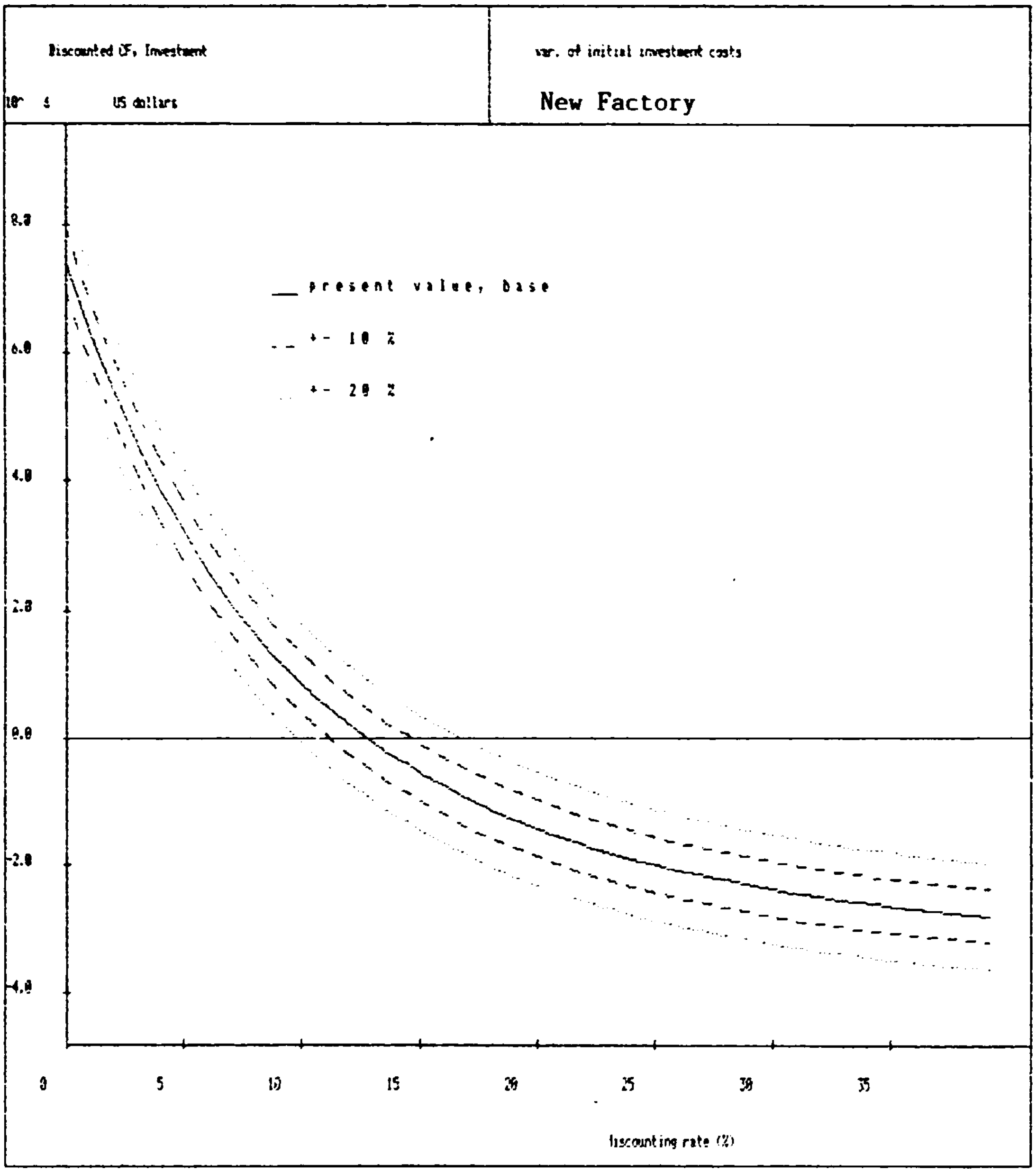
variation of total interest

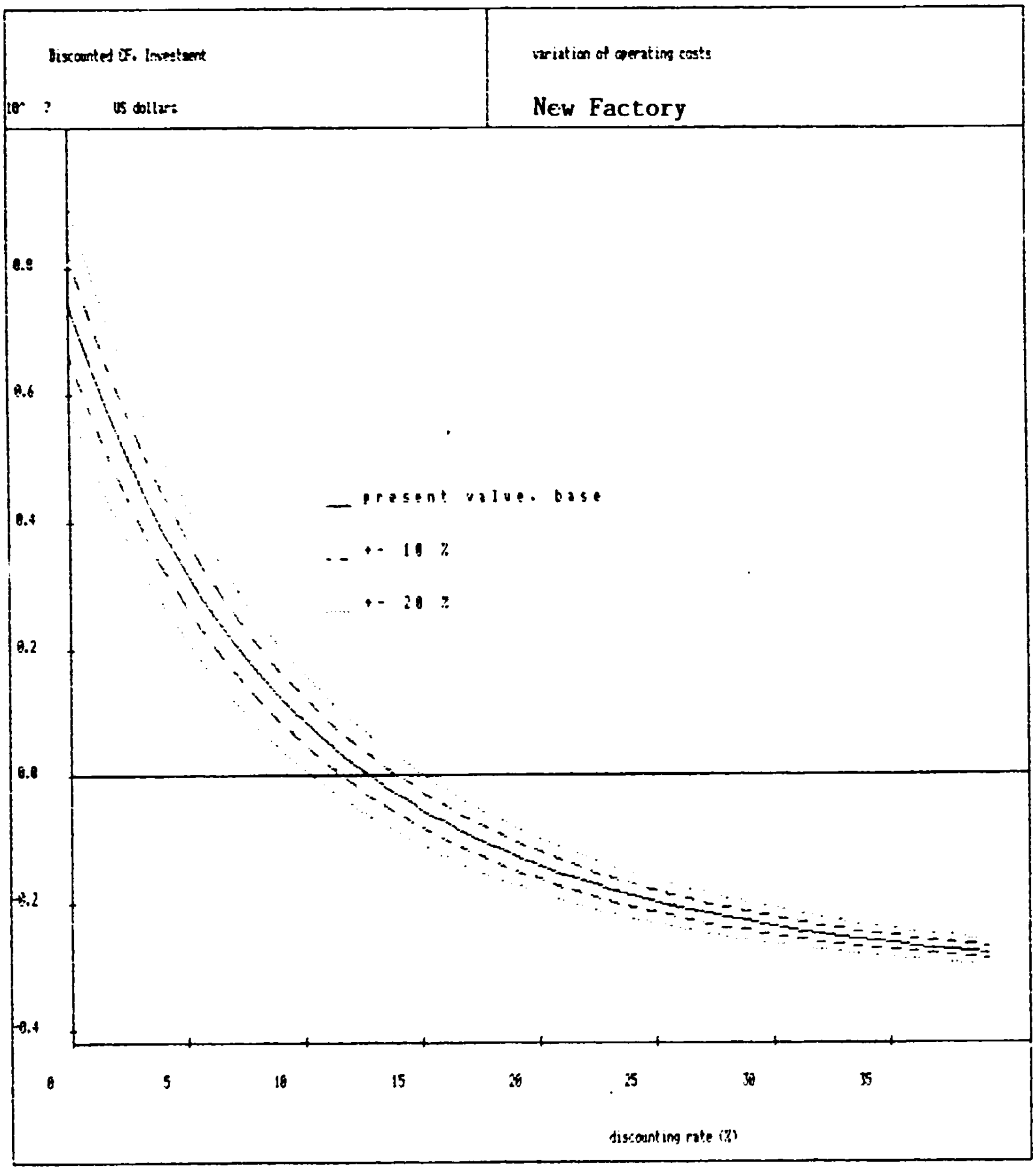
New Factory

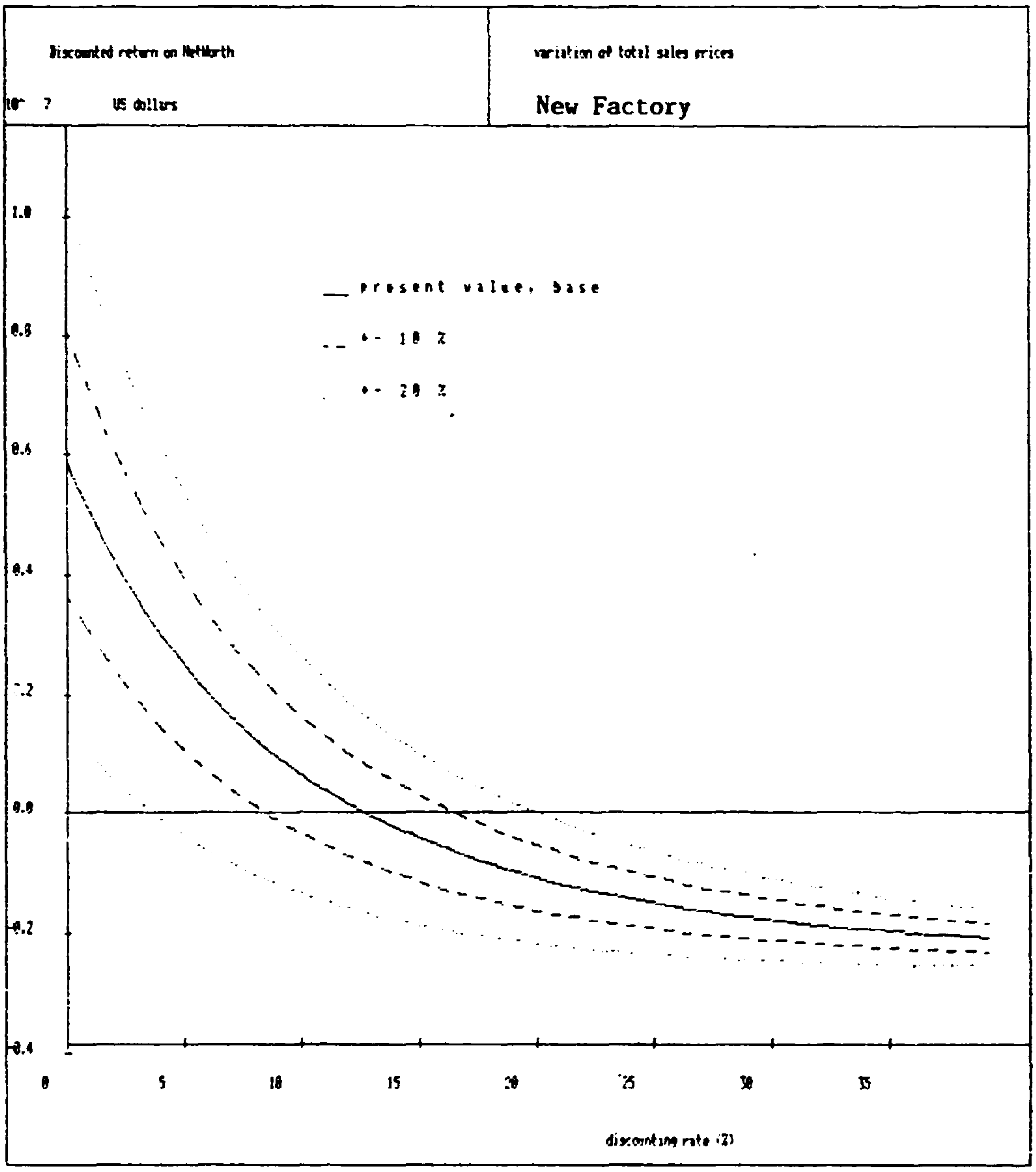



Debt-Equity Ratio, by year
10^ 2
ratio in (%)
New Factory - 2 yr impl
3.0
2.5
2.0
1.5
1.0
0.5
0.0
debt
equity
reserves
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Start up
year

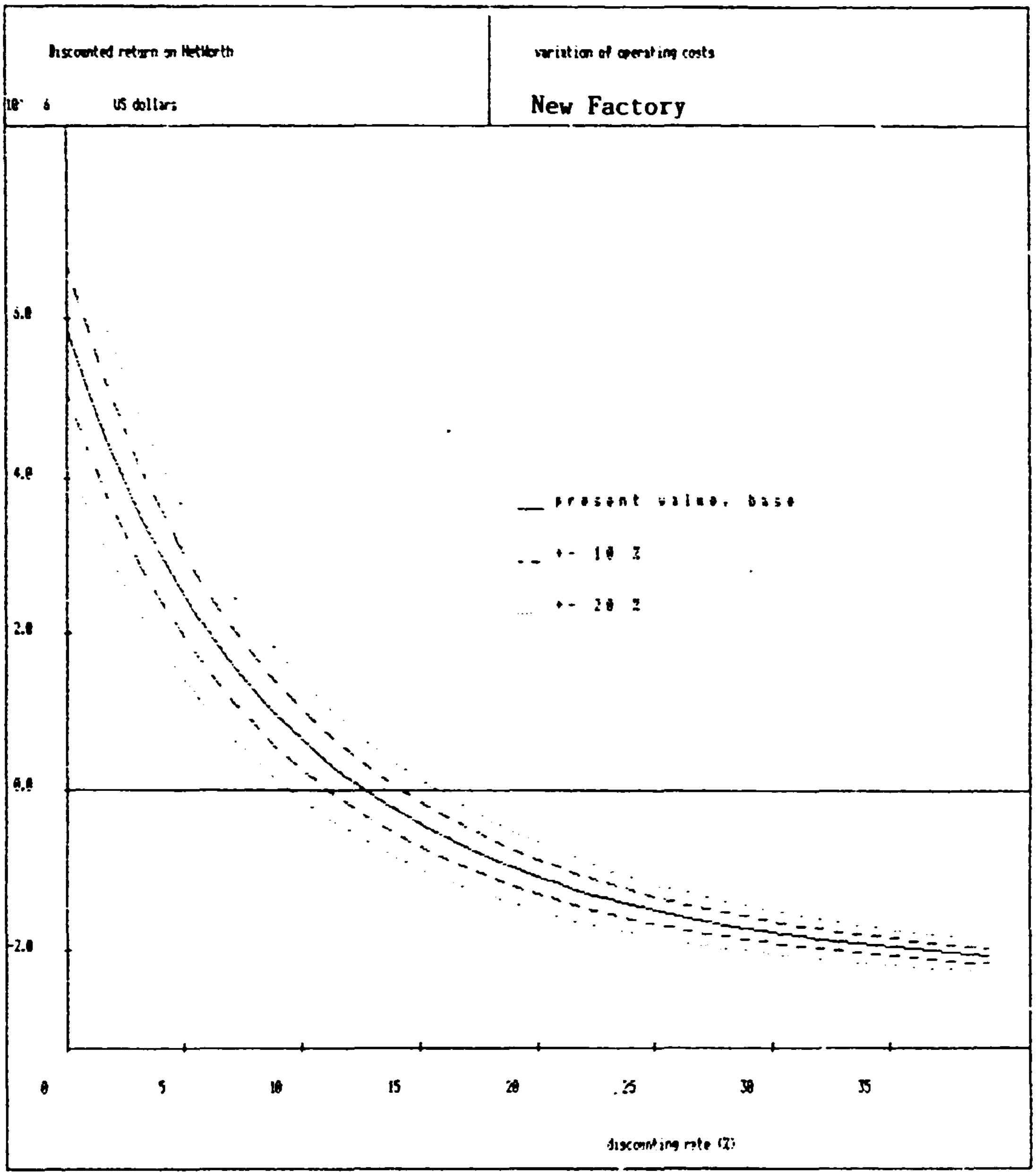

Discounted CF, Investment
10^ 7 US dollars
variation of sales prices
New Factory
present value, base
+- 10 %
+- 20 %
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0
5
10
15
20
25
30
35
discounting rate (%)

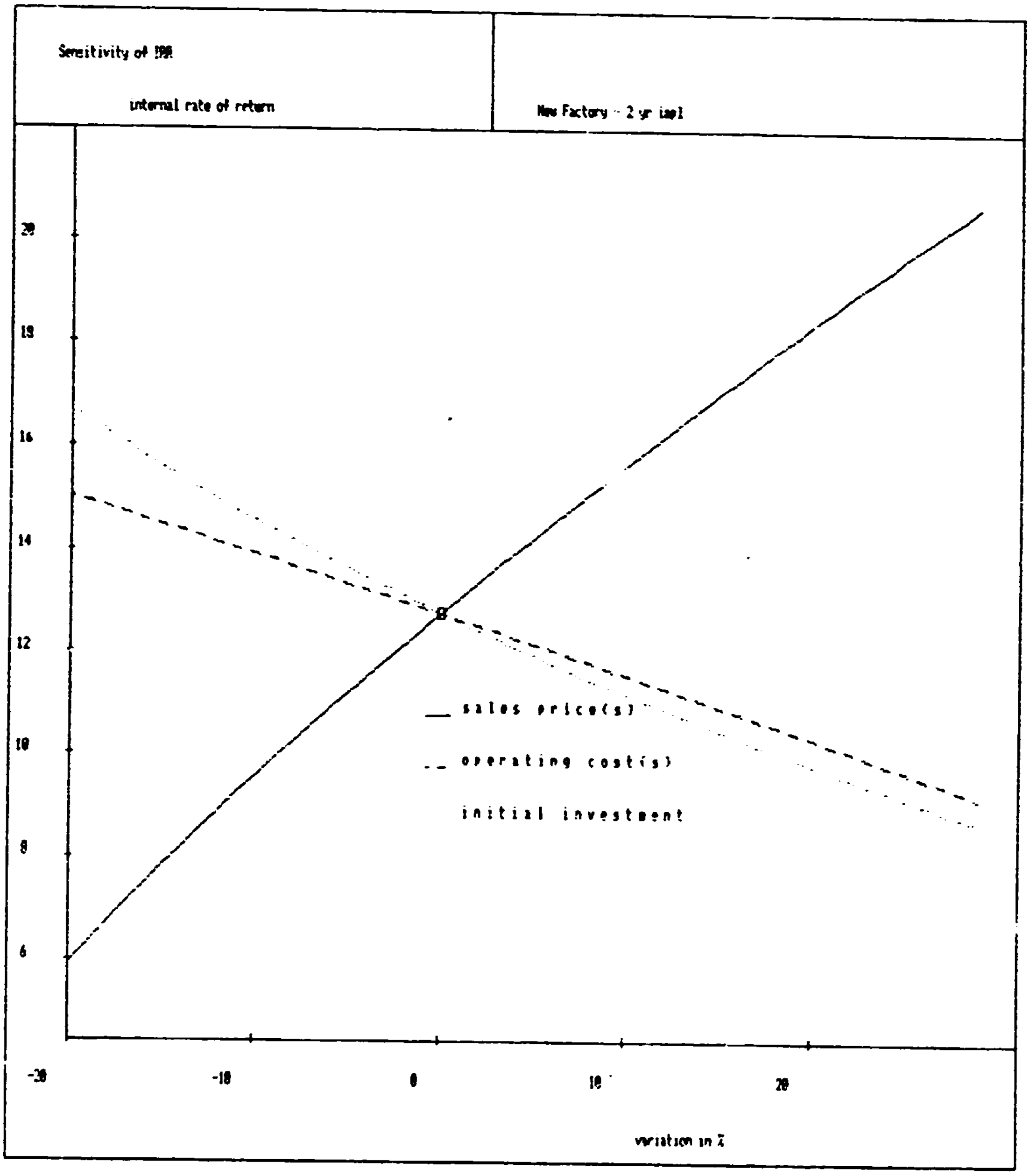

Discounted CF, Investment
10^ 6 US dollars
var. of initial investment costs
New Factory
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
present value, base
+- 10 %
+- 20 %
0
5
10
15
20
25
30
35
Discounting rate (%)

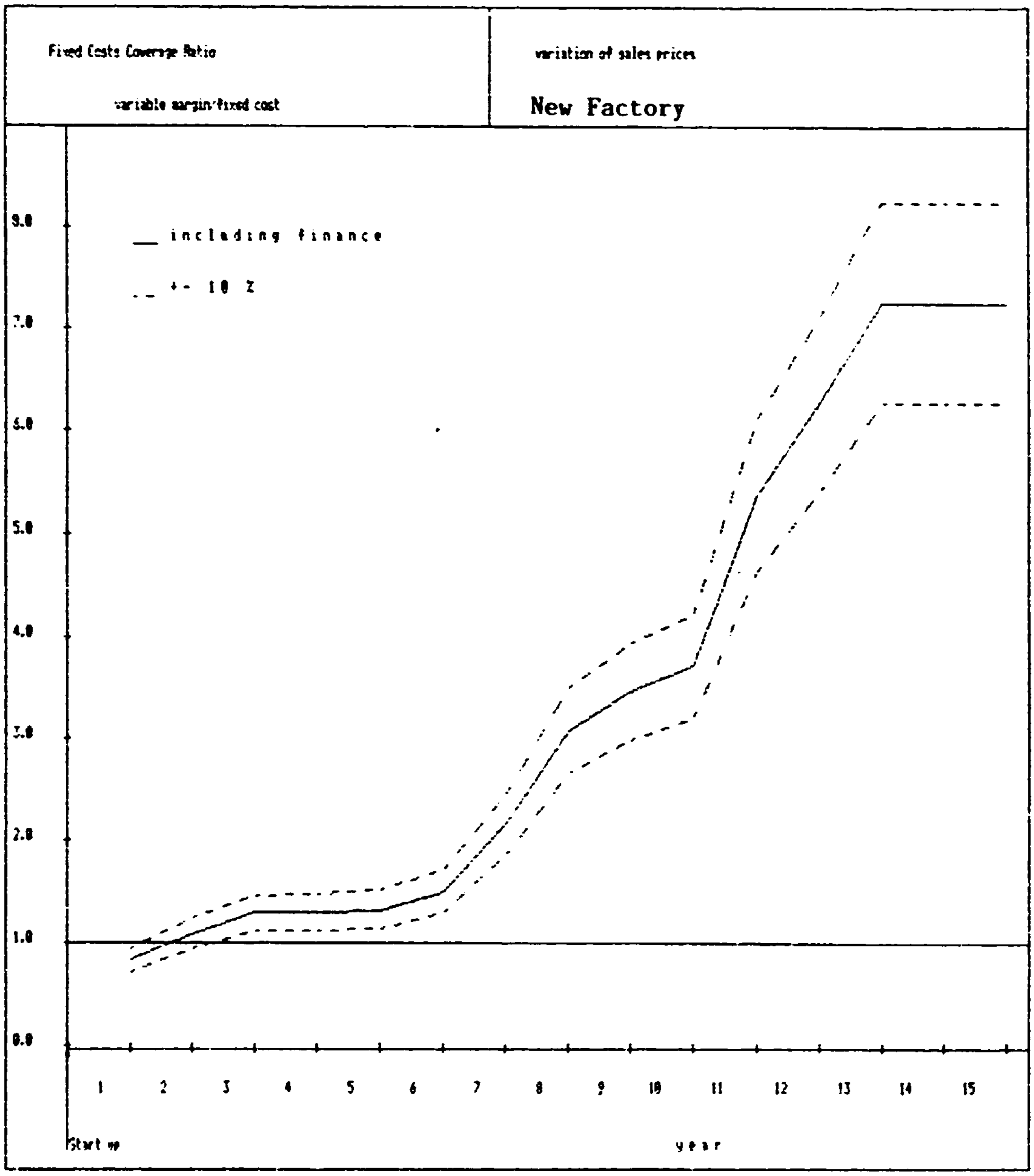

Discounted CF, Investment
10^ ? US dollars
variation of operating costs
New Factory
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
present value, base
+- 10 %
+- 20 %
0
5
10
15
20
25
30
35
discounting rate (%)

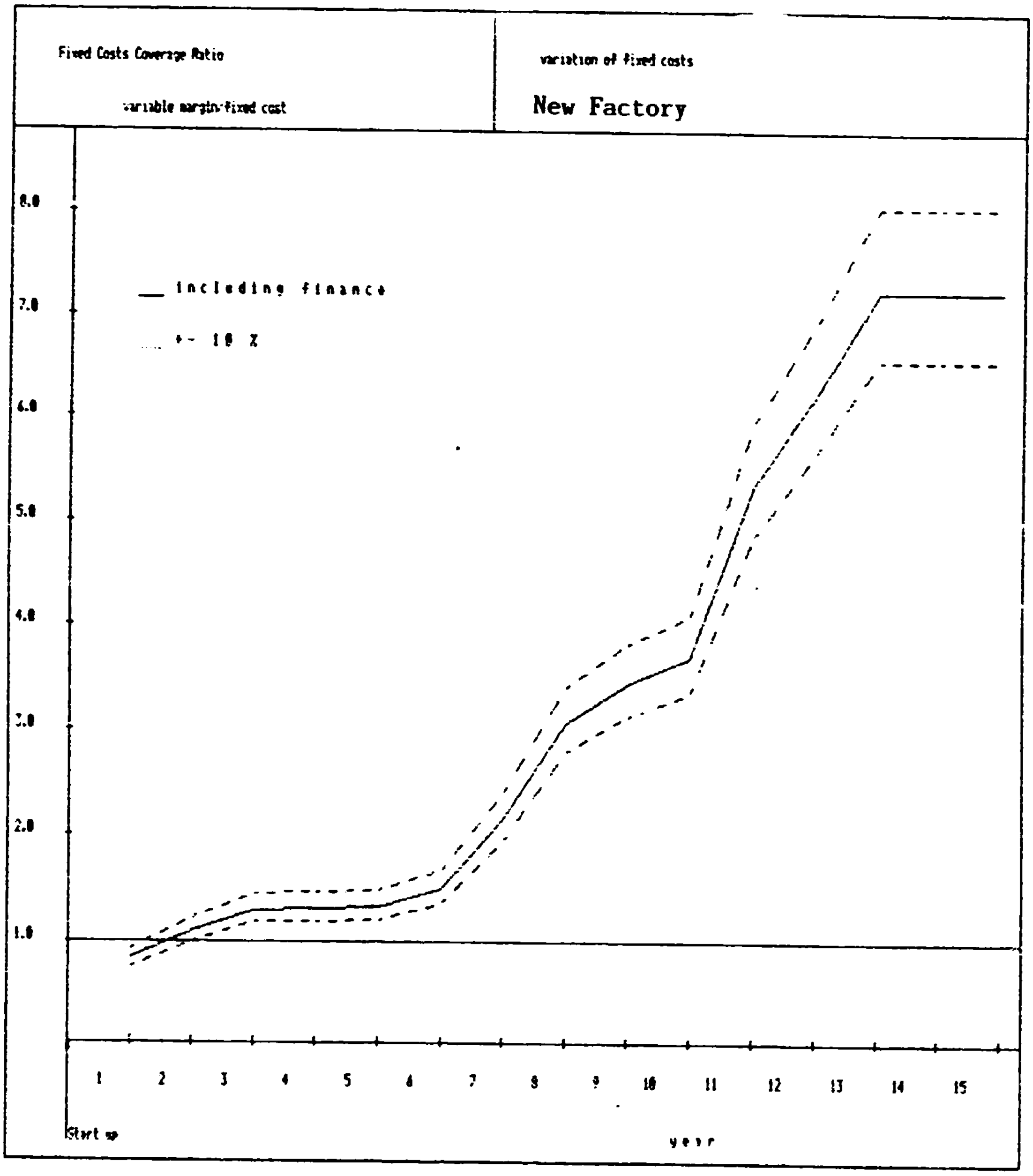


Discounted return on NetWorth
10^ 7 US dollars
variation of total sales prices
New Factory
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
present value, base
+- 10 %
+- 20 %
0
5
10
15
20
25
30
35
discounting rate (%)

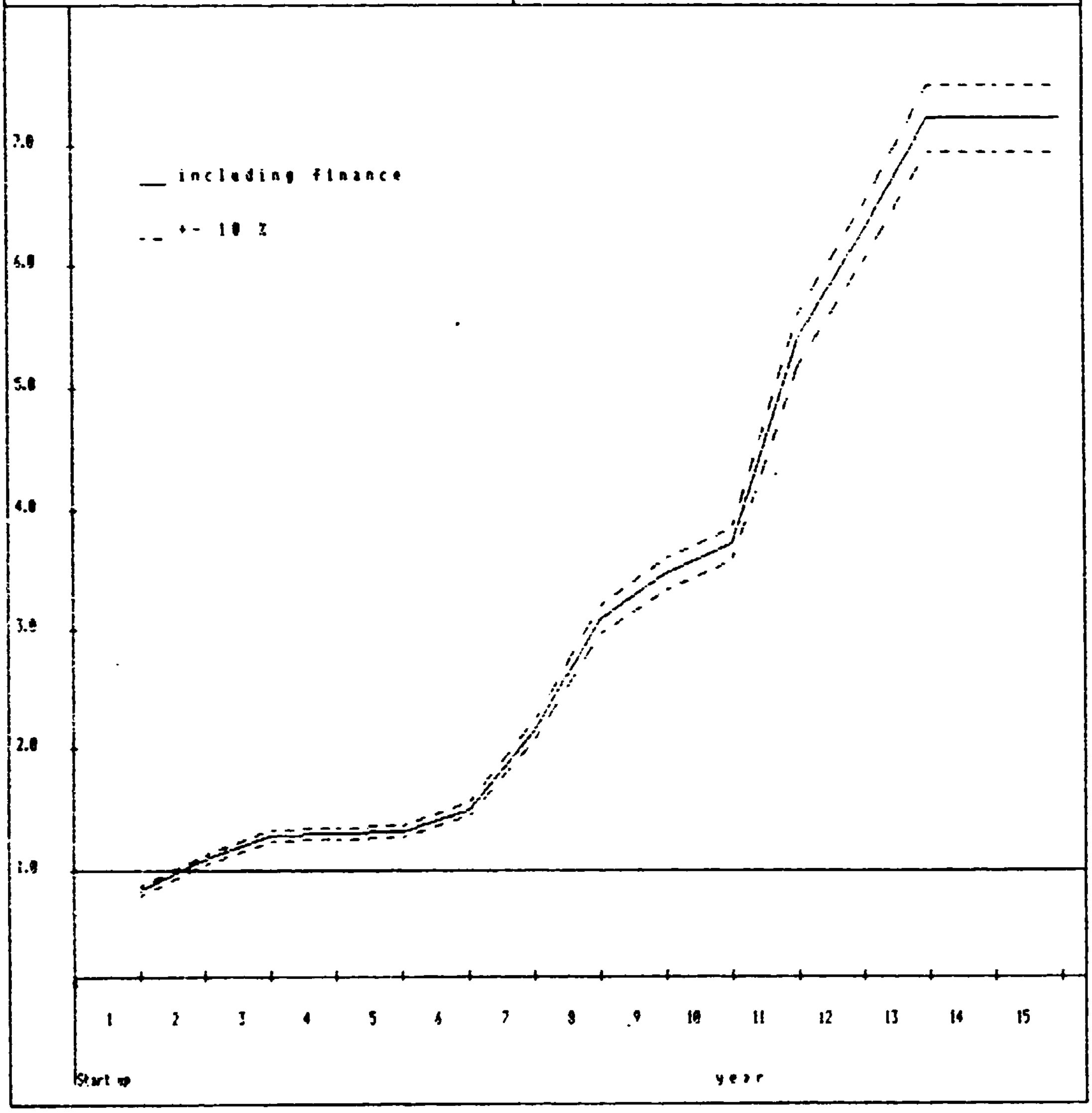

Discounted return on NetWorth
variation of operating costs
New Factory
10^ 6 US dollars
6.0
4.0
2.0
0.0
-2.0
present value, base
+- 10 %
+- 20 %
0
5
10
15
20
25
30
35
discounting rate (%)

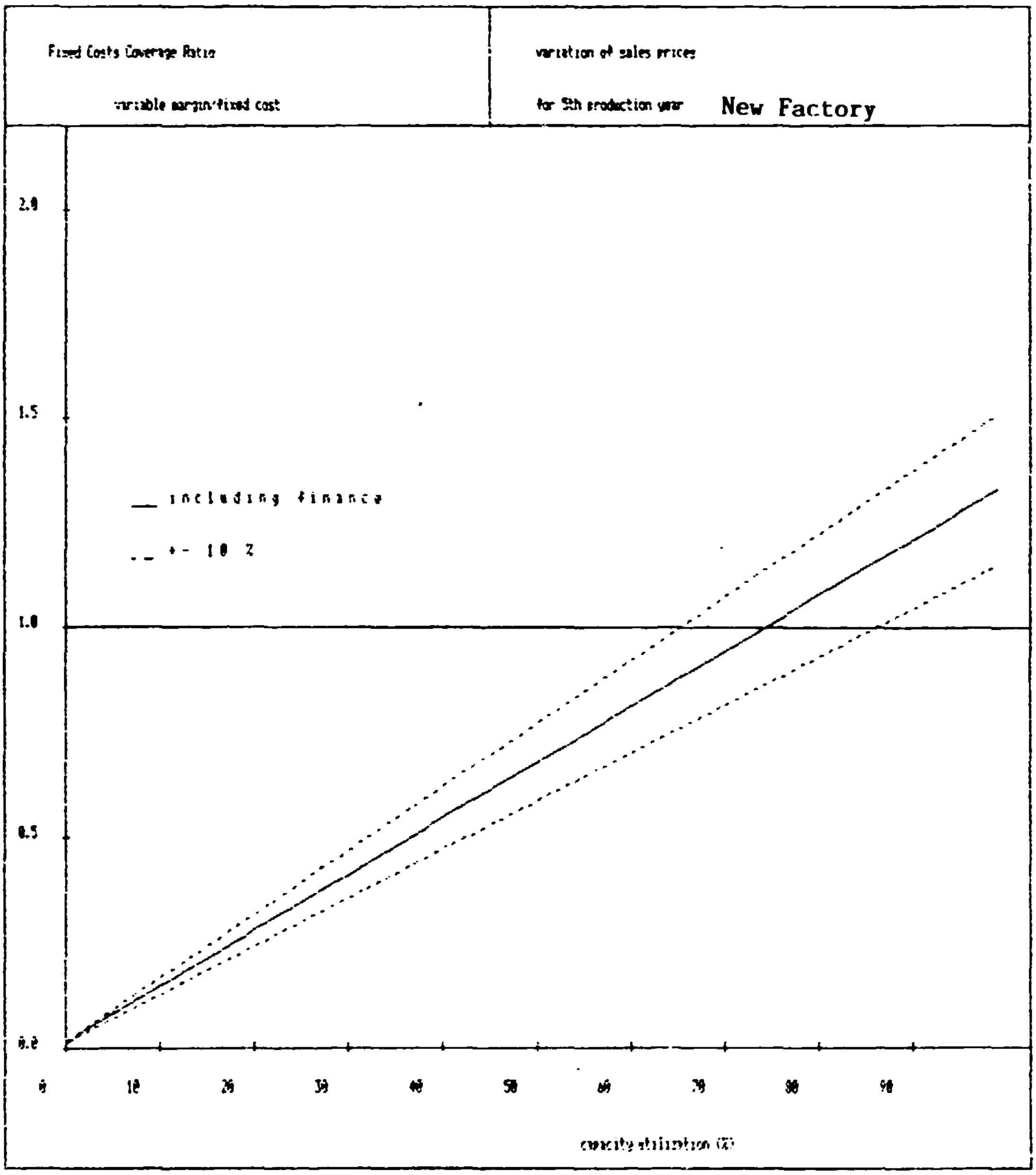

Sensitivity of IRR
internal rate of return
New Factory - 2 yr impl
20
18
16
14
12
10
8
6
-20
-10
0
10
20
variation in %
sales price(s)
operating cost(s)
initial investment

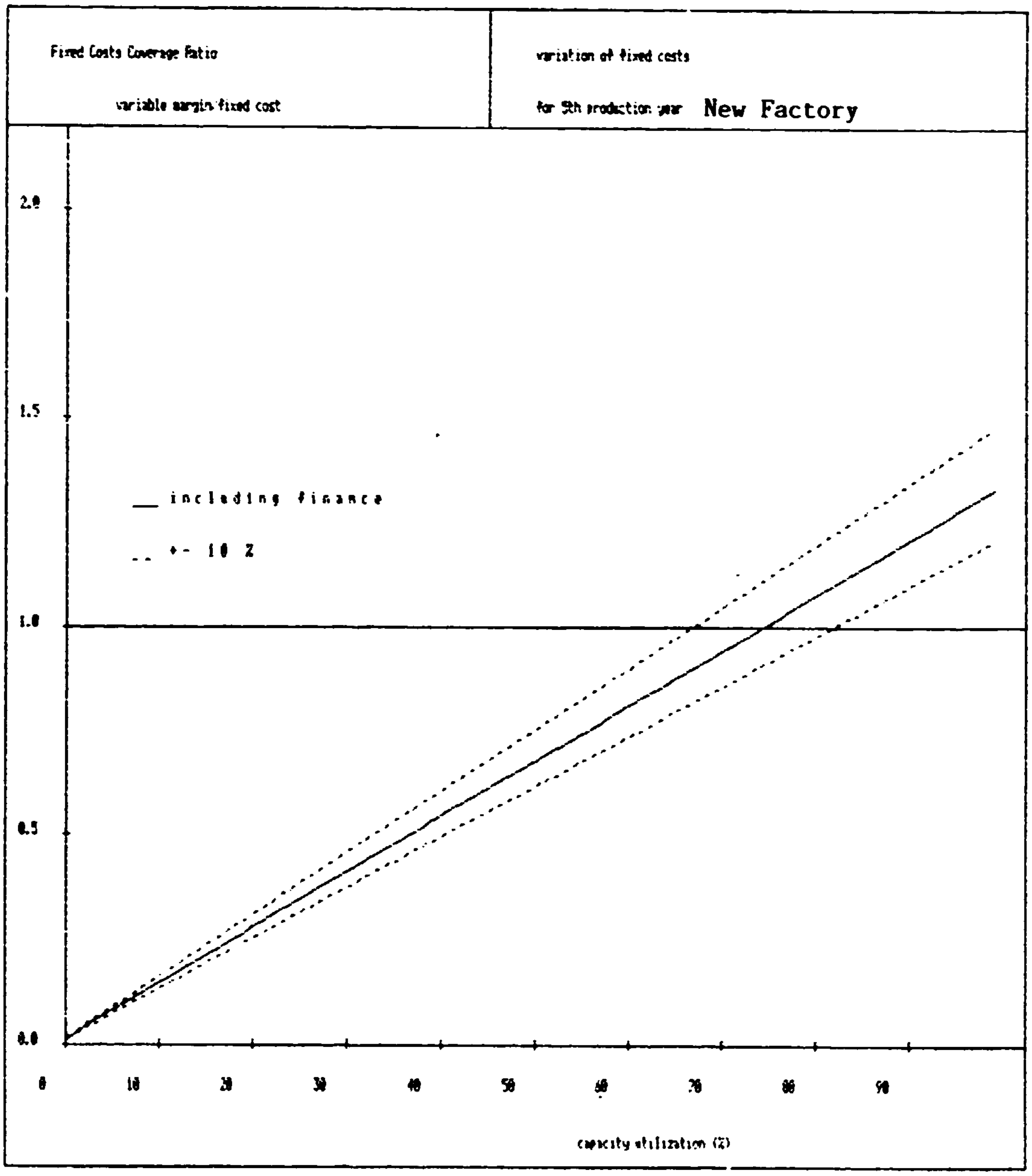

Fixed Costs Coverage Ratio
variable margin/fixed cost
variation of sales prices
New Factory
including finance
+- 10 %
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Fixed Costs Coverage Ratio
variable margin/fixed cost
variation of fixed costs
New Factory
including finance
+- 10 %
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

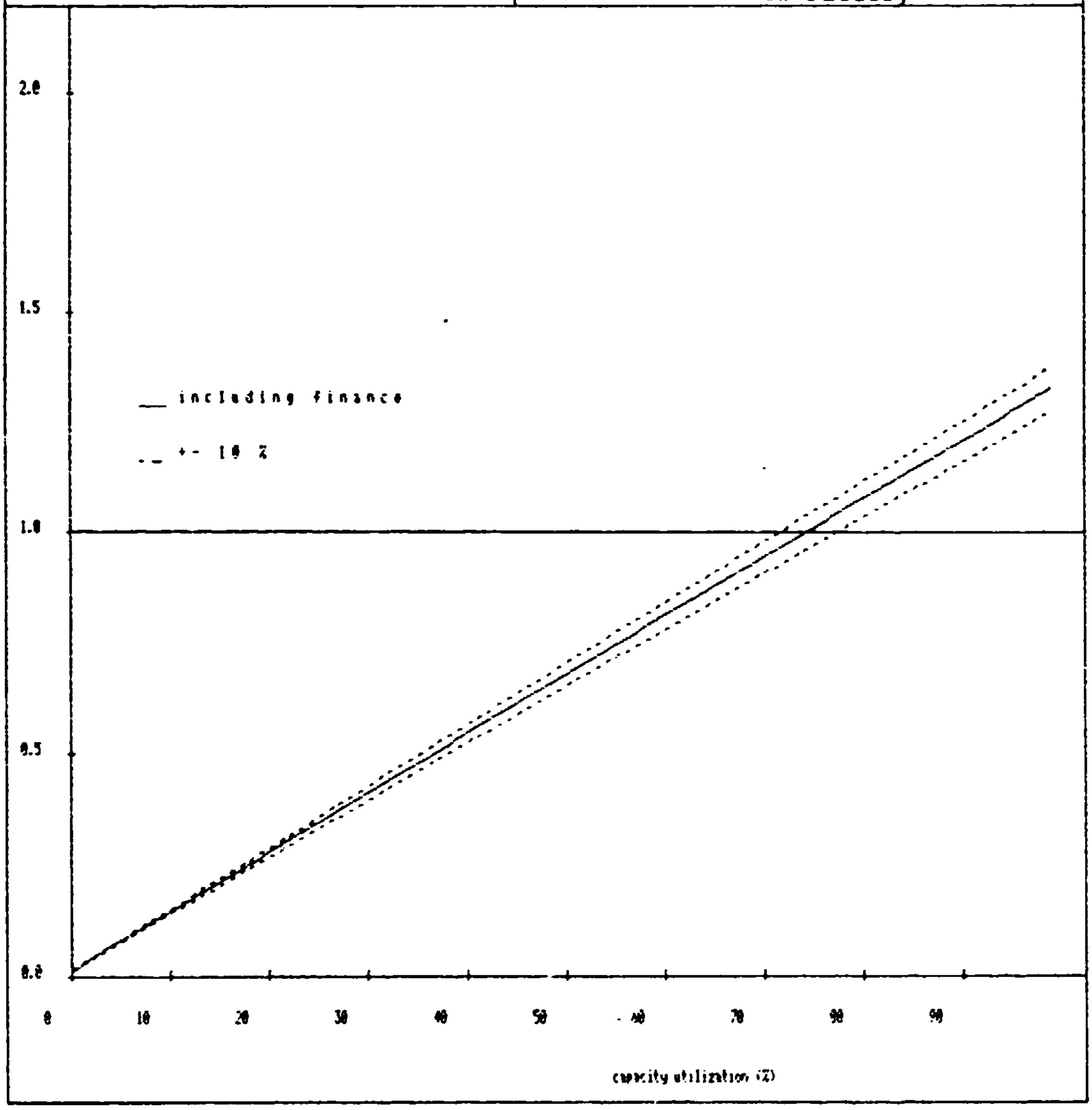
Fixed Costs Coverage Ratio	variation of variable costs
variable margin/fixed cost	New Factory

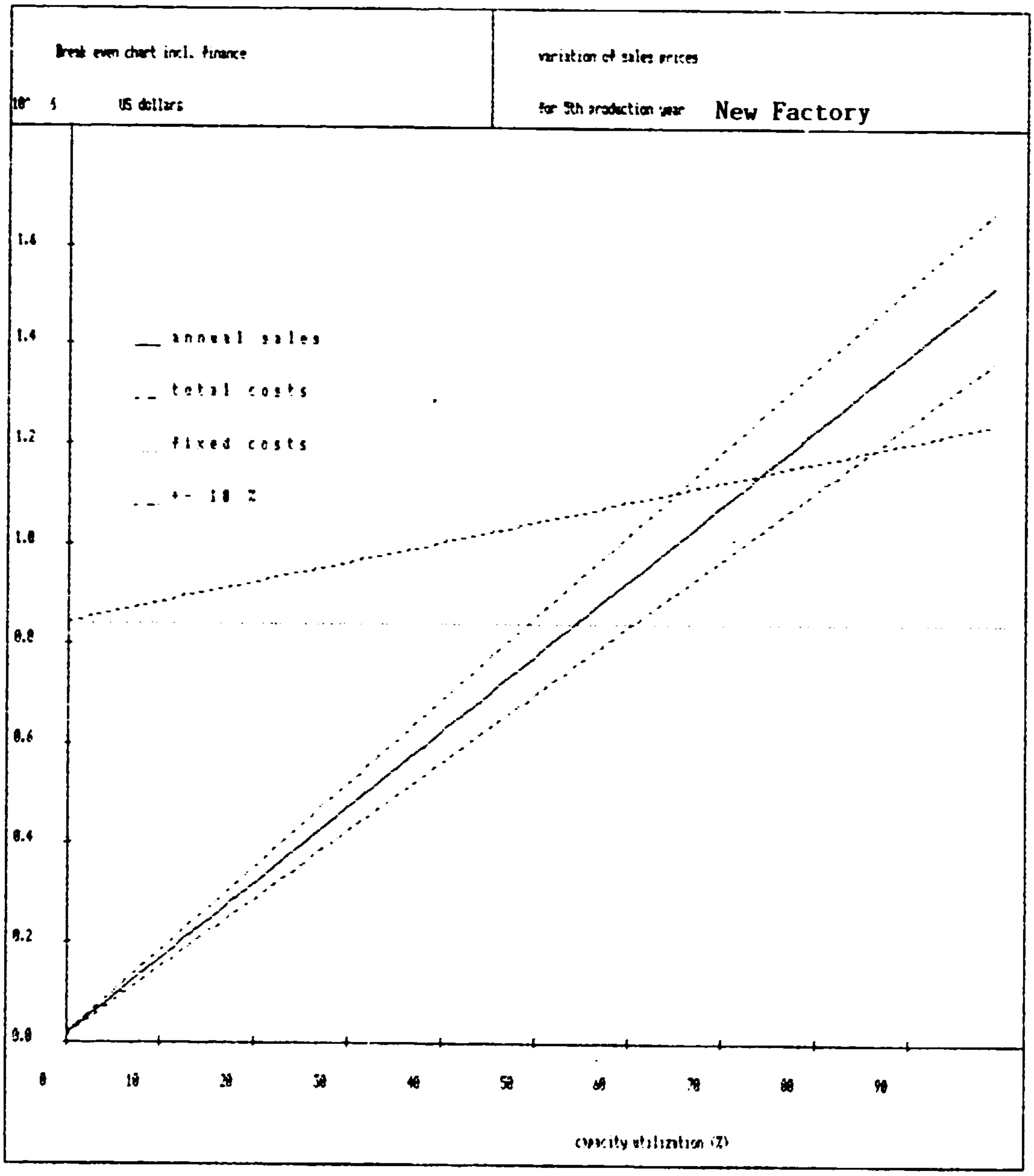



Fixed Costs Coverage Ratio
variable margin/fixed cost
variation of sales prices
for 5th production year
New Factory
2.0
1.5
1.0
0.5
0.0
including finance
+- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

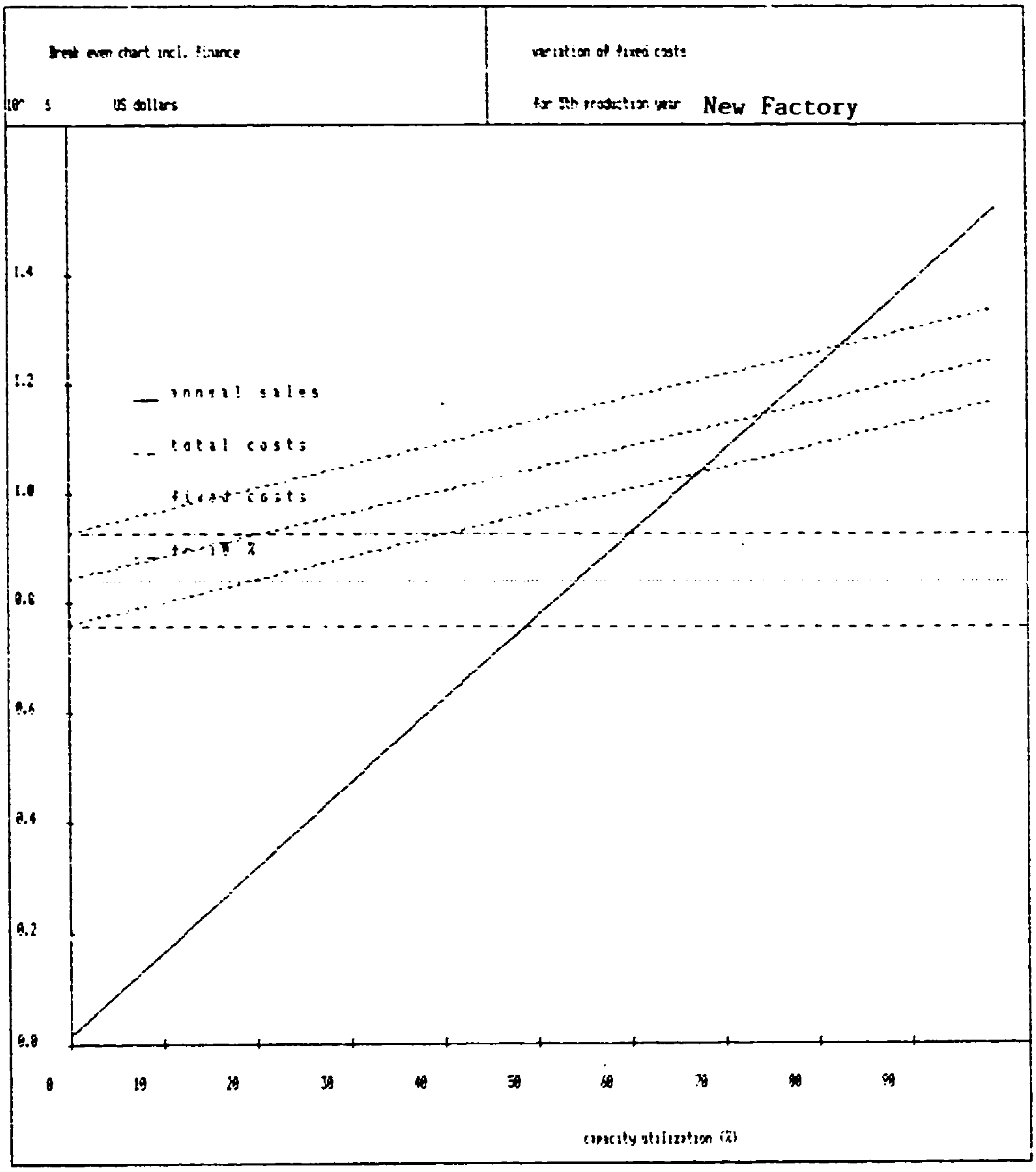

Fixed Costs Coverage Ratio
variable margin/fixed cost
variation of fixed costs
for 5th production year New Factory
2.0
1.5
1.0
0.5
0.0
including finance
+- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

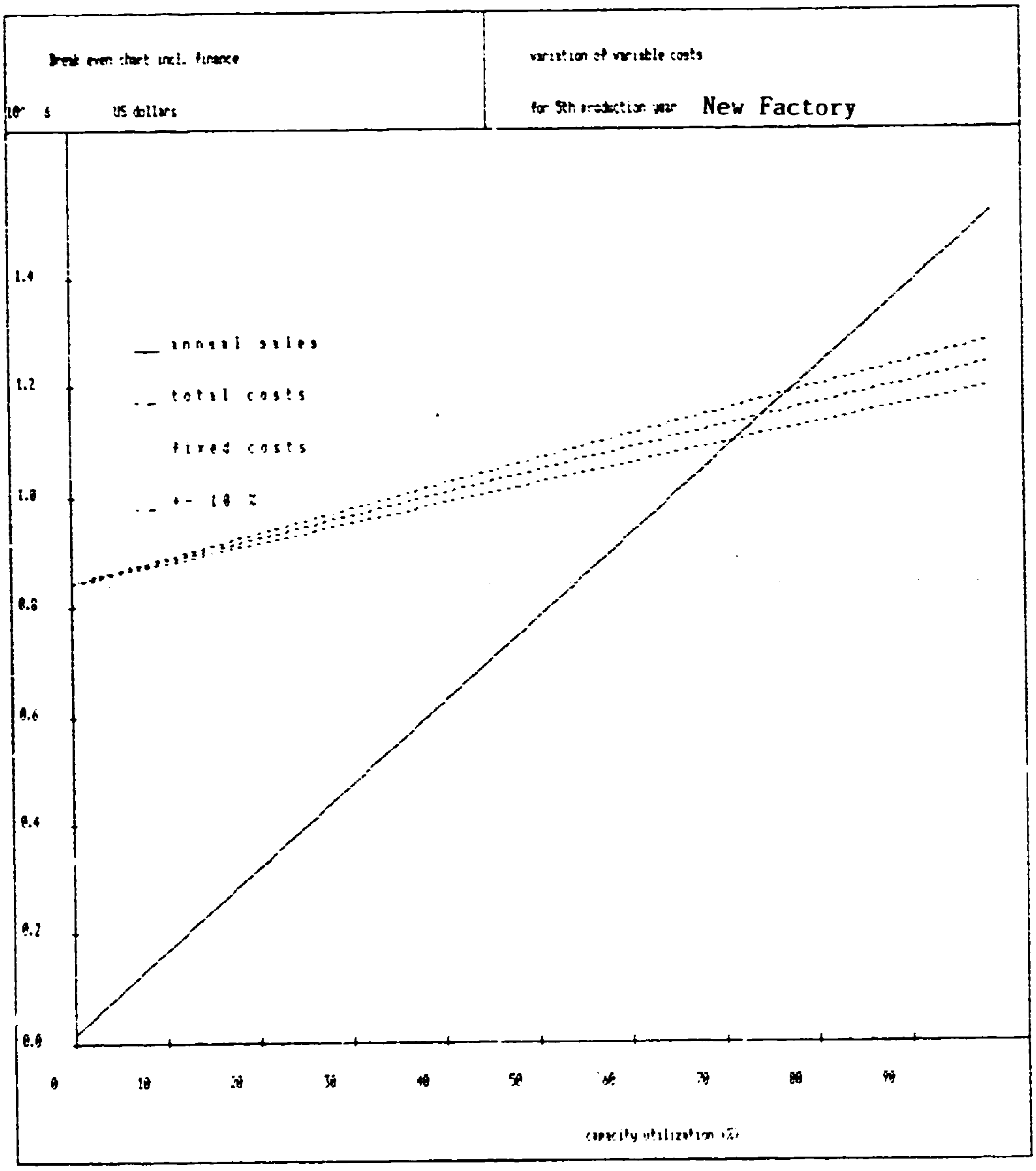
Fixed Costs Coverage Ratio	variation of variable costs
variable margin/fixed cost	for 5th production year New Factory





Break even chart incl. finance
variation of sales prices
10^6 $ US dollars
for 5th production year
New Factory
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
annual sales
total costs
fixed costs
+- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)


Break even chart incl. finance
variation of fixed costs
US dollars
for 5th production year
New Factory
annual sales
total costs
fixed costs
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

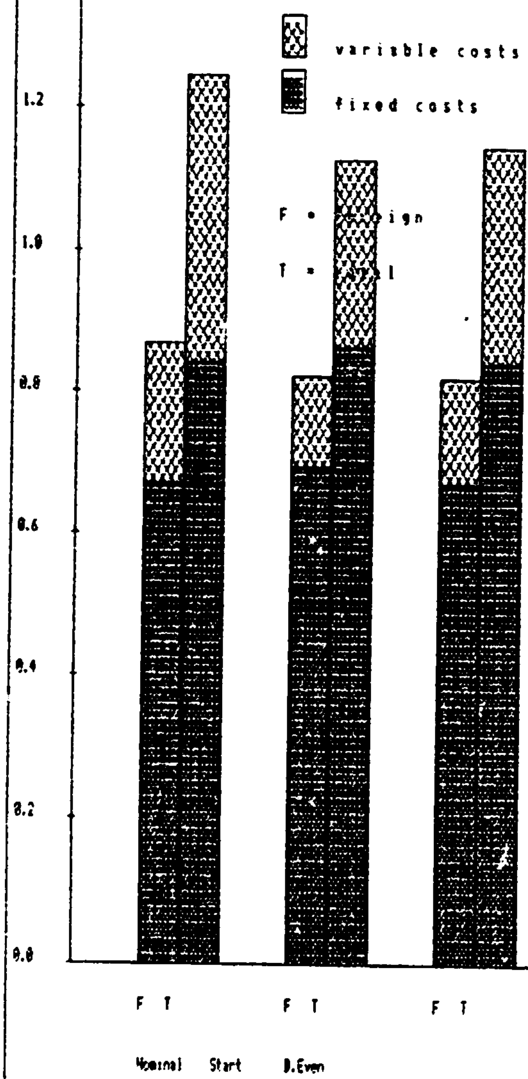

Break even chart incl. finance
US dollars
variation of variable costs
for 5th production year New Factory
annual sales
total costs
fixed costs
+- 10 %
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

Structure of Production Costs

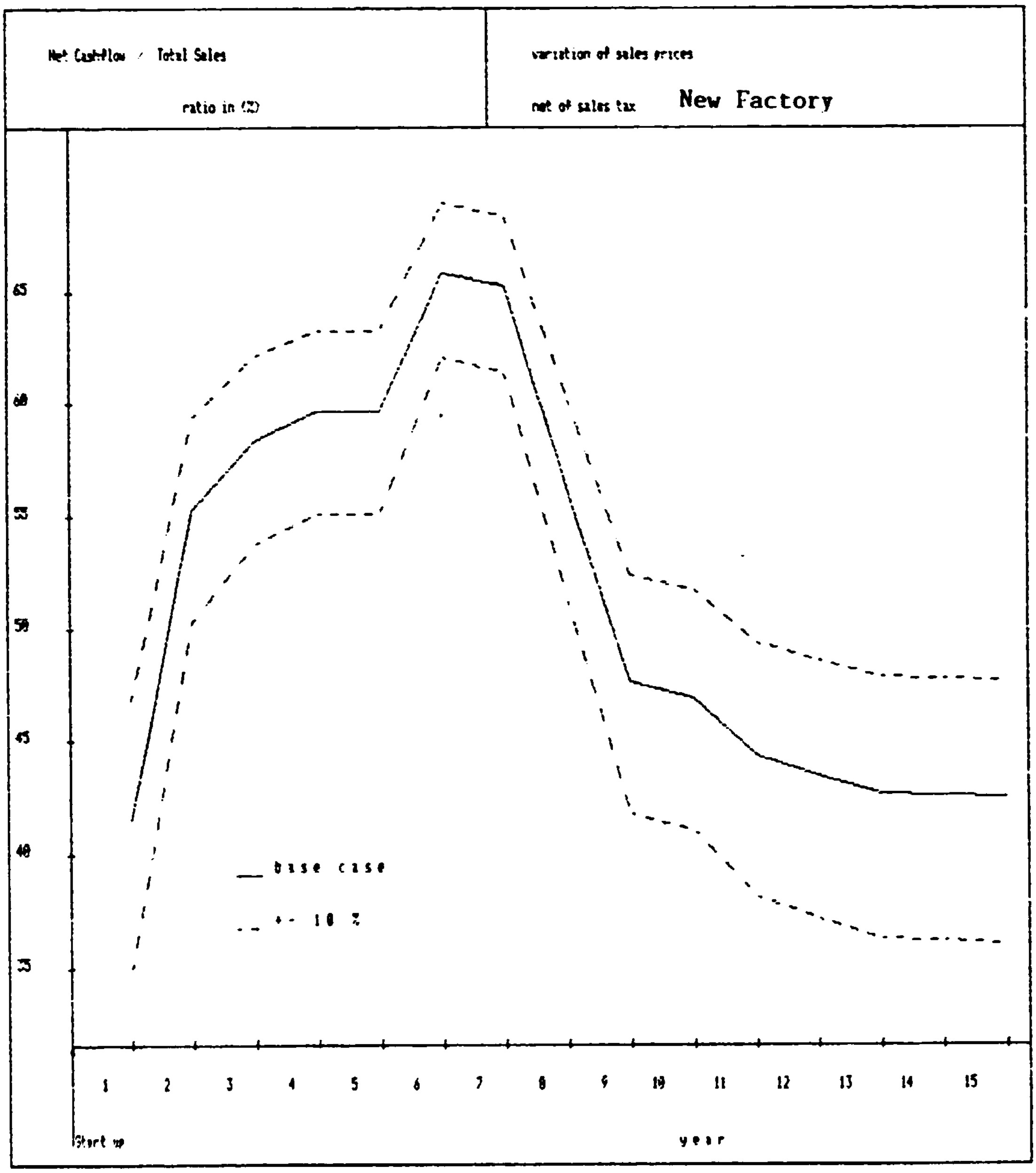
10^ 6 US dollars

for 5th production year

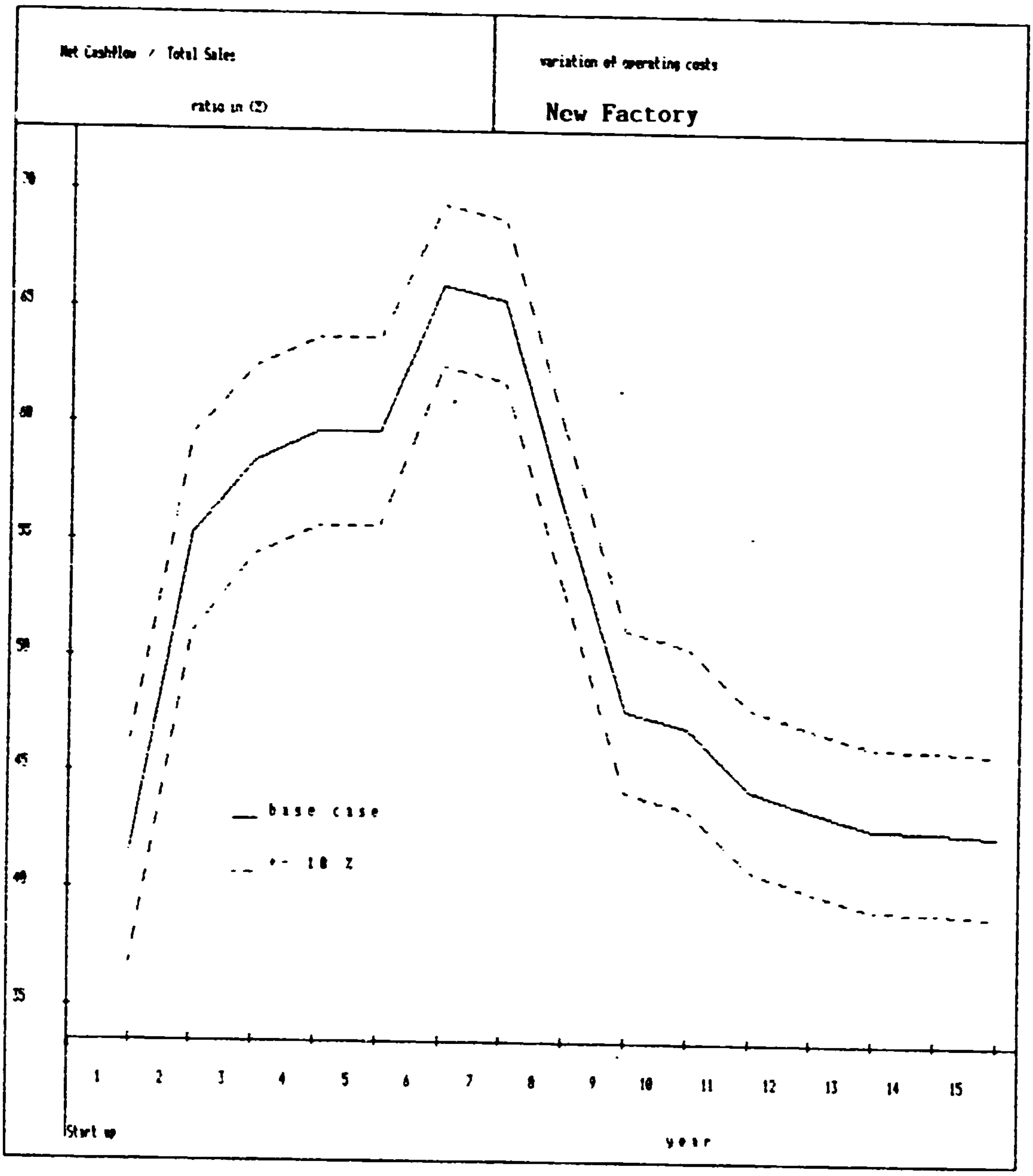
New Factory - 2 yr inl

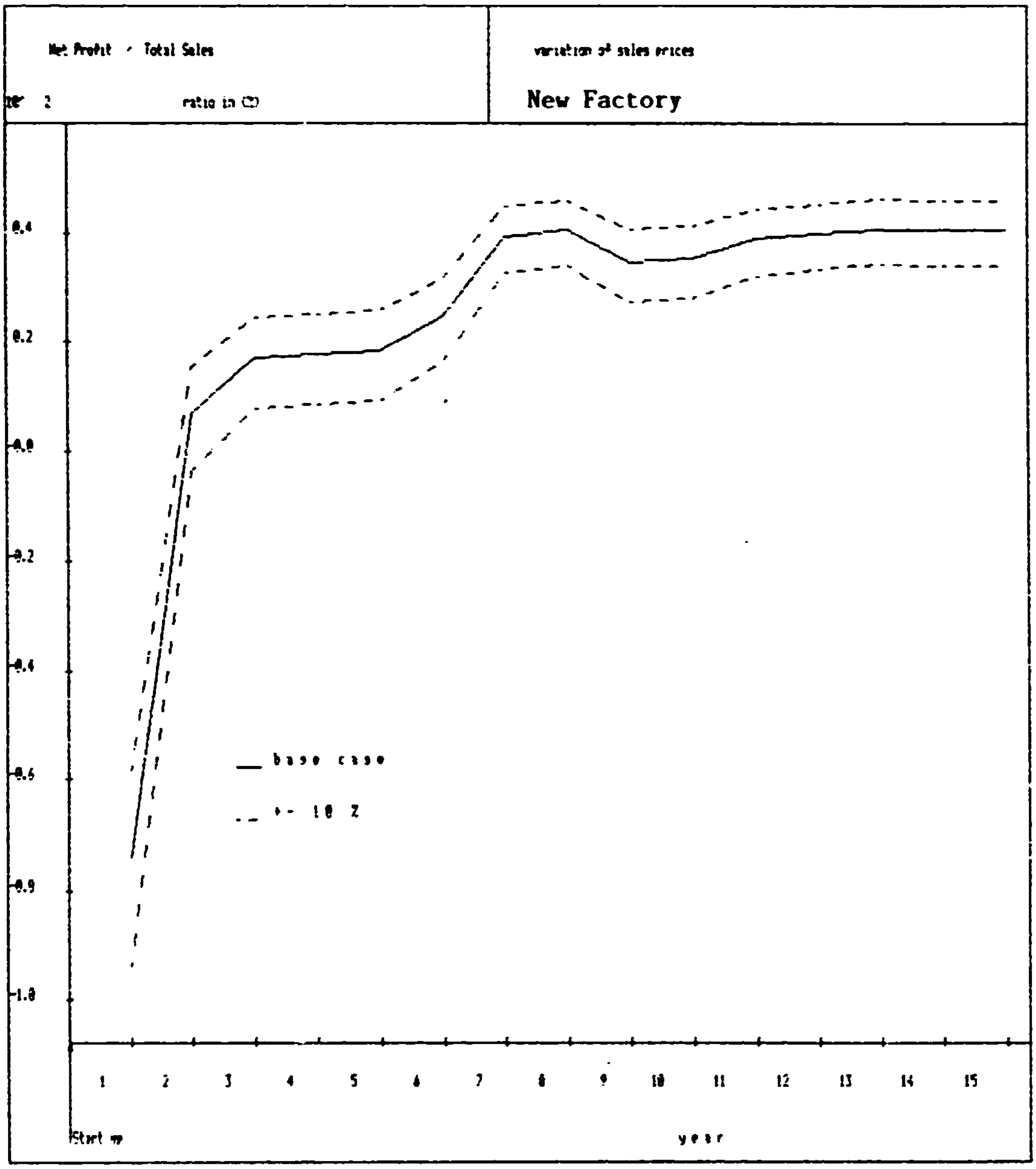


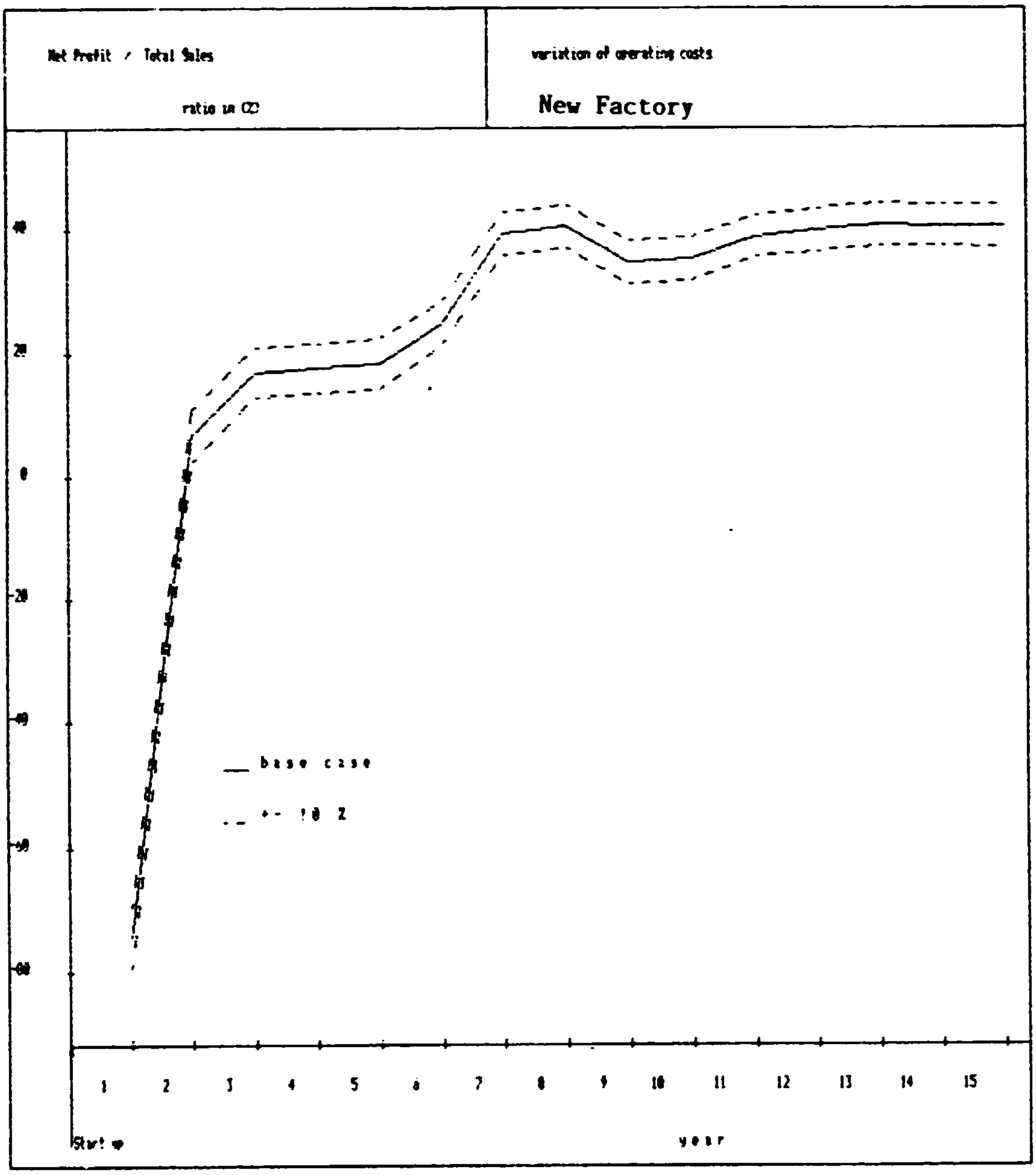
Nominal	Start up	
13.81	9.92	raw material
10.45	7.51	other RM
0.32	0.24	utilities
4.58	3.49	energy
1.87	1.52	labour
0.24	0.24	maintenance
1.49	1.60	spares
16.65	17.43	overheads
37.49	41.44	depreciation
13.19	16.58	interest
100.00	100.00	Total Prod C.



Net Cashflow / Total Sales
ratio in (%)
variation of sales prices
net of sales tax
New Factory
65
60
55
50
45
40
35
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Net Cashflow / Total Sales
ratio in (%)
variation of operating costs
New Factory
70
65
60
55
50
45
40
35
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Net Profit / Total Sales
ratio in (%)
variation of sales prices
New Factory
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year



Net Profit / Total Sales
ratio in (%)
variation of operating costs
New Factory
40
20
0
-20
-40
-60
-80
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

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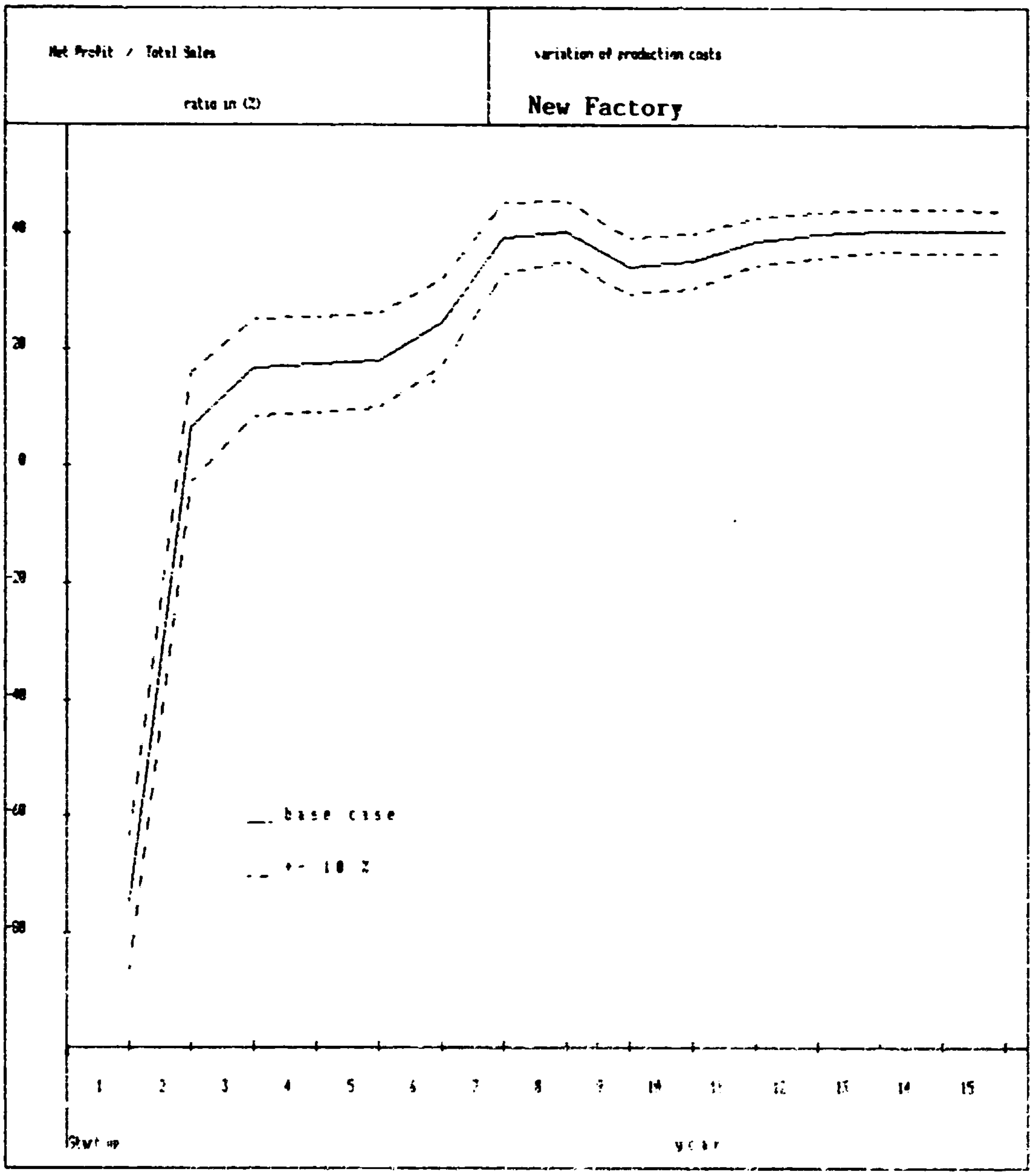

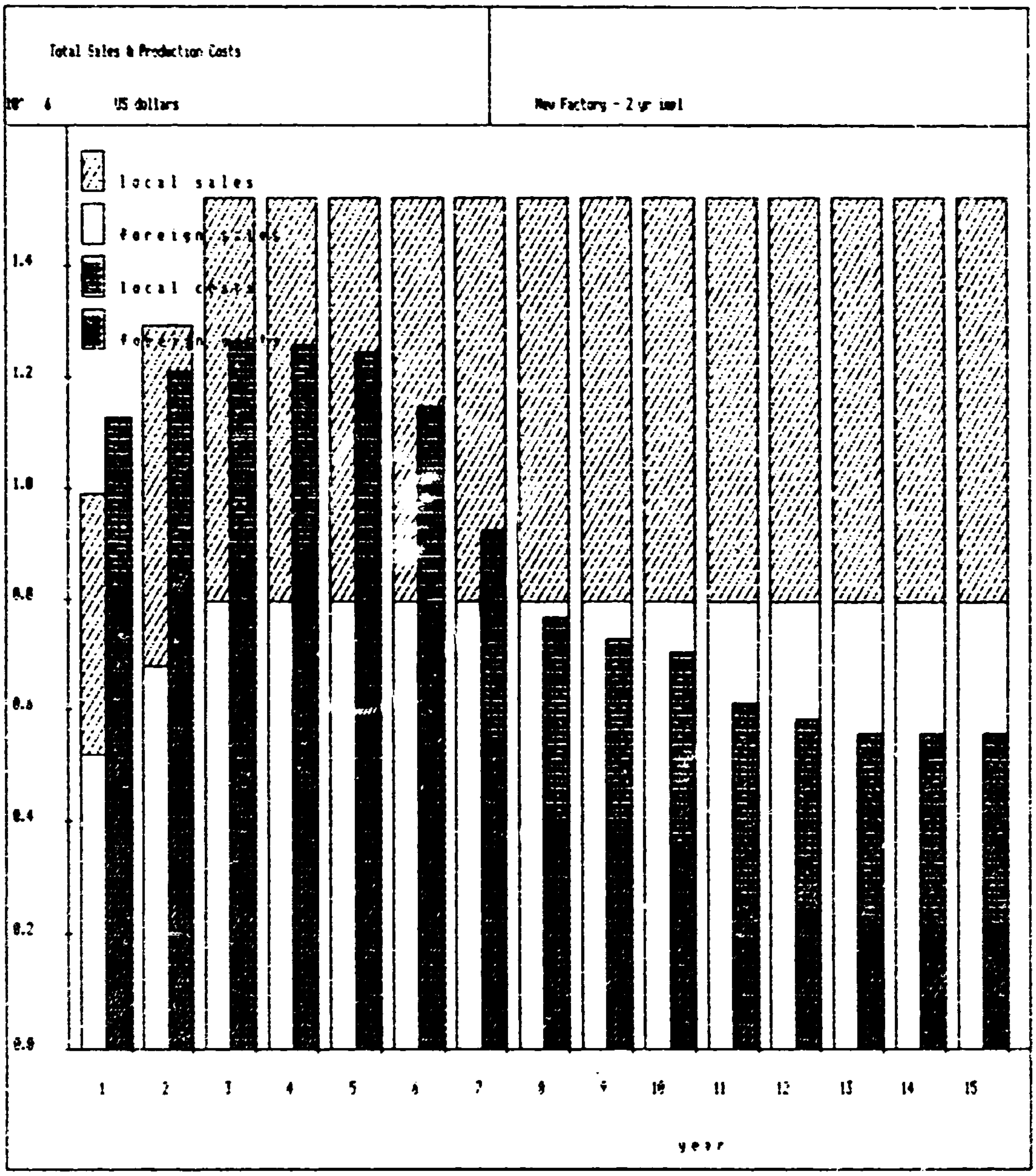
Total Sales & Production Costs
10^ 6
US dollars
New Factory - 2 yr impl
local sales
foreign sales
local costs
foreign costs
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
year

Foreign Cashflows at Adjusted Market Prices in US dollars
Economic Analysis excluding indirect effects

	financial present values			factor	adjusted present values		
	at 0 %	at 12.00 %	at 12.00 %		at 0 %	at 12.00 %	at 12.00 %
foreign cashflow:							
net cashflow, operation	4555673.00	-388352.10	-388352.10	1.46	6636175.00	428833.60	428833.60
sales revenue, incl. tax	13639530.00	5357373.00	5357373.00	1.00	13639530.00	5357379.60	5357373.00
other income	0.00	0.00	0.00	0.00	0.00	0.00	0.00
indirect effects,benefit	....	....	....	....	....	....	....
cash outflow, operation:							
fixed investment	3417551.00	3361499.00	3361499.00	1.00	3417551.00	3361499.00	3361499.00
net working capital . .	0.00	46943.05	46943.05	1.00	0.00	46949.05	46949.05
operating costs	3585806.00	1520096.00	1520096.00	1.00	3585806.00	1520096.00	1520096.00
materials	3108275.00	1224477.00	1224477.00	1.00	3108275.00	1224477.00	1224477.00
unskilled labour . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
supervision & skilled	477531.40	295618.70	295618.70	1.00	477531.40	295618.70	295618.70
taxes	2080501.60	817185.60	817185.60	0.00	0.00	0.00	0.00
indirect effects,costs .	....	....	....	....	....	....	....

New Factory

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Local Cashflows at Adjusted Market Prices in US dollars
Economic Analysis excluding indirect effects

	financial present values			factor	adjusted present values		
	at 0 %	at 12.00 %	at 12.00 %		at 0 %	at 12.00 %	at 12.00 %
l o c a l cashflow :							
net cashflow, operation	3411685.00	673635.30	673635.30	2.63	8958546.00	2491663.00	2491663.00
sales revenue, incl. tax	13665870.00	5367722.00	5367722.00	1.00	13665870.00	5367722.00	5367722.00
other income	0.00	0.00	0.00	0.00	0.00	0.00	0.00
indirect effects,benefit	....	....	....	....	....	....	....
cash outflow, operation:							
fixed investment	114067.00	1022034.00	1022034.00	1.00	114067.00	1022034.00	1022034.00
net working capital . .	0.01	41314.46	41314.46	1.00	0.01	41914.46	41914.46
operating costs	4563254.00	1812051.00	1812051.00	1.00	4563254.00	1812051.00	1812051.00
materials	4083892.00	1621424.00	1621424.00	1.00	4083892.00	1621424.00	1621424.00
unskilled labour . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
supervision, skilled	479362.80	190627.60	190627.80	1.00	479362.80	190627.60	190627.60
taxes	5576862.00	1817768.00	1817768.00	0.00	0.00	0.00	0.00
indirect effects, costs	....	....	....	....	....	....	....

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New Factory

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Total Cashflows at Adjusted Market Prices in US dollars

Economic Analysis excluding indirect effects

	financial present values at 0 %	financial present values at 12.00 %	financial present values at 12.00 %	factor	adjusted present values at 0 %	adjusted present values at 12.00 %	adjusted present values at 12.00 %
t o t a l cashflow :							
net cashflow	7367353.00	285544.50	285544.50	1.96	15624720.00	2320437.00	2920497.00
net indirect effects . .	....	....	....	....	....	....	....
total cash inflow . . .	27305400.00	10725100.00	10725100.00	1.00	27305400.00	10725100.00	10725100.00
total cash outflow . . .	13338040.00	10439560.00	10439560.00	1.00	11680680.00	7804603.00	7804603.00
taxes	7657363.00	2634353.00	2634353.00	0.00	0.00	0.00	0.00
flow of funds:							
net flow of funds . . .	-1013082.00	2339610.00	2339610.00	1.00	-1013082.00	2339610.00	2339610.00
total funds, inflow . .	4835618.00	4676217.00	4676217.00	1.00	4835618.00	4676217.00	4676217.00
equity	3559343.00	3348584.00	3348584.00	1.00	3559343.00	3348584.00	3348584.00
subsidies, grants . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
loans & overdraft . .	1336275.00	1327634.00	1327634.00	1.00	1336275.00	1327634.00	1327634.00
total funds, outflow . .	5308700.00	2276608.00	2276608.00	1.00	5308700.00	2276608.00	2276608.00
interest	1565210.00	824082.60	824082.60	1	1565210.00	824082.60	824082.60
repayment	3416776.00	1282458.00	1282458.00	1.00	3416776.00	1282458.00	1282458.00
dividends distributed	926714.00	170066.60	170066.60	1.00	926714.00	170066.60	170066.60
net flow, foreign funds	-1873373.00	1088576.00	1088576.00	1.00	-1873373.00	1088576.00	1088576.00
foreign funds, inflow .	3342302.00	3240046.00	3240046.00	1.00	3342302.00	3240046.00	3240046.00
equity	2025676.00	1926984.00	1926984.00	1.00	2025676.00	1926984.00	1926984.00
subsidies, grants . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
loans & overdraft . .	1317226.00	1313062.00	1313062.00	1.00	1317226.00	1313062.00	1313062.00
foreign funds, outflow .	5222880.00	2151470.00	2151470.00	1.00	5222880.00	2151470.00	2151470.00
dividends distributed	253344.00	47703.80	47703.80	1.00	253344.00	47703.80	47703.80
debt service	4962936.00	2103767.00	2103767.00	1.00	4962936.00	2103767.00	2103767.00
interest paid .	1565210.00	824082.60	824082.60	1.00	1565210.00	824082.60	824082.60
loan repayment .	3397727.00	1279684.00	1279684.00	1.00	3397727.00	1279684.00	1279684.00

financial rate of return (market prices) 12.39 %

economic rate of return (prelim.adjust) 20.58 %

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New Factory

CONFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Absolute Efficiency Test - 1 in US dollars

Economic Analysis at Market Prices, excluding indirect effects

	grand total	total constr.	total produc.	construction 1991.1	construction 1991.2	construction 1992.1	construction 1992.2
value of output, O	27346170.00	0.00	27346170.00	0.00	0.00	0.00	0.00
material input, I+MI	10723780.00	4859343.00	5864441.00	759000.00	3231756.00	639281.00	229304.00
investment, I	3531618.00	4859343.00	-1327725.00	753000.00	3231758.00	639281.00	229304.00
operation, MI	7192166.00	0.00	7192166.00	0.00	0.00	0.00	0.00
net domestic VA	16622380.00	-4859343.00	21481720.00	-759000.00	-3231756.00	-639281.00	-229304.00
repatriated payments	5222860.00	0.00	5222880.00	0.00	0.00	0.00	0.00
net national VA	11393510.00	-4859343.00	16256850.00	-759000.00	-3231756.00	-639281.00	-229304.00
national wages	356894.30	0.00	356894.30	0.00	0.00	0.00	0.00
social surplus	10442610.00	-4859343.00	15301950.00	-759000.00	-3231758.00	-639281.00	-229304.00

present values at	12.00 %
PV, net national VA	1288630.00
PV, national wages	486246.50
PV, unskilled labour	0.00
PV of social surplus	802643.90

relative efficiency of:	capital invested, E(C) :	0.29
	foreign exchange, E(FE) :	0.33
	skilled labour, E(L) :	2.65

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New Factory
CDMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Absolute Efficiency Test - 1 in US dollars
Economic Analysis at Market Prices, excluding indirect effects

				production			
	1933	1934	1935	1936	1937	1938	1939
value of output, O	1224062.00	1600687.00	1883127.00	1883127.00	1883127.00	1683127.00	1883127.00
material input, I+MI	427118.40	453251.40	505915.40	492198.00	492198.00	490525.60	492196.00
investment, I	68486.06	18292.00	13717.37	0.00	0.00	-1672.22	0.00
operation, MI	358632.40	434959.40	492198.00	432198.00	492196.00	492198.00	492196.00
net domestic VA	796943.90	1147435.00	1377212.00	1390929.00	1330929.00	1392601.00	1390329.00
repatriated payments	280265.90	308362.40	332603.30	332603.30	332603.30	332603.30	332603.30
net national VA	516678.00	838472.30	984606.30	998325.80	998325.80	999998.00	998325.70
national wages	113937.20	118478.00	121883.00	121883.00	121883.00	35683.00	35683.00
social surplus	402740.80	719994.90	862725.30	876442.80	876442.80	964115.00	962442.70

present values at	12.00 %
PV, net national VA	1288830.00
PV, national wages	486246.50
PV, unskilled labour	0.00
PV of social surplus	802643.90

relative efficiency of:	capital invested, E(C) :	0.29
	foreign exchange, E(FE) :	0.33
	skilled labour, E(L) :	2.65

COMFAR

New Factory

Absolute Efficiency Test - 1 in US dollars

Economic Analysis at Market Prices, excluding indirect effects

	production						
	2000	2001	2002	2003	2004	2005	2006
value of output, O	1883127.00	1883127.00	1883127.00	1883127.00	1883127.00	1883127.00	1883127.00
material input, I+MI	492198.00	492198.00	492198.00	492198.00	492198.00	492198.00	492198.00
investment, I	0.00	0.00	0.00	0.00	0.00	0.00	0.00
operation, MI	492198.00	492198.00	492198.00	492198.00	492198.00	492198.00	492198.00
net domestic VA	1390929.00	1390929.00	1390929.00	1390929.00	1390929.00	1390929.00	1390929.00
repatriated payments	392603.30	392603.30	392603.30	392603.30	392605.30	230360.50	230127.50
net national VA	998325.80	998325.80	998325.80	998325.80	998323.80	1160569.00	1160802.00
national wages	35883.00	35883.00	35883.00	35883.00	35883.00	35883.00	35883.00
social surplus	962442.80	962442.80	962442.80	962442.80	962440.80	1124686.00	1124919.00

present values at	12.00 %
PV, net national VA	1288830.00
PV, national wages	486246.50
PV, unskilled labour	0.00
PV of social surplus	802643.30

relative efficiency of:	capital invested, E(C) :	0.23
	foreign exchange, E(FE) :	0.33
	skilled labour, E(L) :	2.65

COMFAR (c)

New Factory

Absolute Efficiency Test - 1 in US dollars

Economic Analysis at Market Prices, excluding indirect effects

	production 2007	2008
value of output, O	1883127.00	40767.75
material input, I+MI	492198.00	-1426548.00
investment, I	0.00	-1426548.00
operation, MI	492198.00	0.00
net domestic VA	1390929.00	1467316.00
repatriated payments	229303.50	17225.67
net national VA	1161026.00	1450090.00
national wages	35883.00	0.00
social surplus	1125143.00	1450090.00
present values at	12.00 %	
PV, net national VA	1288890.00	
PV, national wages	486246.50	
PV, unskilled labour	0.00	
PV of social surplus	802643.90	

relative efficiency of:	capital invested, E(C) :	0.29
	foreign exchange, E(FE) :	0.33
	skilled labour, E(L) :	2.65

COMFAR
UNIDO

New Factory
COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Foreign Exchange Effect in US dollars
Economic Analysis excluding indirect effects
100 units foreign CU = 100.00 units local CU

	grand total	total constr.	total produc.	construction 1991.1	construction 1991.2	construction 1992.1	construction 1992.2
total foreign inflow . .	16962430.00	3325676.00	13656760.00	2041000.00	941056.00	139618.00	204000.00
equity capital	2025676.00	2025676.00	0.00	741000.00	941058.00	139618.00	204000.00
subsidies, grants . . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
loans & overdraft . . .	1317226.00	1300000.00	17225.67	1300000.00	0.00	0.00	0.00
exports	13639530.00	0.00	13639530.00	0.00	0.00	0.00	0.00
indirect effects	....	....	....	....	....	....	....
total foreign outflow .	12226240.00	3570676.00	8655563.00	741000.00	2427056.00	198618.00	204000.00
royalties	0.00	0.00	0.00	0.00	0.00	0.00	0.00
equipment	3417551.00	3570676.00	-153125.00	741000.00	2427058.00	198618.00	204000.00
imported materials . . .	3108275.00	0.00	3108275.00	0.00	0.00	0.00	0.00
repayment loans & overd.	3397727.00	0.00	3397727.00	0.00	0.00	0.00	0.00
other repayments	0.00	0.00	0.00	0.00	0.00	0.00	0.00
repatriated wages . . .	477531.40	0.00	477531.40	0.00	0.00	0.00	0.00
dividends paid	259944.00	0.00	259944.00	0.00	0.00	0.00	0.00
interests	1565210.00	0.00	1565210.00	0.00	0.00	0.00	0.00
indirect costs	....	....	....	....	....	....	....
net foreign exchge flow	4756196.00	-245000.00	5001196.00	1300000.00	-1486000.00	-59000.00	0.00
import substit'n effect	6009249.00	0.00	6009249.00	0.00	0.00	0.00	0.00
net forgn exchge effect	10765450.00	-245000.00	11010450.00	1300000.00	-1486000.00	-59000.00	0.00

present values at	12.00 %
foreign exchange flow .	1506857.00
net forgn exchge effect	3867188.00

Kenyan Sales Tax, collected and paid in Kenya, is included in foreign outflow

COMFAR 21 UNIDO

New Factory

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Foreign Exchange Effect in US dollars

Economic Analysis excluding indirect effects

100 units foreign CU = 100.00 units local CU

	1993	1994	1995	production 1996	1997	1998	1999
total foreign inflow . .	622987.40	802816.50	943088.80	940655.30	940655.30	940655.30	940655.30
equity capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00
subsidies, grants . . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
loans & overdraft . . .	11547.03	3245.13	2433.50	0.00	0.00	0.00	0.00
exports	611440.30	739571.40	940655.30	940655.30	940655.30	940655.30	940655.30
indirect effects	....	....	....	....	....	....	....
total foreign outflow .	582637.40	599107.30	708125.30	695561.30	695561.30	600722.40	609561.30
royalties	0.00	0.00	0.00	0.00	0.00	0.00	0.00
equipment	68[illegible]0.21	16754.47	12564.02	0.00	0.00	-8838.83	0.00
imported materials . . .	145564.40	184506.00	213708.00	213708.00	213708.00	213708.00	213708.00
repayment loans & overd.	93265.90	121362.40	207835.30	217416.90	228426.90	241078.50	255616.80
other repayments	0.00	0.00	0.00	0.00	0.00	0.00	0.00
repatriated wages . . .	88396.94	88884.44	89250.00	89250.00	89250.00	3250.00	3250.00
dividends paid	0.00	0.00	0.00	0.00	0.00	0.00	0.00
interests	187000.00	187000.00	184768.00	175186.40	164176.30	151524.80	136386.50
indirect costs	....	....	....	....	....	....	....
net foreign exchge flow	40349.94	203709.30	234963.50	245094.10	245094.10	339932.90	331094.00
import subst't'n effect	269386.60	352272.70	414429.90	414429.90	414429.90	414429.90	414429.90
net forgn exchge effect	309736.50	555981.30	649393.40	659524.00	659524.00	754362.90	745523.90

present values at 12.00 %

foreign exchange flow . 1506857.00

net forgn exchge effect 3867188.00

Kenyan Sales Tax, collected and paid in Kenya, is included in foreign outflow

Foreign Exchange Effect in US dollars
Economic Analysis excluding indirect effects
100 units foreign CU = 100.00 units local CU

	production						
	2000	2001	2002	2003	2004	2005	2006
total foreign inflow . .	940655.30	940655.30	940655.30	940655.30	940655.30	940655.30	940655.30
equity capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00
subsidies, grants . . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
loans & overdraft . . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
exports	940655.30	940655.30	940655.30	940655.30	940655.30	940655.30	940655.30
indirect effects	....	....	....	....	....	....	....
total foreign outflow .	609561.30	609561.30	609561.30	609561.30	609563.30	447318.50	447085.50
royalties	0.00	0.00	0.00	0.00	0.00	0.00	0.00
equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
imported materials . . .	213708.00	213708.00	213708.00	213708.00	213708.00	213708.00	213708.00
repayment loans & overd.	272323.30	291521.30	313584.80	338939.80	368060.90	143482.50	143482.50
other repayments	0.00	0.00	0.00	0.00	0.00	0.00	0.00
repatriated wages . . .	3250.00	3250.00	3250.00	3250.00	3250.00	3250.00	3250.00
dividends paid	0.00	0.00	0.00	0.00	0.00	86878.00	86645.00
interests	120280.00	101081.40	73018.50	53663.44	24524.36	0.00	0.00
indirect costs	....	....	....	....	....	....	....
net foreign exchge flow	331094.10	331094.00	331094.10	331094.00	331092.10	493336.80	493569.80
import substit'n effect	414429.90	414429.90	414429.30	414429.90	414429.90	414429.90	414429.90
net forgn exchge effect	745524.00	745523.90	745524.00	745523.90	745522.00	907766.80	907999.80

present values at	12.00 %
foreign exchange flow .	1506857.00
net forgn exchge effect	3867188.00

Kenyan Sales Tax, collected and paid in Kenya, is included in foreign outflow

COMFAR

New Factory

Foreign Exchange Effect in US dollars
Economic Analysis excluding indirect effects
100 units foreign CU = 100.00 units local CU

	production 2007	2008
total foreign inflow . .	940655.30	0.00
equity capital	0.00	0.00
subsidies, grants . . .	0.00	0.00
loans & overdraft . . .	0.00	0.00
exports	340655.30	0.00
indirect effects	....	....
total foreign outflow .	446861.50	-224783.10
royalties	0.00	0.00
equipment	0.00	-242014.80
imported materials . . .	213708.00	0.00
repayment loans & overd.	143482.50	17225.67
other repayments	0.00	0.00
repatriated wages . . .	3250.00	0.00
dividends paid	86421.00	0.00
interests	0.00	0.00
indirect costs	....	....
net foreign exchge flow	493793.80	224783.10
import substit'n effect	414429.90	0.00
net forgn exchge effect	908223.80	224789.10
present values at	12.00 %	
foreign exchange flow .	1506857.00	
net forgn exchge effect	3867168.00	

Kenyan Sales Tax, collected and paid in Kenya, is included in foreign outflow

Distrib...on of Net Domestic Value Added in US dollars
Net Income Flow Analysis excluding indirect effects

	grand total	total constr.	total produc.	construction 1991.1	1991.2	1992.1	1992.2
gross domestic VA .	20154000.00	0.00	20154000.00	0.00	0.00	0.00	0.00
annual depreciation	3531618.00	0.00	3531618.00	0.00	0.00	0.00	0.00
net domestic VA . .	16622390.00	0.00	16622390.00	0.00	0.00	0.00	0.00
repatriated payments	5700411.00	0.00	5700411.00	0.00	0.00	0.00	0.00
wages	477531.40	0.00	477531.40	0.00	0.00	0.00	0.00
interest, f.loans	1565210.00	0.00	1565210.00	0.00	0.00	0.00	0.00
dividends, repatr	259944.00	0.00	259944.00	0.00	0.00	0.00	0.00
other payments .	3397727.00	0.00	3397727.00	0.00	0.00	0.00	0.00
net national VA . .	10921970.00	0.00	10921970.00	0.00	0.00	0.00	0.00
wage earners VA w	479362.80	0.00	479362.80	0.00	0.00	0.00	0.00
profit,interest VA p	666770.00	0.00	666770.00	0.00	0.00	0.00	0.00
government VA g	7657363.00	0.00	7657363.00	0.00	0.00	0.00	0.00
undistributed VA u	2118477.00	0.00	2118477.00	0.00	0.00	0.00	0.00
distribution indices							
(VA w)/VA . . .	0.04	0.00	0.04	0.00	0.00	0.00	[illegible]
(VA p)/VA . . .	0.06	0.00	0.06	0.00	0.00	0.00	0.00
(VA g)/VA . . .	0.70	1.00	0.70	1.00	1.00	0.00	0.00
(VA u)/VA . . .	0.19	0.00	0.19	0.00	0.00	0.00	0.00

New Factory

Distribution of Net Domestic Value Added in US dollars
Net Income Flow Analysis excluding indirect effects

				production			
	1993	1994	1995	1996	1997	1998	1999
gross domestic VA .	796943.90	1147435.00	1377212.00	1330923.00	1330923.00	1332601.00	1330923.00
annual depreciation	466834.30	466834.30	466834.30	466834.30	466834.30	466834.30	258859.30
net domestic VA . .	330103.70	680601.00	910377.40	874094.80	874094.80	875767.00	1132070.00
repatriated payments	368662.80	397846.80	481853.30	481853.30	481853.30	395853.30	395853.30
wages	88336.34	88884.44	89250.00	89250.00	89250.00	3250.00	3250.00
interest, f.loans	187000.00	187000.00	184768.00	175186.40	164176.30	151524.80	136986.50
dividends, repatr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
other payments .	93265.31	121962.40	207835.30	217416.30	228426.30	241078.50	255616.80
net national VA . .	-38553.13	282754.20	428524.10	442241.50	442241.50	529313.80	736216.40
wage earners VA w	25540.29	29593.54	32633.00	32633.00	32633.00	32633.00	32633.00
profit,interest VA p	0.00	0.00	0.00	0.00	0.00	0.00	0.00
government VA g	234742.90	306963.40	361133.50	361133.50	361133.50	361133.50	361133.50
undistributed VA u	-298836.40	-53808.78	34757.56	48474.97	48474.97	136147.30	342449.90
distribution indices							
(VA w)/VA . . .	-0.66	0.10	0.08	0.07	0.07	0.06	0.04
(VA p)/VA . . .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(VA g)/VA . . .	-6.09	1.09	0.84	0.82	0.82	0.68	0.49
(VA u)/VA . . .	7.75	-0.19	0.08	0.11	0.11	0.26	0.47

COMFAR

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Distribution of Net Domestic Value Added in US dollars

Net Income Flow Analysis excluding indirect effects

	production						
	2000	2001	2002	2003	2004	2005	2006
gross domestic VA .	1390929.00	1390323.00	1390323.00	1390929.00	1390929.00	1390929.00	1390323.00
annual depreciation	120209.30	98953.30	98953.33	30725.00	30725.00	30725.00	30725.00
net domestic VA . .	1270720.00	1291370.00	1231370.00	1360204.00	1360204.00	1360204.00	1360204.00
repatriated payments	395853.30	395853.30	395853.30	395853.30	395855.30	233610.50	233377.50
wages	3250.00	3250.00	3250.00	3250.00	3250.00	3250.00	3250.00
interest, f.loans	120280.00	101081.40	79018.50	53663.44	24524.36	0.00	0.00
dividends, repatr	0.00	0.00	0.00	0.00	0.00	86878.00	86645.00
other payments .	272323.30	291521.90	313584.80	338939.80	368060.90	143482.50	143482.50
net national VA . .	874866.50	896116.50	896116.40	964350.60	964348.80	1126594.00	1126827.00
wage earners VA w	32633.00	32633.00	32633.00	32633.00	32633.00	32633.00	32633.00
profit,interest VA p	0.00	0.00	0.00	0.00	0.00	222846.00	222243.00
government VA g	517930.30	639917.80	644638.30	684012.60	697471.10	709011.60	710673.20
undistributed VA u	324303.20	223565.80	218784.50	247705.10	234244.70	162102.90	161271.30

distribution indices							
(VA w)/VA . . .	0.04	0.04	0.04	0.03	0.03	0.03	0.03
(VA p)/VA . . .	0.00	0.00	0.00	0.00	0.00	0.20	0.20
(VA g)/VA . . .	0.59	0.71	0.72	0.71	0.72	0.63	0.63
(VA u)/VA . . .	0.37	0.26	0.24	0.26	0.24	0.14	0.14

Distribution of Net Domestic Value Added in US dollars
Net Income Flow Analysis excluding indirect effects

	production 2007	2008
gross domestic VA .	1330929.00	139530.30
annual depreciation	30725.00	0.00
net domestic VA . .	1360204.00	139530.30
repatriated payments	233153.50	17225.67
wages	3250.00	0.00
interest, f.loans	0.00	0.00
dividends, repatr	86421.00	0.00
other payments :	143482.50	17225.67
net national VA . .	1127051.00	122365.30
wage earners VA w	32633.00	0.00
profit,interest VA p	221675.00	0.00
government VA g	712268.00	0.00
undistributed VA u	160474.50	122365.30
distribution indices		
(VA w)/VA . . .	0.03	0.00
(VA p)/VA . . .	0.20	0.00
(VA g)/VA . . .	0.63	0.00
(VA u)/VA . . .	0.14	1.00

APPENDIX D

COMFAR ANALYSIS OF TILE, SANITARYWARE AND CROCKERY PRODUCTION AT AFRICAN CERAMICS COMPANY LIMITED

COMFAR

Tiles & Sanitaryware - African Ceramic
March 1991
Sensitivity with crockery - 1 yr impl

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: US dollars

Total initial investment during construction phase

fixed assets:	4436487.00	70.138 % foreign
current assets:	0.00	0.000 % foreign
total assets:	4436487.00	70.138 % foreign

Source of funds during construction phase

equity & grants:	3303487.00	53.977 % foreign
foreign loans :	1133000.00	
local loans :	0.00	
total funds :	4436487.00	70.138 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	534445.30	658053.10	740531.20
depreciation :	435586.70	435586.70	435586.70
interest :	0.00	0.00	162002.40
production costs	970032.00	1093645.00	1338180.00
thereof foreign	62.35 %	59.44 %	62.89 %
total sales :	1323938.00	1650377.00	2207723.00
gross income :	-471337.00	392362.50	433810.10
net income :	-471397.00	392362.50	433810.10
cash balance :	412663.30	730443.00	788349.30
net cashflow :	412663.30	730443.00	1006182.00

Net Present Value at: 12.00 % = 1620343.00
Internal Rate of Return: 18.69 %
Return on equity1: 10.41 %
Return on equity2: 21.33 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in US dollars

Year	1991.1	1991.2
Fixed investment costs		
Land, site preparation, development	4000.000	0.000
Buildings and civil works	734434.000	295000.000
Auxiliary and service facilities	0.000	230000.000
Incorporated fixed assets	0.000	0.000
Plant machinery and equipment	528000.000	2080000.000
Total fixed investment costs	1266434.000	2605000.000
Pre-production capital expenditures	260408.000	304585.000
Net working capital	0.000	0.000
Total initial investment costs	1526302.000	2909585.000
Of it foreign, in %	47.660	82.026

Total Current Investment in US dollars

Year	1992	1993	1994	1995	1996
Fixed investment costs					
Land, site preparation, development	0.000	0.000	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	0.000	0.000	0.000
Total fixed investment costs	0.000	0.000	0.000	0.000	0.000
Preproduction capitals expenditures.	0.000	0.000	0.000	0.000	0.000
Working capital	113113.300	37505.520	25210.310	5763.438	0.000
Total current investment costs	113113.300	37505.520	25210.310	5763.438	0.000
Of it foreign, %	48.207	36.479	40.696	0.000	0.000

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Total Current Investment in US dollars

Year	1997
Fixed investment costs	
Land, site preparation, development	0.000
Buildings and civil works	0.000
Auxiliary and service facilities	0.000
Incorporated fixed assets	0.000
Plant, machinery and equipment	0.000
Total fixed investment costs	0.000
Preproduction capitals expenditures.	0.000
Working capital	-8838.831
Total current investment costs	-8838.831
Of it foreign, %	0.000

Tiles & Sanitaryware - African Ceramic --- March 1991

Total Production Costs in US dollars

Year	1992	1993	1994	1995	1996
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material I	128318.700	187560.900	225774.300	238204.800	238204.800
Other raw materials	84548.310	110563.100	130071.000	130071.000	130071.000
Utilities	2740.087	3460.087	4000.000	4000.000	4000.000
Energy	43022.160	66263.050	77262.320	81124.040	81124.040
Labour, direct	27595.320	33582.060	37272.090	38871.480	38871.480
Repair, maintenance	26309.600	23897.190	31728.470	33447.270	33447.270
Spares	18022.540	18352.540	18600.000	18600.000	18600.000
Factory overheads	34047.000	34047.000	34047.000	34047.000	34047.000
Factory costs	370604.300	483726.300	558755.800	578365.600	578365.600
Administrative overheads	117379.500	118587.300	119022.400	119063.800	119063.800
Indir. costs, sales and distribution	45862.040	55745.840	62813.000	62813.000	62813.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	435586.100	435586.100	435586.100	435586.100	435586.100
Financial costs	0.000	0.000	162002.400	153637.900	144018.900
Total production costs	970032.000	1093845.000	1338180.000	1349467.000	1339847.000
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	62.346	59.436	62.891	61.745	61.470
Of it variable,%	29.562	37.145	36.319	37.471	37.740
Total labour	124789.800	131832.300	136314.100	137313.500	137913.500

Total Production Costs in US dollars

Year	1997	1998	1999	2000	2001
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	238204.800	238204.800	238204.800	238204.800	238204.800
Other raw materials	130071.000	130071.000	130071.000	130071.000	130071.000
Utilities	4000.000	4000.000	4000.000	4000.000	4000.000
Energy	81124.040	81124.040	81124.040	81124.040	81124.040
Labour, direct	38871.480	38871.480	38871.480	38871.480	38871.480
Repair, maintenance	33447.270	33447.270	33447.270	33447.270	33447.270
Spares	18600.000	18600.000	18600.000	18600.000	18600.000
Factory overheads	34047.000	34047.000	34047.000	34047.000	34047.000
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Factory costs	578365.600	578365.600	578365.600	578365.600	578365.600
Administrative overheads	33063.800	33063.800	33063.800	33063.800	33063.800
Indir. costs, sales and distribution	62813.000	62813.000	62813.000	62813.000	62813.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	435586.100	239986.100	103586.100	88336.280	86336.310
Financial costs	132356.700	120234.700	105603.500	88776.270	69422.880
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Total production costs	1242785.000	1034463.000	883432.100	851355.000	832001.600
	==============	==============	==============	==============	==============
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	58.461	50.036	41.353	41.853	40.506
Of it variable, %	40.688	48.881	56.852	59.395	60.776
Total labour	51913.480	51913.480	51913.480	51913.480	51913.480

Total Production Costs in US dollars

Year	2002	2003	2004- 5	2006
% of nom. capacity (single product).	0.000	0.000	0.000	0.000
Raw material 1	238204.800	238204.800	238204.800	238204.800
Other raw materials	130071.000	130071.000	130071.000	130071.000
Utilities	4000.000	4000.000	4000.000	4000.000
Energy	81124.040	81124.040	81124.040	81124.040
Labour, direct	38871.460	38871.460	38871.460	38871.460
Repair, maintenance	33447.270	33447.270	33447.270	33447.270
Spares	18600.000	18600.000	18600.000	18600.000
Factory overheads	34047.000	34047.000	34047.000	34047.000
Factory costs	578365.600	578365.600	578365.600	578365.600
Administrative overheads	33063.800	33063.800	33063.800	33063.800
Indir. costs, sales and distribution	62813.000	62813.000	62813.000	62813.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000
Depreciation	25837.030	25837.030	25837.030	25836.740
Financial costs	47163.640	21561.720	0.000	0.000
Total production costs	747243.100	721641.300	700079.500	700079.200
Costs per unit (single product)	0.000	0.000	0.000	0.000
Of it foreign, %	35.346	33.052	30.930	30.930
Of it variable,%	67.670	70.071	72.229	72.229
Total labour	51313.460	51313.460	51313.460	51313.460

Net Working Capital in US dollars

Year	mdc	coto	1992	1993	1994	1995	1996
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	66012.400	85202.370	98027.050	101098.000	101098.000
Inventory and materials	89	4.0	53445.250	74819.360	89294.810	92402.290	92402.290
Energy	30	12.0	4085.180	5571.920	6438.527	6760.336	6760.336
Spares	90	4.0	4505.635	4588.135	4650.000	4650.000	4650.000
Work in progress	7	51.4	7206.135	9405.783	10864.700	11246.000	11246.000
Finished products	7	51.4	9500.242	11711.650	13179.020	13561.130	13561.130
Cash in hand	15	24.0	5248.080	5686.087	5344.582	6084.565	6084.565
Total current assets			150003.000	196935.300	228398.700	235802.300	235802.300
Current liabilities and							
Accounts payable	30	12.0	30883.700	40310.500	46562.980	48197.130	48197.130
Net working capital			119119.300	156624.800	181835.700	187605.200	187605.200
Increase in working capital			119119.300	37505.520	25210.890	5769.484	0.000
Net working capital, local			61695.450	85519.170	100470.100	106239.600	106239.600
Net working capital, foreign			57423.830	71105.630	81365.580	81365.580	81365.580

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Net Working Capital in US dollars

Year	mdc	coto	1997	1998-2006
Coverage	mdc	coto		
Current assets &				
Accounts receivable	30	12.0	93931.320	93931.320
Inventory and materials	89	4.0	92402.290	92402.290
Energy	30	12.0	6760.336	6760.336
Spares	90	4.0	4650.000	4650.000
Work in progress	7	51.4	11246.000	11246.000
Finished products	7	51.4	11888.310	11888.310
Cash in hand	15	24.0	6084.565	6084.565
Total current assets			226963.400	226963.400
Current liabilities and				
Accounts payable	30	12.0	48197.130	48197.130
Net working capital			178766.300	178766.300
Increase in working capital			-8838.900	0.000
Net working capital, local			106239.600	106239.600
Net working capital, foreign			72526.690	72526.690

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COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Source of Finance, construction in US dollars

Year	1991.1	1991.2
Equity, ordinary ..	1466212.000	1533275.000
Equity, preference.	60090.000	163310.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	0.000	533000.000
Loan B, foreign..	0.000	600000.000
Loan C, foreign .	0.000	0.000
Loan A, local....	0.000	0.000
Loan B, local....	0.000	0.000
Loan C, local....	0.000	0.000
Total loan	0.000	1133000.000
Current liabilities	0.000	0.000
Bank overdraft	0.000	0.000
Total funds	1526302.000	2303585.000

Source of Finance, production in US dollars

Year	1992	1993	1994	1995	1996	1997
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	0.000	0.000	-25529.370	-29613.930	-34107.040	-39414.950
Loan B, foreign..	0.000	0.000	-30295.950	-34585.840	-39711.810	-45466.060
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	0.000	0.000	-55825.320	-64199.780	-73818.850	-84881.010
Current liabilities	30883.700	9425.803	6242.480	1634.250	0.000	0.000
Bank overdraft	0.000	0.000	0.000	0.000	0.000	0.000
Total funds	30883.700	9425.803	-49582.840	-62565.530	-73818.850	-84881.010

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Source of Finance, production in US dollars

Year	1998	1999	2000	2001	2002	2003
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	-45548.290	-52637.440	-60829.140	-70295.680	-81235.440	-93878.120
Loan B, foreign..	-52054.090	-59596.760	-68232.260	-78119.150	-89438.530	-102399.400
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	-97602.380	-112234.200	-129061.400	-148414.800	-170674.100	-196277.500
Current liabilities	0.000	0.000	0.000	0.000	0.000	0.000
Bank overdraft	0.000	0.000	0.000	0.000	0.000	0.000
Total funds	-97602.380	-112234.200	-129061.400	-148414.800	-170674.100	-196277.500

Cashflow Tables, construction in US dollars

Year	1991.1	1991.2
Total cash inflow . .	1526302.000	2303585.000
Financial resources .	1526302.000	2303585.000
Sales, net of tax . .	0.000	0.000
Total cash outflow . .	1526302.000	2303585.000
Total assets	1526302.000	2303585.000
Operating costs . . .	0.000	0.000
Cost of finance . . .	0.000	0.000
Repayment	0.000	0.000
Corporate tax . . .	0.000	0.000
Dividends paid . . .	0.000	0.000
Surplus (deficit) .	0.000	0.000
Cumulated cash balance	0.000	0.000
Inflow, local	799184.000	522967.000
Outflow, local	799184.000	522967.000
Surplus (deficit) .	0.000	0.000
Inflow, foreign . . .	727718.000	2386618.000
Outflow, foreign . . .	727718.000	2386618.000
Surplus (deficit) .	0.000	0.000
Net cashflow	-1526302.000	-2303585.000
Cumulated net cashflow	-1526302.000	-4436487.000

Cashflow tables, production in US dollars

Year	1992	1993	1994	1995	1996	1997
Total cash inflow . .	1037113.000	1435435.000	1778242.000	1831331.000	1829697.000	1829697.000
Financial resources .	30883.700	9426.803	6252.482	1634.152	0.000	0.000
Sales, net of tax . .	1066235.000	1486008.000	1771990.000	1829697.000	1829697.000	1829697.000
Total cash outflow . .	634448.300	704991.400	989892.300	985483.700	978060.100	883241.200
Total assets	150003.000	46332.310	31463.330	7403.614	0.000	-8838.889
Operating costs . . .	534445.300	658059.100	740591.300	760242.400	760242.400	674242.400
Cost of finance . . .	0.000	0.000	162002.400	153637.300	144018.300	132956.700
Repayment	0.000	0.000	55835.320	64193.780	73818.850	84881.010
Corporate tax . . .	0.000	0.000	0.000	0.000	0.000	0.000
Dividends paid . . .	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	412669.800	790443.100	788349.300	845847.200	851616.600	946455.600
Cumulated cash balance	412669.800	1203113.000	1991463.000	2837310.000	3688927.000	4635382.000
Inflow, local	567336.800	814579.300	978636.000	1034158.000	1032524.000	1032524.000
Outflow, local	381516.800	414674.100	456403.200	464688.000	457284.400	457284.400
Surplus (deficit) .	185820.000	399905.800	522232.800	569470.100	575239.600	575239.600
Inflow, foreign . . .	529722.000	620854.600	799606.300	797172.800	797172.800	797172.800
Outflow, foreign . . .	302932.200	290317.300	533489.200	520795.700	520795.700	425956.800
Surplus (deficit) .	226789.800	390537.300	266117.100	276377.000	276377.100	371215.900
Net cashflow	412669.800	790443.200	1006188.000	1063685.000	1063454.000	1164293.000
Cumulated net cashflow	-4023817.000	-3233374.000	-2227187.000	-1163502.000	-94047.250	1070246.000

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COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Cashflow tables, production in US dollars

Year	1998	1999	2000	2001	2002	2003
Total cash inflow . .	1823697.000	1823697.000	1823697.000	1823697.000	1823697.000	1823697.000
Financial resources .	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax . .	1823697.000	1823697.000	1823697.000	1823697.000	1823697.000	1823697.000
Total cash outflow . .	1035441.000	1221633.000	1238731.000	1248260.000	1263873.000	1295763.000
Total assets	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs . . .	674242.400	674242.400	674242.400	674242.400	674242.400	674242.400
Cost of finance . . .	120234.700	105603.500	88776.270	69472.980	47163.640	21561.720
Repayment	97602.380	112234.200	129061.400	148414.800	170674.100	196277.500
Corporate tax . . .	203360.300	323558.300	346651.100	356173.700	331733.000	403687.400
Dividends paid . . .	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	734255.600	608053.300	590365.500	581437.000	545817.600	533927.800
Cumulated cash balance	5369638.000	5977696.000	6568062.000	7150099.000	7695916.000	8229844.000
Inflow, local	1032524.000	1032524.000	1032524.000	1032524.000	1032524.000	1032524.000
Outflow, local	660645.300	786842.800	803935.500	813464.100	849083.400	860971.800
Surplus (deficit) .	371878.600	245681.300	228588.500	219059.300	183440.600	171552.300
Inflow, foreign . . .	797172.800	797172.800	797172.800	797172.800	797172.800	797172.800
Outflow, foreign . . .	434795.700	434795.700	434795.700	434795.700	434795.700	434797.300
Surplus (deficit) .	362377.000	362377.000	362377.100	362377.000	362377.000	362375.500
Net cashflow	352093.500	825896.100	808803.300	793274.700	763655.400	751767.000
Cumulated net cashflow	2022340.000	2848236.000	3657039.000	4456314.000	5219969.000	5971736.000

Cashflow tables, production in US dollars

Year	2004	2005	2006
Total cash inflow . .	1829637.000	1829637.000	1829637.000
Financial resources .	0.000	0.000	0.000
Sales, net of tax . . .	1829637.000	1829637.000	1829637.000
Total cash outflow . .	1445936.000	1446757.000	1447486.000
Total assets	0.000	0.000	0.000
Operating costs . . .	674242.400	674242.400	674242.400
Cost of finance . . .	0.000	0.000	0.000
Repayment	0.000	0.000	0.000
Corporate tax . . .	413693.300	415411.700	416863.000
Dividends paid . . .	357862.000	357102.800	356374.300
Surplus (deficit) .	383693.100	382940.000	382211.000
Cumulated cash balance	8613543.000	8996483.000	9378694.000
Inflow, local	1032524.000	1032524.000	1032524.000
Outflow, local	1229040.000	1229799.000	1230528.000
Surplus (deficit) .	-196515.600	-197274.300	-198003.800
Inflow, foreign . . .	797172.800	797172.800	797172.800
Outflow, foreign . . .	216958.000	216958.000	216958.000
Surplus (deficit) .	580214.800	580214.800	580214.800
Net cashflow	741561.100	740042.700	738585.400
Cumulated net cashflow	6713297.000	7453340.000	8191925.000

Cashflow Discounting:

a) Equity paid versus Net income flow:
Net present value ....-355383.30 at 12.00 %
Internal Rate of Return (IRRE1) .. 10.41 %
b) Net Worth versus Net cash return:
Net present value ....1709721.00 at 12.00 %
Internal Rate of Return (IRRE2) .. 21.33 %
c) Internal Rate of Return on total investment:
Net present value ....1620349.00 at 12.00 %
Internal Rate of Return (IRR) .. 18.63 %
Net Worth = Equity paid plus reserves

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Net Income Statement in US dollars

Year	1992	1993	1994	1995	1996
Total sales, incl. sales tax	1323338.000	1850377.000	2207723.000	2282630.000	2282630.000
Less: variable costs, incl. sales tax.	544466.900	770606.600	921742.800	958594.000	958594.000
Variable margin	778471.000	1079771.000	1285981.000	1324036.000	1324036.000
As % of total sales	58.875	58.354	58.243	58.005	58.005
Non-variable costs, incl. depreciation	1250869.000	687408.600	690168.600	690168.500	690168.600
Operational margin	-471397.500	392361.900	595811.900	633867.600	633867.700
As % of total sales	-35.606	21.204	26.988	27.769	27.769
Cost of finance	0.000	0.000	162002.400	153637.900	144018.900
Gross profit	-471397.000	392362.500	433810.100	480230.400	489849.400
Allowances	154860.000	148665.000	142713.000	137010.000	131530.000
Taxable profit	0.000	243697.500	291091.100	343220.400	358319.400
Tax	0.000	0.000	0.000	0.000	0.000
Net profit	-471397.000	392362.500	433810.100	480230.400	489849.400
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-471397.000	392362.500	433810.100	480230.400	489849.400
Accumulated undistributed profit . . .	-471397.000	-79034.500	354775.600	835006.000	1324855.000
Gross profit, % of total sales	-35.606	21.204	19.650	21.038	21.460
Net profit, % of total sales	-35.606	21.204	19.650	21.038	21.460
ROE, Net profit, % of equity	-14.270	11.877	13.132	14.537	14.828
ROI, Net profit+interest, % of invest.	-10.348	8.547	12.301	13.708	13.708

Net Income Statement in US dollars

Year	1997	1998	1999	2000	2001
Total sales, incl. sales tax	2282630.000	2282630.000	2282630.000	2282630.000	2282630.000
Less: variable costs, incl. sales tax.	958594.000	958594.000	958594.000	958594.000	958594.000
Variable margin	1324036.000	1324036.000	1324036.000	1324036.000	1324036.000
As % of total sales	58.005	58.005	58.005	58.005	58.005
Non-variable costs, incl. depreciation	604168.500	408568.600	278168.600	256918.500	256918.600
Operational margin	719867.800	915467.700	1045868.000	1067118.000	1067118.000
As % of total sales	31.537	40.106	45.819	46.743	46.743
Cost of finance	132956.700	120234.700	105603.500	88776.270	69422.880
Gross profit	586911.600	795233.600	940264.800	978341.800	997695.200
Allowances	126268.000	121218.000	116369.000	111714.000	107246.000
Taxable profit	0.000	508402.200	823895.800	866627.800	890449.200
Tax	0.000	203360.300	329558.300	346651.100	356179.700
Net profit	586311.600	591872.700	610706.400	631690.700	641515.500
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	586311.600	591872.700	610706.400	631690.700	641515.500
Accumulated undistributed profit	1911767.000	2503640.000	3114346.000	3746037.000	4387553.000
Gross profit, % of total sales	25.712	34.838	41.192	42.860	43.708
Net profit, % of total sales	25.712	25.929	26.755	27.674	28.104
ROE, Net profit, % of equity	17.766	17.317	18.487	19.122	19.419
ROI, Net profit+interest, % of invest.	15.598	15.429	15.520	15.611	15.404

Net Income Statement in US dollars

Year	2002	2003	2004	2005	2006
Total sales, incl. sales tax	2282630.000	2282630.000	2282630.000	2282630.000	2282630.000
Less: variable costs, incl. sales tax.	958594.000	958594.000	958534.000	958534.000	958534.000
Variable margin	1324036.000	1324036.000	1324036.000	1324036.000	1324036.000
As % of total sales	58.005	58.005	58.005	58.005	58.005
Non-variable costs, incl. depreciation	194419.200	194419.200	194419.300	194419.300	194418.900
Operational margin	1129617.000	1129617.000	1129617.000	1129617.000	1129617.000
As % of total sales	49.488	49.488	49.488	49.488	49.488
Cost of finance	47163.640	21561.720	0.000	0.000	0.000
Gross profit	1082454.000	1108056.000	1129617.000	1129617.000	1129618.000
Allowances	102956.000	98837.000	94884.000	91088.000	87445.000
Taxable profit	979497.600	1009219.000	1034733.000	1038529.000	1042173.000
Tax	391799.000	403687.400	413893.300	415411.700	416869.000
Net profit	690654.600	704368.100	715724.000	714205.600	712748.600
Dividends paid	0.000	0.000	357862.000	357102.800	356374.300
Undistributed profit	690654.600	704368.100	357862.000	357102.800	356374.300
Accumulated undistributed profit	5078207.000	5782575.000	6140437.000	6497540.000	6853915.000
Gross profit, % of total sales	47.421	48.543	49.488	49.488	49.488
Net profit, % of total sales	30.257	30.858	31.355	31.289	31.225
ROE, Net profit, % of equity	20.307	21.322	21.666	21.620	21.576
ROI, Net profit+interest, % of invest.	15.987	15.729	15.508	15.475	15.443

Projected Balance Sheets, construction in US dollars

Year	1991.1	1991.2
Total assets	1526302.000	4436487.000
Fixed assets, net of depreciation	0.000	1526302.000
Construction in progress	1526302.000	2909585.000
Current assets	0.000	0.000
Cash, bank	0.000	0.000
Cash surplus, finance available	0.000	0.000
Loss carried forward	0.000	0.000
Loss	0.000	0.000
Total liabilities	1526302.000	4436487.000
Equity capital	1526302.000	3303487.000
Reserves, retained profit	0.000	0.000
Profit	0.000	0.000
Long and medium term debt	0.000	1133000.000
Current liabilities	0.000	0.000
Bank overdraft, finance required.	0.000	0.000
Total debt	0.000	1133000.000
Equity, % of liabilities	100.000	74.462

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Projected Balance Sheets, Production in US dollars

Year	1992	1993	1994	1995	1996
Total assets	4467371.000	4869160.000	4861025.000	5139655.000	5615686.000
Fixed assets, net of depreciation	3433300.000	2937714.000	2562127.000	2126540.000	1630353.000
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	144754.300	191243.200	222454.100	223717.700	223717.700
Cash, bank	5248.080	5686.087	5944.582	6084.565	6084.565
Cash surplus, finance available	412670.300	1203114.000	1991465.000	2837313.000	3688930.000
Loss carried forward	0.000	471397.000	79034.500	0.000	0.000
Loss	471397.000	0.000	0.000	0.000	0.000
Total liabilities	4467371.000	4869160.000	4861025.000	5139655.000	5615686.000
Equity capital	3303487.000	3303487.000	3303487.000	3303487.000	3303487.000
Reserves, retained profit	0.000	0.000	0.000	354775.600	835006.000
Profit	0.000	392362.500	433810.100	480230.400	483849.400
Long and medium term debt	1133000.000	1133000.000	1077165.000	1012965.000	939146.100
Current liabilities	30883.700	40310.500	46562.960	48197.140	48197.140
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	1163884.000	1173311.000	1123728.000	1061162.000	987343.300
Equity, % of liabilities	73.947	67.845	67.959	63.533	58.826

Tiles & Sanitaryware - African Ceramic --- March 1991

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Projected Balance Sheets, Production in US dollars

Year	1997	1998	1999	2000	2001
Total assets	6117716.000	6611986.000	7110453.000	7613087.000	8106188.000
Fixed assets, net of depreciation	1255367.000	1015380.000	905793.500	817456.300	729120.200
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	220878.800	220878.800	220878.800	220878.800	220878.800
Cash, bank	6084.565	6084.565	6084.565	6084.565	6084.565
Cash surplus, finance available	4635386.000	5369642.000	5977702.000	6568667.000	7150105.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	6117716.000	6611986.000	7110453.000	7613087.000	8106188.000
Equity capital	3303487.000	3303487.000	3303487.000	3303487.000	3303487.000
Reserves, retained profit	1324855.000	1911767.000	2503640.000	3114346.000	3746037.000
Profit	586911.600	591872.700	610706.400	631690.700	641515.500
Long and medium term debt	854265.100	756662.100	644427.900	515366.500	366951.700
Current liabilities	48137.140	48137.140	48137.140	48137.140	48137.140
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	902402.300	804859.300	692625.100	563503.600	415148.800
Equity, % of liabilities	53.999	49.967	46.460	43.392	40.753

Projected Balance Sheets, Production in US dollars

Year	2002	2003	2004	2005	2006
Total assets	8626169.000	9134253.000	9849383.000	10206330.000	10561970.000
Fixed assets, net of depreciation	703282.800	677445.400	651608.100	625770.700	599933.700
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	220878.800	220878.800	220878.800	220878.800	220878.800
Cash, bank	6084.565	6084.565	6084.565	6084.565	6084.565
Cash surplus, finance available	7695322.000	8229850.000	8971412.000	9353593.000	9735075.000
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	8626169.000	9134253.000	9849383.000	10206330.000	10561970.000
Equity capital	3303487.000	3303487.000	3303487.000	3303487.000	3303487.000
Reserves, retained profit	4387553.000	5078207.000	5782575.000	6140437.000	6497540.000
Profit	690654.600	704368.100	715724.000	714305.600	712748.600
Long and medium term debt	136277.600	0.063	0.063	0.063	0.063
Current liabilities	48197.140	48197.140	48197.140	48197.140	48197.140
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000
Total debt	244474.700	48197.200	48197.200	48197.200	48197.200
Equity, % of liabilities	38.296	36.166	33.538	32.367	31.277

COMFAR

Production costs for product Tiles, foreign

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	26676.650	34884.850	41041.000	41041.000	41041.000	41041.000
raw material (other)	43715.100	57165.900	67254.000	67254.000	67254.000	67254.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	76391.750	98050.750	114295.000	114295.000	114295.000	114295.000
thereof variable	70391.750	92050.750	108295.000	108295.000	108295.000	108295.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect ..	4698.438	4942.188	5125.000	5125.000	5125.000	5125.000
thereof variable	792.188	1035.938	1218.750	1218.750	1218.750	1218.750
total before depr. and interests ..	124090.200	145992.900	162420.000	162420.000	162420.000	162420.000
total before interests	312407.000	334309.800	350736.800	350736.800	350736.800	350736.800
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	312407.000	334309.800	350736.800	350736.800	350736.800	350736.800
thereof variable	71183.940	93086.690	109513.800	109513.800	109513.800	109513.800
total labour (of tot. prod. cost) .	44198.440	44442.190	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	188316.800	188316.800	188316.800	188316.800	188316.800	188316.800

	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	41041.000	41041.000	41041.000	41041.000	41041.000	41041.000
raw material (other)	67254.000	67254.000	67254.000	67254.000	67254.000	67254.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	114295.000	114295.000	114295.000	114295.000	114295.000	114295.000
thereof variable	108295.000	108295.000	108295.000	108295.000	108295.000	108295.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect ..	5125.000	5125.000	5125.000	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750	1218.750	1218.750	1218.750
total before depr. and interests ..	162420.000	162420.000	162420.000	162420.000	162420.000	162420.000
total before interests	252936.800	187736.800	187736.800	187736.800	162420.000	162420.000
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	252936.800	187736.800	187736.800	187736.800	162420.000	162420.000
thereof variable	109513.800	109513.800	109513.800	109513.800	109513.800	109513.800
total labour (of tot. prod. cost) .	44625.000	44625.000	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	90516.800	25316.800	25316.800	25316.820	0.000	0.000

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Production costs for product Tiles, foreign

	Year:13	Year:14	Year:15
raw material (first)	41041.000	41041.000	41041.000
raw material (other)	67254.000	67254.000	67254.000
utilities	0.000	0.000	0.000
energy	0.000	0.000	0.000
labour	0.000	0.000	0.000
maintenance	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000
subtotal factory costs	114295.000	114295.000	114295.000
thereof variable	108295.000	108295.000	108295.000
administration	43000.000	43000.000	43000.000
marketing, distribution indirect ..	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750
total before depr. and interests ..	162420.000	162420.000	162420.000
total before interests	162420.000	162420.000	162420.000
interests	0.000	0.000	0.000
total production cost	162420.000	162420.000	162420.000
thereof variable	109513.800	109513.800	109513.800
total labour (of tot. prod. cost) .	44625.000	44625.000	44625.000
depreciation borne by product	0.000	0.000	0.000

COMFAR

COMFAR 2.1 - UNITED NATIONS DEVELOPMENT PROGRAMME, KAMPALA

Production costs for productTiles, local

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	48276.800	63131.200	74272.000	74272.000	74272.000	74272.000
raw material (other)	3657.950	4796.550	5643.000	5643.000	5643.000	5643.000
utilities	1370.000	1730.000	2000.000	2000.000	2000.000	2000.000
energy	30180.100	37483.470	42961.000	42961.000	42961.000	42961.000
labour	9361.500	10783.500	11850.000	11850.000	11850.000	11850.000
maintenance	1368.750	1443.750	1500.000	1500.000	1500.000	1500.000
spares	3011.250	3176.250	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	111486.300	136794.700	155776.000	155776.000	155776.000	155776.000
thereof variable	82252.200	107560.600	126541.900	126541.900	126541.900	126541.900
administration	14524.130	14786.530	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect ..	21682.240	24310.390	26281.500	26281.500	26281.500	26281.500
thereof variable	9394.612	12285.260	14453.250	14453.250	14453.250	14453.250
total before depr. and interests ..	147692.700	175891.700	197041.000	197041.000	197041.000	197041.000
total before interests	167343.500	195542.600	216691.800	216691.800	216691.800	216691.800
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	167343.500	195542.600	216691.800	216691.800	216691.800	216691.800
thereof variable	91646.810	119845.800	140995.100	140995.100	140995.100	140995.100
total labour (of tot. prod. cost) .	13564.240	15270.350	16550.000	16550.000	16550.000	16550.000
depreciation borne by product	19650.820	19650.820	19650.820	19650.820	19650.820	19650.820

	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	74272.000	74272.000	74272.000	74272.000	74272.000	74272.000
raw material (other)	5643.000	5643.000	5643.000	5643.000	5643.000	5643.000
utilities	2000.000	2000.000	2000.000	2000.000	2000.000	2000.000
energy	42961.000	42961.000	42961.000	42961.000	42961.000	42961.000
labour	11850.000	11850.000	11850.000	11850.000	11850.000	11850.000
maintenance	1500.000	1500.000	1500.000	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	155776.000	155776.000	155776.000	155776.000	155776.000	155776.000
thereof variable	126541.900	126541.900	126541.900	126541.900	126541.900	126541.900
administration	14983.500	14983.500	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect ..	26281.500	26281.500	26281.500	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250	14453.250	14453.250	14453.250
total before depr. and interests ..	197041.000	197041.000	197041.000	197041.000	197041.000	197041.000
total before interests	216691.800	216691.800	209608.600	209608.600	205653.400	205653.400
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	216691.800	216691.800	209608.600	209608.600	205653.400	205653.400
thereof variable	140995.100	140995.100	140995.100	140995.100	140995.100	140995.100
total labour (of tot. prod. cost) .	16550.000	16550.000	16550.000	16550.000	16550.000	16550.000
depreciation borne by product	19650.820	19650.820	12567.550	12567.550	8612.364	8612.364

Production costs for productTiles, local

	Year:13	Year:14	Year:15
raw material (first)	74272.000	74272.000	74272.000
raw material (other)	5643.000	5643.000	5643.000
utilities	2000.000	2000.000	2000.000
energy	42961.000	42961.000	42961.000
labour	11850.000	11850.000	11850.000
maintenance	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000
subtotal factory costs	155776.000	155776.000	155776.000
thereof variable	126541.900	126541.900	126541.900
administration	14983.500	14983.500	14983.500
marketing, distribution indirect ..	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250
total before depr. and interests ..	197041.000	197041.000	197041.000
total before interests	205653.400	205653.400	205653.300
interests	0.000	0.000	0.000
total production cost	205653.400	205653.400	205653.300
thereof variable	140995.100	140995.100	140995.100
total labour (of tot. prod. cost) .	16550.000	16550.000	16550.000
depreciation borne by product	8612.364	8612.364	8612.247

Production costs for product Sanitaryware, foreign

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	22968.160	30034.760	35333.000	35333.000	35333.000	35333.000
raw material (other)	33204.470	43420.470	51080.000	51080.000	51080.000	51080.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	62172.630	79455.230	92413.000	92413.000	92413.000	92413.000
thereof variable	56172.630	73455.230	86413.000	86413.000	86413.000	86413.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect	4698.496	4942.246	5125.000	5125.000	5125.000	5125.000
thereof variable	792.246	1035.996	1218.750	1218.750	1218.750	1218.750
total before depr. and interests	109871.100	127397.500	140538.000	140538.000	140538.000	140538.000
total before interests	279356.300	296882.600	310023.100	310023.100	310023.100	310023.100
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	279356.300	296882.600	310023.100	310023.100	310023.100	310023.100
thereof variable	56964.870	74491.230	87631.750	87631.750	87631.750	87631.750
total labour (of tot. prod. cost)	44198.500	44442.250	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	169485.100	169485.100	169485.100	169485.100	169485.100	169485.100

	Year: 7	Year: 8	Year: 9	Year: 10	Year: 11	Year: 12
raw material (first)	35333.000	35333.000	35333.000	35333.000	35333.000	35333.000
raw material (other)	51080.000	51080.000	51080.000	51080.000	51080.000	51080.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	92413.000	92413.000	92413.000	92413.000	92413.000	92413.000
thereof variable	86413.000	86413.000	86413.000	86413.000	86413.000	86413.000
administration	43000.000	43000.000	43000.000	43000.000	43000.000	43000.000
marketing, distribution indirect	5125.000	5125.000	5125.000	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750	1218.750	1218.750	1218.750
total before depr. and interests	140538.000	140538.000	140538.000	140538.000	140538.000	140538.000
total before interests	222003.100	163323.100	163323.100	163323.100	140538.000	140538.000
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	222003.100	163323.100	163323.100	163323.100	140538.000	140538.000
thereof variable	87631.750	87631.750	87631.750	87631.750	87631.750	87631.750
total labour (of tot. prod. cost)	44625.000	44625.000	44625.000	44625.000	44625.000	44625.000
depreciation borne by product	81465.120	22785.120	22785.120	22785.140	0.000	0.000

Production costs for product Sanitaryware, foreign

	Year:13	Year:14	Year:15
raw material (first)	35333.000	35333.000	35333.000
raw material (other)	51080.000	51080.000	51080.000
utilities	0.000	0.000	0.000
energy	0.000	0.000	0.000
labour	0.000	0.000	0.000
maintenance	0.000	0.000	0.000
spares	6000.000	6000.000	6000.000
factory overheads	0.000	0.000	0.000
subtotal factory costs	92413.000	92413.000	92413.000
thereof variable	86413.000	86413.000	86413.000
administration	43000.000	43000.000	43000.000
marketing, distribution indirect ..	5125.000	5125.000	5125.000
thereof variable	1218.750	1218.750	1218.750
total before depr. and interests ..	140538.000	140538.000	140538.000
total before interests	140538.000	140538.000	140538.000
interests	0.000	0.000	0.000
total production cost	140538.000	140538.000	140538.000
thereof variable	87631.750	87631.750	87631.750
total labour (of tot. prod. cost) .	44625.000	44625.000	44625.000
depreciation borne by product	0.000	0.000	0.000

COMFAR 2.1 UNIDO

Production costs for product Sanitaryware, local

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	13823.930	18077.130	21266.000	21266.000	21266.000	21266.000
raw material (other)	3961.395	5180.194	6094.000	6094.000	6094.000	6094.000
utilities	1370.087	1730.097	2000.000	2000.000	2000.000	2000.000
energy	9149.895	11363.970	13024.000	13024.000	13024.000	13024.000
labour	8992.900	10358.860	11383.000	11383.000	11383.000	11383.000
maintenance	1368.768	1443.768	1500.000	1500.000	1500.000	1500.000
spares	3011.290	3176.290	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	55928.260	65580.300	72817.000	72817.000	72817.000	72817.000
thereof variable	31371.460	41023.500	48260.200	48260.200	48260.200	48260.200
administration	14524.190	14786.690	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect	21682.870	24311.020	26281.500	26281.500	26281.500	26281.500
thereof variable	9395.311	12295.360	14453.250	14453.250	14453.250	14453.250
total before depr. and interests	92135.330	104678.000	114082.000	114082.000	114082.000	114082.000
total before interests	111786.100	124328.800	133732.800	133732.800	133732.800	133732.800
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	111786.100	124328.800	133732.800	133732.800	133732.800	133732.800
thereof variable	40766.770	53303.460	62713.450	62713.450	62713.450	62713.450
total labour (of tot. prod. cost)	13195.710	14845.820	16083.000	16083.000	16083.000	16083.000
depreciation borne by product	19650.820	19650.820	19650.820	19650.820	19650.820	19650.820

	Year: 7	Year: 8	Year: 9	Year: 10	Year: 11	Year: 12
raw material (first)	21266.000	21266.000	21266.000	21266.000	21266.000	21266.000
raw material (other)	6094.000	6094.000	6094.000	6094.000	6094.000	6094.000
utilities	2000.000	2000.000	2000.000	2000.000	2000.000	2000.000
energy	13024.000	13024.000	13024.000	13024.000	13024.000	13024.000
labour	11383.000	11383.000	11383.000	11383.000	11383.000	11383.000
maintenance	1500.000	1500.000	1500.000	1500.000	1500.000	1500.000
spares	3300.000	3300.000	3300.000	3300.000	3300.000	3300.000
factory overheads	14250.000	14250.000	14250.000	14250.000	14250.000	14250.000
subtotal factory costs	72817.000	72817.000	72817.000	72817.000	72817.000	72817.000
thereof variable	48260.200	48260.200	48260.200	48260.200	48260.200	48260.200
administration	14983.500	14983.500	14983.500	14983.500	14983.500	14983.500
marketing, distribution indirect	26281.500	26281.500	26281.500	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250	14453.250	14453.250	14453.250
total before depr. and interests	114082.000	114082.000	114082.000	114082.000	114082.000	114082.000
total before interests	133732.800	133732.800	126649.600	126649.600	122694.400	122694.400
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	133732.800	133732.800	126649.600	126649.600	122694.400	122694.400
thereof variable	62713.450	62713.450	62713.450	62713.450	62713.450	62713.450
total labour (of tot. prod. cost)	16083.000	16083.000	16083.000	16083.000	16083.000	16083.000
depreciation borne by product	19650.820	19650.820	12567.560	12567.550	8612.364	8612.364

COMFAR

Production costs for product Sanitaryware, local

	Year:13	Year:14	Year:15
raw material (first)	21266.000	21266.000	21266.000
raw material (other)	6094.000	6094.000	6094.000
utilities	2000.000	2000.000	2000.000
energy	13024.000	13024.000	13024.000
labour	11383.000	11383.000	11383.000
maintenance	1500.000	1500.000	1500.000
spares	3300.000	3300.000	[illegible]
factory overheads	14250.000	14250.000	14250.000
subtotal factory costs	72817.000	72817.000	72817.000
thereof variable	48260.200	48260.200	48260.200
administration	14383.500	14383.500	14383.500
marketing, distribution indirect	26281.500	26281.500	26281.500
thereof variable	14453.250	14453.250	14453.250
total before depr. and interests	114082.000	114082.000	114082.000
total before interests	122694.400	122694.400	122694.300
interests	0.000	0.000	0.000
total production cost	122694.400	122694.400	122694.300
thereof variable	62713.450	62713.450	62713.450
total labour (of tot. prod. cost)	16083.000	16083.000	16083.000
depreciation borne by product	8612.364	8612.364	8612.247

Production costs for product Crockery, foreign

	Year:13	Year:14	Year:15
raw material (first)	0.000	0.000	0.000
raw material (other)	0.000	0.000	0.000
utilities	0.000	0.000	0.000
energy	0.000	0.000	0.000
labour	0.000	0.000	0.000
maintenance	0.000	0.000	0.000
spares	0.000	0.000	0.000
factory overheads	0.000	0.000	0.000
subtotal factory costs	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000
administration	0.000	0.000	0.000
marketing, distribution indirect	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000
total before depr. and interests	0.000	0.000	0.000
total before interests	0.000	0.000	0.000
interests	0.000	0.000	0.000
total production cost	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000
total labour (of tot. prod. cost)	0.000	0.000	0.000
depreciation borne by product	0.000	0.000	0.000

COMFAR

Production costs for product Crockery, foreign

	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	0.000	0.000	0.000	0.000	0.000	0.000
raw material (other)	0.000	0.000	0.000	0.000	0.000	0.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	0.000	0.000	0.000	0.000	0.000	0.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	0.000	0.000	0.000	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000	0.000	0.000	0.000
administration	0.000	0.000	0.000	0.000	0.000	0.000
marketing, distribution indirect	0.000	0.000	0.000	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000	0.000	0.000	0.000
total before depr. and interests	0.000	0.000	0.000	0.000	0.000	0.000
total before interests	18931.680	18931.680	18931.680	18931.680	18931.680	18931.680
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	18931.680	18931.680	18931.680	18931.680	18931.680	18931.680
thereof variable	0.000	0.000	0.000	0.000	0.000	0.000
total labour (of tot. prod. cost)	0.000	0.000	0.000	0.000	0.000	0.000
depreciation borne by product	18931.680	18931.680	18931.680	18931.680	18931.680	18931.680

	Year: 7	Year: 8	Year: 9	Year:10	Year:11	Year:12
raw material (first)	0.000	0.000	0.000	0.000	0.000	0.000
raw material (other)	0.000	0.000	0.000	0.000	0.000	0.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	0.000	0.000	0.000	0.000	0.000	0.000
labour	0.000	0.000	0.000	0.000	0.000	0.000
maintenance	0.000	0.000	0.000	0.000	0.000	0.000
spares	0.000	0.000	0.000	0.000	0.000	0.000
factory overheads	0.000	0.000	0.000	0.000	0.000	0.000
subtotal factory costs	0.000	0.000	0.000	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000	0.000	0.000	0.000
administration	0.000	0.000	0.000	0.000	0.000	0.000
marketing, distribution indirect	0.000	0.000	0.000	0.000	0.000	0.000
thereof variable	0.000	0.000	0.000	0.000	0.000	0.000
total before depr. and interests	0.000	0.000	0.000	0.000	0.000	0.000
total before interests	9051.680	2531.680	2531.680	2531.682	0.000	0.000
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	9051.680	2531.680	2531.680	2531.682	0.000	0.000
thereof variable	0.000	0.000	0.000	0.000	0.000	0.000
total labour (of tot. prod. cost)	0.000	0.000	0.000	0.000	0.000	0.000
depreciation borne by product	9051.680	2531.680	2531.680	2531.682	0.000	0.000

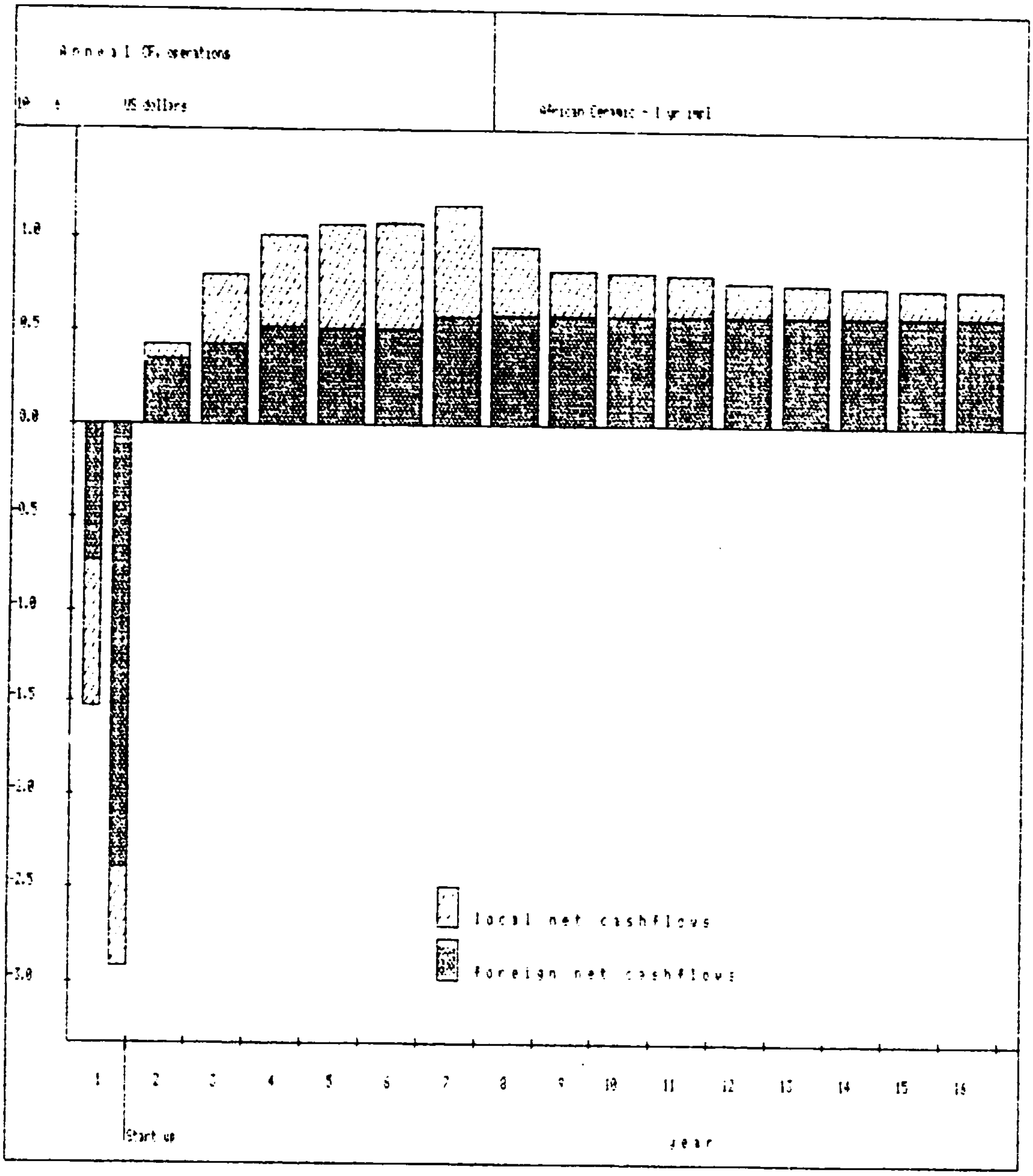
Production costs for product Crockery, local

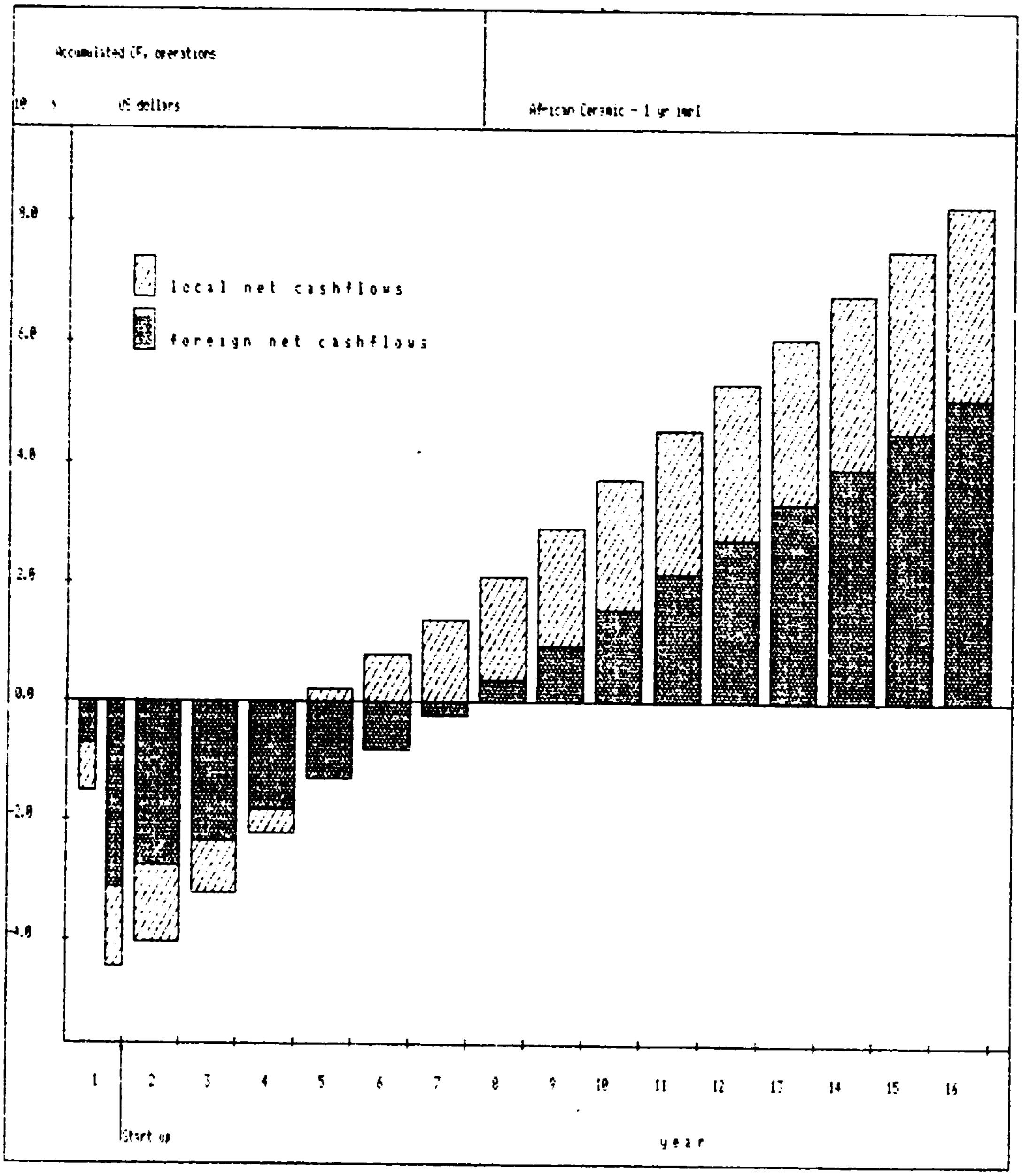
	Year: 1	Year: 2	Year: 3	Year: 4	Year: 5	Year: 6
raw material (first)	16573.200	41433.000	53862.900	66292.800	66292.800	66292.800
raw material (other)	0.000	0.000	0.000	0.000	0.000	0.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	9692.160	17415.600	21277.320	25139.040	25139.040	25139.040
labour	9240.920	12439.700	14039.090	15638.480	15638.480	15638.480
maintenance	23572.080	27009.690	28728.470	30447.270	30447.270	30447.270
spares	0.000	0.000	0.000	0.000	0.000	0.000
factory overheads	5547.000	5547.000	5547.000	5547.000	5547.000	5547.000
subtotal factory costs	64625.360	103845.000	123454.800	143064.600	143064.600	143064.600
thereof variable	26146.410	65366.020	84975.830	104585.600	104585.600	104595.600
administration	2931.200	3014.000	3055.400	3096.800	3096.800	3096.800
marketing, distribution indirect ..	0.000	0.000	0.000	0.000	0.000	0.000
thereof variable	55.200	138.000	179.400	220.800	220.800	220.800
total before depr. and interests ..	67556.560	106853.000	126510.200	146161.400	146161.400	146161.400
total before interests	87207.380	126509.800	146161.000	165812.200	165812.200	165812.200
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	87207.380	126509.800	146161.000	165812.200	165812.200	165812.200
thereof variable	26201.610	65504.020	85155.230	104806.400	104806.400	104806.400
total labour (of tot. prod. cost) .	9532.920	12831.700	14431.090	16030.480	16030.480	16030.480
depreciation borne by product	19650.820	19650.820	19650.820	19650.820	19650.820	19650.820

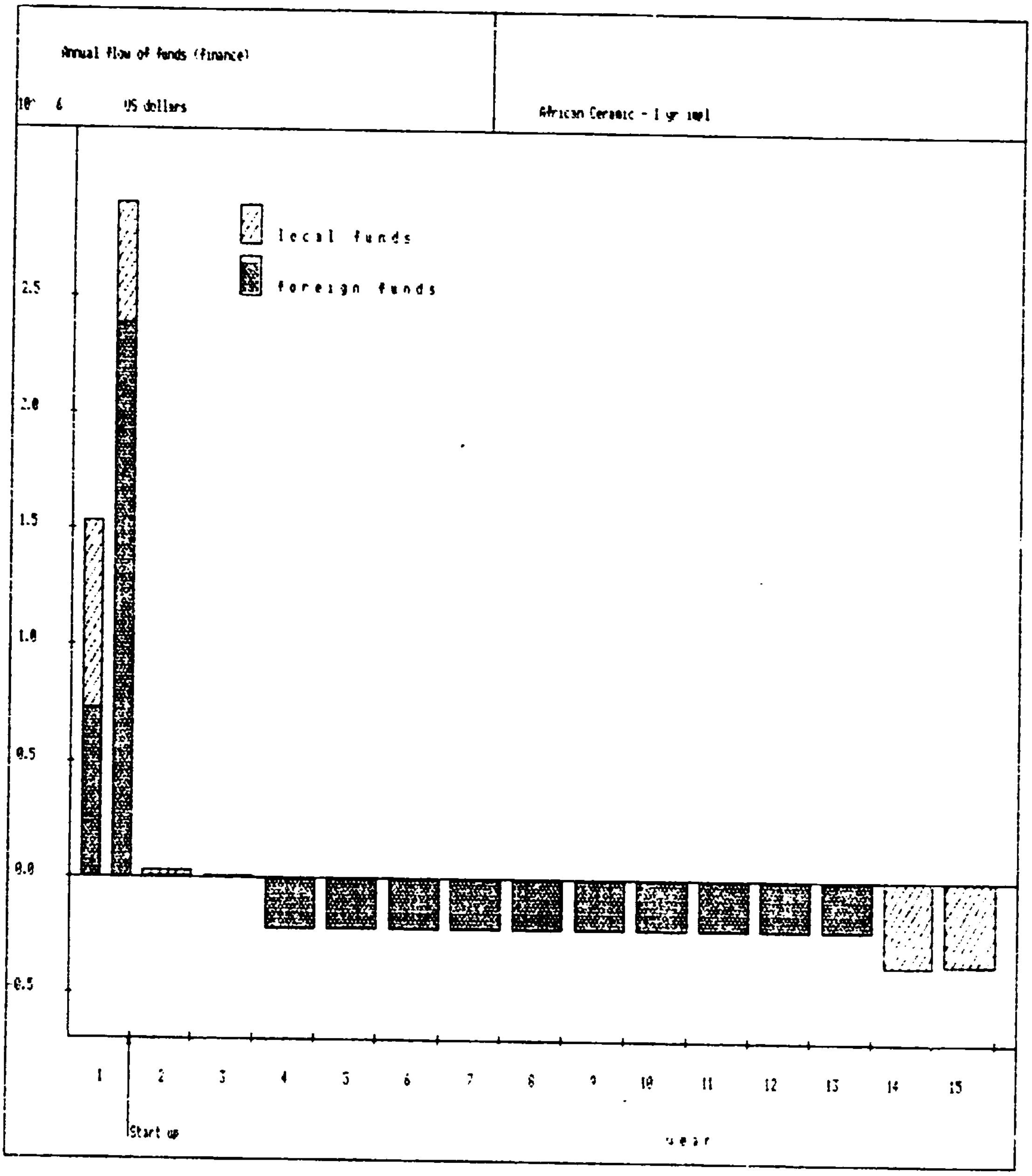
	Year: 7	Year: 8	Year: 9	Year: 10	Year: 11	Year: 12
raw material (first)	66292.800	66292.800	66292.800	66292.800	66292.800	66292.800
raw material (other)	0.000	0.000	0.000	0.000	0.000	0.000
utilities	0.000	0.000	0.000	0.000	0.000	0.000
energy	25139.040	25139.040	25139.040	25139.040	25139.040	25139.040
labour	15638.480	15638.480	15638.480	15638.480	15638.480	15638.480
maintenance	30447.270	30447.270	30447.270	30447.270	30447.270	30447.270
spares	0.000	0.000	0.000	0.000	0.000	0.000
factory overheads	5547.000	5547.000	5547.000	5547.000	5547.000	5547.000
subtotal factory costs	143064.600	143064.600	143064.600	143064.600	143064.600	143064.600
thereof variable	104585.600	104585.600	104585.600	104585.600	104585.600	104585.600
administration	3096.800	3096.800	3096.800	3096.800	3096.800	3096.800
marketing, distribution indirect ..	0.000	0.000	0.000	0.000	0.000	0.000
thereof variable	220.800	220.800	220.800	220.800	220.800	220.800
total before depr. and interests ..	146161.400	146161.400	146161.400	146161.400	146161.400	146161.400
total before interests	165812.200	165812.200	158729.000	158728.900	154773.800	154773.800
interests	0.000	0.000	0.000	0.000	0.000	0.000
total production cost	165812.200	165812.200	158729.000	158728.900	154773.800	154773.800
thereof variable	104806.400	104806.400	104806.400	104806.400	104806.400	104806.400
total labour (of tot. prod. cost) .	16030.480	16030.480	16030.480	16030.480	16030.480	16030.480
depreciation borne by product	19650.820	19650.820	12567.560	12567.550	8612.364	8612.364

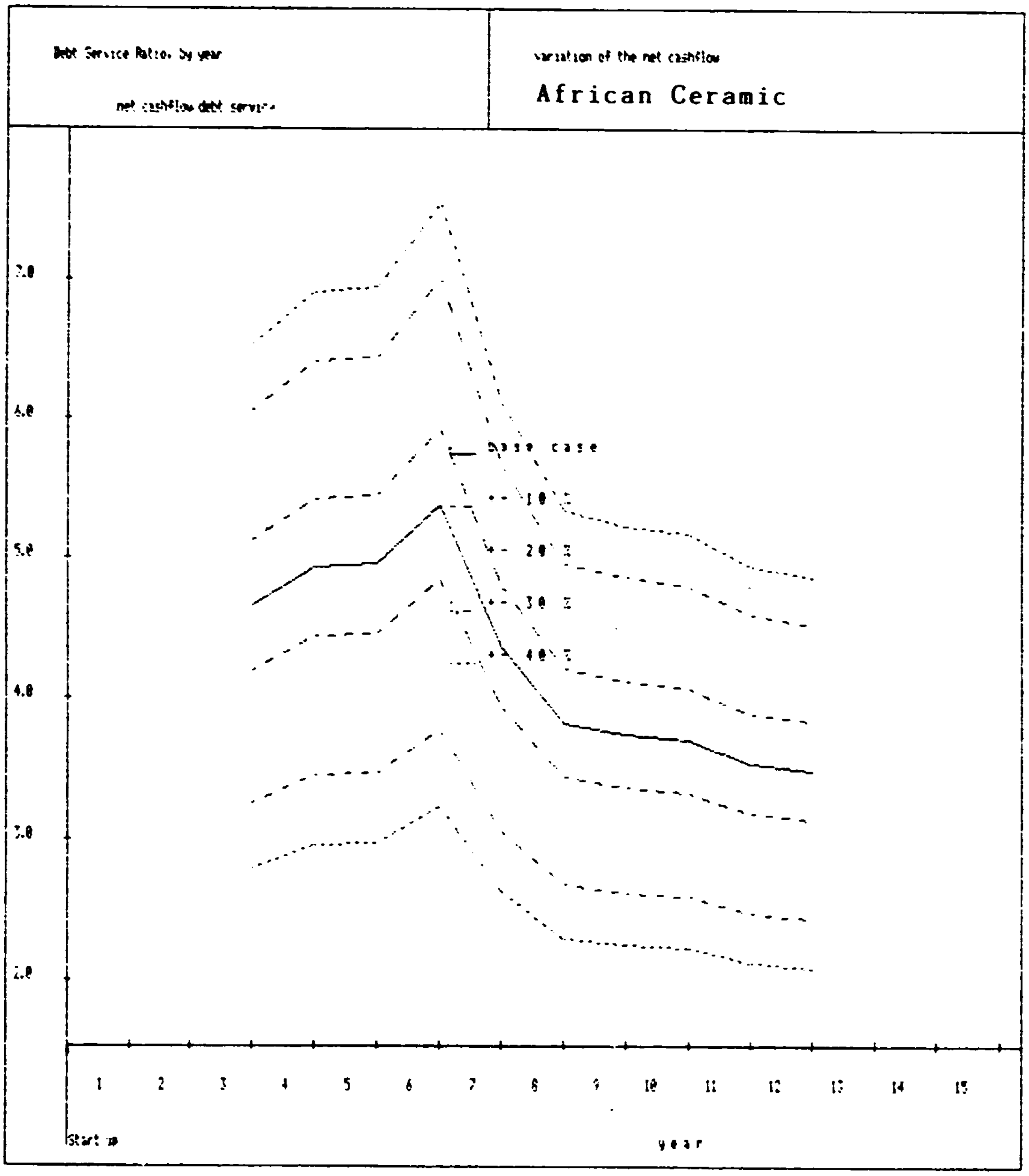
Production costs for product Crockery, local

	Year:13	Year:14	Year:15
raw material (first)	66292.800	66292.800	66292.800
raw material (other)	0.000	0.000	0.000
utilities	0.000	0.000	0.000
energy	25139.040	25139.040	25139.040
labour	15638.480	15638.480	15638.480
maintenance	30447.270	30447.270	30447.270
spares	0.000	0.000	0.000
factory overheads	5547.000	5547.000	5547.000
subtotal factory costs	143064.600	143064.600	143064.600
thereof variable	104585.600	104585.600	104585.600
administration	3096.800	3096.800	3096.800
marketing, distribution indirect ..	0.000	0.000	0.000
thereof variable	220.800	220.800	220.800
total before depr. and interests ..	146161.400	146161.400	146161.400
total before interests	154773.800	154773.800	154773.600
interests	0.000	0.000	0.000
total production cost	154773.800	154773.800	154773.600
thereof variable	104806.400	104806.400	104806.400
total labour (of tot. prod. cost) .	16030.480	16030.480	16030.480
depreciation borne by product	8612.364	8612.364	8612.247


Annual CF, operations
10 6 US dollars
African Ceramic - 1 yr impl
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
local net cashflows
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Start up
year


Accumulated CF, operations
US dollars
African Ceramic - 1 yr impl
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
local net cashflows
foreign net cashflows
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Start up
year


Annual flow of funds (finance)
10^ 6 US dollars
African Ceramic - 1 yr impl
local funds
foreign funds
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

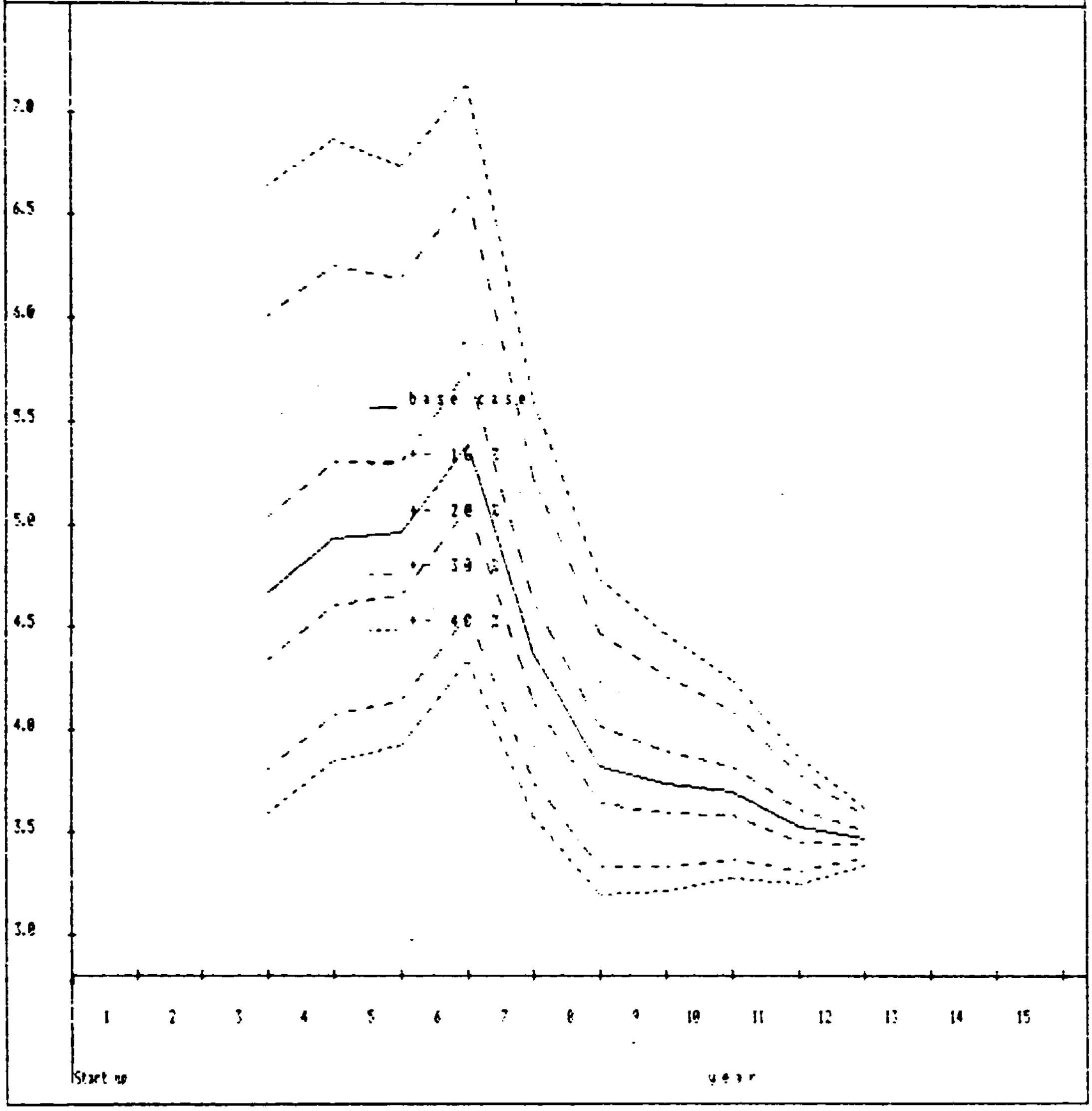

Debt Service Ratio, by year
net cashflow/debt service
variation of the net cashflow
African Ceramic
base case
+- 10 %
+- 20 %
+- 30 %
+- 40 %
7.0
6.0
5.0
4.0
3.0
2.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

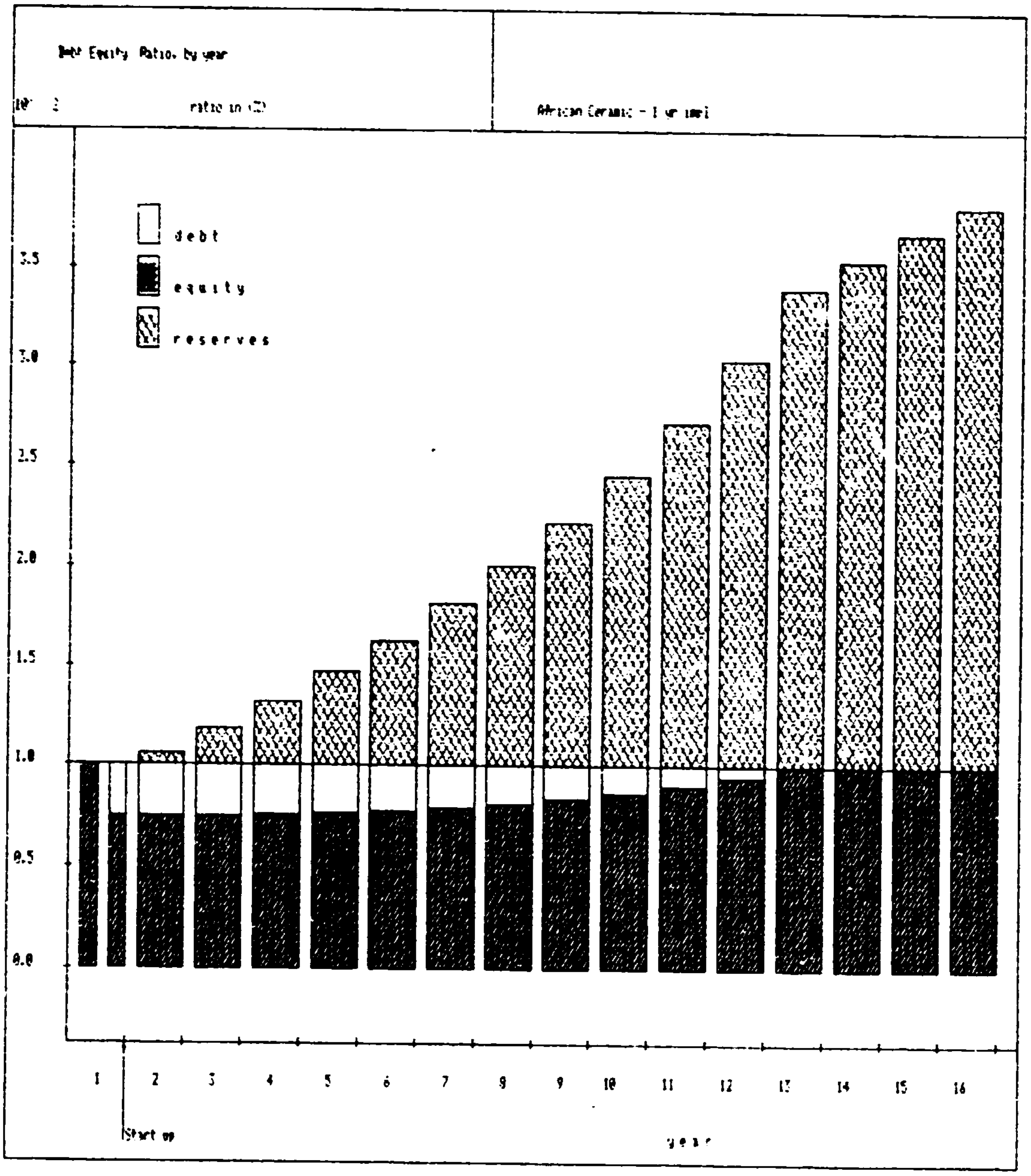
Debt Service Ratio, by year

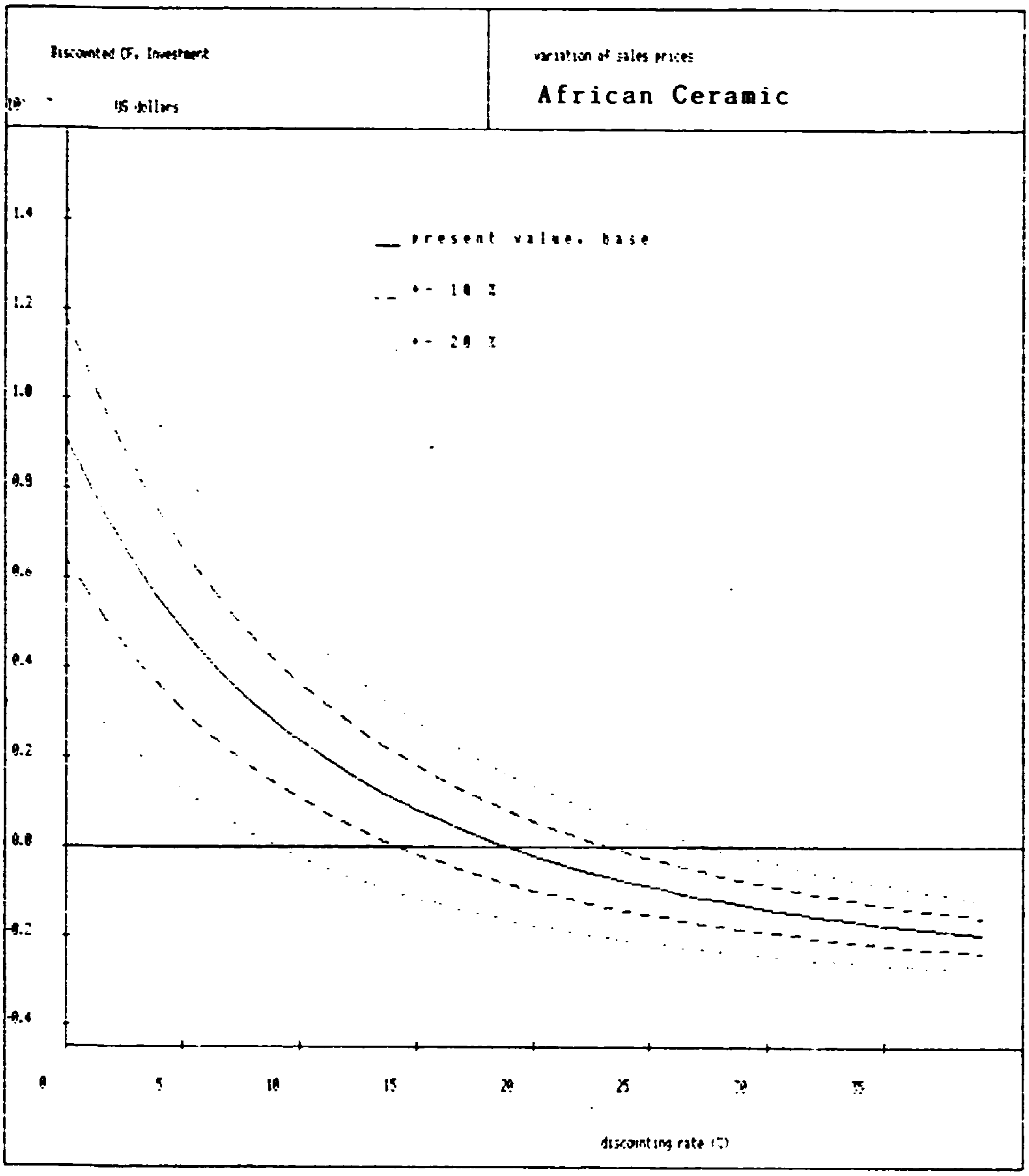
net cashflow-debt service

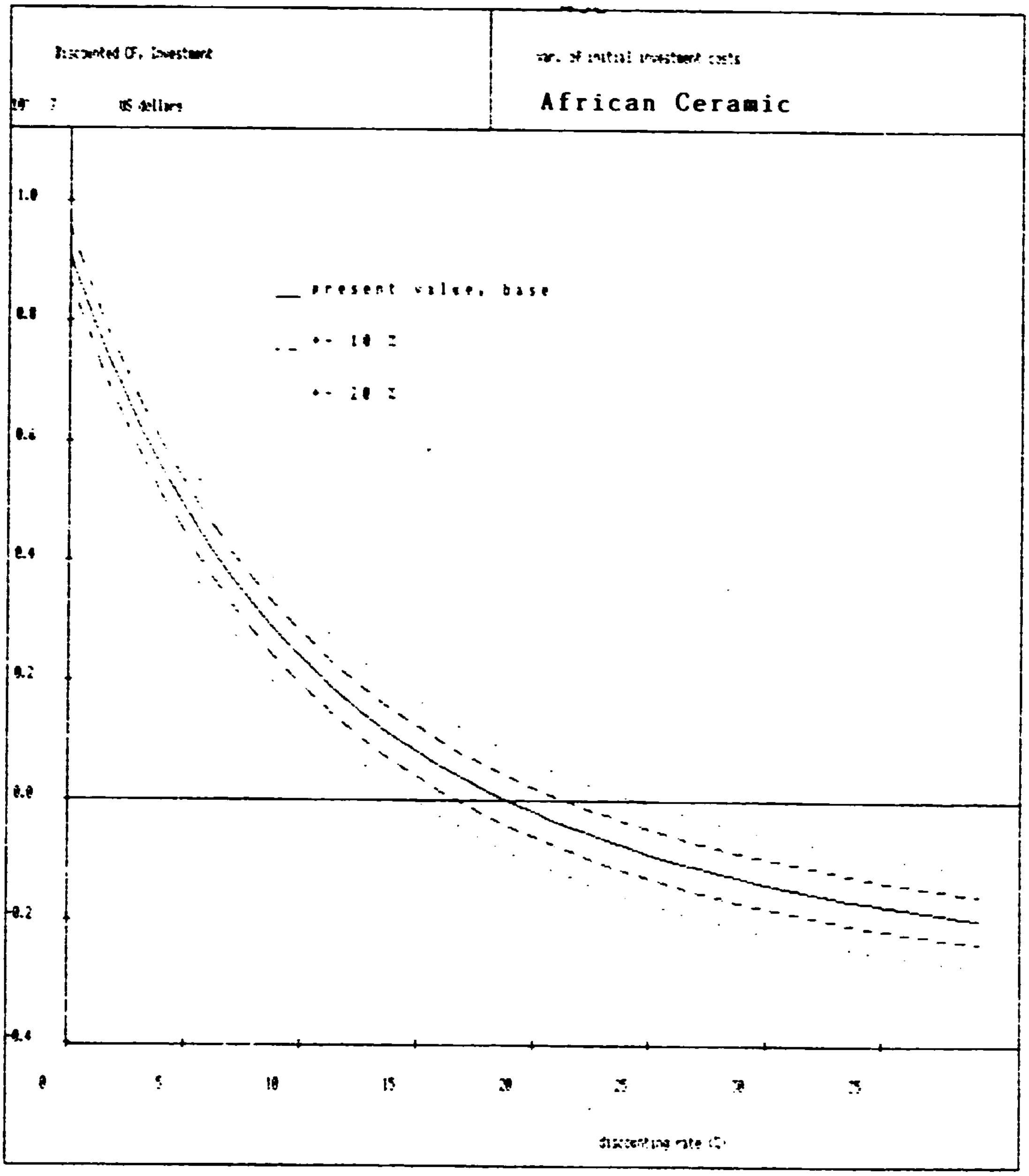
variation of total interest

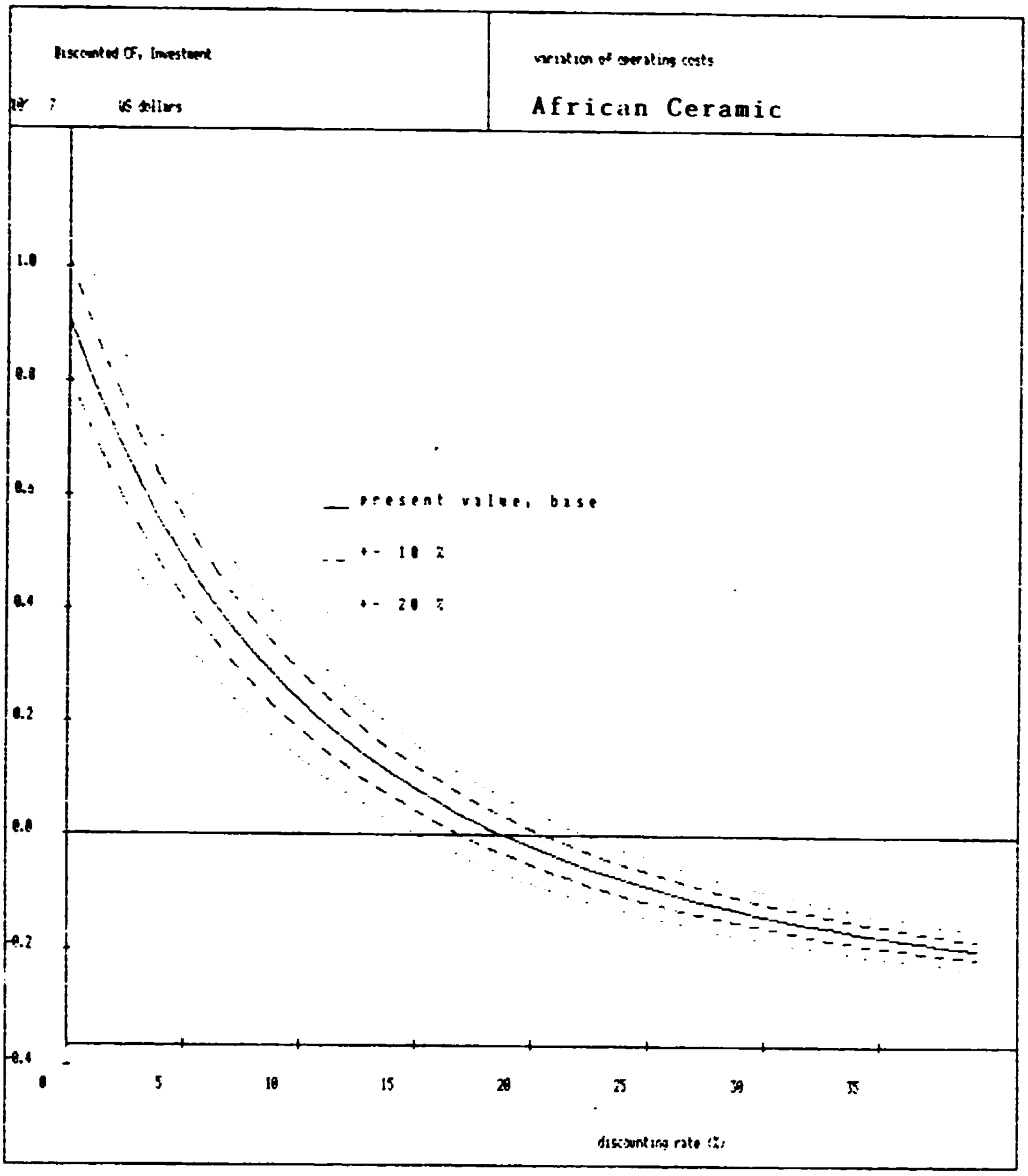
African Ceramic




Debt Equity Ratio, by year
10^ 2
ratio in (%)
African Ceramic - 1 yr impl
debt
equity
reserves
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Start up
year


Discounted CF, Investment
US dollars
variation of sales prices
African Ceramic
present value, base
+- 10 %
+- 20 %
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0
5
10
15
20
25
30
35
discounting rate (%)


Discounted CF, Investment
US dollars
African Ceramic
present value, base
+- 10 %
+- 20 %
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0
5
10
15
20
25
30
35
discounting rate (%)

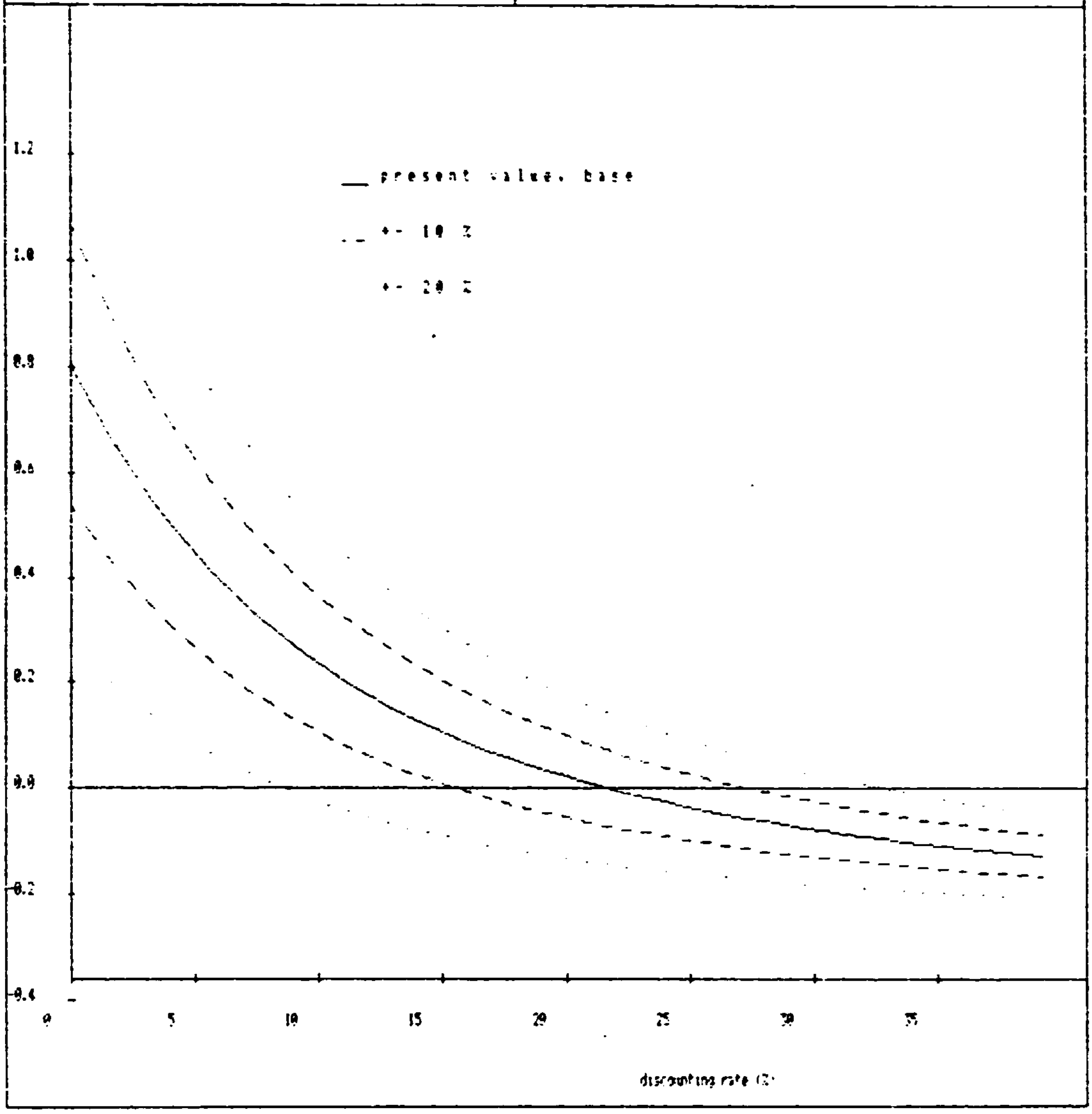

Discounted CF, Investment
10^7 US dollars
variation of operating costs
African Ceramic
present value, base
+- 10 %
+- 20 %
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0
5
10
15
20
25
30
35
discounting rate (%)

Discounted return on NetWorth

10^7 US dollars

Variation of total sales prices

African Ceramic

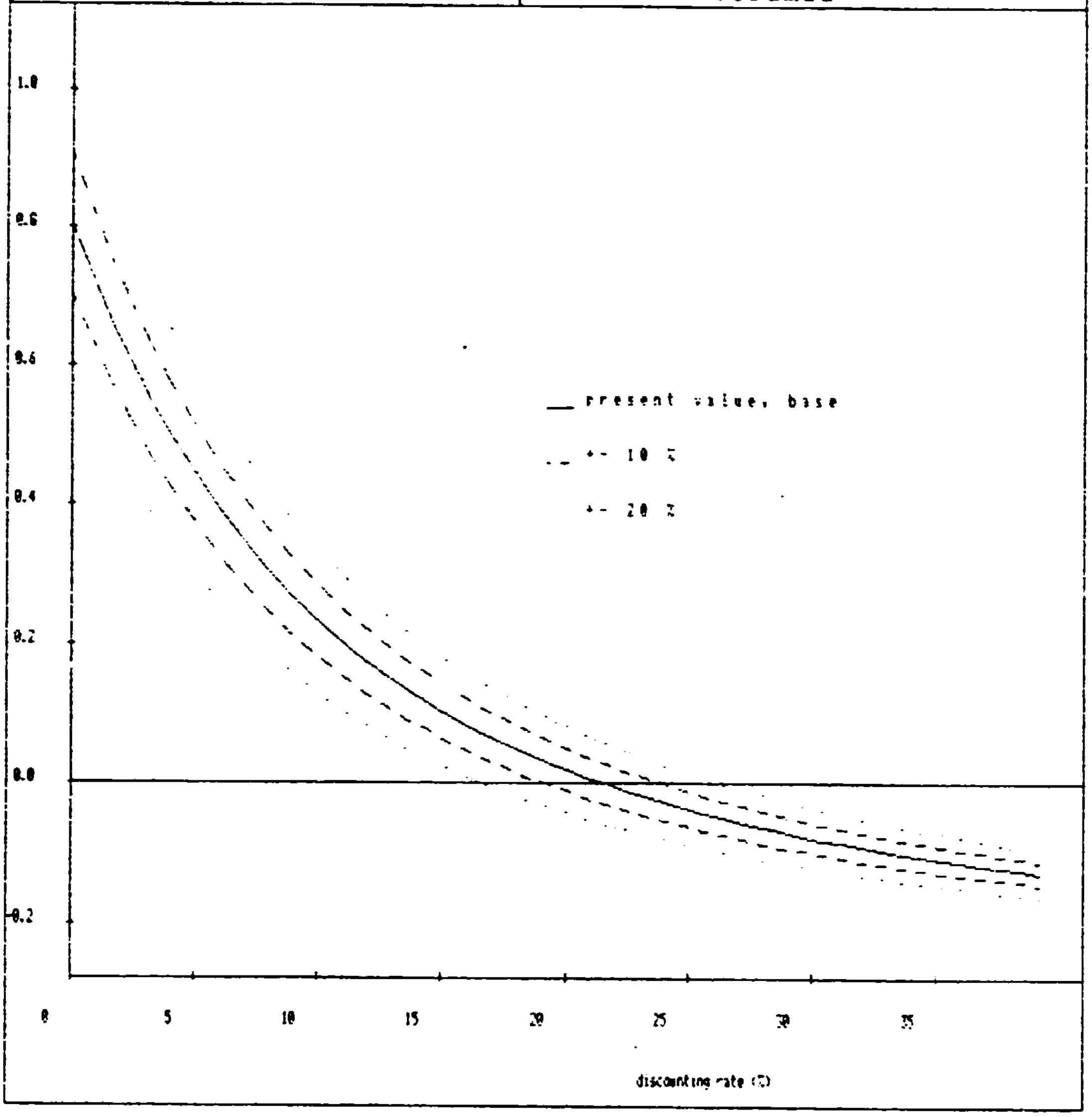


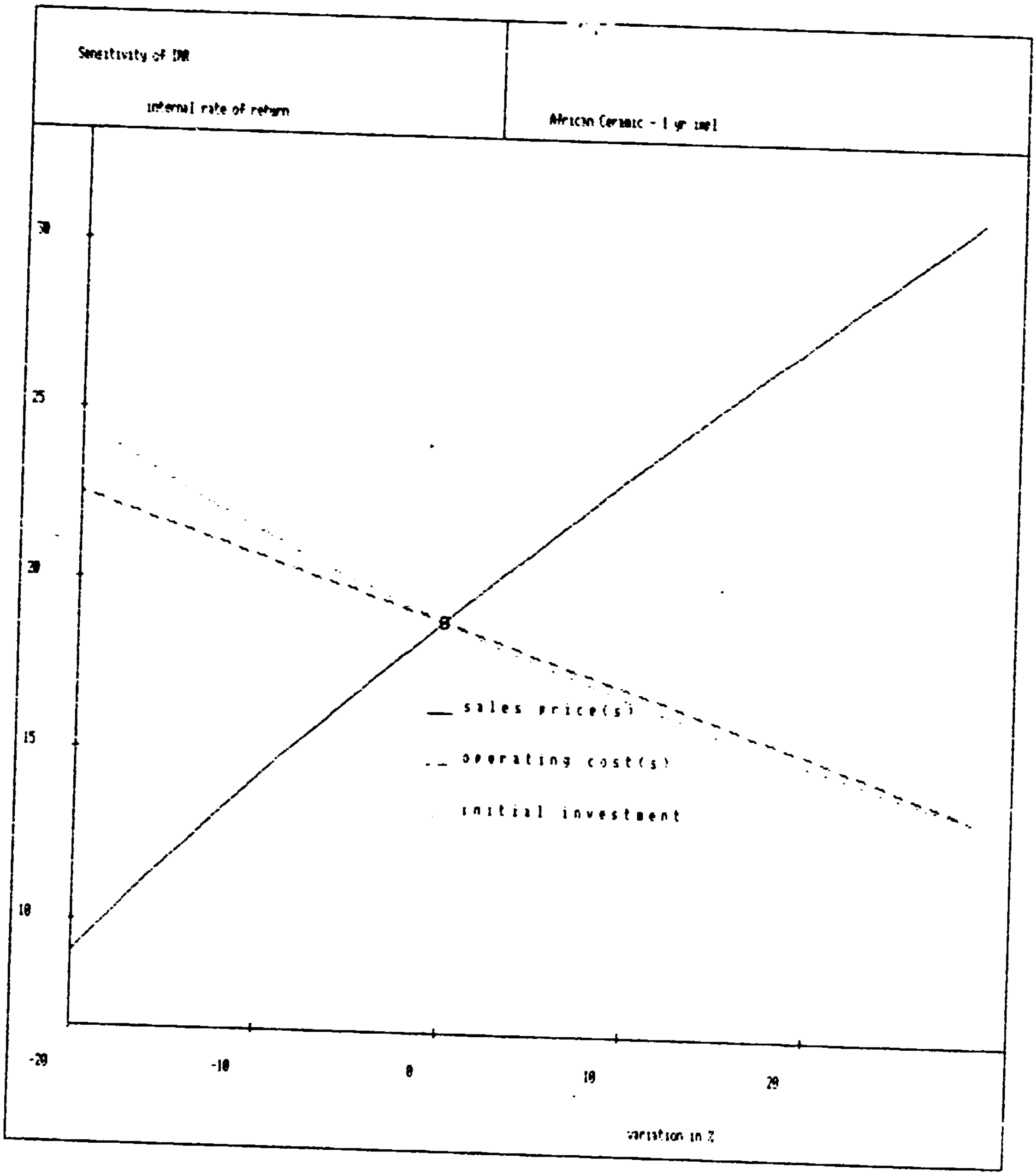
Discounted return on NetWorth

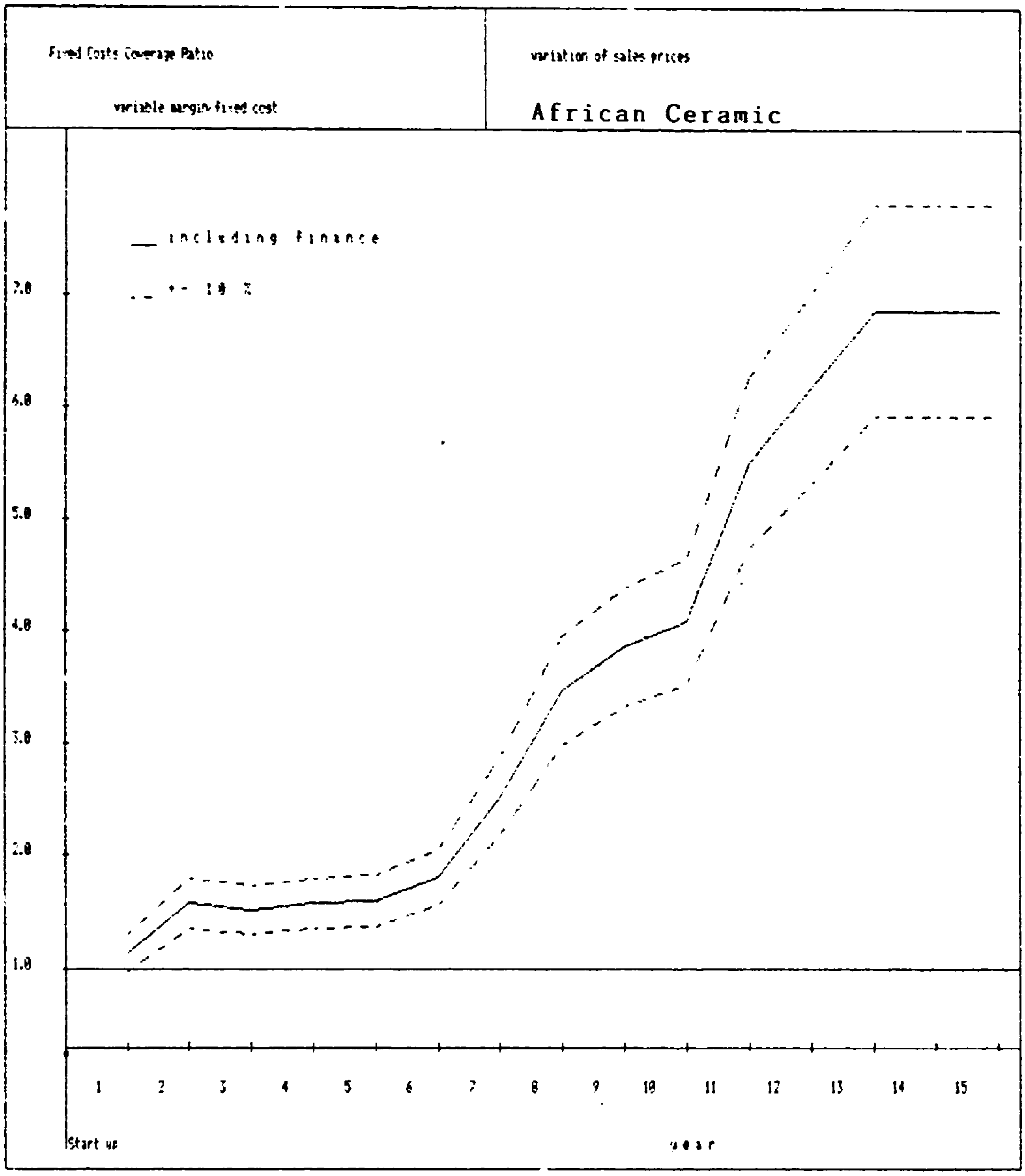
10^ 7 US dollars

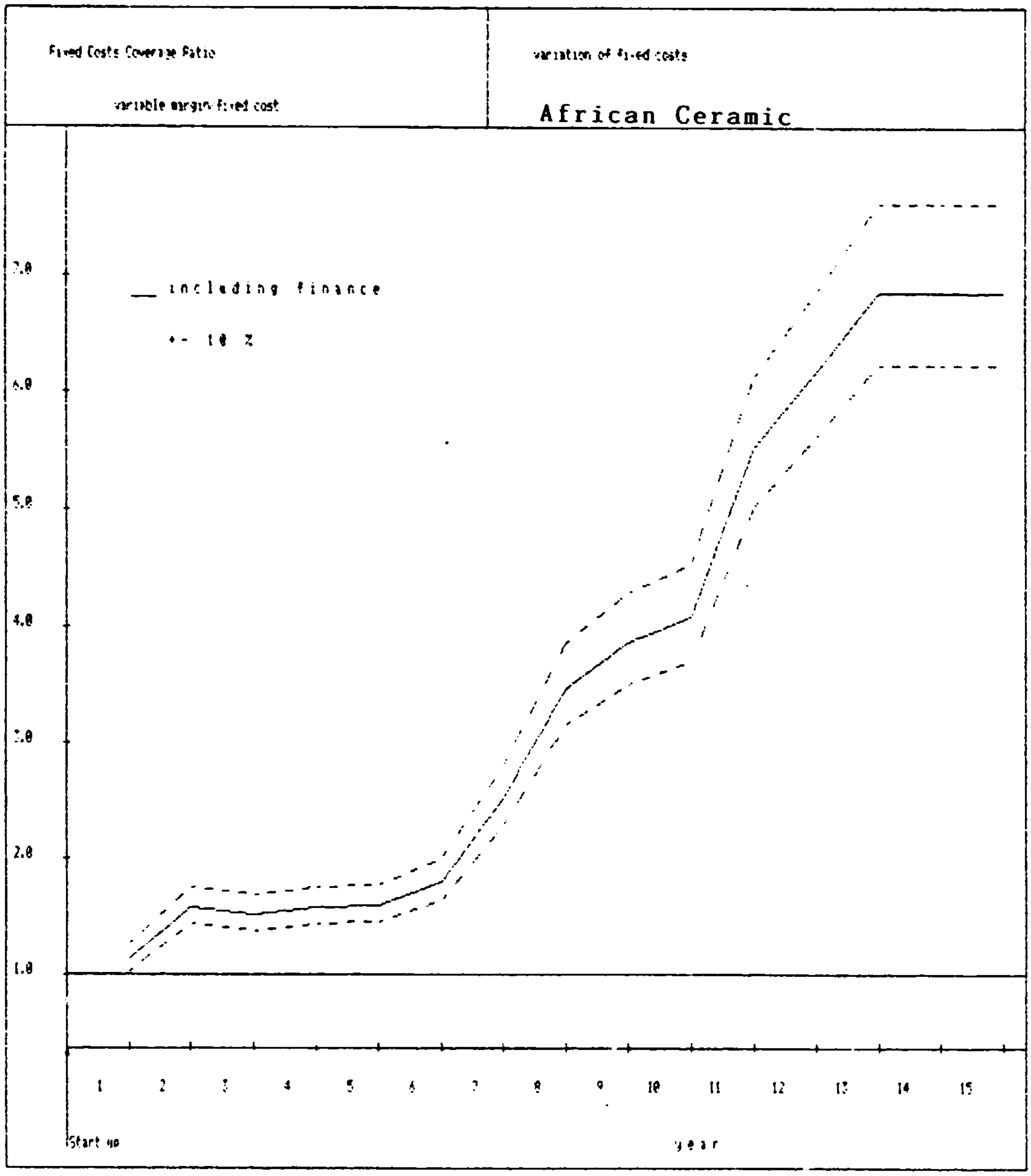
variation of operating costs

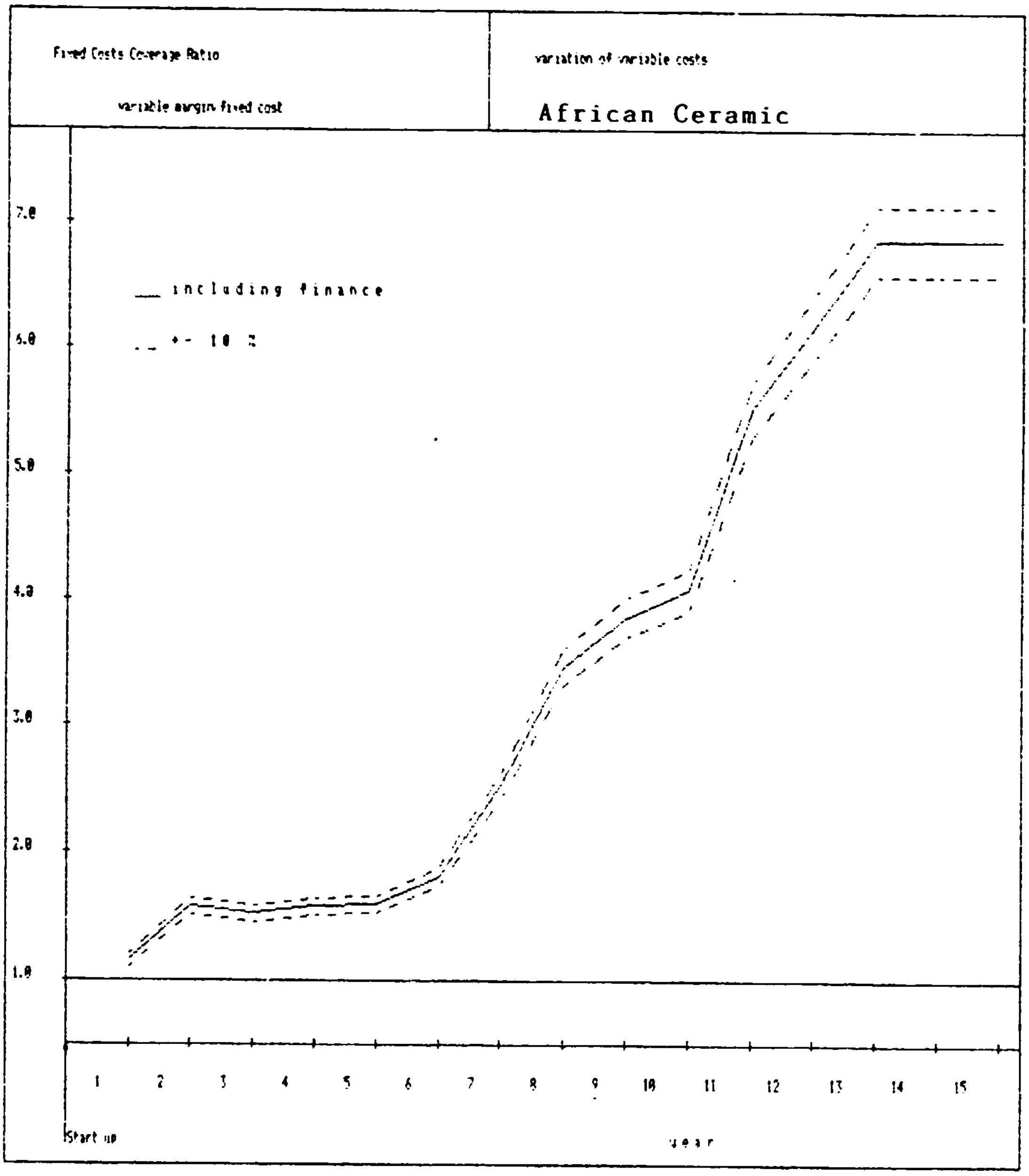
African Ceramic

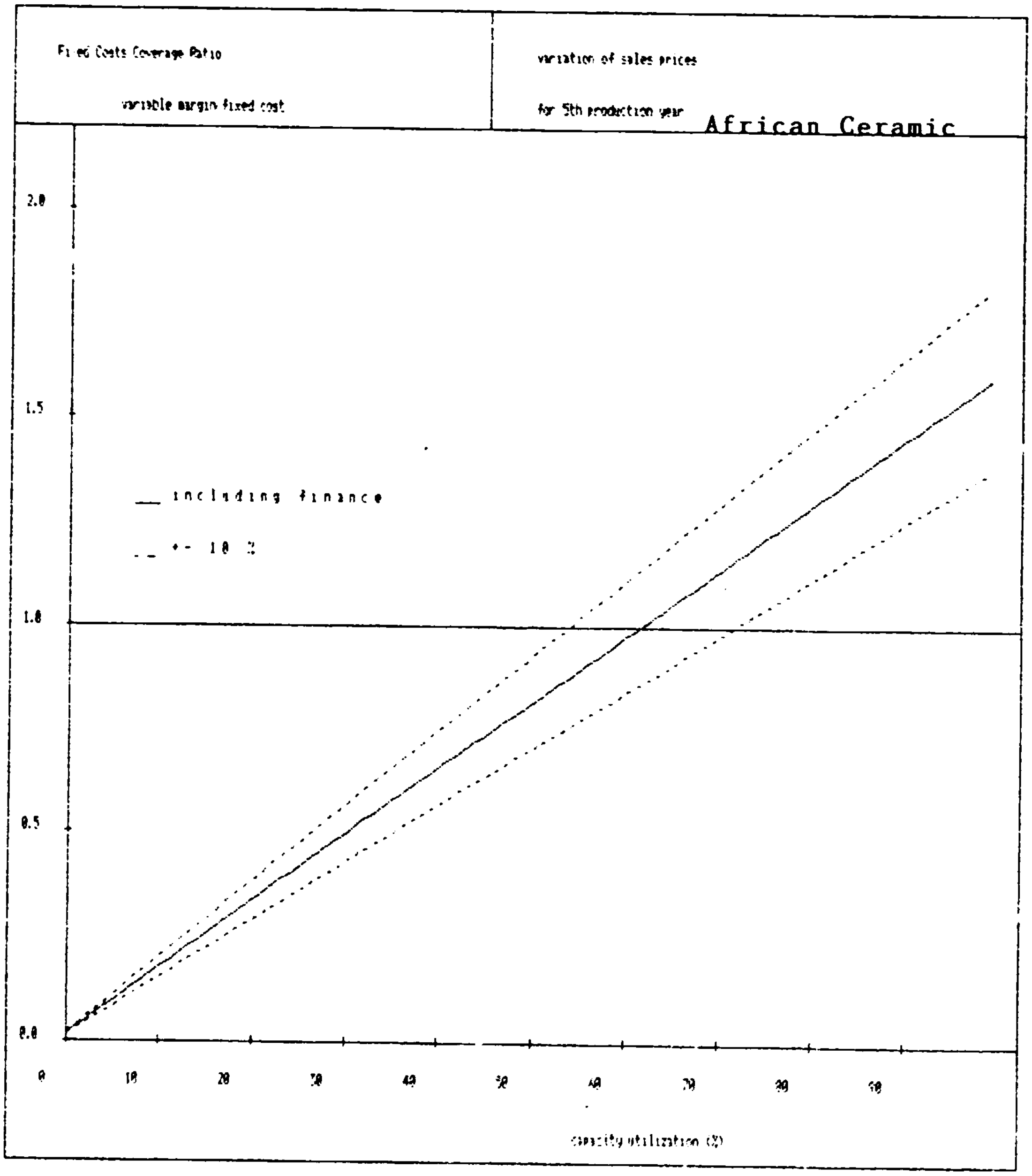



Sensitivity of IRR
internal rate of return
African Ceramic - 1 yr inel
30
25
20
15
10
-20
-10
0
10
20
sales price(s)
operating cost(s)
initial investment
variation in %

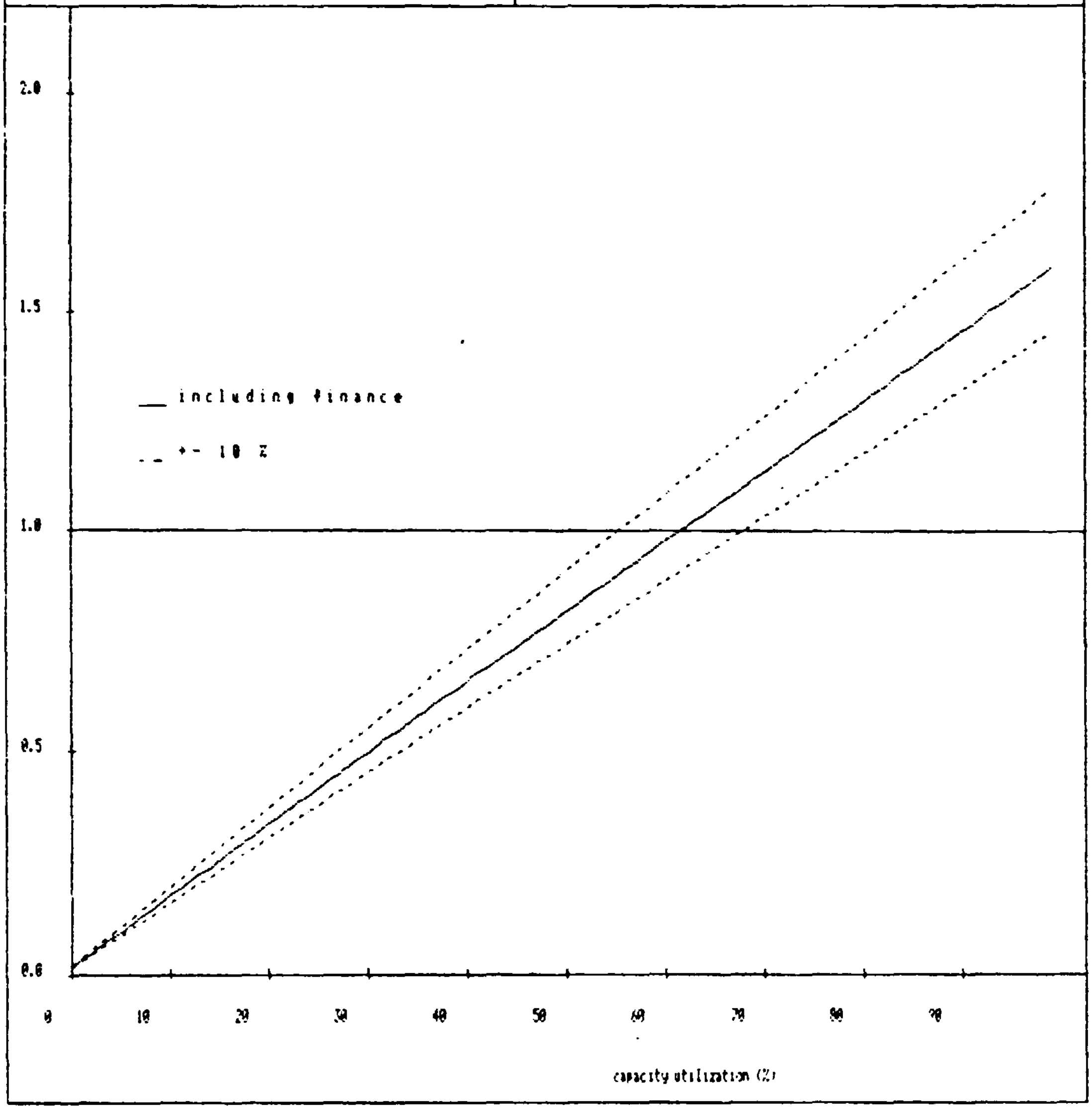

Fixed Costs Coverage Ratio
variable margin-fixed cost
variation of sales prices
African Ceramic
including finance
+- 10 %
7.0
6.0
5.0
4.0
3.0
2.0
1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Fixed Costs Coverage Ratio
variable margin/fixed cost
variation of fixed costs
African Ceramic
including finance
+- 10 %
7.0
6.0
5.0
4.0
3.0
2.0
1.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

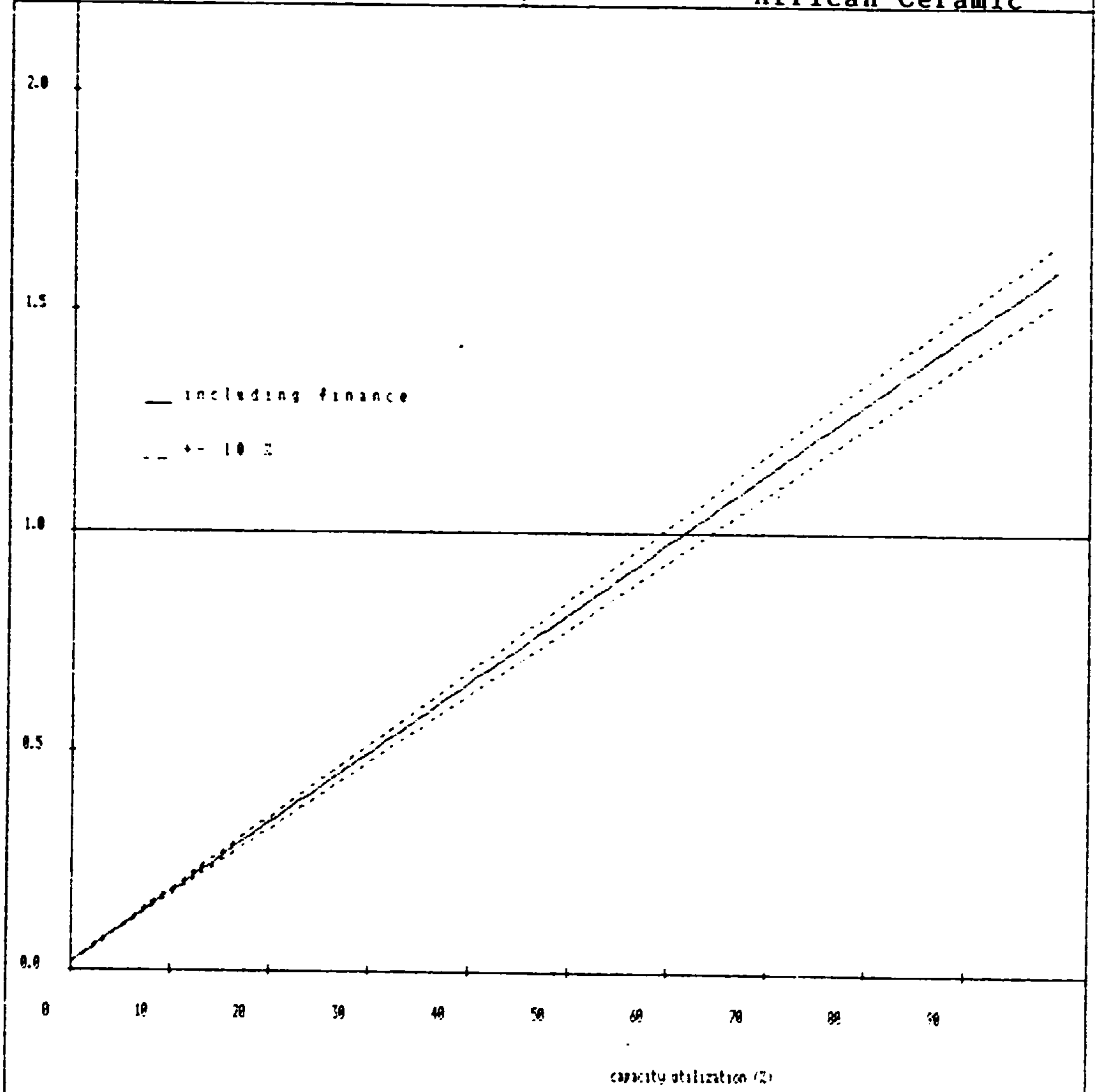

Fixed Costs Coverage Ratio
variable margin-fixed cost
variation of variable costs
African Ceramic
7.0
6.0
5.0
4.0
3.0
2.0
1.0
including finance
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year

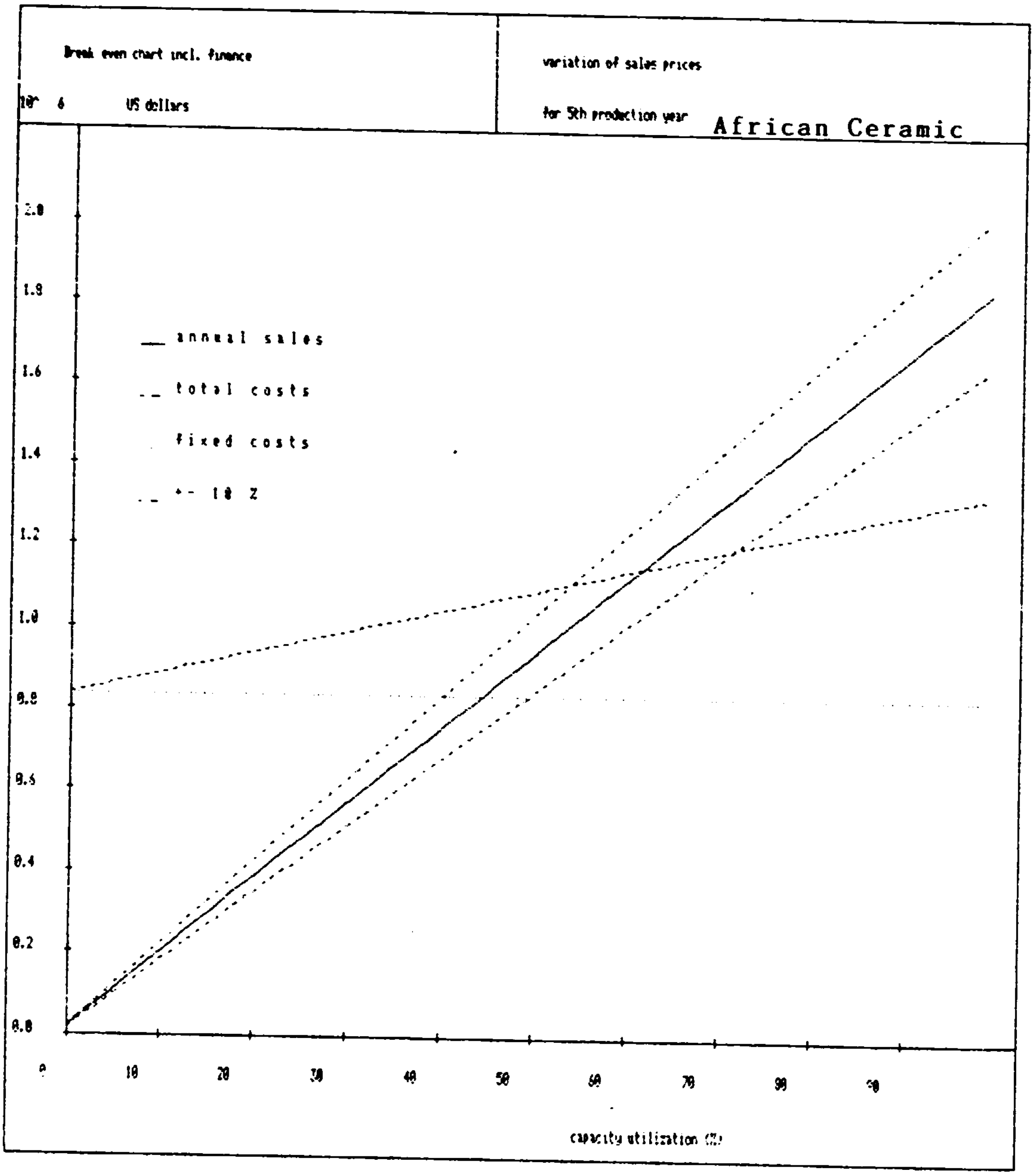

Fixed Costs Coverage Ratio
variable margin fixed cost
variation of sales prices
for 5th production year
African Ceramic
2.0
1.5
1.0
0.5
0.0
including finance
+- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

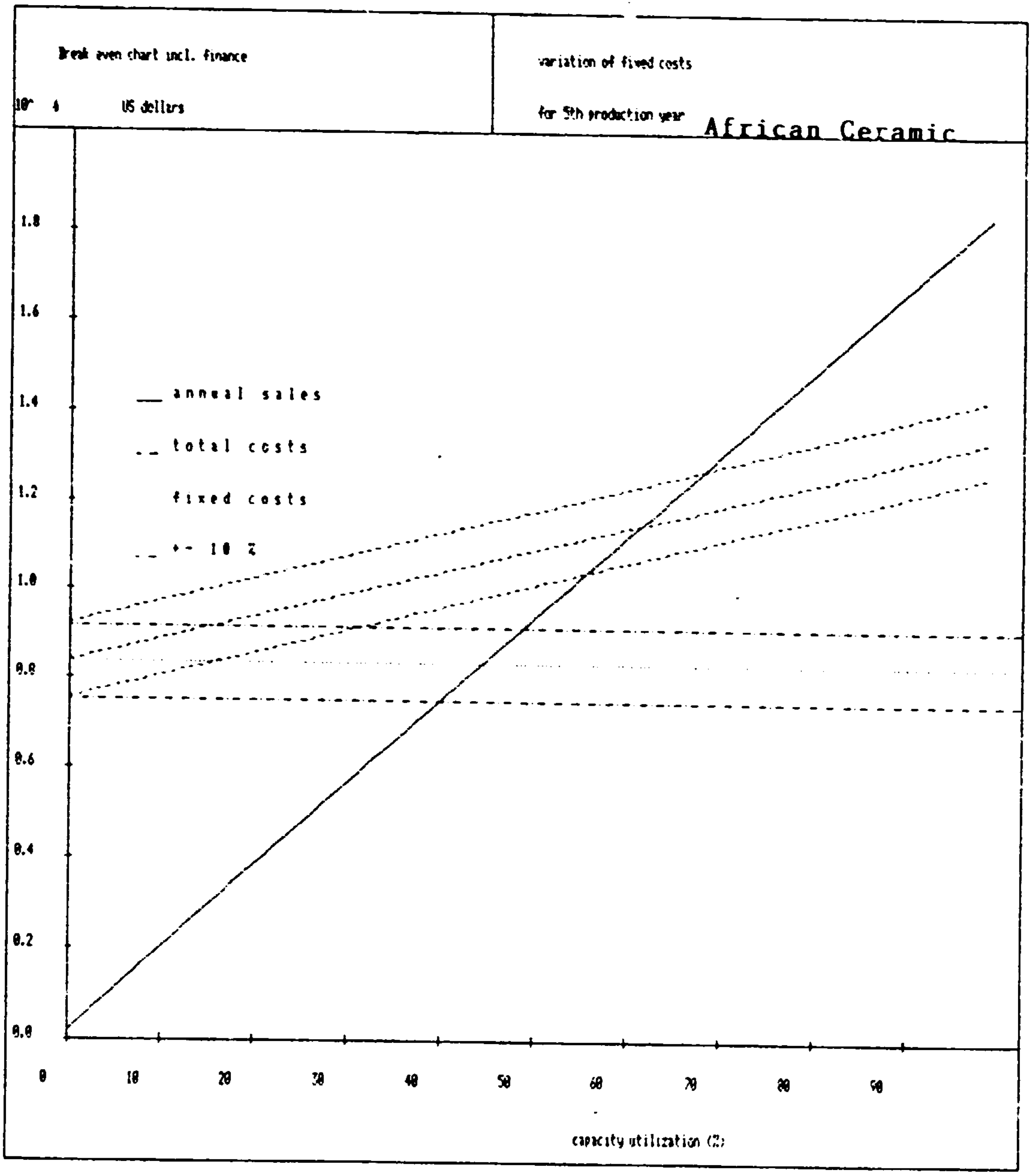
Fixed Costs Coverage Ratio variable margin/fixed cost	variation of fixed costs for 5th production year African Ceramic

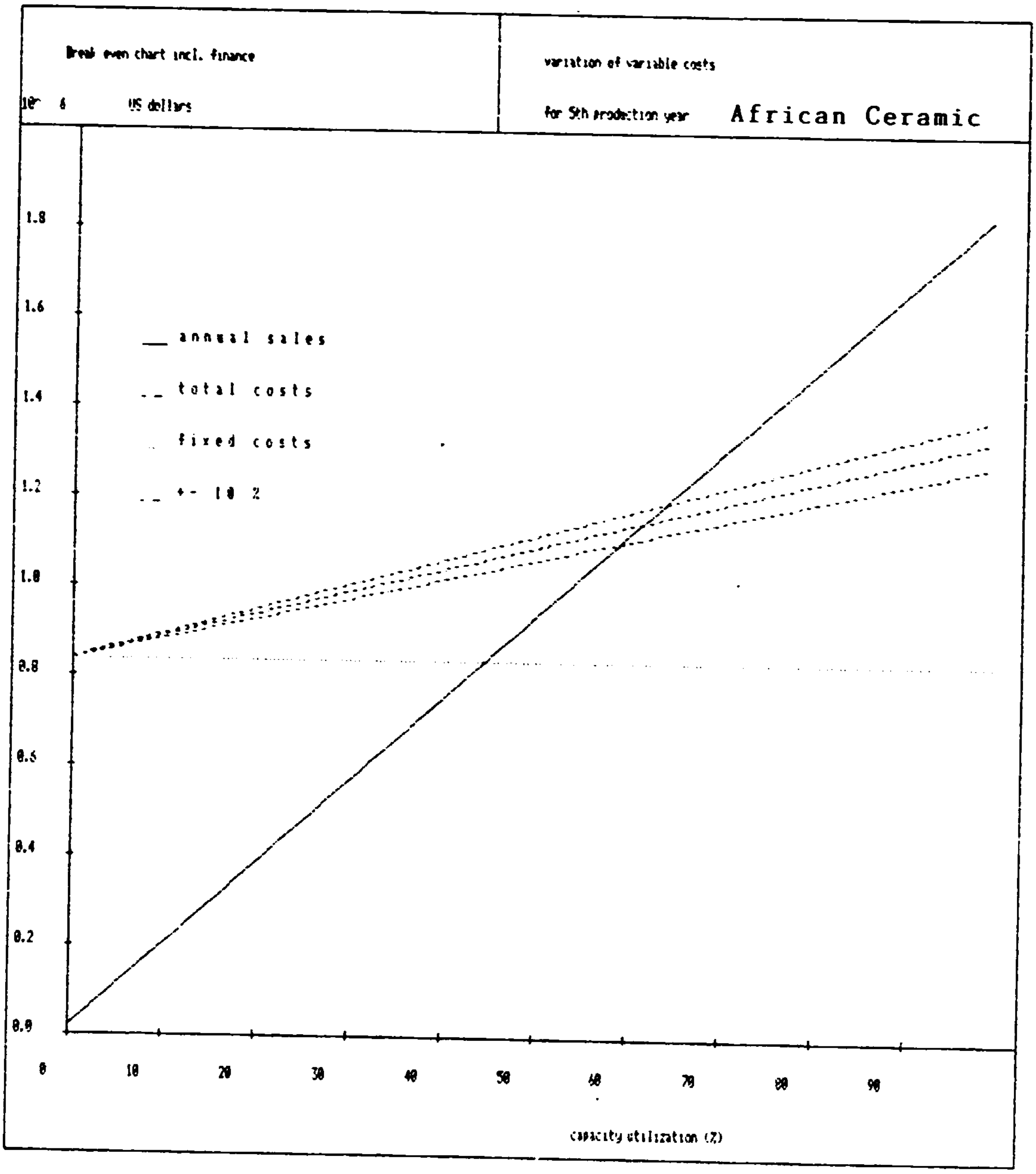


Fixed Costs Coverage Ratio variable margin-fixed cost	variation of variable costs for 5th production year African Ceramic




Break even chart incl. finance
10^ 6 US dollars
variation of sales prices
for 5th production year
African Ceramic
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
annual sales
total costs
fixed costs
+- 10 %
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)


Break even chart incl. finance
10^ 6 US dollars
variation of fixed costs
for 5th production year
African Ceramic
annual sales
total costs
fixed costs
+- 10 %
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)



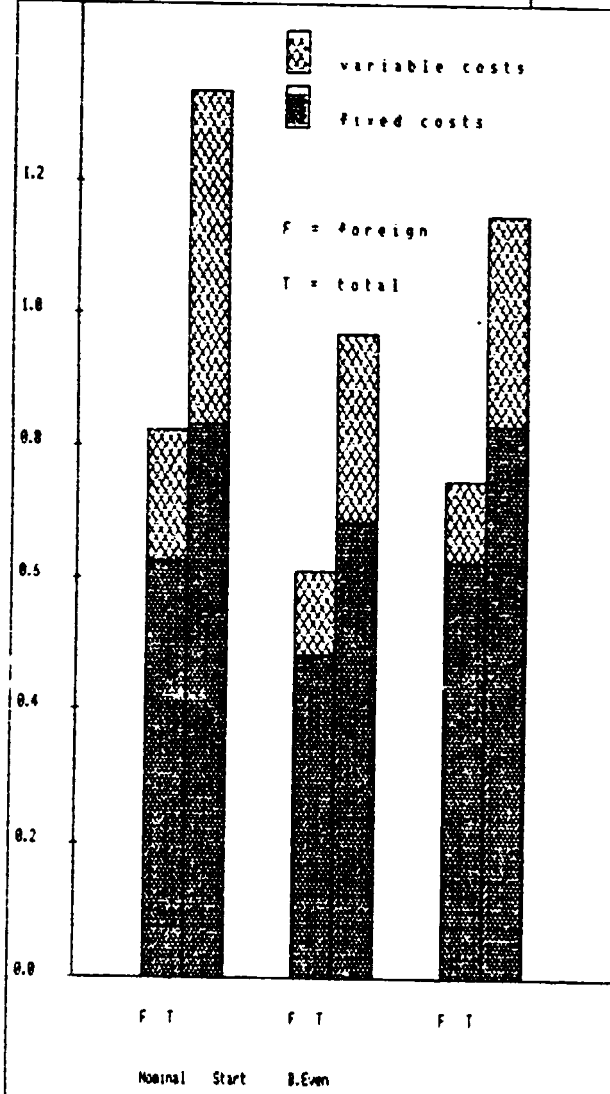
Break even chart incl. finance
10^ 6 US dollars
variation of variable costs
for 5th production year
African Ceramic
annual sales
total costs
fixed costs
+- 10 %
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
80
90
capacity utilization (%)

Structure of Production Costs

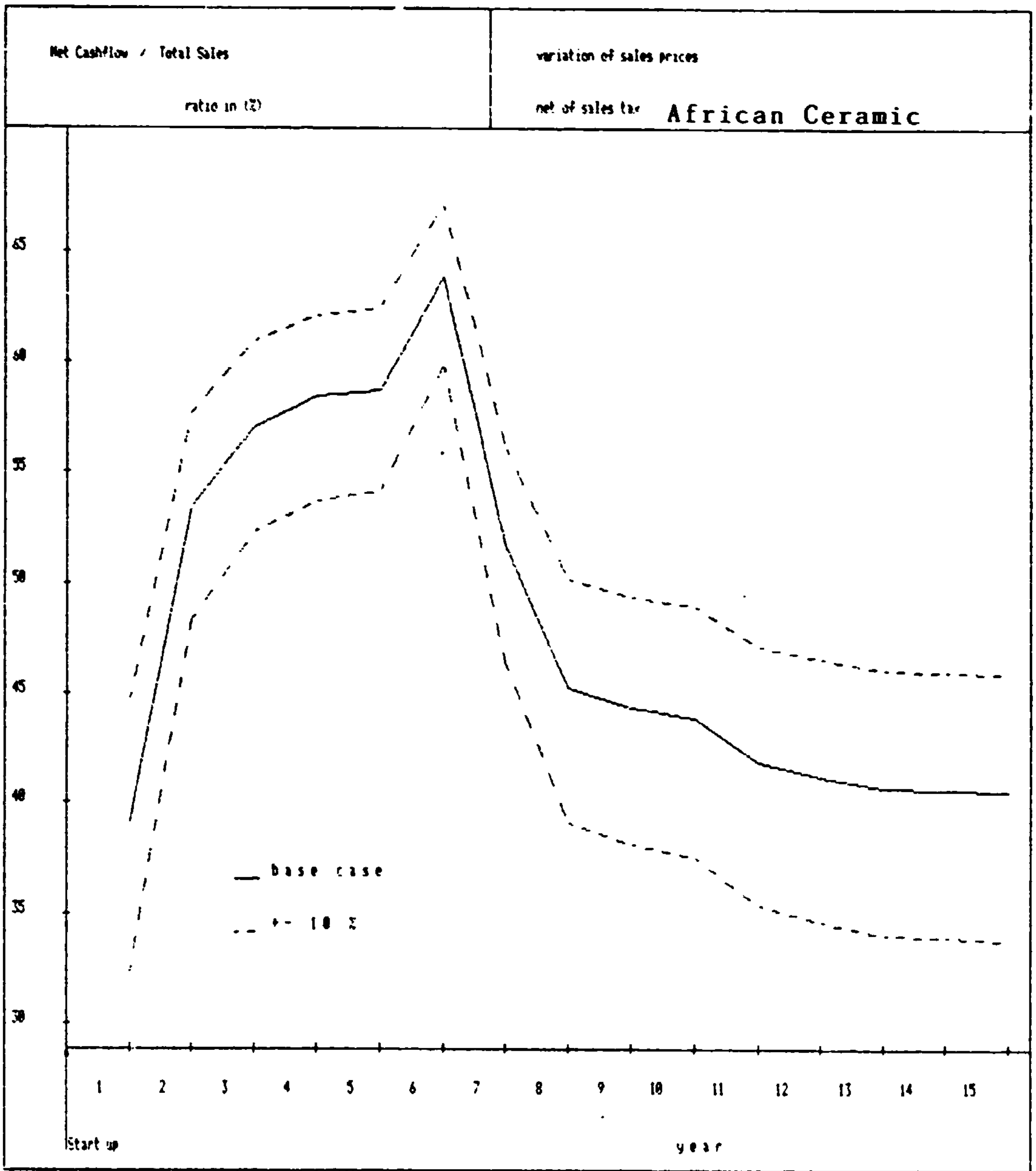
10^ 6 US dollars

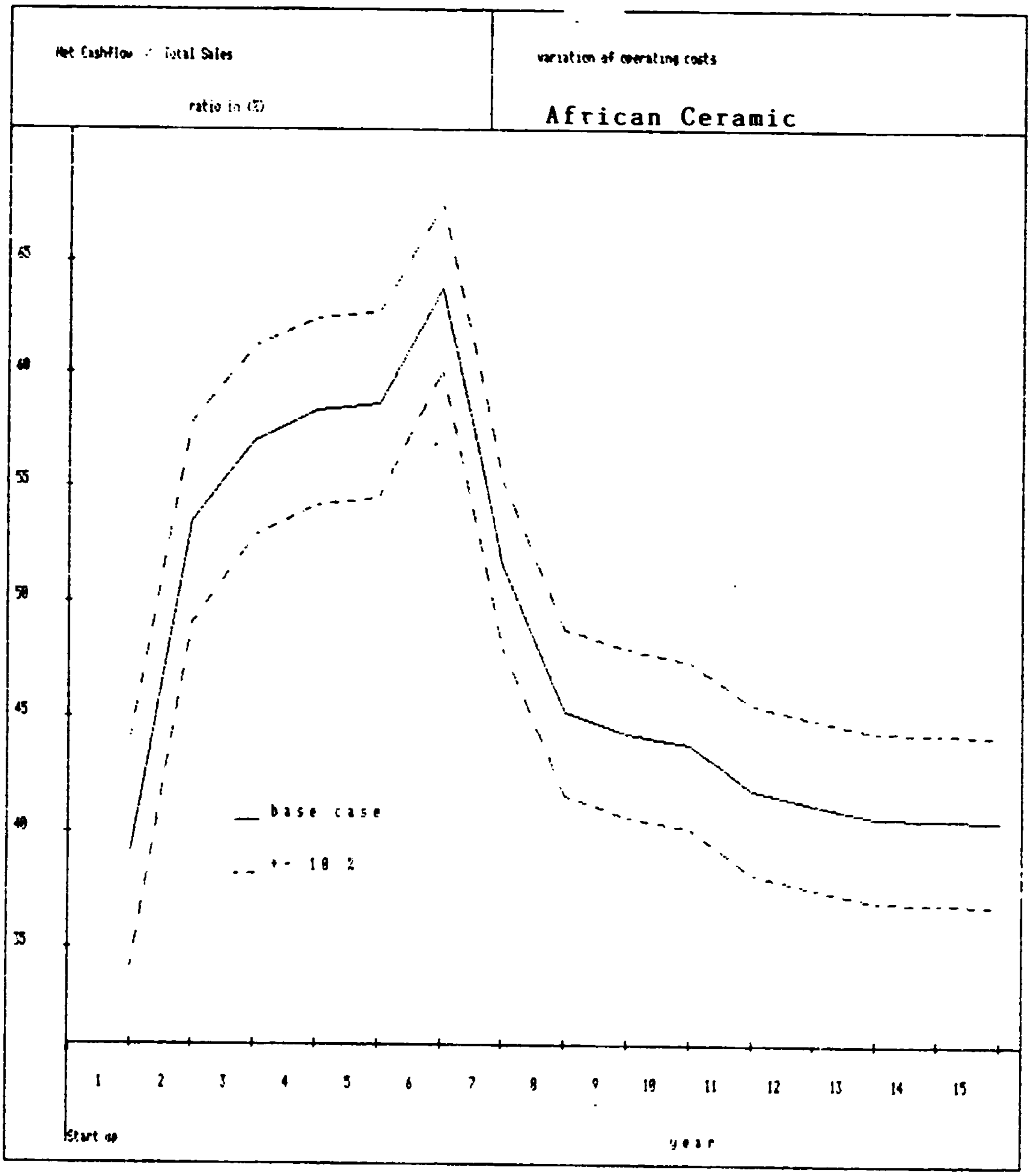
for 5th production year

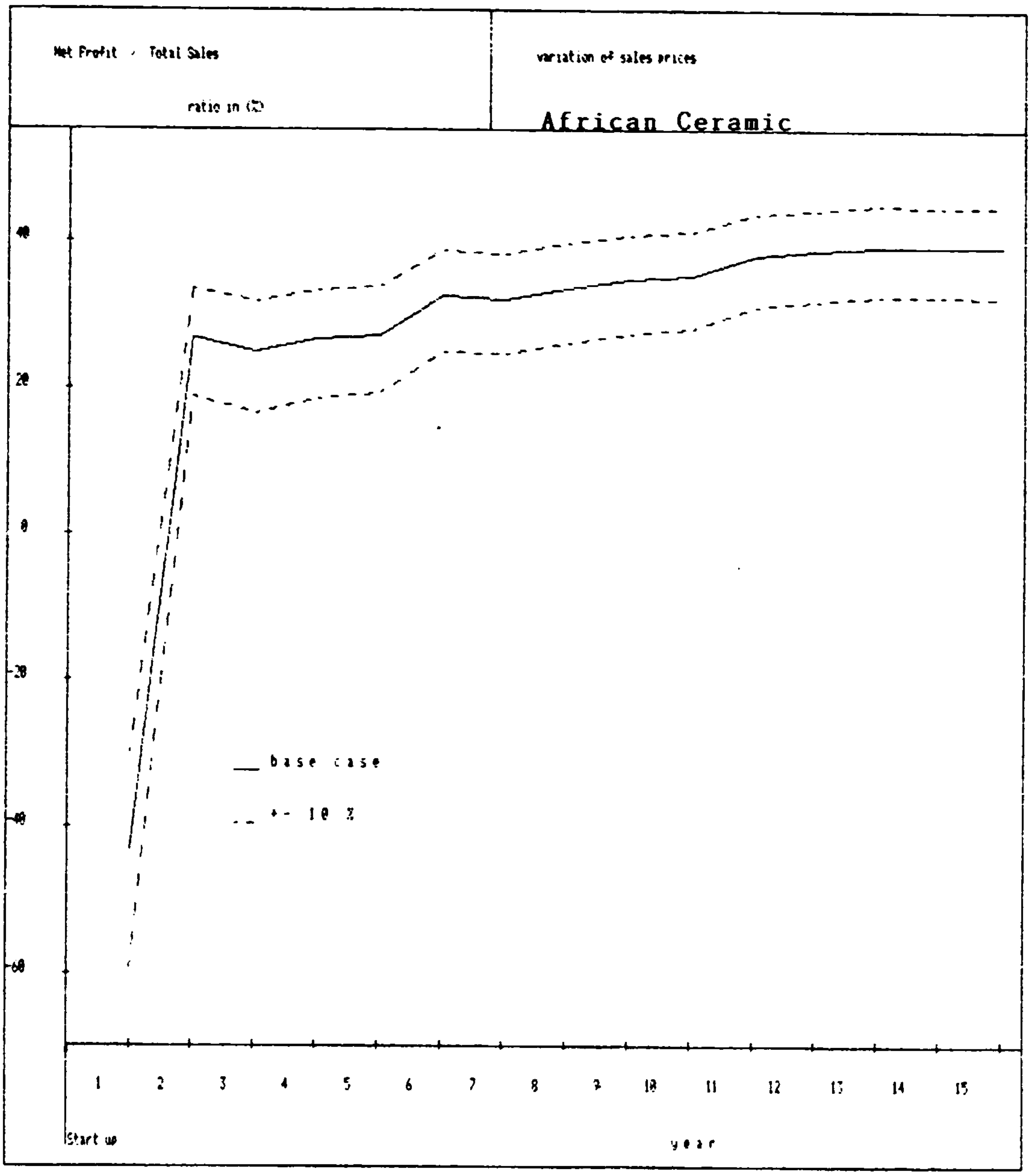
African Ceramic - 1 yr real

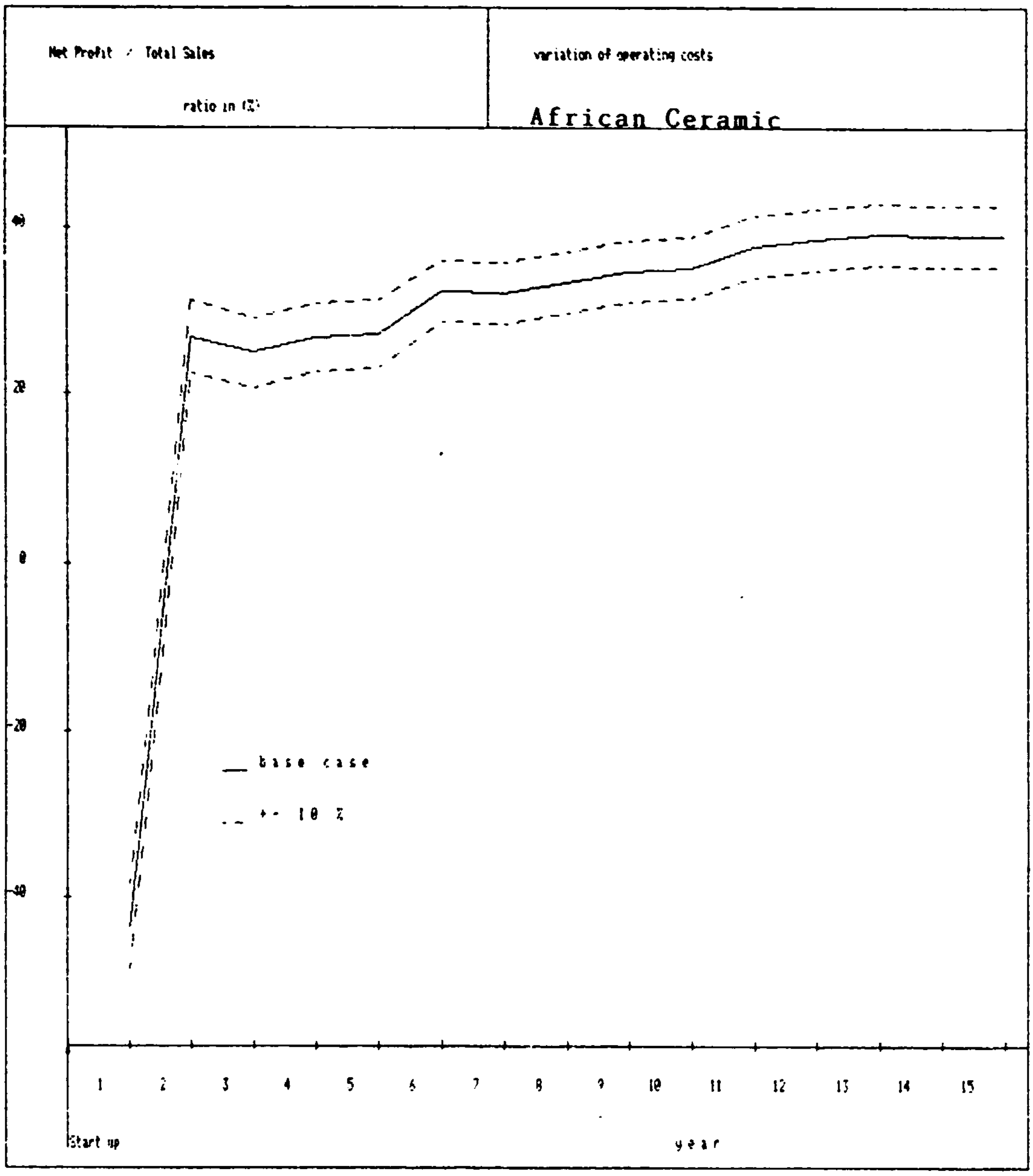


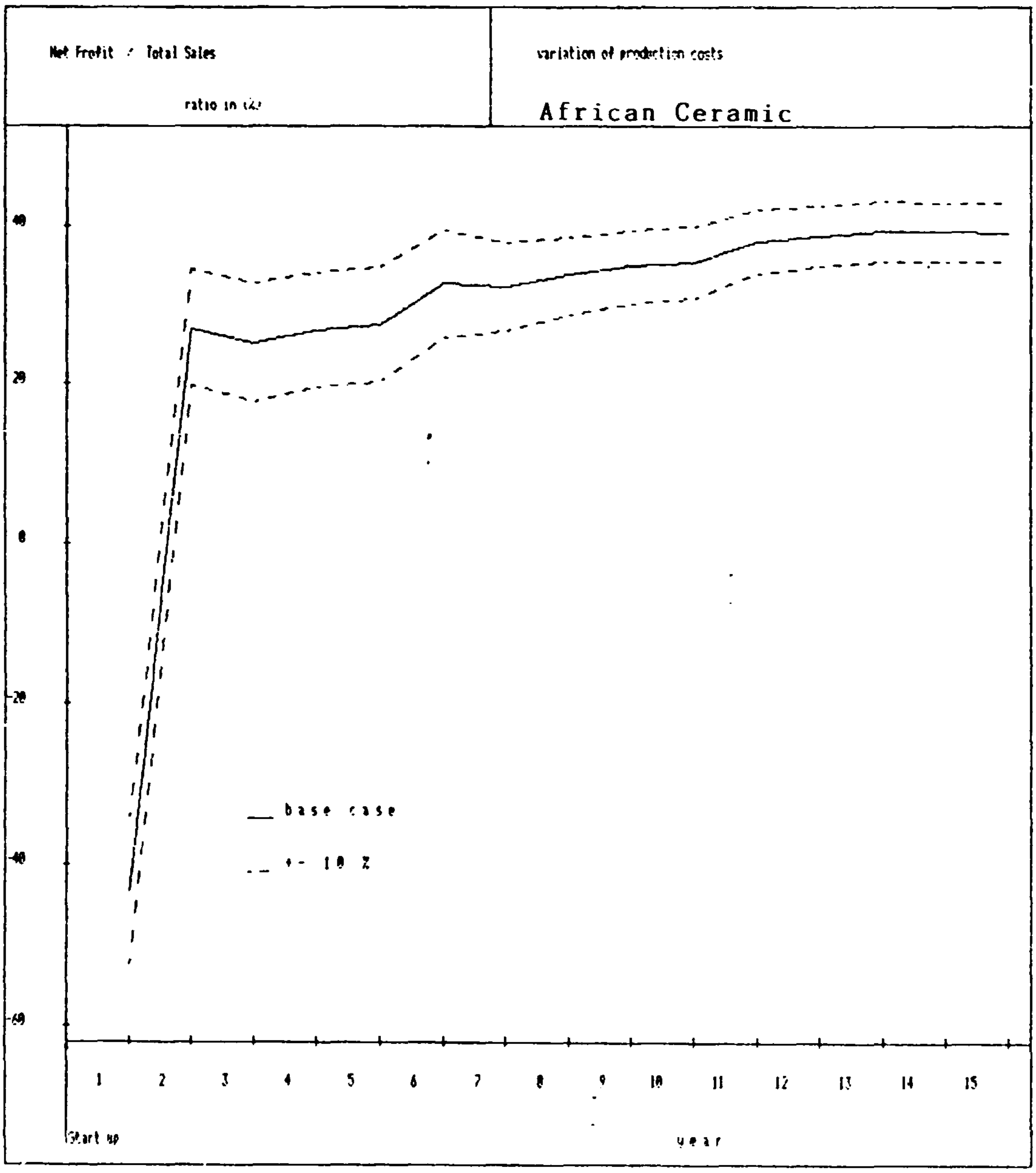
Nominal	Start up	
17.78	13.23	raw material
9.71	8.72	other RM
0.30	0.28	utilities
6.05	5.95	energy
2.90	2.84	labour
2.50	2.71	maintenance
1.37	1.86	spares
16.12	20.40	overheads
32.51	44.90	depreciation
10.75	0.00	interest
100.00	100.00	Total Prod C.

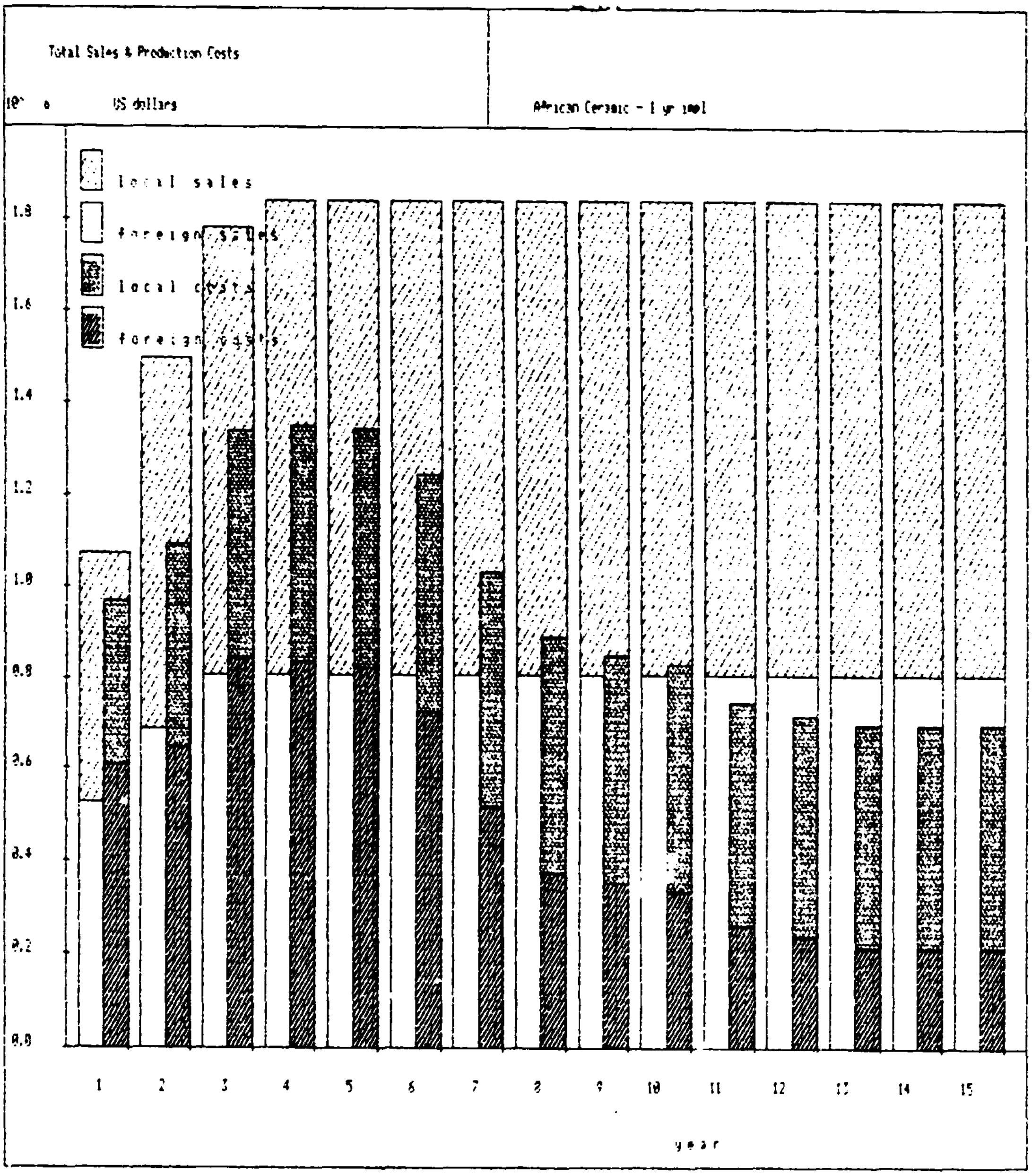

Net Cashflow / Total Sales
ratio in (%)
variation of sales prices
net of sales tax
African Ceramic
65
60
55
50
45
40
35
30
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Net Cashflow / Total Sales
ratio in (%)
variation of operating costs
African Ceramic
65
60
55
50
45
40
35
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Net Profit / Total Sales
ratio in (%)
variation of sales prices
African Ceramic
40
20
0
-20
-40
-60
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Net Profit / Total Sales
ratio in (%)
variation of operating costs
African Ceramic
40
20
0
-20
-40
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Net Profit / Total Sales
ratio in (%)
variation of production costs
African Ceramic
40
20
0
-20
-40
-60
base case
+- 10 %
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Start up
year


Total Sales & Production Costs
10^ 6 US dollars
African Ceramic - 1 yr impl
local sales
foreign sales
local costs
foreign costs
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
year

APPENDIX E

UGANDA FOREIGN EXCHANGE RATES
AND FORFAITING BULLETINS

HUNGARIAN INTERNATIONAL BANK LIMITED

AUTUMN/WINTER 1990/91

474

APPENDIX E

forfaiting bulletin

FORFAITING COUNTRY LIST

For your information, and in order to assist our clients in discounting their uninsured trade receivables at a fixed interest rate on a 'without recourse' basis, we give below our indicative list of countries for which refinancing possibilities exist in the market: –

DEBTOR'S COUNTRY	INDICATIVE CREDIT PERIODS	INDICATIVE COMMITMENT/ MANUFACTURING PERIODS	DEBTOR'S COUNTRY	INDICATIVE CREDIT PERIODS	INDICATIVE COMMITMENT/ MANUFACTURING PERIODS
ALBANIA	1 YEAR	6 MONTHS	MAURITIUS	2 YEARS	3 MONTHS
ALGERIA	1 YEAR	IMMEDIATE	MEXICO*	3 YEARS	3 MONTHS
AUSTRALIA	7 YEARS	6 MONTHS	MOROCCO	2 YEARS	6 MONTHS
AUSTRIA	7 YEARS	1 YEAR	NETHERLANDS	7 YEARS	1 YEAR
BAHRAIN	5 YEARS	3 MONTHS	NEW ZEALAND	7 YEARS	1 YEAR
BELGIUM	7 YEARS	1 YEAR	NORWAY	7 YEARS	1 YEAR
BOTSWANA*	1YEAR	3 MONTHS	OMAN	2 YEARS	3 MONTHS
BRAZIL*	3 YEARS	3 MONTHS	PAKISTAN	SIGHT	6 MONTHS
CANADA	7 YEARS	1 YEAR	PAPUA NEW GUINEA	1 YEAR	6 MONTHS
CHILE*	3 YEARS	6 MONTHS	POLAND*	5 YEARS	6 MONTHS
CHINA	5 YEARS	6 MONTHS	PORTUGAL	7 YEARS	1 YEAR
COLOMBIA*	3 YEARS	6 MONTHS	PUERTO RICO	3 YEARS	3 MONTHS
CYPRUS	5 YEARS	6 MONTHS	QATAR	3 YEARS	3 MONTHS
CZECHOSLOVAKIA	3 YEARS	3 MONTHS	ROMANIA	6 MONTHS	3 MONTHS
DENMARK	7 YEARS	1 YEAR	SAUDI ARABIA	5 YEARS	1 YEAR
FINLAND	7 YEARS	1 YEAR	SINGAPORE	7 YEARS	1 YEAR
FRANCE	7 YEARS	1 YEAR	SOUTH AFRICA	3 YEARS	6 MONTHS
GREAT BRITAIN	7 YEARS	1 YEAR	SOUTH KOREA	7 YEARS	1 YEAR
GREECE	5 YEARS	6 MONTHS	SPAIN	7 YEARS	1 YEAR
HONG KONG	5 YEARS	6 MONTHS	SWEDEN	7 YEARS	1 YEAR
HUNGARY	5 YEARS	1 YEAR	SWITZERLAND	7 YEARS	1 YEAR
ICELAND	5 YEARS	1 YEAR	TAIWAN	7 YEARS	1 YEAR
INDIA	5 YEARS	6 MONTHS	THAILAND	7 YEARS	1 YEAR
INDONESIA	5 YEARS	6 MONTHS	TUNISIA	5 YEARS	3 MONTHS
IRAN	2 YEARS	6 MONTHS	TURKEY	3 YEARS	6 MONTHS
IRELAND	7 YEARS	1 YEAR	UNITED ARAB EMIRATES	3 YEARS	1 YEAR
ISRAEL	5 YEARS	3 MONTHS	URUGUAY	2 YEARS	6 MONTHS
ITALY	7 YEARS	1 YEAR	USA	7 YEARS	1 YEAR
JAPAN	7 YEARS	1 YEAR	USSR*	SIGHT	3 MONTHS
KENYA	3 YEARS *	3 MONTHS	GERMANY	7 YEARS	1 YEAR
LIBYA*	SIGHT	6 MONTHS	YUGOSLAVIA*	6 MONTHS	IMMEDIATE
MALAYSIA	5 YEARS	6 MONTHS	ZIMBABWE	3 YEARS	3 MONTHS
MALTA	3 YEARS	6 MONTHS			

A Guarantee of payment or Aval should be given on behalf of the importer in the above mentioned countries by a first class local bank acceptable to ourselves. We also have possibilities to consider unguaranteed business on a case by case basis.

*At clients' requests, we occasionally have opportunities to consider transactions for these countries. Other markets may be considered on specific request.

How NatWest Forfaiting Unit can help Exporters

by David Cooper, Senior Manager,
Forfaiting Unit, International Trade Services

Successful Trading

It has become more evident that in today's harsh economic climate and in most overseas markets, where there is fierce competition both from home and abroad, that it is not just a company's goods and services that are being looked at, but also its ability, or willingness to provide a financial package alongside them, which can offer the benefit of deferred payments to the buyers.

Naturally, to provide extended credit terms brings its problems, not least of which is the effect on the cash flow of the seller. Also the additional risks involved when selling overseas can present a daunting picture.

What risks?

No doubt some readers will have first hand experience of such risks as:

(1) the inability of the buyer to pay — Commercial Risk

(2) the inability to pay on time, or in the invoiced currency, owing for instance, to local exchange control regulations — Transfer Risk

(3) the inability, or unwillingness of the importer's country to honour its international obligations — Political Risk

(4) the inability to enforce payment, owing to defects in documentation.

Companies naturally want to minimise such risks to ensure payment is received on the due dates. However, even if this is achieved, there is still the cash flow cost which is often borne within bank-provided, working capital borrowing facilities. These, at times, can be stretched to the limits and beyond. At other times they could be used more effectively elsewhere in the business.

Forfaiting as a solution

Banks can provide a variety of services to assist companies in their trading activities and each has features designed to match particular needs.

Forfaiting can solve the difficulties highlighted above, and can give advantages to the buyer.

It can be one of the most flexible means available for financing trade transactions and does so 'without recourse' to the seller. This means that not only are those daunting risks removed, but debtors are turned into cash, leaving working capital facilities unaffected and free for alternative uses.

How does it work?

In trade finance there are two financial instruments commonly used to evidence a buyer's commitments to pay on future dates — these are Bills of Exchange and Promissory Notes.

As soon as negotiations are contemplated a supplier/exporter should contact the NatWest Forfaiting Unit to obtain indication financing rates. The finance costs can then be incorporated into the contract price to achieve a full sales price — all figures can be provided to make life simple. All things being equal, after shipment the Bills or Promissory Notes are purchased by the bank, at a 'discount'. The net payment to the exporter will in effect, equate to the amount of the 'goods' invoice'. The difference between this and the full face values of the Bills are the finance costs which are borne by the buyer, who is benefiting from the extended credit terms.

The bank will be taking on the risks in such transactions 'without recourse'. Therefore, it will be looking at the credit standing of the buyer. This can not be assessed easily, nor readily in many cases. So, in such circumstances, the bank would need to have some comfort, as would you as suppliers, and would look for some payment guarantee from, say the buyer's bank. Bank guarantees are a common feature in international trade but are not always needed.

NatWest's Forfaiting Unit has a booklet which explains the service in more detail. If you would like a copy and wish to find out more, contact either David Cooper, Charles Brough or Peter Swift, telephone 01-920 5538/5332.

A table showing countries in which forfaiting arrangements are possible, together with the maximum term available, is shown on the facing page.

Forfaiting List — February 1991

For information we provide a list of countries for which there are possibilities to discount trade receivables without recourse. Receivables should carry the guarantee/aval of a first class bank of the country concerned

Country	Maximum Term	Country	Maximum Term	Country	Maximum Term
Abu Dhabi	*	Iceland	360 days	Poland	*
Argentina	180 days	India	3 years	Portugal	5 years
Australia	5 years	Iran	*	Saudi Arabia	*
Austria	7 years	Ireland	7 years	Sharjah	*
Bahrain	*	Israel	*	Singapore	7 years
Bangladesh	180 days	Italy	7 years	South Africa	3 years
Barbados	180 days	Japan	7 years	South Korea	5 years
Belgium	7 years	Jordan	*	Soviet Union	*
Brazil	360 days	* Kenya	3 years	Spain	7 years
Bulgaria	*	Luxembourg	7 years	Sri Lanka	180 days
Canada	7 years	Malaysia	5 years	Sweden	7 years
Chile	2 years	Malta	5 years	Switzerland	7 years
China	3 years	Mexico	2 years	Taiwan	5 years
Cyprus	2 years	Morocco	2 years	Thailand	7 years
Czechoslovakia	*	Myanmar	*	Tunisia	2 years
Denmark	5 years	Nepal	360 days	Turkey	2 years
Dubai	*	Netherlands	7 years	United Kingom	7 years
Finland	5 years	New Zealand	7 years	USA	7 years
France	7 years	Norway	5 years	Uruguay	360 days
Germany	7 years	Oman	*	Venezuela	2 years
Greece	3 years	Pakistan	360 days	Yemen	*
Hong Kong	7 years	Papua New Guinea	180 days	Yugoslavia	*
Hungary	*	Paraguay	180 days	Zimbabwe	2 years

* Please refer for up to date position

— Funding in all major currencies

— Fixed rate funding in US Dollars, £ Sterling and Deutsche Marks for up to 7 years

— Commitment periods up to 2 years considered

For further information on any aspect of Forfaiting, please call National Westminster Bank, Forfaiting Unit

— David Cooper Telephone 071-920 5538

— Peter Swift Telephone 071-920 5332

— Charles Brough Telephone 071-920 1987

ECONOMY AND BUSINESS

"For years, there has not been any competition among international auditing firms in Uganda"
- Simon Fisher(Price Waterhouse resident partner)

BANK OF UGANDA

FOREIGN EXCHANGE OPERATIONS

Dealing Date: 12 - 2 - 91
Value Date: 14 - 2 - 91

CURRENCY	MIDDLE RATE	BUYING RATE	SELLING RATE
U.S. Dollar	570.00	560.88	583.68
Pound Sterling	1139.26	1121.03	1166.60
German Mark	389.86	387.56	403.31
French Franc	115.55	113.70	118.32
Swiss Franc	461.09	453.71	472.16
Japanese Yen	4.46	4.39	4.56
UAPTA	830.06	816.78	849.98
Australian Dollar	444.69	437.57	455.36
Canadian Dollar	493.38	485.48	505.22
Dutch Guilder	353.60	347.94	362.09
Belgian Franc	19.10	18.80	19.56
Italian Lira	0.5228	0.5144	0.5353
Swedish Kroner	104.57	102.89	107.08
Norwegian Kroner	100.48	98.88	102.89
Danish Kroner	102.22	100.59	104.67
Austrian Schilling	56.06	55.16	57.18
Spanish Peseta	6.24	6.14	6.40
Indian Rupee	--	--	--
Pakistan Rupee	--	--	--
Gold	368.65	--	

Source: FEDERAL RESERVE BANK OF NEW YORK
BANK OF UGANDA

OPEN MARKET RATE U.S $1 = UShs. 750

BANK OF UGANDA FOREIGN EXCHANGE OPERATIONS DEPARTMENT OTHER RATES FOR PTA MEMBER COUNTRIES

Dealing date : 12 - 2-91
Value date : 14 - 1-91

	MIDDLE RATE	BUYING RATE	SELLING RATE
Zimbabwe Dollars	213.79*	210.37	218.92
Zambian Kwacha	11.38	11.20	11.65
Malawian Kwacha	--	--	--
Kenya Shillings	23.15	22.78	23.71
Swaziland Lilangeni	225.40	221.78	230.81
Ethiopian Birr	275.38	270.97	281.99
Uganda Shilling	--	--	--
Rwanda Franc	4.82	4.74	4.94
Burundi Franc	3.57	3.51	3.66
Mauritian Rupees	40.99	40.34	41.97
Lesotho Maloti	2.29	2.26	2.34
Comoros Francs	--	--	--
Djibuti Francs	3.20	3.16	3.28
Somali Shillings	--	--	--
Tanzania Shillings	2.89	2.85	3.28

Source of Information :
P.T.A CLEARING HOUSE, HARARE.

NOTE; During week commencing 18th February 1991 the bank rate of exchange was changed to USh 614 per US Dollar

S, £ st, DM, Y =

RATES OF EXCHANGE AT VARIOUS FOREX BUREAUX as on 6/2/1991

BUREAU	BUYING	SELLING
1. UCB	UShs	UShs
	US$ 740 T/C	800
	Others	780
	US$ 775 (Cash)	800
	£ st 1400 T/C	1500
	£ st 1410 (Cash)	1500
2. Barclays		
	US$ 750 (Cash)	790
	£ st 1430 (Cash)	1530
	DM 490(Cash)	510
3. Baroda	US$ 750 T/C	775
	US$ 770 (Cash)	790
	£ st 1430 T/C	1490
	£ st 1440 (Cash)	1500
4. Standard Bank	US$ 750 (Cash)	770
	£ st 1420 (Cash)	1470
5. Orient Forex Bureau Ltd. Ground Floor, Uganda House	US$ 750 T/C	780
	US$ 780 (Cash)	800
	£ st 1425 T/C	1520
	£ st 1475 (Cash)	1500
6. Grindlays Bank	US$ 750 T/C	780
	US$ 760 (Cash)	800
	£ st 1420 T/C	1510
	£ st 1430 (Cash)	1530
7. Nile Bank	US$ 760 (Cash)	790
	£ st 1450 (Cash)	1520
8. Crane Forex Bureau Limited	US$ 750 T/C	
	US$ 780 (cash)	810
	£ St 1440 T/C	
	£ St 1475 (Cash)	1525
9. International Forex Bureau Ltd	US$ 750 (Cash)	800
	£ st 1400 (Cash)	1500
	DM 400 (Cash)	450
10. Cooperative Bank Ltd.	US$ 730 T/C	770
	US$ 750 (Cash)	780
	£ st 1390 T/C	1470
	£ st 1400 (Cash)	1500
	SEK 105 (Cash)	110
11. Gold Trust Forex Bureau	US$ T/C 730	780
	6$ cash 760	800
	£ st T/C 1400	1500
	£ st Cash 1450	1500
12. Diamond trust Forex Bureau	US$ Cash 780	775
	£ st Cash 1475	1550
13. Almeta Froex Burea Ltd	US $ Cash 765	810
	£ St Cash 1475	1550
	DM Cash 480	550
14. Travellers' Bureau De change Ltd	US$ T/C 775	800
	US$ Cash 775	815
	£ st T/C 1470	1560
	£ st ash 1510	1590
15. Safari Forex Bureau Ltd	US$ 730 T/C	-
	US$ 780 (Cash)	820
	£ st 1350 T/C	-
	£ st 1460 (Cash)	1550
16. Musicraft Forex bureau Ltd	US$ cash 780	810
	£ st Cash 1440	1550
17. Sembule Forex Bureau Ltd	US $ T/C 710	--
	US$ Cash 750	790
	£ st T/C 1200	-
	£ st Cash 1350	1450
18. Metropolitan Forex bureau Ltd	US$ T/C 730	-
	US$ Cash 760	800
	£ st T/C 1420	..
	£ st Cash 1470	1580
19. Cash Y Point Forex Bureau Ltd	US$ T/C 700	-
	US$ Cash 740	790

APPENDIX F

TYPICAL TILE AND SANITARYWARE PRODUCTS

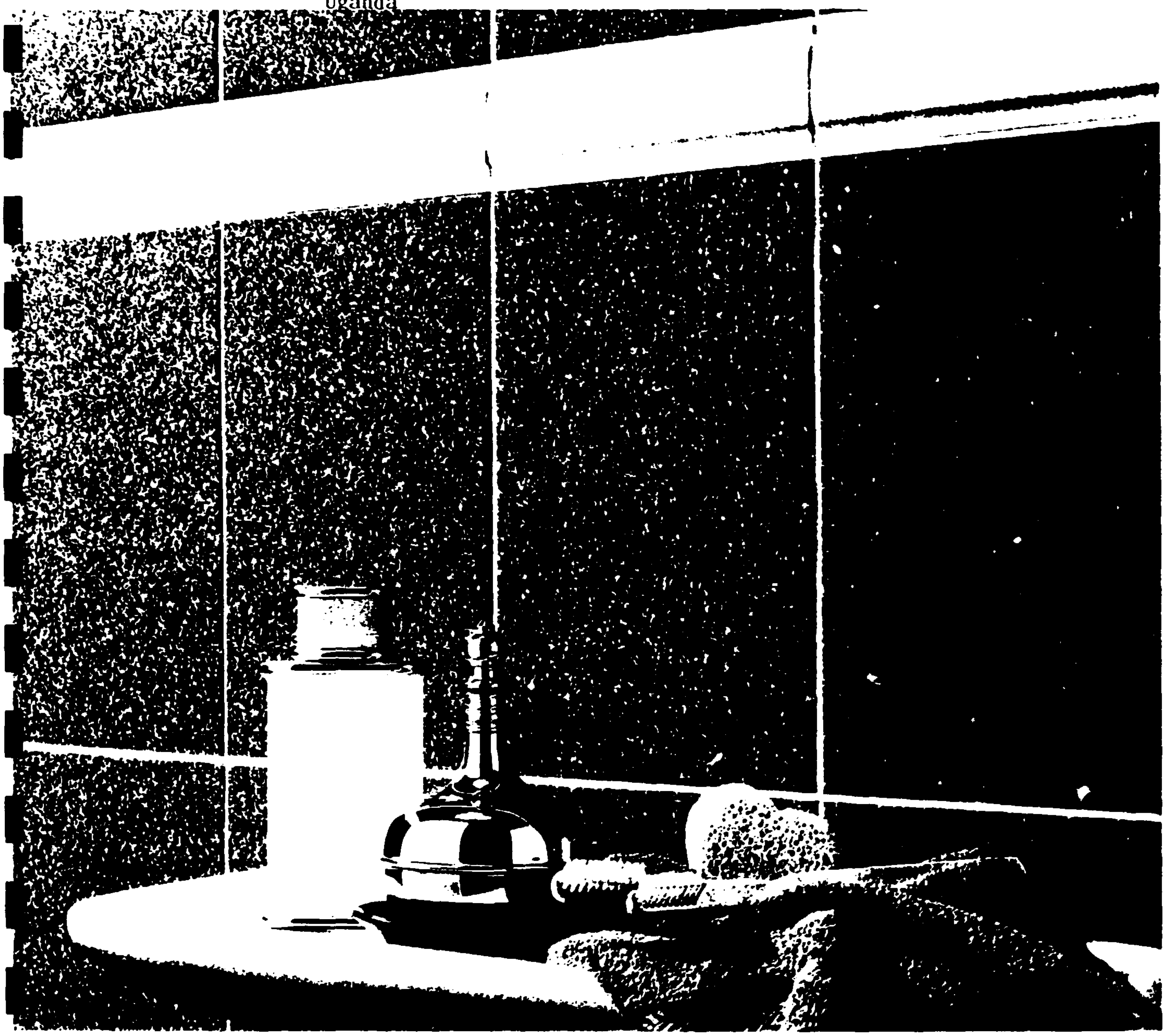
TILE PRODUCTS

a) Sphinx, HOLLAND

Sphinx — Luxury Wall Tiles

16.5 x 25cm Glaze finish is acceptable for Uganda

N E W E D I T I O N S

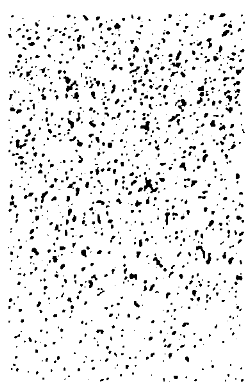


Canyon and Feature Strip Tiles (Strip: 16.5 x 5cm)


Black P8070


Blue P8040


Beige P8060

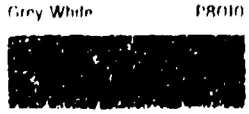

Grey White P8010


Yellow P8020

Mont Blanc V7615

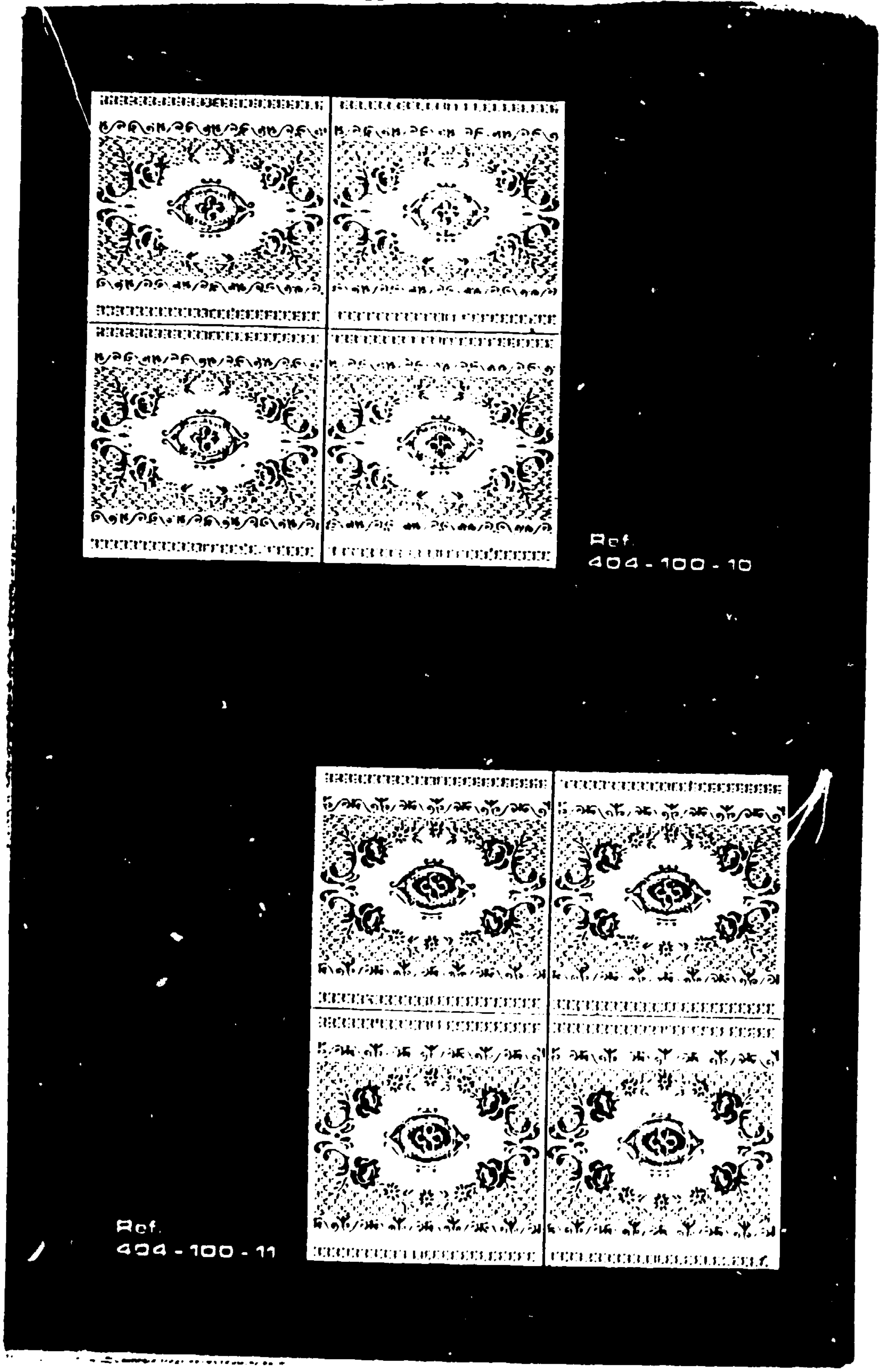
Bermuda V7601

Beige V7603


Granite V7616

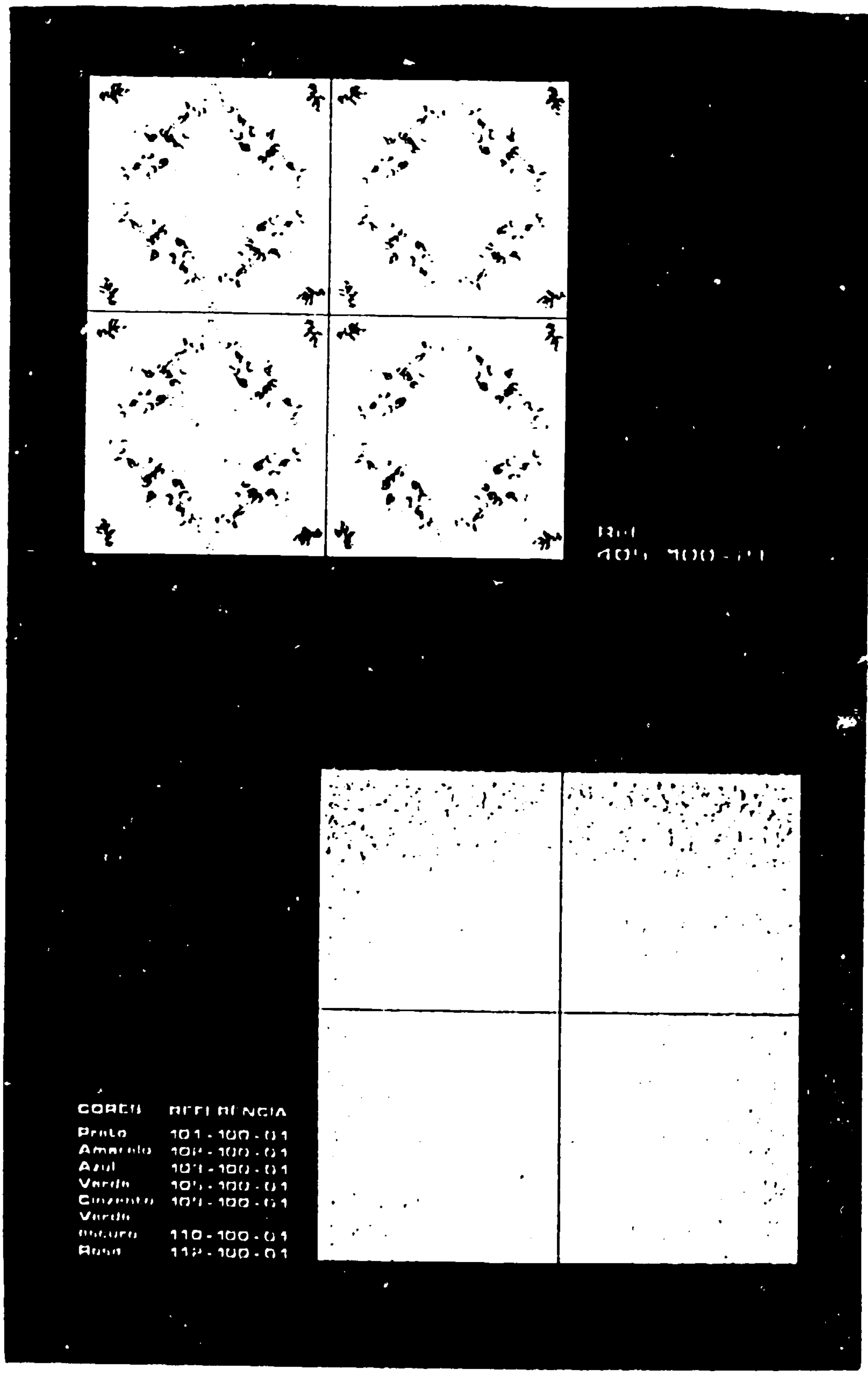
Jamaica V7608

b) CCA, ANGOLA



CCA, ANGOLA

Screen printed tile are not to be part of the initial range



CCA, ANGOLA

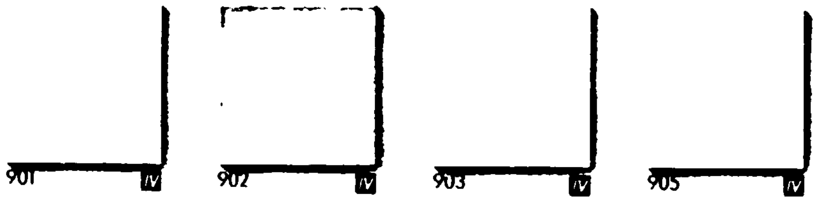
Multi-coloured glazed tile (as bottom) are to be part of initial range

c) Villeroy & Boch, GERMANY

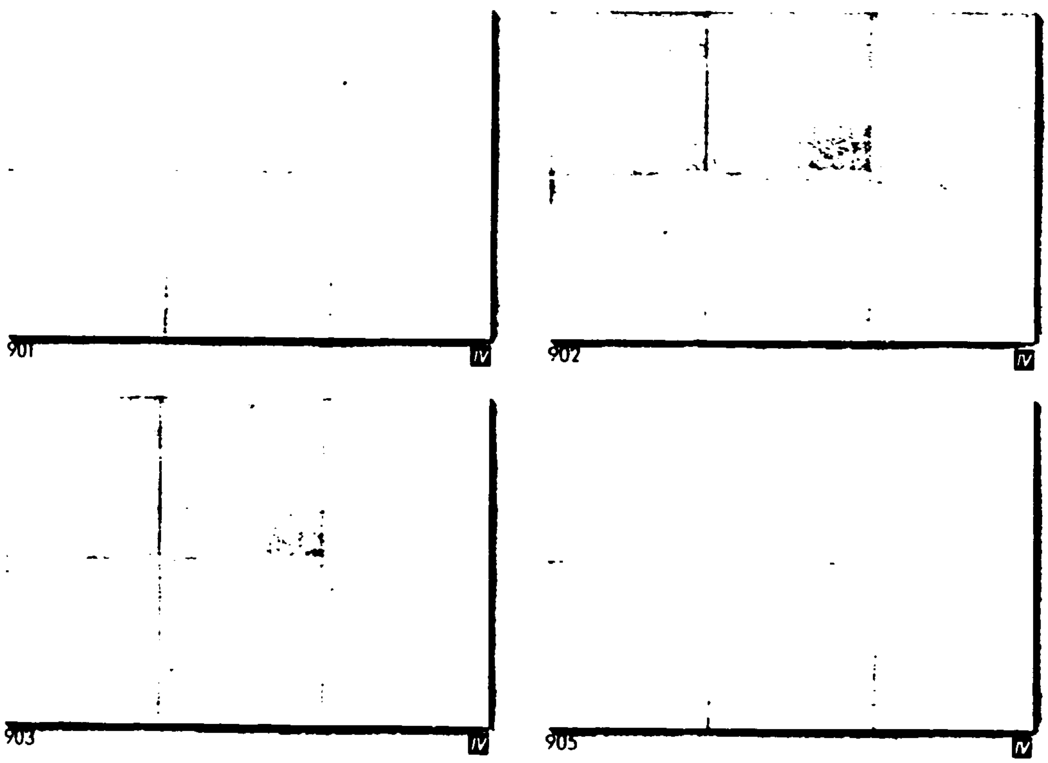
ASTOR

15 x 15 cm

Art. 3103 · 15 x 15 cm (148 x 148 x 7 mm)



Art. 3133 · 15 x 15 cm (148 x 148 x 7 mm)*



All suitable for Uganda

Steinzeug glasiert
»Harmonie«
Frostbeständig
IV Abriebgruppe
*Tafelgröße: 0,135 m²
Farbabweichungen vorbehalten

Grès émaillé
»Harmonie«
Ingélif
IV Groupe d'application
*Panneaux de 0,135 m²
Variations de nuances possibles

Glazed vitreous
»Harmony«
Frost-resistant
IV Application Group
*Size of sheet: 0,135 m²
Subject to shade variation

Ihr Fachhändler · Votre spécialiste · Your specialist

[redacted]

Normgeprüfte Fliesen-Qualität.
Das Überwachungszeichen des Verbandes der Materialprüfämter (VMPA)

VILLEROY & BOCH

d) CISA, ITALY

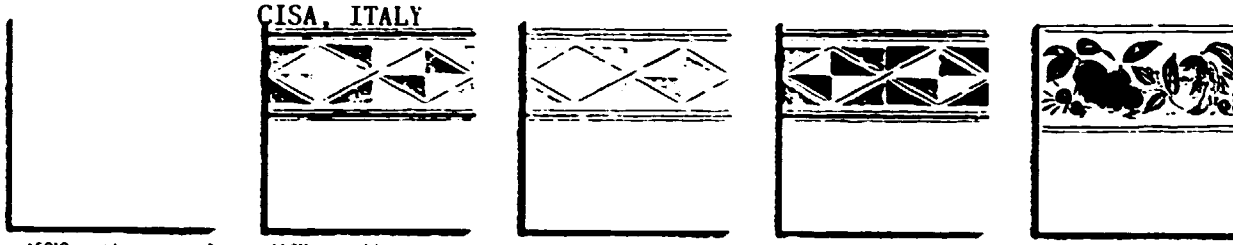
serie
meridiana

486
conforme
EN. 159 B III

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44	[illegible]	94	94	14	1?76

15x15
6"x6"

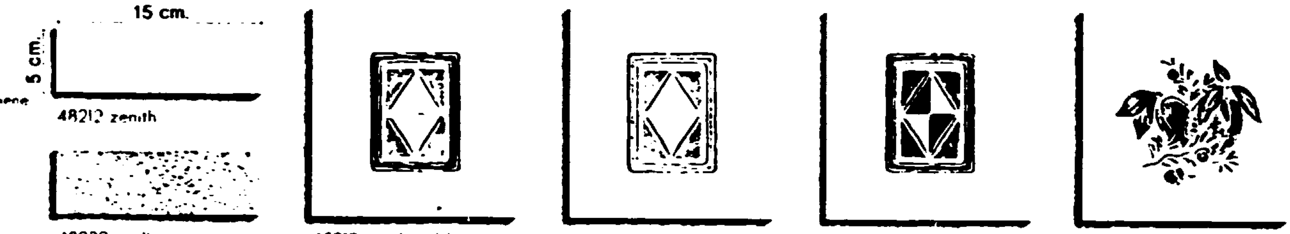
CISA, ITALY



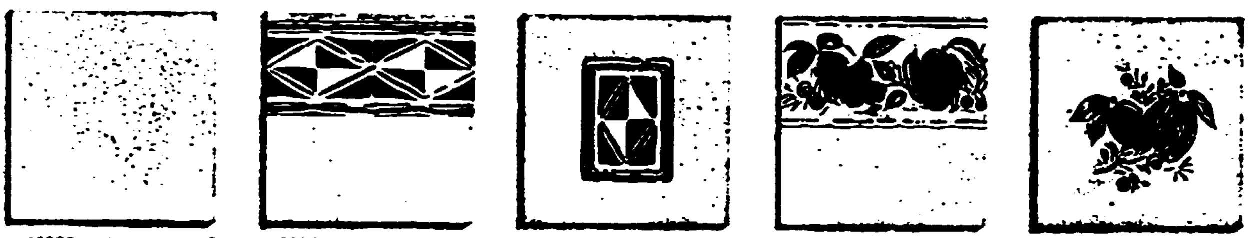
• 45210 zenith — 45311 incas blu — 45313 incas rosa — 45315 incas bruno — 45317 frutta

bullnose

1 scatola contiene 134pezzi



48212 zenith — 48232 nadir — 45312 amuleto blu — 45314 amuleto rosa — 45316 amuleto bruno — 45318 centro frutta

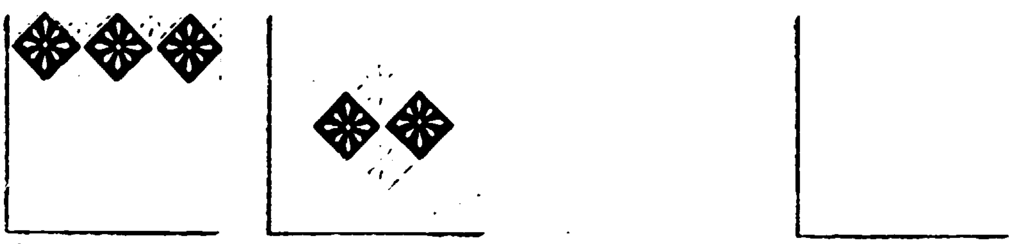


• 45230 nadir — 45335 incas marron — 45336 amuleto marron — 45337 frutta — 45338 centro frutta

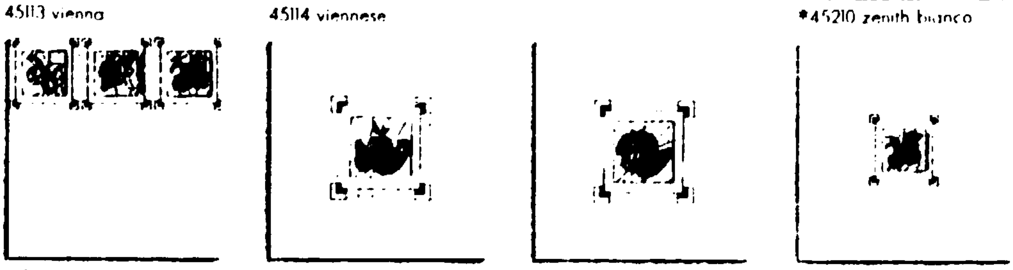
serie
meridiana

1 scatola contiene 12 pezzi

15x15
6"x6"



45113 vienna — 45114 viennese — •45210 zenith bianco



45115 market — 45116 market a — 45116 market b — 45116 market C

48510 v. cap. zenith
1 scatola contiene 24 pezzi

48530 v. cap. nadir

48511 v. cap. zenith — 1 scatola contiene 12pezzi

48531 v. cap. nadir

serie 503 atelier
cisaker

489

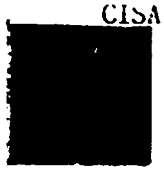
conforme
EN. 176 B I GL

formato nominale **10x10**
nominal size **4"x4"**

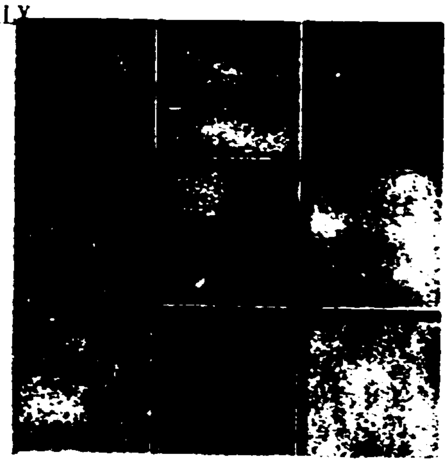
CISA, ITALY

50120

50721 DBC

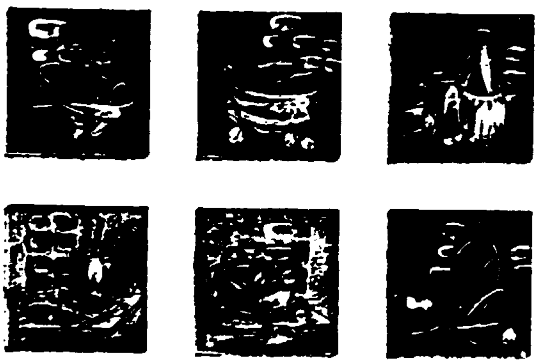


50720 BC



50253 (su rete)

serie 503
atelier



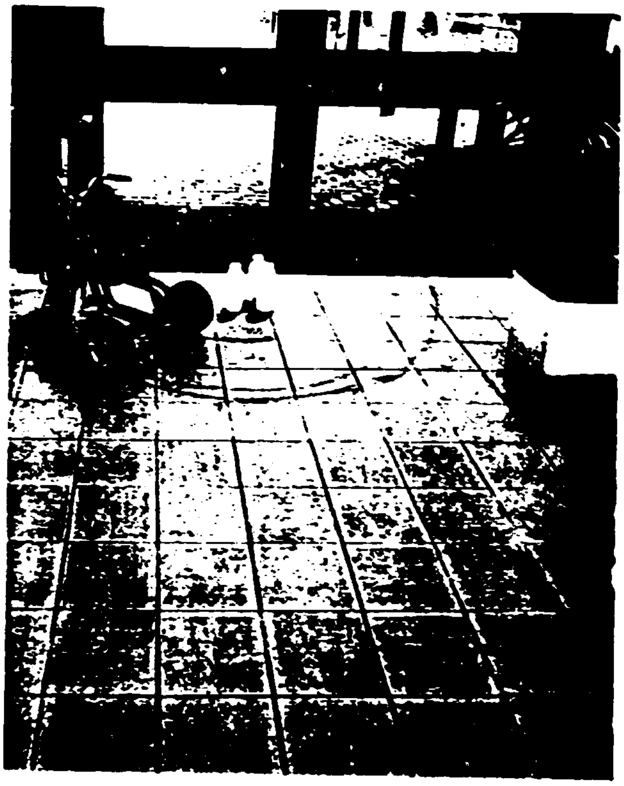
50321 cestino 6

50326 cestino 8

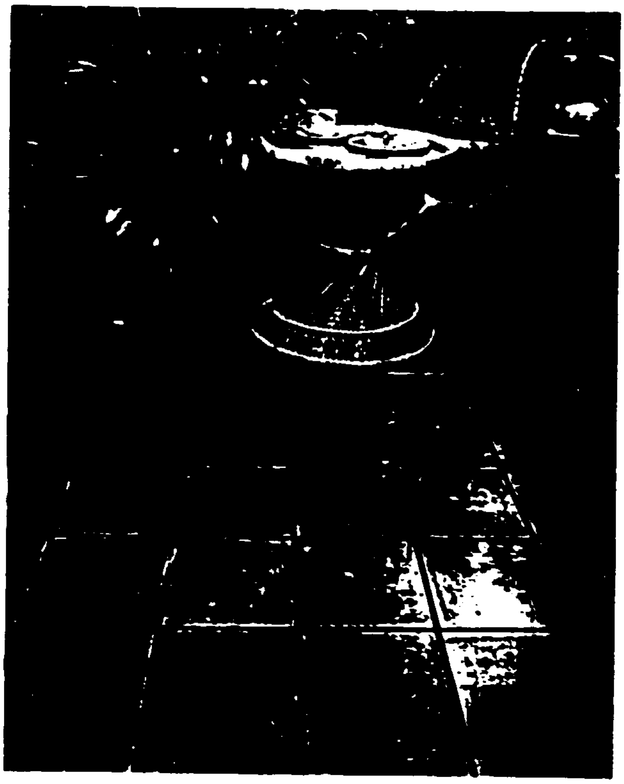
Plain and multi-coloured tiles are suitable for the initial range of tiles in Uganda

e) Laufen, SWITZERLAND

OLYMP Eine wirkliche Schönheit mit sicheren Werten.



OLYMP quarzit Farb-Nr.: 27



OLYMP topas Farb-Nr.: 26

Mit der Fliese OLYMP hat OSTARA einen lang-gehegten Wunsch der Bauherren, Architekten und Planer nach einer gleichzeitig wohnlichen, pflege-leichten und trittsicheren Fliese erfüllt.

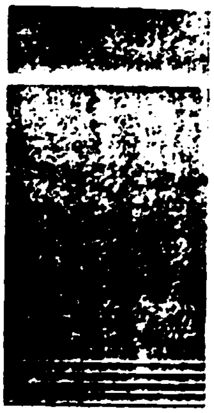
So können jetzt auch naß belastete Räume wie Badezimmer, Eingangsbereiche, Treppenhäuser, Ladenlokale, Balkone und Terrassen nicht nur funktionell, sondern auch farbharmonisch gestaltet werden.

Die in einem besonderen Verfahren mit größter Sorgfalt aufgebrachte trittsichere Glasur behält selbst bei starker Beanspruchung jahrelang ihre geprüften Sicherheits-Werte.

OLYMP Fliesen von OSTARA erhalten Sie im Format 20 × 20 cm und in zwei beliebten und viel-seitig anwendbaren Farbtönen: quarzit und topas. Mit Treppenfliesen im Format 20 × 30 cm und Sockeln von 6,5 × 20 cm wird dieses Programm sinnvoll ergänzt.

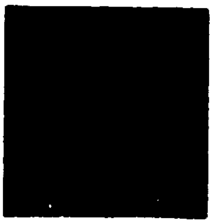
OLYMP Fliesen von OSTARA sind eine wohl-überlegte Investition überall dort, wo hohe Ansprü-che an unkonventionelle Gestaltung, dauerhafte Qualität, Trittsicherheit und problem-lose Reinigung und Pflege gestellt werden. Dafür bürgen wir mit diesem Siegel.

Marken-Keramik Deutsche Fliese



Alle OSTARA Fliesen sind Naturprodukte und erhalten im Ofenbrand ihren unverwechsel-baren, einmaligen Charakter.

quarzit Nr. 27



topas Nr. 26

Artikel	OLYMP
Bestell-Nr.	73826 (topas) 73827 (quarzit)
Format	20 × 20 cm
Stärke	9–10 mm
Gewicht	20 kg/m
Abrieb-Festigkeit	Gruppe IV

Säurefest und frostsicher

Ihr OSTARA Fliesen Fachhändler

Suitable for Uganda

OSTARA
LAUFEN

OSTARA Fliesen GmbH & Co. KG
Postfach 140 · D-4005 Meerbusch 2
Telefon 02159/2044
Telex 08 53 795

Prospekt Nr. G 1/81

f) Buchtal, GERMANY

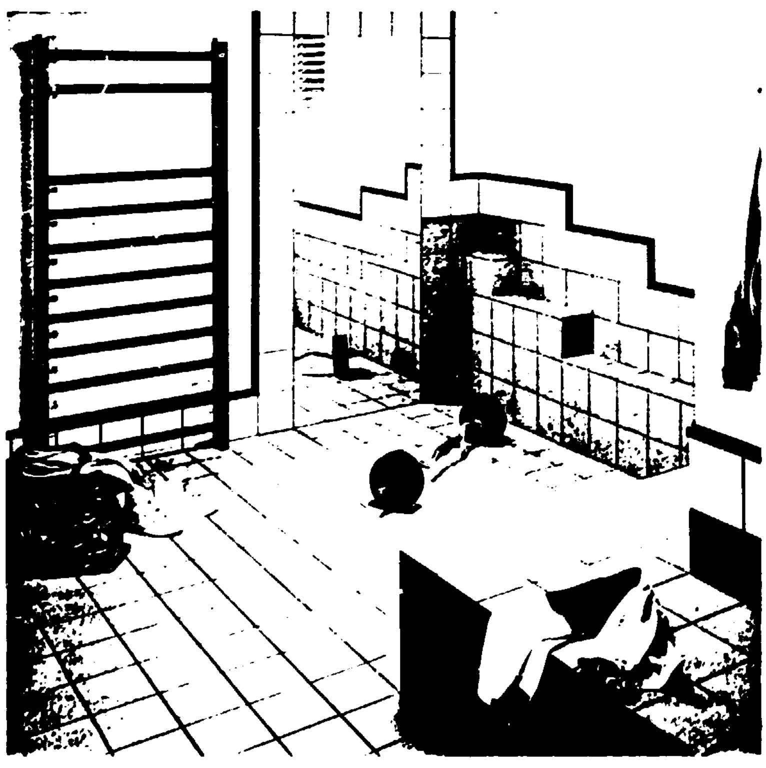
FERRUM – DER „EDELSTAHL" DER BAUKERAMIK

FERRUM kann vieles leisten und hat dementsprechend viele Anwendungsgebiete: vom Schwimmbad-Umkleidebereich, der trittsicher und rutschhemmend sein soll, zum Industriebereich, wo etwa Chemikalienbeständigkeit gefragt ist, bis hin zur Werkstatt, wo Robustheit, Stoßfestigkeit und leichte Reinigung gefordert sind. FERRUM kann nüchtern und sachlich, aber auch angenehm natürlich wirken, man findet es in öffentlichen Repräsentationsbauten genauso wie in Kraftwerkanlagen oder sogar im Schiffbau – z. B. in der Großküche des Luxusliners „Queen Elisabeth II". Immer mehr Planer und Bauherren sind es, die sich die funktionale Zuverlässigkeit hochentwickelter, industrieerprobter Produkte auch für andere Bereiche zunutze machen – Stichwort „High-Tech". Dieser Trend und die vielseitigen gestalterischen Möglichkeiten sind wohl mit die Gründe, weshalb FERRUM heute bis in den modernen Wohnbereich hinein Verwendung findet.

Suitable for Uganda

927 SCHWARZBRAUN

Unglasiert feinaufbereitetes Material von BUCHTAL genügt auch den höchsten Ansprüchen im Wohnbereich!
Bild unten: Format 240 x 115 mm.



923 ALTBRAUN

Ein keramischer natürlicher Farbton, der hier [illegible] mit anderen Naturmaterialien dezent [illegible] Atmosphäre sorgt und trotzdem sachlich und [illegible].

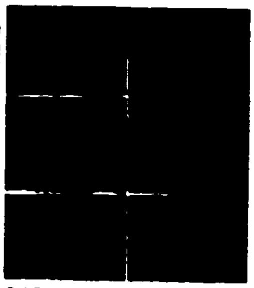
915 MITTELGRAU

Ein weiteres Beispiel aus dem Wohnbereich. Die unglasiert feinaufbereitete Keramik MITTELGRAU in diesem Fitness-Raum macht alles mit. Auch Mittelgrau ist in Beanspruchungsgruppe [illegible]

903 BEIGE
911 BRAUN

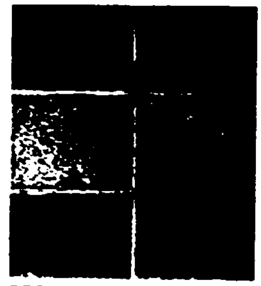
QUANTUM hält, was es verspricht! Zum Beispiel überall dort, wo große Belastungen auftreten wie in stark frequentierten Verkaufshallen!
Im Bild: „Beige", Format 194 x 194 mm und „Braun", 94 x 94 mm

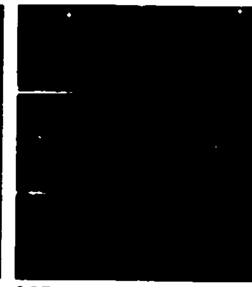
UNGLASIERTE NATURKERAMIK


945 Apennin U

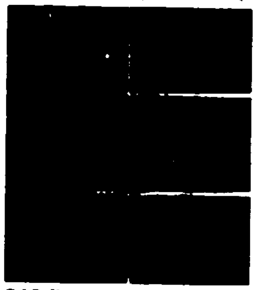

947 Porto-Antik U


948 Portofino U


950 Braunpalette U

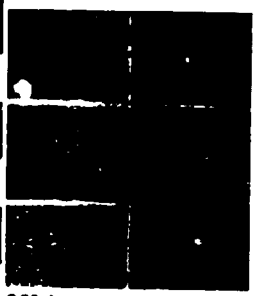

957 Terra Natur U

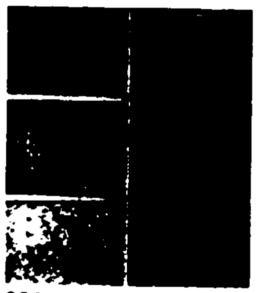

958 Ziegelrot U

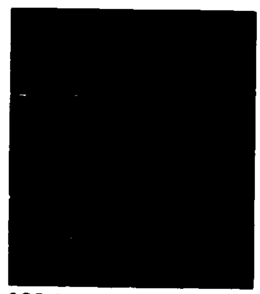

960 Rotbraun-Violett U

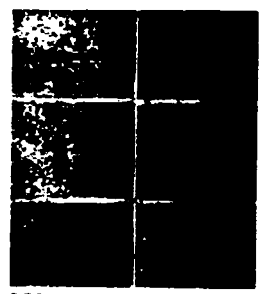
Unglazed tile suitable for Uganda

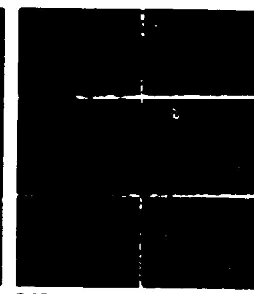
GLASIERTE NATURKERAMIK

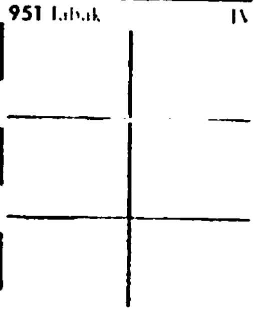

951 Tabak IV

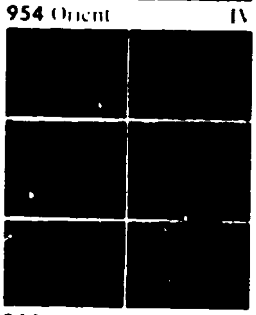

954 Orient IV

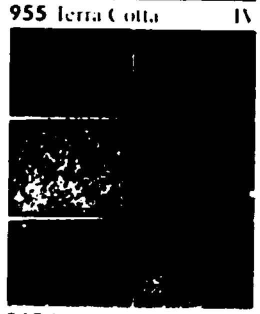

955 Terra Cotta IV

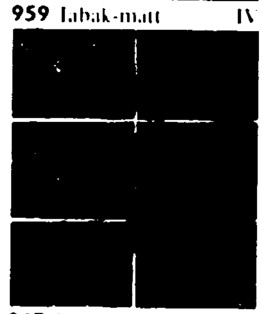

959 Tabak-matt IV

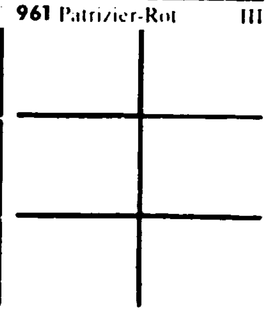

961 Patrizier-Rot III

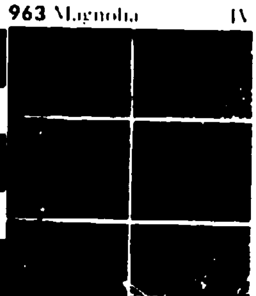

963 Magnolia IV

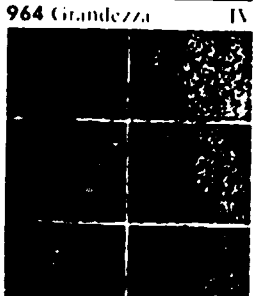

964 Grandezza IV

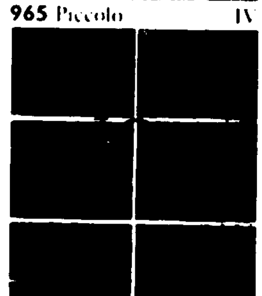

965 Piccolo IV

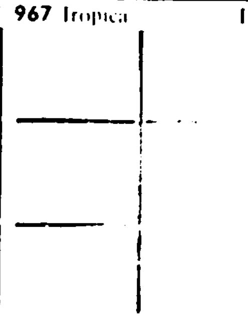

967 Tropica IV

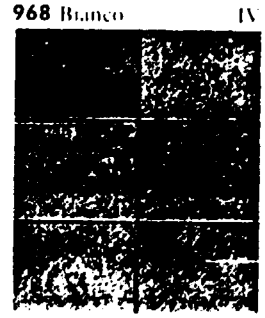

968 Bianco IV

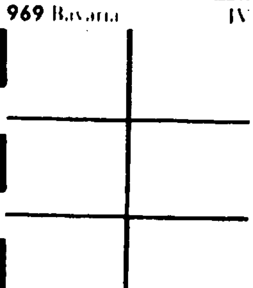

969 Bavaria IV

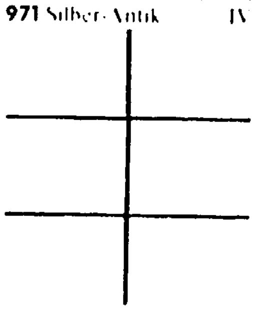

971 Silber-Antik IV


972 Gold-Antik III


973 Alabaster IV


976 Virginia IV


977 Palazzo IV


978 Palais IV

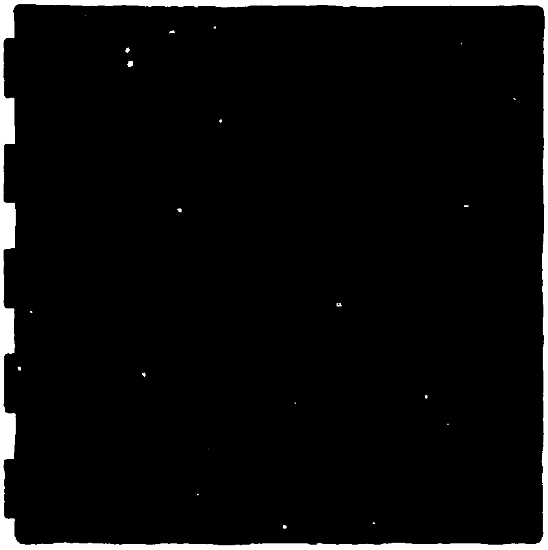
Die Schönheit keramischer Materialien kann im Druck nicht originalgetreu wiedergegeben werden. Jede keramische Platte erhält im Brand ihre einmalige Schönheit und Eigenart. Daher können Abbildungen und Einzelmuster nur als Anhaltswerte dienen.

Glazed tile suitable for Uganda

g) Lafaenza, ITALY

407

50x50 (19¾"x19¾")



8507 La Paz •

7,5x31 (3"x12¼")

W507 Battiscopa La Paz

15x31 (5⅞"x12¼")

B207 Zoccolo La Paz

H207 Angolo esterno

Q207 Angolare interno

20x20 (8"x8")

7507 La Paz •

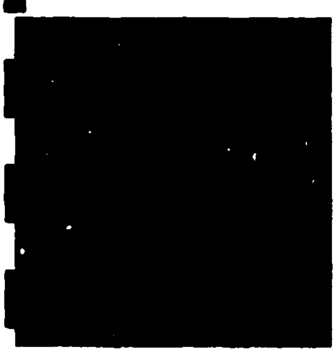
10x20 (4"x8")

4507 La Paz •

most suitable for Uganda

ARROTATO

31x31 (12¼"x12¼")



0666 Cotto arrotato •

0699 Cotto arrotato Matt •

10x31 (4"x12¼")*

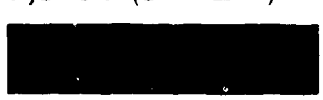
F666 Listello arrotato

10x10 (4"x4")*

2666 Cotto arrotato •

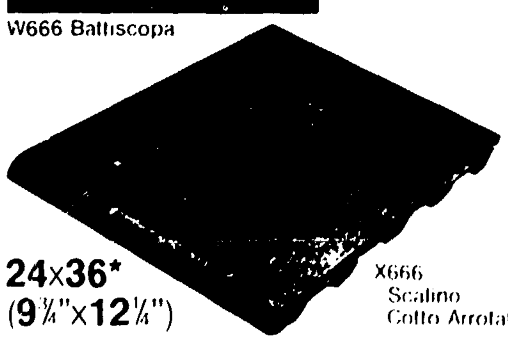
G666 Rilievo cotto arrotato •

7,5x31 (3"x12¼")*



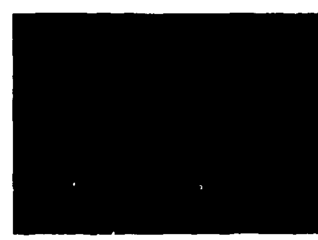
W666 Battiscopa

24x36* (9¾"x12¼")



X666 Scalino Cotto Arrotato •

22x31 (8¾"x12¼")



5507 La Paz arrotato •

5513 Panama arrotato •

5511 Caracas arrotato •

* Pezzi speciali in finitura Matt sono disponibili su richiesta. Listelli e tozzetti dello stesso colore del 31x31 ma con tonalità non sempre uguali.

* Sonderformate in Ausführung Matt sind auf Bestellung lieferbar. Leisten und Einlagen in dem Farben der 31x31 cm. Farbabweichung möglich.

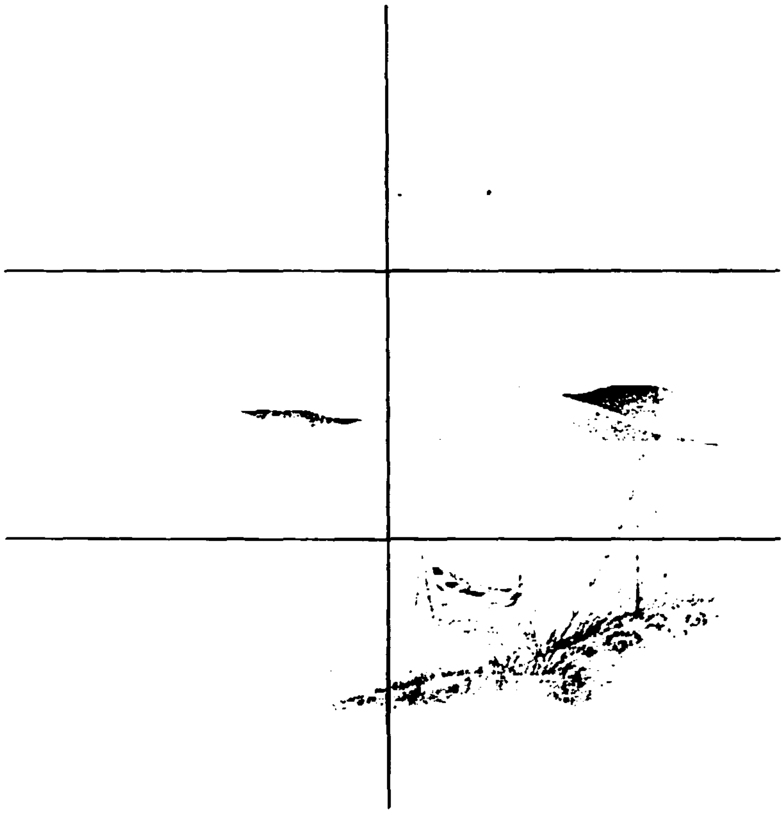
* Trim pieces in matt finish are available on request. Strip and dot tiles in the same colours as 31x31 but not always in the same shades.

* Pieces speciales en finissage mat sont disponibles à la demande. Listel et cabochon dans les mêmes colors que le 31x31, mais les nuances ne sont pas toujours les memes.

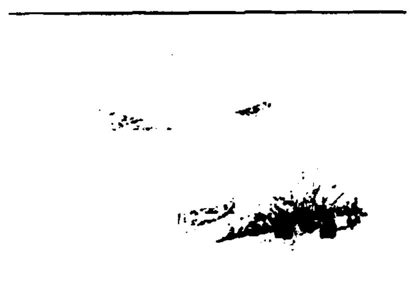
h) Ceramiche Paola Spa, ITALY

RAINBOW 20x30

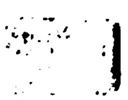
UNI 0850



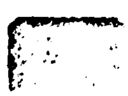
DEC. 6/STCK 0856



DEC. 1/STCK 0851



STELLA



MANHATTAN

CROCUS

BERMUDA

CERAMICHE **PAOLA** S.p.A.

41042 FIORANO MODENESE - ITALY - Via Viazza, 45 - Telefono (0536) 84.38.14
Telex 510395 PAOLA I - P.O. BOX 26 SPEZZANO (MO)

UNI 0850

Plain or multi-coloured tile are recommended for initial range

CERAMICHE **PAOLA** S.p.A.

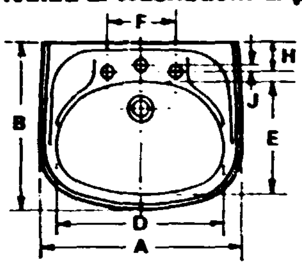
41042 FIORANO MODENESE - ITALY - Via Viazza, 45 - Telefono (0536) 84.38.14
Telex 510395 PAOLA I - P.O. BOX 26 SPEZZANO (MO)

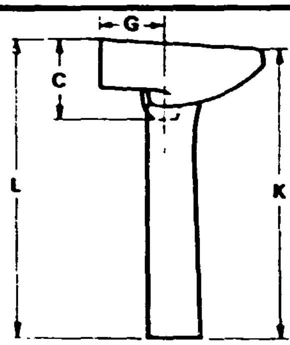
SANITARYWARE PRODUCTS

a) Shires Bathrooms Limited, U.K.

Naiad II suite

Naiad II washbasin & pedestal





Tap hole options 1, 2 or 3 hole

Naiad II washbasin 580mm x 470mm (22⅞" x 18½")

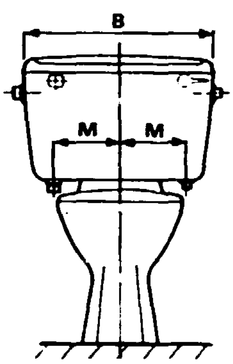
	A	B	C	D	E	F	G	H	J	K	L
mm	580	470	225	495	305	200	190	80	15	800	830
ins	22⅞	18½	8⅞	19½	12	7⅞	7½	3⅛	⅝	31½	32⅝

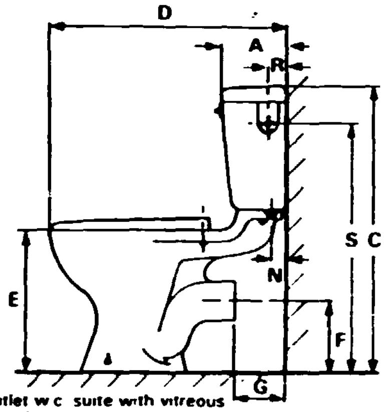
Naiad II washbasin 500mm x 410mm (19⅝" x 16⅛")

	A	B	C	D	E	F	G	H	J	K	L
mm	500	410	210	420	265	200	185	80	15	785	815
ins	19⅝	16⅛	8¼	16½	10½	7⅞	7¼	3⅛	⅝	31	32⅛

Note On small Naiad II basin 2 hole version only 'H' dimension becomes 95mm (3¾")

Naiad II w.c. suite

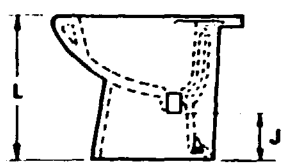


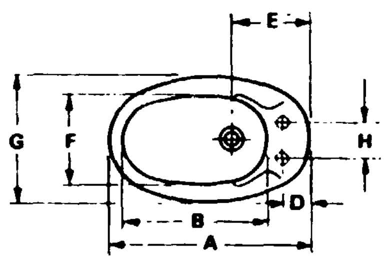


Washdown close coupled horizontal outlet w c suite with vitreous china or black heavy duty cistern Side or bottom connections please specify.

	A	B	C	D	E	F	G	M	N	R	S
mm	185	545	790	665	390	190	140	195	50	55	685
ins	7¼	21½	31	26⅛	15¼	7½	5½	7⅝	2	2⅛	27

Naiad II over rim bidet





Naiad II over rim bidet Available as 1 or 2 hole versions

	A	B	D	E	F	G	H	J	L
mm	550	405	75	210	260	360	100	135	400
ins	21½	16	3	8¼	10¼	14⅛	4	5⅛	15¾

For 1 hole bidet D = 60mm (2⅜")

Shires can supply waste fittings and brassware in a choice of chrome, Venetian Gold or Diamond White finish for the basin and bidet, and soil pipe connectors and seats for the W C For colour selection see Shires colour chart

SL 1089

SHIRES BATHROOMS

Shires Limited,
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Shires Ireland Limited,
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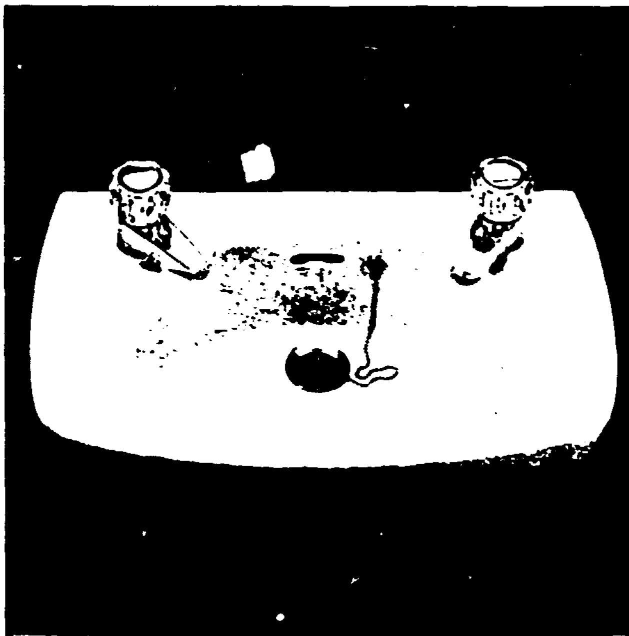
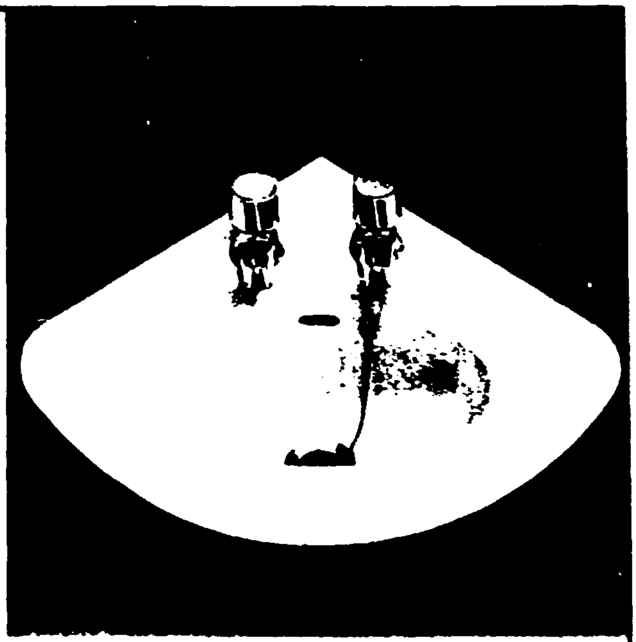
Telex 31337 Fax (01) 515534

Newby & Selby II basins

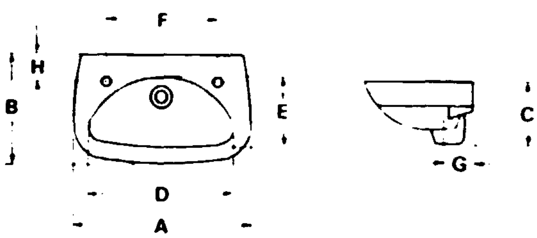


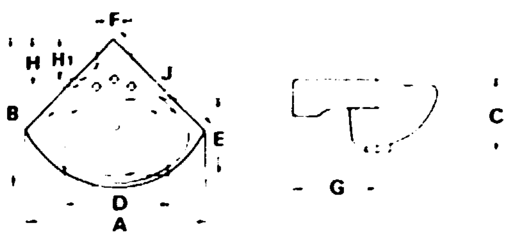


Newby

Selby II

Two vitreous china wall-mounted cloakroom basins. The Newby is a standard basin with flat back edge and soap area. The Selby II is a corner-mounted basin featuring concealed fixing, roll front, flat top and ergonomically designed bowl.





2 hole version only

1 or 2 hole version available

	A	B	C	D	E	F	G	H
mm	510	320	180	420	230	320	100	70
ins	20	12'	7	16'	9	12'	4	2',

	A	B	C	D	E	F	G	H	H1	J
mm	500	400	200	280	185	100	233	130	110	354
ins	19',	15',	7',	11	7',	4	9',	5',	4',	14

Accessories: Waste fittings and Shires range of taps and mixers are available in a choice of Chrome, Venetian Gold and Diamond White finish

Fixing: A screw to wall mounting bracket (Ref. SF 74) is available for Newby basin
Selby II is screwed direct to wall through two concealed 6mm diam. holes and supported by a corner bracket (Ref. SF 76)

For colour selection see Shires colour chart

SL1119

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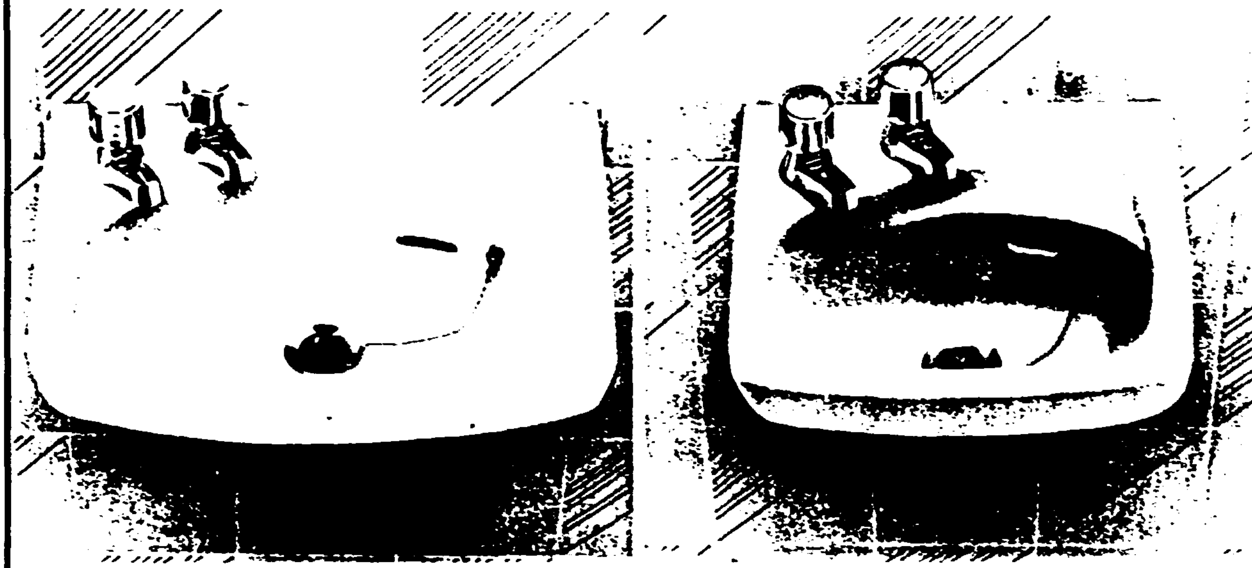
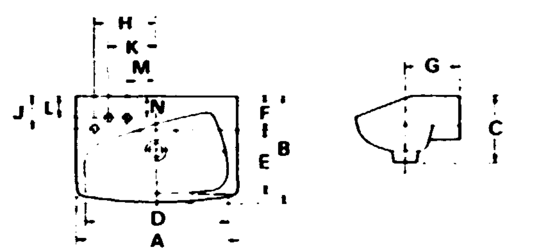
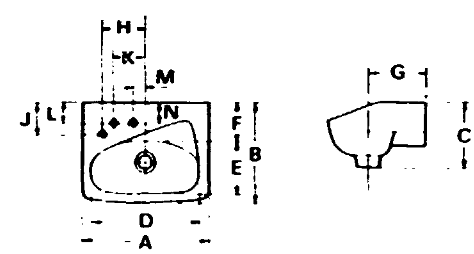
Ashby II basins



Two vitreous china wall-mounted cloakroom basins featuring drop-front, and asymmetrical design for easy access, integral soap pocket and ergonomically designed bowl.





1 or 2 hole version available for both basins.

	A	B	C	D	E	F	G	H	J	K	L	M	N
mm	450	290	185	390	175	90	150	167	92	131	57	82	59
ins	17[illegible]	11[illegible]	7[illegible]	15[illegible]	6[illegible]	3[illegible]	5[illegible]	6[illegible]	3[illegible]	5[illegible]	2[illegible]	3[illegible]	2[illegible]

	A	B	C	D	E	F	G	H	J	K	L	M	N
mm	350	275	180	300	145	105	163	118	92	83	57	34	59
ins	13[illegible]	10[illegible]	7	11[illegible]	5[illegible]	4[illegible]	6[illegible]	4[illegible]	3[illegible]	3[illegible]	2[illegible]	1[illegible]	2[illegible]

Accessories: Waste fittings and Shires range of taps and mixers are available in a choice of Chrome, Venetian Gold and Diamond White finish.

Fixing: Basins secured by 2 off screw to wall mounting brackets (Ref. SF 75) & 2 off screws direct to wall.

For colour selection see Shires colour chart.

SL1120

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BATHROOMS

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Broomhill Road, Tallaght, Dublin 24, Ireland
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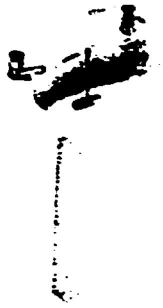
ECTIVE

DENBIGH



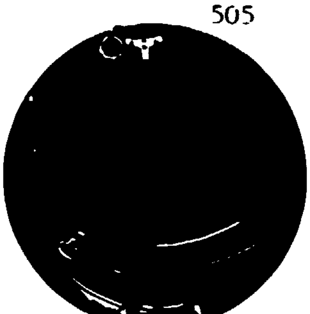
700mm x W560mm x P405mm

H990mm x W545mm x P705mm

DENBIGH UITE

IN WILLOW GREEN

Washdown w.c. suite with horizontal outlet. Basin suitable for corner pillar taps. The Naiad bidet co-ordinates. Featured here with Medici taps in chrome.



RONDO

A spacious luxury bath in high gloss acrylic incorporating large central bathing area, internal seating and arm rests. A special quadrant panel enables the bath to be mounted in a number of positions including a corner site. 1800mm dia

EROS

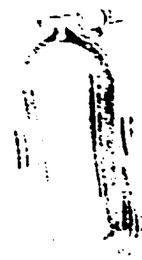
Elegantly styled luxury corner bath with spacious bathing area 1425mm x 1425mm

CHORALE

A compact corner bath incorporating integrally moulded seat, removable handgrip, rolled front, matching panel, and a choice of left or right hand tap options. 1200mm x 1200mm

LARGO

Magnificent bath with double bathing area and special deep formed roll front. 1830mm x 1100mm

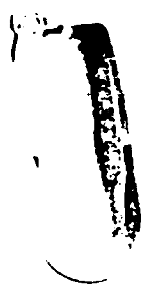


OPUS

Luxury twin grip bath with removeable handgrips, raised headrest, armrests and anti slip showering area. 1700mm x 800mm

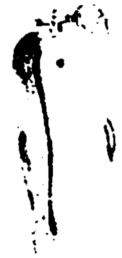
PRELUDE

Superb quality spacious bath incorporating distinctive circular showering area. 1700mm x 800mm



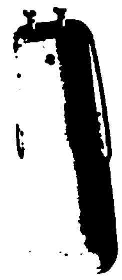
CAROUSEL

A spacious twin grip bath, with removeable hand grips, raised headrest and anti slip showering area. 1700mm x 750mm



NAIAD

Stylish twin grip bath, with headrest and anti slip showering area. 1700mm x 700mm (Also available in 1500mm x 1700mm)



MELODY

Stylish twin grip bath with showering area. 1700mm x 700mm (also available in 1500mm x 700mm)

CHELSEA

Specifically for the elderly or disabled. Low level bath with handrail for aided entry or exit. 1500mm x 700mm (380mm high)

H380mm x W365mm x P420mm

ARIA

IN WILLOW GREEN

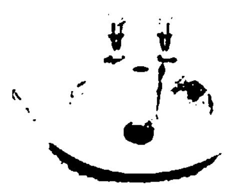
A compact back-to-wall washdown w.c. for use with Lynx concealed thermoplastic cistern

Large W450mm x P290mm
Small W350mm x P275mm

ASHBY II

IN PEACH

Vitreous china wall mounted cloakroom basins, with assymetrical design and drop front for easy access. Choice of 1 or 2 tap holes.



W500mm x P400mm

SELBY II

IN PEACH

Vitreous china basin for corner mounting. Choice of 1 or 2 tap holes.

W510mm x P320mm

NEWBY

IN PEACH

Vitreous china basin with flat back edge and soap area. Available with 2 tap holes.

BRINGING IT ALL INTO PERS

OPUS
SHADOWS PASTORALE

Large Basin H765mm x W650mm x P520mm
Small Basin H765mm x W560mm x P450mm

H785mm x W410mm x P730mm

H390mm x W390mm x P550mm

OPUS SUITE
IN PEACH

Syphonic w.c. suite with horizontal outlet. Basin available in two sizes for monobloc mixer. Over rim bidet offering 1 or 2 tap holes. Featured here with Discus mixers in Diamond White.

PRELUDE

H785mm x W635mm x P490mm
H785mm x W555mm x P435mm

H755mm x W475mm x P700mm

H395mm x W360mm x P580mm

PRELUDE SUITE
IN CHIFFON

Syphonic w.c. suite with horizontal outlet. Basin available in two sizes, large for monobloc mixer, small offering 1, 2 or 3 tap holes. Over rim bidet offering 1 or 2 tap holes. Featured here with Medici mixers in Venetian Gold.

CAROUSEL

H785mm x W635mm x P510mm
H785mm x W560mm x P460mm

H765mm x W475mm x P675mm

H390mm x W360mm x P575mm

CAROUSEL SUITE
IN MISTY GREY

Washdown w.c. suite with horizontal outlet. Basin available in two sizes, each offering 1, 2 or 3 tap holes. Rim and spray bidet for 3 hole mixer. Featured here with Discus mixers in Diamond White.

NAIAD II
BLUE DELF

H800mm x W580mm x P[illegible]mm
H785mm x W500mm x P[illegible]mm

H[illegible]mm x W545mm x P665mm

H400mm x W360mm x P550mm

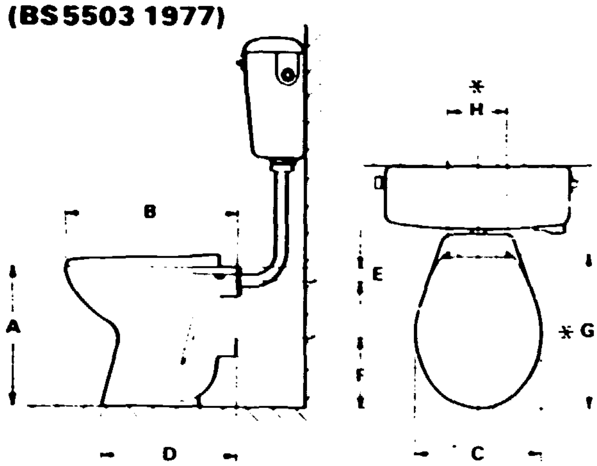
NAIAD II SUITE
IN IVORY

Washdown w.c. suite with horizontal outlet. Basin available in two sizes, large offering 1, 2 or 3 holes, small basin for pillar taps only. Over rim bidet offering 1 or 2 tap holes. Featured here with Medici mixers in chrome.

DIMENSIONS: H = Height, W = Width, P = Projection
NOTE: Height of pedestal basins (measured from floor to front of basin)

Denbigh suite

Denbigh horizontal outlet pan (BS5503 1977)

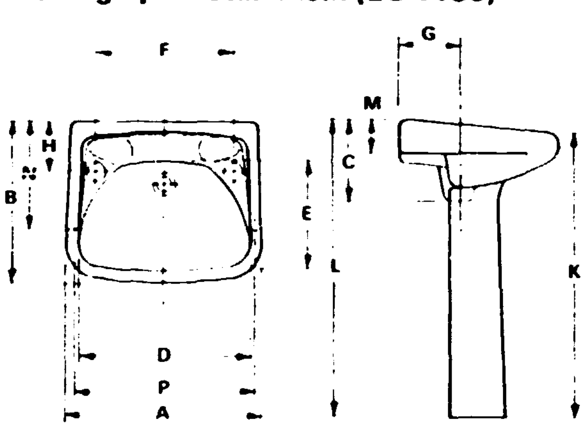


✱ Pan seat bolt hole centres

	A	B	C	D	E	F	G	H
mm	390	485	355	385	40	190	435	165
ins	15⅜	19⅛	14	15⅛	1⅝	7½	17⅛	6½

The Denbigh pan is suitable for use with high or low level cisterns. Please see the reverse of this leaflet for dimensional details using the Shires range of cisterns.

Denbigh pedestal basin (BS 1188)



N and P are bracket centres

	A	B	C	D	E	F	G	H	K	L	M	N	P
mm	560	406	235	500	250	406	180	140	800	825	102	305	510
ins	22	16	9¼	19¾	9¾	16	7	5½	31½	32½	4	12	20

Accessories & Fixing. A standard 1¼" (30mm) BSP chain waste and stay is available as are ½" pillar taps in chrome, Venetian Gold and in Diamond White. Vitreous china overlaps are available for basin when mounted in rows. Basin is screwed to wall when used with pedestals. Can also be used without pedestal on wall hung brackets. For colour selection see Shires colour chart.

SL 1090

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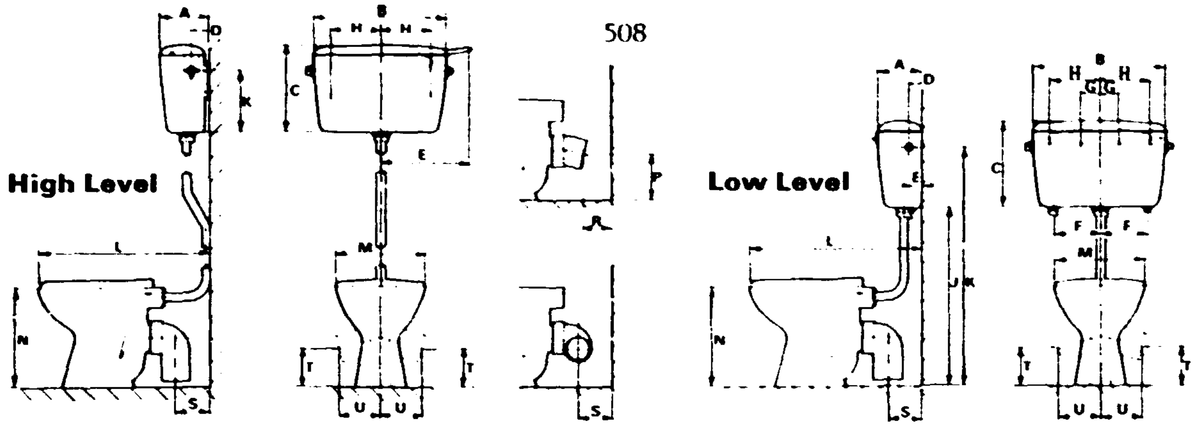
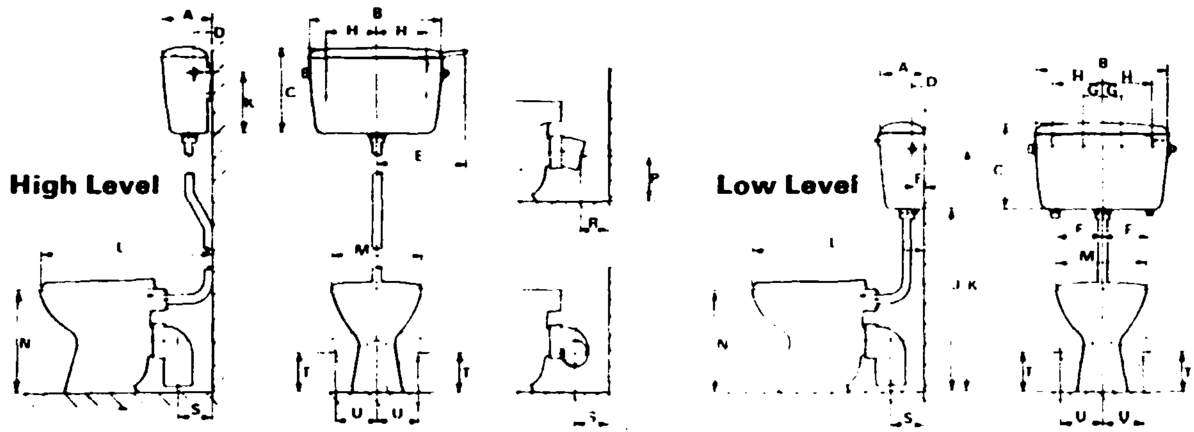
High and low level suites with Denbigh horizontal outlet pan



Dimensional reference (mm) using PHETCO "MULTIKWIK" Connectors																		
CISTERN	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U
LYNX Heavy Duty																		
High Level	195	520	335	70	355			160		235	610 670	355	390	170	50 110	80 140	150	160
Low Level	175	520	335	50	50	190		160	600 700	835 935	675 750	355	390	170	115 190	145 220	150	160
PUMA Heavy Duty																		
High Level	195	515	320	70	355			230		235	610 670	355	390	170	50 110	60 140	150	160
Low Level	175	515	320	50	50	195		230	600 700	835 935	675 750	355	390	170	115 190	145 220	150	160
RUBBERWELL Heavy Duty																		
High Level	240	465	295	65	335					[illegible]	[illegible]	355	390	170	50 110	80 140	150	160
DENBIGH Vitreous China																		
Low Level	185	530	340	55	50	195		[illegible]	[illegible]	835 935	[illegible]	355	390	170	115 190	145 220	150	160
LYNX Thermoplastic Fineline																		
High Level	185	500	335	65	355			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50 110	80 140	150	160
Low Level	155	500	335	35	45	185	75	200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	115 190	145 220	150	160
PANTHER Thermoplastic																		
Low Level	110	535	395	45	35	205	75	225	470 540	755 825	[illegible]	355	[illegible]	[illegible]	[illegible]	80 200	150	160



Dimensional reference (mm) using BS5627 Type Connectors																		
CISTERN	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U
LYNX Heavy Duty																		
High Level	195	520	335	70	355			160		235	610 670	[illegible]	[illegible]	[illegible]	45 105	65 125	150	165
Low Level	175	520	335	50	50	190		160	600 700	835 935	675 750	[illegible]	[illegible]	[illegible]	110 185	130 205	150	165
PUMA Heavy Duty																		
High Level	195	515	320	70	355			230		235	610 670	355	[illegible]	[illegible]	[illegible]	65 125	150	165
Low Level	175	515	320	50	50	195		230	600 700	835 935	675 750	355	[illegible]	[illegible]	[illegible]	130 205	150	165
RUBBERWELL Heavy Duty																		
High Level	240	465	295	65	335					215	610 670	355	390	[illegible]	[illegible]	65 125	150	165
DENBIGH Vitreous China																		
Low Level	185	530	340	55	50	195		160	600 700	835 935	675 750	355	390	175	110 185	130 205	150	165
LYNX Thermoplastic Fineline																		
High Level	185	500	335	65	355			200		230	610 670	355	390	175	45 105	65 125	150	165
Low Level	155	500	335	35	45	185	75	200	600 700	830 930	675 750	355	390	175	110 185	130 205	150	165
PANTHER Thermoplastic																		
Low Level	110	535	395	45	35	205	75	225	470 540	755 825	610 730	355	390	175	45 165	65 185	150	165

The Denbigh horizontal outlet pan may be converted to 'S' trap, 'P' trap or turned 'P' trap using either PHETCO "MULTIKWIK" or BS5627 type connectors.

SL 1090

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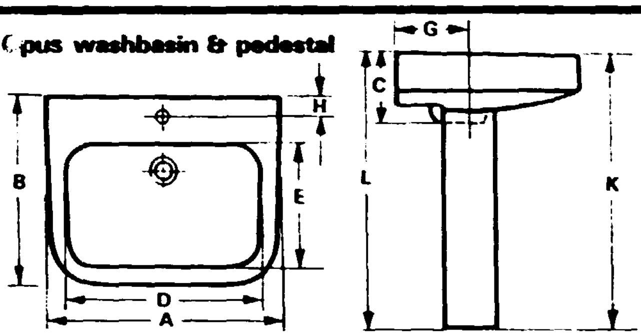
Opus suite

Opus washbasin & pedestal



Washbasin 660mm x 520mm (26" x 20½")
Available as 1 tap hole only

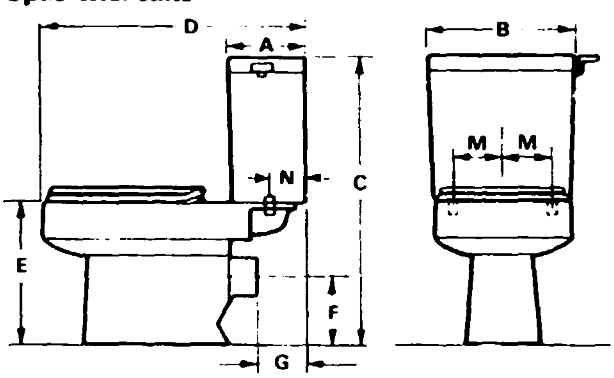
	A	B	C	D	E	G	H	K	L
mm	660	520	205	560	340	205	70	765	775
ins	26	20½	8	22	13⅜	8	2¾	30⅛	30½

Washbasin 560mm x 450mm (22" x 17¾")
Available as 1 tap hole only

	A	B	C	D	E	G	H	K	L
mm	560	450	205	470	295	190	60	765	775
ins	22	17¾	8	18½	11⅝	7½	2⅜	30⅛	30½

Both basins can be wall hung without pedestal using two Fischer bolts. Ref WD 140 80656

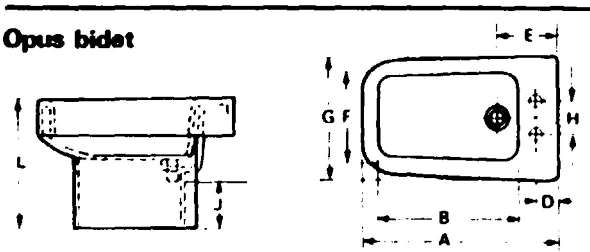
Opus w.c. suite

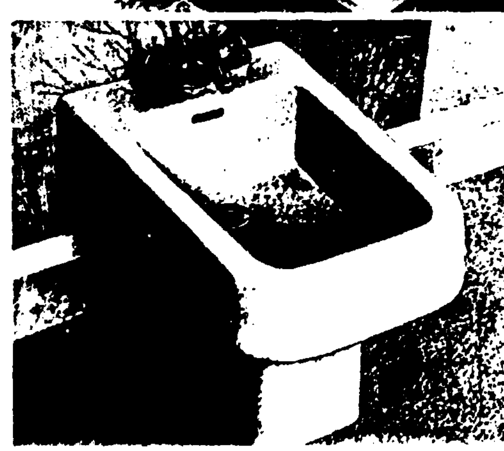


Opus double trap, syphonic, close coupled w.c. suite with horizontal outlet

	A	B	C	D	E	F	G	M	N
mm	210	410	785	730	390	185	140	140	55
ins	8¼	16⅛	30⅞	28¾	15⅜	7¼	5½	5½	2⅛

Opus bidet





Over rim supply bidet. Available as 1 or 2 hole versions (2 hole dimensions)

	A	B	D	E	F	G	H	J	L
mm	550	390	50	160	280	390	100	165	390
ins	21⅝	15⅜	2	6¼	11	15⅜	4	6½	15⅜

For 1 hole bidet 'D' dimension is 50mm (2")

Shires can supply waste fittings and brassware in chrome, Venetian Gold or Diamond White for the basin and bidet, and soil pipe connectors and seats for the W.C. For colour selection see Shires colour chart

SL 1099

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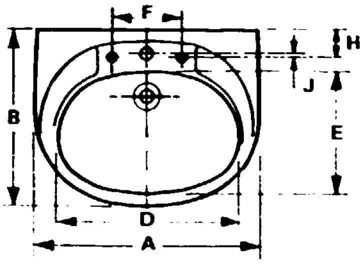
BATHROOMS

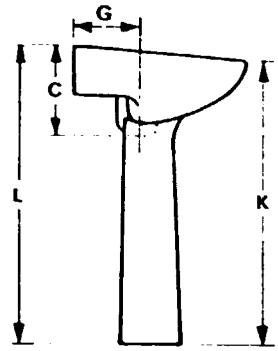
Shires Limited,
Guiseley, Leeds, LS20 8AP, England
Telephone Guiseley (0943) 870055
Telex 51482 Fax (0943) 870061

Shires Ireland Limited
Broomhill Road, Tallaght, Dublin 24, Ireland
Telephone Dublin (01) 515877
Telex 31337 Fax (01) 515534

Prelude suite

Prelude washbasin





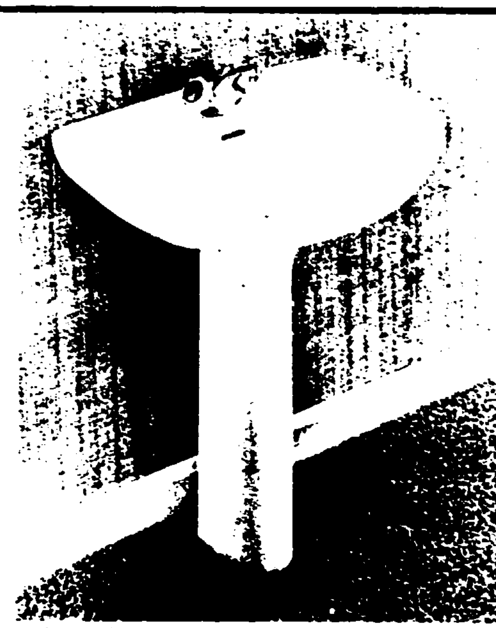
Prelude washbasin 635mm x 490mm (25" x 19¼")
Available as 1 / 3 tap hole only

	A	B	C	D	E	F	G	H	J	K	L
mm	635	490	250	520	340	200	190	80	15	785	820
ins	25	19¼	9⅞	20½	13⅜	7⅞	7½	3⅛	⅝	31	32¼

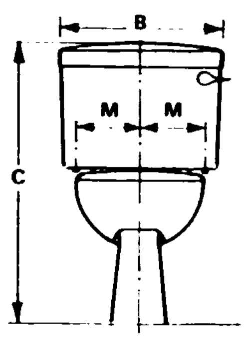
Prelude washbasin 555mm x 435mm (21⅞" x 17") Available as 1, 2 or 3 tap holes

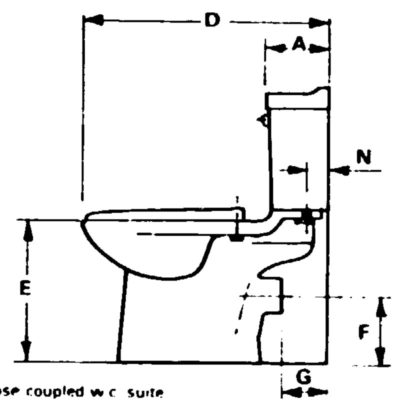
	A	B	C	D	E	F	G	H	J	K	L
mm	555	435	235	470	285	200	185	85	15	785	820
ins	21⅞	17	9¼	18½	11¼	7⅞	7¼	3⅜	⅝	31	32¼

The small Prelude basin can be wall hung without pedestal using two Fischer bolts. Ref WD 140 80656



Prelude w.c. suite

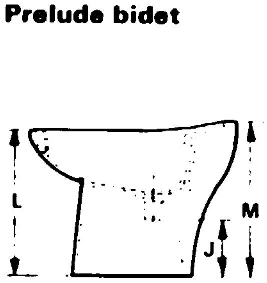


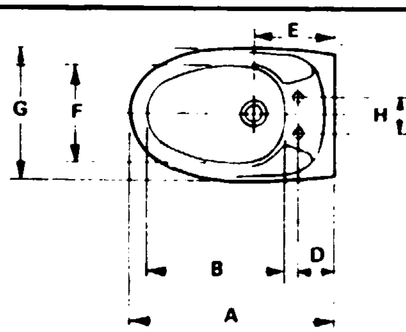


Prelude double trap syphonic close coupled w c suite

	A	B	C	D	E	F	G	M	N
mm	183	474	764	700	392	190	130	184	48
ins	7¼	18⅝	30⅛	27½	15½	7½	5⅛	7¼	1⅞

Prelude bidet

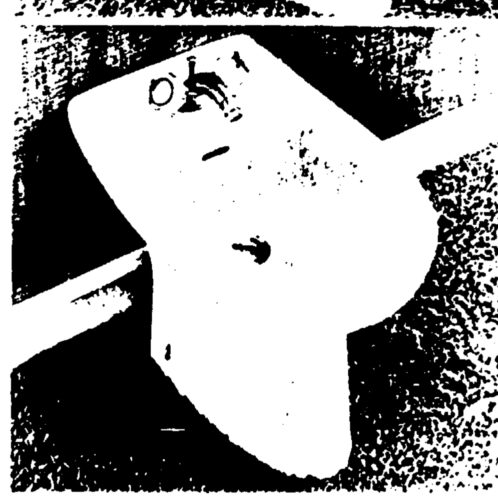




Prelude over rim supply bidet
Available as 1 or 2 hole versions

For 1 hole version D = 85mm (3⅜)

	A	B	D	E	F	G	H	J	L	M
mm	580	390	105	235	265	360	100	150	395	470
ins	22⅞	15⅜	4⅛	9¼	10½	14⅛	4	5⅞	15½	18½



Shires can supply waste fittings and brassware in chrome, Venetian Gold or Diamond White for the basin and bidet, and soil pipe connectors and seats for the W C For colour selection see Shires colour chart

SL 1087

SHIRES
BATHROOMS

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Guiseley, Leeds, LS20 8AP, England
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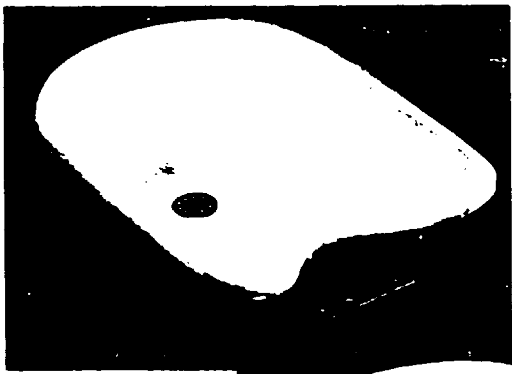


Duet Backwash basin set into a cabinet ▲

Duet Backwash basin mounted directly onto a cabinet ►

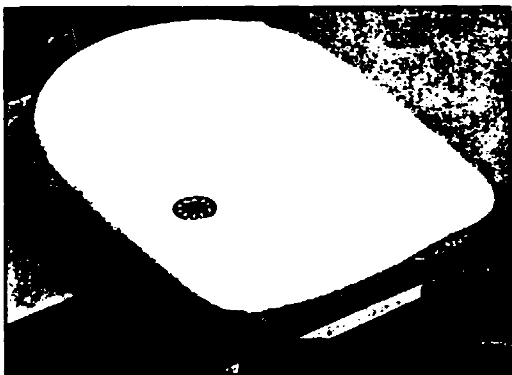
Duet

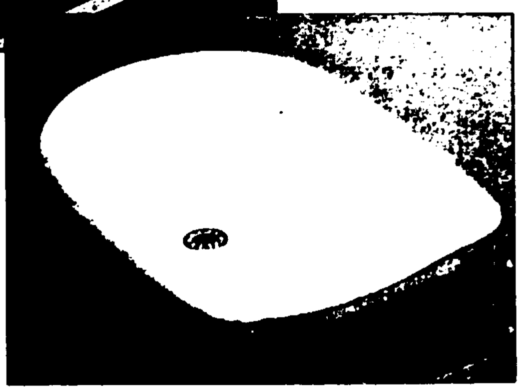
Shires have an unrivalled reputation for design and quality and the Duet vitreous china shampoo basin maintains that enviable tradition.

Duet has been developed to offer a quality vitreous china basin that can be used in a variety of installations in the modern hairdressing salon.

The Duet basin is available in a frontwash version or a backwash version. Each basin can be installed set into a cabinet or mounted directly onto a cabinet. Duet therefore offers you co-ordination of design for a range of salon applications.

- Designed to be set into a cabinet or mounted directly onto a cabinet
- Designed to be used in conjunction with either an instant wall heater or a mixer valve and hose
- Nominal projection 610mm (24")
- Nominal width 455mm (18")
- Available in a range of fashion colours
- Deep bowl area to reduce splashing
- Manufactured from vitreous china to BS 3402
- Supplied in a protective carton complete with comprehensive fixing instructions





Duet Frontwash basin set into a cabinet ▲

Duet Frontwash basin mounted directly onto a cabinet ►

The Duet range is designed to be used in conjunction with either an instant wall heater or the traditional mixer valve and hose fitting. When used with the instant water heater the hose fitting can be positioned alone.

[illegible] range of shampoo basins [illegible] from Shires. The front [illegible] Pink.
Mixer valves and hose fittings are by [illegible]
Cabinets are by [illegible] Products
Floor covering by Amtico
Hand painted brushes are by [illegible]

b) Spring Bathrooms Limited, U.K.

SPECIFICATIONS

THE SPRING FASHION COLLECTION

Planning the perfect bathroom may sound a daunting task, but with a little help from Spring Bathrooms your dream can become a reality.

Spring Bathrooms Fashion Collection of totally co-ordinated suites have been specifically created to enable you to bring the designer look to your bathrooms – without spending a fortune.

Our philosophy is simple and unshakeable – quite simply, we believe that good design, fashionable shapes and shades should be within the reach of everyone.

Our Spring Fashion Suites Alexis, Lois, Paris and Marquis reflect this philosophy in everyway. Your suite has been designed with complete co-ordination in mind.

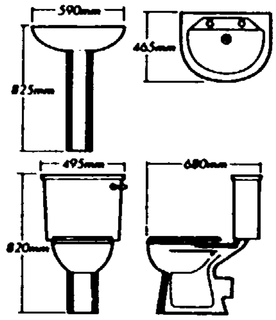
The suites are available in six fashion colours – Misty Peach, Misty Pink, Misty Grey, White, Wild Sage and Champagne – giving you the versatility to create the mood of your choice in the bathroom.

The specifications featured here allow you to make variations on the recommended suite packages and thus tailor your choice to your bathroom in terms of style, size and price.

VITREOUS CHINA SANITARYWARE

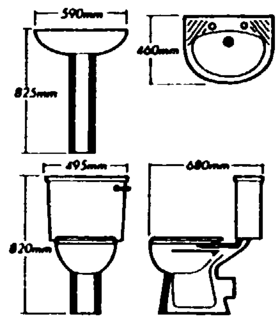
ALEXIS

Price Ex. VAT



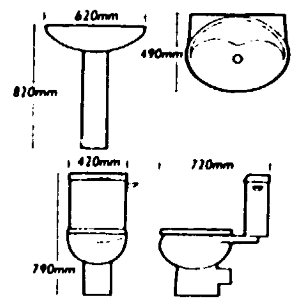
Alexis Basin – 1 or 2 tap holes	$31.86
Pedestal	$18.09
Close Coupled Washdown W.C.	$39.87
Alexis B.I.B.O. Cistern	
Chrome fittings	$36.79

LOIS



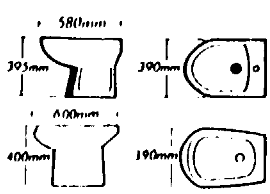
Lois Basin – 1 or 2 tap holes	$41.[illegible]
Pedestal	$18.09
Close Coupled Washdown W.C.	$39.87
Lois B.I.B.O. Cistern	
Chrome fittings	$41.11
Lois B.I.B.O. Cistern, White fittings (Standard with Misty Pink, Misty Grey, Misty Peach)	$13.61

PARIS



Paris Basin – 1 tap hole	$39.7[illegible]
Pedestal	$22.10
Close Coupled Washdown W.C.	$71.9[illegible]
Paris B.I.B.O. Cistern, Chrome fittings	$56.[illegible]
Paris B.I.B.O. Cistern White fittings (Standard with Misty Pink, Misty Grey, Misty Peach)	$59.[illegible]

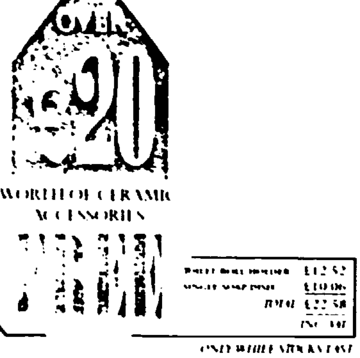
BIDETS

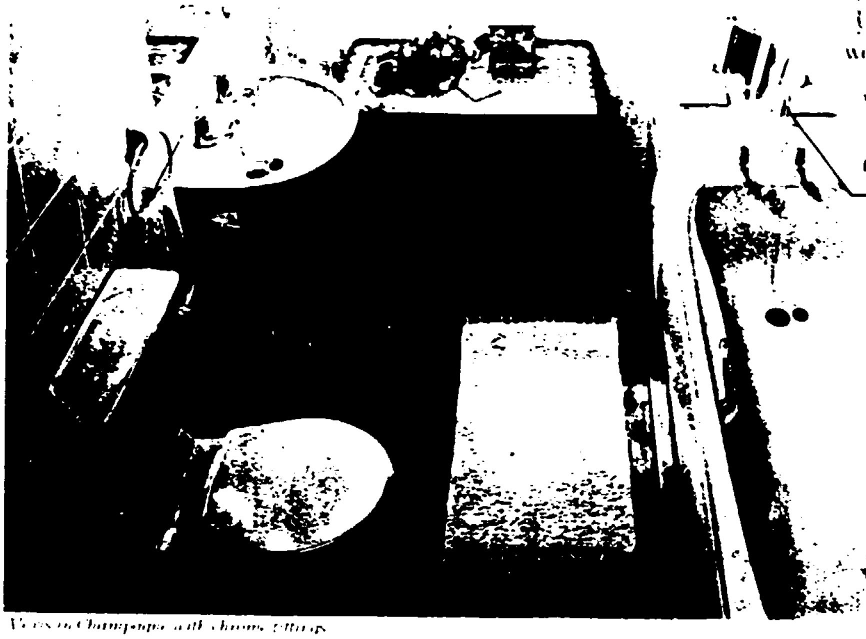


Bidet for Alexis Lois	$59.99
Paris Bidet	$69.99

...ris in Misty Peach with white fittings

Marquis in Misty Green with white fittings





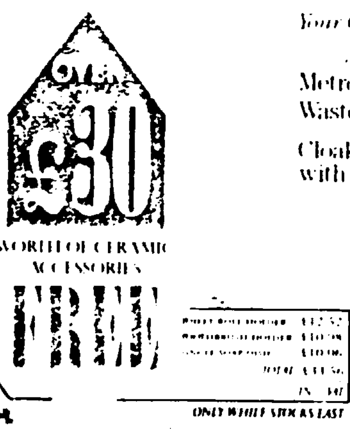
Champagne with chrome fittings

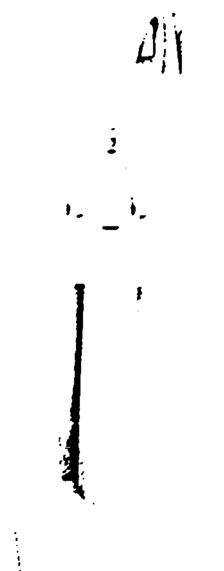
The slimline WC Suite and elegant Metro 18″ x 11″ wall basin are for use where convenience insists and space is at a real premium — in the cloakroom or shower room

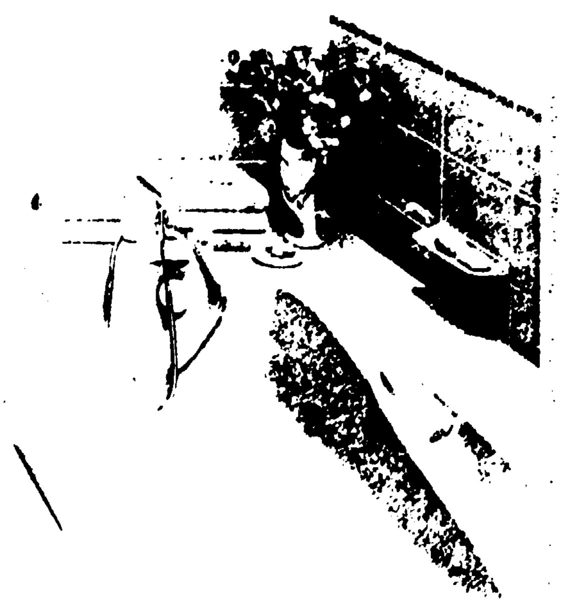
Your Cloakroom Suite comprises

Alexis Close coupled WC and Seat · Metro Wall Basin · Metro Basin Taps · Wastes and fittings

Cloakroom Suite
with chrome fittings

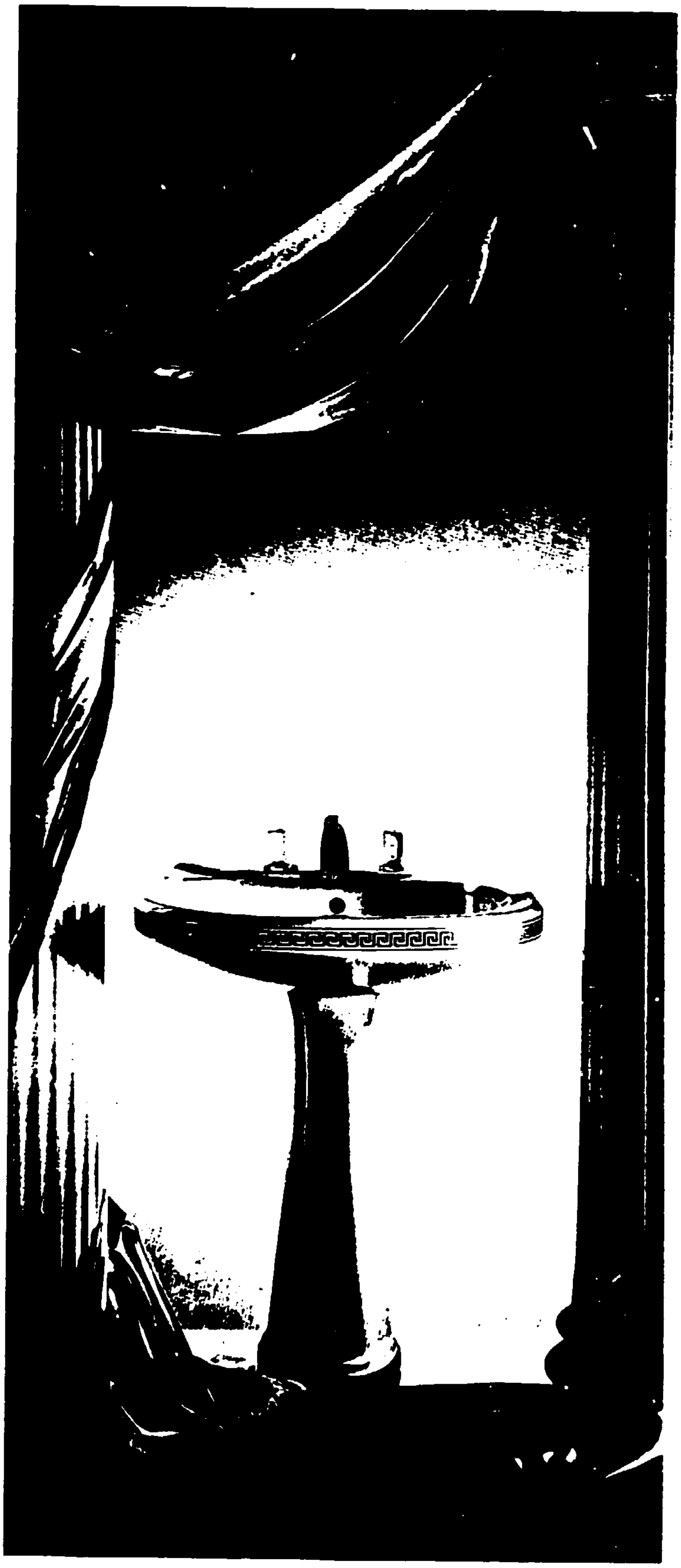






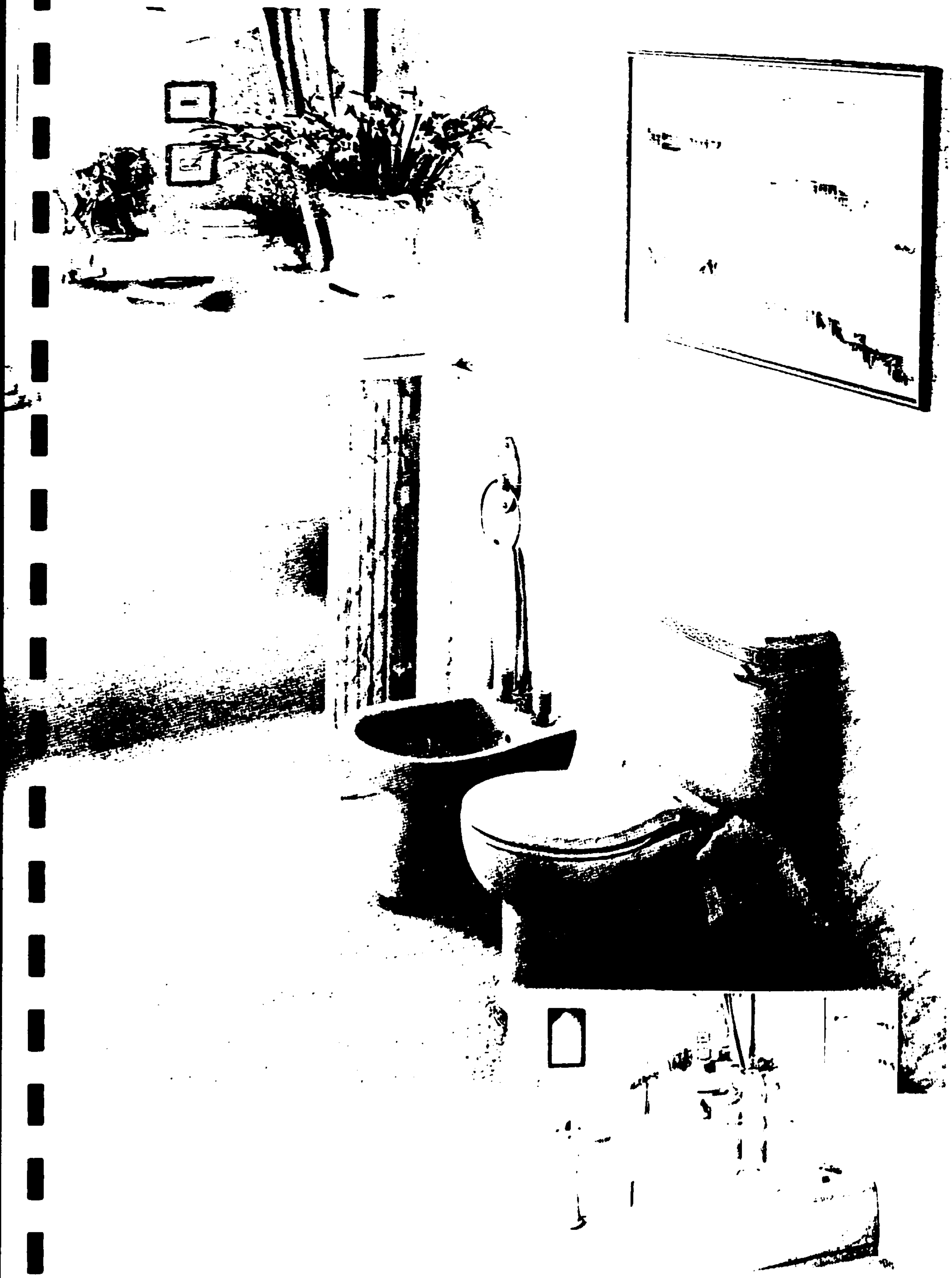
c) Balterley Bathrooms Limited, U.K.

The *Balterley* Book of Bathrooms



Balterley

Balterley



Romana Champagne Gold Greek Key with rectangular bath and decorated panels.

Balterley

Charisma in Pearl Blue with Chrome fittings

Enchanting fashion...
Exceptional Price

Charisma is a fashion you'll find hard to resist, offering you a choice of delicate pastel shades, or if you prefer, the ever popular Champagne or white.

Charisma is designed for the discerning who require elegance in a modern fashion. As with all Balterley Suites, the range incorporates a cloakroom format, see page 19 (basins)

Balterley

Shell Misty Pink Satsuma

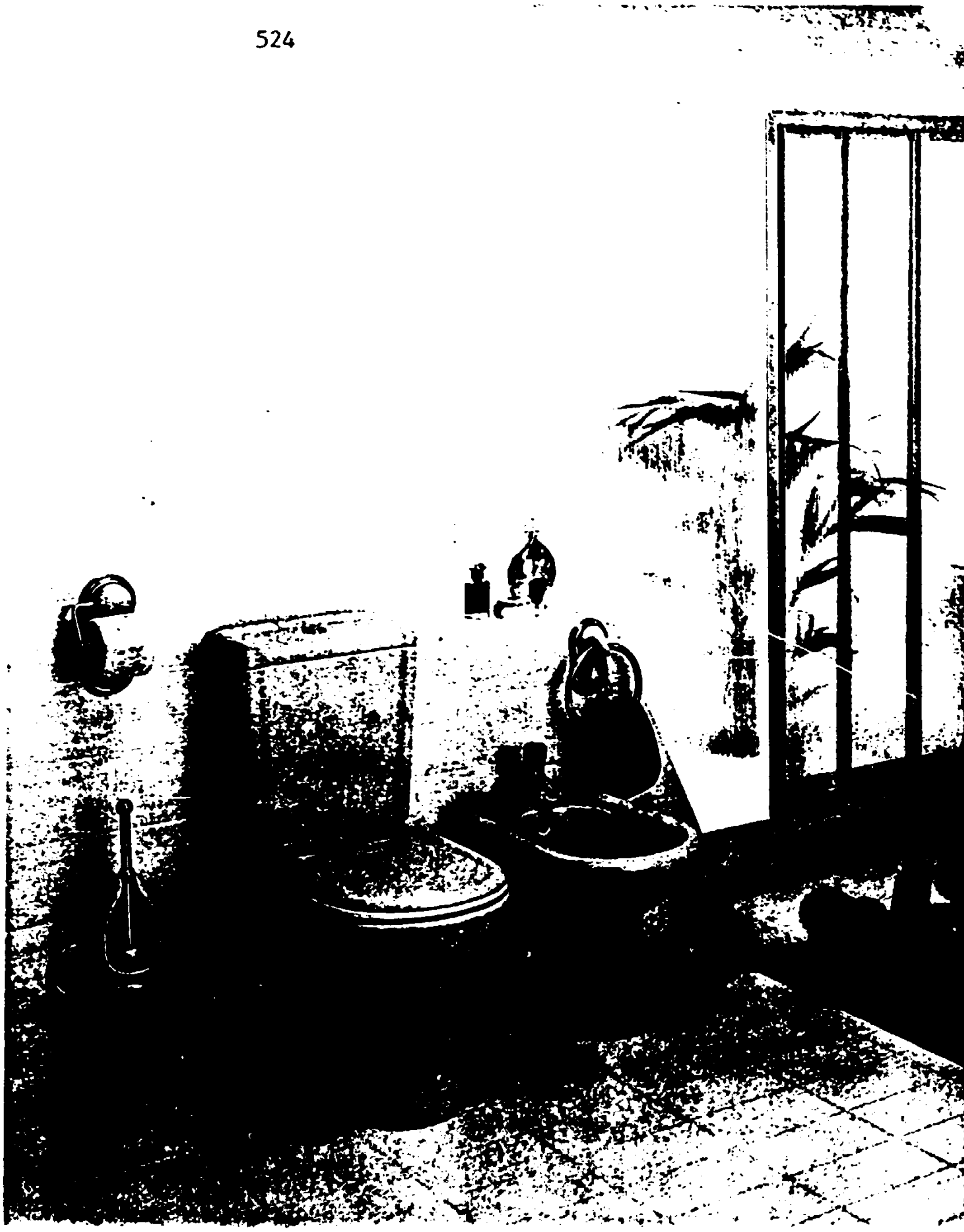
Shell Misty Grey Satsuma

d) Laufen, SWITZERLAND

AROLLA — DAS ELEGANTE BAD

AROLLA ist kein alltägliches Badezimmer, obwohl Sie es doch täglich benutzen. Die elegant gestylte Keramik zeichnet sich durch zurückhaltende Einfachheit aus. Sie hat Charakter, Stil und Format. Die konsequente Linienführung und die kreative Form, verbunden mit ausgezeichneter Funktionalität, verleihen AROLLA ein besonders eigenständiges Profil.

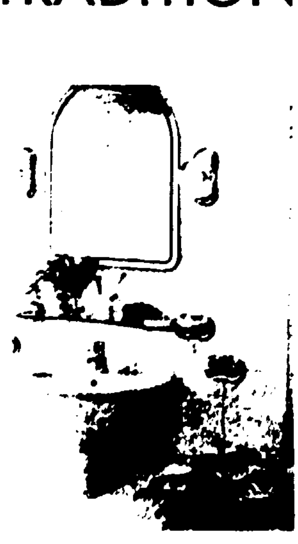
LAUFEN STUDIO LINE



VIENNA – DAS BAD MIT STIL UND TRADITION

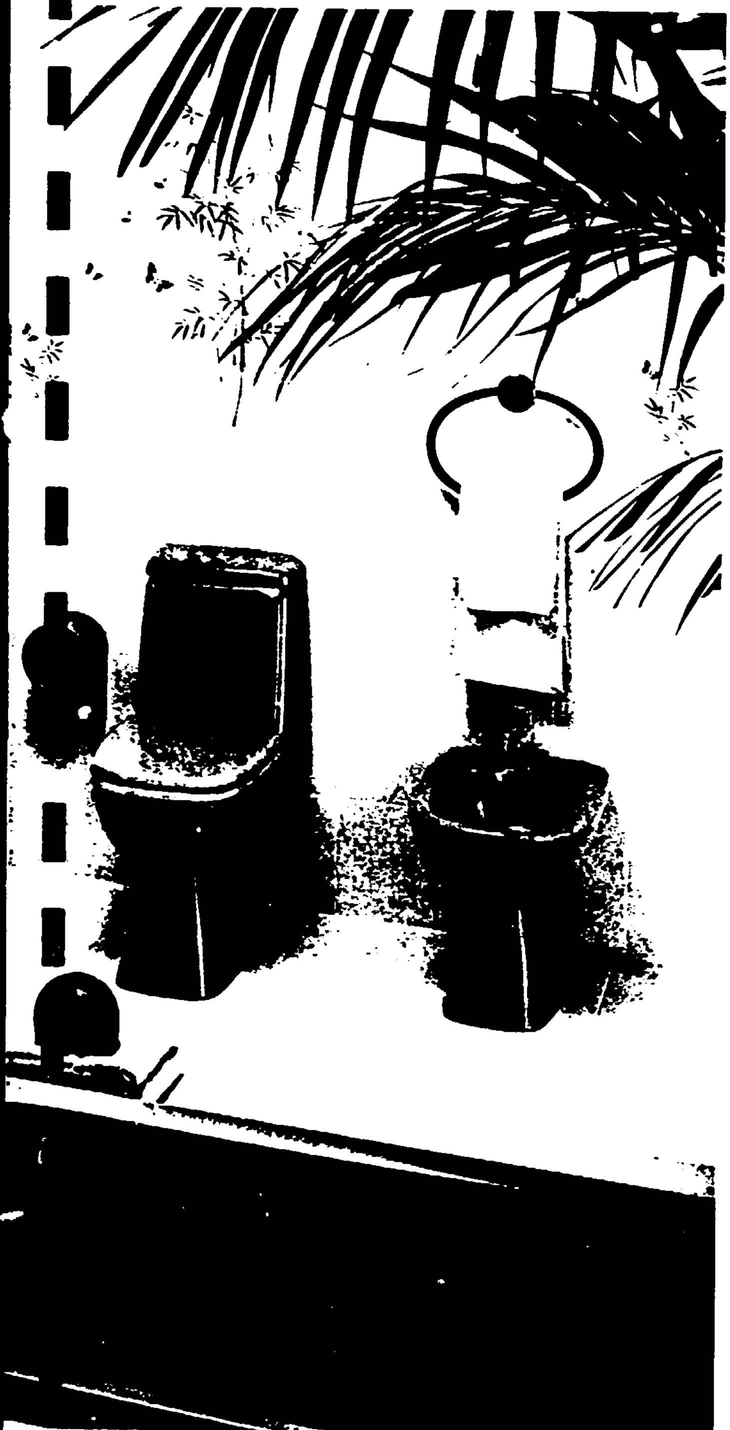
Ein Hauch von Luxus fängt Sie ein, wenn Sie dieses Badezimmer betreten. Die angenehme Atmosphäre wirkt erfrischend und regenerierend. Lebensfreude wird geweckt und auch das Gefühl, sich mit schönen, individuellen Dingen umgeben zu haben.

Waschtisch 1003.5 VIENNA, 65 x 55 cm, und Siphonverkleidung 1903.1 mit Federnbefestigung (weitere Waschtischgrößen 60 x 46 cm, 80 x 56,5 cm), auch mit Säule 1903.0 lieferbar



Sanitärfarbe: CARAMEL
Waschtisch 1151.8 CAPELLA, 80 x 54 cm (weitere Größen: 60 x 48 cm, 65 x 50 cm), dazu Säule 1990.0, Tiefspülklosett 2595.9 CAPELLA (6 Liter Sparspülung), kombiniert mit Porzellanspülkasten 2593.0 CAPELLA, Wasseranschluß hinten Mitte (mit Wasseranschluß rechts: Nr. 2593.2), Bidet 3603.1 CAPELLA Porzellanaccessoires UNIVERSAL (siehe Seite 18)
Fliesen LAUFEN:
Grundfliese: 5027 MARBRE mit Dekor 6109, 6110, 6111 BAMBUS
Armaturen: Grohe

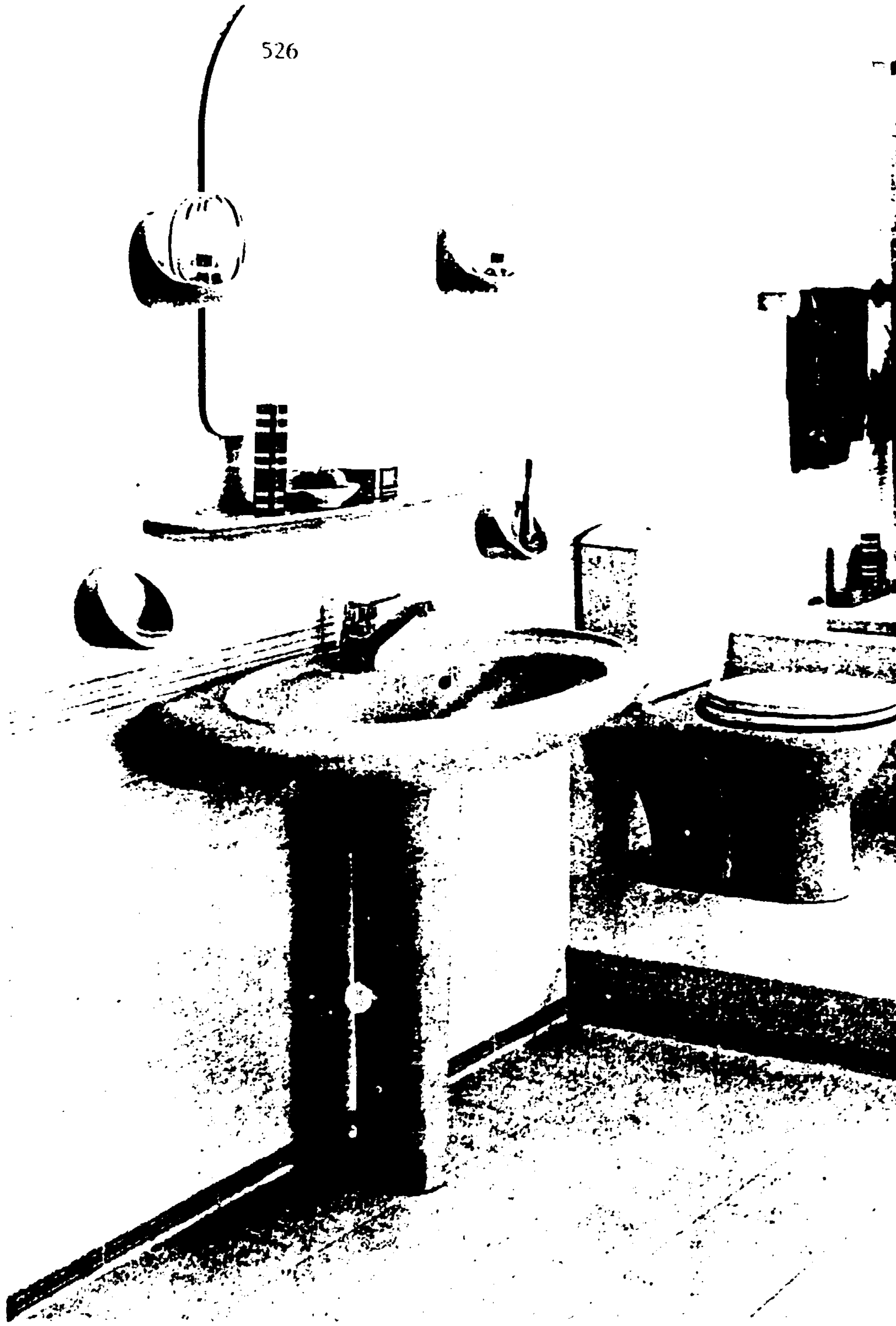
Wandtiefspülklosett 2227.0 CAPELLA (6-Liter-Sparspülung), für Unterputzspülkasten, Wandbidet 3607.1 CAPELLA



Ergänzt durch attraktive Accessoires wird die Gestaltung Ihres Badezimmers mit CAPELLA zu einem interessanten Erlebnis.

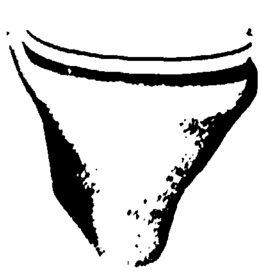
[illegible] Tip: Platzsparend [illegible] raumfreundlich [illegible] elegant: WC-Schale und Bidet als wandhängende Modelle.

LAUFEN STUDIO LINE



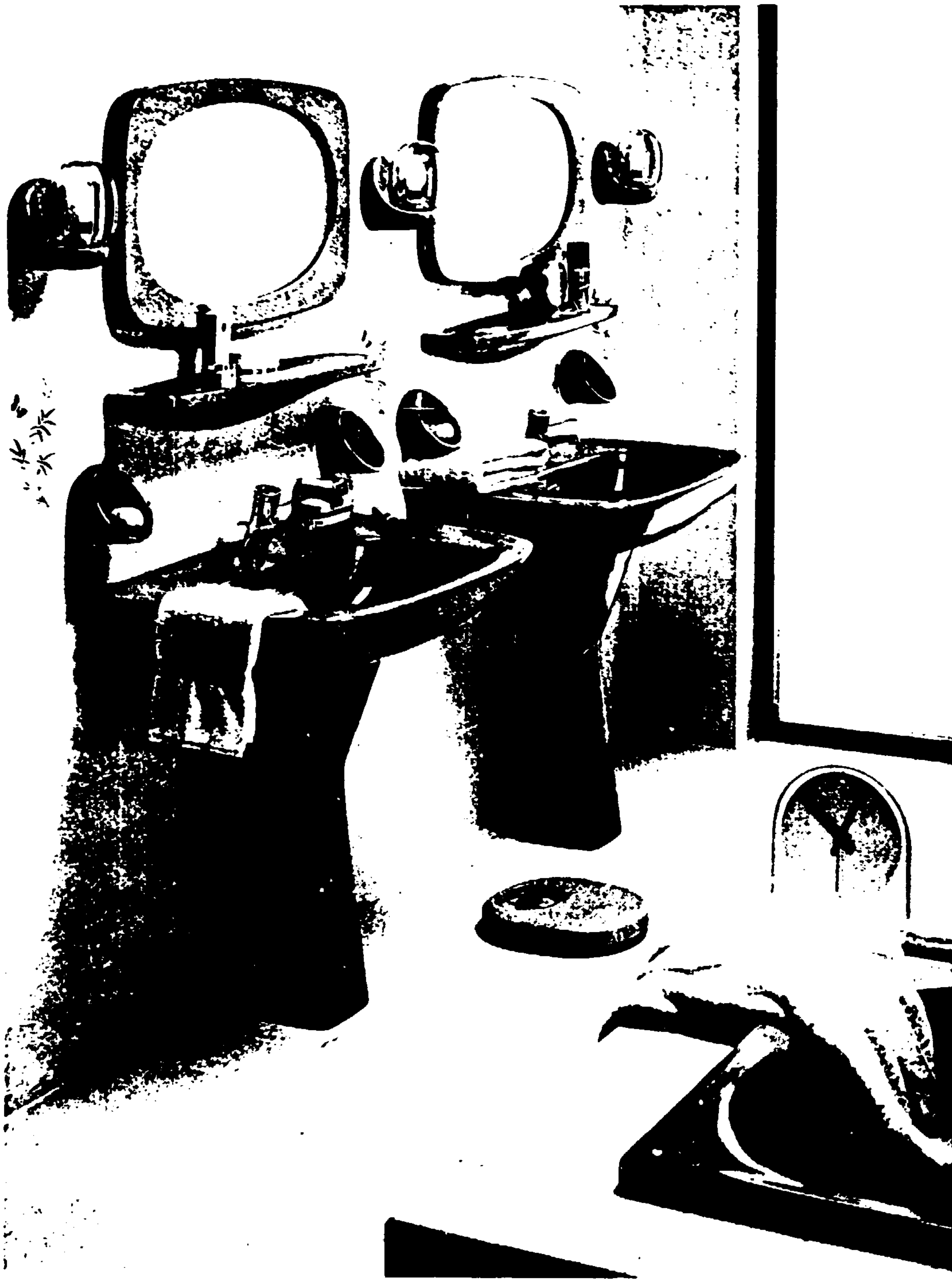
Wand WC, Tiefspüler
2348.0 PACIFIC und
Wand Bidet 3048.1 PACIFIC

PACIFIC — WIE EINE BRISE DES OZEANS



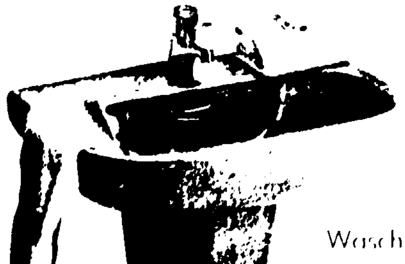
Sie schätzen gehobene Wohnkultur, und Sie bevorzugen dabei das Außergewöhnliche. Sie entscheiden sich für die Studio Line PACIFIC

LAUFEN STUDIO LINE



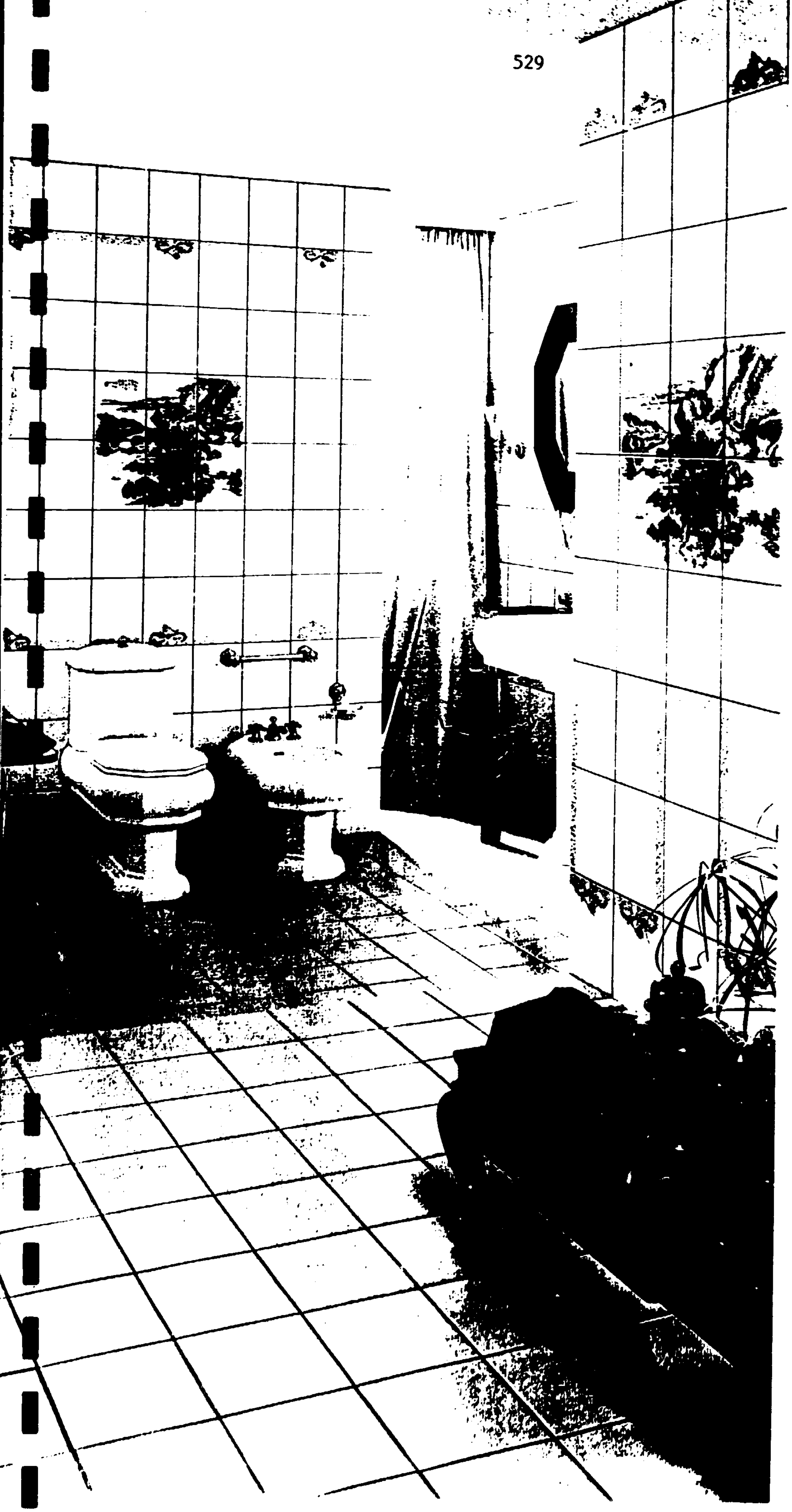
CAPELLA — DER BADEZIMMER-SCHLAGER

CAPELLA, die Studio Line von LAUFEN, besticht durch ihre Einfachheit. Die reichhaltige Farbskala, aus der Sie Ihren Wunschton auswählen können, und die breite Produktpalette gestatten Ihnen vielfältige Variationsmöglichkeiten.

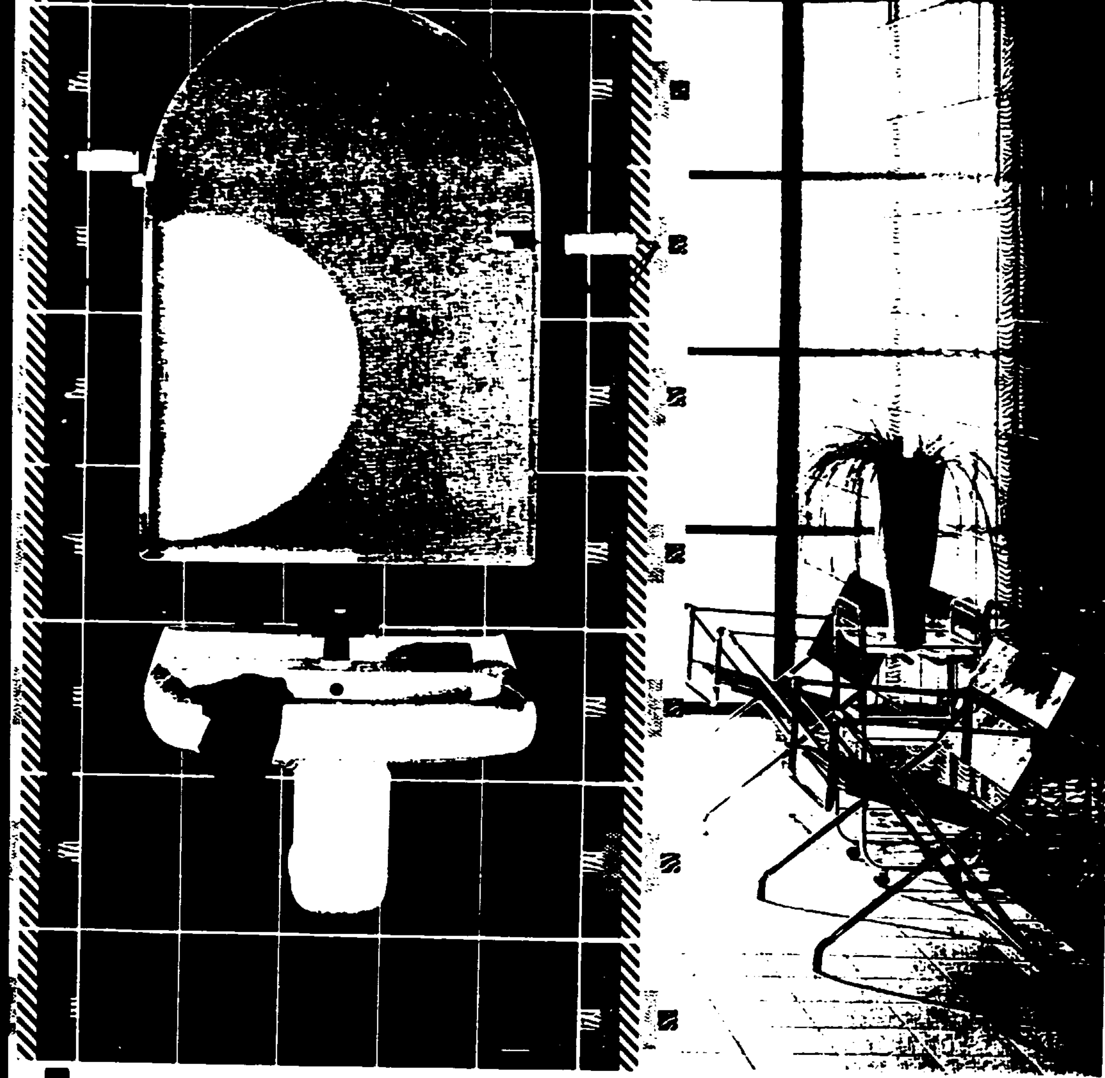


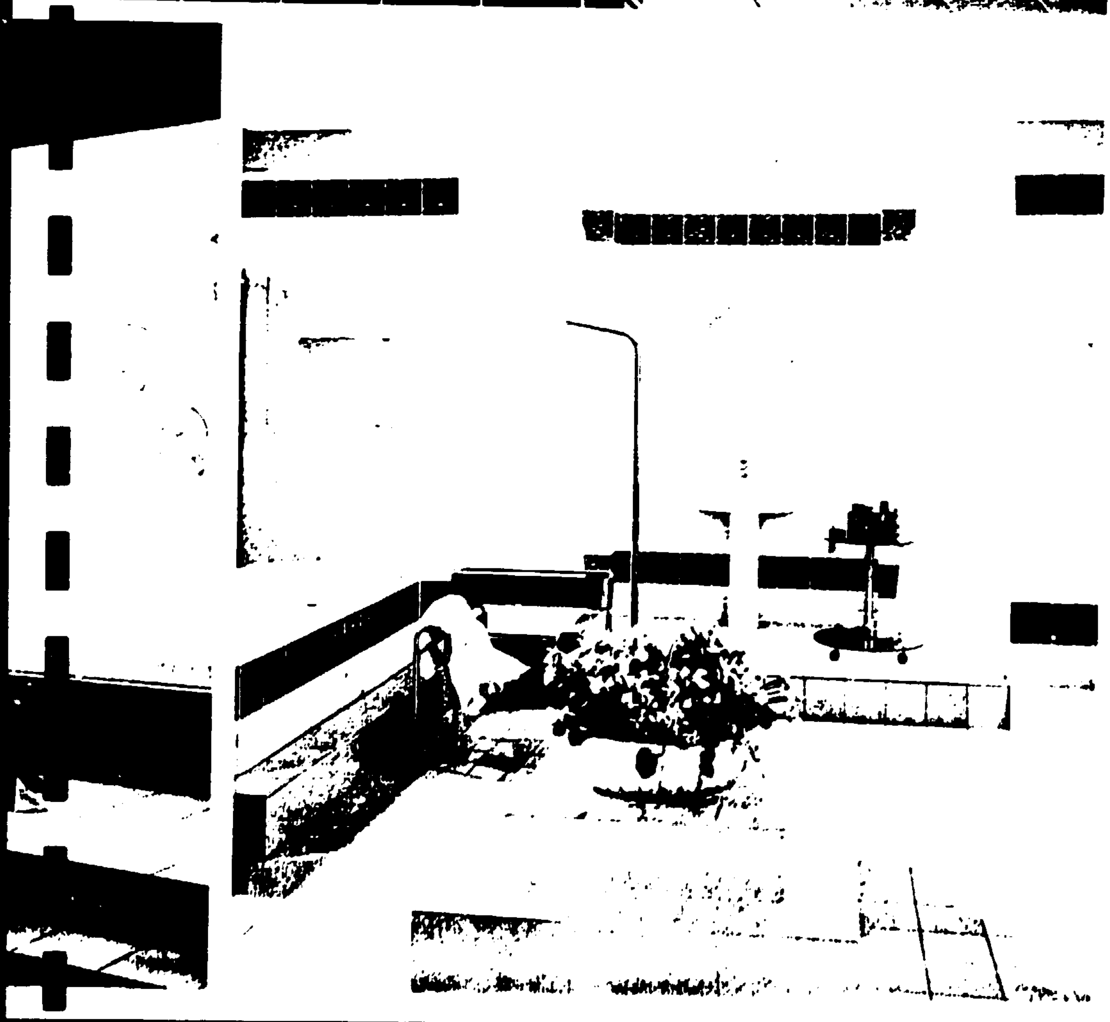
Waschtisch 1151.5
CAPELLA, 65 x 50 cm, dazu
Siphonverkleidung 1990.1
mit Federnbefestigung

e) Villeroy & Boch, GERMANY



Wand und Boden:
MANDSCHU
Fliesen 20 x 25 cm · Farben 'retrograu', 'türkis', 'türkis gold retrograu' und Dekor auf 'retrograu' Sanitär Kollektion OPERA · Farbe »weiß alpin«



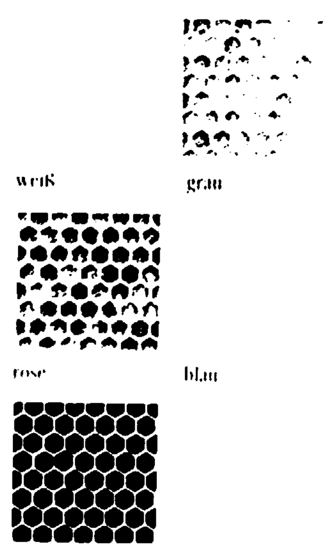


VENDANGES
Wandfliesen 20 x 20 cm 'Uni 'perlweiß' und Dekor auf 'grau' Reliefleiste 5,5 x 20 cm in 'perlweiß' BELCANTO Bodenfliesen 20 x 20 cm Farben 'crocus' und 'silbergrau' Sanitär Waschtisch ARIANE Badewanne NAOKO Farbe -weiß alpin-

◁ Das Gäste-WC vor der Renovierung

Das Gäste-WC nach der Renovierung
Wand: CLIP glasiert 1,75 x 2 cm in 'weiß' mit einem Streifen CLIP FORTE in 'creme'. Boden: CLIP FORTE 1,75 x 2 cm in 'creme'. Diese Fliesen sind – wie alle unglasierten Bodenfliesen – besonders verschleißbeständig.
Die glasierten Wand- und Bodenfliesen CLIP sind in insgesamt 9 Farben erhältlich. (Sie sehen sie auf Seite 10.) Die unglasierten Bodenfliesen CLIP FORTE sind in den hier abgebildeten Farben erhältlich. Sanitär: Kollektion MARINA – Ernal COLANI – Farbe 'patina'.

Weitere Farben:

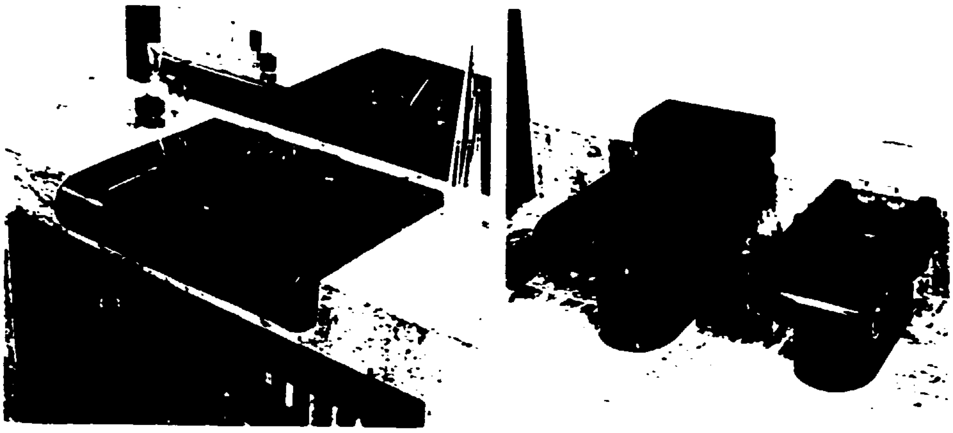


weiß grau

rose blau

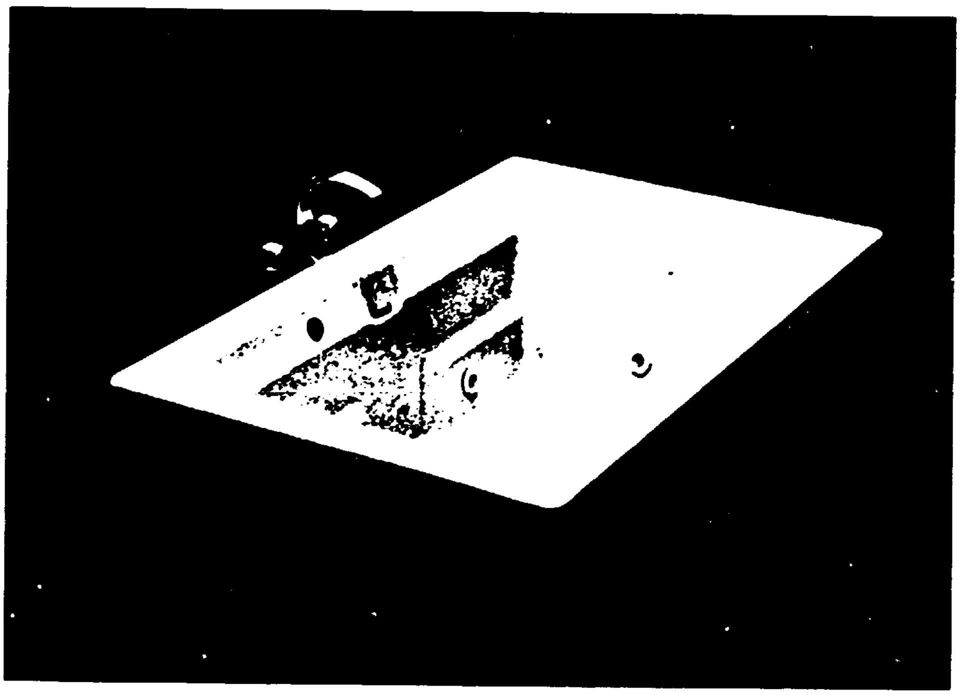
schwarz

f) Kohler, U.S.A. & CANADA

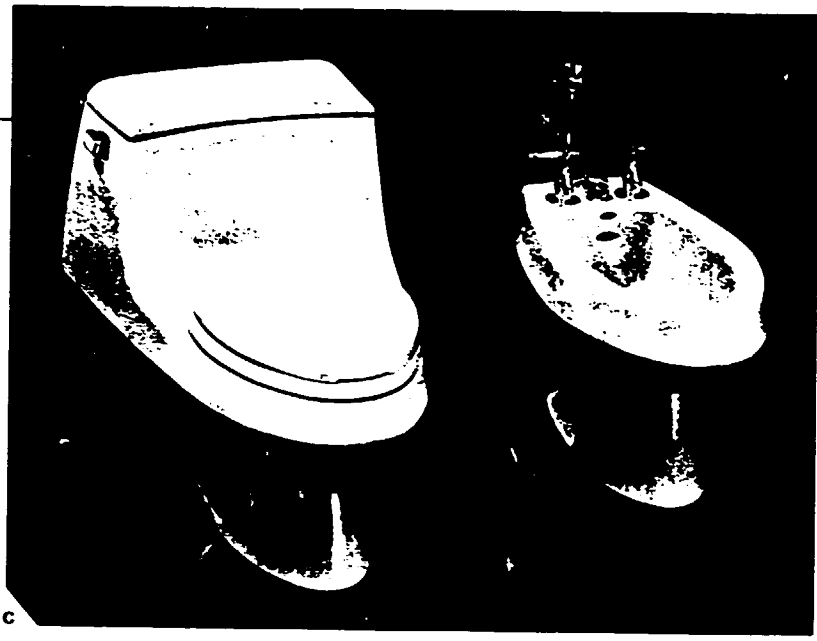


Pillow Talk™ *lavatory (K-2110) 28" x 21-1/2" for vanity or counter installation. Vitreous china in Black Black.™ Taboret™ faucet (K-8211) in polished chrome.*

Pillow Talk™ *toilet (K-3378-EB) in Black Black™ with integrated seat and cover (K-4678) and* **Pillow Talk** *bidet (K-4858) in Black Black with integrated cover (K-4638). One-piece, elongated bowl toilet. Taboret™ bidet faucet (K-8244) in polished chrome.*

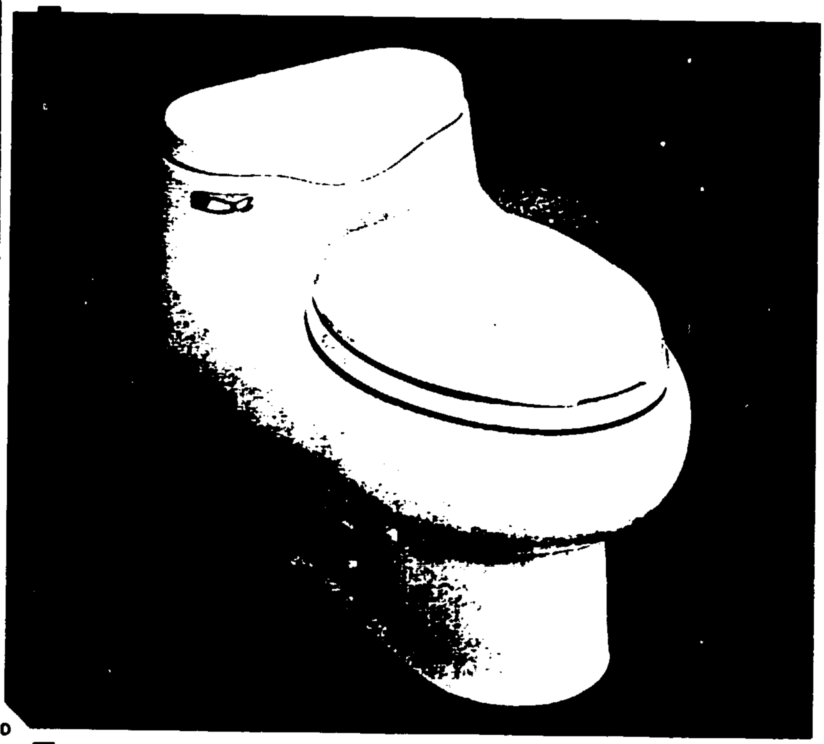


Watersilk™ Whirlpool *(K-1384) 72" x 48" x 23" in Tender™ Grey. Acrylic reinforced with fiberglass. Featuring the Kohler Whirlpool System 8 independently adjustable jets (K-9698) for air and water, self-draining whirlpool pump with high and low speeds, flush-mount control actuator, low-water electrical shut-off, 20-minute safety shutoff, hair entrapment safety shutdown, and rigid PVC recirculating harness. Choice of colored trim or brass trim in six metal finishes. Lumbar back supports at both ends, and integral arm and head rests. Designed to accommodate two people. UL Listed. Polished chrome trim. Alterna™ deck-mount bath faucet (K-6926) with white ceramic insets and Crescent spout (K-6915), high volume Clearflo™ drain (K-7167) in polished chrome. Watersilk Whirlpool available with heater (K-1384-H).*



C

C San Miguel™ Water-Guard® (K-3406-EB) in French Vanilla® with French Curve™ seat and cover (K-4653) and **San Tropez™** bidet (K-4863) in French Vanilla. One-piece elongated toilet. Operates with 3.5 gallons of water at any pressure. Available with Insuliner® tank lining. Bidet also complements many other Kohler toilets. Antique™ bidet faucet (K-142-R) with vacuum breaker in polished gold.



D

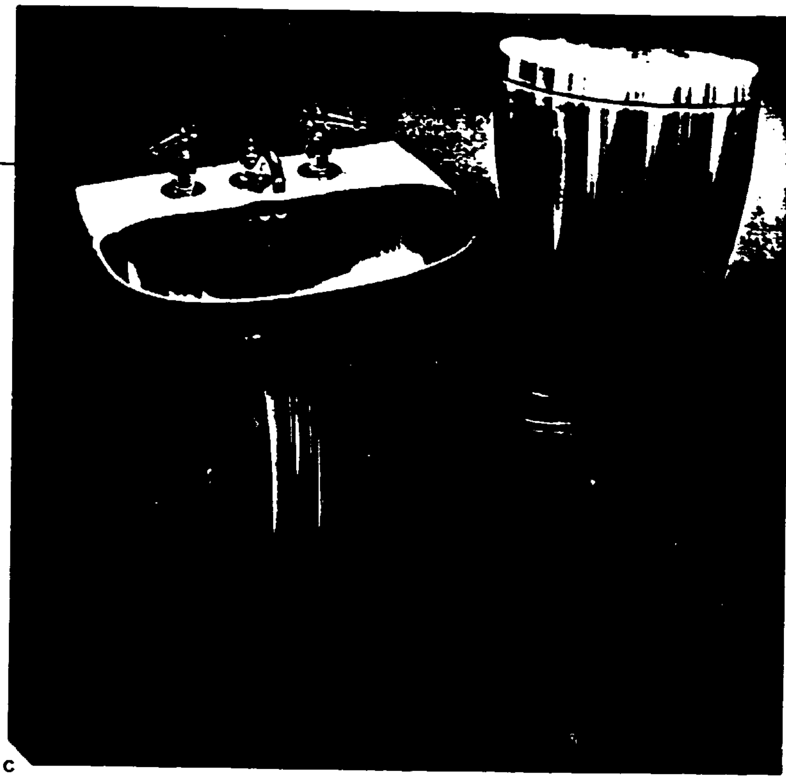
D Cabernet™ Water-Guard® (K-3408-EB) in Innocent Blush™ with French Curve™ seat and cover (K-4653). One-piece low profile toilet with elongated bowl. Operates with 3.5 gallons of water.

A **Serpentine™** by Jan Axel. Adventurous contours and smooth texture enliven the semi matte finish. Toilet (K-14112), pedestal lavatory (K-14113). Shown with Bravura™ faucet and Crescent spout (K-6847) in polished gold.

B **Tic Wicker™** by Art Nelson. An orderly array of rectangular shapes create movement. Toilets (K-14110/K-14110-0-58), pedestal lavatories (K-14105/K-14105-0-58) in Tender™ Grey/White and Thunder™ Grey/Black Black™. Shown with Cygnet™ faucets (K-6762-XL) in White and Black.

C **Northern Lights™** by William Metz. Luminescent gradations of color create flickering movement. Toilet (K-14128), pedestal lavatory (K-14126). Shown with Antique™ faucet (K-108-R) in polished chrome.

D **Sentimenti™** by Patricia Ancona. Lively motifs and pastel colors play on a field of Innocent Blush™ Toilet (K-14100), pedestal lavatory (K-14097), lavatory (K-14099). Shown with Antique™ faucets (K-108-R) in brushed chrome with vitreous china inserts (K-9637) in Innocent Blush™



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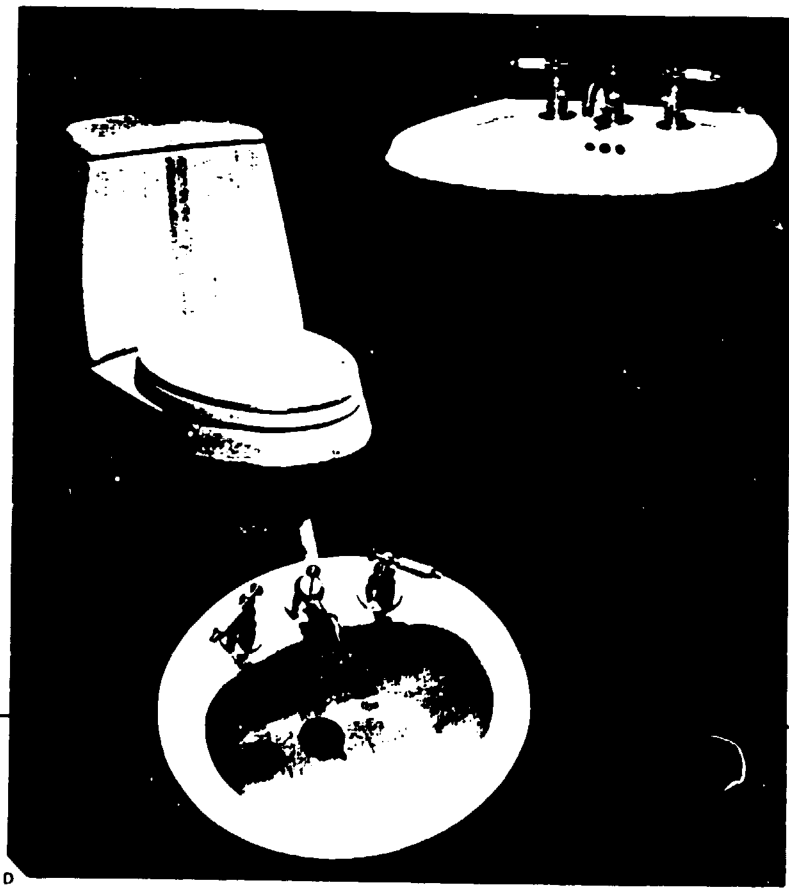

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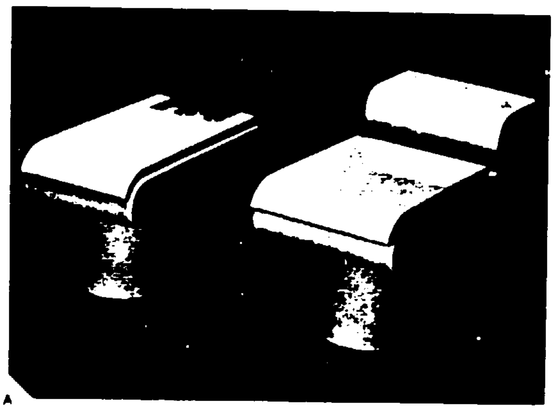
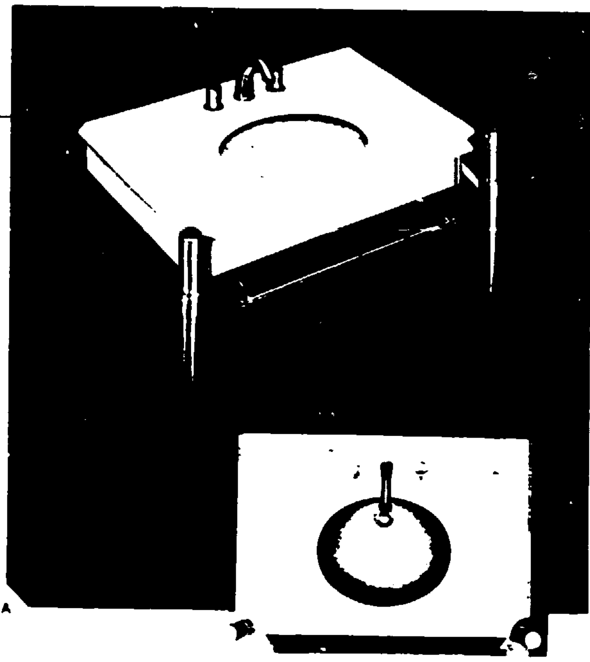


▲

Pillow Talk™

An opulent signature of contemporary bath fashion. Crafted in vitreous china, Pillow Talk's stylized geometric designs are distinctly modern.

▲ **Pillow Talk** toilet (K-3378-EB) in Tender™ Grey with integrated seat and cover (K-4678) and **Pillow Talk** bidet (K-4858) in Tender Grey with integrated cover (K-4638). One-piece elongated bowl toilet. Taboret™ bidet faucet (K-82[illegible]) in polished chrome.



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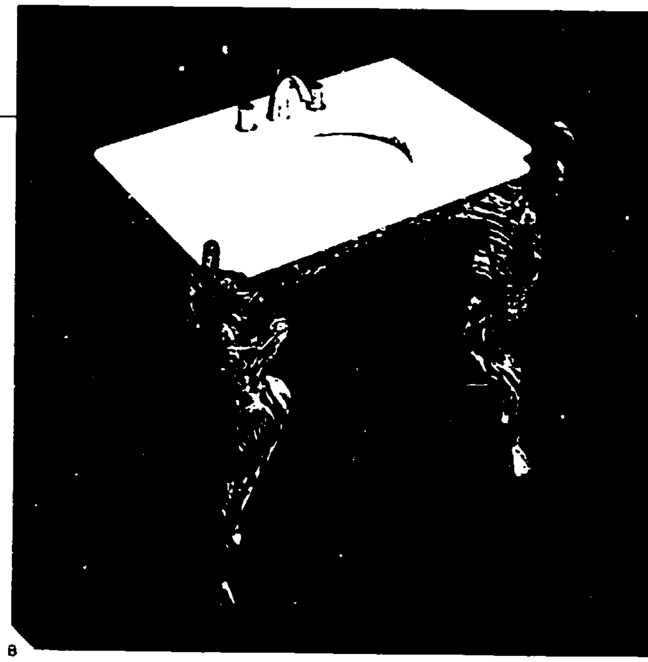

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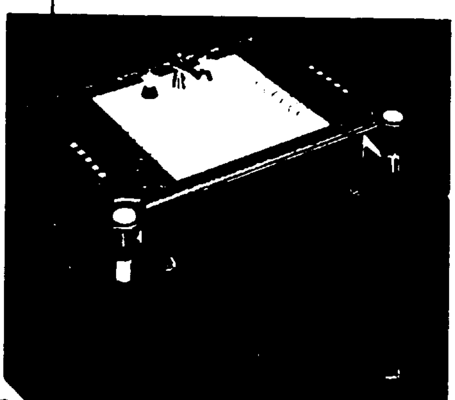

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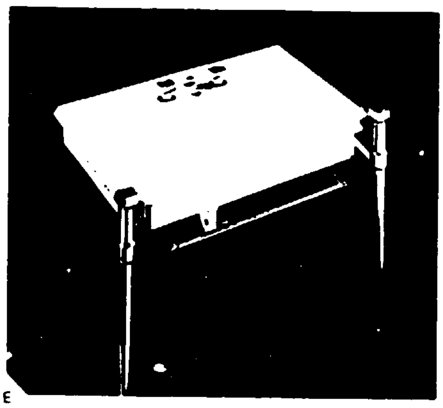
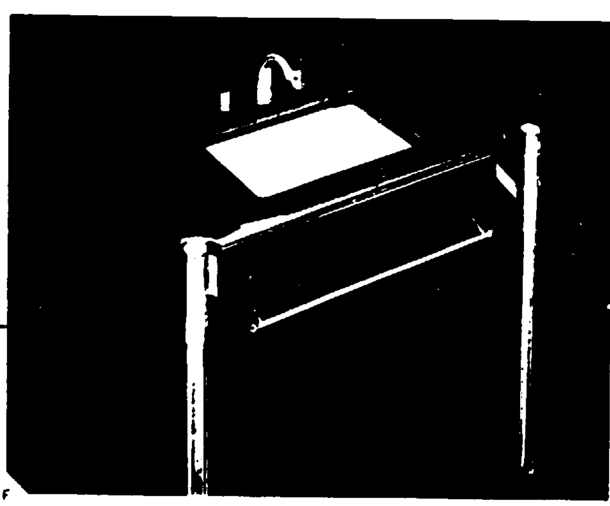


E

Kohler® Console Tables

Beyond mere form and color. Starkly appealing in their simplicity Kohler console tables. Tops of softly contoured vitreous china, or strikingly rich marble, or Minralite™, a granite like material that is durable and handsome. With leg styling to match Kohlers Cygnet™, IV Georges Brass™, Alterna™, Colibri™ and Bellamonte™ lines, or unique sculptured Uccello™ bronze bird legs. Soothing tones or dramatic accents for your bath, powder room or dressing room. Beautifully simple



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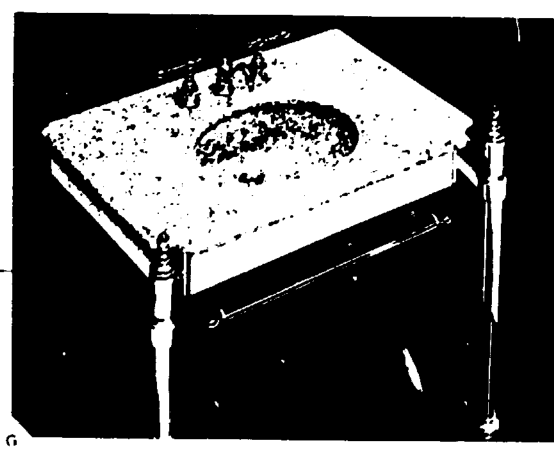
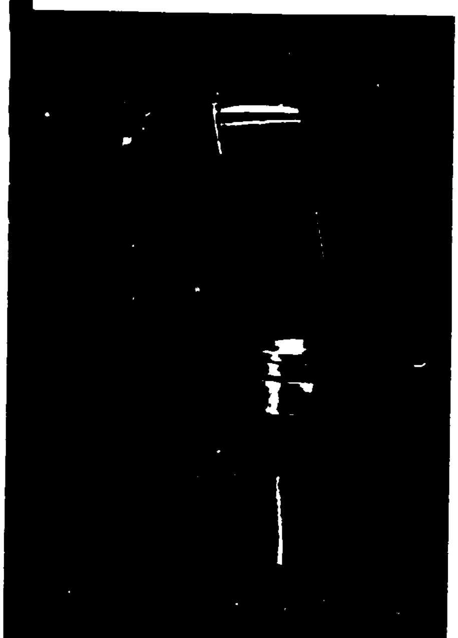


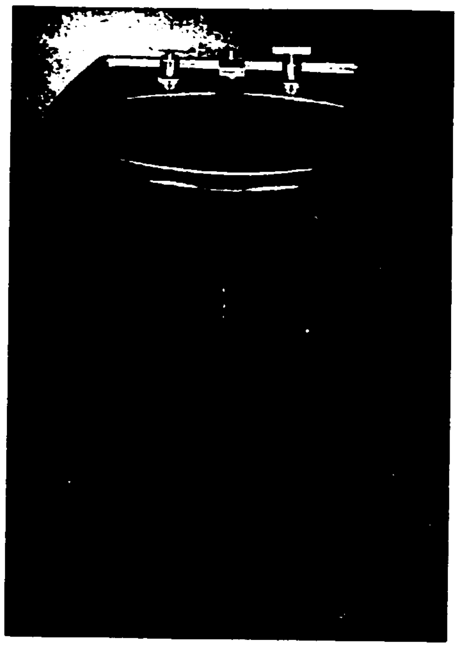
G

Desert Bloom™
A new pastel shade that creates images of desert sunsets and softly glowing sand dunes. A beautiful new color for subtle but dramatic effects. ***Steeping Bath™*** *Whirlpool (K-792) in Desert Bloom™ with Bravura™ bath valve (K-6840) and spout (K-6834).*

Wild Rose™
A popular bath color, this rosy hue now adds its delightful and sophisticated appeal to the kitchen. ***Entertainer™*** *(K-6554) in Wild Rose with Coralais™ Multi-Swivel™ bar sink faucet (K-15279).*



Terra Nueva™
The color of sun-baked clay. Capture the earthen hue of old fashioned pottery. A matte finish that is uniquely suited to textured materials: rattan, wicker, and woven wood. ***Wellington™ Water-Guard® Toilet*** *(K-3415-EB) in Terra Nueva™ with French Curve™ seat and cover (K-4653).*



Chablis™ pedestal lavatory
(K-2138 2142) in Terra Nueva™ with Taboret™ faucet (K 8241).

Artist Editions
Designed expressly for Kohler Co. by leading ceramic artists. Lavatories and toilets lavished with colors, patterns and textures that capture a mood, express an emotion. A daring, stylish and luxurious departure from the ordinary. Each impressive Artist Editions design opens up unique decorating possibilities. Choose either a lavatory or toilet for a subtle impression — a matching set for bold impact.

A **Serpentine™** by Jan Axel. Adventurous contours and smooth texture enliven the semi-matte finish. Pedestal lavatory (K-14113) 24" x 19" x 33," toilet (K-14112). Shown with Bravura™ faucet and Crescent spout (K-6847) in polished gold.

A

B **Pic Wicker™** by Art Nelson. An orderly array of rectangular shapes create movement. Pedestal lavatories (K-14105/K-14105-0-58) 22" x 18" x 32¾," toilets (K-14110, K-14110-0-58) in Tender™ Grey/White and Thunder™ Grey/Black Black™. Shown with Cygnet™ faucets (K-6762-XL) in White and Black.

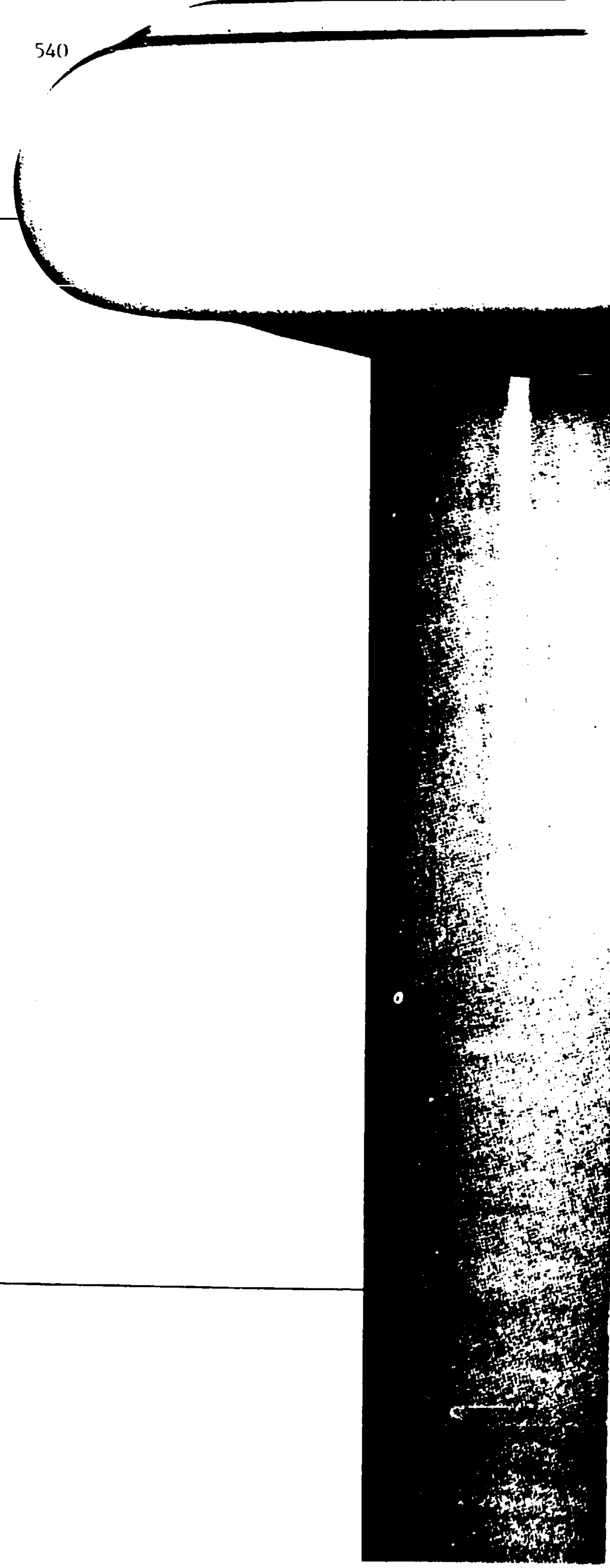
C **Sentimenti™** by Patricia Ancona. Lively motifs and pastel colors play on a field of Innocent Blush™. Pedestal lavatory (K-14097) 24" x 19" x 33," lavatory (K-14099) 20¼" x 17¼," toilet (K-14100). Shown with Antique faucets (K-108-R) in brushed chrome with vitreous china inserts (K-9637) in Innocent Blush™.

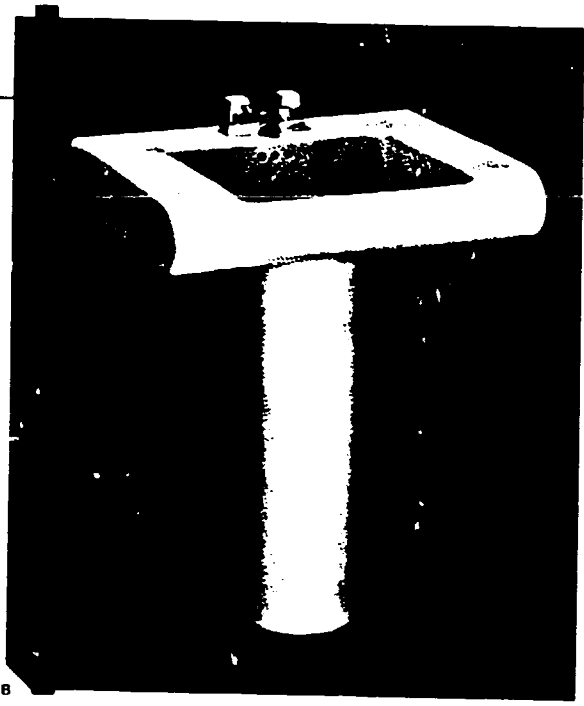
B

C

D **Northern Lights™** by William Mead. Luminescent gradations of color create flickering movement. Pedestal lavatory (K-14126) 22" x 18" x 32¾," toilet (K-14128). Shown with Antique™ faucet (K-108-R) in polished chrome.

D





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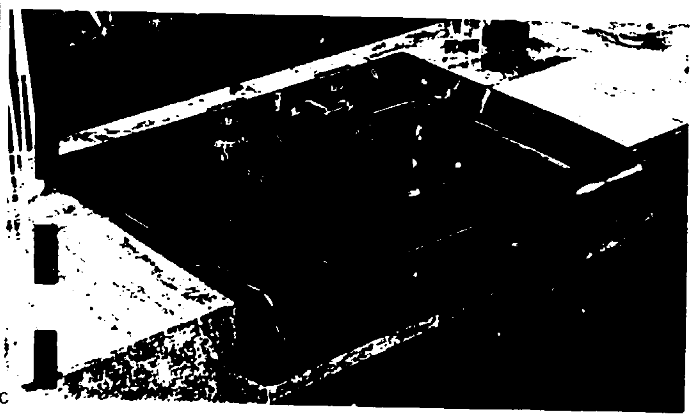

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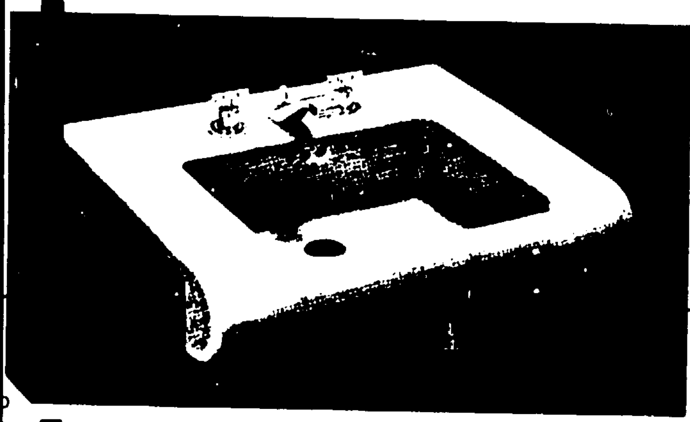

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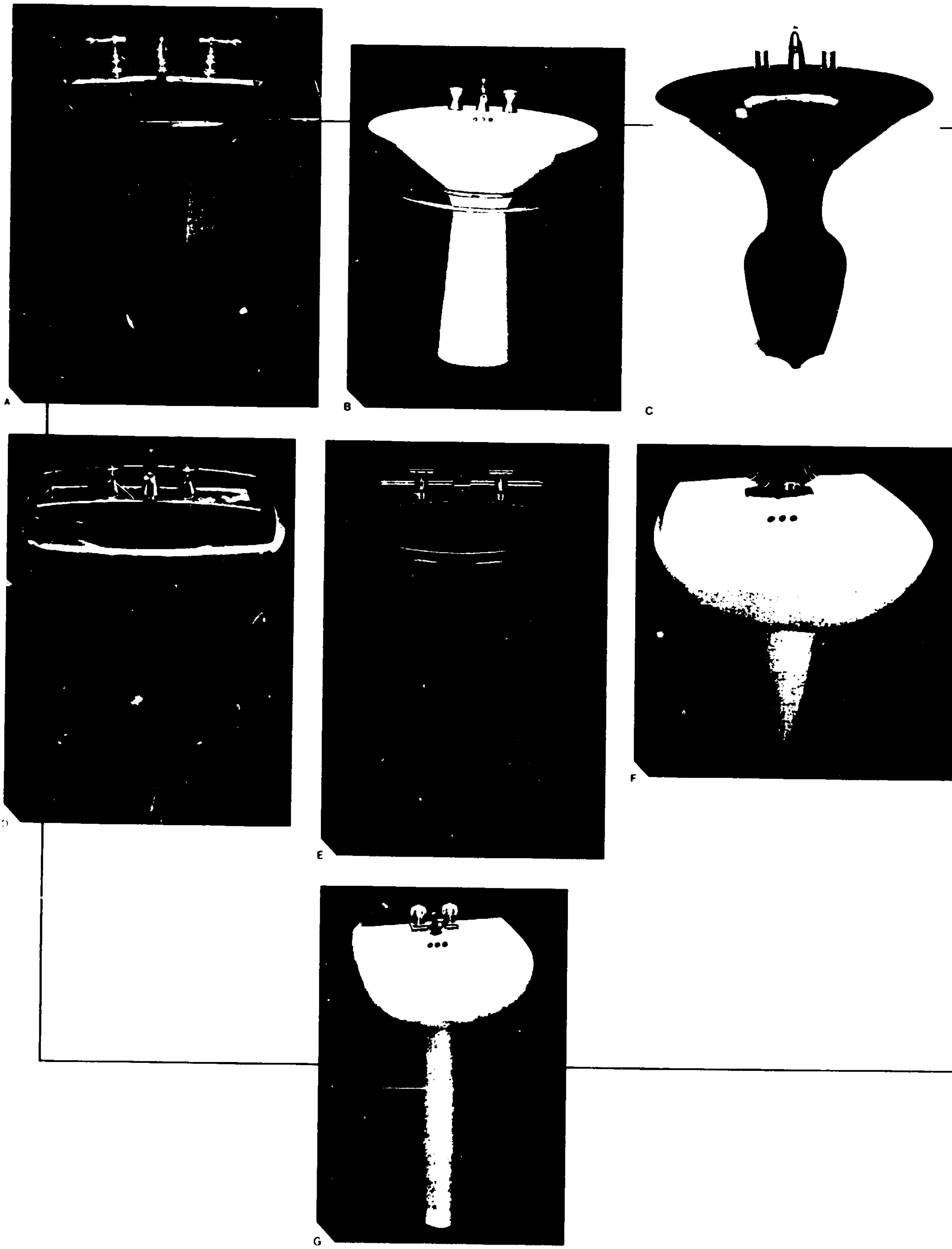
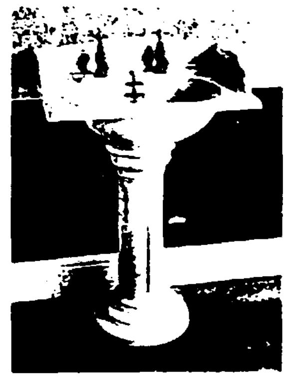

A
B
C
D
E
F
G

g) B.C. Sanitan Bathrooms, U.K.

VICTORIAN RANGE

Decorated sanitary-ware had its heyday in the Victorian Era. The tradition sprang from the 18th Century tubs and wash bowls which were usually decorated both inside and out. Victorian decorative ideas were often taken from nature, with birds, fishes and flowers as popular themes. Blue and white became the dominant colours, but multi-coloured patterns too found favour in many houses.
Patterns and colours were carefully chosen to complement the sometimes very elaborate shapes of the pieces. In some cases the work was so overwhelmingly ornate that nowadays probably only the most dedicated Victorian buffs would find them appealing. However, the vast majority of pieces had the classical elegance which is so sought-after today.
The B.C. Sanitan Victorian Range offers authentic shapes and patterns. Each piece is available in plain white, with or without the Sanitan logo in blue or brown (an important period detail), or with a charming design. This comes either in blue pattern or multicoloured – in which the dominant colour is the traditional sepia. The decoration is applied with a thin glaze to give the authentic effect.

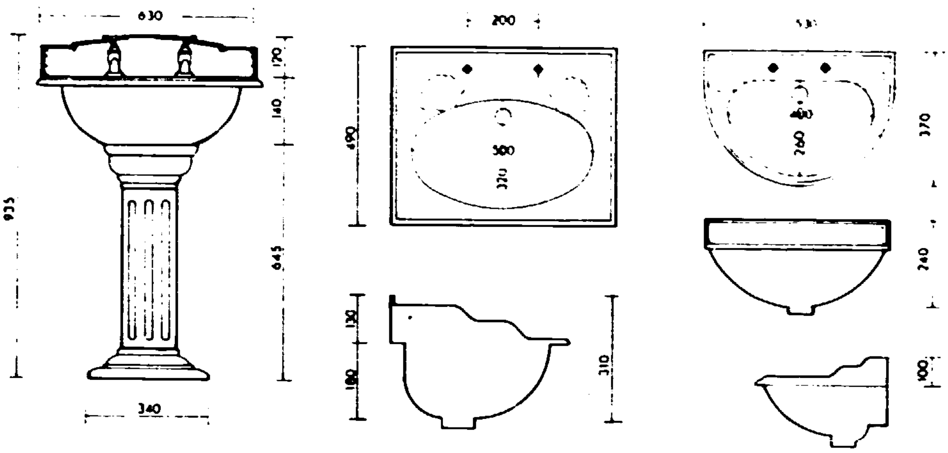


HAND BASINS

1. Basin and pedestal in multicolour 2. Small hand basin 3. Basin with blue logo.

LOW LEVEL CLOSETS

SPECIFICATION

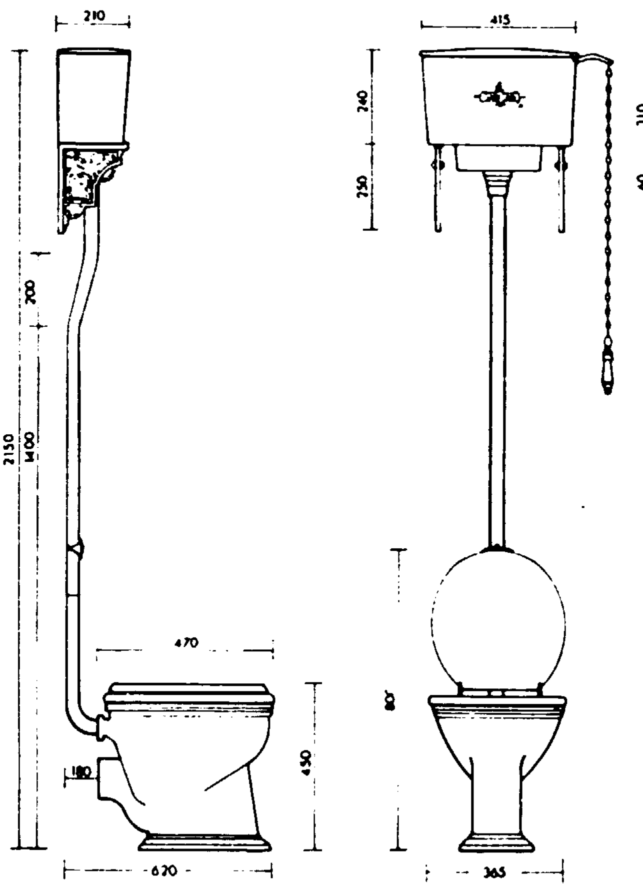


BASIN WITH PEDESTAL

Tap holes: 2 or 3
Fittings: Basin pillar taps or basin pillar mixer, basin waste.

SMALL HAND BASIN

Tap holes: 2
Fittings: as large basin.



CLOSET WITH HIGH LEVEL CISTERN

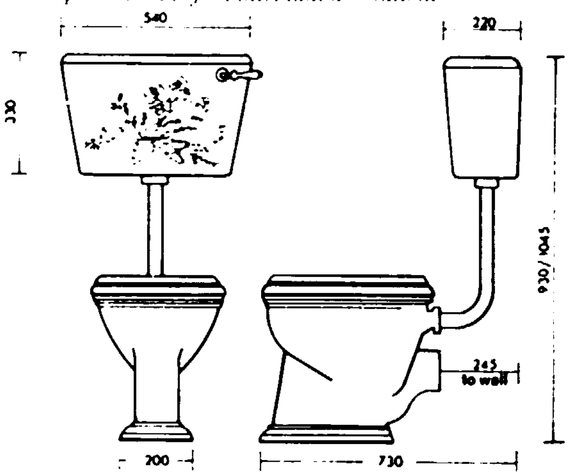
Fittings: ornate brackets, china pull handle and chain, high down pipe, shroud and clip,* mahogany seat.***

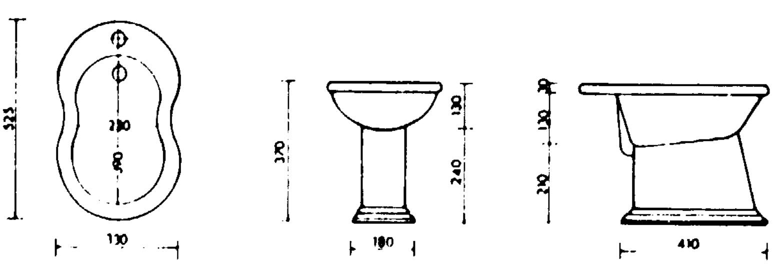
CLOSET WITH LOW LEVEL CISTERN

Fittings: china lever handle low down pipe* mahogany seat.***

* *These fittings are antique finish as standard but can be obtained in chrome finish.*

** *Seat hinges are plated in antique finish as standard. Seat is supplied light or dark mahogany, antiqued pine, or primed ready for individual decoration.*





BIDET

Tap holes: single
Fittings: monobloc bidet with pop-up waste.

BERKELEY

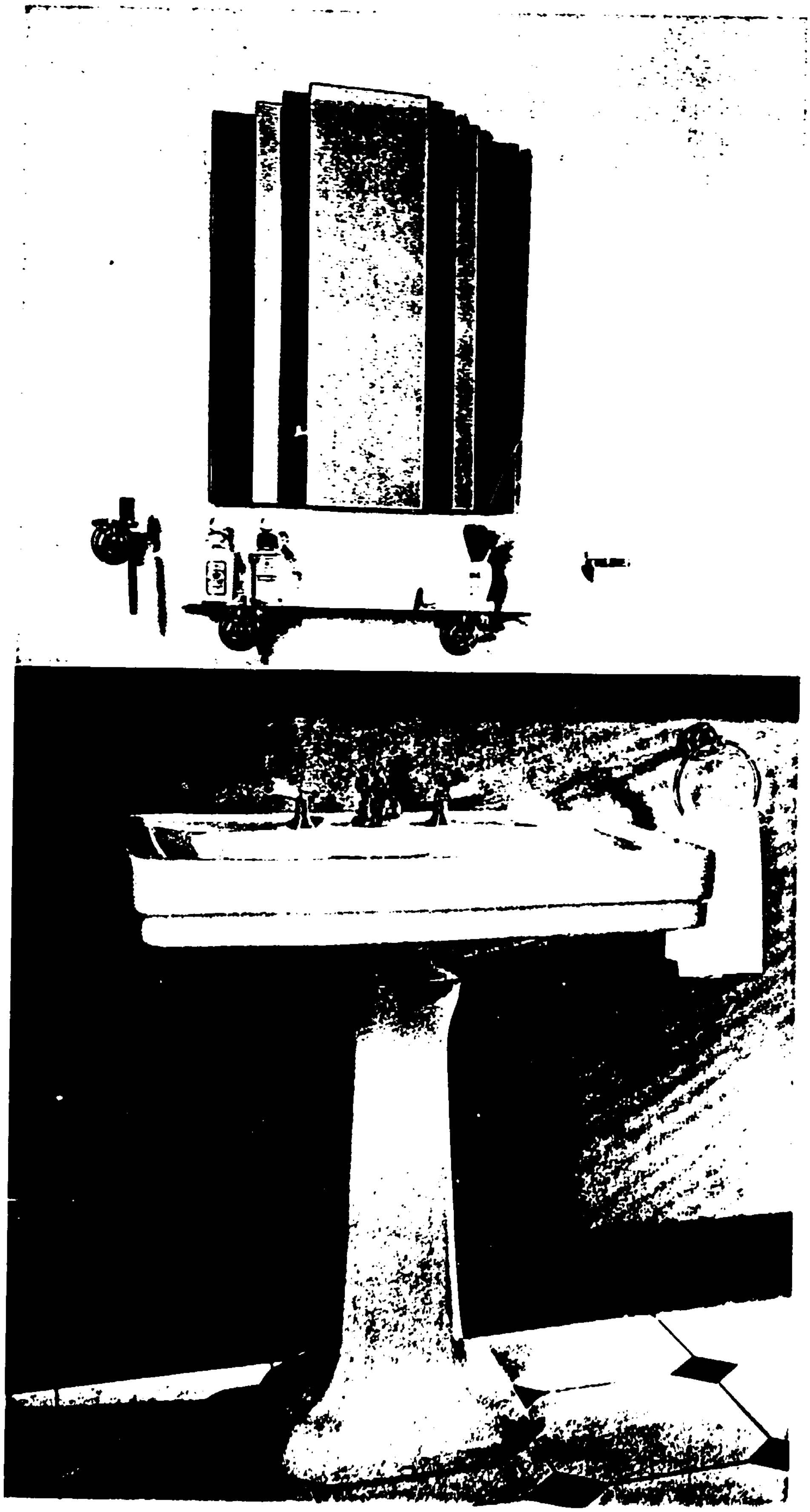
THE BERKELEY SUITE

The 1930's saw the establishment of a ...w, and radical, school of modern ...esign. One which set out to combine the most opulent of materials with the ...ost geometrically precise of lines. ...t and architecture joined forces and became almost indistinguishable. Steel, chrome and mirror-glass ...came fashion focal points.

...athroom design too entered this new era. The solid warmth of Edwardiana ...as replaced in favour of cleaner, more ...urist lines, and uncluttered spaces. One of the finest examples of this new look was chosen for the bathrooms of

London's magnificent Art Deco show-...ce, The Savoy Hotel. The Berkeley Suite is B C Sanitan's painstaking ...creation of that design.

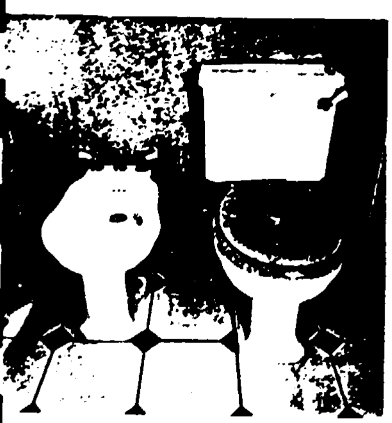
...shioned from original mouldings, ...e Berkeley Suite comprises a vitreous china basin and pedestal, close coupled closet and bidet, ...gether with a GRP bath. Authentic ...wn to the last detail, the look is completed by Art Deco lever taps, ...ramic floor tiles and chrome ...cessories – all available from the extensive B C Sanitan range.

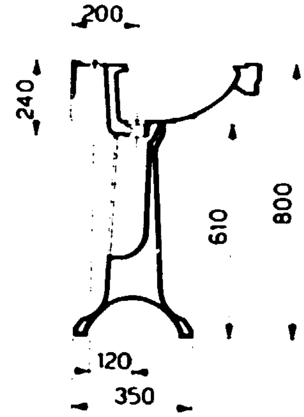


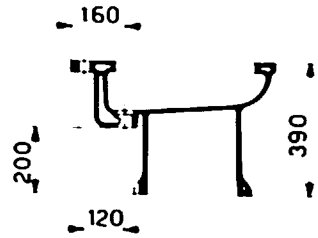
B·C
SANITAN

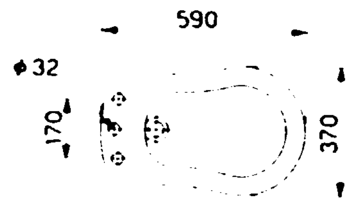
B·C SANITAN

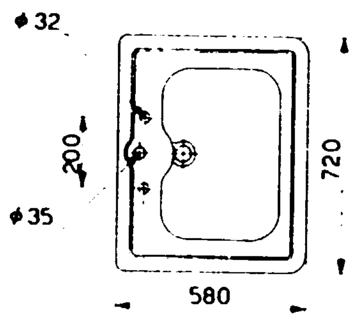
B C Sanitan, Britain's leading bathroom specialists, are famous for their attention to detail, such as the range of chrome accessories which includes Art Deco lever taps, glass shelving, towel rings and toothmug holders.
The ceramic floor is softly marbled and is available with contrasting ceramic and marble inserts. Marble inserts include green Fontaine, grey Bardighetto, pink Rosso, and terracotta coloured Asiago. Ceramic inserts available in black, brown and grey.

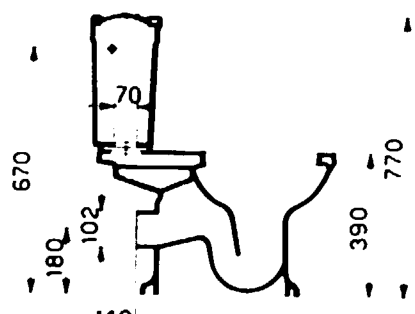


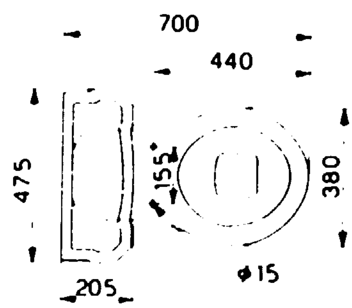






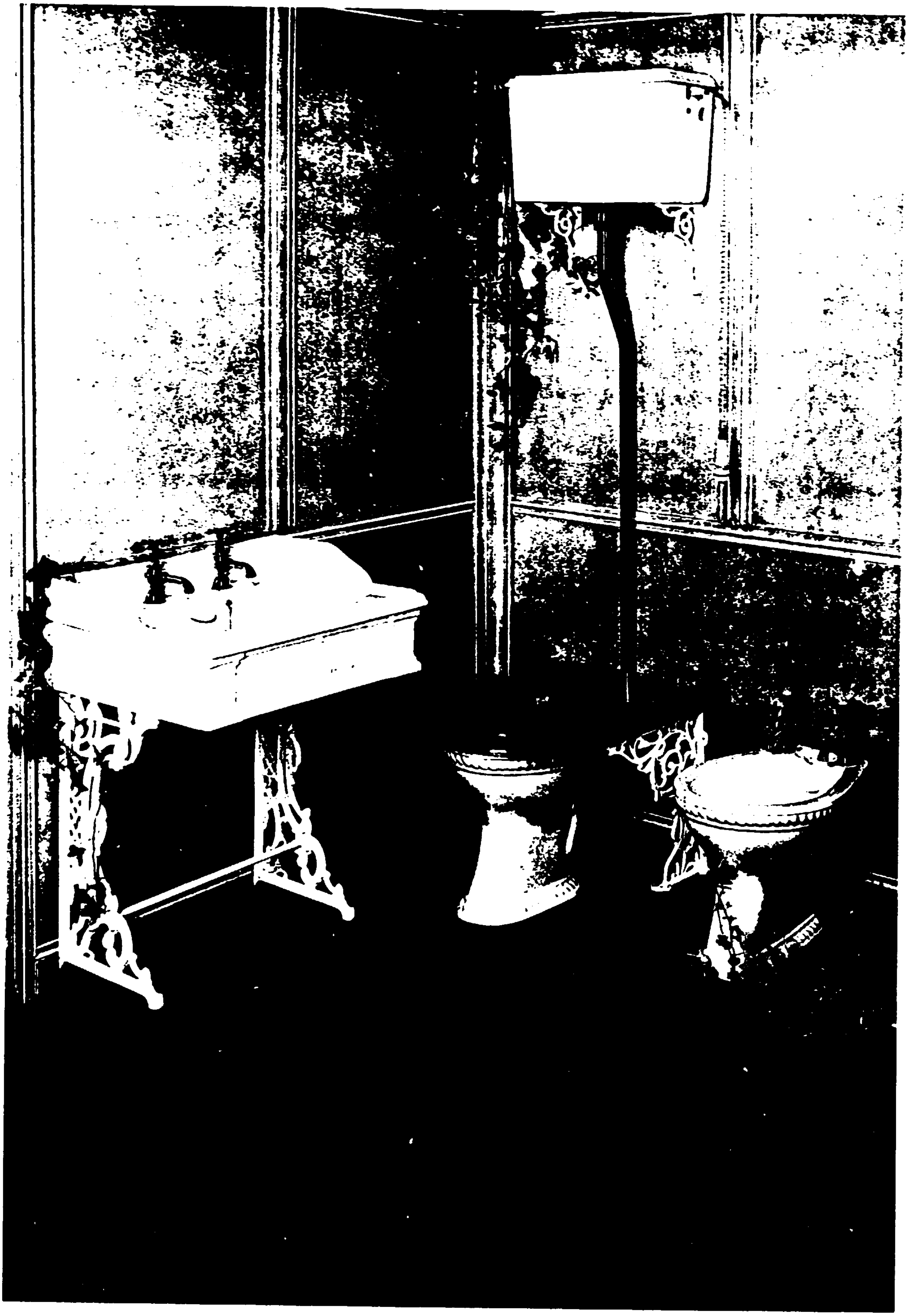






For details of your nearest B C Sanitan Studio, please telephone 0734 868900 or write to B C Sanitan 12 Nimrod Way Reading RG2 0EB

h) Heritage Bathrooms, U.K.

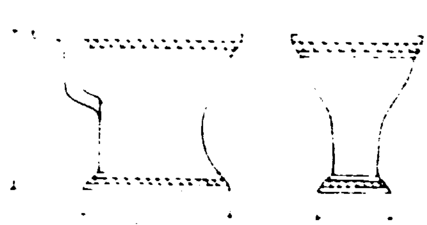


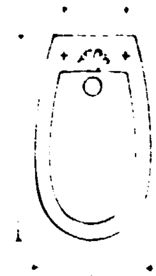
CLASSICAL WHITE

THE DELFT BLUE SUITE

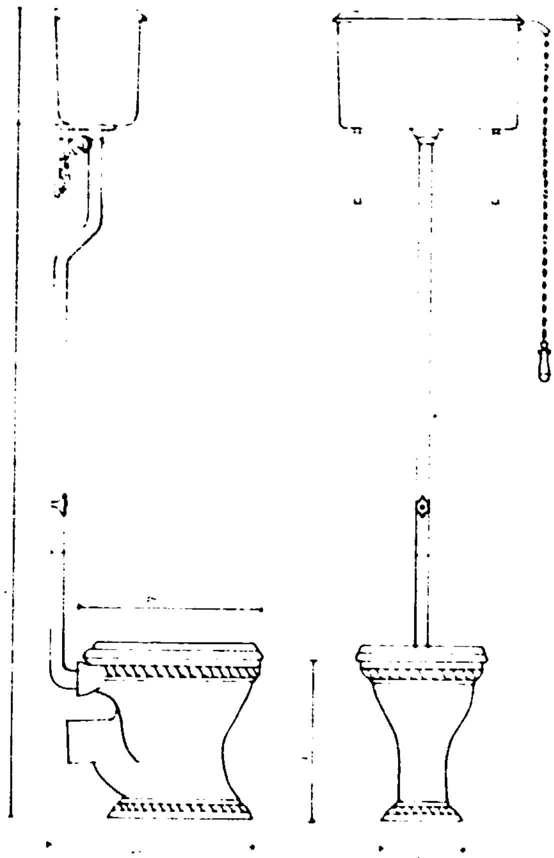
THE COUNTRY GARDEN SUITE

SPECIFICATIONS

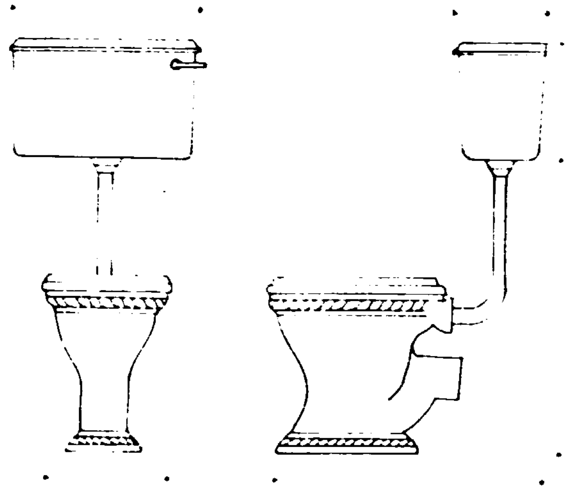




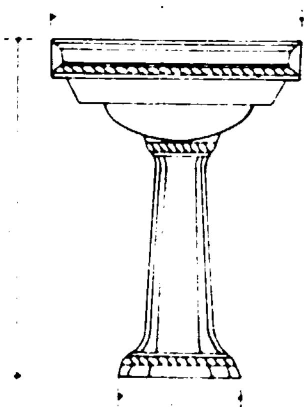
BIDET: 2 Tap Hole



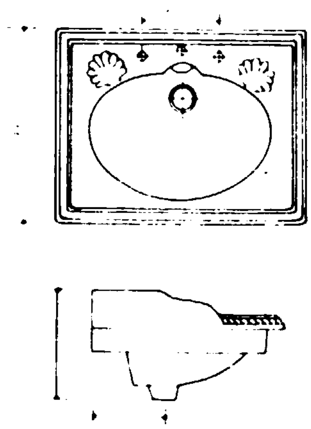
CLOSET WITH HIGH LEVEL CISTERN



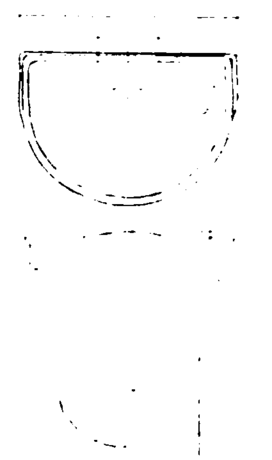
CLOSET WITH LOW LEVEL CISTERN



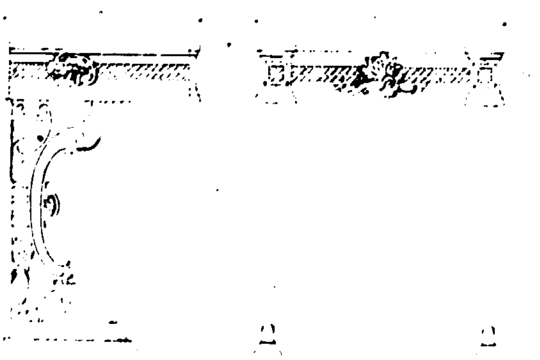
BASIN WITH PEDESTAL



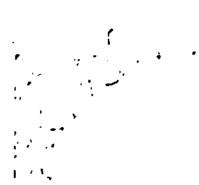
2 or 3 Tap Hole



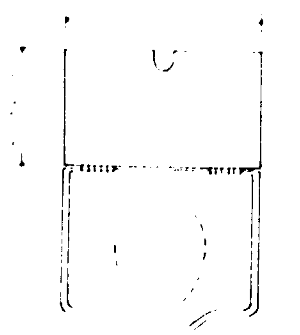
CLOAKROOM BASIN
2 Tap Hole



CAST BASIN STAND

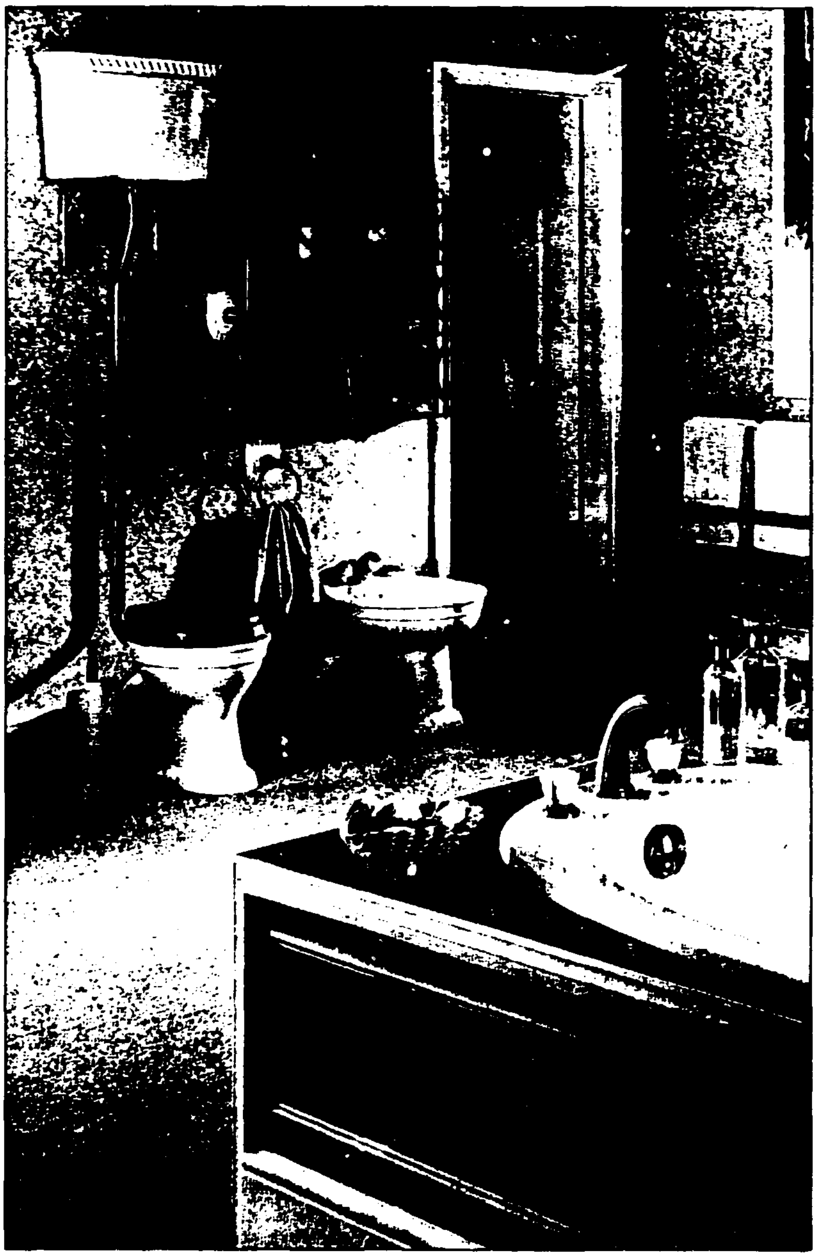


CAST BRACKETS FOR THRONE SEAT

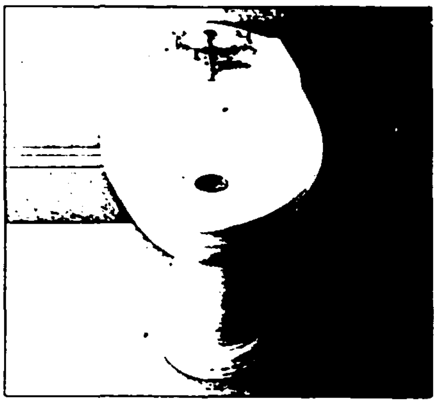


THRONE SEAT

i) Vernon Tutbury Bathrooms, U.K.



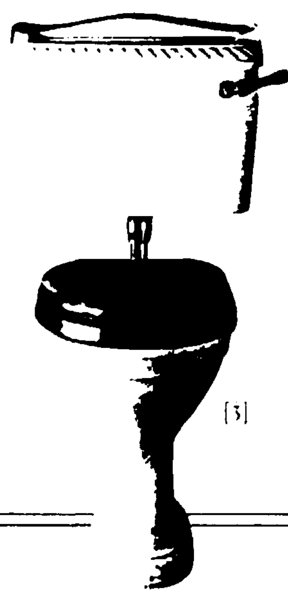
THE VINTAGE BATHROOM



Our master craftsmen, potters and cabinet makers have worked together to develop the understated elegance of the rope relief work that is a major decorative feature of Vintage.

Notice, too, their final flourishes: the Vernon Tutbury initials set into the feet of the freestanding Richmond cast iron bath ... the matching recessed vine leaf cartouches either side of the tap platform on the basin ... and a hand applied vine leaf detail in the centre of the back of the bidet and basin bowls.

Who would deny the creators of such classic pieces their added touches of flamboyance?



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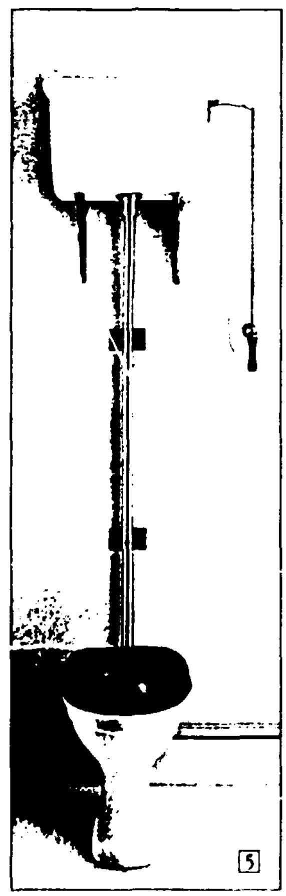


[5]

Vintage Bidet with [1] Vintage Single Hole Bidet Mixer.

Vintage Basin & Pedestal [2] with Vintage Pillar Taps.

Vintage W.C. & Low Level [3] Cistern.

Vintage W.C. & High [4] Level Mahogany Cistern with Ornamental Brackets.

Vintage W.C. & High [5] Level Ceramic Cistern with rope pattern motif.

THE COTSWOLD BATHROOM

Cotswold 65cm Wash [1] Basin on Pedestal with Isis Single Hole Basin Mixer.

Cotswold 45cm [2] Cloakroom Basin with Isis Single Hole Basin Mixer.

Cotswold Bidet with Isis [3] Single Hole Bidet Mixer.

Cotswold Washroom W.C. [4] with Barrel Cistern.

The Richmond Cast Iron [5] Bath shown here in White with Ceramic Feet. It is also available in exclusive Cotswold colours with matching Ceramic Feet or Brass Feet.

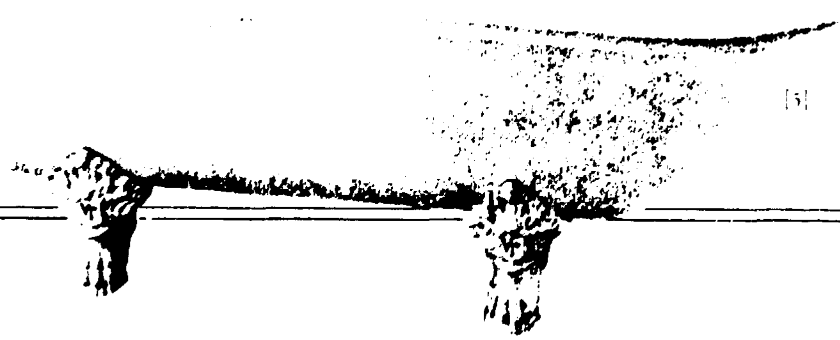
The accessories add eminently practical finishing touches. And, as with the Vintage bathroom, matching tiles are available in two sizes, plain or decorated with the appropriate motif, to complete the picture.

All the Cotswold items shown here are in delicate Muscadet – another colour available only in Vernon Tutbury bathrooms – teamed with the Pink Primrose floral motif.

Nothing has been overlooked in creating harmony throughout your Cotswold bathroom – and extending the theme into en-suite areas, bedrooms, cloakrooms and the like.

[3]

The brassware is carefully chosen to complement each piece, and besides our exclusive cast iron bath with its elegant brass, and decorated ceramic feet, there is a choice of complementary modern styles to consider.



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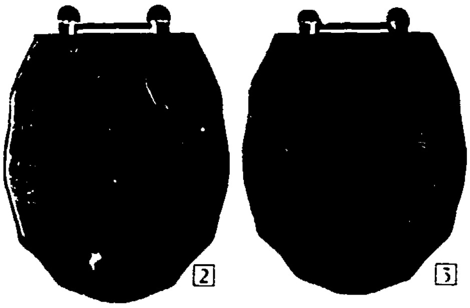

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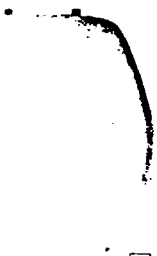
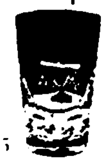


4

1 Cotswold Washdown W.C. with rectangular Box Cistern.
2 Pine finish Toilet Seat.
3 Mahogany finish Toilet Seat.
4 Muscadet Toilet Seat.

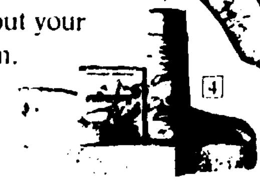
COTSWOLD ACCESSORIES

Cotswold provides all the accessories you could possibly need to complete your bathroom design. Vernon Tutbury offers the choice of both background shade and your chosen motif, to echo your interpretation of the Cotswold theme. The result is complete co-ordination, throughout your bathroom.



1

2



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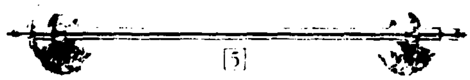

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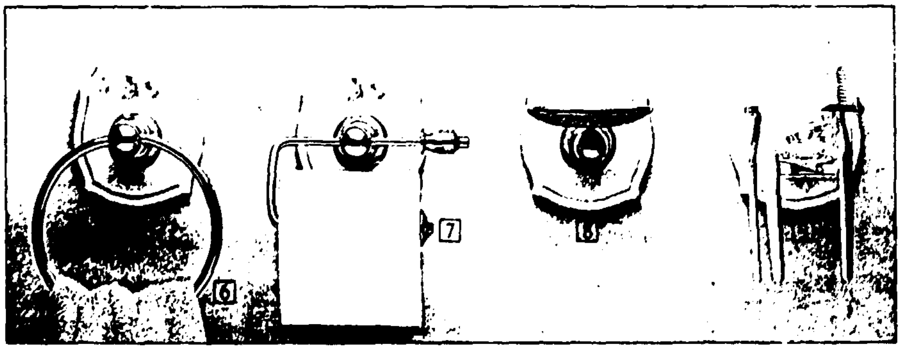


6 7 8

1 Cotswold Looking Glass.
2 Cotswold Loo Brush Holde
3 Cotswold Crystal Tumbler with Vernon Tutbury engraved initials.
4 Cotswold Shelf.
5 Cotswold Towel Rail.
6 Cotswold Towel Ring.
7 Cotswold Loo Roll Holder.
8 Cotswold Soap Dish.
9 Cotswold Toothbrush/ Tumbler Holder.

j) Armitage Shanks, U.K.

CHOOSE A SHAPE

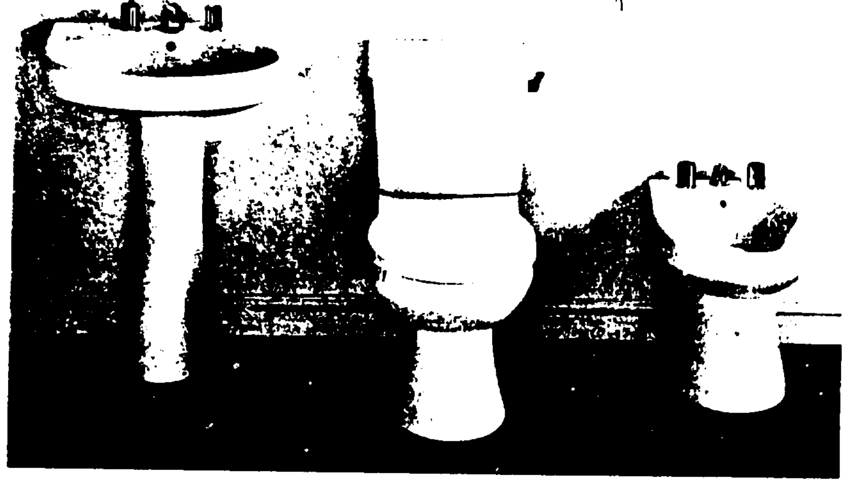
Choosing the shape of your suite calls for just as much careful consideration as is needed to decide upon a colour.

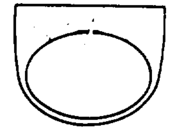
Its style has to complement your chosen shade and decor.

Available space must be taken into account, particularly if you have an irregularly shaped bathroom.

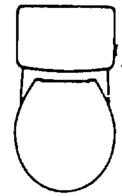
In the Armitage Shanks range of suites you'll find more than enough alternatives to satisfy all needs.

Each one has its own distinctive features. Designed to be practical and elegant.

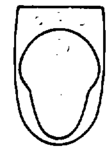




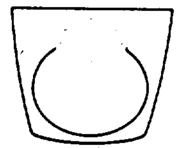
620 x 506mm



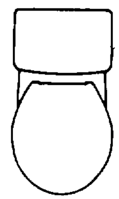
Syphonic Double trap
795 x 785 x 400mm
Wall to face of outlet 145mm



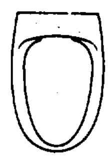
Bowl of douche supply
425 x 545 x 370mm



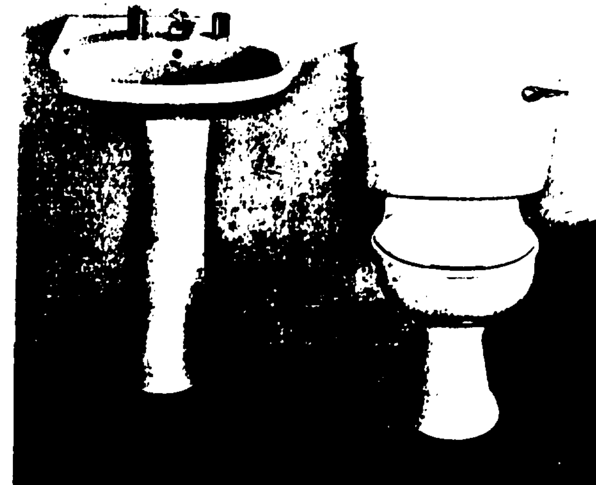
620 x 510mm

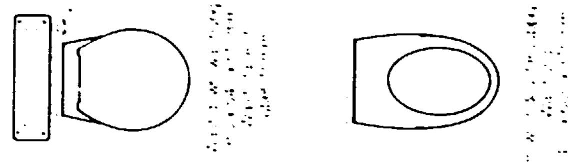


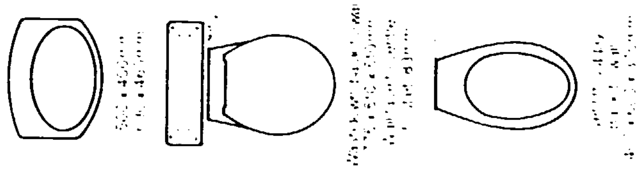
Washdown
790 x 765 x 400mm
Wall to face of outlet 150mm

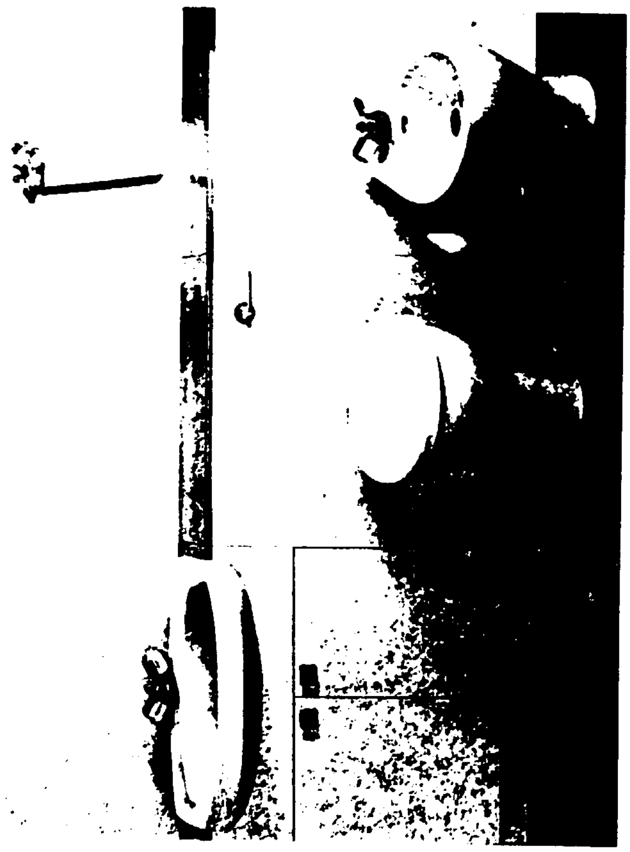


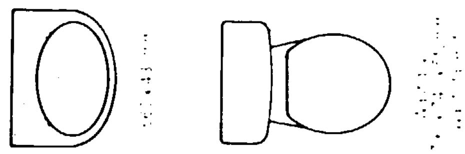
Bowl of douche supply
405 x 565 x 365mm

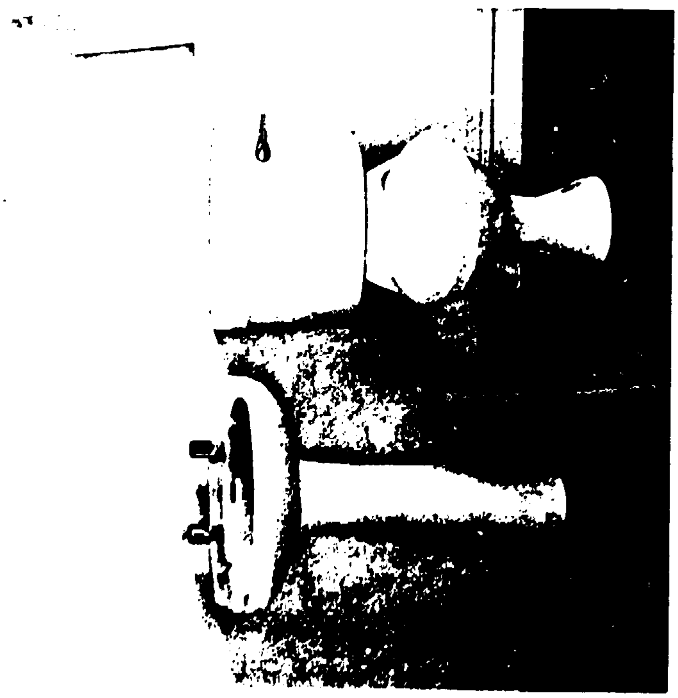


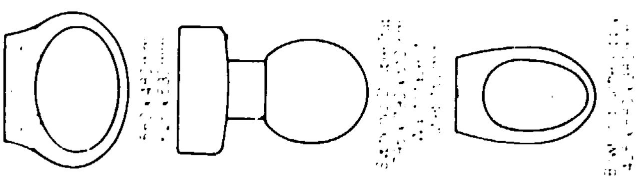


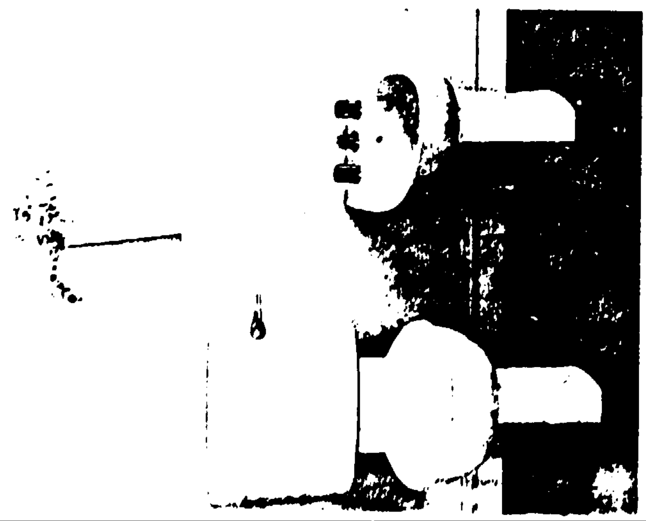


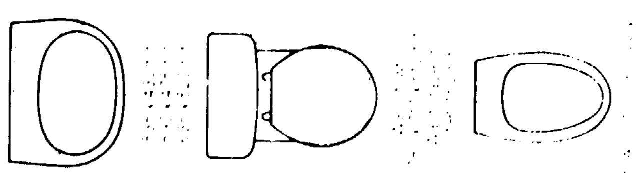


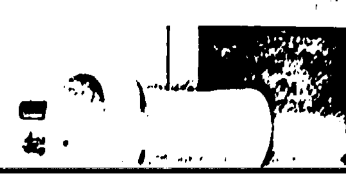


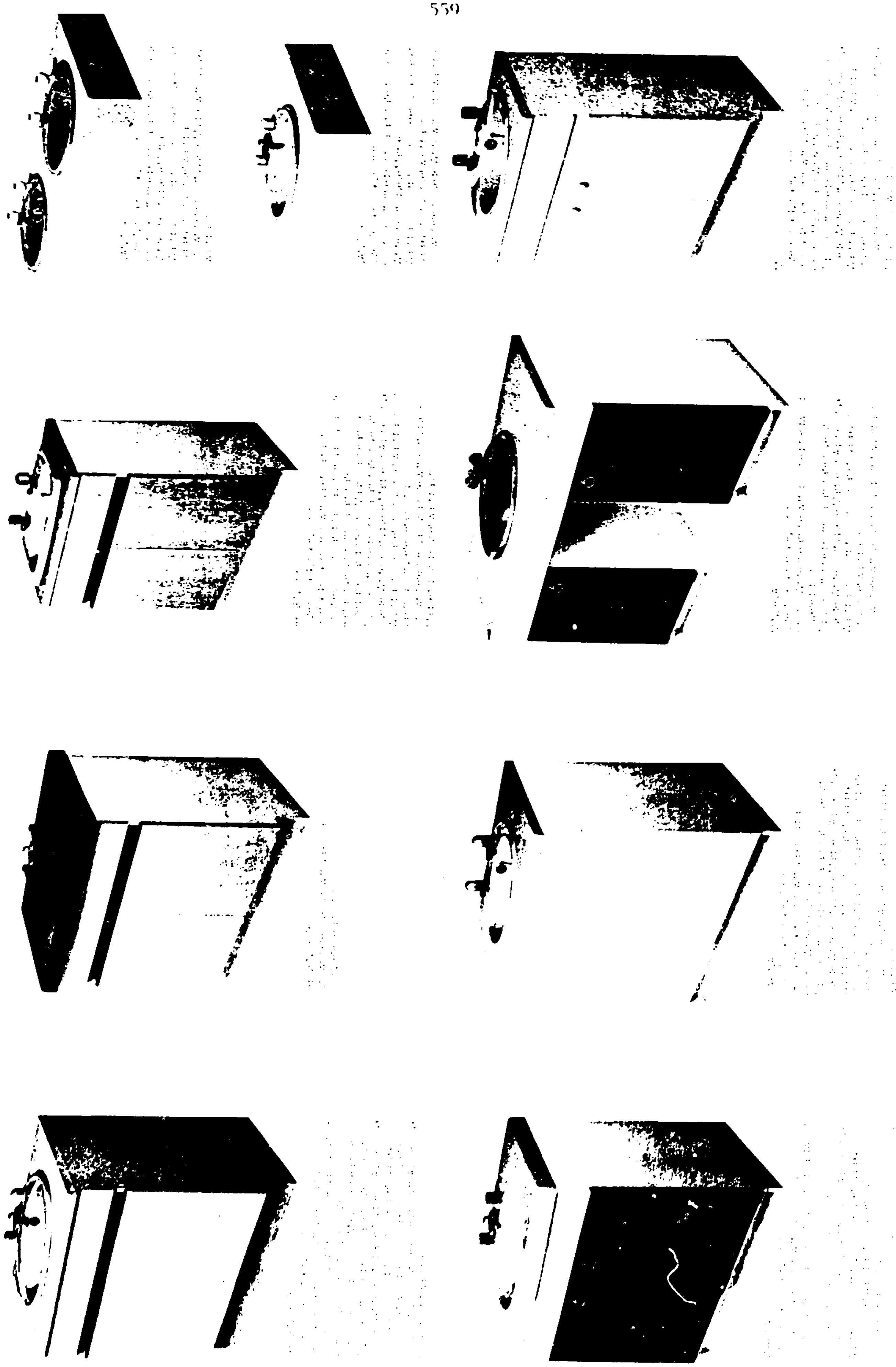






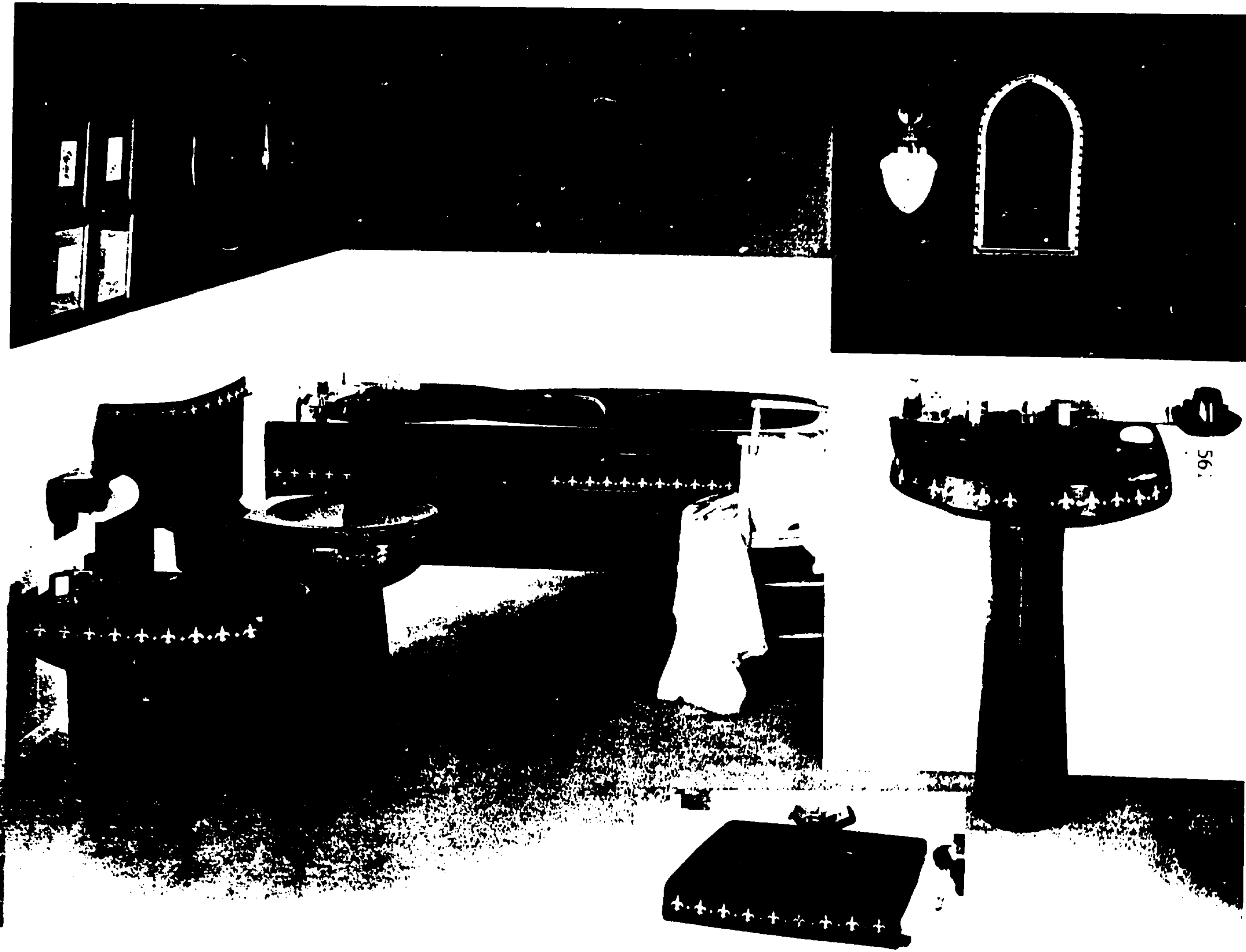






WILD SAGE

...OR CHOOSE A DECORATED SUITE



DAUPHINE

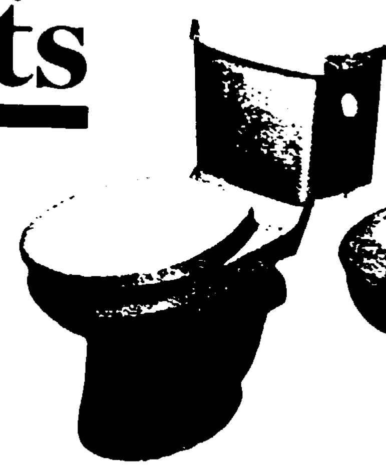
Wc's & Bidets

Armitage Shanks have such a wide range of quality w.c.s — there's bound to be one that's st for you.

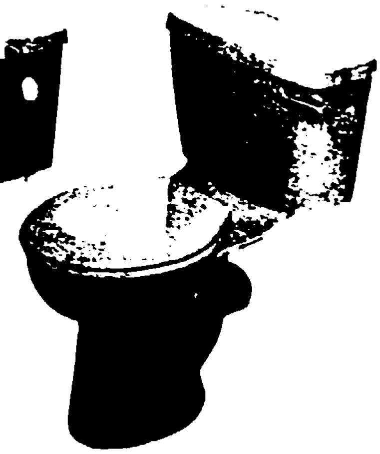
The close coupled w.c. is the modern stylish unit — the cistern is fitted directly onto the back of the bowl. Or you can hide the cistern in a duct, with either a floor or wall mounted w.c.

There are two actions to choose from — the traditional, economical washdown or, with noise a major consideration in modern planning, the quiet, efficient syphonic which works by suction as well as water flow.

Bidets, made to match our w.c.'s are an outstandingly practical addition to the bathroom — as is common knowledge on the Continent. Choose from over the rim supply, or rising spray, or the single parabolic spray.



CLARENDON
Syphonic Double trap
705 x 785 x 400mm
Wall to face of outlet 145mm
Shown here in Wild Sage



WENTWORTH
Washdown 780 x 710 x 510mm
Wall to face of outlet 150mm
Shown here in Pompadour

ARLTON
ashdown 790 x 785 x 400mm
all to face of outlet 150mm
Shown here in Sun King

KENSINGTON
Syphonic Double trap 795 x 790 x 510mm
Wall to face of outlet 150mm
Shown here in Sable

UNREGAL
Washdown 780 x 630 x 435mm
Wall to face of outlet 150mm
Shown here in Pampas

PROFILE
Syphonic Double trap back to wall
775 x 580 x 510mm
Wall face to centre of outlet 85mm
Shown here in Pacific Blue

WENTWORTH
Bowl or douche supply
405 x 580 x 380mm
Shown here in Champagne

PROFILE
Over rim supply back to wall
400 x 600 x 375mm
Shown here in Avocado

CONTOUR 2
Washdown back to wall
1070 x 520 x 510mm
Wall face to centre of outlet mm
Shown here in Wild Sage

ARLTON
ow or Douche supply
x 590 x 380mm
Shown here in Sable

BRAEMAR
Bowl or Douche supply
Wall hung 400 x 600 x 375mm
Shown here in Pompadour

KENSINGTON
Bowl or Douche supply
405 x 580 x 380mm
Shown here in Sun King

CLARENDON
Bowl or douche supply
425 x 585 x 370mm
Shown here in Pacific Blue

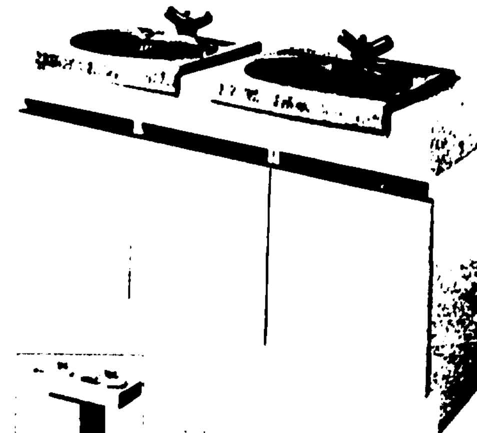
BRAEMAR
Washdown wall hung
540 x 510 x 510mm
Wall to face of outlet mm
Shown here in Champagne

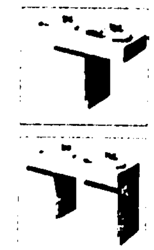
CHOOSE THE COMPLETE LOOK

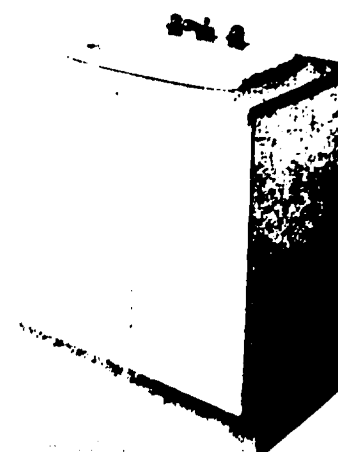
VANITY UNITS

[illegible] beautifully made vanity unit will coordinate with any of our bathroom suites, complement any bathroom and improve [illegible]

Our self-assembly vanity units have an extremely stylish way of being practical by offering lots of storage space whilst still creating a look of sheer elegance. Available in a variety of shapes, styles and sizes, they are easy to clean and offer you a wide choice of finishes, tops and basins.

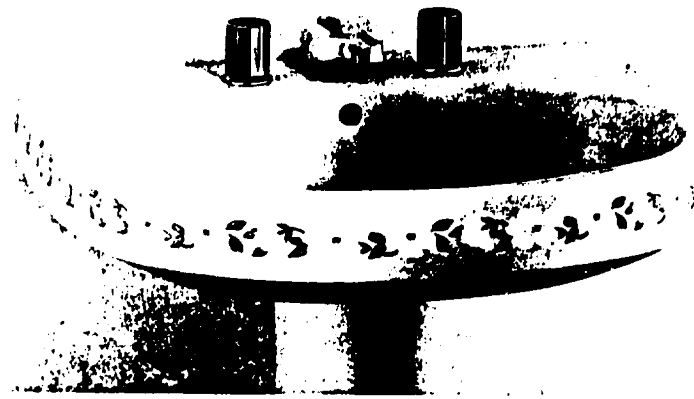




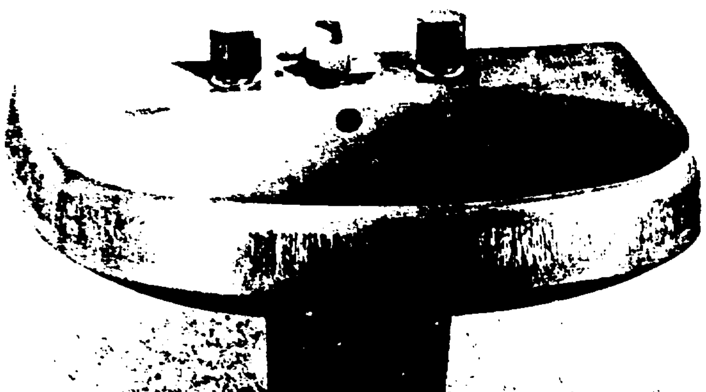


CAPRICE

SWEETBRIER



SHANGRI-LA



And here are three more Armitage Shanks decorated suites.

Caprice. A lovely floral border, complemented by a cool, crisp white, brings springtime to any bathroom.

And Sweetbrier. This exquisite garland of flowers breathes fresh air and an inviting warmth into the bathroom.

For those who want to do more than just dream of paradise, choose Shangri-la. A stunningly simple gold pattern that's a reflection of supreme bathroom quality.

The sensational shape of the Clarendon suite has been chosen to illustrate the attraction of Armitage Shanks patterns. And because the design is fired into the glaze, the appeal of Dauphine, Caprice, Sweetbrier and Shangri-la will be a lasting one.

You can also elect to have a Herculux vanity washbasin if you prefer.

There are several baths to complement the suite. The Montreux bath is featured with Dauphine but you can also choose from the Hawaii or Mirage corner baths, king-size Vermont, Sheraton shower bath, the relaxing Clarendon or the small but stylish Minto to complete your decorated bathroom.

Altogether, the exclusivity of the Armitage Shanks decorated range ensures you can have a bathroom that is entirely unique.

WC'S AND BIDETS

With such a wide variety of wc's to choose from there's little doubt you'll find the one that's best for you.

The close-coupled wc is the modern stylish unit with the cistern fitted directly onto the back of the bowl. Or you can hide the cistern in a duct, with either a floor or wall-mounted wc.

You also have two flushing actions to choose from — the traditional economical washdown or the quiet, efficient syphonic which works by suction as well as water flow.

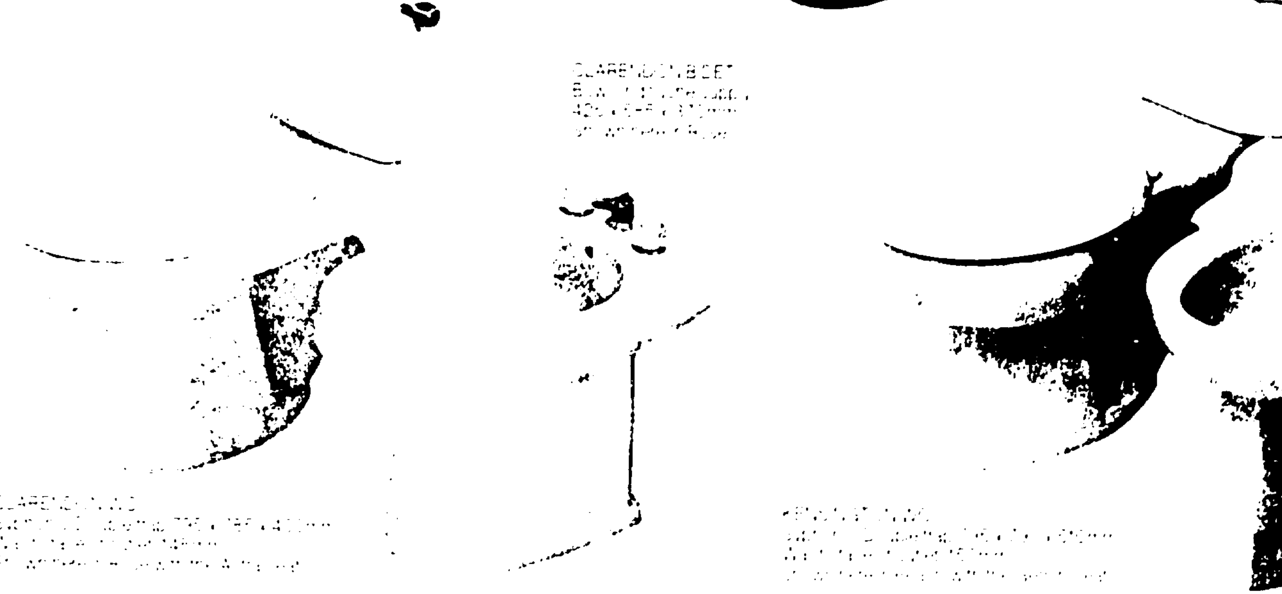
Bidets made to match our wc's are an outstanding practical addition to the bathroom — as is now readily accepted. Select from over-rim supply, rising spray, or the single pillar hole jet.

For wc's there are three different designs of seats in warm-to-the-touch plastics.

Stylish Astra that's removable for easy cleaning. Gemini, an elegant wrap-over seat and Orion, beautifully designed on traditional lines.

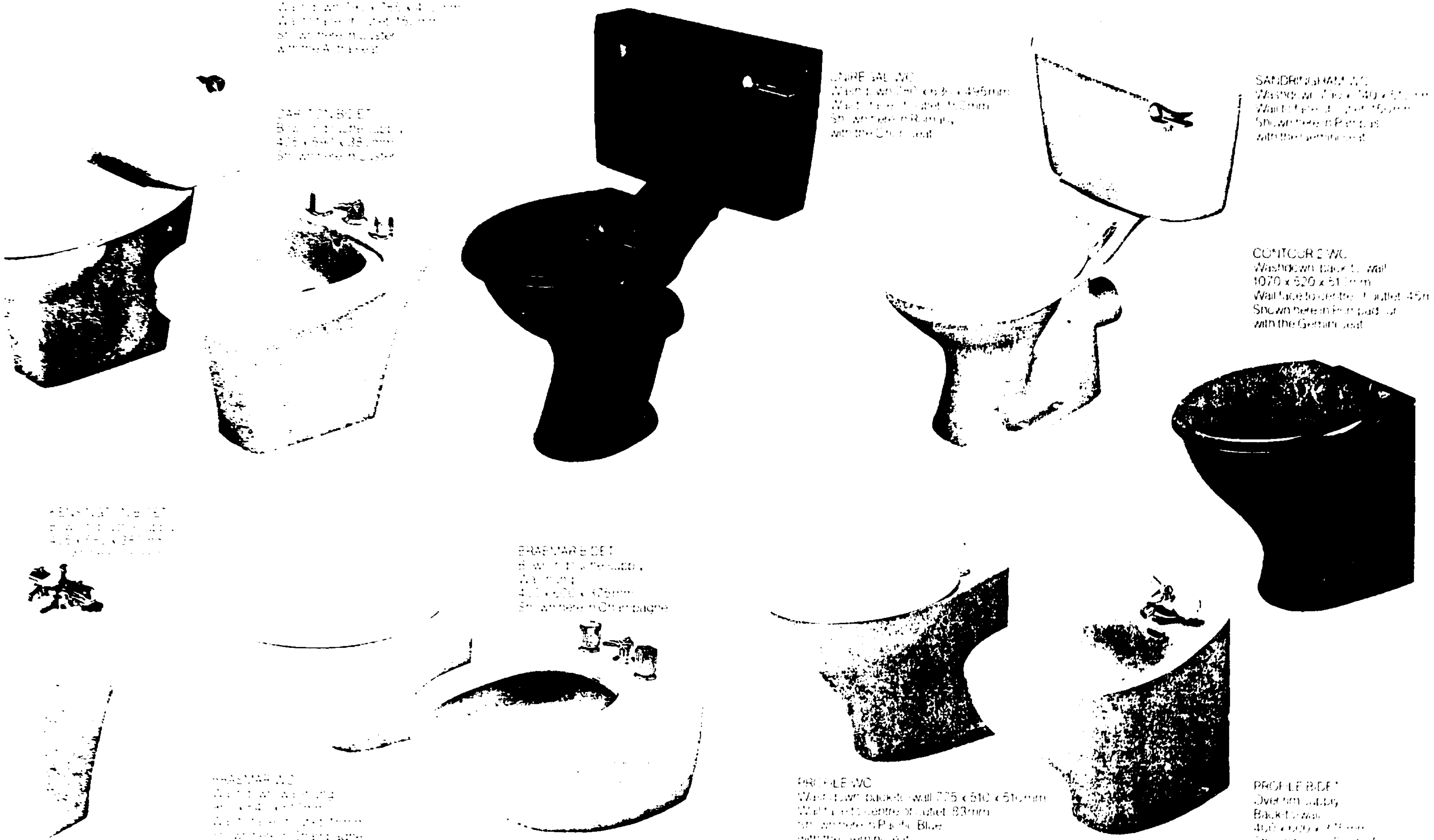
WENTWORTH WC

WENTWORTH BIDET



CLARENDON BIDET

CLARENDON WC



UNIREGAL WC

SANDRINGHAM WC
Shown here in Pampas

CONTOUR 2 WC
Washdown back to wall
1070 x 520 x 510mm
Shown here in
with the Gemini seat

BRAEMAR BIDET
Shown here in Champagne

PROFILE WC
Washdown back to wall 775 x 510 x 510mm
Wall face to centre of outlet 83mm
Shown here in Pacific Blue

PROFILE BIDET
Over rim supply
Back to wall
Shown here in Pacific Blue

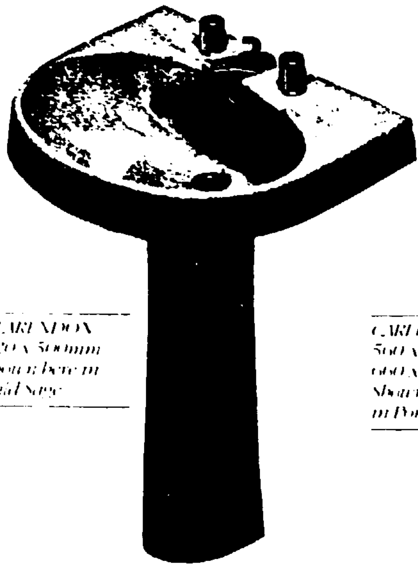
Washbasins

The washbasin is the most used item in the bathroom. So it makes sense to get one that is a useful size — or better still, to get two, to beat the morning rush hour.

As you can see, we make basins in all sorts of sensible shapes and sizes, including space saving cloakroom models, traditional pedestal basins and complete luxury vanity tops.

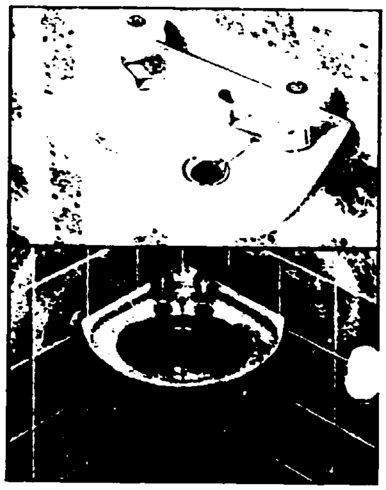
You can choose wall, pedestal or inset fixing, and don't forget to decide whether you want ordinary taps, single hole monobloc fittings or three hole mixers.

All our basins are easy to clean, and ceramic unless otherwise indicated.



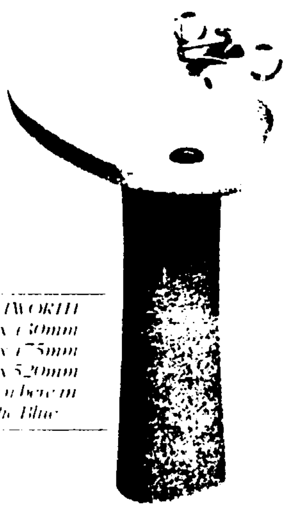
CLARENDON
[illegible]20 x 500mm
Shown here in
Wild Sage

CARLTON
560 x 455mm
660 x 565mm
Shown here
in Pompadour

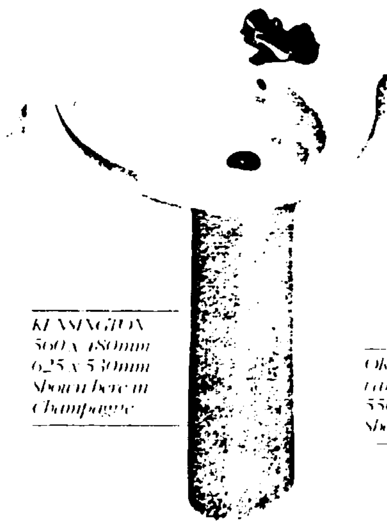


DOREN
Wall hung
365 x 255mm
455 x 285mm
Shown here in
Pacific Blue

COREN
Wall hung
455 x 405mm
Shown here in
Wild Sage

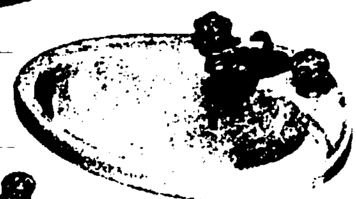


WENTWORTH
535 x 430mm
590 x 475mm
635 x 520mm
Shown here in
Pacific Blue



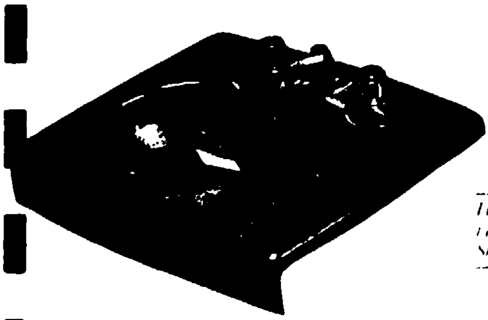
KENSINGTON
560 x 480mm
625 x 530mm
Shown here in
Champagne

SIRIUS
vanity basin in Acetal
500 x 400mm
Shown here in Sable



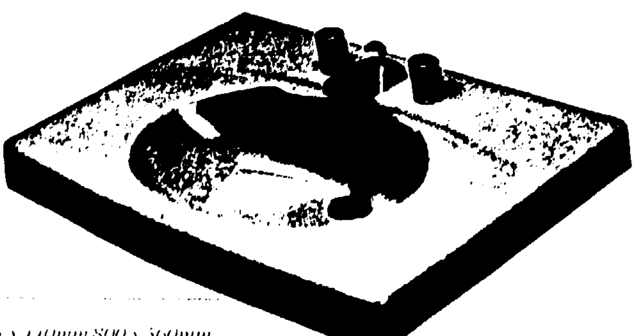
ORBIT
vanity basin
550 x 450mm
Shown here in Pampas

COSMOS
vanity basin
600 x 420mm
Shown here in Avocado



HERCULES
vanity basin 550 x 480mm
Shown here in Sable

PLANET
vanity basin
510 x 360mm
Shown here in
Pacific Blue

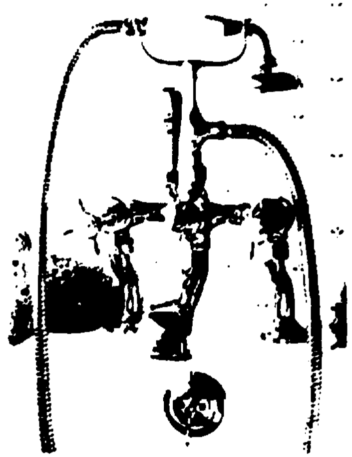


VALENCIA
vanity basin 635 x 440mm 800 x 560mm
Shown here in Sun King

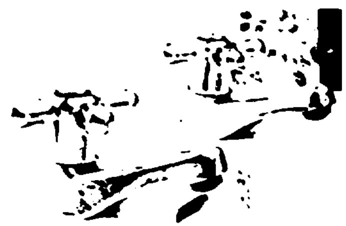
PROFILE
vanity basin
500 x 400mm
630 x 460mm
Shown here in
Pompadour

GALAXY
vanity basin in
Acetal
510 x 430mm
Shown here in
Champagne

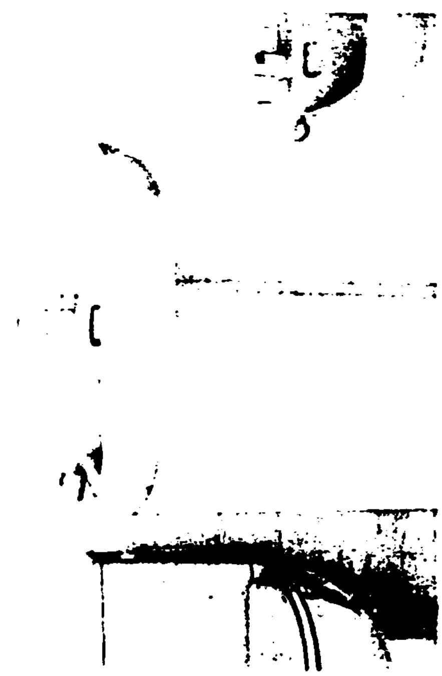
[illegible]



TWO UNIQUE DESIGNS IN TRADITIONAL BATHROOM LUXURY.



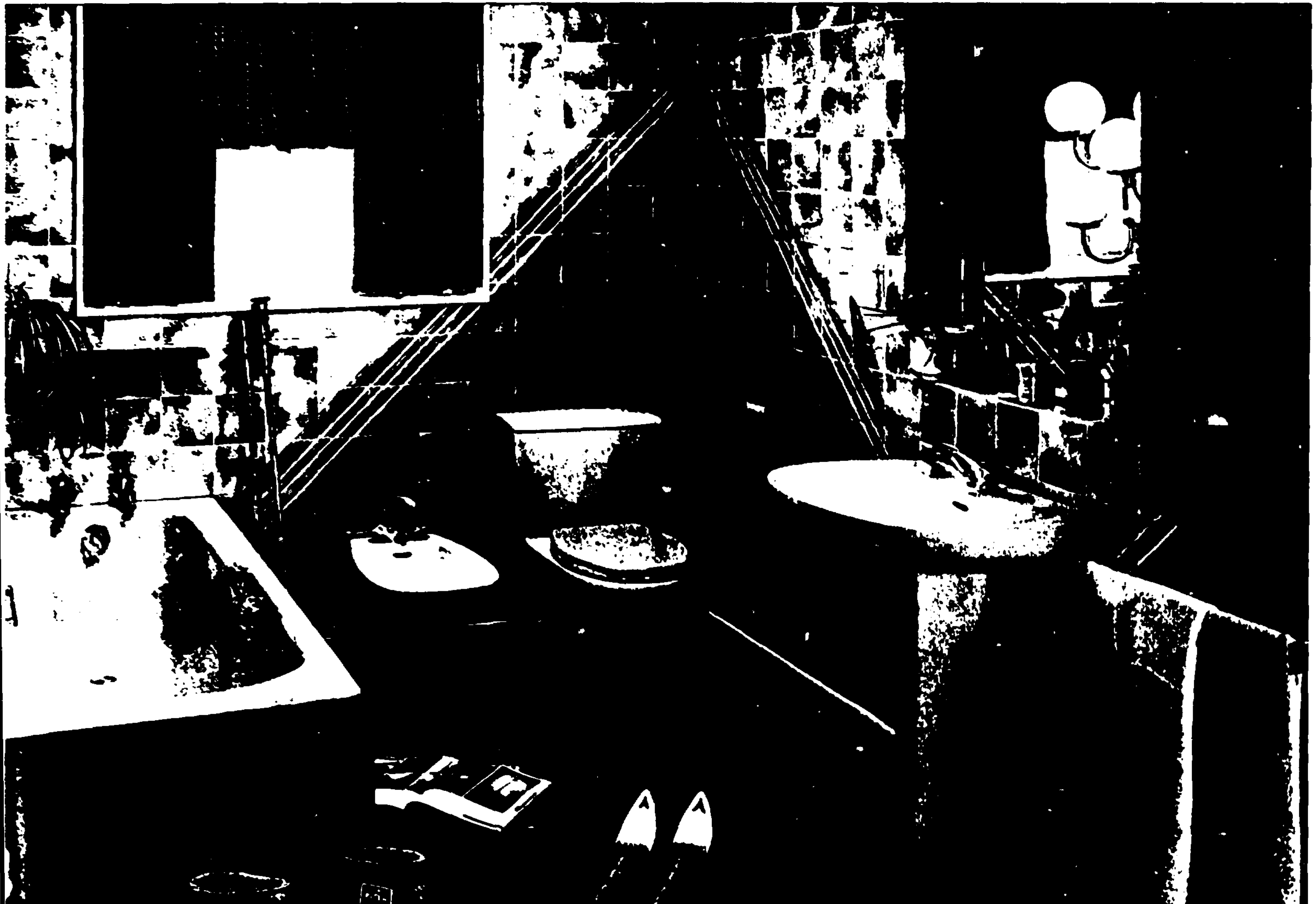
k) Jacob Delafon, FRANCE

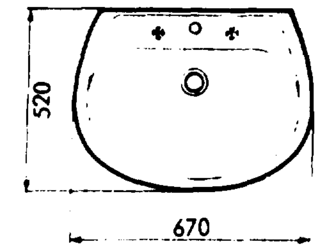


JACOB DELAFON

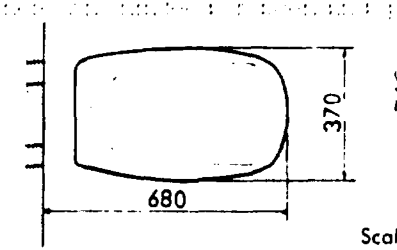
VENUS

Venus bathroom suite in Rose Nuage, with matching Noyon 1700 x 700mm cast iron bath.

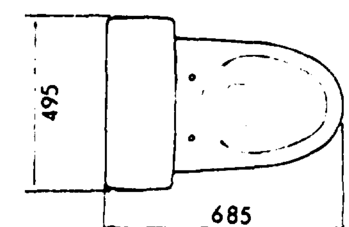




Scale 1:20



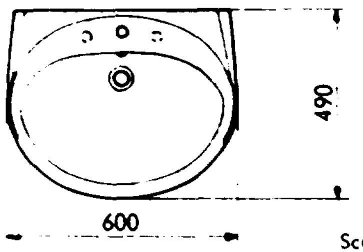
Scale 1:20



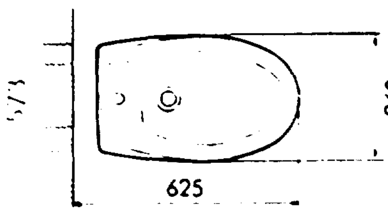
Scale 1:20

Venus is available in the following colours:
Group 1: White, Indian Ivory, Bleu Celeste, Rose Celeste, Grey Celeste. Group 2: Pierre Antique, Rose Nuage, Bleu Nuage, Grey Nuage.

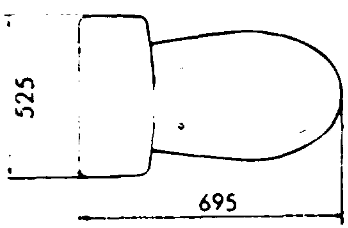
RIVELLA



Scale 1:20



Scale 1:20



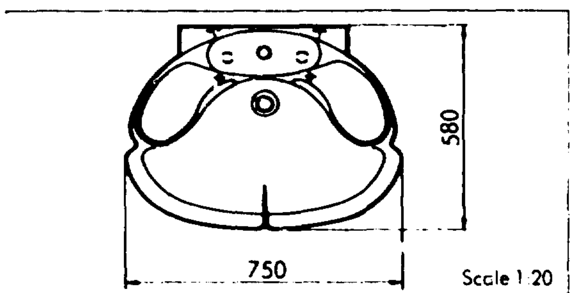
Scale 1:20

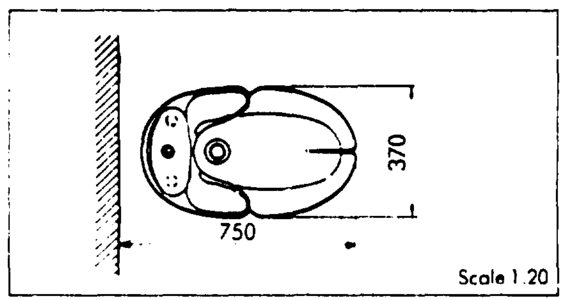
Rivella bathroom suite in Bleu Nuage, with matching Melanie Twin Grip 1700 x 700mm cast iron bath.

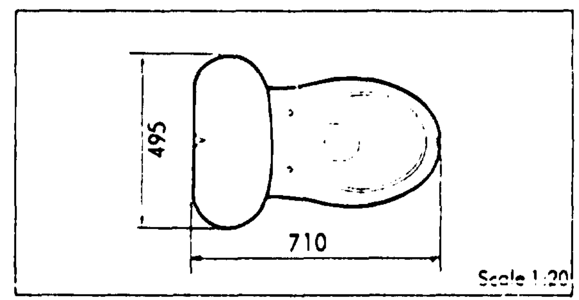
Rivella is available in the following colours:
Group 1: White, Indian Ivory, Rose Celeste, Bleu Celeste, Grey Celeste.   Group 2: Pierre Antique, Rose Nuage, Bleu Nuage, Grey Nuage.

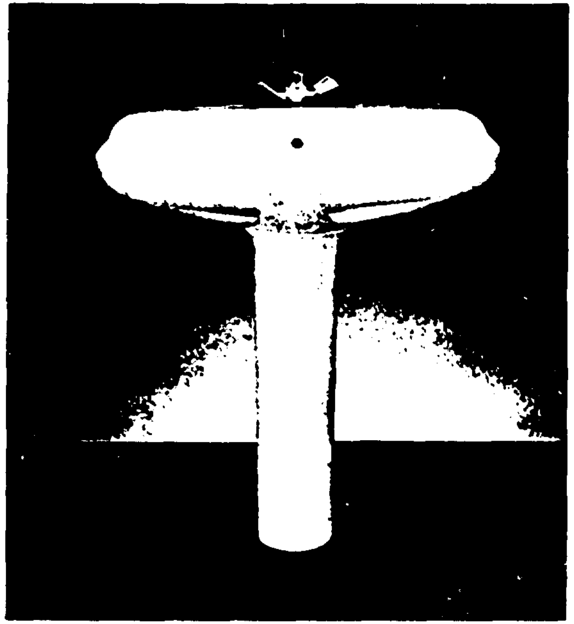
Fleur is available in the following colours:

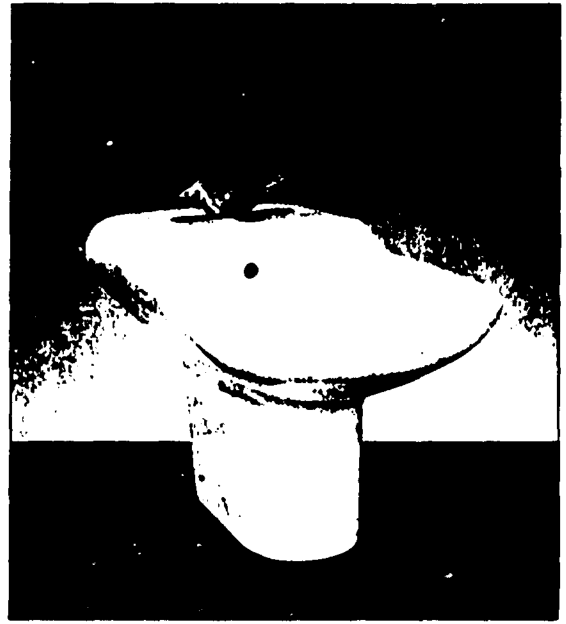
Group 2: White, Pierre Antique, Vert Aquatique, Rose Nuage, Bleu Nuage.



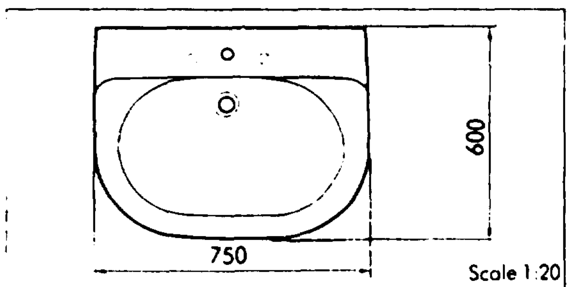


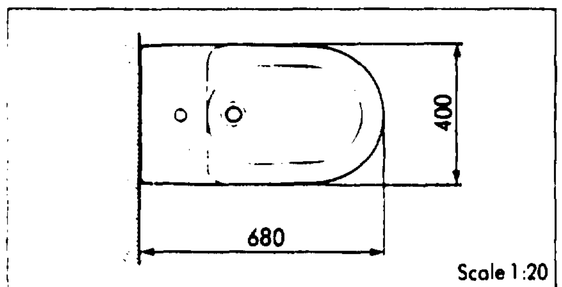


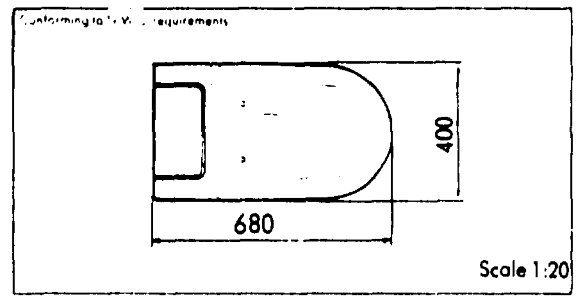




Iris is available in the following colours:
Group 1: White, Indian Ivory, Rose Celeste, Bleu Celeste, Grey Celeste; Group 2: Pierre Antique, Vert Aquatique.

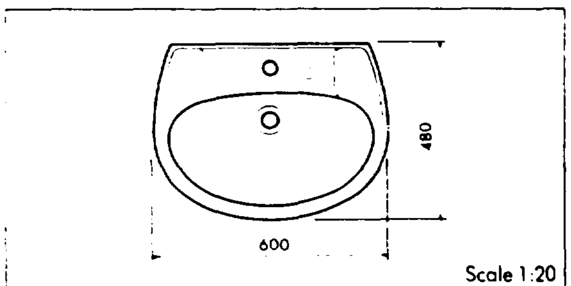


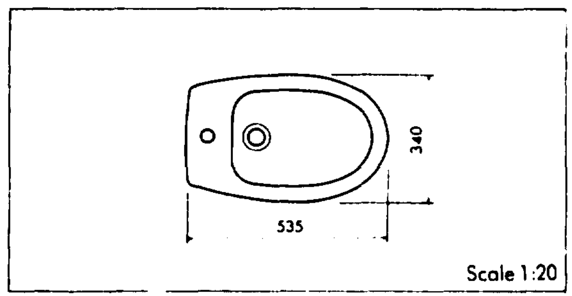


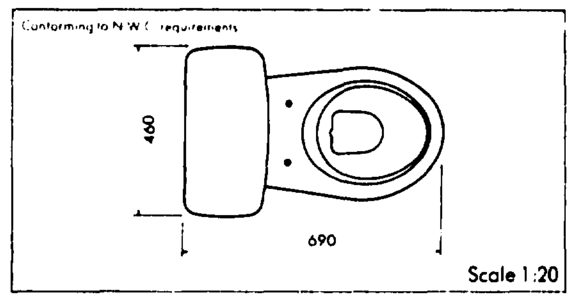


BRIVE

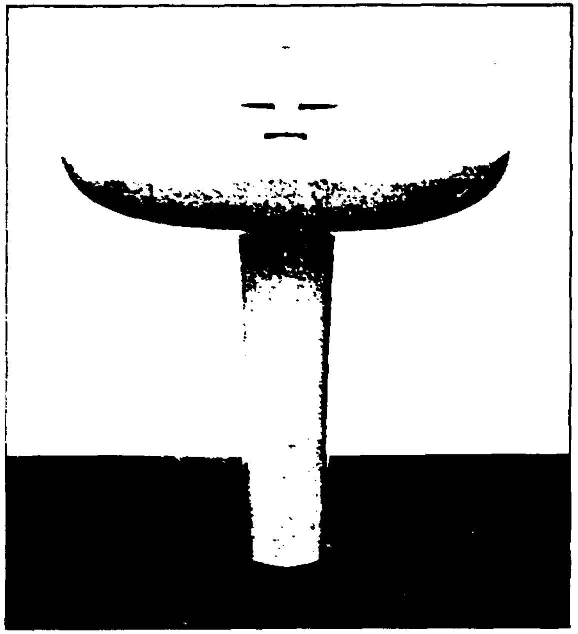
Brive is available in the following colours:
Group 1: White, Indian Ivory, Rose Sunset, Grey Celeste; Group 2: Azalea Nuage, Bermuda Nuage

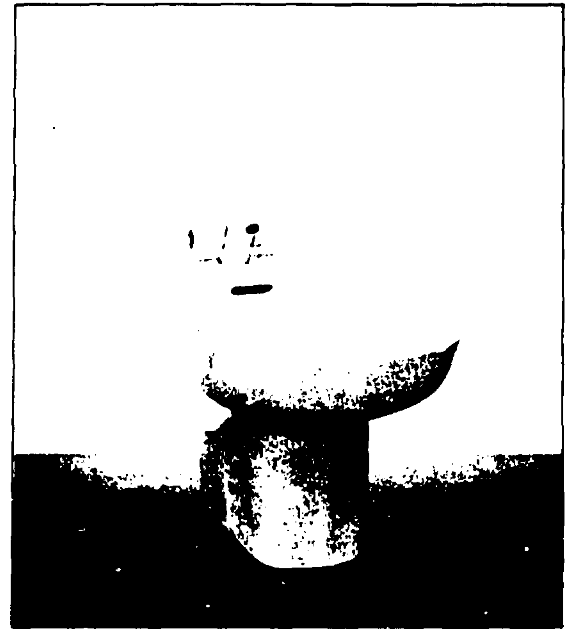


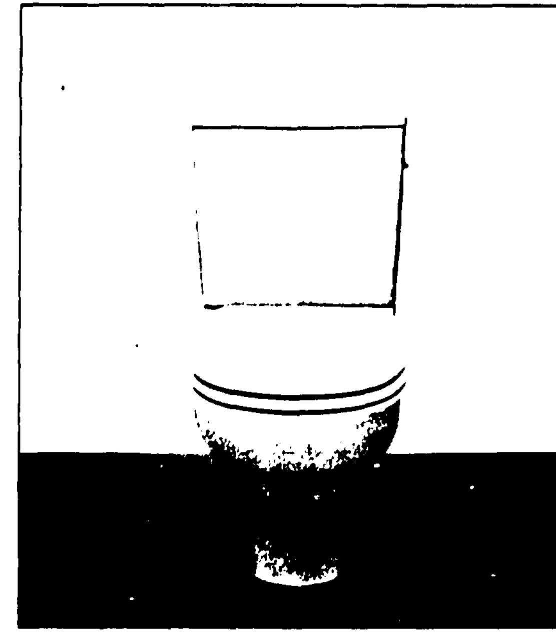




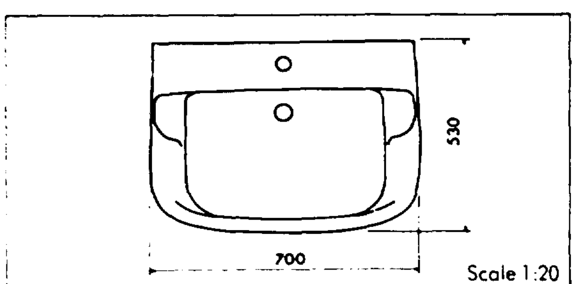
ANTARES

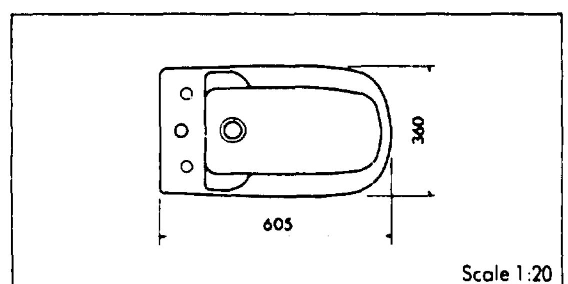


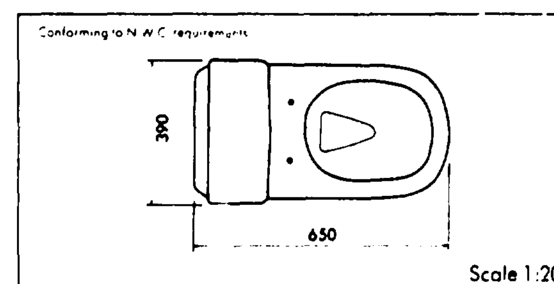




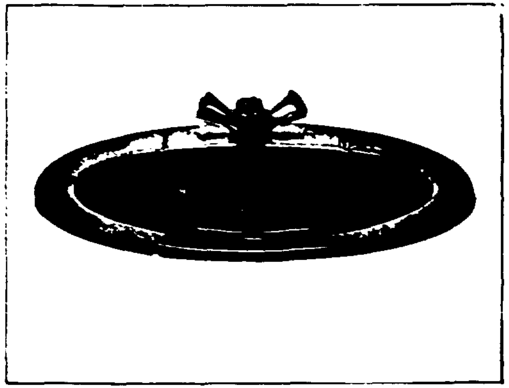
Antares is available in the following colours:
Group 1: White, Indian Ivory, Rose Celeste, Grey Celeste;   Group 2: Pierre Antique.







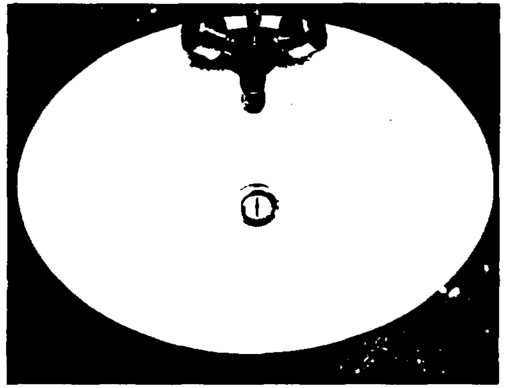
Inset Vanity Basin 1273



Colours

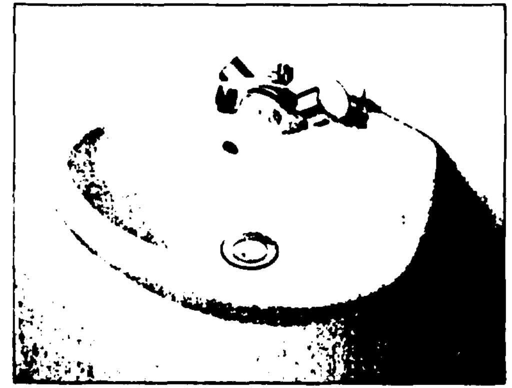
Also available in Limited Edition and Victoriana

Inset Vanity Basin 1274



Colours

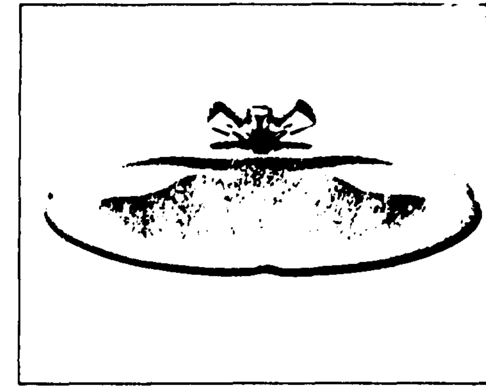
Bengali Hand Basin 1115



Colours

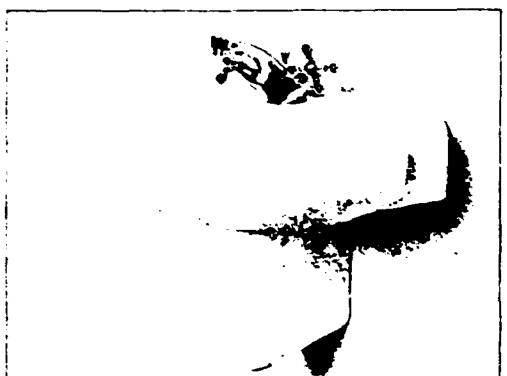
Also available in Limited Edition and Victoriana

Fleur Vanity Basin



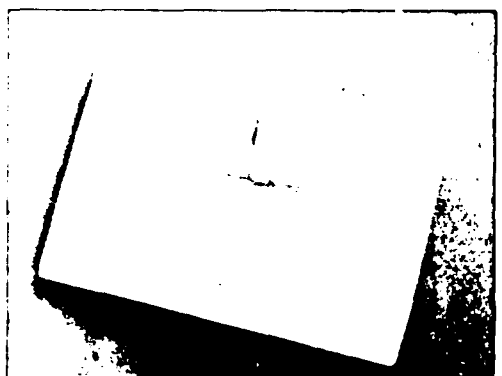
Colours

Fleur Hand Basin



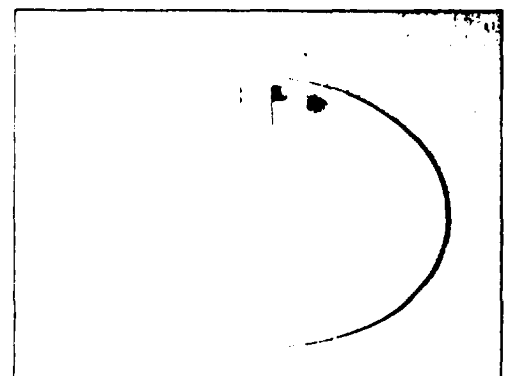
Colours

Aria Vanity Top



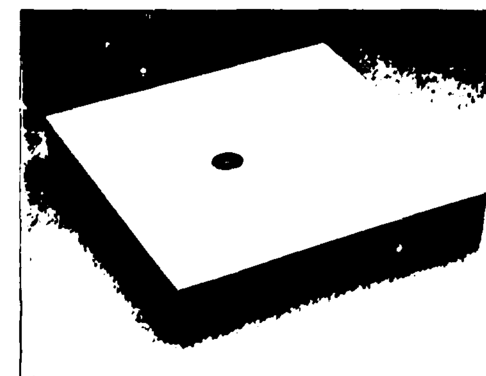
Colours

Visa Vanity Basin



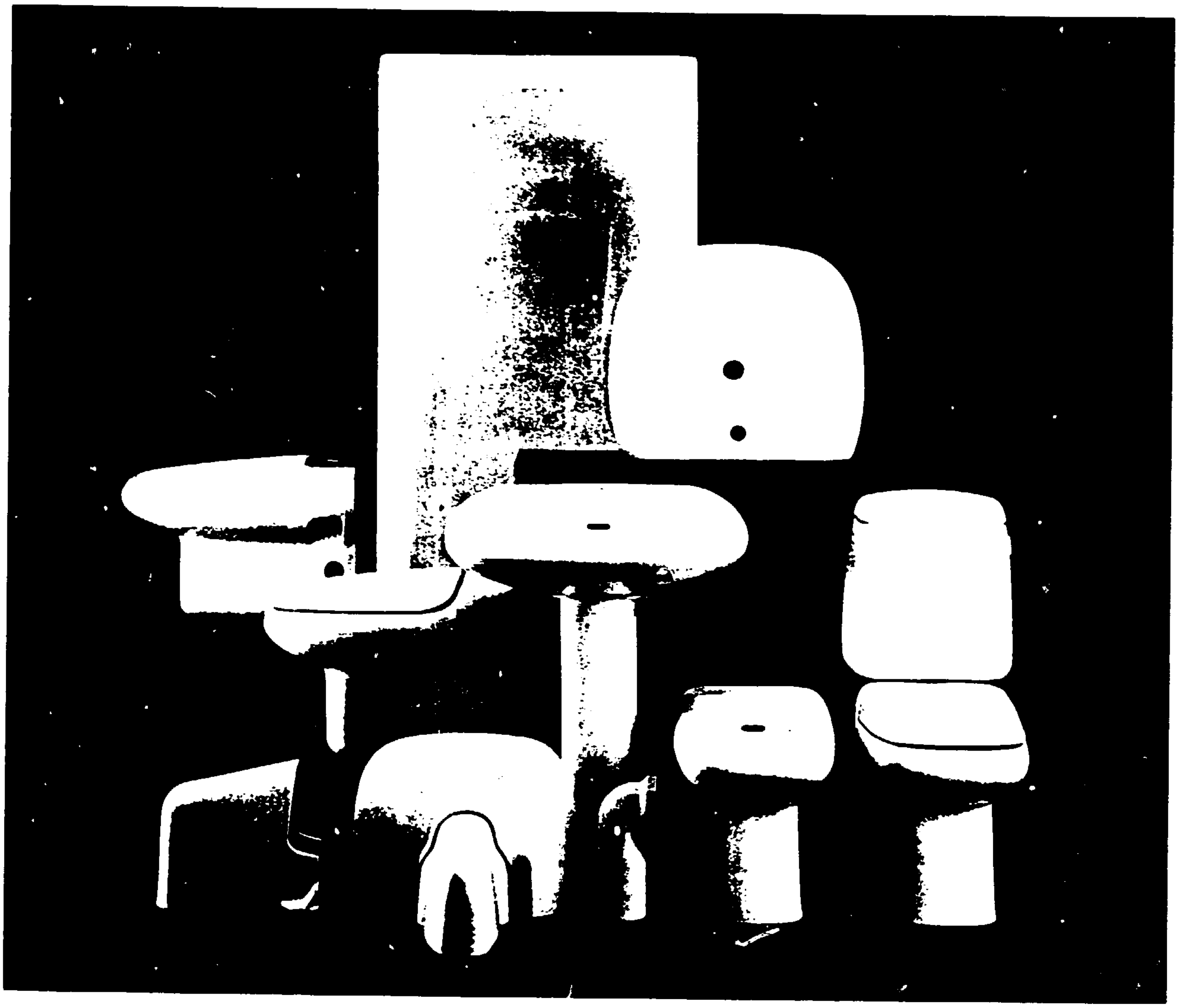
Colours

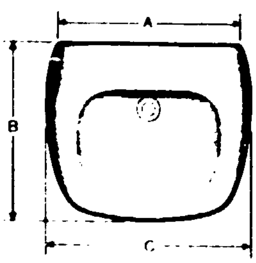
New Fontenay Shower Tray



Colours

1) Ideal Standard, U.K.

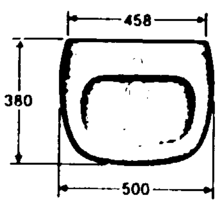




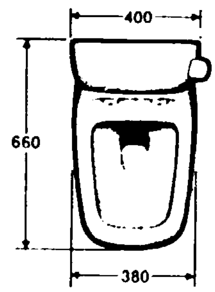
Height - floor to rim D

	87	68	61
A	800	610	530
B	600	565	500
C	870	680	610
D	815	810	810

ACCENT 87, 68 AND 61CM BASIN

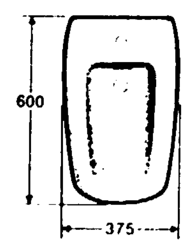


ACCENT 50CM HAND RINSE BASIN



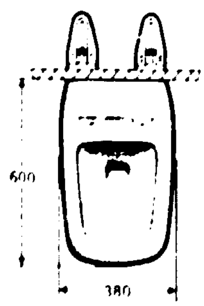
Height – floor to rim 390
– overall 865

ACCENT FLOOR STANDING TOILET SUITE



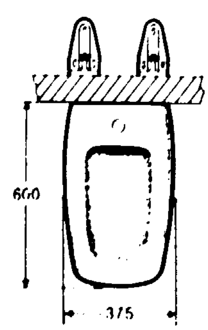
Height – floor to rim 390

ACCENT FLOOR STANDING BIDET



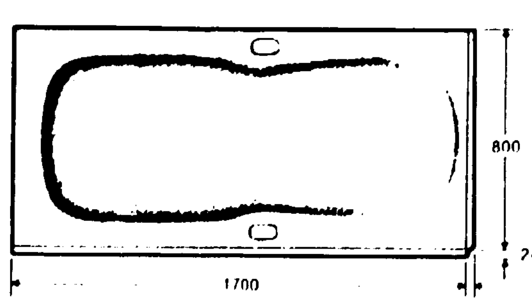
Height – floor to rim 470 420

ACCENT WALL HUNG TOILET



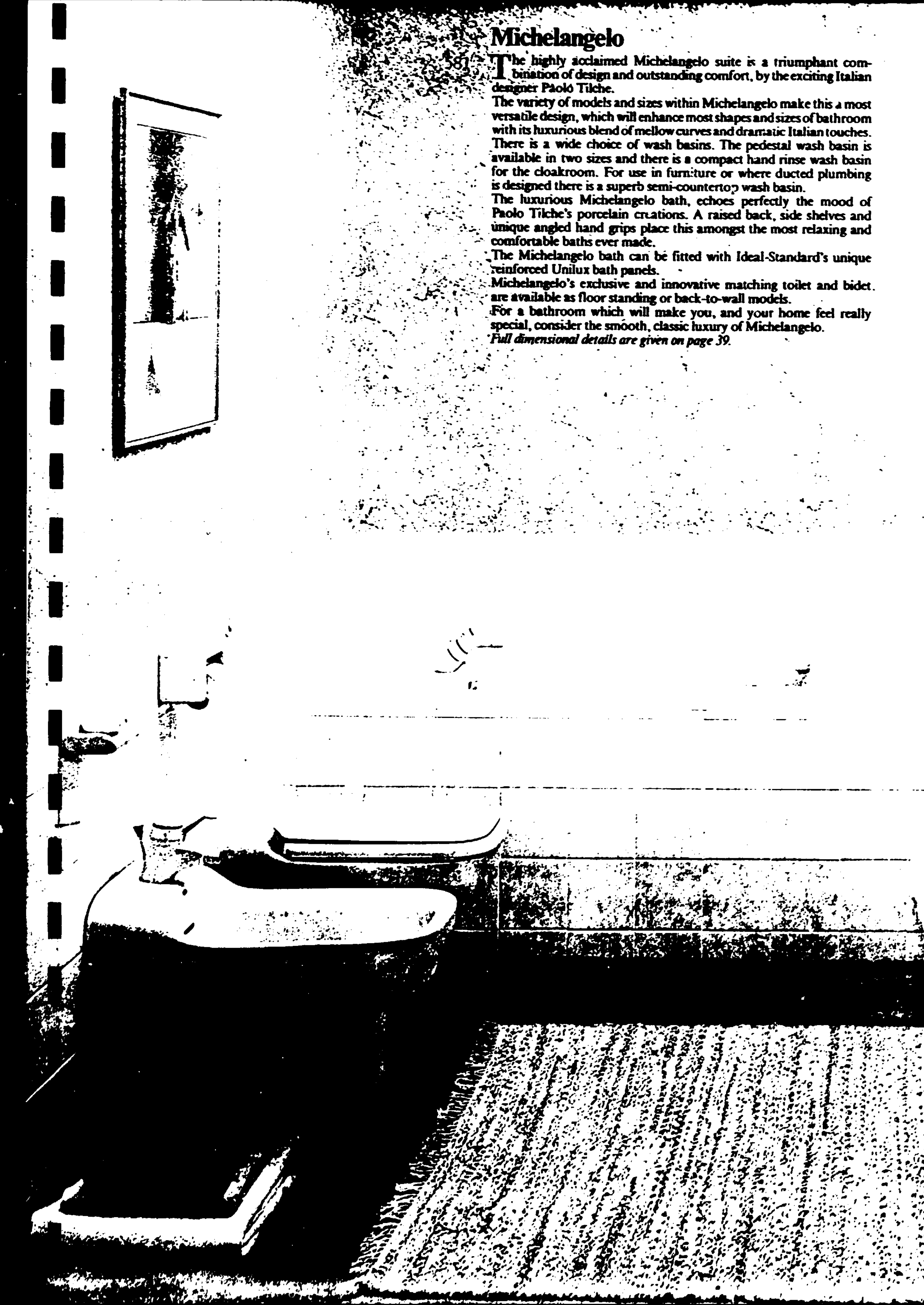
Height – floor to rim 452 402

ACCENT WALL HUNG BIDET



Height – floor to rim 580 520

ACCENT BATH



Michelangelo

The highly acclaimed Michelangelo suite is a triumphant combination of design and outstanding comfort, by the exciting Italian designer Paolo Tilche.

The variety of models and sizes within Michelangelo make this a most versatile design, which will enhance most shapes and sizes of bathroom with its luxurious blend of mellow curves and dramatic Italian touches.

There is a wide choice of wash basins. The pedestal wash basin is available in two sizes and there is a compact hand rinse wash basin for the cloakroom. For use in furniture or where ducted plumbing is designed there is a superb semi-countertop wash basin.

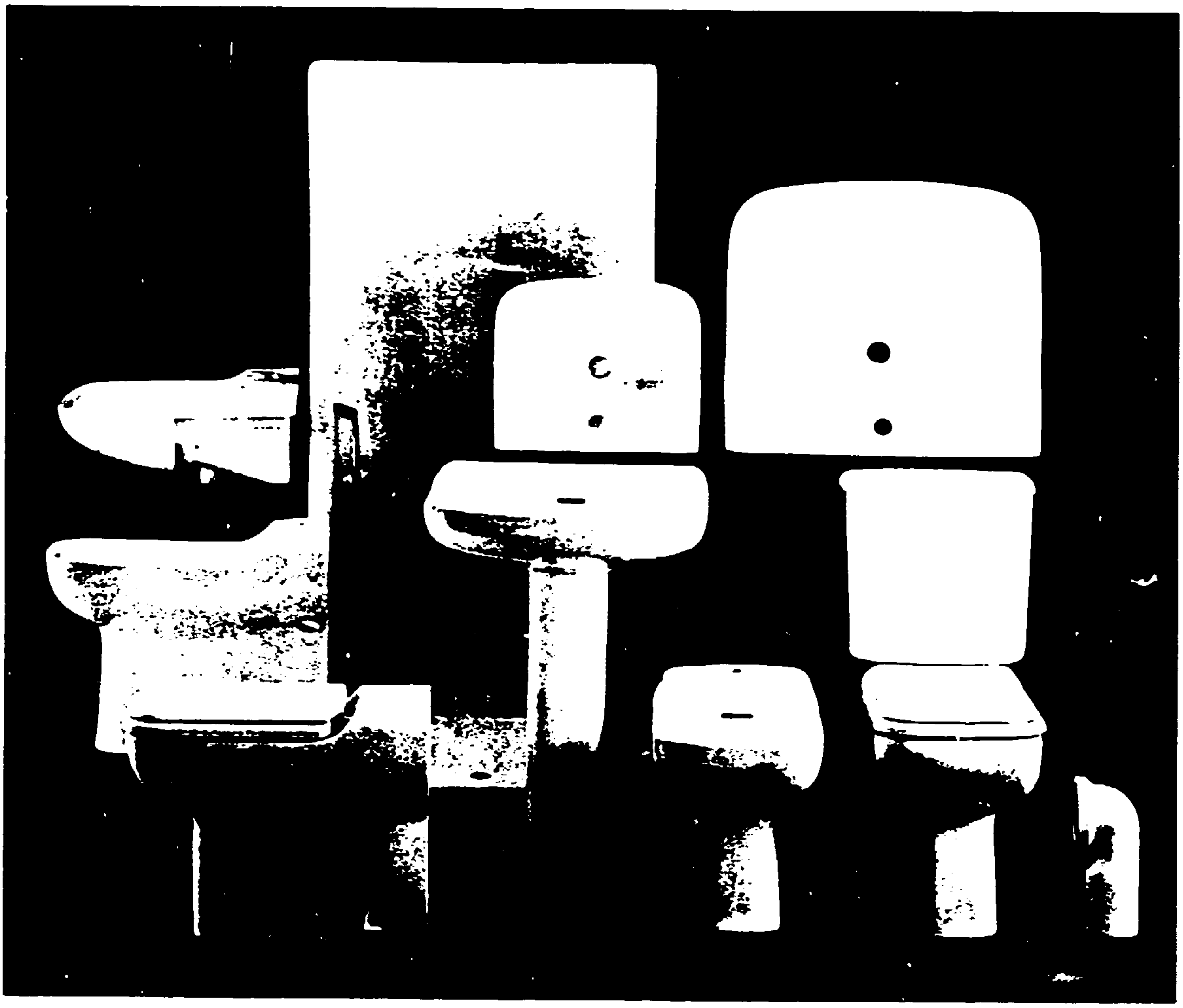
The luxurious Michelangelo bath, echoes perfectly the mood of Paolo Tilche's porcelain creations. A raised back, side shelves and unique angled hand grips place this amongst the most relaxing and comfortable baths ever made.

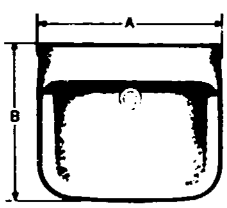
The Michelangelo bath can be fitted with Ideal-Standard's unique reinforced Unilux bath panels.

Michelangelo's exclusive and innovative matching toilet and bidet are available as floor standing or back-to-wall models.

For a bathroom which will make you, and your home feel really special, consider the smooth, classic luxury of Michelangelo.

Full dimensional details are given on page 39.

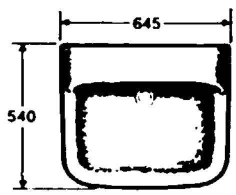




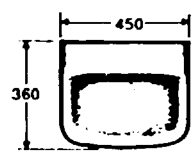
Height – floor to rim C

	70	60
A	690	600
B	580	510
C	830	810

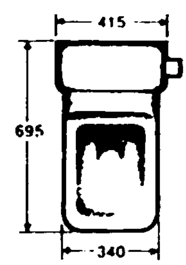
MICHELANGELO 70 AND 60CM BASIN



MICHELANGELO SEMI-COUNTERTOP BASIN

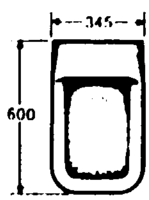


MICHELANGELO WALL MOUNTED HAND RINSE BASIN



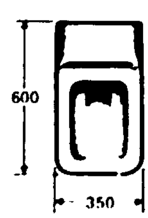
Height – floor to rim 400
– overall 825

MICHELANGELO FLOOR STANDING TOILET SUITE



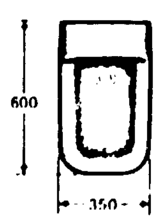
Height – floor to rim 395

MICHELANGELO FLOOR STANDING BIDET



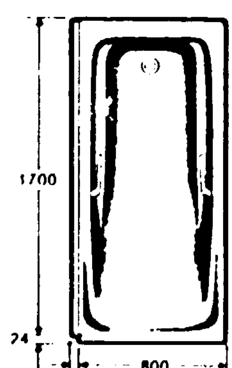
Height – floor to rim 395

MICHELANGELO BACK-TO-WALL TOILET



Height – floor to rim 385

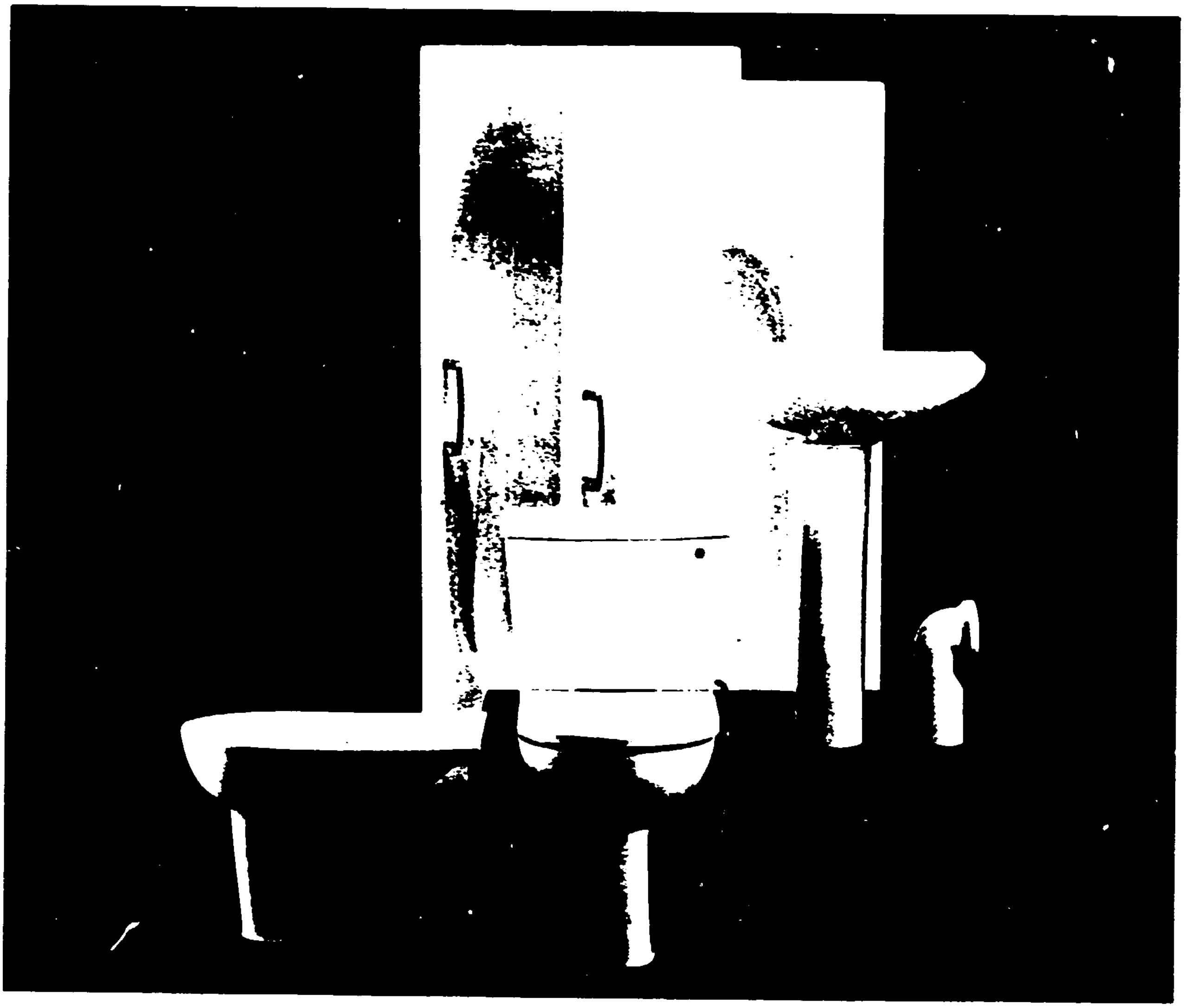
MICHELANGELO BACK-TO-WALL BIDET

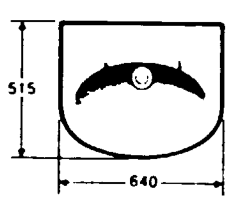


Height floor to rim 500 560

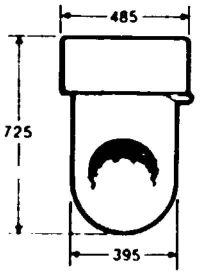
MICHELANGELO BATH

Brasilia

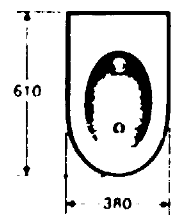




Height – floor to rim 800



Height – floor to rim 410
– overall 790

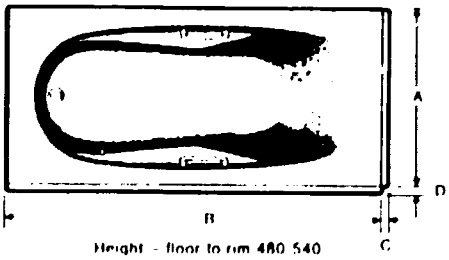


Height – floor to rim 405

BRASILIA BASIN

BRASILIA TOILET SUITE

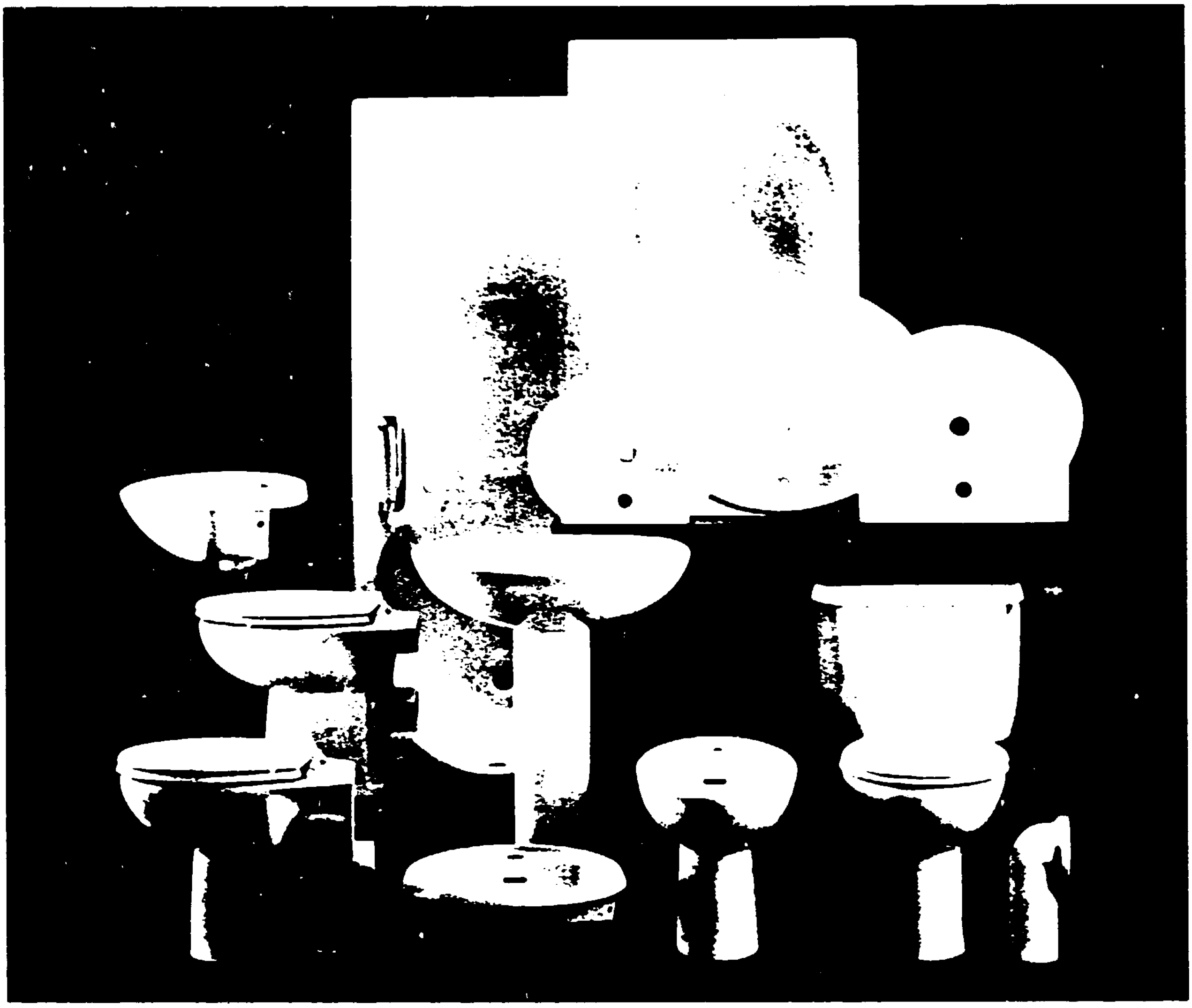
BRASILIA BIDET

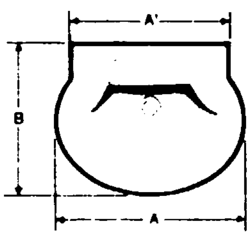


Height – floor to rim 480 540

	180	170
A	800	750
B	1800	1700
C	24	24
D	24	24

BRASILIA 180 AND 170CM BATH

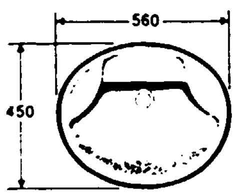




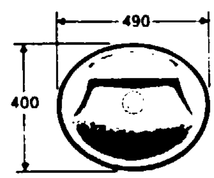
Height – floor to rim C

	69	63	56
A	690	630	560
A'	607	544	488
B	550	485	450
C	835	814	802

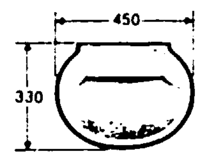
TULIP 69, 63 AND 56CM BASIN



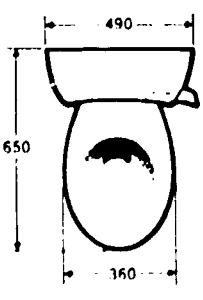
TULIP SEMI-COUNTERTOP BASIN



TULIP COUNTERTOP BASIN

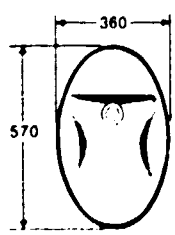


TULIP HAND RINSE WALL BASIN



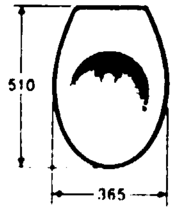
Height – floor to rim 390
– overall 740

TULIP TOILET SUITE



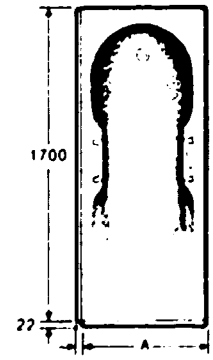
Height – floor to rim 390

TULIP BIDET



Height – floor to rim 395

TULIP FULL-BACK-TO-WALL AND SEMI-BACK-TO-WALL TOILETS

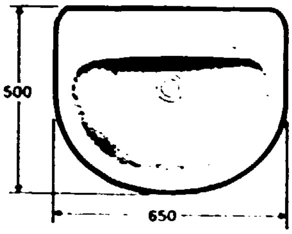


Height – floor to rim 480 540

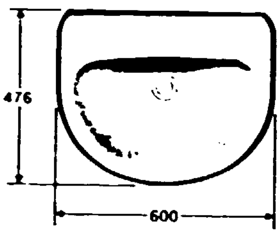
	Tulip GL	Tulip
A	750	700

TULIP GL 170 x 75CM AND TULIP 170 x 70CM BATH

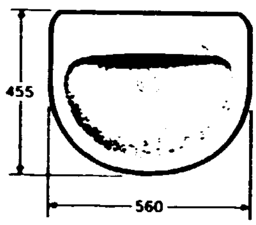
Studio



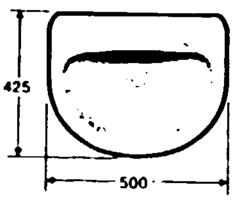
STUDIO 65CM
PEDESTAL BASIN



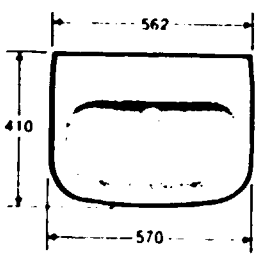
STUDIO 60CM
PEDESTAL BASIN



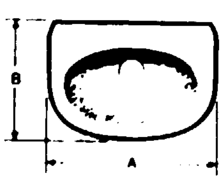
STUDIO 56CM
PEDESTAL BASIN



STUDIO 50CM
PEDESTAL BASIN

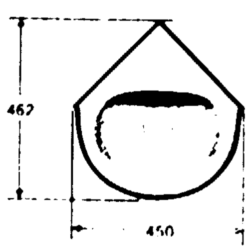


STUDIO BR BASIN

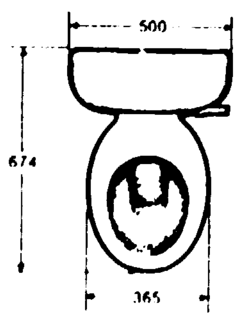


	45	35
A	450	350
B	300	250

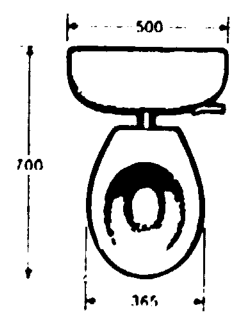
STUDIO WALL MOUNTED
HAND RINSE BASIN



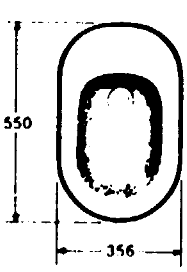
STUDIO CORNER BASIN



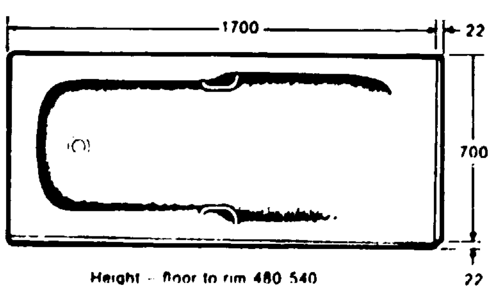
STUDIO CLOSE COUPLED
WASHDOWN TOILET SUITE



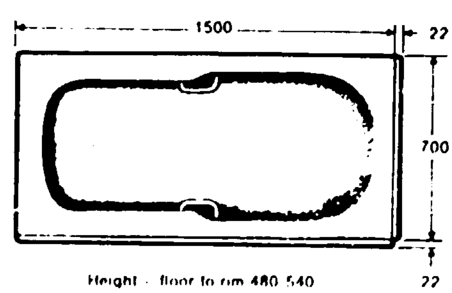
STUDIO LOW LEVEL
WASHDOWN TOILET BOWL



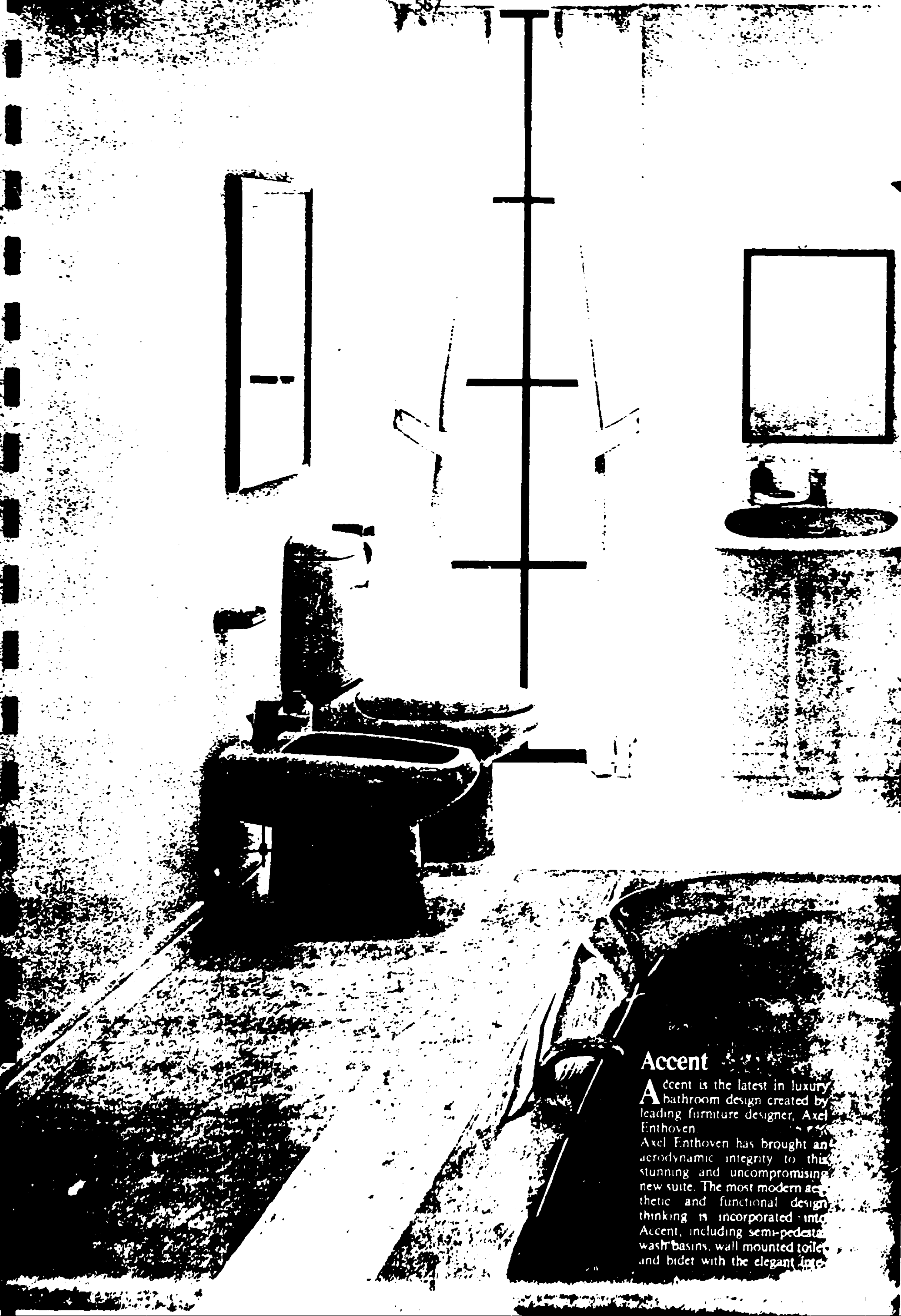
STUDIO BIDET

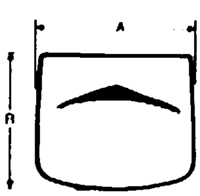


STUDIO 170 x 70CM BATH



STUDIO 150 x 70CM BATH

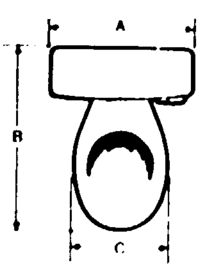

Accent
Accent is the latest in luxury bathroom design created by leading furniture designer, Axel Enthoven.
Axel Enthoven has brought an aerodynamic integrity to this stunning and uncompromising new suite. The most modern ae-thetic and functional design thinking is incorporated into Accent, including semi-pedesta[l] wash basins, wall mounted toile[t] and bidet with the elegant inte-



Height floor to rim C

	60	50
A	610	500
B	470	400
C	810	790

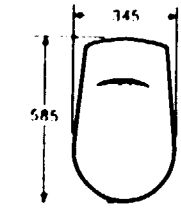
TIARA 2 60 AND 50CM BASIN



Height floor to rim D
overall E

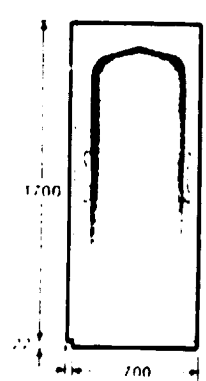
	A	B	C	D	E
Siphonic	490	710	350	410	770
Washdown	490	710	360	390	755

TIARA TOILET SUITE



Height floor to rim 400

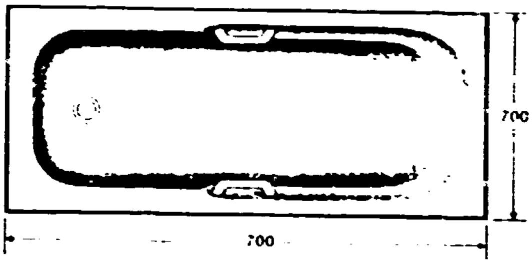
TIARA BIDET



Height floor to rim 480 540

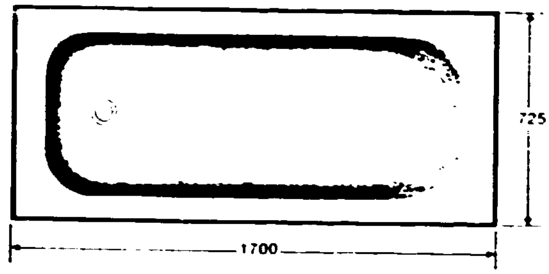
TIARA BATH

580 Cast-iron Baths



Height – floor to rim 510 570

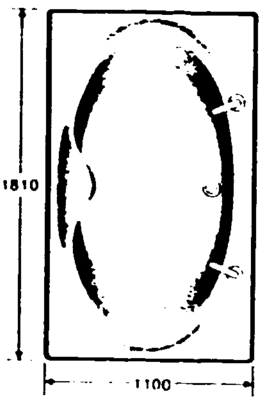
CITY BATH



Height – floor to rim 510-570

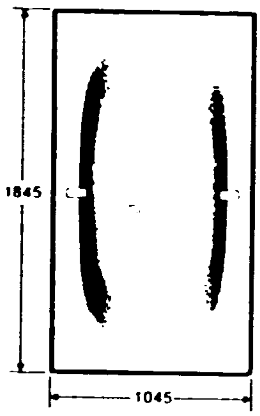
SIMPLICITY BATH

Acrylic Baths



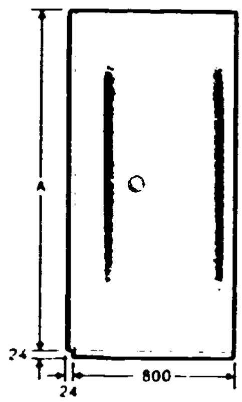
Height – floor to rim 610-645

ULTRA BATH



Height – floor to rim 565-600

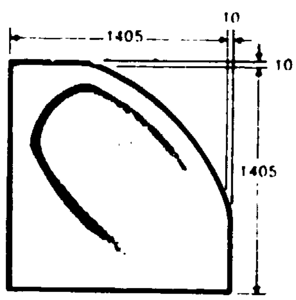
COPACABANA BATH



Height – floor to rim 515-575

	180	170
A	1800	1700

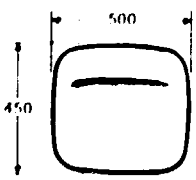
LINDA 180 AND 170CM BATH



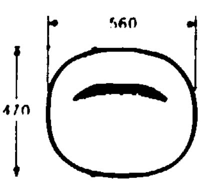
Height – floor to rim 550

LIDO BATH

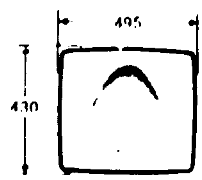
Basins



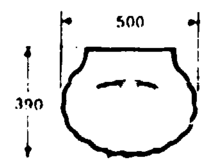
TAMURA COUNTERTOP BASIN



ISIS COUNTERTOP BASIN



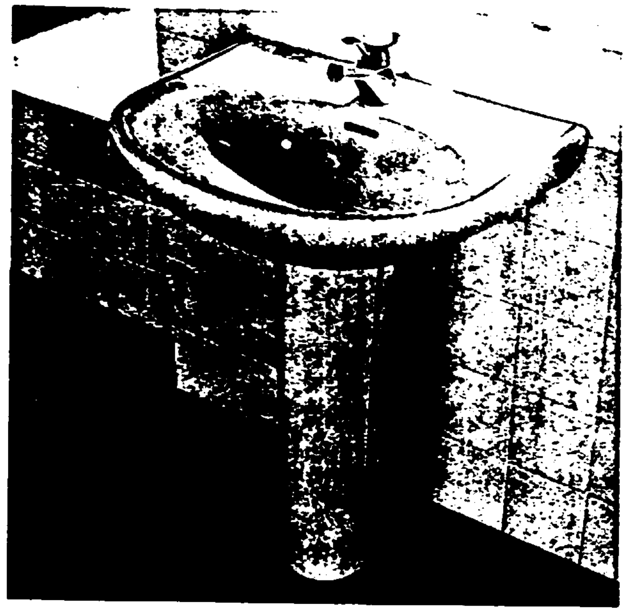
MITRE COUNTERTOP BASIN



MARMARA WALL MOUNTED BASIN

Brasilia Patterns 590

Tricia Stainton of the Queensberry Hunt Design Group has introduced a whole new design dimension to the Brasilia range, which is already regarded as one of the finest bathroom suites available.
With her unique talent for restrained, subtle, yet striking variations on this bathroom concept, she has introduced to Norman Westwater's classic range, a selection of new decor and colour options which are setting a trend in sophistication.
Tricia Stainton has also designed unique co-ordinating tiles to reflect each of the Brasilia Patterns, these are produced by Pilkington's Tiles, one of the UK's leading tile manufacturers.



Casablanca

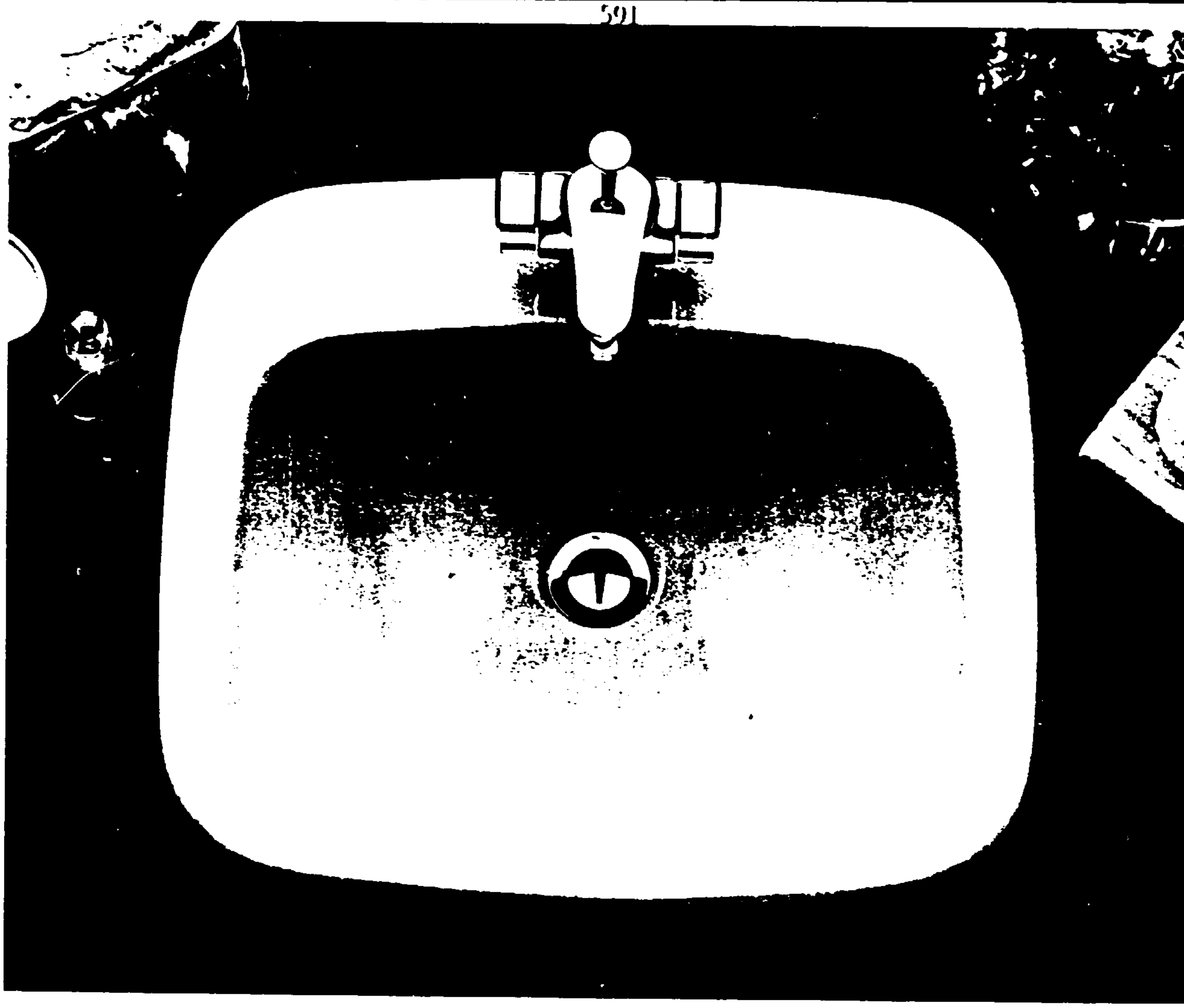
Brasilia and Casablanca are a combination guaranteed to bring an air of understated sophistication to your bathroom.
Casablanca is a devastatingly simple and modern design, totally uncluttered and very exclusive, consisting of brilliant white high gloss ceramic with asymmetrical black bands.
Pilkington's equally understated Casablanca tiles create an impression of crisp, bright spaciousness which complements perfectly what is surely Tricia Stainton's boldest design statement.
A Monolux decor disc is available as a finishing touch to the Casablanca design, which is available with the Brasilia wash basin and pedestal, toilet suite and over rim bidet. The compact Tamura countertop basin is also available in Casablanca decor.

Kyoto

The gentle pastel lines of Kyoto reconcile the most individualistic of colours — orange, blue and turquoise, into a warm and subtle blend, both timeless and inviting, which carries more than a hint of the oriental.
Kyoto utilises Ideal-Standard's exclusive relief texture glaze which adds a further feel of quality to this unique colour combination. Based on Ideal-Standard's newest "Whisper" shade, Whisper Peach, the design range includes a Monolux porcelain decor disc to complete the effect and is set off to perfection by Pilkington's matching Kyoto tiles.
Kyoto is available on the Brasilia wash basin and pedestal, toilet suite and over rim bidet. For countertop installations, the elegant Tamura basin is available in the Kyoto design.

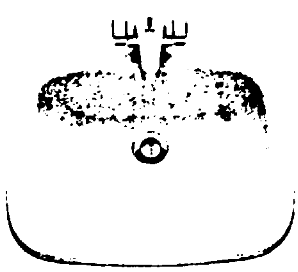
Geneva

Geneva is a cool break with convention. Parallel ribbons of lilac, white and turquoise frame the form of the Whisper Blue ceramic, the perfect enhancement of Brasilia's sleek lines. Geneva is a delight to the touch, with its high gloss glaze and the unique Ideal-Standard textured surface.
Pilkington's matching Geneva tiles echo the ribbon design of the suite, maintaining the impression of cool elegance. The raised design also features on the matching Geneva Monolux decor disc for the mixer fittings.
Geneva is available on the Brasilia wash basin and pedestal, toilet suite and over rim bidet. For countertop installation, the elegant Tamura basin is also available in the Geneva design.



Basins

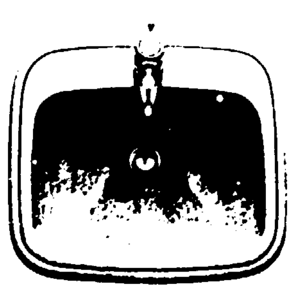
Ideal-Standard's range of individually designed countertop basins and Marmara wall mounted basin are ideal both for bedroom and cloakroom use and in conjunction with Ideal-Standard bathroom suites.
The Tamura basin is a simple but classically elegant model which will blend in well with most designs and is the perfect complement to the exciting new Kyoto, Casablanca and Geneva variations on the Brasilia suite and the delicate tracings of Michelangelo The Line.
Equally pleasing to the eye is the compact, rounded Isis basin. This attractive oval basin has a raised ledge and is generous in size.
Mitre is a compact basin of asymmetric design, its clever integration of flair and function provides a generous soap rest as part of its tasteful asymmetrical contours and an apt framing for its distinctive offset brassware.
The Marmara is a compact luxury wall mounted wash basin of unique "shell" design. This very elegant basin is suitable for use in bedrooms and cloakrooms.
Full dimensional details are given on page 45.



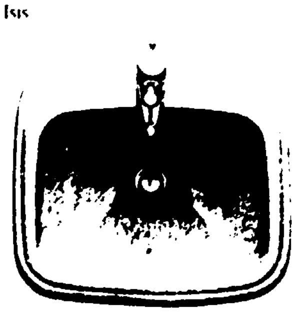
Tamura

Isis

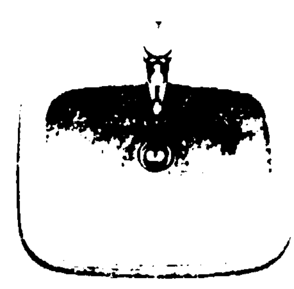
Mitre



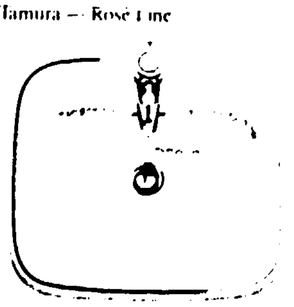
Tamura — Rosé Line



Tamura — Blue Line



Tamura — Kyoto



Tamura — Casablanca

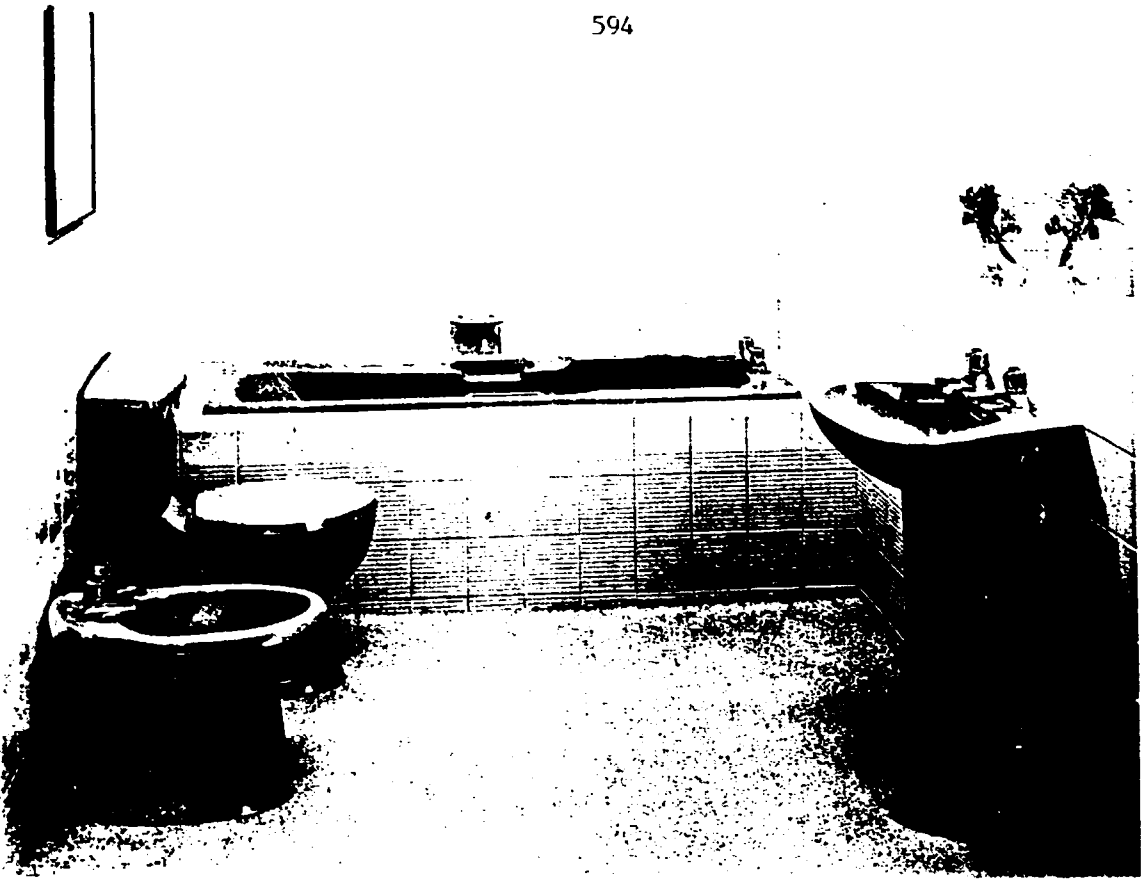
Tamura — Geneva

Marmara

m) Qualcast Bathrooms, U.K.

Bathroom Options

QUALCAST Ceramics



Luxury with economy is the hallmark of the LOTUS suite.

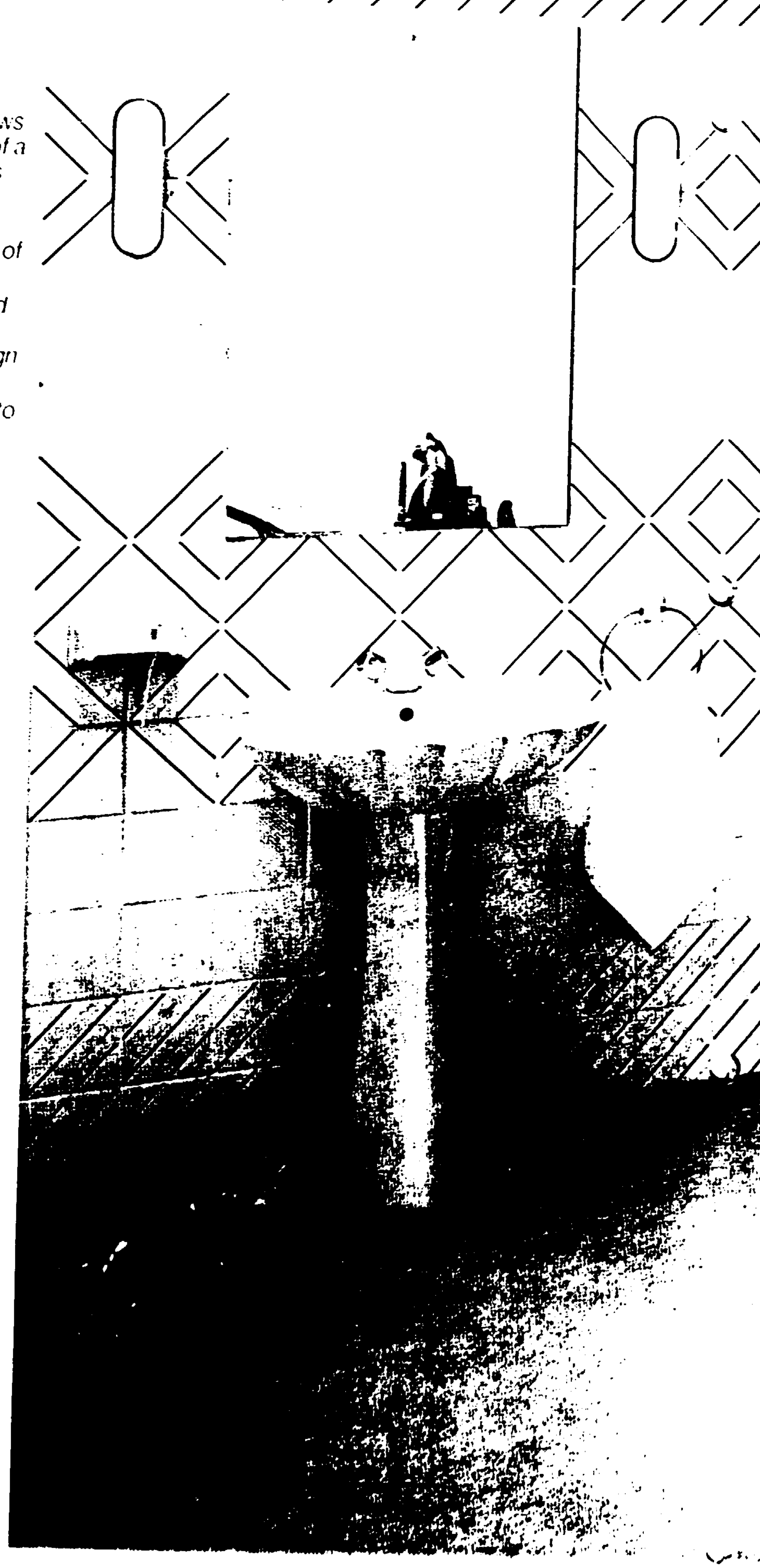
The LOTUS offers all the features of a close coupled cistern and closet, bidet and attractively designed basin and pedestal in a group that will transform your bathroom for a modest outlay.

Aptly named, the PEARL suite follows the delicate and distinctive shape of a shell, while the luxury finish reflects the sheen of the gem itself.

The shape is implied in the integral soap dishes and repeated in the lid of the close-coupled cistern.

The lines of the closet, the bidet and the pedestal basin are styled to complement PEARL's striking design features.

Definitely a suite to add distinction to your bathroom.

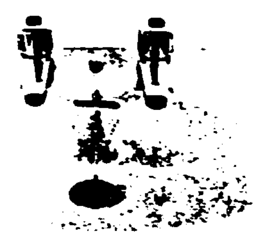


QUALCAST also offers a choice of individual washbasins designed to augment their range of bathroom suites

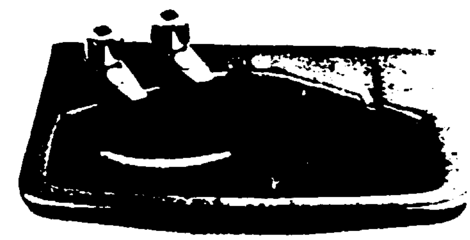
These basins are available in a choice of three styles in the full range of bathroom suite colours. Each one is equally at home in a cloakroom, an en suite situation, the children's playroom, hobbies room ... even the garage!

Clever styling ensures the maximum practical size within modest unit dimensions whether the basin is curved, square or for corner fitting. All have integral soap dishes and wall brackets are available for simple installation.

Corner Basin



Apollo Cloakroom Basin



Cloakroom Basin

The ideal basin for the master bedroom, the guest bedroom or the bed sitting room. Attractive styling is married to a practical shape for setting into a vanity unit, but it can equally well be fitted into a tiled work surface or a bedroom unit.

Colours shown are as accurate as the limitations of print allow.
The Company pursue a policy of continued modification and improvement and reserve the right to change the specifications without prior notice.

Your local stockist.

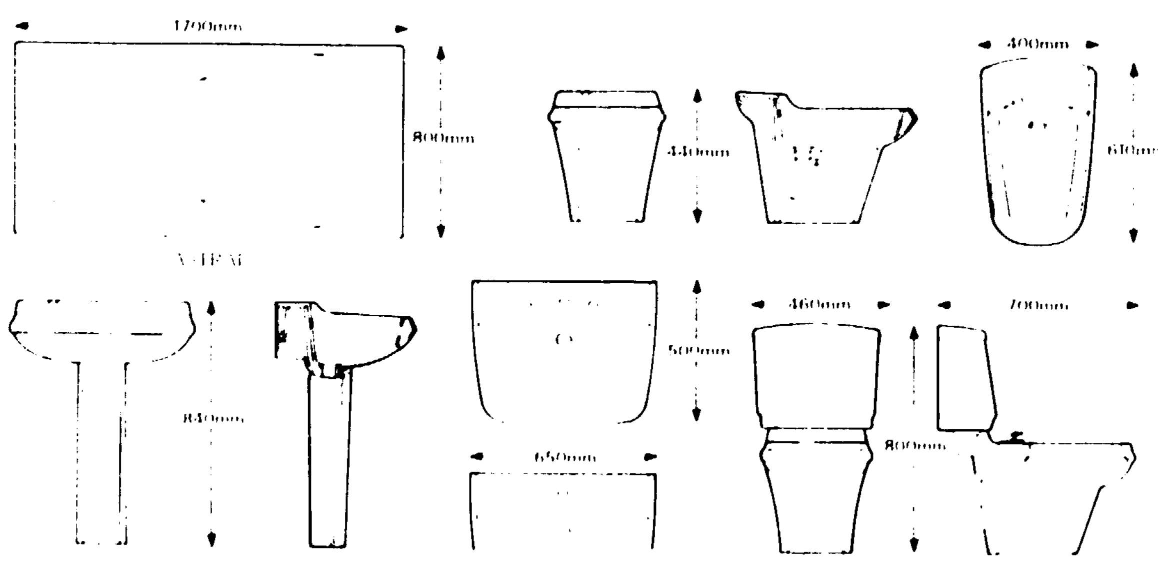
QUALCAST Ceramics

Qualcast (Ceramics) Limited

Hartshorne Road, Woodville, Burton on Trent, DE11 7JD.
Tel: (0283) 221622 Telex: 342246

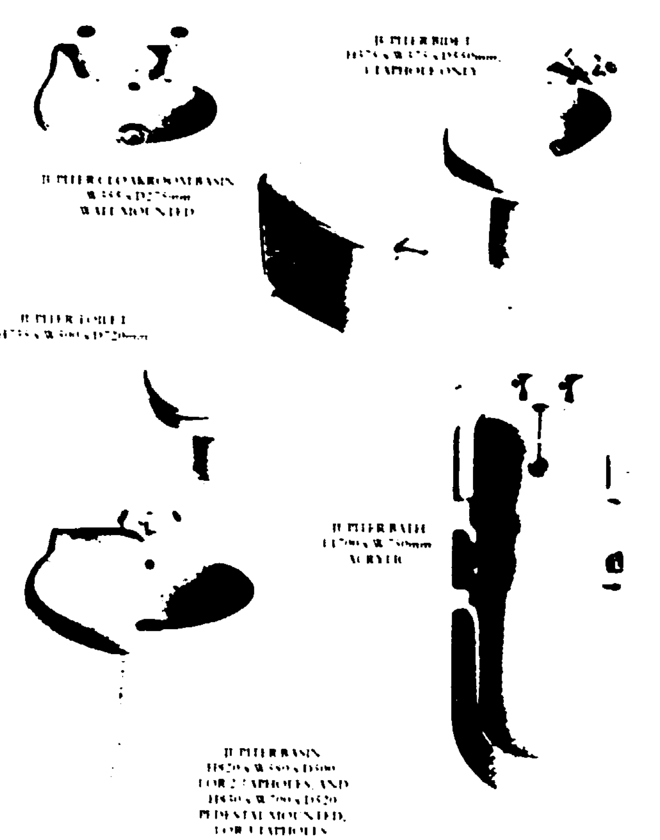
11.85

n) Twyfords Bathrooms, U.K.


1700mm
800mm
440mm
400mm
610mm
840mm
500mm
460mm
700mm
650mm
800mm

TWYFORDS GUIDE

JUPITER SUITE
shown here in Platinum



JUPITER BIDET
[illegible]
1 TAPHOLE ONLY

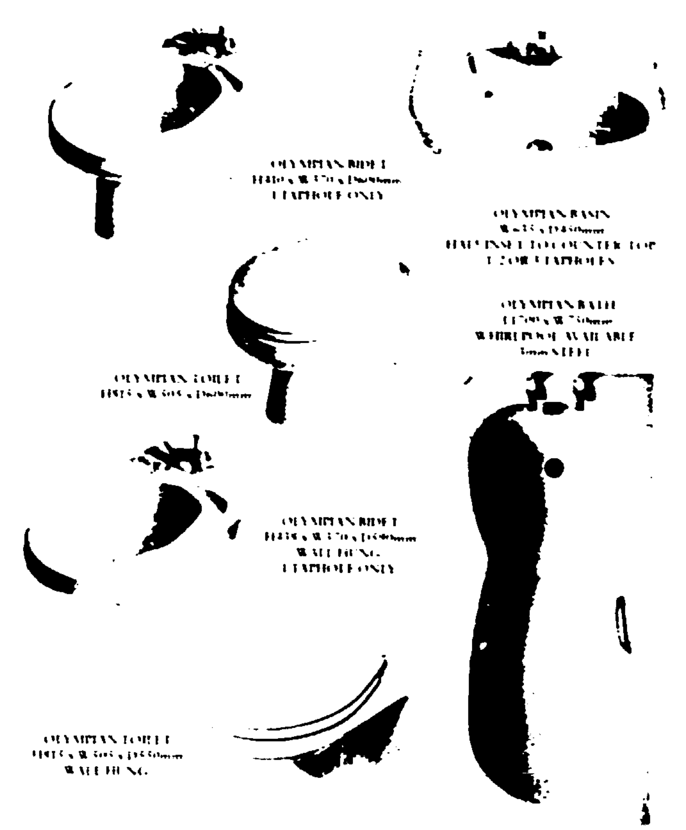
JUPITER CLOAKROOM BASIN
[illegible]
WALL MOUNTED

JUPITER TOILET
[illegible]

JUPITER BATH
[illegible]
ACRYLIC

JUPITER BASIN
[illegible]
FOR 2 TAPHOLES, AND
[illegible]
PEDESTAL MOUNTED,
FOR 3 TAPHOLES

OLYMPIAN SUITE
Shown here in Almond



OLYMPIAN BIDET
[illegible]
1 TAPHOLE ONLY

OLYMPIAN BASIN
[illegible]
HALF INSET TO COUNTER TOP
1, 2 OR 3 TAPHOLES

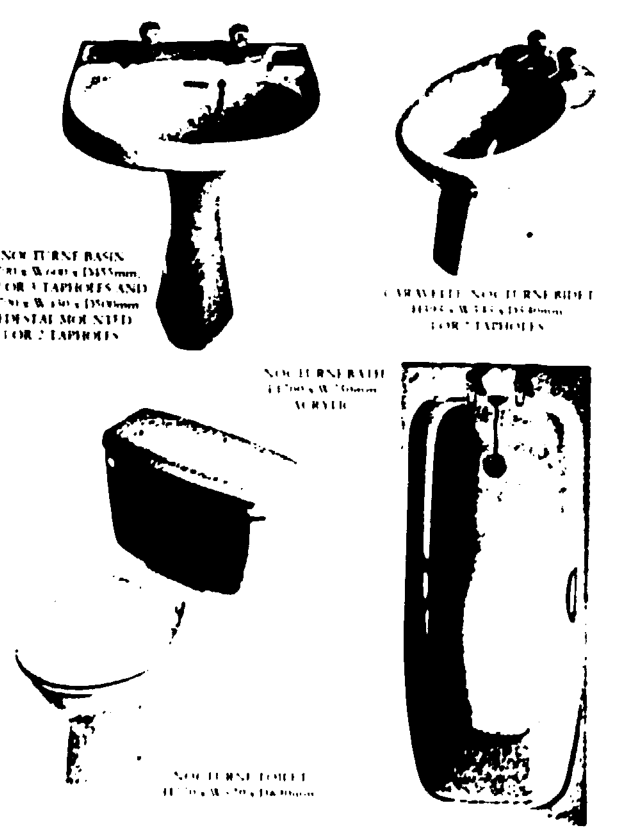
OLYMPIAN BATH
[illegible]
WHIRLPOOL AVAILABLE
3mm STEEL

OLYMPIAN TOILET
[illegible]

OLYMPIAN BIDET
[illegible]
WALL HUNG
1 TAPHOLE ONLY

OLYMPIAN TOILET
[illegible]
WALL HUNG

NOCTURNE SUITE
Shown here in Linden



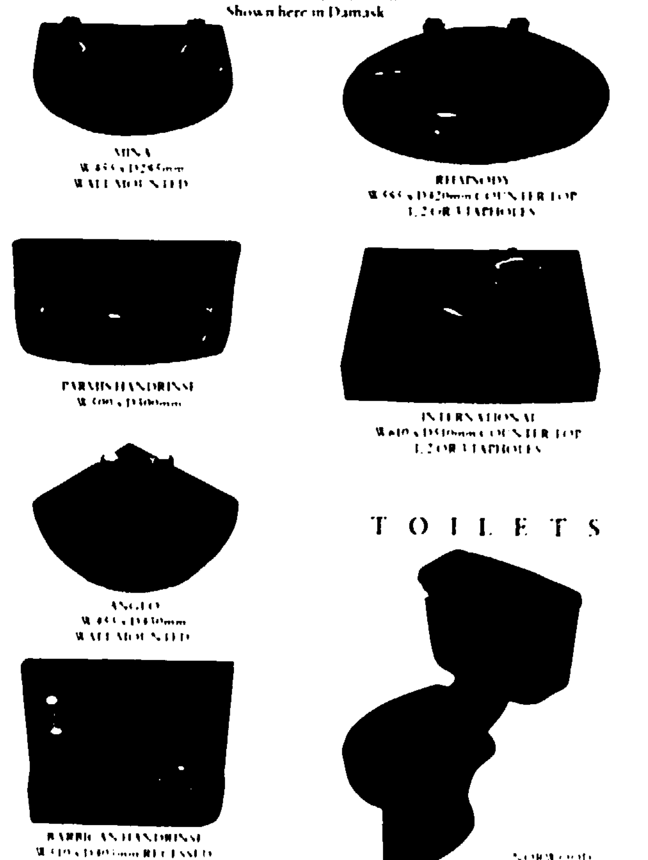
NOCTURNE BASIN
[illegible]
1, 2 OR 3 TAPHOLES AND
[illegible]
PEDESTAL MOUNTED
FOR 2 TAPHOLES

CARAVELLE NOCTURNE BIDET
[illegible]
FOR 2 TAPHOLES

NOCTURNE BATH
[illegible]
ACRYLIC

NOCTURNE TOILET
[illegible]

BASINS
Shown here in Damask



MINA
[illegible]
WALL MOUNTED

RHAPSODY
[illegible] COUNTER TOP
1, 2 OR 3 TAPHOLES

PARMIS HANDRINSE
[illegible]

INTERNATIONAL
[illegible] COUNTER TOP
1, 2 OR 3 TAPHOLES

ANGLO
[illegible]
WALL MOUNTED

BARBICAN HANDRINSE
[illegible] RECESSED

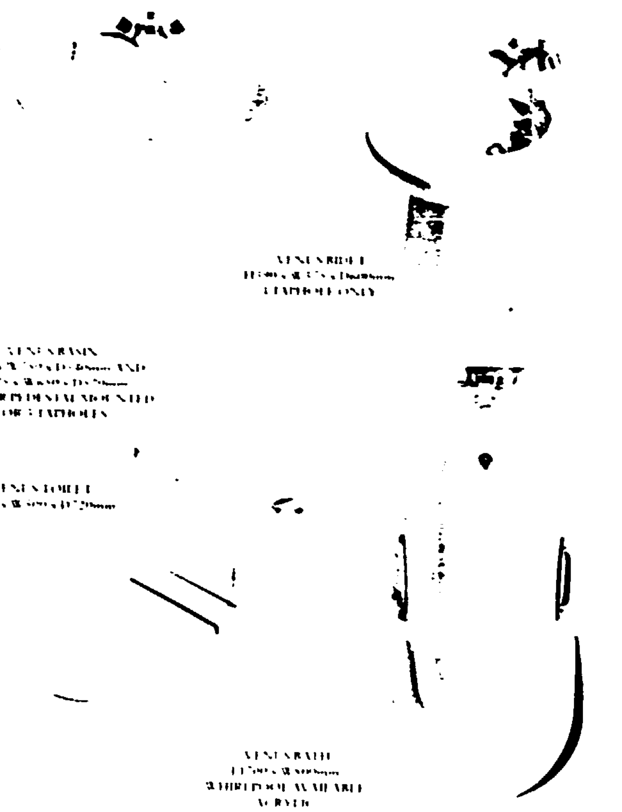
TOILETS

[illegible]

All products are available in all colours shown on the back cover with the following exceptions: CAMELLIA Only available on Jupiter Basins, W.C. and Bidet, Olympian Steel Bath, Calypso Shower Tray, Rhapsody Counter Top Basin. DEBUT ROYALE Burnished Gold Lines on Surface – Available on Debut

W = WIDTH D = DEPTH projection from wall L = LENGTH H = HEIGHT

V E N U S S U I T E
Shown here in Cornflower



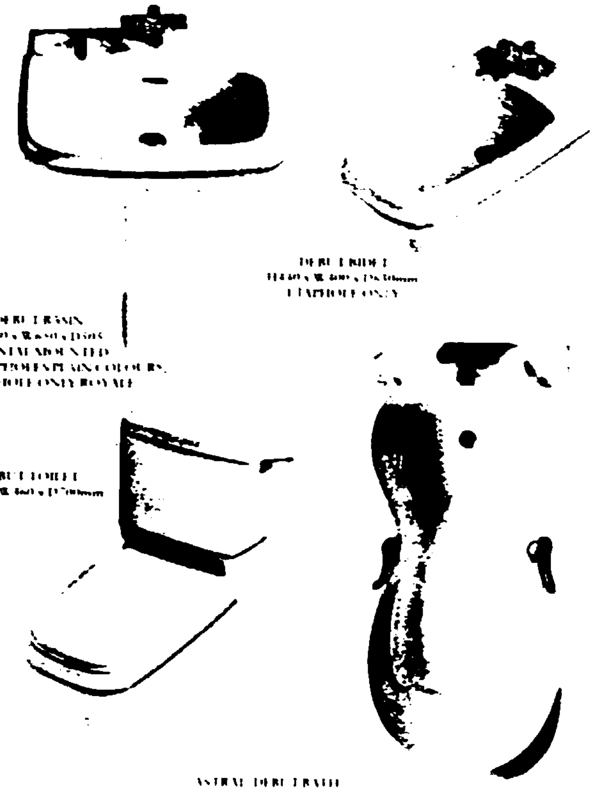
VENUS BIDET
[illegible]
1 TAPHOLE ONLY

VENUS BASIN
[illegible] AND
[illegible]
WALL OR PEDESTAL MOUNTED
FOR 3 TAPHOLES

VENUS TOILET
[illegible]

VENUS BATH
[illegible]
WHIRLPOOL AVAILABLE
ACRYLIC

D E B U T S U I T E
Shown here as Debut Royale - burnished gold lines on Sorbet -



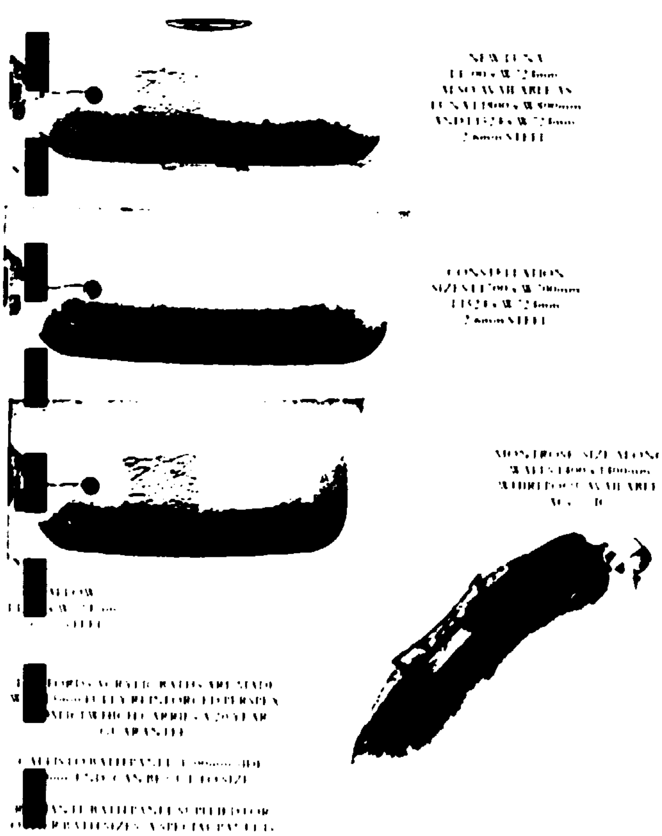
DEBUT BIDET
[illegible]
1 TAPHOLE ONLY

DEBUT BASIN
[illegible]
PEDESTAL MOUNTED
FOR 3 TAPHOLES PLAIN COLOURS,
1 TAPHOLE ONLY ROYALE

DEBUT TOILET
[illegible]

ASTRAL DEBUT BATH
[illegible]
WHIRLPOOL AVAILABLE
ACRYLIC

B A T H S
Shown here in Pampas



NEW LUNA
[illegible]
ALSO AVAILABLE AS
[illegible]
STEEL

CONSTELLATION
[illegible]
STEEL

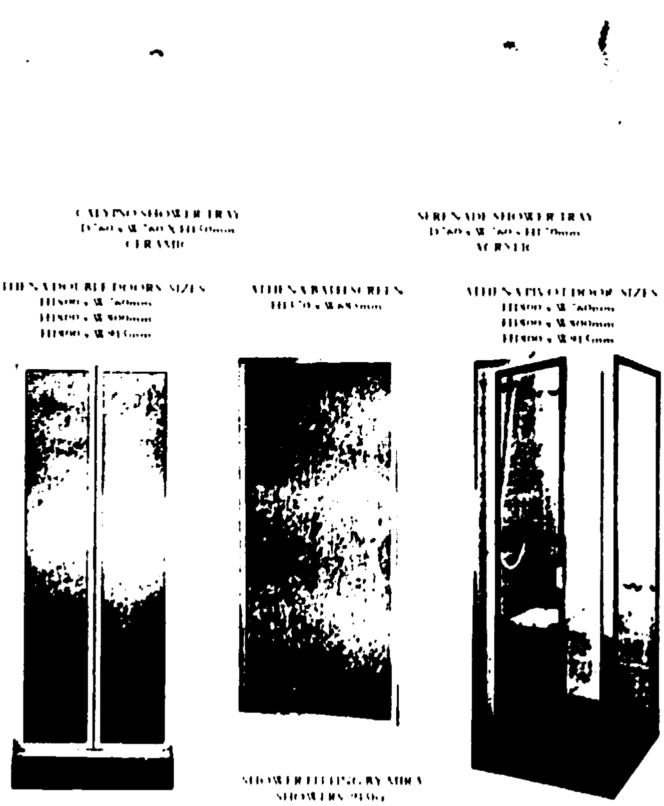
MONTROSE [illegible]
WHIRLPOOL AVAILABLE
[illegible]

[illegible]

[illegible]

[illegible]

S H O W E R S
Athena Shower Screens offer a choice of white, silver and gold frames, and bronze or Cotswold natural glass



CALYPSO SHOWER TRAY
[illegible]
CERAMIC

SERENADE SHOWER TRAY
[illegible]
ACRYLIC

ATHENA DOUBLE DOORS SIZES
[illegible]

ATHENA BATHSCREEN
[illegible]

ATHENA PIVOT DOOR SIZES
[illegible]

SHOWER FITTING BY MIRA SHOWERS [illegible]

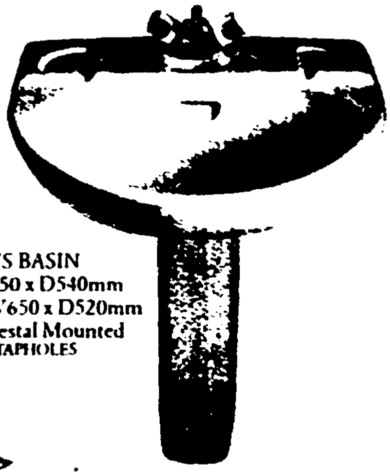
[illegible] Colours shown in this Brochure are as close to the actual Product Colours as the printing process will allow

[illegible] W.C. and Bidet only. Debut Basins, W.C. and Bidet are not available in [illegible] White. Due to the process of continuous development we reserve the right

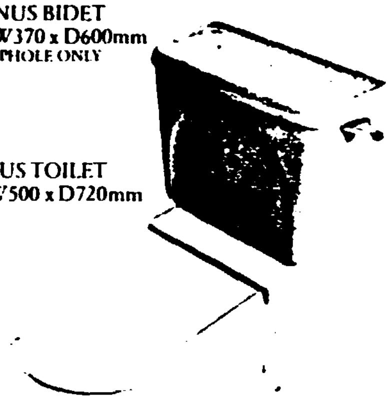
VENUS

H – HEIGHT W – WIDTH D – DEPTH (projection from wall) L – LENGTH

VENUS BIDET
405 x W370 x D600mm
1 TAPHOLE ONLY

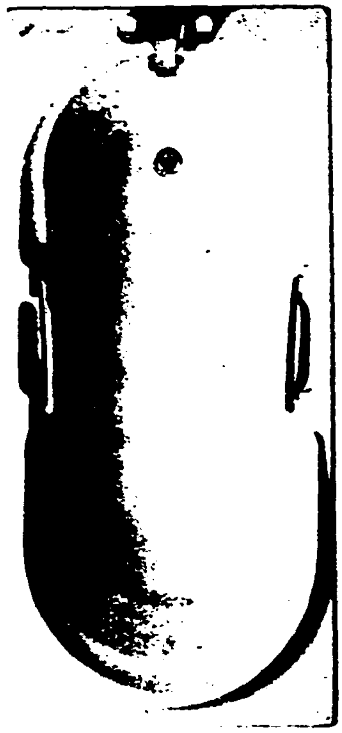


VENUS BASIN
H840 x W750 x D540mm
and H820 x W650 x D520mm
Wall or Pedestal Mounted
1 OR 3 TAPHOLES



VENUS TOILET
H770 x W500 x D720mm

VENUS CLOAKROOM BASIN
W455 x D275mm
Wall Mounted
1 OR 2 TAPHOLES



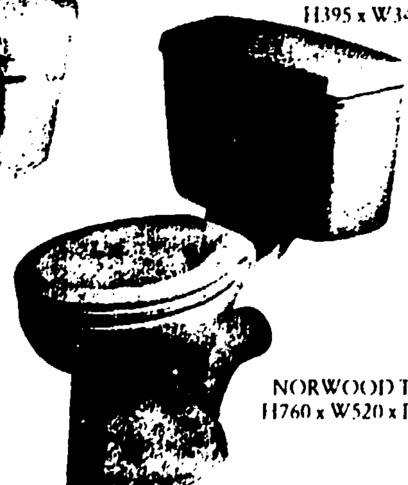
VENUS BATH
L1700 x W800mm
5mm Fully re-inforced acrylic.
Whirlpool available.

NOCTURNE/NORWOOD

NOCTURNE BASIN
H790 x W600 x D455mm
1, 2 OR 3 TAPHOLES
and H790 x W500 x D430mm
1 OR 2 TAPHOLES
Pedestal Mounted

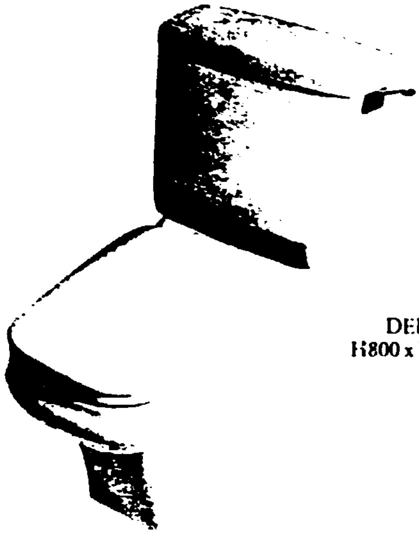
CARAVELLE/
NOCTURNE BIDET
H395 x W345 x D540mm

NOCTURNE TOILET
H770 x W520 x D690mm

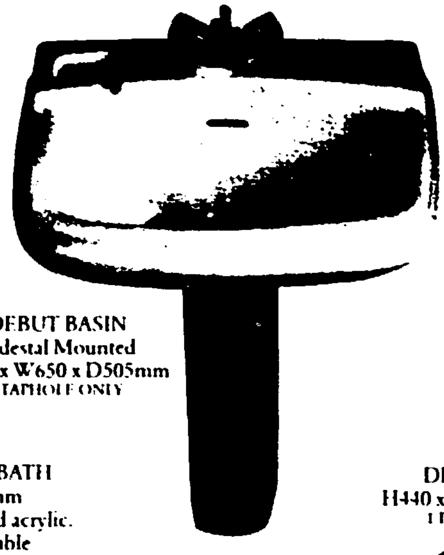


NORWOOD TOILET
H760 x W520 x D700mm

NOCTURNE BATH
L1700 x W750mm
5mm Fully re-inforced acrylic.

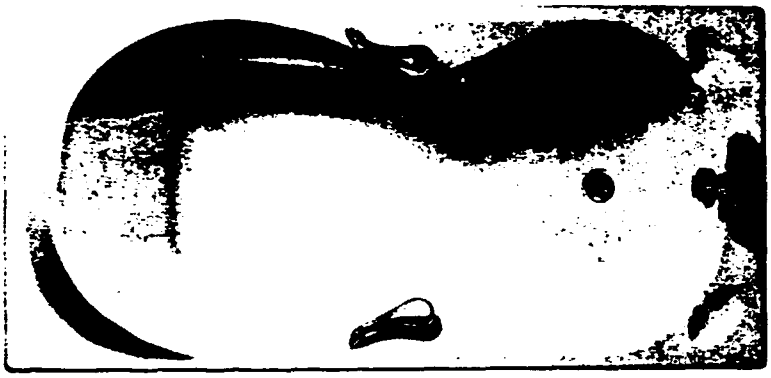


DEBUT TOILET
H800 x W460 x D700mm

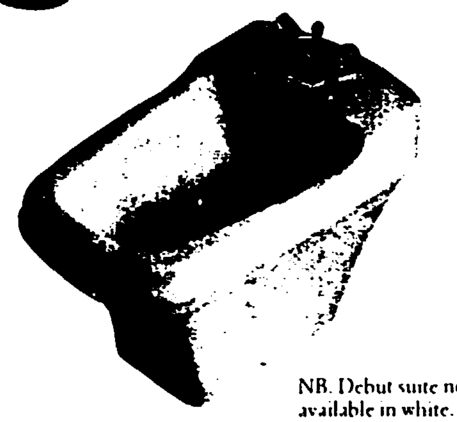


DEBUT BASIN
Pedestal Mounted
H840 x W650 x D505mm
1 TAPHOLE ONLY

DEBUT/ASTRAL BATH
L1700 x W800mm
5mm Fully re-inforced acrylic.
Whirlpool Available

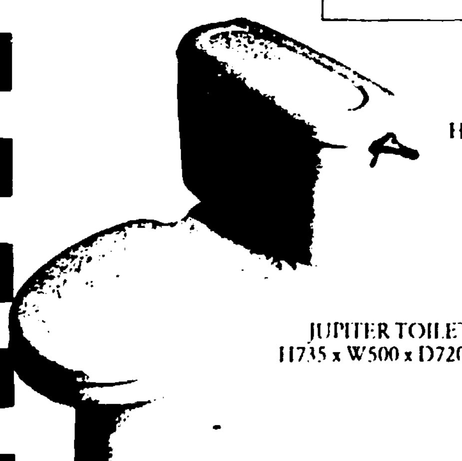


DEBUT BIDET
H440 x W400 x D630mm
1 TAPHOLE ONLY



NB. Debut suite not available in white.

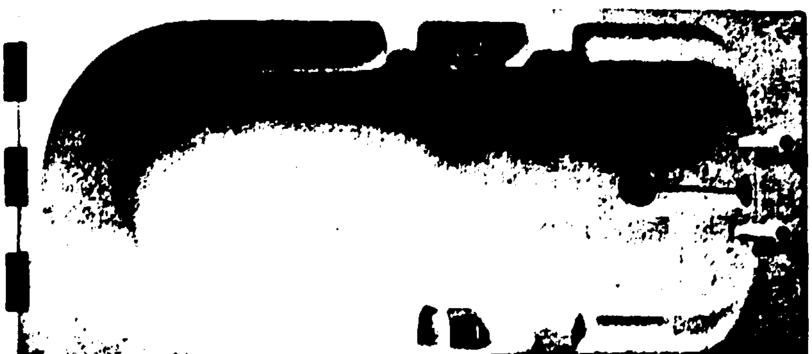
JUPITER



JUPITER TOILET
H735 x W500 x D720mm

JUPITER BIDET
H375 x W375 x D550mm
1 TAPHOLE ONLY

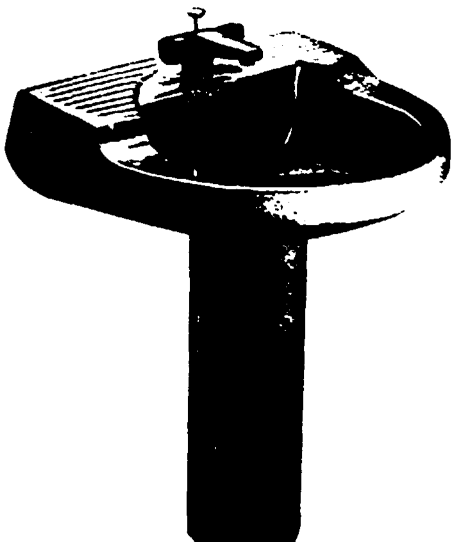
JUPITER BASIN
H820 x W580 x D500mm
FOR 2 TAPHOLES
H820 x W700 x D520mm
FOR 3 TAPHOLES
Pedestal Mounted

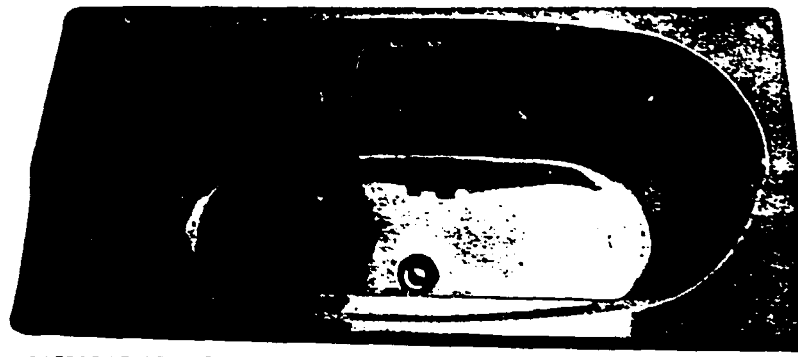


JUPITER BATH
L1700 x W750mm
5mm Fully
re-inforced acrylic

JUPITER
CLOAKROOM BASIN
W355 x D275mm
Wall Mounted
2 TAPHOLES ONLY

605 CAPRICORN





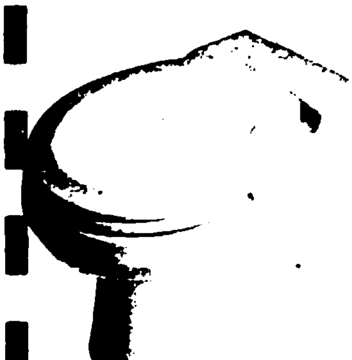
CAPRICORN BATH
L1700 x W800mm
5mm Fully re-inforced acrylic.
Whirlpool available.
Optional positioning of taps.

CAPRICORN TOILET
H800 x W400 x D710mm

CAPRICORN BIDET
H425 x W390 x D590mm
1 TAPHOLE ONLY

CAPRICORN BASIN
H900 x W700 x D520mm
Pedestal Mounted
1 TAPHOLE ONLY

OLYMPIAN



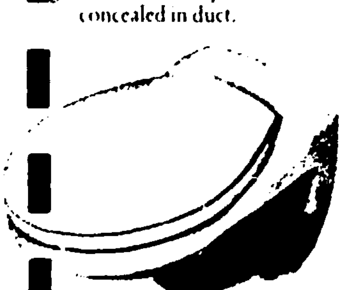
OLYMPIAN BATH
L1700 x W750mm
Whirlpool Available
3.5mm, Super Steel.

The ultimate bath - both extremely strong and beautifully styled.

OLYMPIAN BASIN
W635 x D450mm
Half inset to Counter Top
1, 2 OR 3 TAPHOLES

OLYMPIAN TOILET
H815* x W505 x D600mm

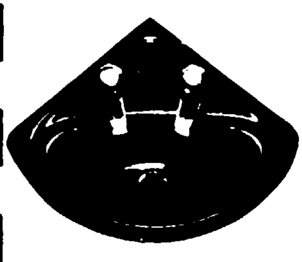
*Height measured to top of cistern concealed in duct.



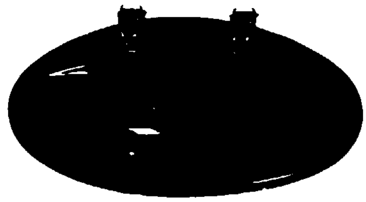
OLYMPIAN BIDET
H438 x W370 x D590mm
Wall Hung

OLYMPIAN TOILET
H815* x W505 x D550mm
Wall Hung

OLYMPIAN BIDET
H410 x W370 x D600mm

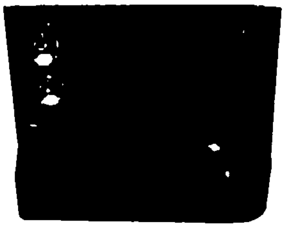


ANGLO II CLOAKROOM BASIN
W495 x D420mm
Wall Mounted
2 TAPHOLES ONLY



RHAPSODY BASIN
W585 x D420mm
Counter Top
1, 2 OR 3 TAPHOLES

INTERNATIONAL BASIN
W610 x D510mm
Counter Top
1, 2 OR 3 TAPHOLES



BARBICAN HANDRINSE BASIN
W510 x D405mm
Recessed
Special Aztec Fittings

CLASSIC TOILET
H895 x W520 x D710mm

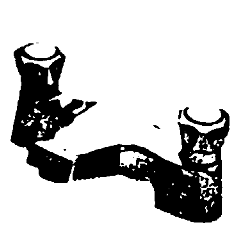
CLASSIC BASIN
H845 x W635 x D455mm
and W635 x D455
Wall or Pedestal Mounted
2 TAPHOLES ONLY

PARMIS HANDRINSE BASIN
W500 x D300mm
Recessed
2 TAPHOLES ONLY

TA

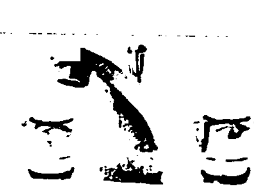
AZTEC

½" pillar taps for basins or bidets
¾" pillar taps for baths



Bath mixer

Mixer for baths/showers

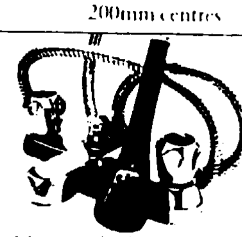


Basin mixer with 200mm centres

AMAZON

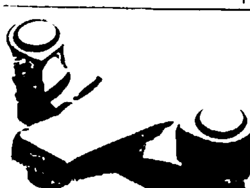
½" Pillar taps for basins or bidets
¾" Pillar taps for baths

Bath mixer

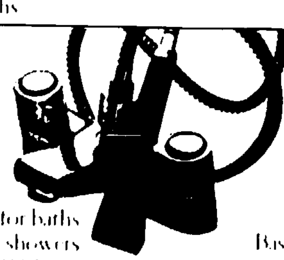


Mixer for baths/showers

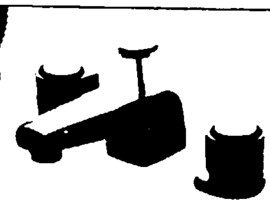
INCA



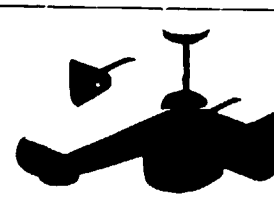
Bath mixer



Mixer for baths/showers



Basin mixer with 200mm centres

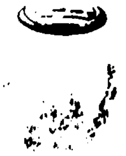


Single hole mixer for basins

Single le
direction

TAP HEADS

AMAZON ONYX



BLUE

GREEN

PINK

BEIGE

BLUE

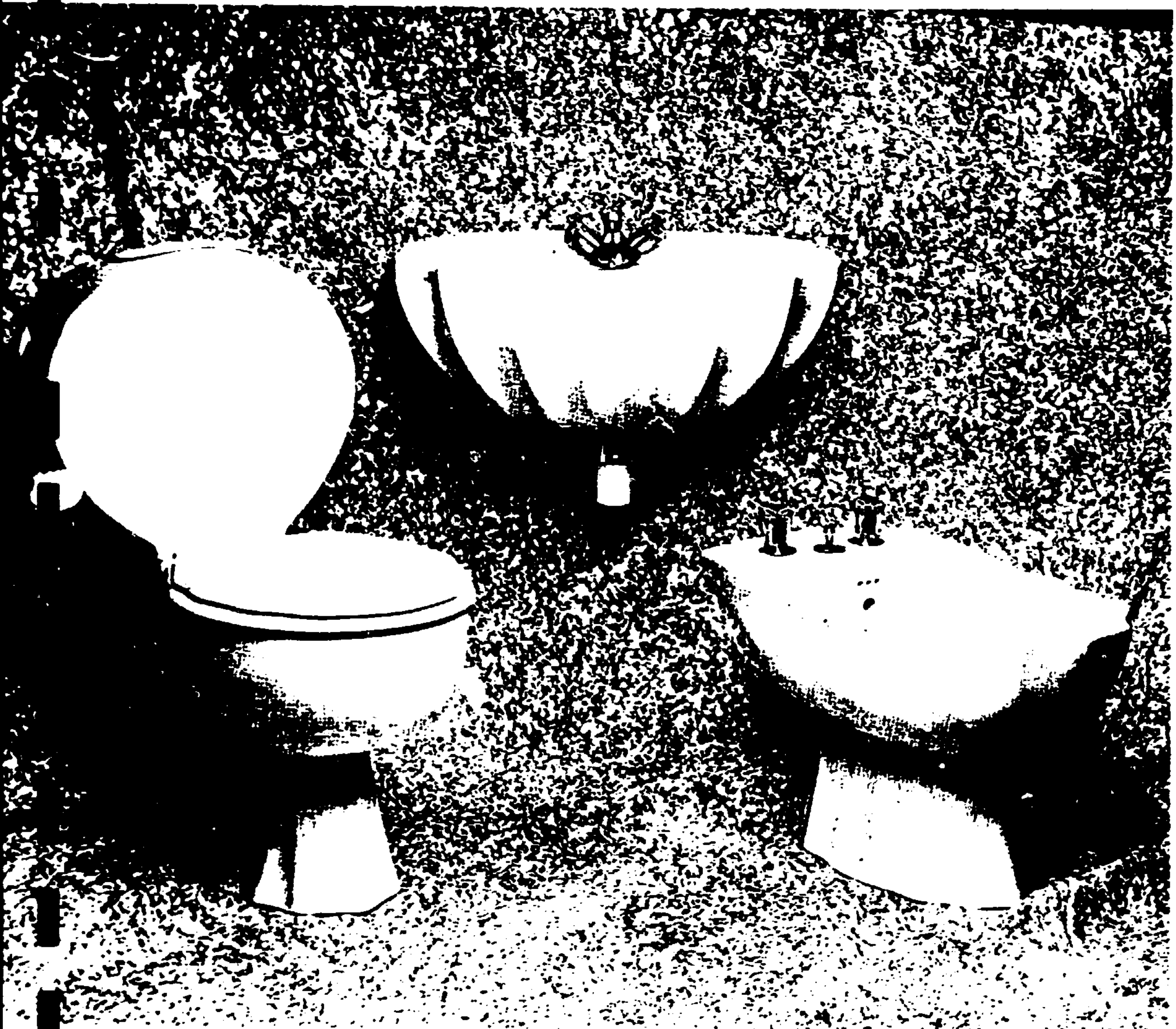
ALSO AVAILABLE WITH GOLD FINISH TRIM

o) Vitra, TURKEY

VENÜS

VENUS

LAVABO
KLOZET REZERVUAR
BIDE

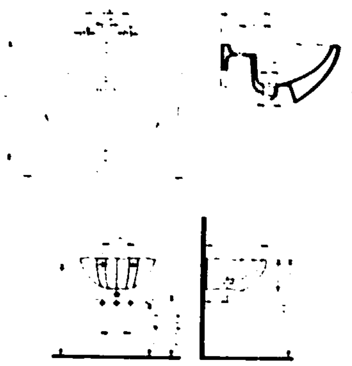


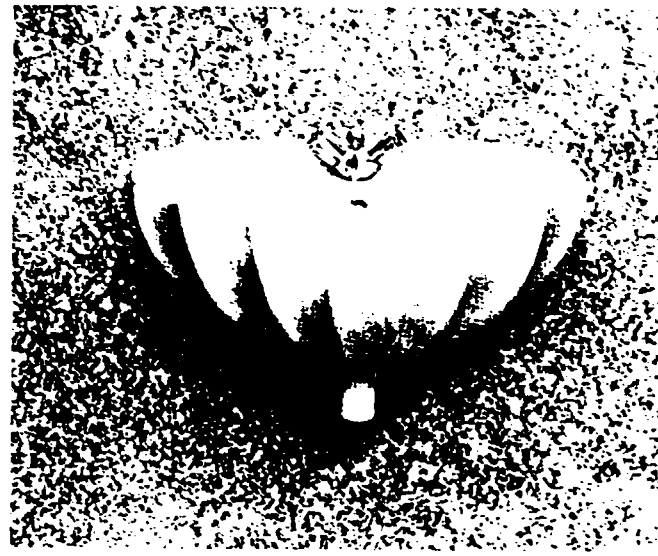
Eczacıbaşı

LAVABO

VENUS
Wash basin
Venus

6045



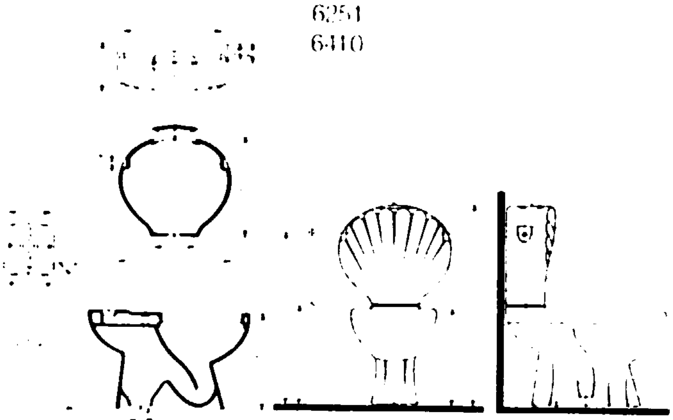


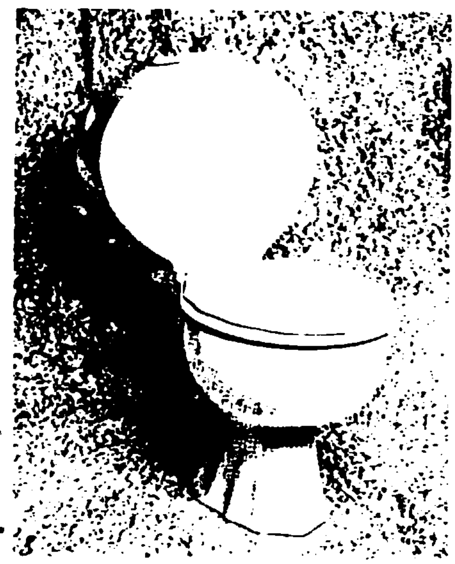
Venus [illegible] ARTEMA [illegible] Apollo [illegible]
[illegible]

KLOZET REZERVUAR

VENUS
Cistern and pan
Venus

6251
6410

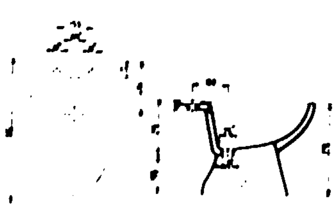




BIDE

VENUS
Bidet
Venus

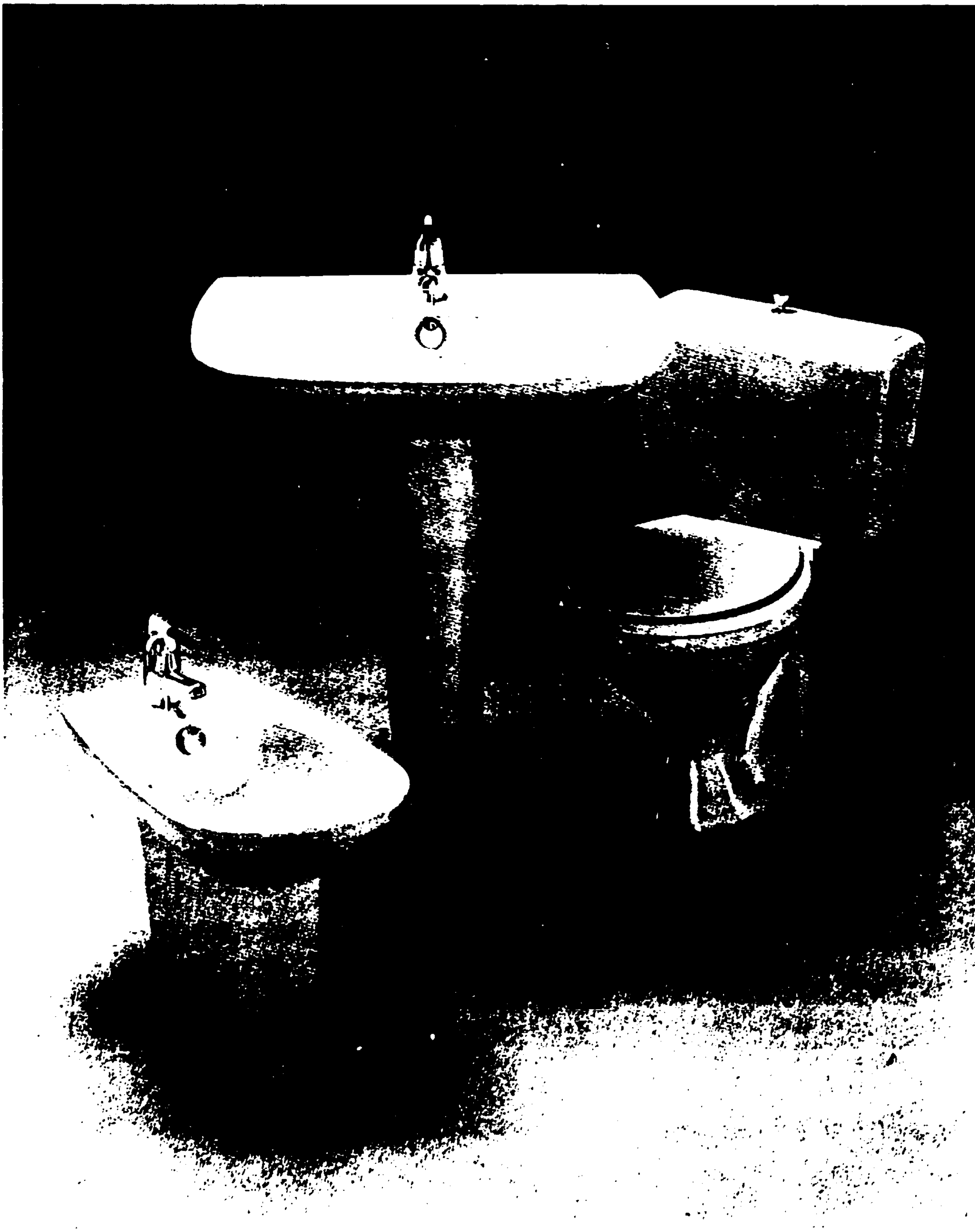
6248



Venus bide [illegible] ARTEMA [illegible] Apollo [illegible]
[illegible]

p) Porcher, France

LIGNE CONCORDE



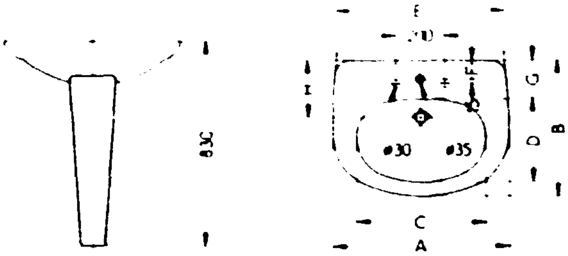
LAVABOS

Réf.:
1218.. - Lavabo 0,72 m x 0,55 m
1238.. - Lavabo 0,60 m x 0,50 m
1940.. - Colonne

Percé 1 trou O 35 mm
Pré-percement 2 trous O 30 mm

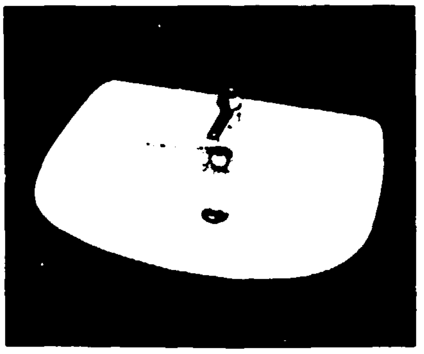
Fixation de la colonne au sol par un fixe-pied n 6729

Fixation du lavabo au mur par 2 attaches
N 0176 - laiton chromé ou
N 0175 - fonte plastifiée permettant de l'adosser au mur ou de l'éloigner de 5 cm environ



N°	A	B	C	D	E	F	G	H	Poids
121	720	555	530	340	665	80	160	230	17 kg
123	600	500	460	300	550	70	150	220	13 kg
194									6 kg

Sur consoles permettant d'adosser le lavabo au mur ou de l'éloigner de 5 cm environ
N 0115 - sachet de 2 consoles fonte plastifiée et 2 fixations
N 0110 - 1 console fonte brute et 1 fixation



Lavabo CONCORDE "bleu" n° 123831 sur consoles n° 0115, vidage n° 7160 et mitigeur PORPHYRE n° 687 X 30

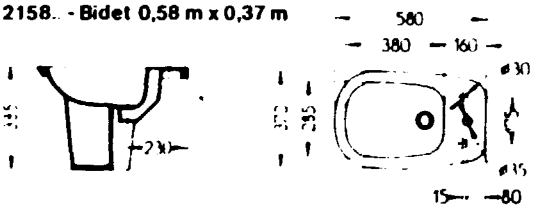
BIDET

Réf.:
2158.. - Bidet 0,58 m x 0,37 m

Percé 1 trou O 35 mm
Pré-percement 2 trous O 30 mm

Fixation du bidet au sol par 2 fixe-pied n° 6729

Poids ≈ 11 kg

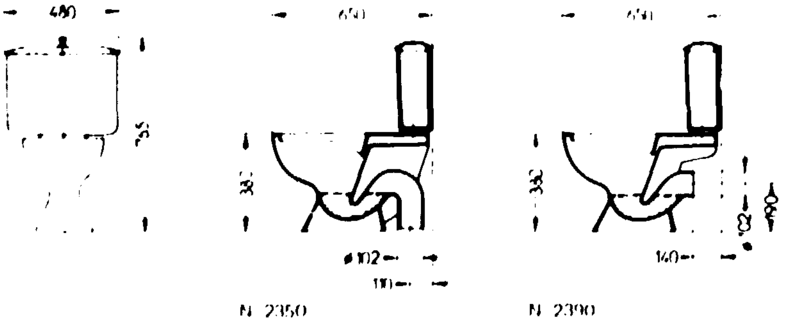


W.C. PERFECTO

Réf.:
2350.. - Cuvette - sortie verticale
2390.. - Cuvette - sortie orientable

Réservoirs livrés complets avec robinet d'arrêt
9389.. - Intégral acétal
9459.. - Intégral silentor
9441.. - Galbé silentub

Cuvette à chasse directe - sortie extérieure O 102 - Côtes de raccordement conformes aux normes NF D 12 105 et EN 33

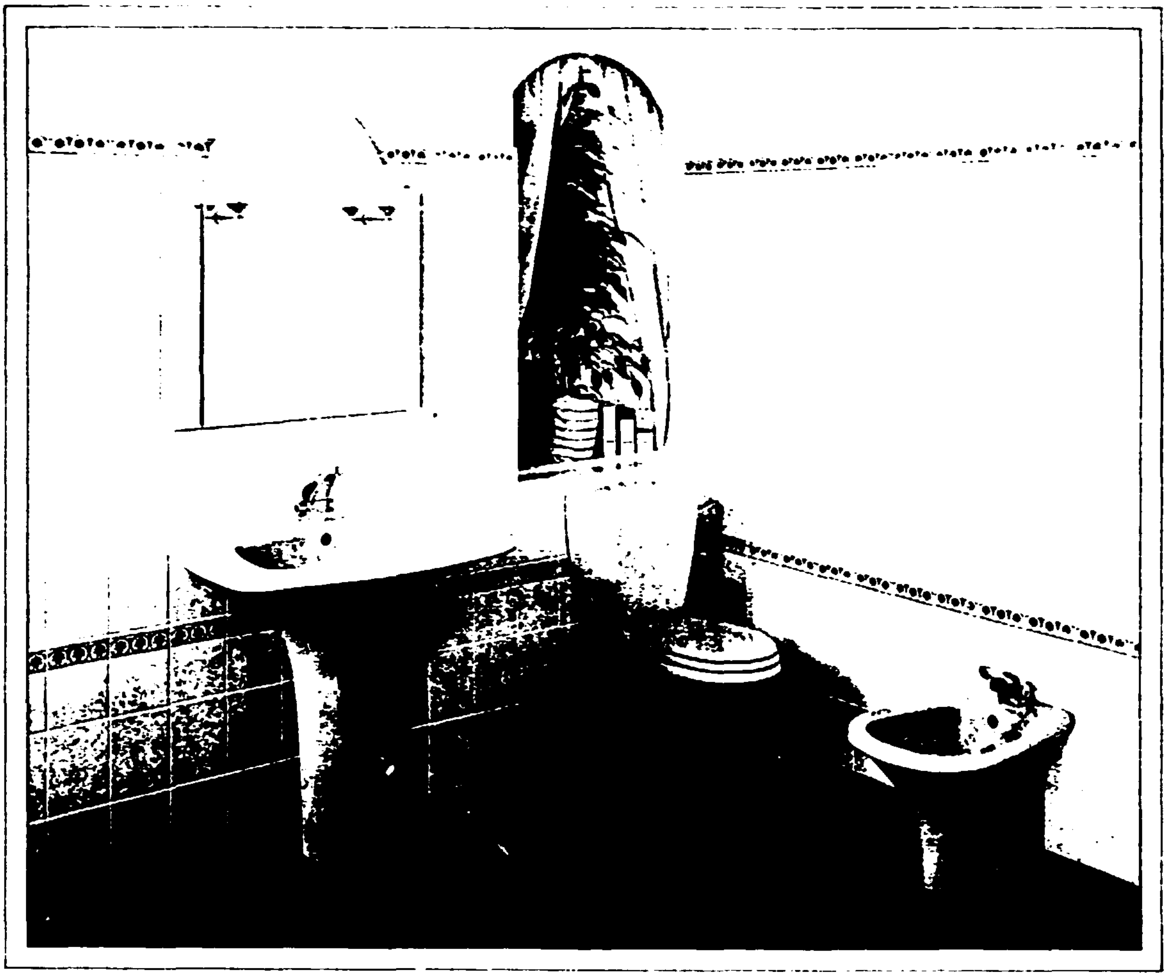


N 2350 N 2390

Poids ≈ Cuvette 14 kg
Réservoir 13 kg

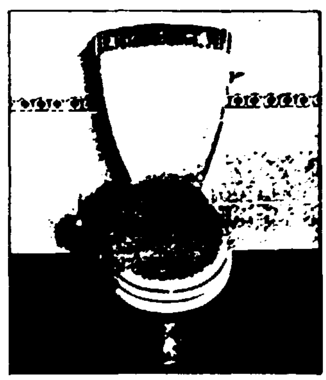
THE CALICEA ENSEMBLE

". . . a suite for all reasons . . ."

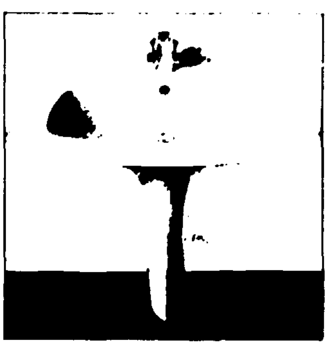


A strong French influence on this chic design of today is the hallmark of Calicea. with a choice of single and double basins. Calicea is available in all colours except Black.

Double basin and pedestal 1 20m



Close coupled WC
with luxury seat



Basin and pedestal 0 80m

Bidet

Tiles SERENITY EVENING MIST
by City Ceramics

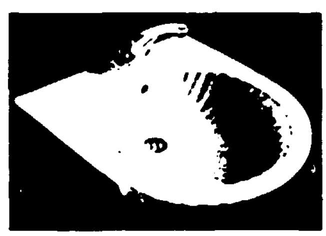
THE COQUILLE ENSEMBLE

"... quite simply exquisite"

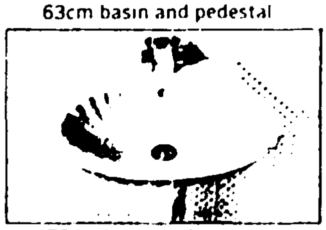
Coquille is available in White, Indian Ivory, Creme, Black, Violine, Coraline and Blue/Blue. In addition to the 75cm basin and pedestal, the close-coupled WC, the bidet and the mirror and accessories illustrated above, the Coquille collection also includes the designs pictured below. The Agate series of water fittings, also manufactured by Porcher, marry perfectly with the sculptured elegance of the Coquille Ensemble.

Vanity Bowl (60 x 47cm)

63cm basin and pedestal

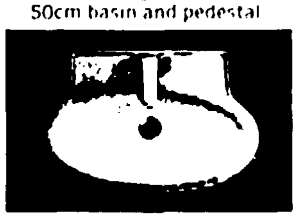


Semi cantilevered hand basin (64 x 53cm)

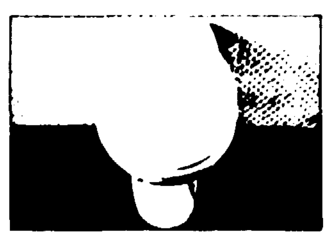


50cm basin and pedestal

Shell styled acrylic bath (size 1800 x 860mm)



53cm hand basin



Odessa ducted pan with Coquille seat

Tiles: TRAPUNTA BIANCO by City Ceramics

"ODESSA"

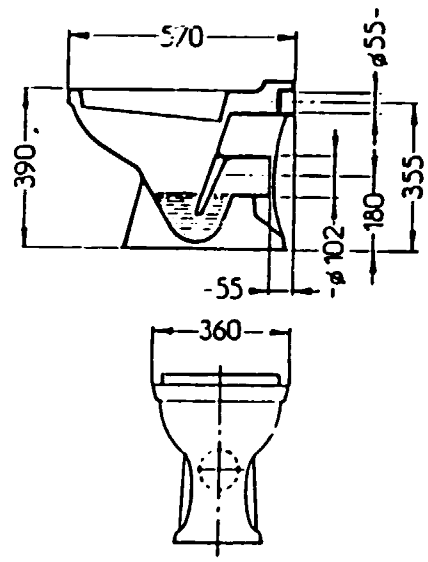
CUVETTE A ALIMENTATION SÉPARÉE

N° de code :
417.0 - Sortie horizontale.

Cuvette à alimentation séparée d'esthétique nouvelle.

Peut être alimentée par réservoir en élévation "EXCELSIOR". Réf. 991.9.

Abattant 134 V.



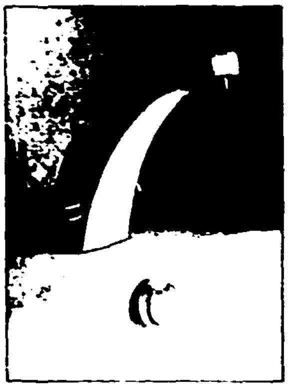
PORCHER

75-77, boulevard Victor Hugo
93404 SAINT-OUEN
Tél. : (1) 42 57 11 55

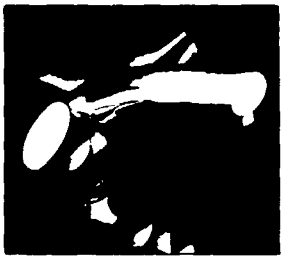
Salon d'exposition
16, place de la Madeleine
75008 PARIS
Tél. : (1) 42 65 28 07

Water Fittings

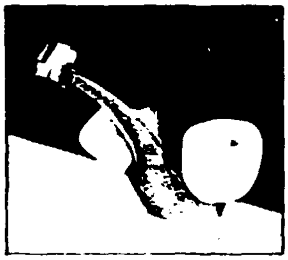
Porcher present three ranges of quite magnificent brass water fittings — **AGATE** — a luxury range available in a stunning collection of special finishes incorporating ceramic cartridges — **VALBONNE** — a chic design available in gold edged satin chrome and other finishes, also with ceramic cartridges and — **OPALE** — a modern range available in chrome, gold or white but including the fashionable feature of coloured ceramic handles to match the sanitary ware



AGATE

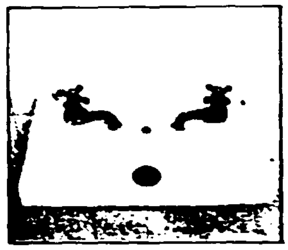


VALBONNE



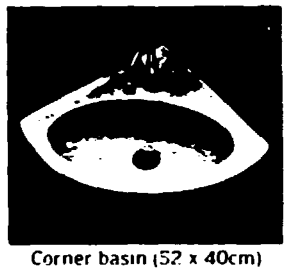
OPALE

PALAIS Vanity bowl (57 x 46cm)



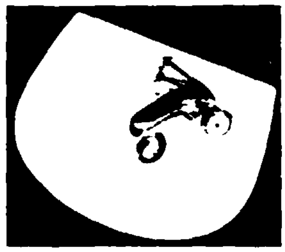
RETRO wall hand basin (45 x 32cm)

OVALE Vanity bowl (55 x 43cm)



Corner basin (52 x 40cm)

FEMINA 53cm Hand-basin



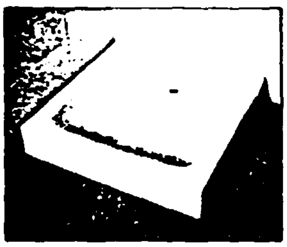
Standard hand basin (42 x 30cm)

The **RETRO** wall hand basin is available in White only. All the other products illustrated above are available in all colours except Black

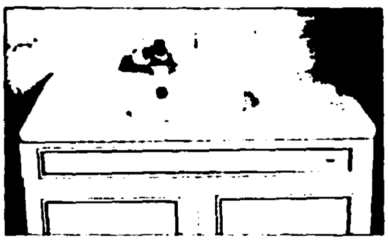
Shower Trays

in durable enamelled fire clay

The **EGEE** model (illustrated) is 80 x 80cm square. The range is completed by the **ETOILE**, 100 x 75cm, and the **EMERAUDE**, an 82cm rounded corner style tray. All models are available in all colours except Black



EGEE



PRIAM 80 and LUTETIA 110

The Priam and Lutetia ranges provide a wonderful combination of beauty and practicality for the bathroom or bedroom. With lightweight one piece all ceramic tops set in spacious purpose-made cabinets, there are a range of furniture units available with three different door colours

SAPHO

A very special basin (65 x 52cm). Porcher present a range of three exclusive models basically in White with matching taps and towel rails in a range of fashion colours.

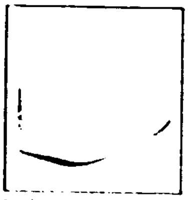
PORCHER

Exclusive U.K. Agents:

Kingston Marketing Services Ltd.
15 Royal Parade, North Bersted,
Bognor Regis, West Sussex PO21 5QH
Tel: Bognor Regis (0243) 866633
Telex: 86465 KMS

Designed and produced by AMBERWELL 05828 3 1369

q) Ariston, Italy


Bath Soap Dish

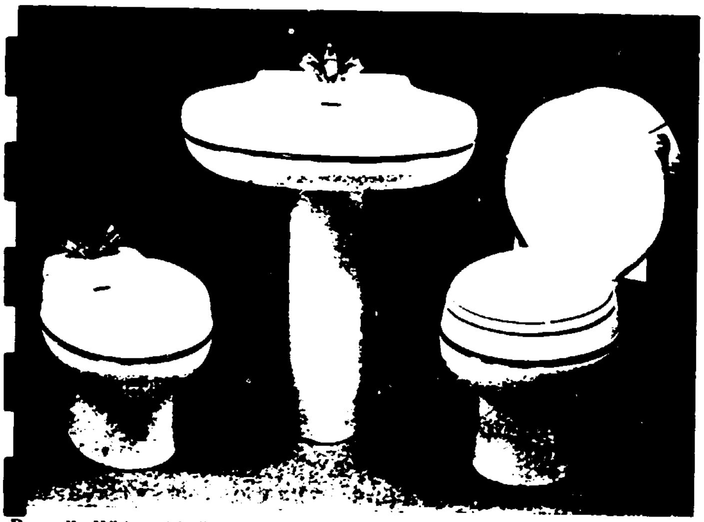

Toilet Roll Holder

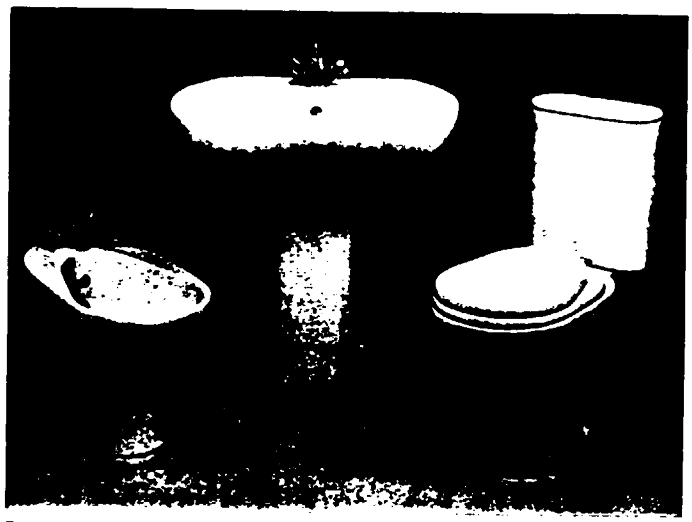
Senesi Ceramic Collection

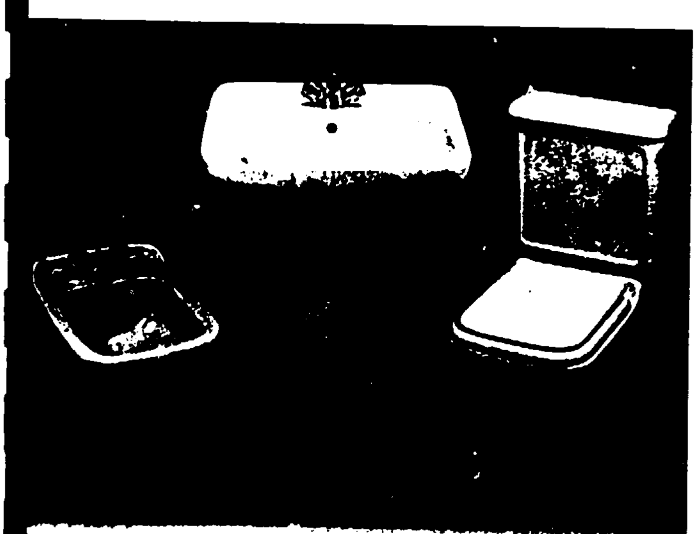

Bidet Soap Dish

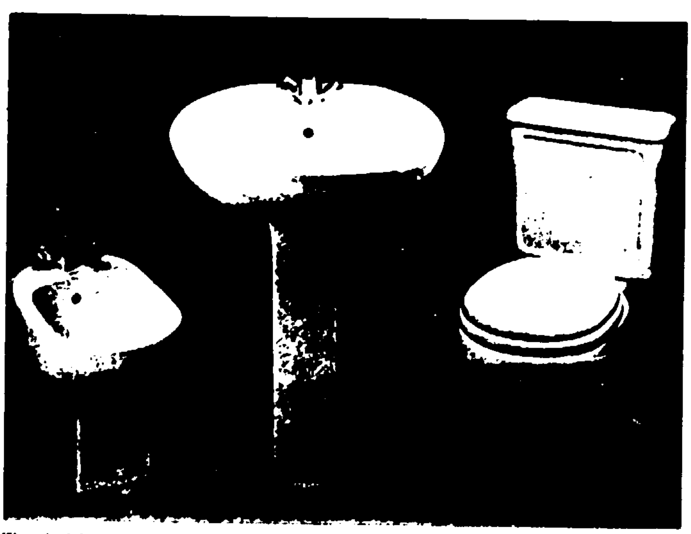

Sponge Holder

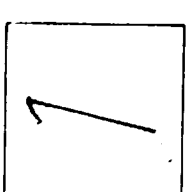
Ariston Senesi Collection brings the best in Continental design to your bathroom. The bold Brunello with contrasting line, the square, sculptured Duccio and the classic Sovana and Tuscia. All with a complete range of co-ordinating accessories.

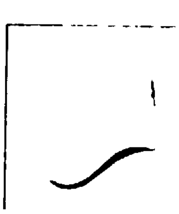

Brunello White with Gold

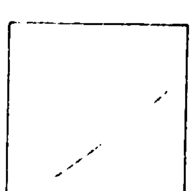

Sovana Champagne


ccio Misty Grey


Tuscia Misty Pink


Towel Rail


Robe Hook


Shelf

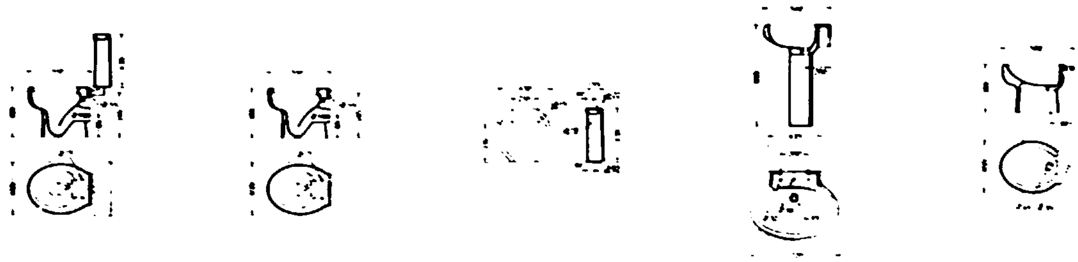
See back page for technical information

Ariston Bathroom Collection

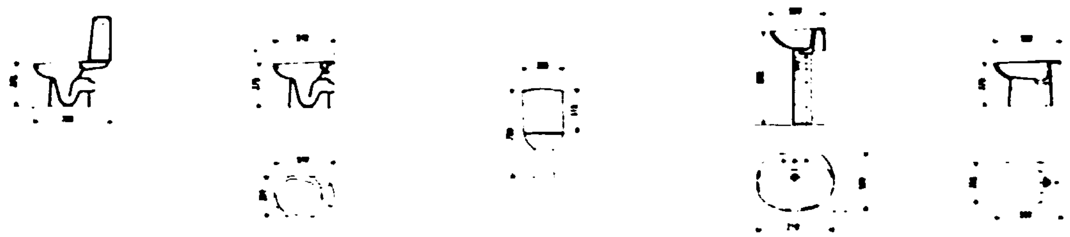
CERAMIC COLLECTION

DIMENSIONS

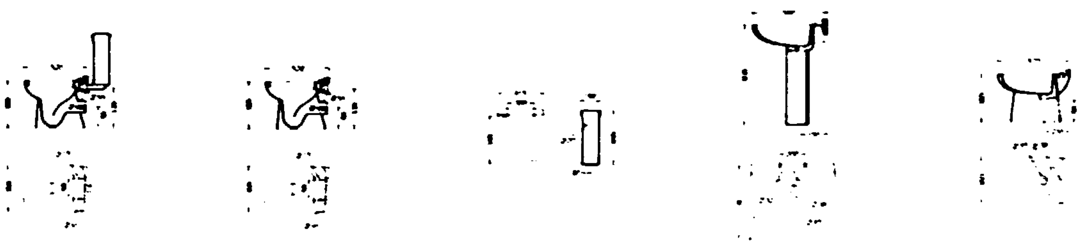
Brunello



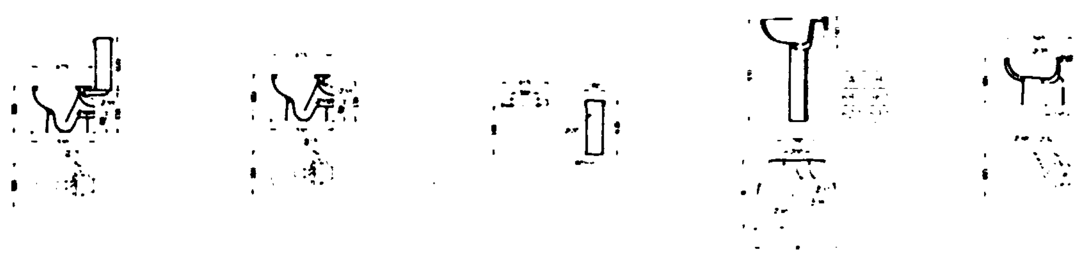
ovana



Duccio



Tuscia



*Surcharge on this colour	White	Avocado	Pampas	Kashmir	Indian Ivory	Sun King	Sandalwood	Champagne	*Penthouse Red	Alpine Blue	Bermuda Blue	Misty Pink	Misty Blue	Misty Green	Misty Grey	Wild Sage	Almond	Whisky	Honeysuckle	Linden Green	Primrose	Turquoise	Sky Blue	Pink	Bamboo	Sorbet	Willow Green	Chiffon Pink	White with blue line	White with gold line	Champagne with brown trim
0mm Plain Steel Bath	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
00mm Twin Grip Steel Bath	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
1500mm Plain Steel Bath	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
-Luxe Steel Bath	•	•	•	•	•			•	•		•	•			•	•									•						
per De-Luxe Steel Bath	•	•	•	•	•			•	•		•	•	•	•	•	•	•	•	•	•					•	•	•	•			
Shower Tray	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
Senesi Brunello																													•	•	•
nesi Sovana/Duccio/Tuscia	•							•				•			•	•															
st Iron Baths	•		•		•			•				•			•	•															

(NB Specification Range White only)

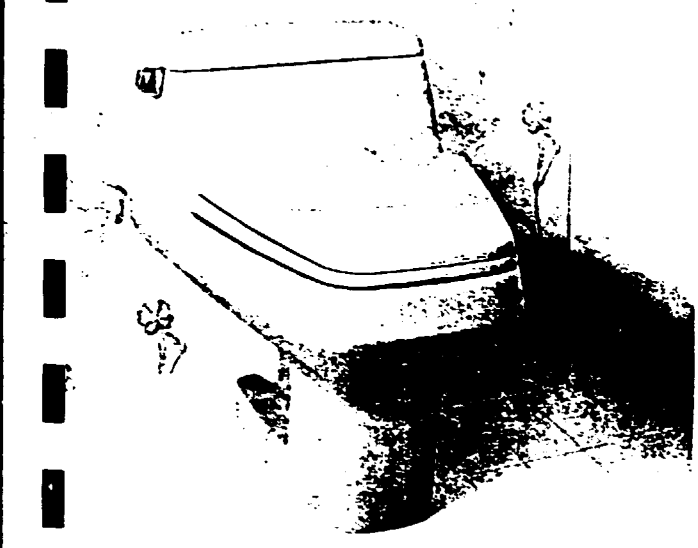
Due to our constant endeavours to improve our products, we reserve the right to alter specifications or appearance without notice

ARISTON

BATHROOMS LIMITED

Ariston House, London Road, High Wycombe, Bucks HP11 1 ·· Phone (0494) 459711 Telex 83751 ARIBAL G Fax (0494) 459 ··

r) American Standard, U.S.A.



Plaza Toilet

Tapered angular lines create a comfortable one piece shape.

AF [illegible]

Vitreous china — free standing toilet combination — elongated reverse trap syphon vortex action bowl — chrome plated push button side flush actuator — bowl and insulated tank in one piece — concealed bolt covers — solid plastic toilet seat and cover included — C.S.A. certified.

Nominal Dimensions

A — 20" (508 mm)

B — 22¾" (578 mm)

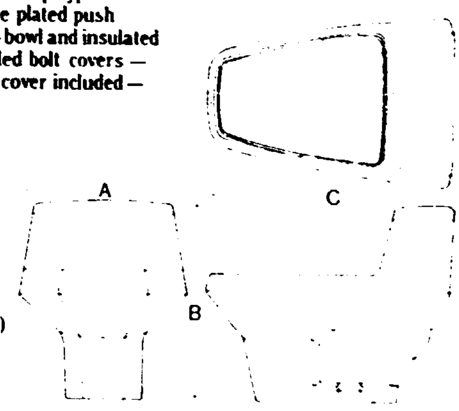
C — 29½" (749 mm)

Water Surface

9½" (241 mm) x 12" (305 mm)

Seal depth 4" (102 mm)

Pass 2" (51 mm) ball



Plaza Bidet

The natural style companion to the Plaza Toilet.

AF 5015

Vitreous china with flushing rim wash and douche spray — integral overflow — supplied with factory installed Heritage fittings with crystal clear handles — concealed bolt covers — C.S.A. certified.

To order Plaza bidet with optional Heritage Supreme bidet fitting specify AF-5015 S.M.A. and the product number of the fitting of your choice. See page 48.

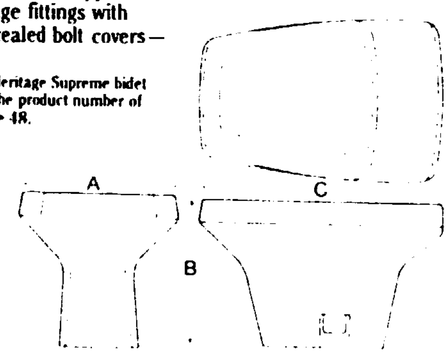
(Heritage Supreme bidet fitting illustrated.)

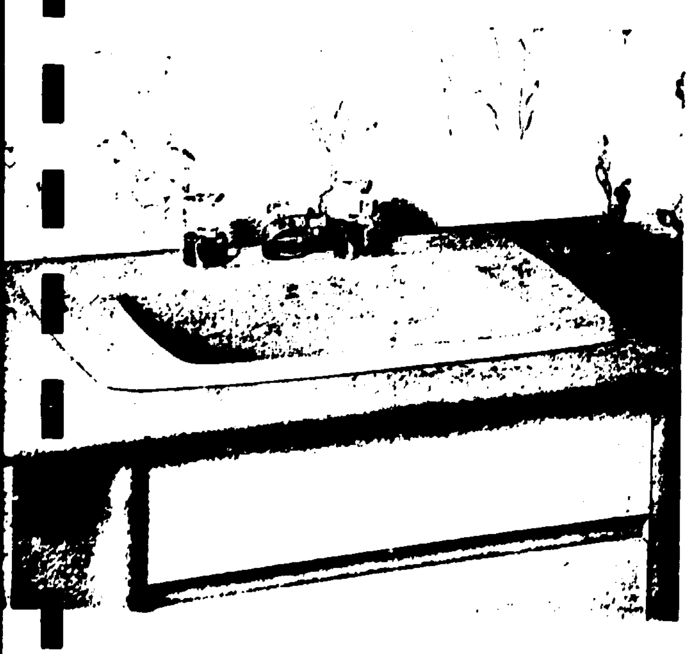
Nominal Dimensions

A — 15¾ [illegible]00 mm)

B — 14½" (368 mm)

C — 25½" (648 mm)





Plaza Countertop Basin

A generously proportioned countertop basin to fit perfectly in your bathroom.

AF 0160 — single hole punching
AF 0166 — 8" (203 mm) centres
Vitreous china — self-rimming with sealant — fitting ledge — front overflow — C.S.A. certified.

Nominal Dimensions

A — 26" (660 mm)

B — 18" (457 mm)

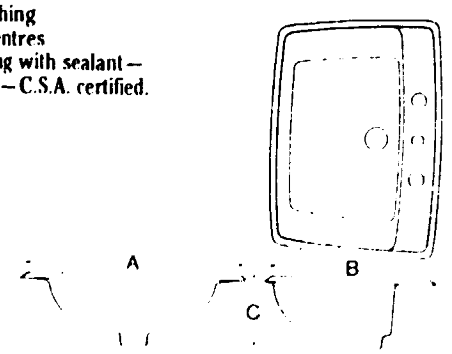
C — 7¼" (184 mm)

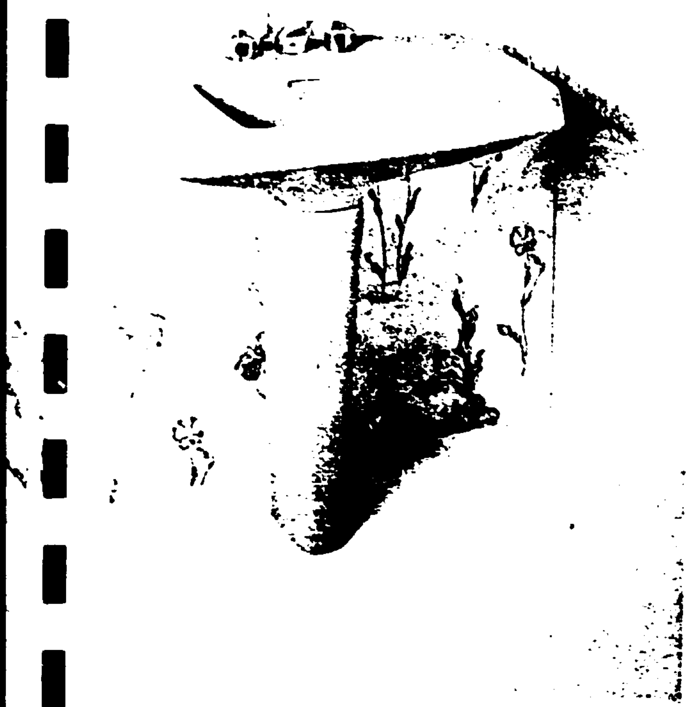
Bowl Dimensions

18" (457 mm) wide

11¼" (286 mm) front to back

5½" (140 mm) deep





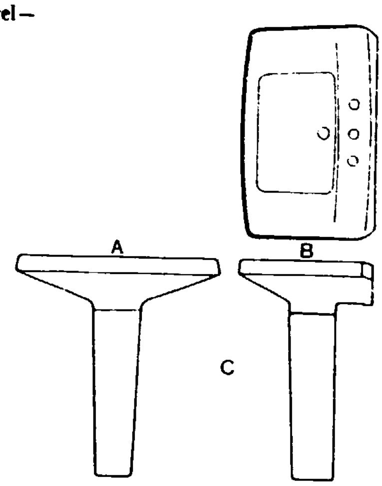
Plaza Pedestal Basin

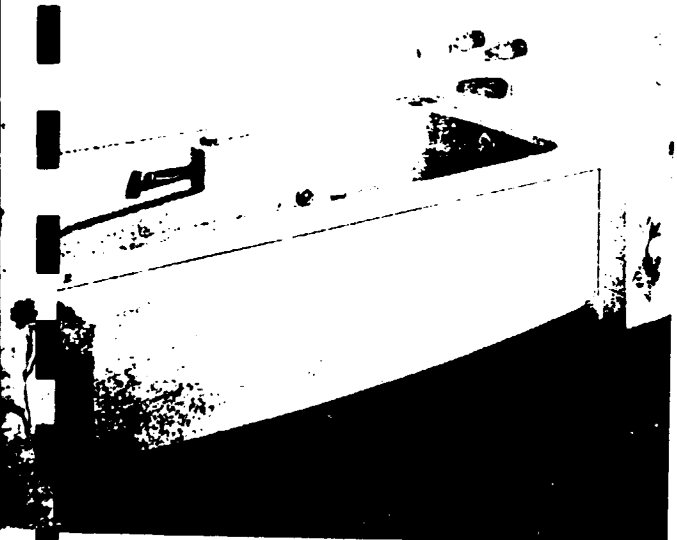
Spacious bowl and stately pedestal combine for beautiful styling in vitreous china.

— single hole punching
— 8" (203 mm) centres
Fitting ledge with spacious shelf area — rear overflow — anchoring screw parcel — C.S.A. certified.

Nominal Dimensions
A — 30" (762 mm)
B — 19" (483 mm)
C — 32¼" (819 mm)

Bowl Dimensions
17" (432 mm) wide
11¼" (286 mm) front to back
6½" (165 mm) deep





▲ *Plaza Acrylic Bathing Pool with detachable apron*

Plaza Acrylic Bathing Pool

A luxurious bathing pool for total relaxation.

bathing pool
Acrylic — slip-resistant surface — chrome plated brass grab bars — built-in lumbar support — universal design with optional detachable apron for left or right hand recessed installation — without apron, bathing pool may be installed as corner, sunken, peninsular or island — Multi Flex pop-up drain — suitable for above floor drain installation — C.S.A. certified.

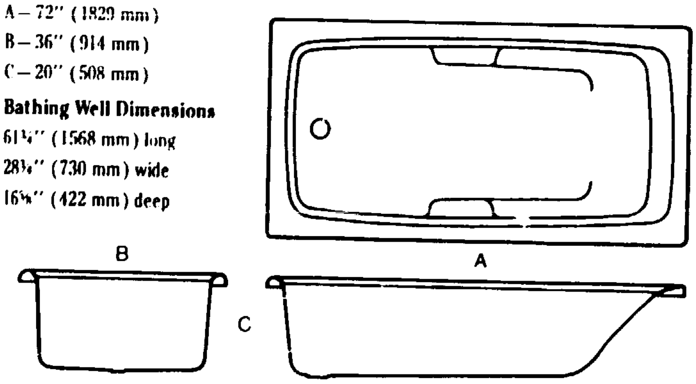
bathing pool with whirlpool
As above with factory mounted whirlpool equipment including: 8 colour co-ordinated multi-directional jets, chrome finish dual air induction controls — colour co-ordinated anti-vortex suction fitting — ¾ h.p. (.56kW) pump — 0-30 minute timer — C.S.A. certified.

apron only (order if required)

As the leader in whirlpool technology, American-Standard offers Touch-Tell*, an electronic digital whirlpool control system as an option. For more information see Luxury Whirlpool Features on page 34.

Nominal Dimensions
A — 72" (1829 mm)
B — 36" (914 mm)
C — 20" (508 mm)

Bathing Well Dimensions
61¾" (1568 mm) long
28¾" (730 mm) wide
16⅝" (422 mm) deep

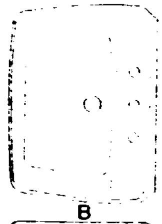


The opposite page shows the Plaza Acrylic Bathing Pool with Whirlpool as an island installation ▶

Plaza Petite Pedestal Basin

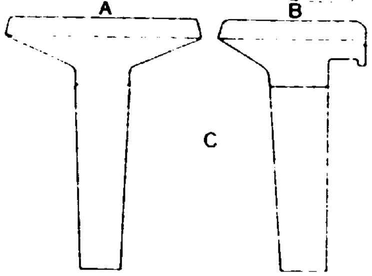
The clean lines of Plaza in a contoured bowl and matching pedestal.

—4" (102 mm) centres
—8" (203 mm) centres
Vitreous china basin and pedestal — fitting ledge with generous shelf area — rear overflow — anchoring screw parcel — C.S.A. certified.



Nominal Dimensions
A — 24" (610 mm)
B — 18" (457 mm)
C — 31½" (800 mm)

Bowl Dimensions
17" (432 mm) wide
10¾" (273 mm) front to back
5½" (140 mm) deep



Plaza Petite Acrylic Bath

Pamper yourself in a generous sized bath with detachable apron for complete freedom in installation selection.

bath
Acrylic — slip-resistant surface — built-in grab bars — built-in lumbar support — universal design with optional detachable apron for left or right hand recessed installation — without apron, bath may be installed as corner, sunken, peninsular or island — suitable for above floor drain installation — C.S.A. certified.

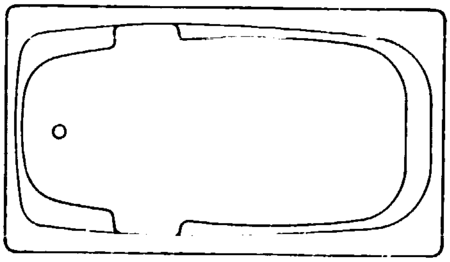
bath with whirlpool
As above with factory mounted whirlpool equipment including: 4 colour co-ordinated multi-directional jets — chrome finish dual air induction controls — colour co-ordinated anti-vortex suction fitting — ½ h.p. (.37kW) pump — 0-30 minute timer — C.S.A. certified.

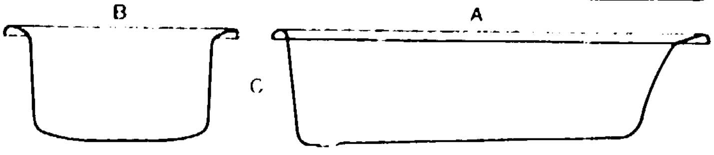
— apron only (order if required)

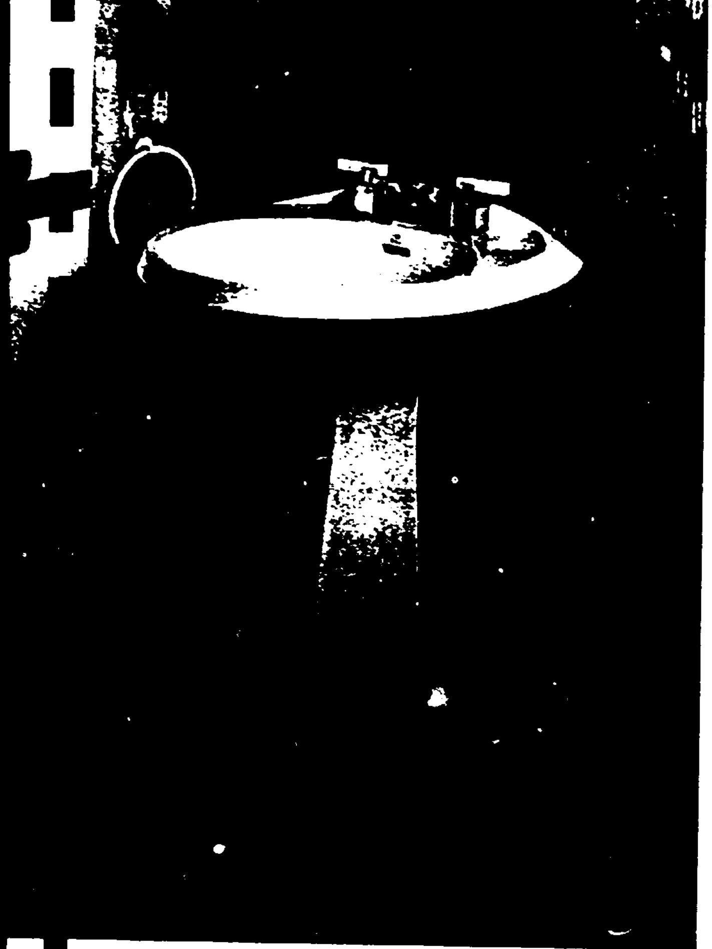
As the leader in whirlpool technology, American-Standard offers Touch-Tell*, an electronic digital whirlpool control system as an option. For more information see Luxury Whirlpool Features on page 34.

Nominal Dimensions
A — 60" (1524 mm)
B — 32" (813 mm)
C — 18" (457 mm)

Bathing Well Dimensions
52¾" (1340 mm) long
24½" (622 mm) wide
14¾" (375 mm) deep



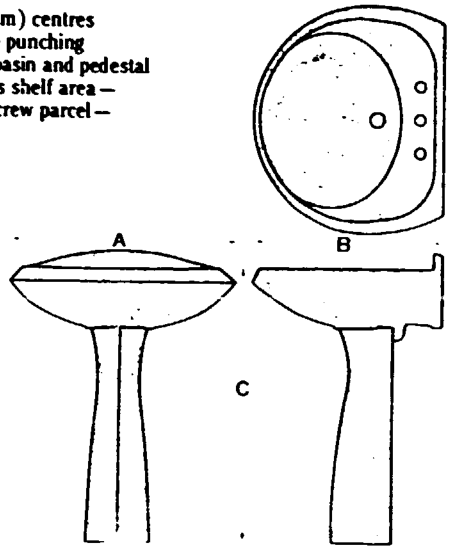




Ellisse Pedestal Basin

Classically beautiful with large sculptured bowl and elegant pedestal.

AF 0075 0100 – 8" (203 mm) centres
AF 0075 0370 – single hole punching
Vitreous china splash back basin and pedestal – fitting ledge with spacious shelf area – rear overflow – anchoring screw parcel – C.S.A. certified.



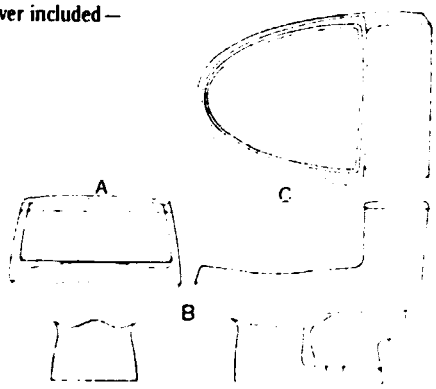
Nominal Dimensions
A – 26¾" (679 mm)
B – 22½" (572 mm)
C – 31½" (800 mm)

Bowl Dimensions
21" (533 mm) wide
16" (406 mm) front to back
7" (178 mm) deep

Ellisse Toilet

Ultimate luxury – one low beautifully sculptured vitreous china piece.

Vitreous china – free standing toilet combination – elongated reverse trap syphon vortex action bowl – chrome plated push button side flush actuator – bowl and insulated tank in one piece – concealed bolt covers – solid plastic toilet seat and cover included – C.S.A. certified.



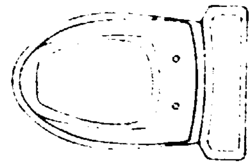
Nominal Dimensions
A – 21½" (546 mm)
B – 22⅞" (581 mm)
C – 30¼" (768 mm)

Water Surface
11¾" (298 mm) x
12¼" (311 mm)
Seal depth 3" (76 mm)
Pass 2" (51 mm) ball

Ellisse Petite Toilet

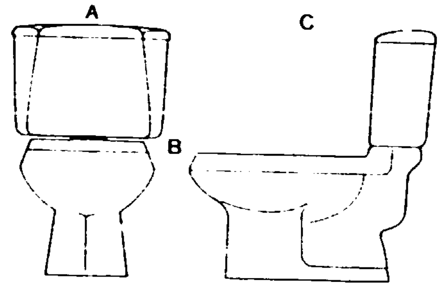
Luxurious, elongated two piece toilet combination

Vitreous china — free standing close coupled toilet combination — AF-3065 elongated syphon jet bowl and AF-4075-L insulated tank complete-chrome finish brass trip lever — 2 bolt caps — toilet seat and cover not included — C.S.A. certified.



Nominal Dimensions
A — 19" (483 mm)
B — 28⁵⁄₁₆" (719 mm)
C — 29⅛" (740 mm)

Water Surface
10" (254 mm) x 12" (305 mm)
Seal depth 3" (76 mm)
Pass 2⅛" (54 mm) ball



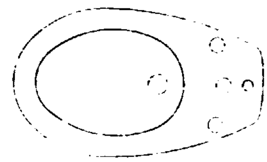
Ellisse Bidet

A style companion to the Ellisse Petite toilet.

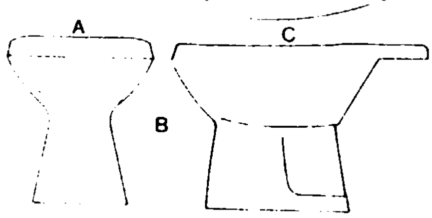
with Ceramix over-the-rim bidet fitting with pop-up drain
with Dualux over-the-rim bidet fitting with pop-up drain (illustrated)
with factory installed Heritage bidet fitting with pop-up drain

The Ellisse Bidet is offered with your choice of fittings (see above) — vitreous china — with flushing rim wash and douche spray — integral overflow — C.S.A. certified.

Note: To order the Ellisse Bidet with optional Heritage Supreme bidet fittings specify AF-5006 S.M.A. and the product number of the fitting of your choice. See page 48.



Nominal Dimensions
A — 14⅝" (371 mm)
B — 15⅞" (403 mm)
C — 22⅜" (568 mm)



Ellisse Petite Countertop Basin

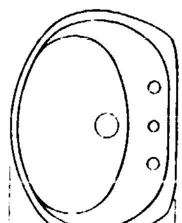
Elegant countertop basin with distinctive Ellisse lines and generous washing area.

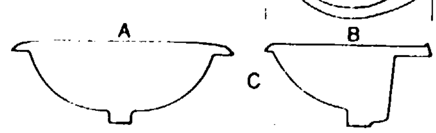
— 4" (102 mm) centres
— 8" (203 mm) centres

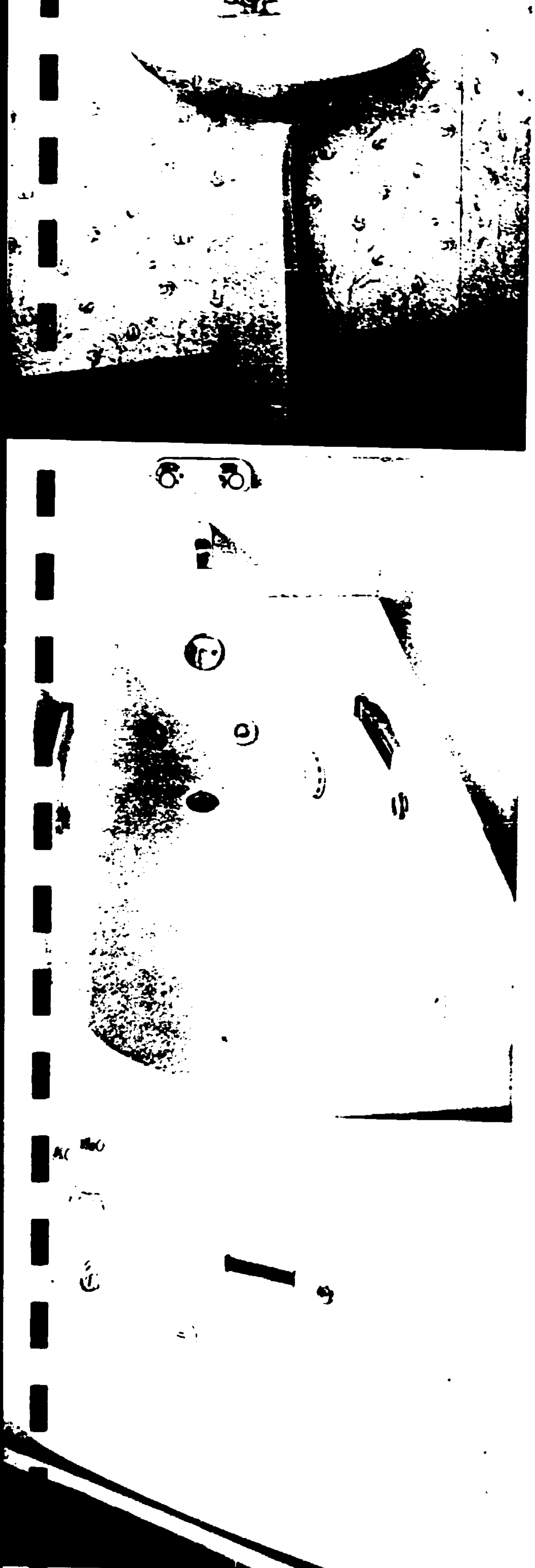
Vitreous china — self-rimming with sealant-fitting ledge — rear overflow — C.S.A. certified.

Nominal Dimensions
A — 24" (609 mm)
B — 18¼" (464 mm)
C — 8⅞" (225 mm)

Bowl Dimensions
19" (483 mm) wide
12" (305 mm) front to back
6⅜" (162 mm) deep



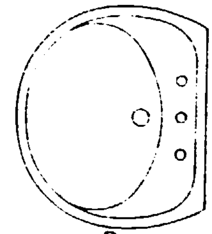




Ellisse Petite Pedestal Basin

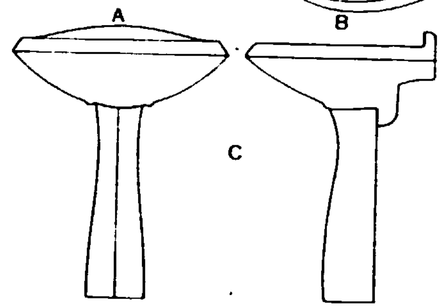
Sculptured bowl and pedestal create a look of classic beauty.

[illegible] —4" (102 mm) centres
[illegible] —8" (203 mm) centres
Vitreous china splash back basin and pedestal—fitting ledge with generous shelf area—rear overflow—anchoring screw parcel—C.S.A. certified.



Nominal Dimensions
A—24¼" (616 mm)
B—21" (533 mm)
C—31½" (800 mm)

Bowl Dimensions
20" (508 mm) wide
15¼" (387 mm) front to back
6¾" (171 mm) deep



Ellisse Petite Acrylic Bath

A beautifully proportioned luxury bath, sized to fit the conventional 5' (1524 mm) recess with a detachable apron to allow a variety of installation alternatives.

[illegible] **bath**
Acrylic—slip-resistant surface—built-in grab bars—built-in lumbar support—universal design with detachable apron for left or right hand recessed installation—without apron, bath may be installed as corner, sunken, peninsular or island—suitable for above floor drain installation—C.S.A. certified.

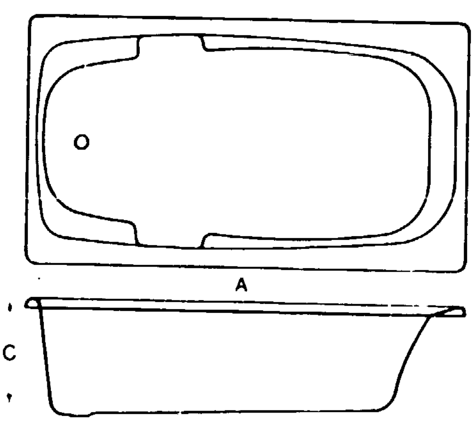
[illegible] **bath with whirlpool**
As above with factory mounted whirlpool equipment including: 4 colour co-ordinated multi-directional jets—chrome finish dual air induction controls—colour co-ordinated anti-vortex suction fitting—½ h.p. (.37kW) pump—0-30 minute timer—C.S.A. certified.

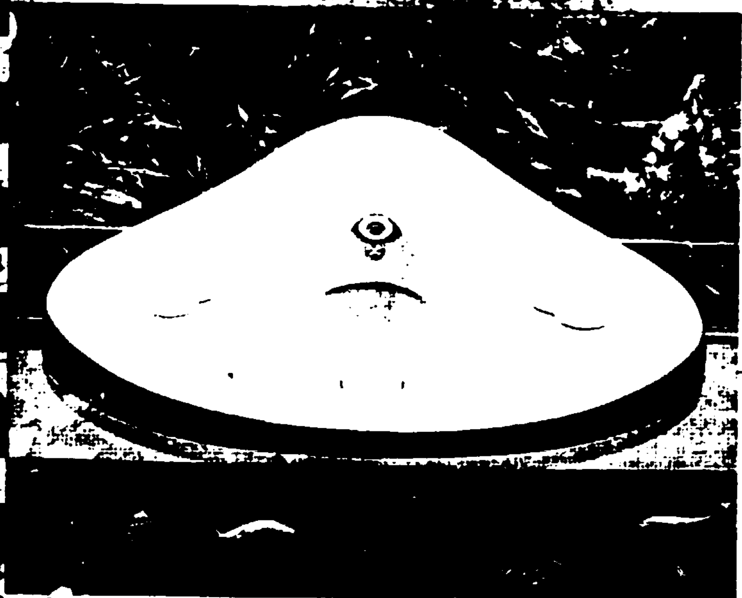
[illegible] **apron only (order if required)**

As the leader in whirlpool technology, American-Standard offers Touch-Tell®, an electronic digital whirlpool control system as an option. For more information see Luxury Whirlpool Features on page 34.

Nominal Dimensions
A—60" (1524 mm)
B—32" (813 mm)
C—18" (457 mm)

Bathing Well Dimensions
52¾" (1340 mm) long
24½" (622 mm) wide
14¾" (375 mm) deep





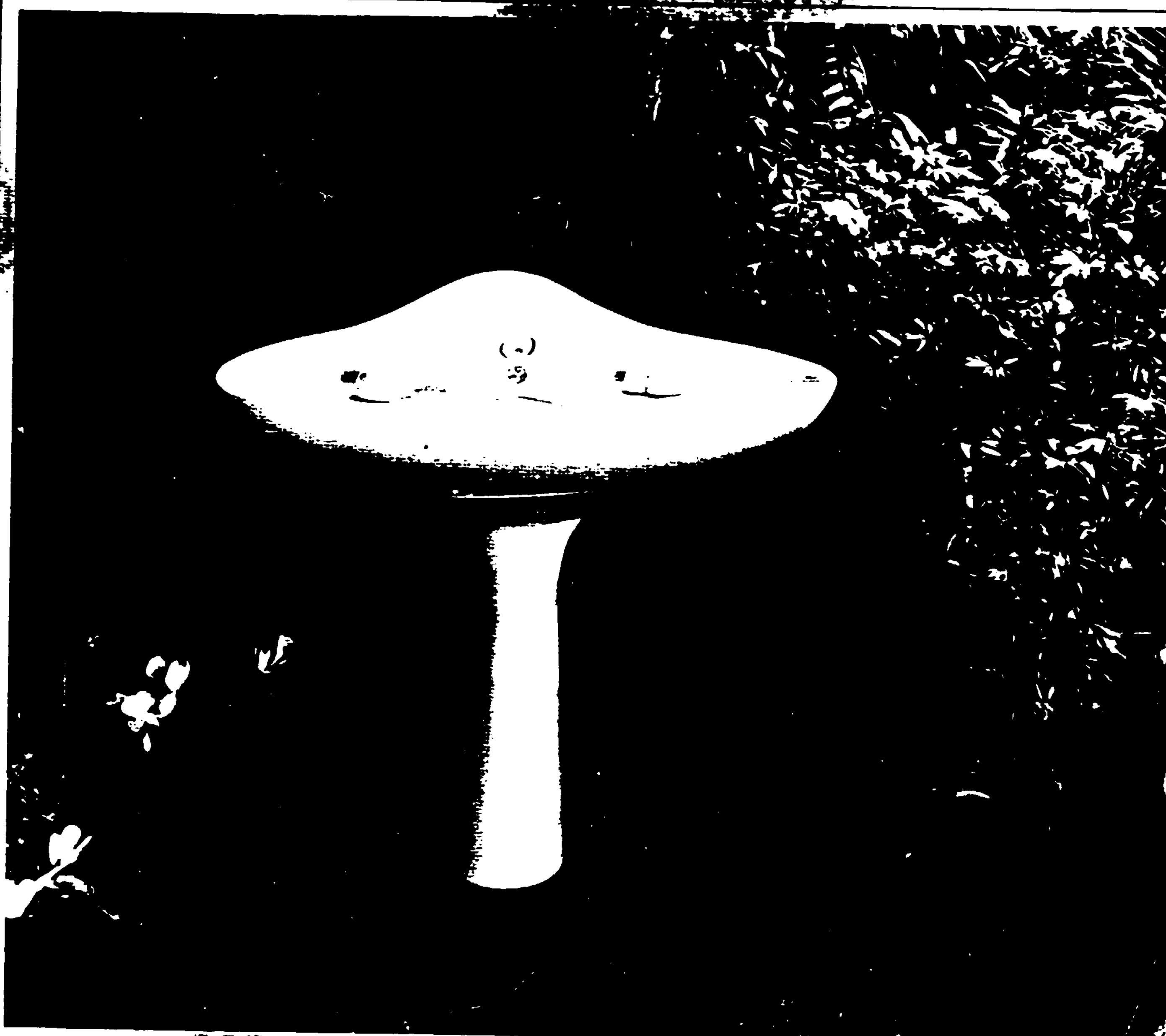
THE *Warren Platner* COLLECTION

American Standard captures nature's most exquisite qualities ... the Warren Platner Collection reflects excellence of design and a timeless quality equalled by none.

Masterfully created by world-renowned architect and designer, Warren Platner, this exclusive collection is sensuously sculpted into soft shell-shaped contours producing a magnificent bathroom suite.

For the discriminating few who have an intrinsic appreciation of excellence, the Warren Platner Collection is enhanced by eliminating the conventional look and touch of metal.

The shell-shaped or twist fitting handles, bolthole covers and push button flush actuator are finely crafted in splendid vitreous china. A unique fountain-like effect is created by integrating the waterspout into the counter top and pedestal basins. The end result is a luxurious bathroom environment that perfectly defines the elements of comfort, beauty and style.

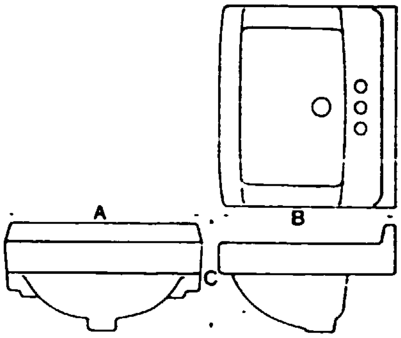


Timeless beauty crafted from nature

VITREOUS CHINA BASIN WALL HUNG

Acadian

[illegible]—4" (102 mm) centres
Vitreous china basin—for wall hung installation—wall hanger—splash back design—front overflow—soap dish—C.S.A. certified.

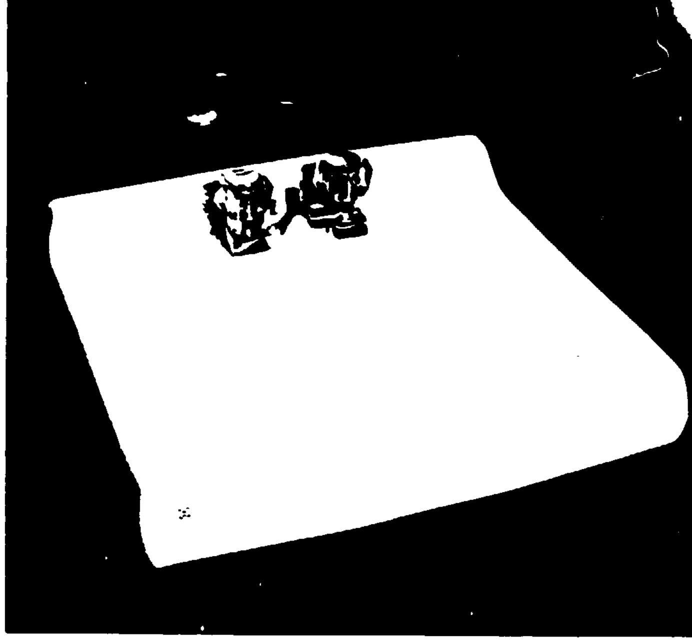


Nominal Dimensions

A—19" (483 mm)
B—17" (432 mm)
C—10" (254 mm)

Bowl Dimensions

15" (381 mm) wide
11¼" (286 mm) front to back
6½" (165 mm) deep



APPENDIX G

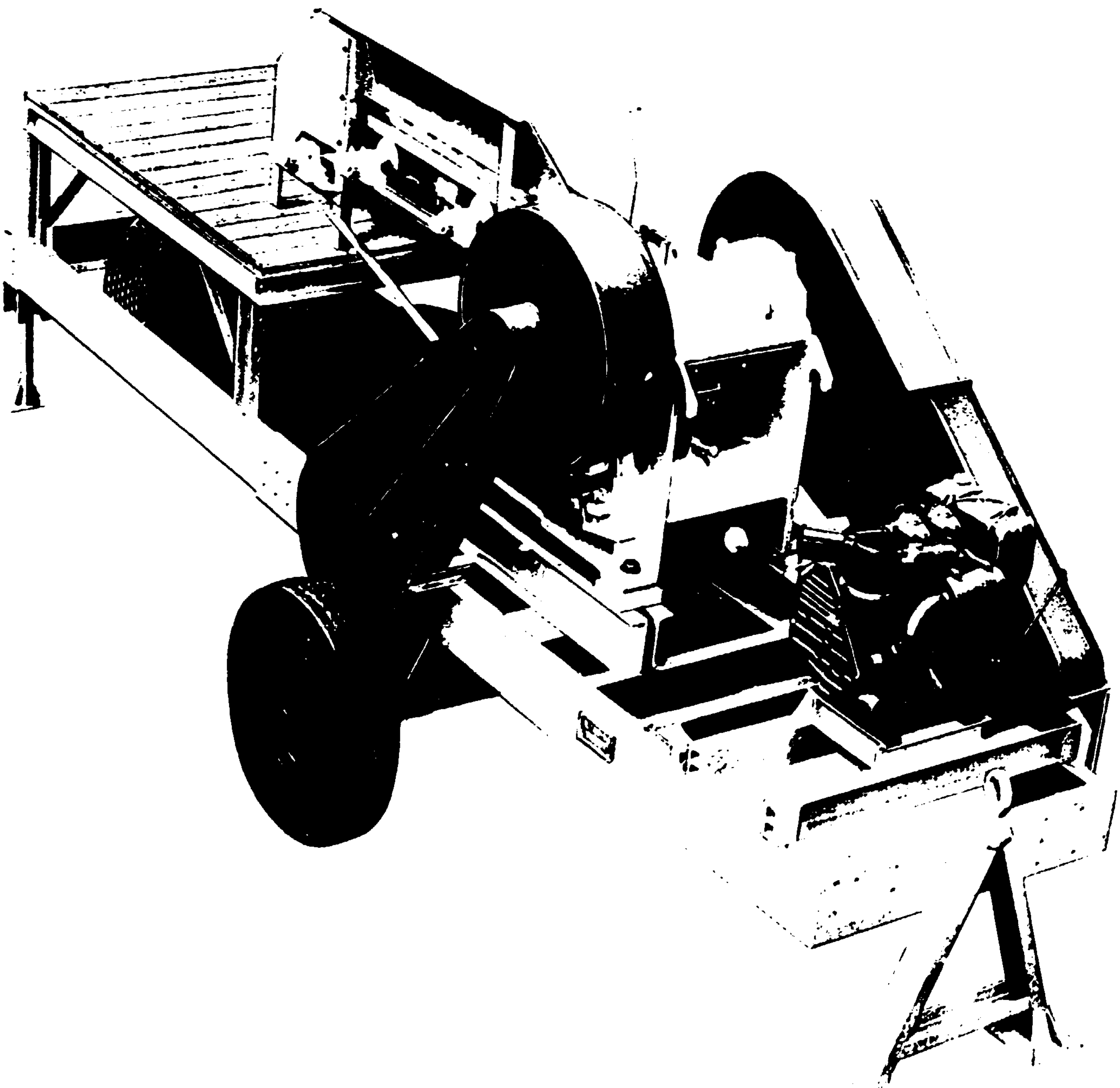
TILE AND SANITARYWARE PRODUCTION EQUIPMENT

COMMON PROCESSING EQUIPMENT

PEGSON

TELSMITH

SINGLE TOGGLE ROLLER BEARING 'D' STYLE JAW CRUSHERS WITH GRANULATOR CONVERSION KIT



10 x 16 & 10 x 21 ROLLER BEARING JAW CRUSHERS

Features

- **MODERN DESIGN, HIGH CAPACITY HANDLING, DEPENDABILITY AND ECONOMY IN OPERATION.**
- **LARGE DIAMETER, ACCURATELY FORGED SHAFT SEALED AGAINST THE INGRESS OF DUST AND MOISTURE.**
- **VARIABLE DISCHARGE SIZES.**
- **A CAREFULLY DESIGNED MAIN FRAME OF ALL STEEL WELDED CONSTRUCTION.**
- **HEAVY DUTY, DOUBLE ROW, ANTI-FRICTION ROLLER BEARINGS.**

Specification

MAIN FRAME

The main frame is of welded plate construction, amply proportioned to take the strain during crushing operations. The design also allows for easy inspection of wearable parts and ample access for service work. All frame members are accurately positioned and fixed together, and where necessary large fillet continuous weld is used to provide greater strength. The side plates are of sufficient dimensions to absorb tension under load. After welding the frame is STRESS RELIEVED and accurately machined to allow a precise fit and contact for jaws, toggle beam and main frame bearing housings.

JAWSTOCK

This is a large steel casting of deep, box-like shape, cored in the right places to retain strength. It is carefully annealed to eliminate all internal stresses prior to accurate machining, thus providing a precise fit for the jawstock bearings, toggle seat and perfect abutment for the one piece manganese swing jaw. Both the fixed and swing jaw can be turned through 180° to place less worn surfaces at the bottom where most work is done, thus prolonging their useful life. Replaceable manganese cheek plates protect the sides of the crushing chamber.

OPERATION

The eccentric shaft when turned via the flywheel gives the jawstock its throw. The bottom of the jawstock rides on a toggle plate and is held in contact with the toggle beam via a tension rod and springs. The flywheels turn towards the crushing chamber to give a forced feed action.

ADJUSTMENT TO DISCHARGE SIZE

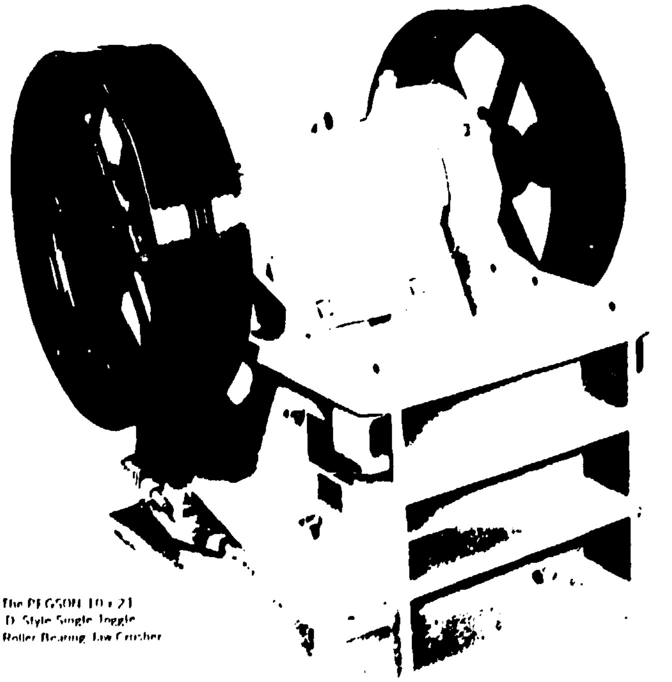
Adjustment of the discharge opening is made by adding or removing shims between the toggle beam and the rear wall. The toggle block slides forward by turning jacking screws, and is rigidly bolted in place with the shims during crushing operations. Together with different lengths of toggle available and also a feature whereby the toggle can be installed at two angles due to interchange of toggle seats, various ranges of shim adjustment are available. These are from a minimum of ½" (12 mm) to a maximum of 2½" (64 mm) on the 10 · 16 Jaw Crusher, and a minimum of ¾" (19 mm) to a maximum of 2½" (64 mm) on the 10 · 21 model.

BEARINGS

Heavy duty, double row, spherical roller bearings are fitted to the jawstock and main frame. All bearings are protected against entry of dirt by grease packed mechanical seals. The combined jawstock and shaft assembly, including main frame and bearing housing, can be removed from the crusher for easier service work.

LUBRICATION

Lubrication of all bearings is by means of high pressure type grease nipples. The toggle plates which are of the rolling type, operate dry and require no lubrication. They are protected from dust by a canvas apron.



The PEGSON 10 x 21
D Style Single Toggle
Roller Bearing Jaw Crusher

MODEL	10" × 16" JAW CRUSHER **		10" × 21" JAW CRUSHER	
Size of feed opening (Note 1)	10" × 16"	250 × 405	10" × 21"	250 × 530
Net weight of Crusher approx. Weight crated, approx.	4950 lbs. 5200 lbs.	2242 Kilos 2355 Kilos	6380 lbs. 6730 lbs.	2900 Kilos 3058 Kilos
Cubic contents, crated	115 cu.ft.	3.25 cu.m.	130 cu.ft.	3·68 cu.m.
Horse Power (Note 2)	10–15 hp.	7·5–11 kW	15–20 h.p.	11–15 kW
Drive Pulley Diameter Face Bore R.P.M.	33" 8½" 3 15/16" 350	878 mm 216 mm 100 mm 350	33" 8½" 3 15/16" 350	878 mm 216 mm 100 mm 350

CAPACITY (See Notes 1 & 4)

** Suitable for Uganda

	10 × 16 JAW CRUSHER		10 × 21 JAW CRUSHER		7 × 16 GRANULATOR		7 × 21 GRANULATOR	
Discharge Opening (Notes 3, 5 & 6)	Long ton/hr.	Short ton/hr.	Long ton/hr.	Short ton/hr.	Long ton/hr.	Short ton/hr.	Long ton/hr.	Short ton/hr
½" (12 mm)	—	—	—	—	4-6	5-7	6-8	7-9
¾" (19 mm)	5-7	6-8	6-9	7-10	6-8	7-9	7-10	8-11
1" (25 mm)	7-10	8-11	8-11	9-13	8-11	9-12	9-13	10-15
1½" (38 mm)	9-13	10-15	13-18	15-20	10-15	11-17	15-20	17-22
2" (51 mm)	12-18	14-20	17-23	19-26				
2½" (63 mm)	15-22	17-25	19-29	22-33				

Note 1. To obtain the capacities specified, a feeder should be used ahead of the crusher to give a continuous regulated feed; all feed should be of a size that will readily enter the crushing chamber and undersize materials should be removed from the feed by the means of a grizzly or scalping screen to eliminate packing and excessive wear on the jaws.

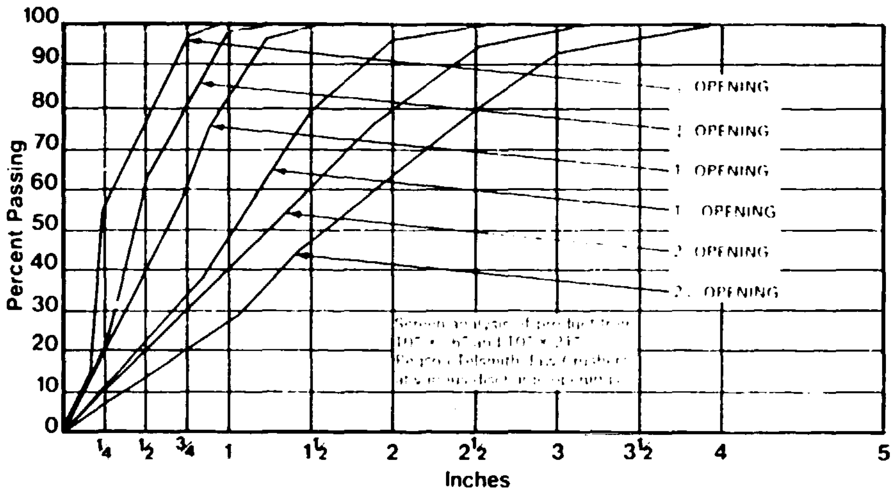
Note 2. The horsepower required varies with the size of the product being made, the capacity and the hardness of the rock or ore.

Note 3. No crusher, when set to a given discharge opening, will make a product all of which will pass a screen opening of the same dimensions as the given discharge opening. The amount of oversize will vary with the character of the rock.

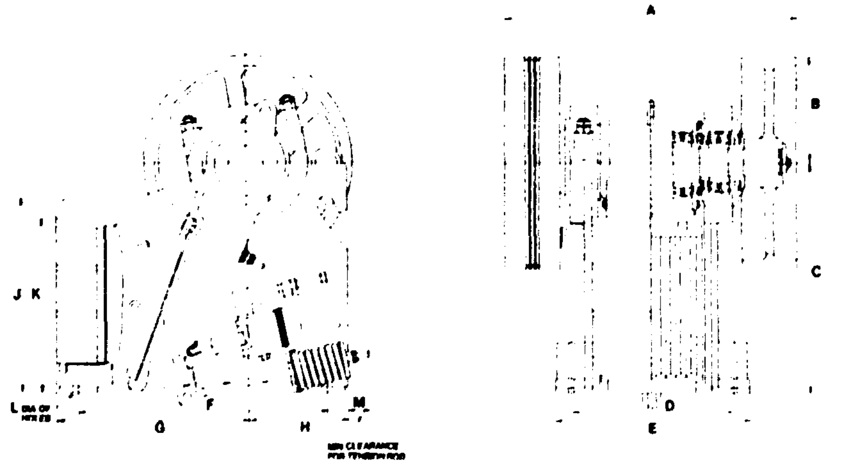
Note 4. The capacities are based on crushing clean, dry limestone weighing loose about 2 600 lbs. per cubic yard and having a specific gravity of 2.6. Wet, sticky feeds will tend to reduce crusher capacities.

Note 5. The discharge opening of a Jaw Crusher is measured with the jaws in the closed position.

Note 6. It is not usually economical to operate the crushers at a discharge opening smaller than shown in the table. Consult Pegson Ltd. if it is desired to use a smaller or larger discharge opening than those given.



Dimensions:



	10 × 16		10 × 21	
A	1172mm	46⅛"	1300mm	51 3/16"
B	419mm	16½"	419mm	16½"
C	886mm	34⅞"	886mm	34⅞"
D	660mm	26"	787mm	31"
E	786mm	30 15/16"	914mm	35 15/16"
F	1016mm	40"	1016mm	40"
G	771mm	30⅜"	771mm	30⅜"
H	397mm	15⅝"	397mm	15⅝"
J	734mm	28⅞"	734mm	28⅞"
K	662mm	26 1/16"	709mm	27 15/16"
L	40mm	1 9/16"	40mm	1 9/16"
M	279mm	11"	279mm	11"

PEGSON
LIMITED

PEGSON LIMITED, Coalville, Leicestershire, LE6 3ES, England
☎ Coalville 36322. Grams: Pegson, Coalville. Telex: 34423

NOTE. In compiling this leaflet every care has been taken but because of our policy of continuous development we reserve the right to change specification details without notice. Therefore, they must not be regarded as binding and the illustrations are approximate only.

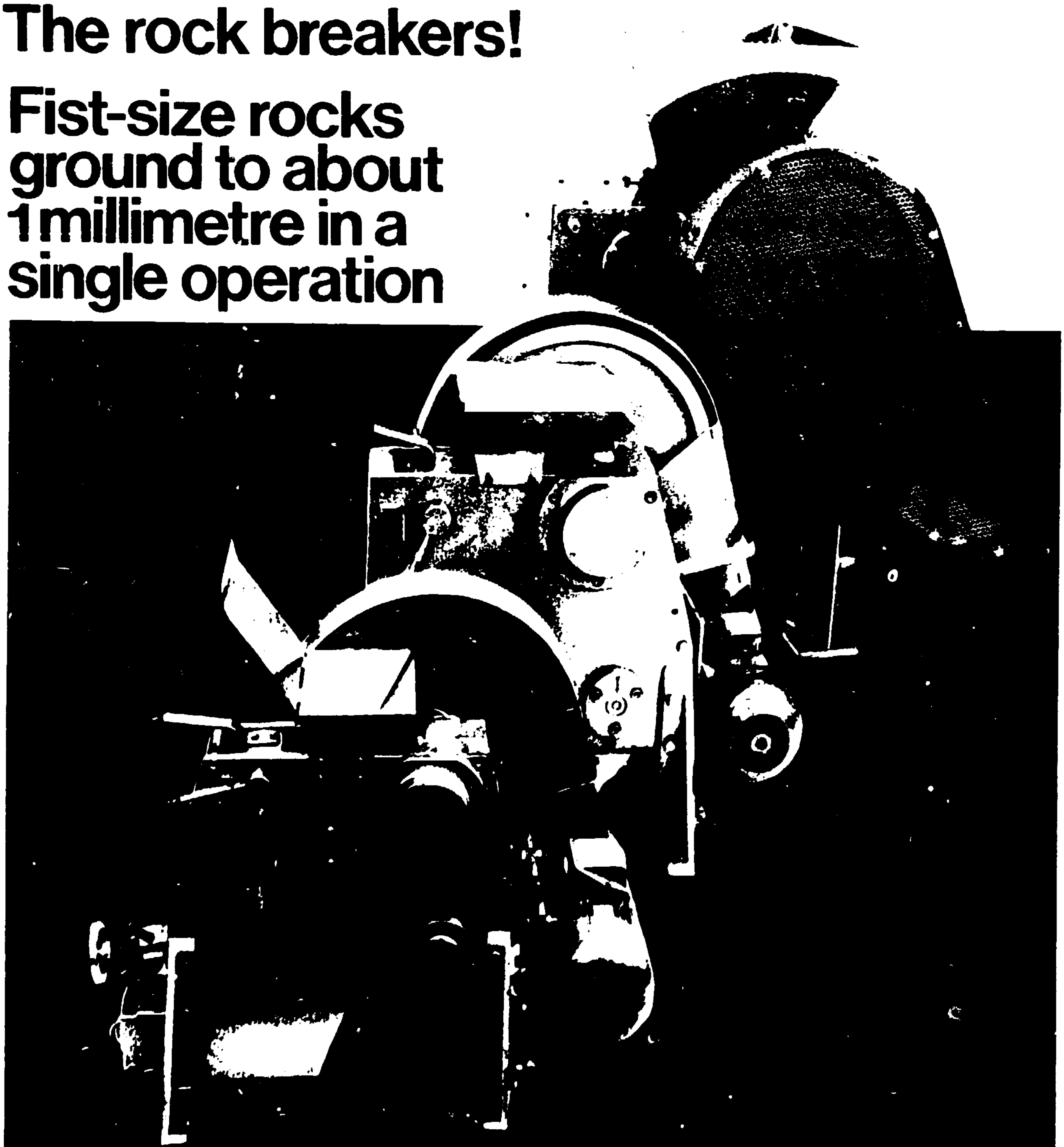
635

GLEN CRESTON

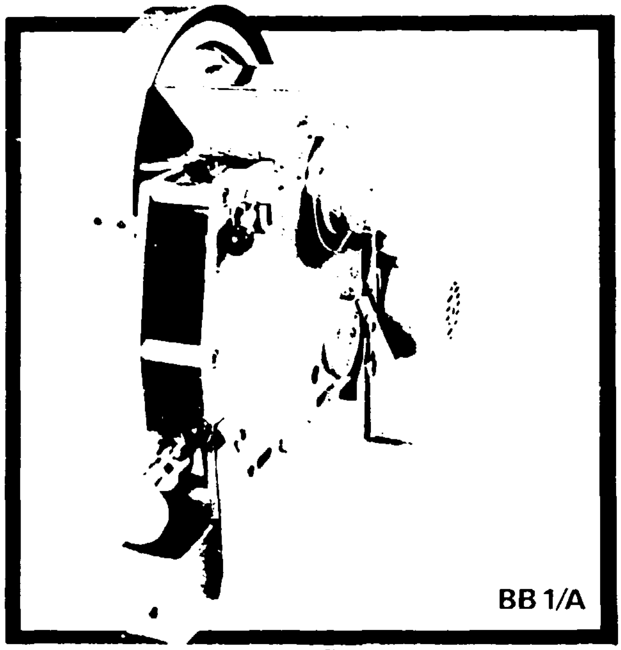
Jaw Crushers

The rock breakers!

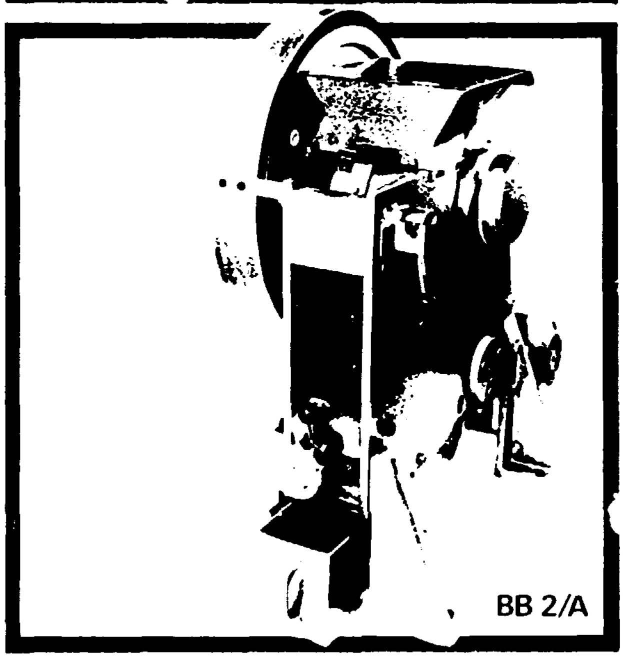
Fist-size rocks ground to about 1 millimetre in a single operation



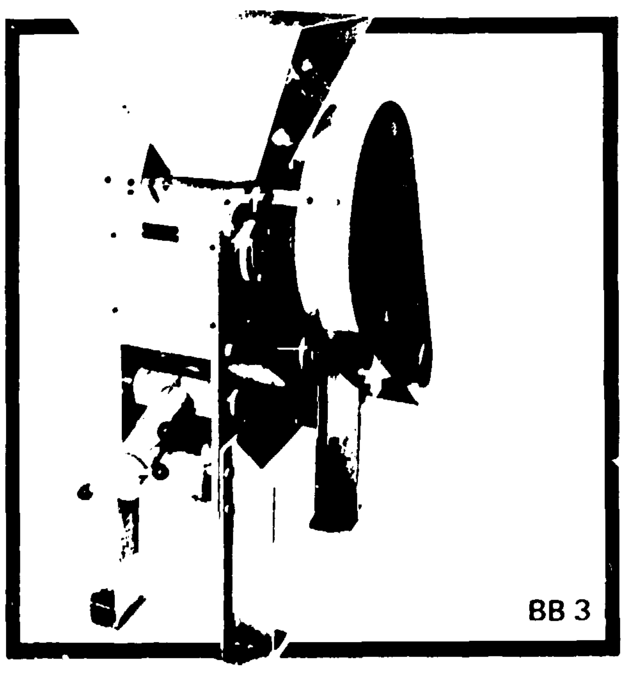
Jaw Crushers for laboratory and production purposes



BB 1/A



BB 2/A



BB 3

Compact
The largest of the three models stands only 130cm high, the smallest stands 62cm high.

Adjustable
Fineness of the ground product is determined by the size of the discharge slit between the breaker jaws, variable from 1 to 20mm on the BB 1/A and BB 2/A, and from 1 to 40mm on the BB 3. This gap can be altered even during operation.

Versatile in output
Glen Creston Jaw Crushers will grind a single chunk or any quantity up to 600kg per hour.

Breaker Jaws available in 3 materials
- wear resistant manganese steel
- stainless steel
- tungsten carbide

Overload protection
All three models are fitted with motor cut-out switches. The BB 1/A and BB 2/A have shock absorbers to protect the breaker jaws, and the BB 3 is fitted with a shear bolt.

Demonstrations and trial grindings
See back of leaflet.

Applications
Glen Creston Jaw Crushers have a wide application. They can disintegrate most hard, non malleable substances, such as:

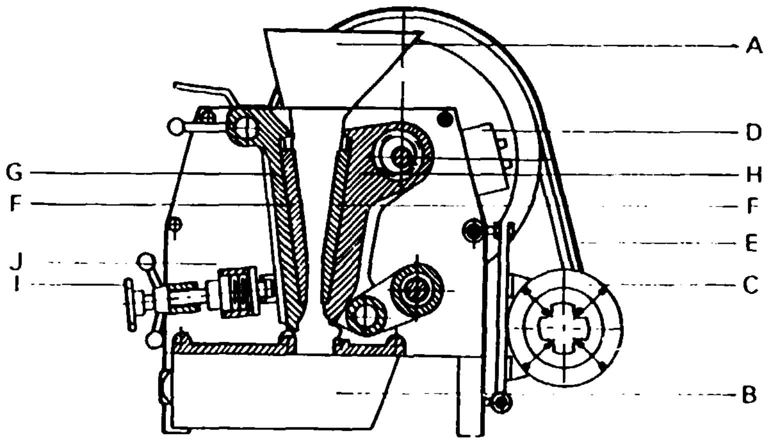
ashes	fireclay	potash
bauxite	fibrolite	quartzite
bone	glass	rock
cement	granite	silicates
chemicals	limestone	slag
clinker	marble	soil
coal	minerals	synthetic resins
coke	nuts	uranium ores
core samples	ores	

Technical Data

Working Principle

From the hopper, the substance to be disintegrated falls into the crushing channel between one fixed breaker jaw and one swinging breaker jaw, made either of manganese steel, stainless steel or tungsten carbide. The swinging jaw is actuated by a rugged cam shaft, running in ball/roller bearings to ensure smooth operation. The channel tapers down towards the discharge slit which can be adjusted in width even during operation, thus determining the end particle size. The collecting tray can be replaced by larger containers when necessary.

Simplified diagram of the Jaw Crusher BB 1/A



- A Hopper with cover
- B Collecting tray
- C Motor
- D Cut-out switch (normally wall mounted)
- E Pulley guard
- F Breaker jaws
- G Stationary breaking arm
- H Swinging breaking arm
- I Slit adjustment
- J Shock absorber

Model BB 1/A

Hopper opening.	60 x 60mm
Discharge slit:	steplessly adjustable from 1 to 20mm
Output:	50 to 100kg per hour
Drive:	1 H.P. motor, three phase or single phase
Overload protection:	cut out switch, shock absorber
Dimensions (approx):	72cm L x 32cm W x 62cm H
Weight:	140kg gross

Model BB 2/A

Hopper opening:	100 x 100mm
Discharge slit:	steplessly adjustable from 1 to 20mm
Output:	100 to 200kg per hour
Drive:	2 H.P. motor, three phase or single phase
Overload protection:	cut out switch, shock absorber
Dimensions:	85cm L x 45cm W x 82cm H
Weight:	300kg gross

Model BB 3

Hopper opening:	200 x 150mm
Discharge slit:	steplessly adjustable from 1 to 40mm
Output:	up to 600kg per hour
Drive:	4 H.P. motor, three phase
Overload protection:	cut out switch, shear bolt
Dimensions:	115cm L x 65cm W x 130cm H
Weight:	800kg gross

* Could be considered for Uganda, if mining is controlled to give maximum size of 200 x 150mm lumps

Ellgreave Street Burslem Stoke on Trent Staffs ST6 4DQ
Telephone 0782 577136 Telex 36166 BOULTN G

Cobam

From its headquarters in Stoke-on-Trent, Cobam offers a complete engineering service to customers all over the world.

From machining and supplying small components, up to installing and commissioning equipment, Cobam has made important contributions to industries as diverse as effluent treatment, crane and automotive manufacture, paper making and water drilling, ceramics and automatic tile making equipment, mechanical handling and earth moving. Cobam are also major suppliers to nationalised industries like coal and steel.

Although each of Cobam's three Divisions has its own specialised area of expertise, each can draw on shared corporate technical resources to ensure that customers enjoy a high standard of after-sales servicing as well as a reliable supply of spare parts.

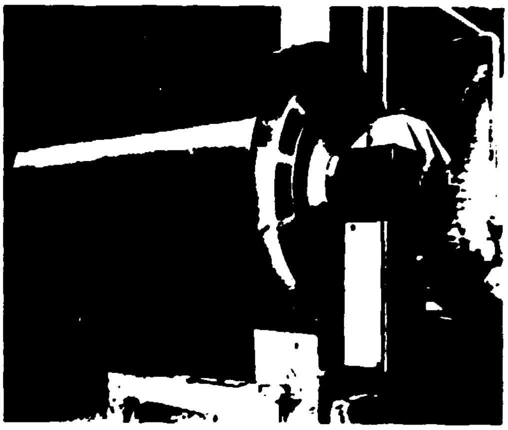
Company supplies standard mixers, blungers, sanitaryware and tile production machines

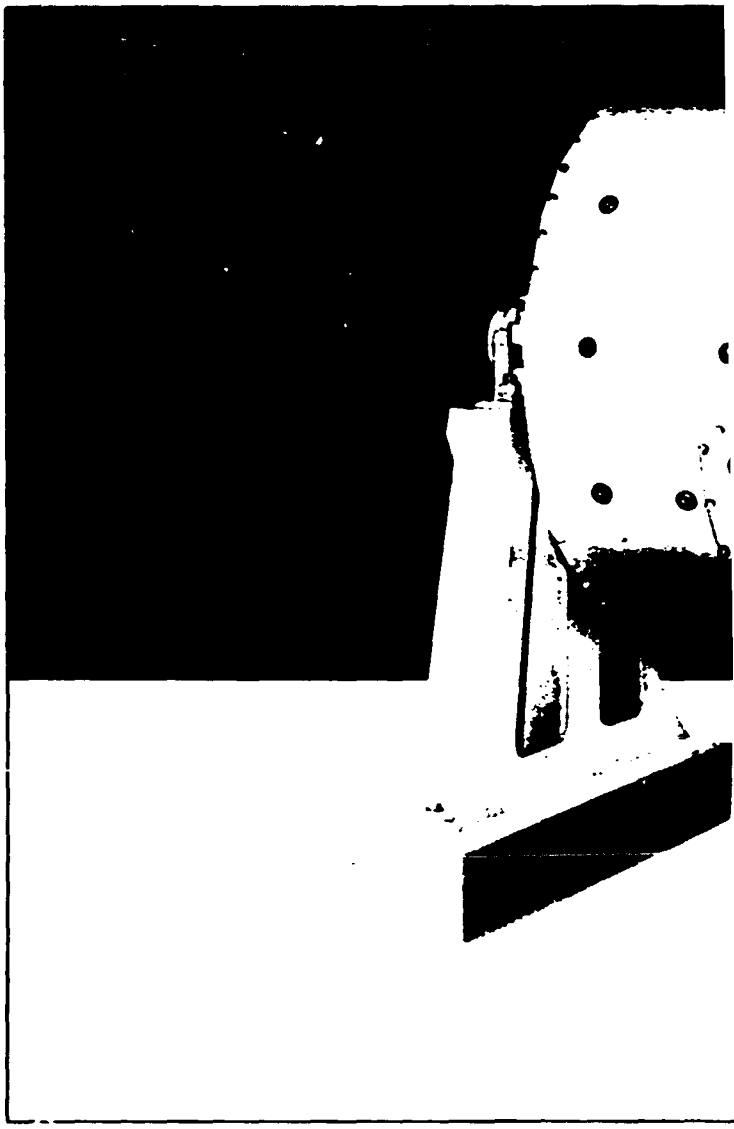
BALL AND PEBBLE MILLS

INTRODUCTION

With over a century of experience E. & J. is one of the world's leading manufacturers of Ball and Pebble Mills. Various sizes and types are available for particle size reduction and batch grinding of mineral ores and other industrial materials. The company's international reputation for high quality engineering is reflected in the outstanding design of E. & J. mills, which combine exceptional performance with extremely low operational costs. The mills are especially suited to the breaking down of very hard and abrasive materials, in either wet or dry grinding applications.

In addition to the range of mills illustrated, a full range of Pot and Cage Mills are available to suit individual customer needs.





CONSTRUCTION

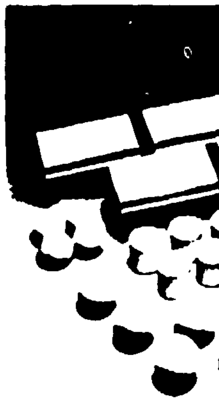
An E. & J. Ball mill basically consists of a finely engineered sturdily built cylindrical steel shell lined with a choice of quality, abrasion resistant liners to suit each client's individual applications.

Standard Ball Mill drives are of the direct driven gear box type, although a range of alternative drives can be fitted where specified, including: Ring Wheel and Pinion, 'V' Flat Drive to cylinder shell, 'V' Drive and Spur Gear Drives. All drives are designed to compensate for high starting torque and the live load of the mill.

Every mill is manufactured to the strictest quality control standards in E. & J.'s own workshops and experienced engineers are always available, both to supervise erection and to commission the plant on installation.

LININGS, CHARGES AND TEMPERATURE CONTROL

The wide range of applications and grinding operations that E. & J. mills are called upon to handle means that the choice of linings has to be extensive and includes; stainless steel, rubber, porcelain, steatite and silex in various thicknesses and configurations.
The grinding charge can be steel balls, natural or synthetic pebbles.
Mills can also be jacketed for heating or cooling, making them totally flexible



PORCELAIN-LINED BALL MILLS FOR THE CERAMIC INDUSTRY

m m	Mill size External (inches)	Total capacity Litres	Galls	Cu m	Cu ft	Operating capacity Wet Litres	galls	Dry Kg	lb	Grinding media Balls Kg	lb	Pebbles Kg	lb	Kw	H P	Speed r p m
610 x 610	24 x 24	82	18	079	2 78	41	9	33	73	64	140	73	160	1 1	1½	60
610 x 838	24 x 33	123	27	·122	4 3	64	14	46	100	96	210	109	240	1 1	1½	60
762 x 762	30 x 30	164	36	164	5 8	82	18	66	144	136	300	155	340	1 5	2	50
762 x 991	30 x 39	237	52	·235	8 3	118	26	96	210	191	420	214	470	1 5	2	50
915 x 915	36 x 36	332	73	331	11 7	168	37	135	295	250	550	282	620	2 2	3	40
915 x 1067	36 x 42	400	88	399	14 1	200	44	160	352	289	635	323	710	2 2	3	40
915 x 1143	36 x 45	441	97	·439	15 5	227	50	182	400	309	680	344	760	2 2	3	40
1067 x 1067	42 x 42	573	126	·595	21 0	286	63	227	500	418	920	482	1060	4 0	5½	36
1067 x 1296	42 x 51	728	160	725	25 6	364	80	291	640	546	1200	614	1350	4 0	5½	36
1219 x 1219	48 x 48	910	200	906	32 0	455	100	364	800	641	1410	718	1580	4 0	5½	30
1219 x 1372	48 x 54	1037	228	1 034	36 5	513	114	418	920	732	1610	818	1800	4 0	5½	30
1372 x 1372	54 x 54	1310	290	1 317	46 5	659	145	546	1200	914	2010	1023	2250	5 5	7½	30
1524 x 1524	60 x 60	1820	400	1 812	64 0	909	200	727	1600	1318	2900	1477	3250	11	15	28
1524 x 1676	60 x 66	2000	440	1 982	70 0	1000	220	800	1760	1409	3100	1577	3470	11	15	28
1676 x 1676	66 x 66	2728	600	2 719	96 0	1363	300	1091	2400	1909	4200	2136	4700	15	20	28
1829 x 1829	72 x 72	3354	740	3 342	118 0	1682	370	1346	2960	2364	5200	2659	5850	18 5	25	25
1829 x 2134	72 x 84	3909	860	3 908	138 0	1955	430	1564	3440	2773	6100	3046	6700	18 5	25	25
2134 x 2134	84 x 84	5637	1240	5 607	198 0	2818	620	1709	3760	4091	9000	5000	11000	22	30	21
2134 x 2743	84 x 108	7246	1594	7 193	254 0	3623	797	2197	4834	5273	11600	6455	14200	30	40	21

SILEX-LINED BALL MILLS FOR THE CERAMIC INDUSTRY

m.m.	Mill size External (inches)	Total capacity Litres	Galls	Cu m	Cu ft	Operating capacity Wet Litres	galls	Dry Kg	lb	Grinding media Pebbles Kg	lb	Kw	H P	Speed r p m
610 x 610	24 x 24	75	16 5	·075	2 65	41	9	26	56	64	140	1 1	1½	60
610 x 838	24 x 33	104	23 0	·103	3 64	55	12	44	96	96	210	1 1	1½	60
762 x 762	30 x 30	118	26 0	·118	4 15	59	13	47	104	136	300	1 5	2	50
762 x 991	30 x 39	182	40 0	182	6 42	91	20	76	168	191	420	1 5	2	50
915 x 915	36 x 36	250	55 0	249	8 80	127	28	102	224	250	550	2 2	3	40
915 x 1067	36 x 42	314	69 0	·312	11 0	159	35	127	280	289	635	2 2	3	40
915 x 1143	36 x 45	345	76 0	·348	12 3	173	38	147	324	309	680	2 2	3	40
1067 x 1067	42 x 42	436	96 0	428	15 1	227	50	182	400	418	920	4 0	5½	36
1067 x 1296	42 x 51	546	120	·544	19 2	273	60	218	480	546	1200	4 0	5½	36
1219 x 1219	48 x 48	682	150	680	24 0	341	75	273	600	641	1410	4 0	5½	30
1219 x 1372	48 x 54	750	165	·748	26 4	377	83	302	664	732	1610	4 0	5½	30
1372 x 1372	54 x 54	1046	230	1 042	36 8	523	115	455	1000	914	2010	5 5	7½	30
1524 x 1524	60 x 60	1500	332	1 501	53 0	755	166	591	1300	1318	2900	11 0	15	28
1524 x 1676	60 x 66	1636	360	1 628	57 5	818	180	659	1450	1409	3100	11 0	15	28
1676 x 1676	66 x 66	2272	500	2 265	80 0	1136	250	927	2040	1909	4200	11 0	15	28
1829 x 1829	72 x 72	2682	590	2 662	94 0	1348	295	1091	2400	2364	5200	15 0	20	25 **
1829 x 2134	72 x 84	3081	680	3 072	108 5	1546	340	1236	2720	2773	6100	18 5	25	25
2134 x 2134	84 x 84	4637	1020	4 616	163 0	2318	510	1350	3024	4091	9000	22	30	21
2134 x 2743	84 x 108	5940	1311	5 933	209 5	2978	655	1736	3889	5273	11600	30	40	21

** Suitable for Uganda

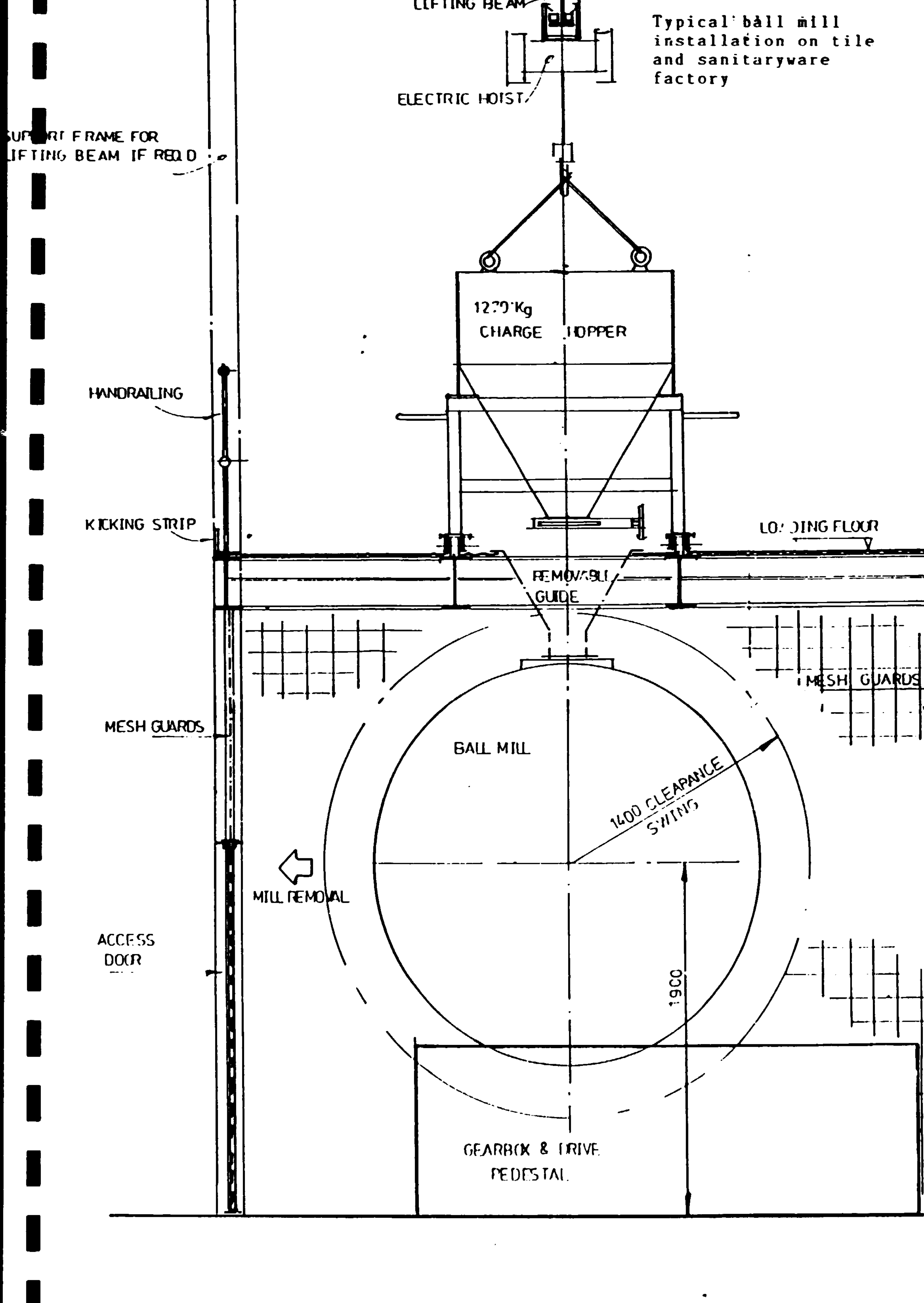
Types of Mill Lining.
Porcelain Block
Silex Block
Steatite Block
Stainless Steel
Manganese Steel
Rubber
Cast Iron Section

Types of Grinding Media:
Porcelain Balls
Flint Pebbles
Steatite Balls
Hard Steel Balls
Alumina Loaded Balls

Note: The policy of the Company is one of continuous development and improvement of its products. The right is therefore reserved to supply products which may slightly differ from the description or illustrations in this publication.

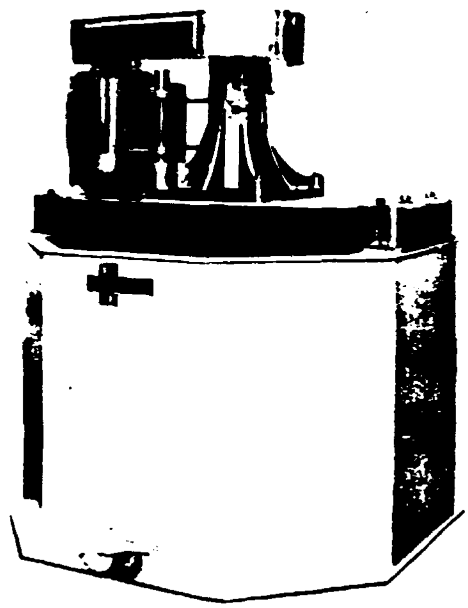
Edwards & Jones Limited,
Whittle Road, Meir, Stoke-on-Trent ST3 7QD, England.
Telephone: 0782 316181 Telex: 36397

Typical ball mill installation on tile and sanitaryware factory



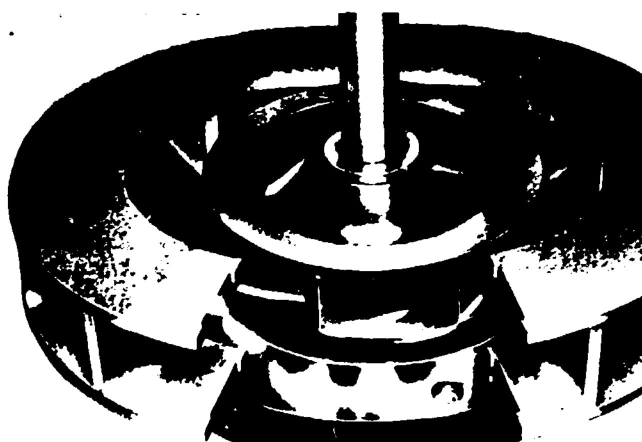
Blungers & Mixers

Introduction



Edwards & Jones, with over a century of experience, is one of Britain's leading manufacturers of Blungers and Mixers. The company has earned a worldwide reputation for outstanding engineering and uncompromising quality control throughout its whole range of products designed specifically for the Ceramic Industry. E. & J. offers a comprehensive choice of Blungers and Mixers of different types and sizes for the most efficient breaking down and mixing into slurry of all types of material.

High Speed Blunger



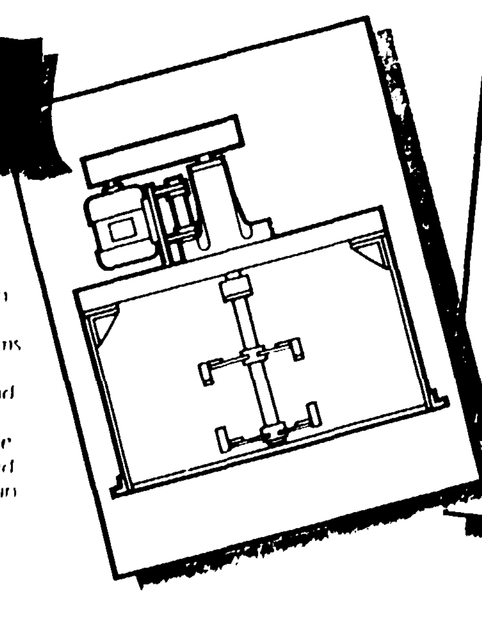
First patented by Edwards & Jones, the E. & J. High Speed Blunger is probably the most revolutionary development for years in the Ceramic Industry. Up to 7 times faster than conventional methods, the H.S. Blunger will blunge Ball Clay, for example in 20 minutes or China Clays and Clay Scraps in just 15 minutes.

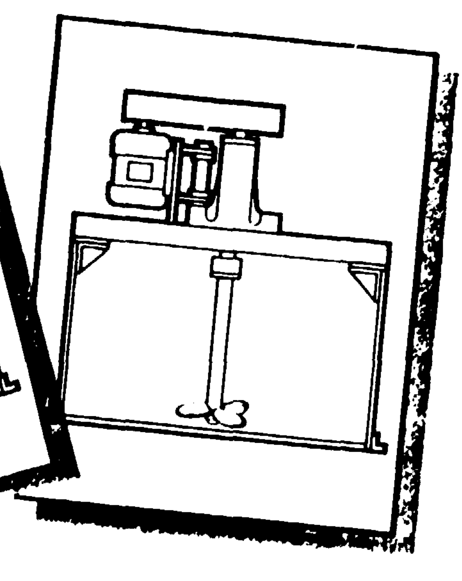
The High Speed Blunger casings are available in a range of materials. The drive unit, mounted on a sturdy cast iron crossrail, consists of a specially designed Heavy Duty Top Steady Housing, vertically mounted motor and V drive.

Blunging and Dispersion is achieved by a unique Rotor, designed and patented by E. & J. in S.G. Iron, which rotates at speeds up to 1500rpm, depending on application. The rotor is housed in a stator securely fastened to a base plate, which in turn is fixed to the bottom of the Blunger case.

It offers substantial savings right down the line. Energy Savings — the H.S. Blunger gives more power while using less energy than other systems. As less machines are required there is a substantial saving on floor space. Add that to savings on labour and a low capital cost and the H.S. Blunger proves to be a big saver all round!

Medium Speed Blunger/Mixer





The casing of this type of blunger is usually either octagonal or hexagonal. The drive, mounted like H.S. Blungers on a substantial cast iron crossrail, comprises an E. & J. Heavy Duty Top Steady Housing driven by a vertically mounted motor with V drive.

The Blunger shaft has special horizontal arms with adjustable tips to obtain efficient Blunging. Mixing. Blunging speed will depend on the type of application and size of Blunger.

This Medium Speed Blunger is also available with a bladed ship type propeller. A two speed motor can be fitted if slow stirring is required in addition to Blunging.

[redacted]

Wearing and contact parts can be in the following:-

Materials
Mild Steel
Stainless Steel
Cast Iron
Polyester Reinforced
Glass Fibre

Coatings
Metals can be coated in the following:
Rubber
P.R.G Fibre
P.V.C.
Epoxy Resin

Capacity
Generally, overall capacity can range from 5 galls to 1,000 galls, with a special application upto 7,000 galls.

	WORKING CAPACITIES		TANK DIMENSION	
	Gallons	Litres	Ft. ins. DIA. DEEP	Metres
	5	23	1'0" x 1'0"	.306 x .306
	12	54	1'6" x 1'6"	.457 x .457
	22	100	1'9" x 1'9"	.534 x .534
	36	162	2'0" x 2'0"	.610 x .610
	50	227	2'6" x 2'0"	.763 x .610
	75	340	3'0" x 2'0"	.914 x .610
	100	454	3'0" x 2'9"	.914 x .838
	130	585	3'0" x 3'0"	.914 x .914
	150	680	3'6" x 3'0"	1.06 x .914
	200	908	4'0" x 3'0"	1.22 x .914
	250	1135	4'0" x 3'6"	1.22 x 1.06
**	310	1407	4'0" x 4'0"	1.22 x 1.22
	400	1816	4'8" x 4'0"	1.42 x 1.22
	650	2950	6'0" x 4'0"	1.83 x 1.22
	820	3722	7'0" x 4'0"	2.13 x 1.22
	1000	4540	7'0" x 5'0"	2.13 x 1.525

** Recommended size for Uganda

Other equipment in the E. & J. range of Ceramic Process Equipment includes:-

● Ball Mills, together with linings and grinding media ● Pot/Jar Mills ● Agitators and Storage Tanks ● Mixers and Dissolvers, high, medium or slow speeds ● Pumps (transfer/pressure) ● Filter Presses, hand operated, semi-automatic or fully mechanised ● Pug Mills/Extruders ● Upright Jolleys ● Pipe Making Machines ● Pipe Finishing Machines ● Clot Cutters ● Double and Single Shafted Horizontal Mixers ● Circular Clay Storage / Feeder ● Conveyors ● Semi-automatic Single and Double Headed Cup Machines ● Semi-automatic Flatware Making Machines ● Hand Operated Jiggers and Jolleys ● Batting Out Machines ● Flatware Edge Sponging Machines ● Throwing Wheels, Cone Operated ● Potters Lathes ● Small Self Contained Clay Plants ● Autoclaves ● Semi-automatic and Hand Operated Insulator Turning Machines ● Sifters ● Magnets ● Clay Preparation Plants ● Casting Plants (pressure vessel or gravity) ● Effluent and Waste Water Treatment Plants ● Wear resisting Alloy Castings (knives and augers etc.) ● Colleges, Craft Potter and Laboratory Equipment.

Note: The policy of the company is one of continuous development and improvement of its products. The right is therefore reserved to supply products which may slightly differ from the descriptions or illustrations in this publication.

Edwards & Jones Ltd.,
Whittle Road, Meir, Stoke-on-Trent, ST3 7QD, England.
Telephone: (0782) 316181. Telex: 36397.

DIMENSION OF STANDARD AGITATING UNITS

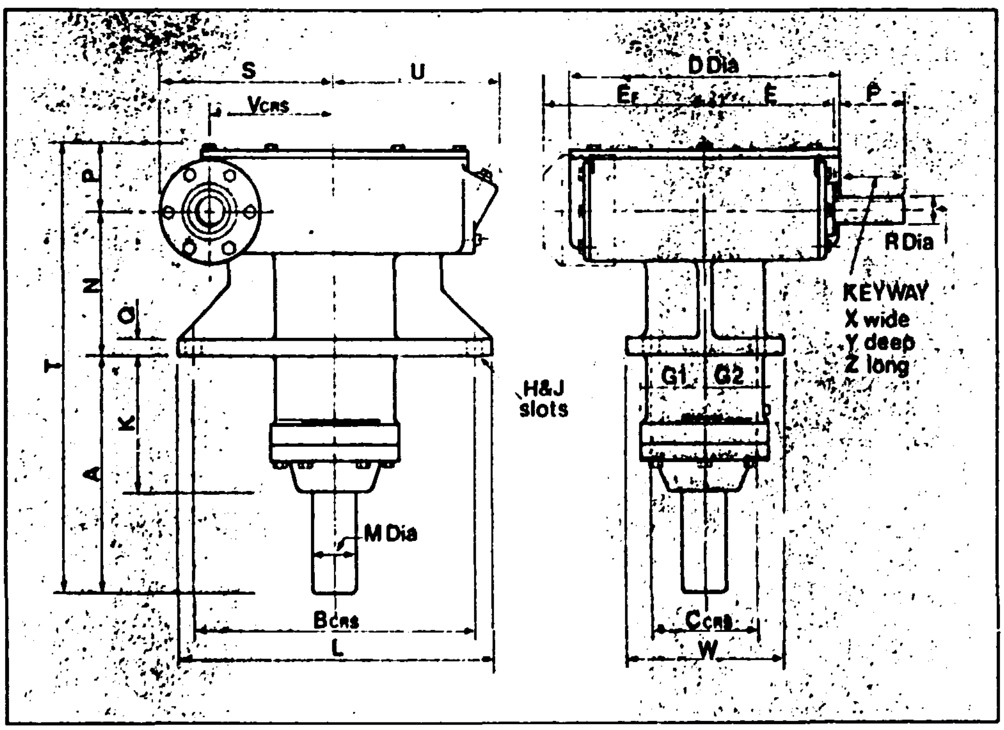
Type of Unit	A mm/ins	B mm/ins	C mm/ins	D mm/ins	E mm/ins	Ef mm/ins	F mm/ins	G1 mm/ins	G2 mm/ins	H mm/ins	J mm/ins	K mm/ins	L mm/ins
No. 0	153 6	178 7	89 3 1/2	172 6 3/4	95 3 3/4	– –	45 1 3/4	60 2 3/8	60 2 3/8	25 1	16 5/8	94 3 11/16	229 9
No. 1 **	242 9 1/2	267 10 1/2	115 4 1/2	267 10 1/2	143 5 5/8	– –	54 2 1/8	70 2 3/4	79 3 1/8	32 1 1/4	19 3/4	159 6 1/4	330 13
No. 2	330 13	406 16	153 6	388 15 1/4	187 7 3/8	– –	102 4	86 3 5/8	99 3 7/8	23 7/8	23 7/8	191 7 1/2	457 18
No. 3	223 8 3/4	381 15	229 9	508 20	226 8 7/8	– –	86 3 3/8	115 4 1/2	115 4 1/2	23 7/8	23 7/8	102 4	457 18
No. 4	156 6 1/8	597 23 1/2	178 7	635 25	292 11 1/2	381 15	127 5	124 4 7/8	124 4 7/8	21 13/16	– –	25 1	762 30
No. 5	438 17 1/4	737 29	228 9	940 37	476 18 3/4	457 18	114 4 1/2	124 4 7/8	124 4 7/8	22 7/8	– –	203 8	813 32
Type of Unit	**M mm/ins**	**N mm/ins**	**P mm/ins**	**Q mm/ins**	**R mm/ins**	**S mm/ins**	**T mm/ins**	**U mm/ins**	**V mm/ins**	**W mm/ins**	**X mm/ins**	**Y mm/ins**	**Z mm/ins**
No. 0	38 1 1/2	115 4 1/2	54 2 1/8	16 5/8	19 3/4	115 4 1/2	321 12 5/8	111 4 3/8	76 3	127 5	6 1/4	3 1/8	38 1 1/2
No. 1 **	51 2	162 6 3/8	70 2 3/4	16 5/8	25 1	175 6 7/8	473 18 5/8	165 6 1/2	124 4 7/8	178 7	6 1/4	3 1/8	51 2
No. 2	64 2 1/2	203 8	95 3 3/4	23 7/8	38 1 1/2	251 9 7/8	619 24 3/4	241 9 1/2	181 7 1/8	229 9	10 3/8	5 3/16	95 3 3/4
No. 3	64 2 1/2	381 15	153 6	32 1 1/4	38 1 1/2	305 12	756 29 3/4	254 10	235 9 1/4	305 12	10 3/8	5 3/16	70 2 3/4
No. 4	76 3	540 21 1/4	140 5 1/2	19 3/4	51 2	432 17	835 32 7/8	375 14 3/4	292 11 1/2	241 9 1/2	13 1/2	6 1/4	115 4 1/2
No. 5	102 4	400 15 3/4	178 7	32 1 1/4	65 2 1/2	584 23	1016 40	533 21	445 17 1/2	305 12	18 3/4	7 1/4	115 4 1/2

** Size for Uganda

Max. K.W. (H.P.) AT 30 R.P.M.

	0	3/4	55
**	1	3	2.2
	2	7 1/2	5.5
	3	10	7.5
	4	25	19 kw
	5	25	19

No 4 Agitator Unit obtainable with Circular Base only



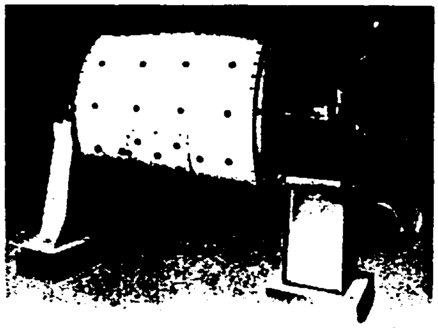
Edwards & Jones Limited,
Whittle Road, Meir, Stoke-on-Trent ST3 7QD, England.
Telephone: (0782) 599000 Telex: 36397 Fax: (0782) 599001

Typical ball mills, blungers and mixers required by a new factory in Uganda

PROCESS EQUIPMENT

ÉQUIPMENT DE PROCÉDÉ
BETRIEBSAUSSTATTUNGEN
EQUIPOS DE PROCESO
加工设备

***BALL MILLS:** From 2' Dia × 2' Long to 8' Dia × 11' Long, with or without linings and media.*



***BROYEURS À BILLES:** De 61cm de diametre × 61cm de long a 2,45m de diamètre × 3,35 de long, avec ou sans revêtement et billes.*

***TROMMELNASSMUHLEN:** Von 610mm × 610mm lang bis 2440mm × 3353mm lang, mit oder ohne Auskleidung und Kugeln*

***TRITURADORAS DE BOLAS:** De 61cm dia × 61cm longitud a 2.45m dia. × 3.35m longitud con o sin revestimientos y medios*

[illegible]

***BLUNGERS:** A full range of high, medium and conventional speed blungers.*

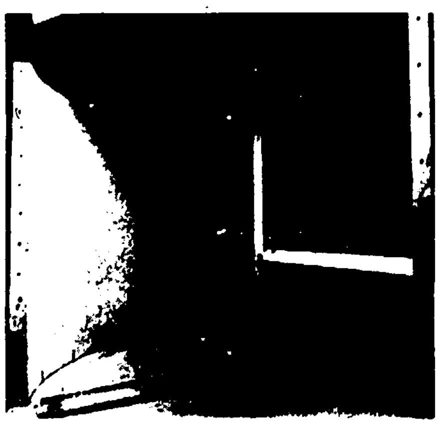
***MALAXEURS:** Une gamme complète de malaxeurs a régime rapide, moyen et traditionnel.*

***MISCHQUIRLE:** Ein Gesamtbereich von Mischquirlen fur hohe, mittlere und normale Geschwindigkeiten*

***AGITADORAS:** Gama completa de agitadoras de velocidades alta, media y convencional*

[illegible]

***AGITATORS & MIXERS:** For all applications including: mixing and storing from 36 gallons to 45,000 gallons. Tanks can be made of mild steel, stainless steel or reinforced glass fibre.*



***AGITATEURS ET MÉLANGEURS:** Pour toutes les applications y compris le melange et le stockage de 160 à 200.000 litres. Les réservoirs seront fabriques en acier doux, en inox ou en fibre de verre renforcee.*

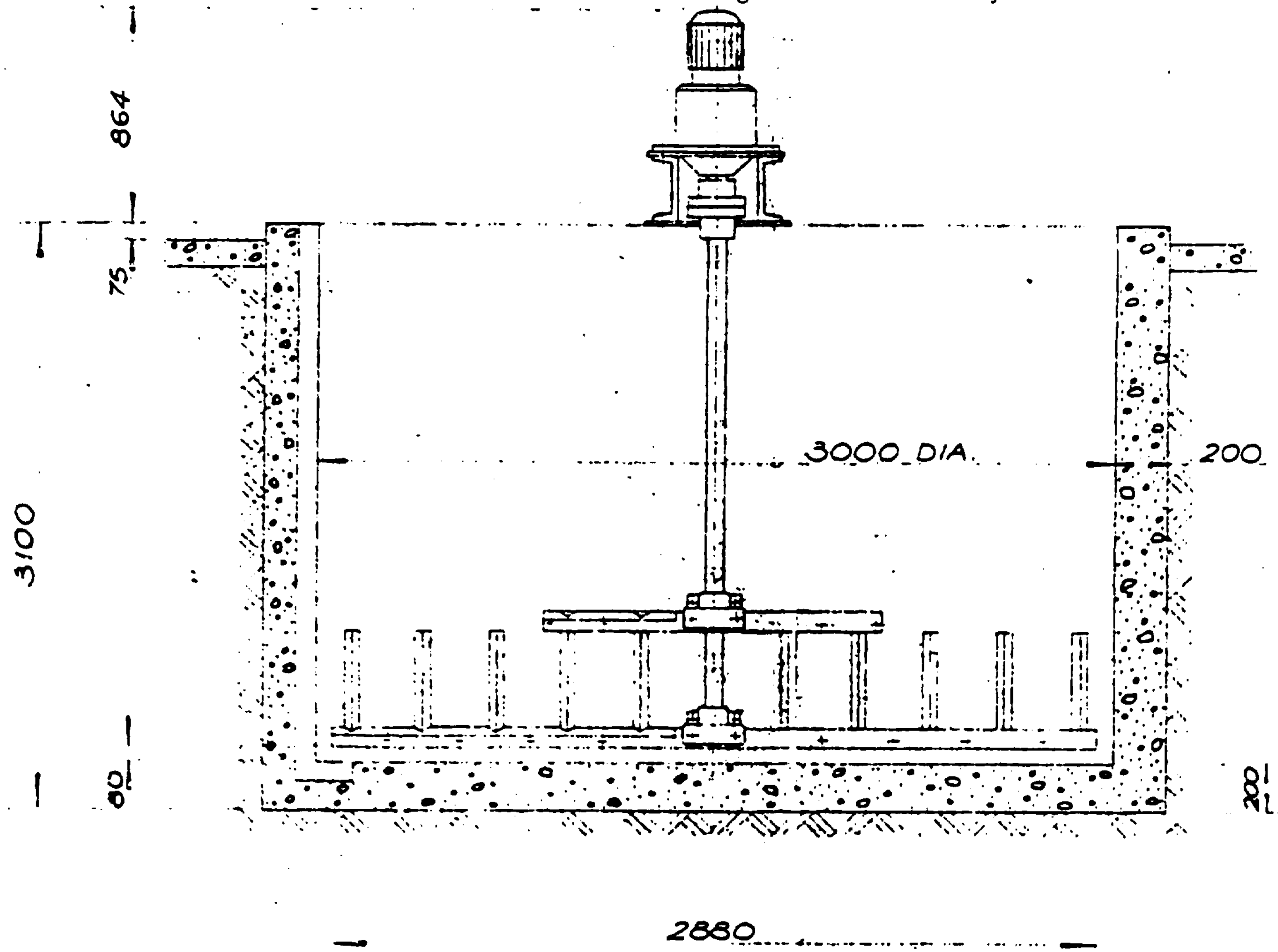
***RUHRWERKE UND MISCHER:** Fur alle Anwendungen, einschließlich: Mischung und Lagerung von 160 Liter bis 200.000 Liter*
Behalter konnen aus Flußstahl, rostfreiem Stahl oder verstärktem Glasfasermaterial hergestellt werden

***AGITADORAS Y MEZCLADORAS:** Para todos los usos inclusive mezcla y almacenamiento de 160 a 200.000 litros. Los depósitos pueden ser de acero dulce o inoxidable o reforzado con fibra de vidrio*

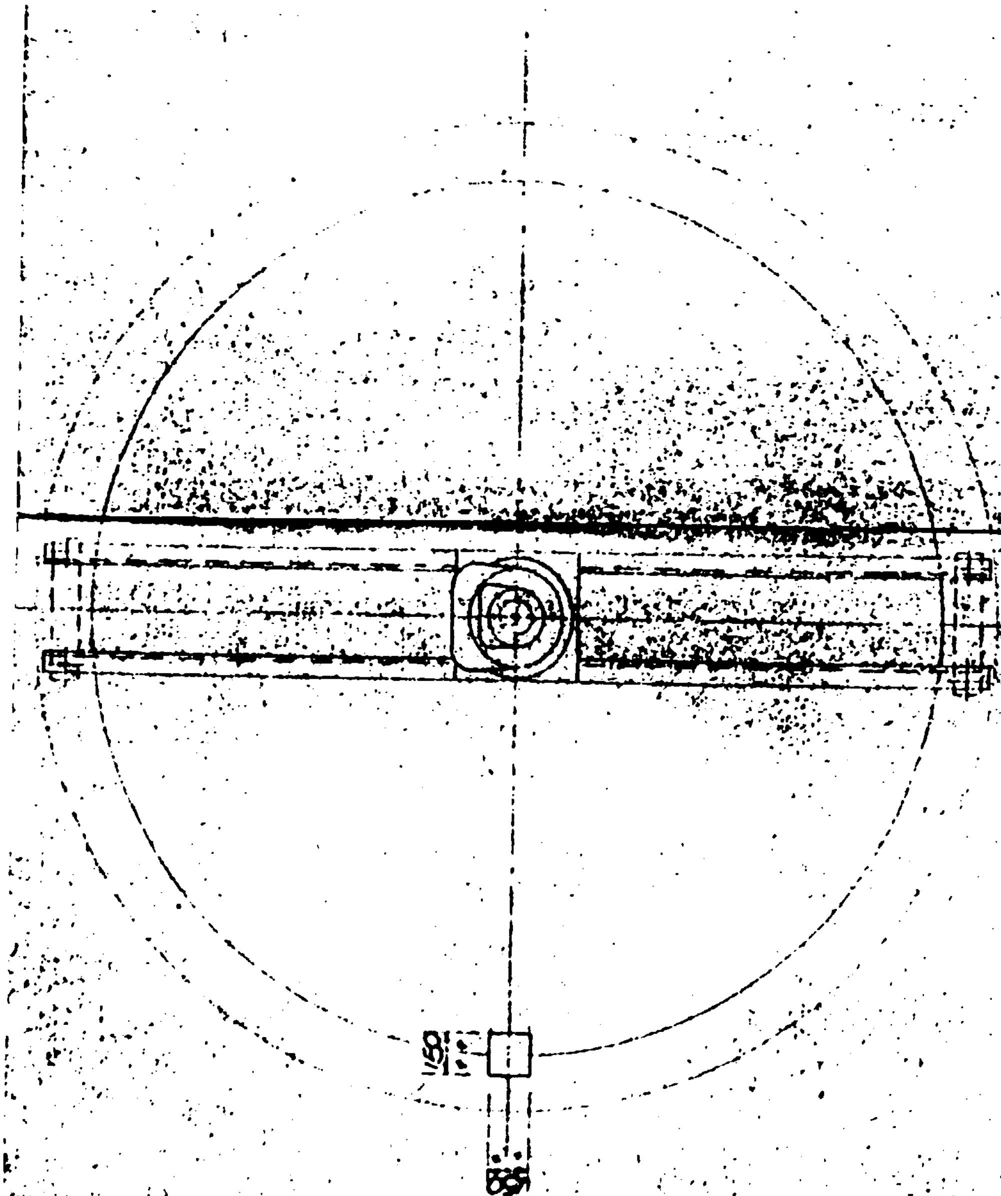
[illegible]

Typical in-ground installation of a mixing tank or storage tank

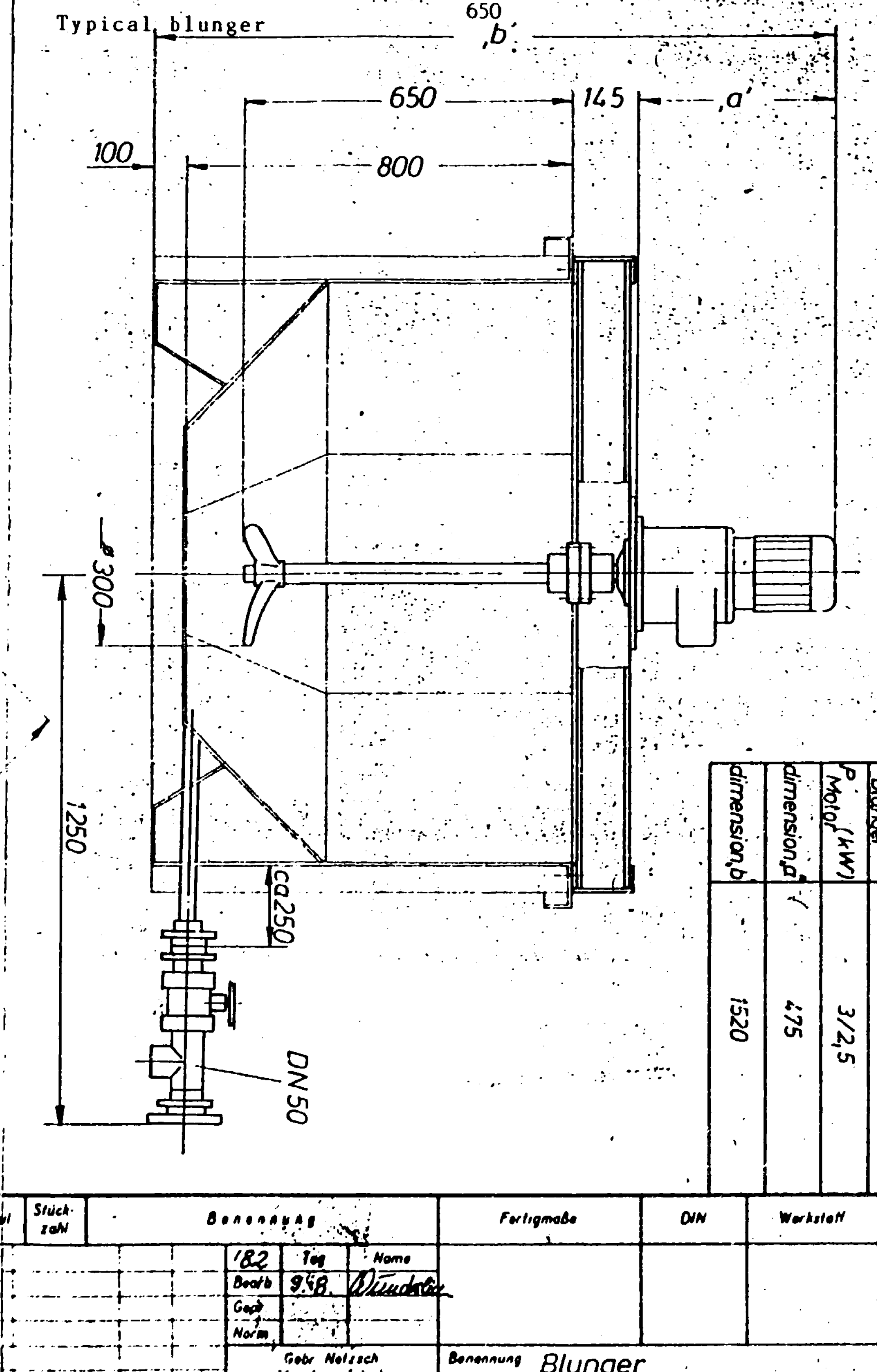
The tank is constructed in the building foundations by the local contractor



Typical plan view of mixing tank or storage tank (ark)



Typical blunger



	dissolver/stirrer
Fig. Nr.	262.22
$n_{blunger}$ 1/min	460/230
P_{Motor} (kW)	3/2,5
dimension ,a'	475
dimension ,b'	1520

Teil	Stückzahl	Benennung	Fertigmaße	DIN	Werkstoff	Bemerkung
						Pos: B31
						Pos: B33

1982	Tag	Name
Bearb	9.8.	[signature]
Gepr		
Norm		

Gebr Netzsch Maschinenfabrik Selb (Bayern)

Benennung Blunger Schraubenquirl

Maßstab

2 6 2.2 2/0 0

Rohgew. kg

Ausgabe | Änderung | Tag | Name

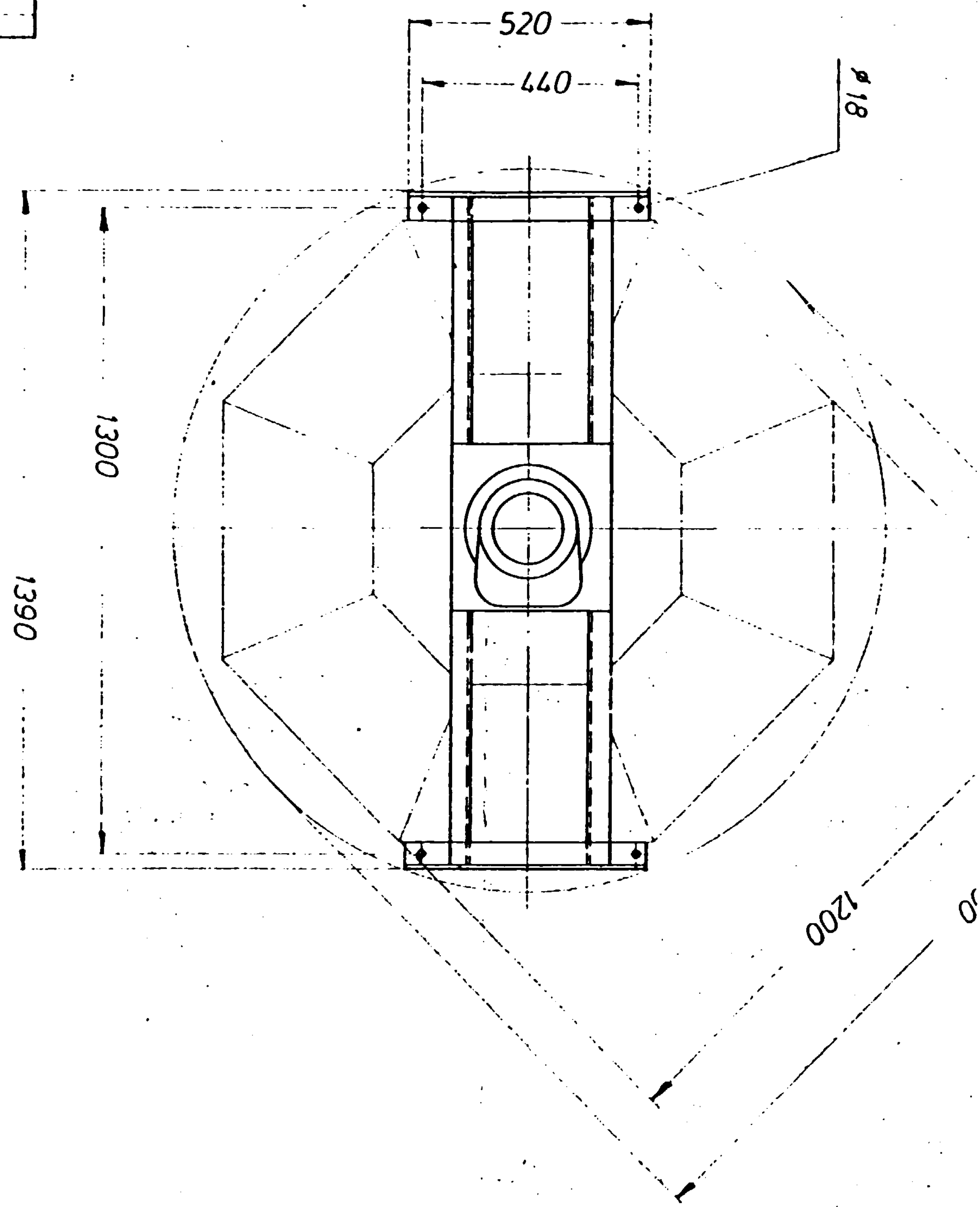
LM Nr 1252359

Figur Nr | Größe

Ers. f. 1406 309

Faßmaß	Abmaß	Bearbeitung 651	Kanten gebröchen mm

Typical blunger



Dimensions and construction are subject to modifications

Maß- und Konstr... änderungen vorbeh...

NETZSCH

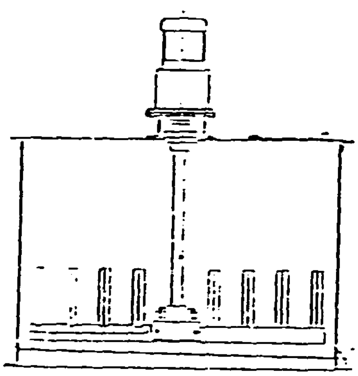
Typical mixing tank installations

Electric Stirrer, Type 009

The electric stirrers are used in the ceramics industry for agitating glazes and slips. They avoid sedimentation and separation of liquids. For this purpose, the stirrers can also be used in other industrial lines.

Drive is made by geared motor. The stirring rake is made of special wood

Type 009	Size	01	02	03	04	14	05	06	07	08	09	10	11	12	13
Inner dia. of tank	mm	1000	1200	1400	1600	2000	2500	3000	3500	4000	5000	5200	6000	6000	6000
Inner depth of tank	mm	800	800	1100	1200	1200	1500	2000	2200	2500	2500	3000	3000	4000	5000
Useful contents at ⁴/₅ filling	m³	0.5	0.75	1.25	1.8	2.3	5.5	10.5	16	24	40	64	85	90	112
Speed of stirrer	rpm	13	13	13.5	13.5	13	13	12	12.5	23	7.6	7	7	7	7
Motor power	kW	0.37	0.55	0.75	1.1	1.1	1.5	2.2	3.0	4.0	5.5	7.5	7.5	7.5	11
Profile of substructure		U 80	U 100	U 140	U 140	U 160	U 160	U 200	U 220	U 240	U 240	U 280	U 280	U 280	U 280



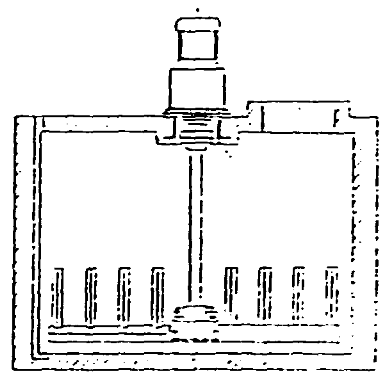
Electric stirrer with steel tank

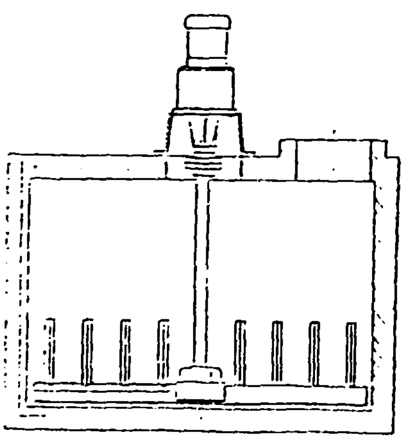
The stirrer is fixed on two steel channels which are mounted over the tank cover. One half of the cover is equipped with a mounting hole. The feed opening and the discharge can be supplied according to the customers wishes.

The tank can be supplied of steel, rubberized steel, glass-reinforced polyester, or stainless steel.

Electric stirrer with concrete tank. (Tank not supplied).

The stirrer is mounted on two steel channel girders embedded in the concrete cover.



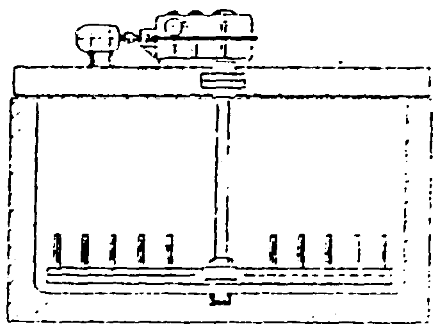


Electric stirrer with concrete tank. (Tank not supplied).

The stirrer is mounted over a lantern-shaped support. The advantage of this arrangement is that the reinforcement of the tank cover is not affected.

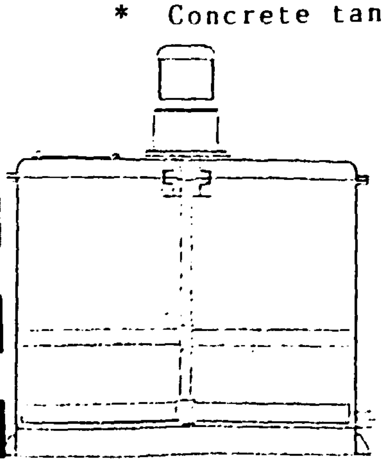
Electric stirrer of reinforced design with concrete tank. (Tank not supplied).

The electric motor and the vertical bevel spur gear are mounted on a steel channel traverse anchored in the tank wall. The tank bottom is provided with a maintenance-free pivot bearing so that the stirrer shaft is guided exactly under extreme stresses.



* Concrete tank type prefered for Uganda due to lower maintenance

Stirrer with closed tank, Type 135



for stirring of ceramic enamel slips and other suspensions

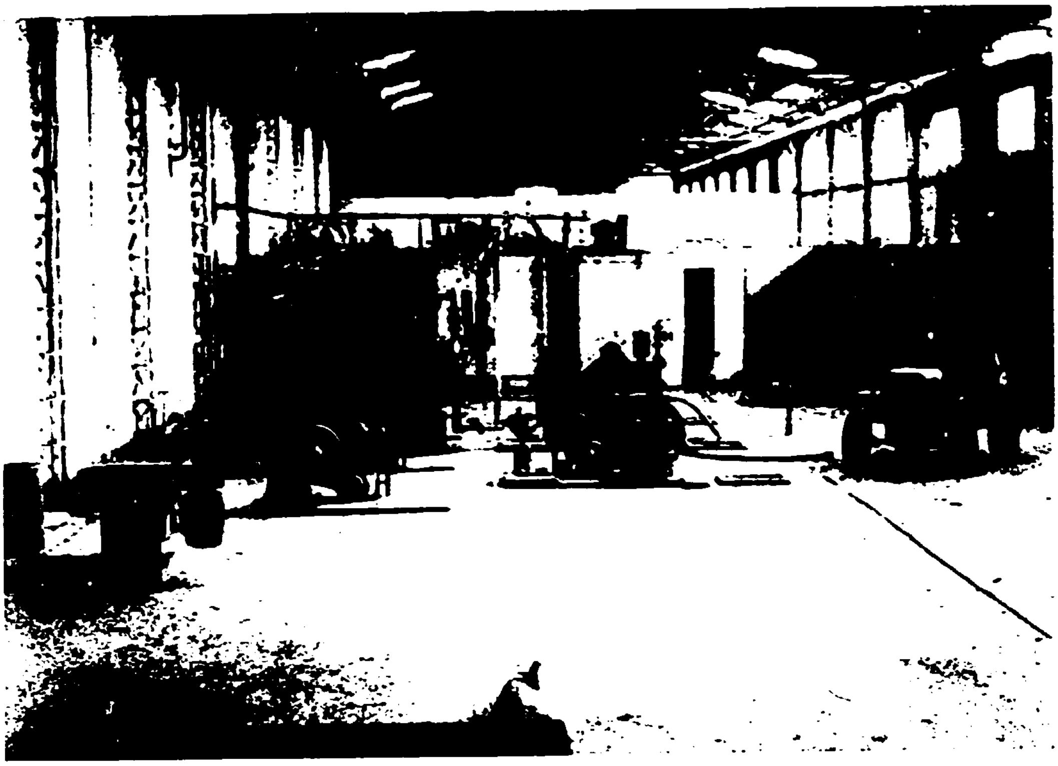
The heavy-duty gear is bolted to the tank cover and connected with the stirring shaft by means of a rigid coupling, which is resistant to bending. The stirrer shaft is provided with two slim running blades.

According to the use, it is possible to supply the tank made of stainless steel, rubberized or of plastic material.
The stirrer shaft and the blade are made of stainless steel

Additionally, the tank cover can be provided with openings for magnetic filter or vibration screens. The positioning of feed and discharge will be made according to the wishes of the customer

For mixing and dispersing the stirrer can also be equipped with propeller, turbine or similar agitators made of various materials

Type 135	Size	01	02	03	04	05	06	07	08	09	10	11
Useful contents	liter	100	200	300	500	750	1000	1500	2000	3000	5000	7500
Dia. of tank (inside)	mm	600	800	900	1000	1200	1200	1400	1600	2000	2300	2500
Height of tank (outs.)	mm	650	750	850	1050	1100	1450	1550	1550	1550	1900	2300
Blade speed	rpm	29	24	20	20	18	18	16	16	15	14	[illegible]
Motor power	kW	0.37	0.37	0.55	0.55	1.1	1.1	1.5	2.2	3.5	4.0	[illegible]



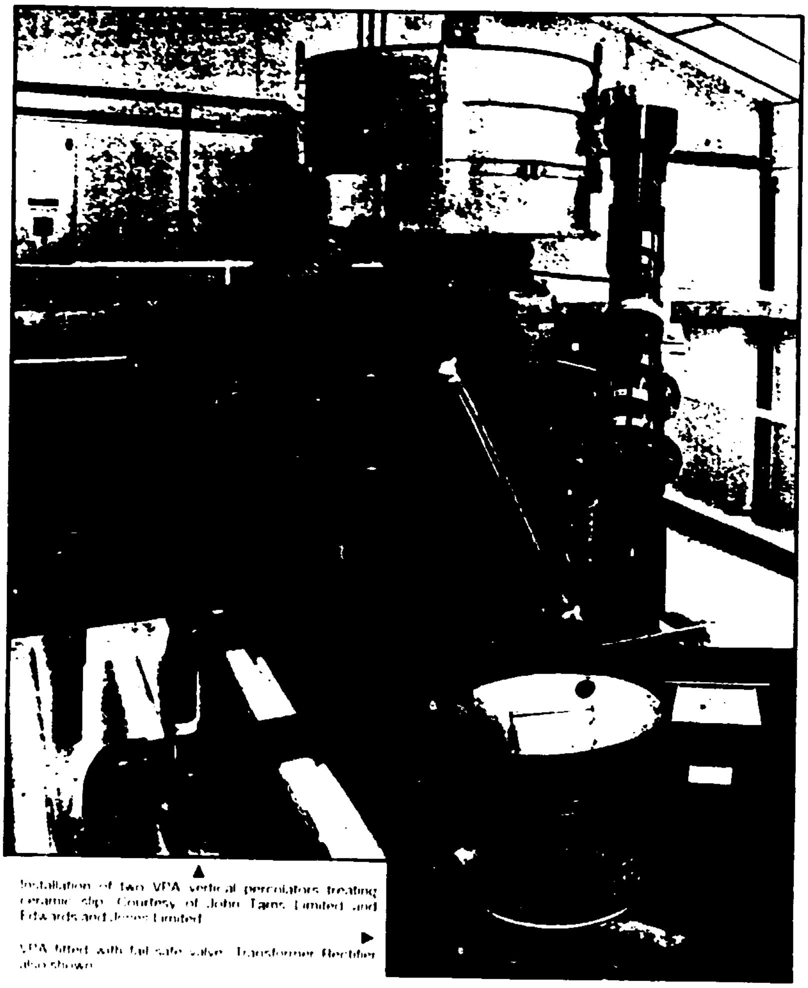
Typical in-ground mixers and storage arks

(Angola)

BOXMAG RAPID

Type VP Vertical Magnetic Percolators

for the extraction of fine particles of iron contamination from ceramic slip or glaze and chemical/industrial slurries



▲ Installation of two VPA vertical percolators treating ceramic slip. Courtesy of John Tams Limited and Edwards and Jones Limited

▶ VPA fitted with fail-safe valve. Transformer Rectifier also shown

OPERATION

When liquid flows through the VP Percolator it makes contact with edges of high flux gradient produced from a stack of grids magnetised by a surrounding electrical coil. As a result iron particles in the liquid are retained on the grids.

The cleaned liquid discharges through a spout at the bottom of the housing.

By connecting the outlet to a separate container, switching off the electrical supply and flushing through with water, the extracted iron particles can be removed from the grids. When necessary, the stack of grids can be easily removed from the Percolator and each individual grid removed from the stack, in order to clean them more thoroughly and prevent any possibility of build-up of dried solid material.

To prevent iron particles from being discharged into cleaned liquid if the coil is de-energised unintentionally, a solenoid-operated shut-off valve can be fitted as an optional extra.

SPECIFICATION

Feed Hopper Non magnetic stainless steel.

Grid Housing and Container Non-magnetic stainless steel.

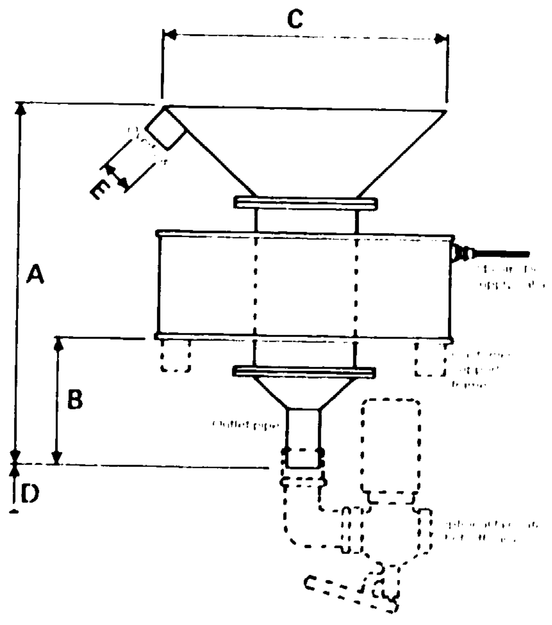
Coil Housing Mild steel and non-magnetic stainless steel.

Grids Magnetic stainless steel.

Energising Coil Wound with aluminium wire insulated to B.S. Class H temperature specification. Rated for continuous operation on 24 volts DC.

Power Supply Via 2 metres length of 3 core cable and watertight cable gland.

Transformer Rectifier Wall mounting naturally air cooled type with IP65 enclosure.



TECHNICAL DATA

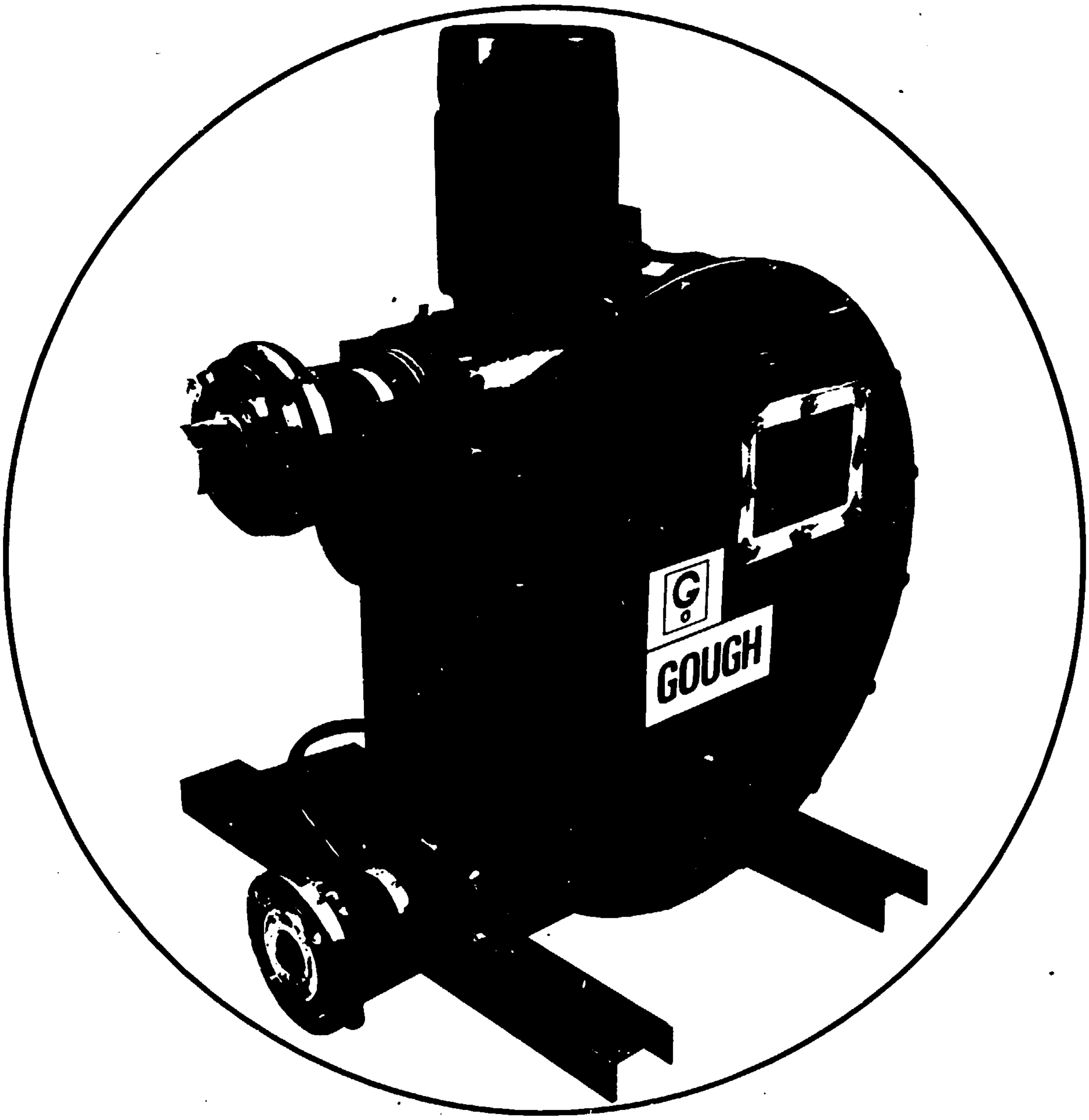
	Size	† Capacity (litres min.)	Dimensions (mm) A	B	C	D	E	*Watts on 24 volts DC	*Mass (kg) Nett	Gross	*Shipping Space (m³)
**	VPA	135	670	263	500	48	60	320	105	155	0.53

** Suggested type for Uganda

Edwards & Jones Ltd

Whittle Road, Meir, Stoke-on-Trent, ST3 7QD.
Telephone: (0782) 599000. Telex: 36397.
Fax: (0782) 599001.

GOUGH PERISTALTIC PUMPS



Gough Pumping Equipment
For All Industries

How the "Tube Pump" works

The peristaltic pumping action is achieved by compressing the tube between the internal wall of the housing and one of the roller arm assemblies, as it rotates inside the cavity. This has the effect of leaving a vacuum which causes further liquid to prime the tube, ready for the second roller arm to begin the compressing action once more.

The operation of the pump directs the liquid in contact with the inner surface of the tube only, with no other parts coming into contact with the product.

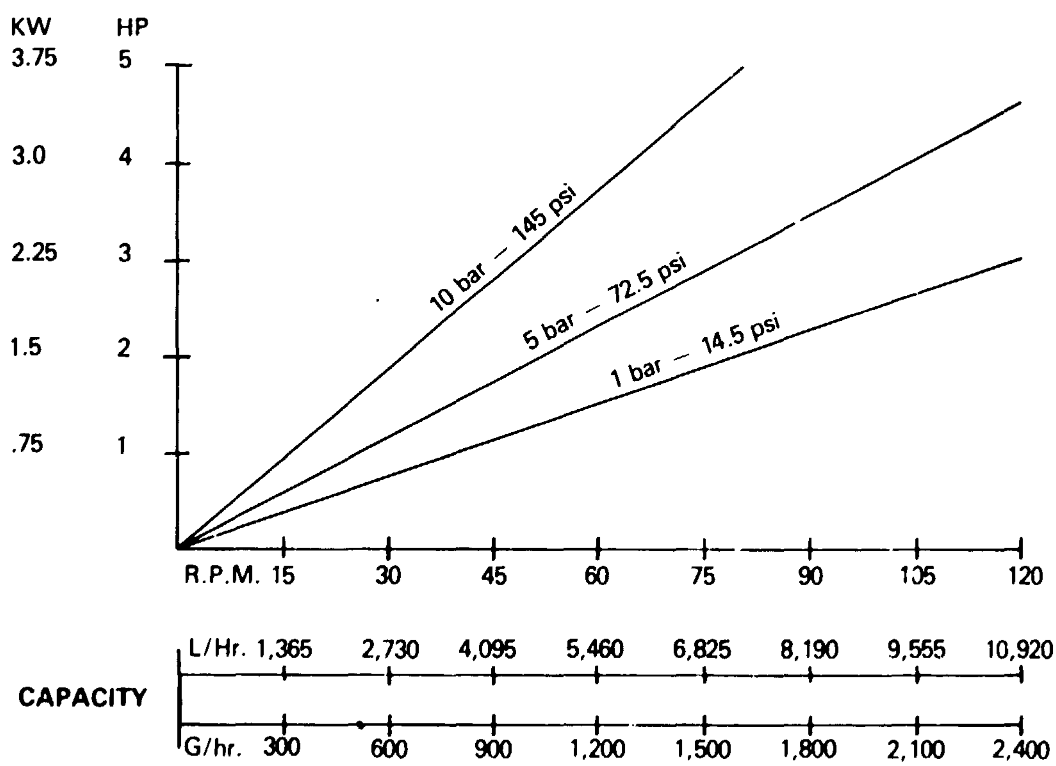
The "Tube Pump" is ideal for use on slurries and slips from a wide range of industries and solid/liquid processes.

Typical Applications

Here the Type 150F is being used to pump ceramic casting slip from the preparation area through a ring-main casting circuit, to the production area.
(To reduce the pulsating effect of the pump at low revs a damper can be fitted).

Here the Type 150F is being used to pump contaminated water in a spray paint area. The water is heavily contaminated with the overspray paint. A Gough Vibrecon Separator should be used to remove the paint from the water.

Performance Chart



PLATFORM WEIGHERS

MODEL FP
Free-standing Platform

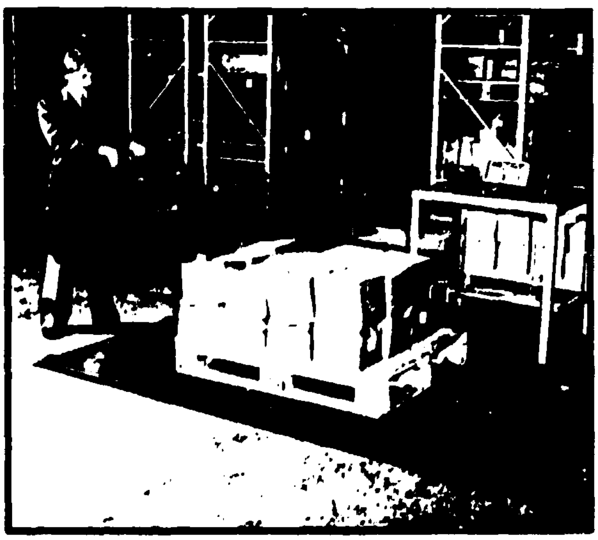
1500mm x 1500mm, 2000 kg unit, with stainless steel wall-mounted digital weight indicator and lift truck guides

QUALITY

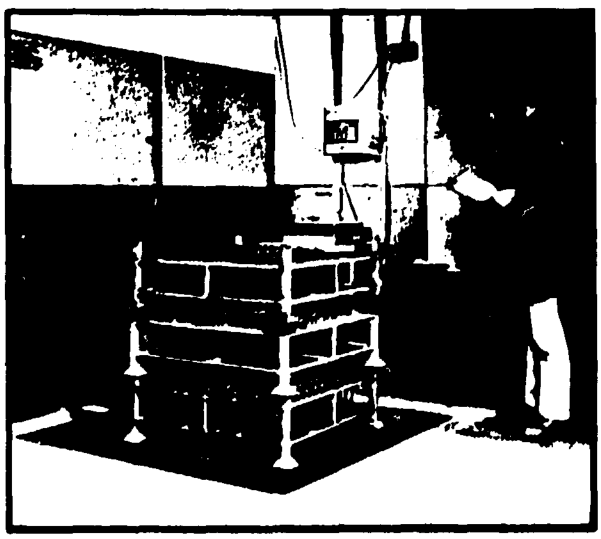
- ★ High Accuracy—standard 1 part in 5000
- ★ Advanced British Design and Manufacture
- ★ Department of Trade approved

RELIABILITY

- ★ Guaranteed structurally for 5 years
- ★ Maintenance free, no movement weighing
- ★ Fully protected against shock and side impacts, overload protected to 800% of platform capacity

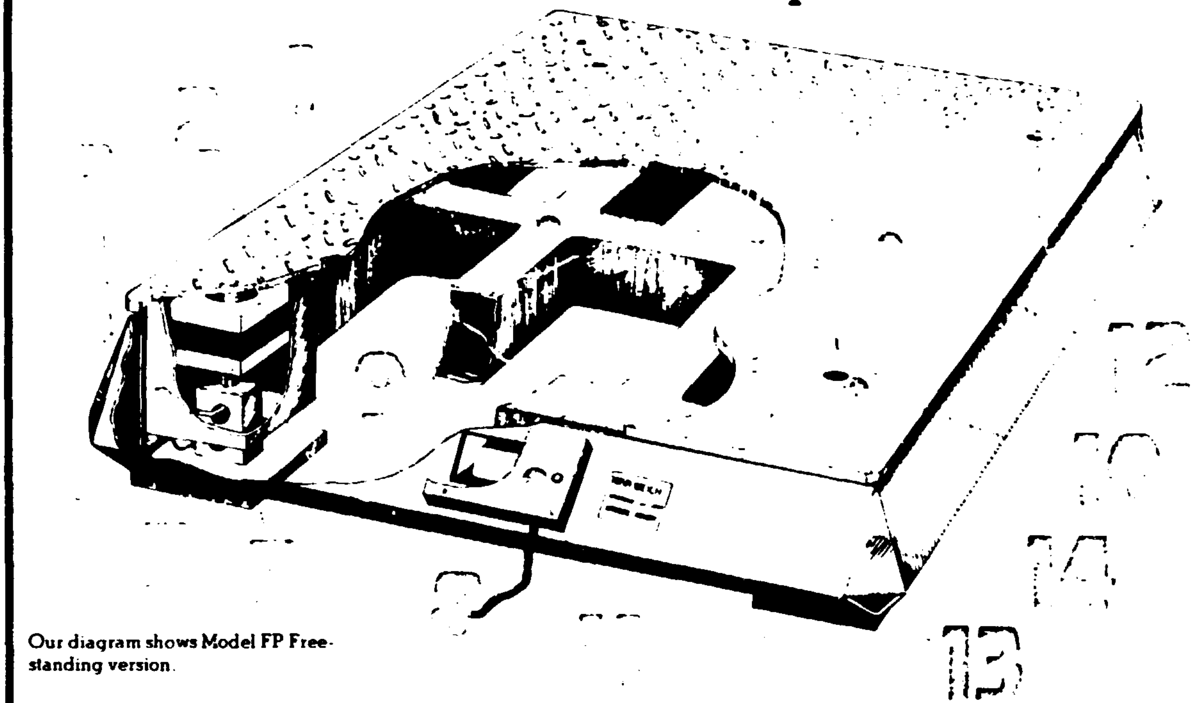


MODEL LP Low Profile Platform
1000mm x 1000mm, 2000kg platform, standing only 75mm high, with desk mounted indicator and ramps



MODEL DP Dormant Platform
1500mm x 1500mm, 2000kg basework, shown with wall mounted parts counting system

Main features of NOVA WEIGH platform scales



Our diagram shows Model FP Free-standing version.

- Welded framework of rectangular hollow steel section.
- Platform finished in blue synthetic enamel paint as standard.
- Impact guards to protect against fork-lift truck damage.
- Corner posts to shroud and protect the load cell.
- 'Neoprene' shock-absorbing mounts.
- Triangular section for strength and cable protection.
- Precision load cell (protected against corner overload to 200% of platform capacity) and water proof to IP65.
- Shielded load cell cable.
- Locating pegs for easy removal and replacement of Deck Assembly.
- Eye bolt holes for removal of Deck Assembly.
- Junction Box summates and adjusts outputs from each load cell.
- Non-slip 'Durbar' pattern deck-plate (8mm thick).
- Cranehook lifting facility.
- Angled safety corners.

Our heavy-duty range of 4 load cell electronic platform weighers is available in three versions:

— A floor-standing unit, which can also be supplied with attachments for moving by lift truck (as illustrated overleaf). 175mm high +5mm

— Designed to ease loading by lift truck, without the need for a "pit", with optional ramps.

— Our "flush-mounted" basework, invaluable where floor space is at a premium.

These unique weighing machines, with their combination of precision and strength are ideal for many weighing and counting applications in a wide range of industries – from the accurate weight-monitoring of chemicals, foods and pharmaceuticals to the check-weighing of steel and automotive components.

Since the scales contain no mechanical parts, they do not suffer from any of the problems associated with lever system baseworks and can be relied upon to provide long-term accuracy and durability. No matter how many times they are moved, NOVA WEIGH bases maintain their calibration and, as there is nothing to wear out, require very little maintenance – resulting in reduced production down-time, and no "bottlenecks".

** Suitable for Uganda (free standing)

STANDARD RANGE (metric) - MODELS FP, DP, LP

Platform sizes.	Weighing capacities and increments				
	200 kg x 0.05 kg	500 kg x 0.1 kg	1000 kg x 0.2 kg	2000 kg x 0.5 kg	5000 kg x 1kg
500mm x 500mm					
1000mm x 1000mm		**			
1250mm x 1250mm					
1500mm x 1500mm					
2000mm x 1500mm					

Other sizes and capacities available upon request.

We reserve the right to alter or modify the specification without notice.

OPTIONS

Fork-lift truck 'guides' and support feet (Model FP only).

Grit-blasted and spray-galvanised/epoxy-painted finish.

Fully stainless steel basework and load cells (for "wash-down" applications).

Drive on and off ramps (Model LP only).

BASEEFA - approved basework (for Hazardous Area installations).

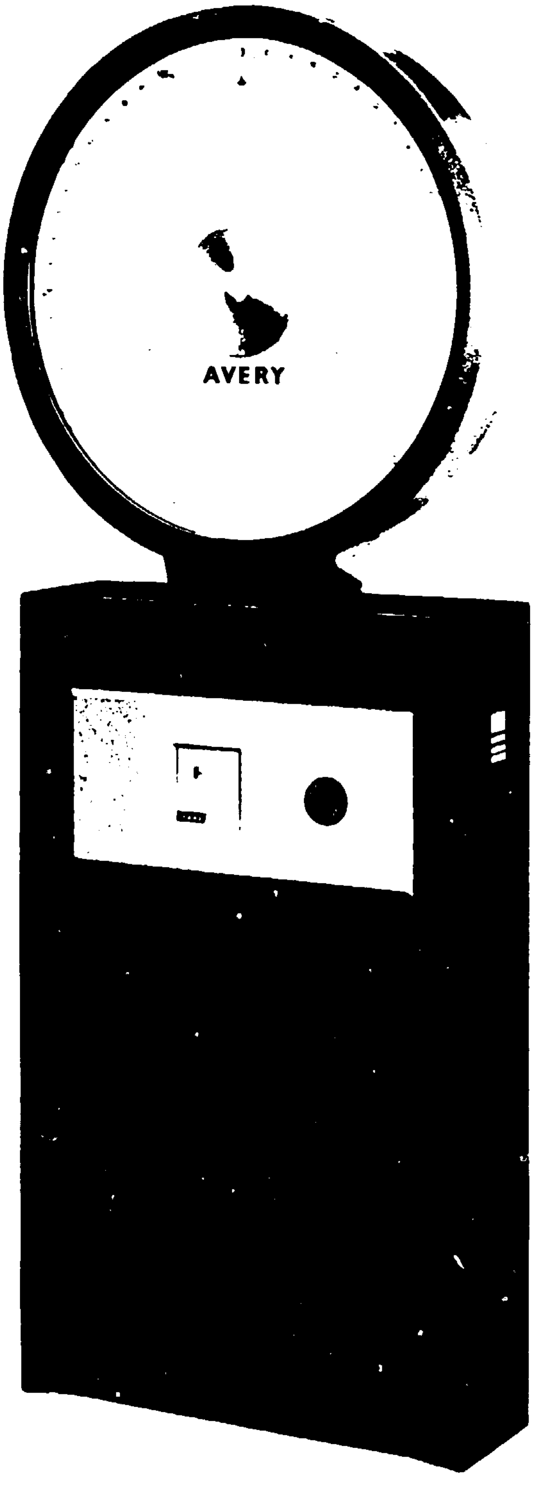
Plain deck-plate (for conveyor fitments etc).

Acknowledgements.

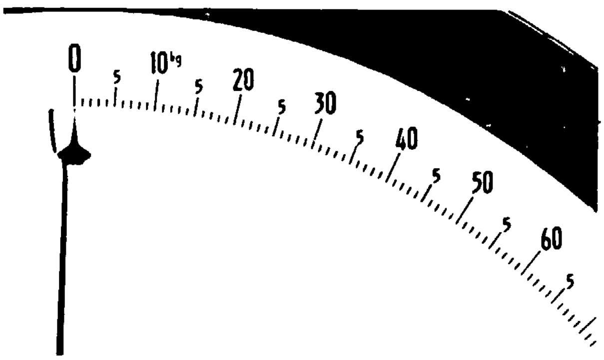
Parsons Chain Company, Garretts Airesearch Ltd and Miller Bridges Fasteners Ltd for allowing photographs to be taken in their premises

Madeley Road, North Moons Moat Industrial Estate, Redditch, Worcs. B98 9NB. Tel: Redditch (0527)67557

Dial indicator system type COG



Compact, with modern styling and of robust construction, this indicator system has been designed for use with light and heavy floor-level dormant platform scales in capacities from 110kg to 1250kg. It provides clear, easy-to-read shadowless indication on a 24in diameter (610 mm) reading line chart.
A wide choice of metric, metric/cental and cental only charts is available (see overleaf).



RAPID, ACCURATE READING

The line to line shadowless indication on both main chart and the rapid tare means that the pointer points at, and does not overlap, the graduation lines (single graduated charts only, see illustration above). There are no shadows to confuse readings, which can be taken from a wide angle. The widely spaced divisions, bold figures and large-diameter 24in (610mm) reading line also help to ensure that weights can be read quickly and precisely.

DEPENDABLE AND TROUBLE-FREE

This indicator system will give a long trouble-free life with the minimum of maintenance. The dial housing is sealed back and front by special rubber gaskets to prevent the entry of dust and moisture. The glass protecting the chart is flexibly mounted which reduces the risk of breakage. To avoid unnecessary wear the mechanism can be locked when the scale is not in use.

CHARTS

The following charts are available, at extra cost, in addition to those listed below:

Tare, net and gross charts. (cannot be provided when indicator system is equipped with tare or double graduations).

Single graduated metric chart (and tare, if fitted) as listed, with minor graduations denominated in multiples of grammes. (Not metric charts with 1000 divisions).

Double graduated metric/cental chart (and tare, if fitted) as listed, with minor metric graduations denominated in multiples of grammes.

METRIC

Total capacity	Chart	Graduated rapid tare (extra)
160 kg	110 kg × 0·2 kg	50 kg × 0·2 kg
375 kg	250 kg × 0·5 kg	125 kg × 0·5 kg
750 kg	500 kg × 1 kg	250 kg × 1 kg
1250 kg	1000 kg × 2 kg	250 kg × 2 kg

METRIC CHARTS WITH 1000 DIVISIONS*

150 kg	100 kg × 0·1 kg	50 kg × 0·1 kg
300 kg	200 kg × 0·2 kg	100 kg × 0·2 kg
750 kg	500 kg × 0·5 kg	250 kg × 0·5 kg
1250 kg	1000 kg × 1 kg	250 kg × 1 kg

CHARTS WITH DUAL GRADUATIONS

160 kg	110 kg × 0·2 kg	50 kg × 0·2 kg
350 lb	240 lb × 8 oz	110 lb × 8 oz
375 kg	250 kg × 0·5 kg	125 kg × 0·5 kg
825 lb	550 lb × 1 lb	275 lb × 1 lb
750 kg	500 kg × 1 kg	250 kg × 1 kg
1650 lb	1100 lb × 2 lb	550 lb × 2 lb
1250 kg	1000 kg × 2 kg	250 kg × 2 kg
2740 lb	2200 lb × 4 lb	540 lb × 4 lb

CENTALS

320 lb	220 lb × 8 oz	100 lb × 8 oz
405 lb	280 lb × 8 oz	125 lb × 8 oz
750 lb	500 lb × 1 lb	250 lb × 1 lb
800 lb	550 lb × 1 lb	250 lb × 1 lb
1500 lb	1000 lb × 2 lb	500 lb × 2 lb
2500 lb	2000 lb × 4 lb	500 lb × 4 lb

*Charts must have regard to local Weights and Measures regulations if stamping is required.

INDICATOR MECHANISM

Self indicating/spring-type/dust and moisture-proof/clip-on housing scroll.

CHARTS

Charts have a 610mm diameter reading line. Single graduated charts are fitted with shadowless indication, dual charts with an overlapping pointer.

CABINET

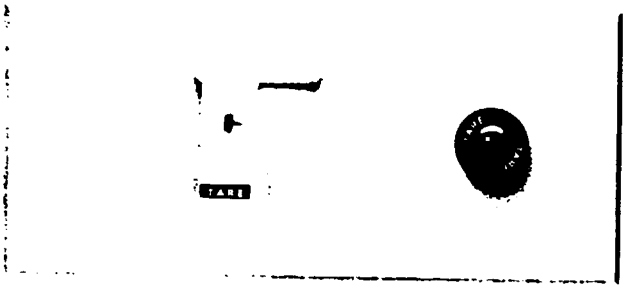
Fabricated sheet metal with indicator locking device.

FINISH

Stoved synthetic enamel in attractive red gloss.

NET WEIGHING

The graduated rapid tare available in single or dual graduations, enables the weights of containers, pallets, etc. to be deducted automatically from the weight indication given on the main dial. To tare off, the operator merely adjusts a control knob on the front of the cabinet until the tare weight appears through the neighbouring window (see illustration below). Since the tare knob is connected indirectly to the tare poise, there is no chance of interference with the weighing mechanism if the knob is accidentally touched. This design also minimizes wear of the weighing mechanism.



TWO-WAY INDICATION

Charts can be fitted so that readings can be taken from the front or the back of the indicator, or both.

WEIGHING KNOWN LOADS

A rim fitting with one or more compounding pointers can be supplied to enable predetermined loads to be identified.

DIAL GUARD

To protect the chart and glass from damage, a wire mesh dial guard can be fitted to the front of the chart housing.

STAINLESS STEEL CABINET

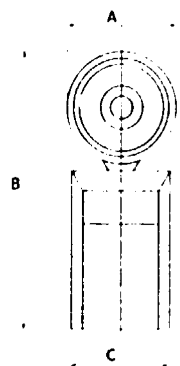
DIMENSIONS

A 787mm.

B 1943mm.

C 711mm.

Front to back: 279mm.



SHIPPING SPECIFICATION

Details on application.

SMETHWICK, WARLEY, WEST MIDLANDS B66 2LP, ENGLAND
Telephone: 021-558 1112/2161 Telegrams: Avery Warley Telex: 336490

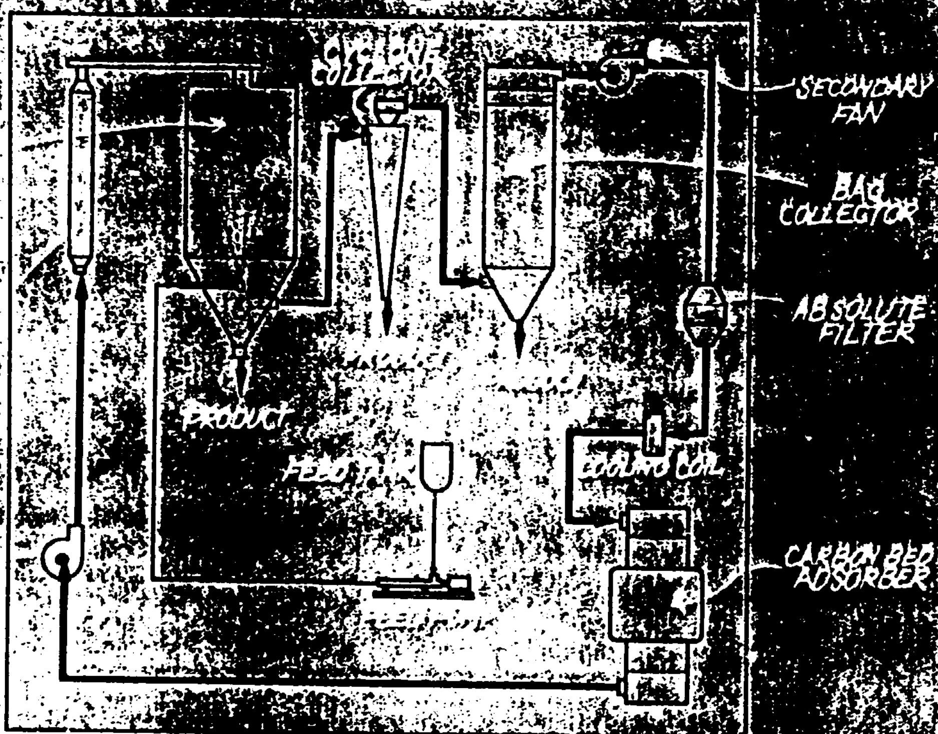
Avery has been involved in the manufacture, installation and repair of weighing machines for over 250 years, and its reputation is based not only on its products but also upon the comprehensive facilities for after sales service.
To maintain efficiency and continued accuracy precise equipment such as weighing machines requires regular service.
Avery offer a range of inclusive Maintenance Contracts, tailored to meet the requirements of both product and customer, whether Industrial or Retail.

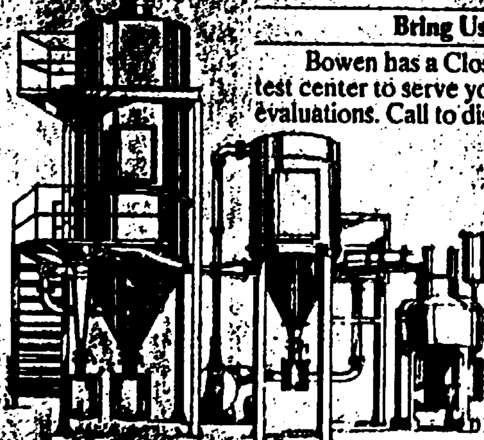
Avery's Service Organisation has an extensive network of Service Branches throughout the United Kingdom and Eire.
In other countries throughout the world a comprehensive organisation of associated Companies and Distributors provide service from any one of over 200 centres.

Please ask your Avery representative for full details of the Avery Maintenance Contract.

TILE SPRAY DRYERS

Bowen has made it easy to spray dry ceramics formulated in organic solvents.





Bowen designs Closed Cycle Spray Drying Systems specifically to spray dry traditional or advanced ceramic slurries which are formulated in non-aqueous solvent vehicles. They are used for a wide range of ceramics including: ***aluminas, carbides, catalysts, clays, ferrites, silicon nitrides, titanates (PZT's), zirconias (PSZ's).***

Ceramics can be formulated in a variety of organic solvents including chlorinated hydrocarbons, straight chain hydrocarbons, aromatics, ketones, alcohols ... and others.

Bring Us Your Product

Bowen has a Closed Cycle Spray Dryer in its test center to serve your needs for spray drying evaluations. Call to discuss test rates and available test dates. Product literature available upon request.

System Features

Spray dry samples as small as ½ gal. (approx. 2 liters) • Gas tight construction • Co-current or mixed flow drying concept • Fully inerted (nitrogen or argon) system • Continuous oxygen level monitoring in drying gas stream and regulation of system pressure balance • From 10-50 lbs/hr (4.5-22.6 Kg/hr) evaporative capacity • Nozzle or rotary atomization • Particle size up to 100 microns.

Bowen Engineering, Inc.

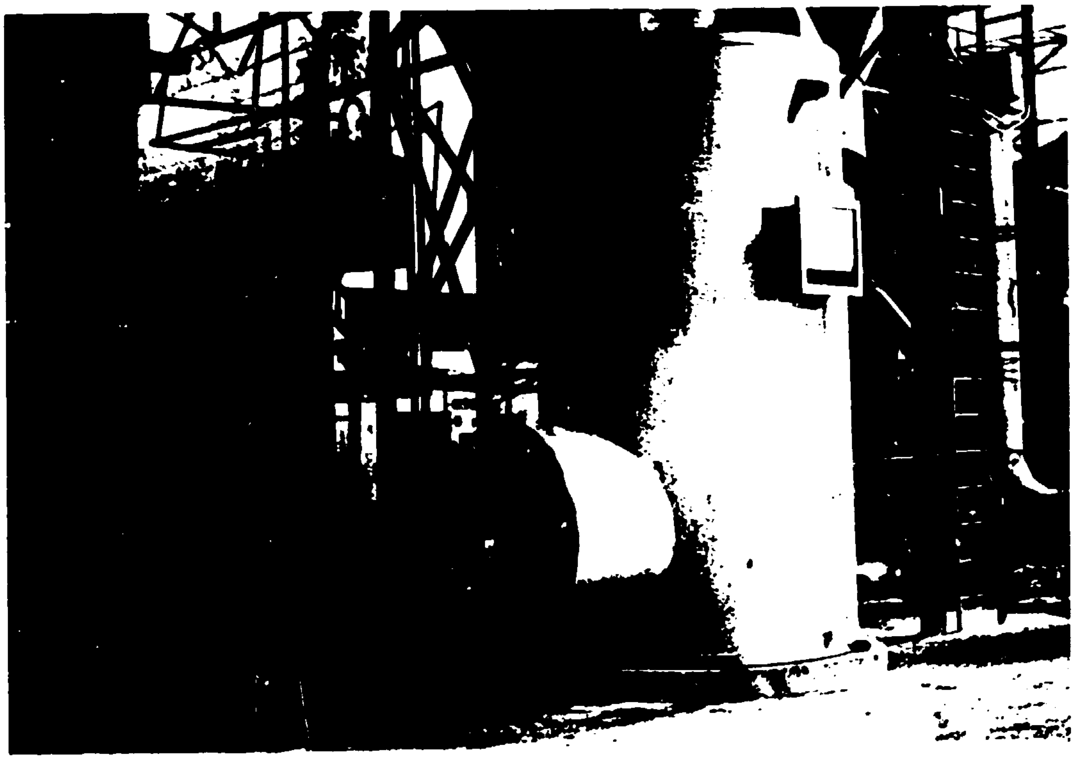
Spray Drying Specialists Since 1926

P.O. Box 898 Somerville, NJ 08876-0898 Telex 4754067 (ITT) Telephone (201) 725-3232

ENGINEERING • DESIGN • SALES • TECHNICAL SERVICE • TEST FACILITIES

Typical spray dryer installation

(Angola)



TILE PRESSES, TILE DRYER,

TILE BISCUIT SETTING

GRUPPO MARTINELLI

The moulding by pressing, operating the mechanical compression of the body in the moulds, is one of the most economical ways to carry out ceramic manufacture, but through the MARTINELLI's technology it especially works when manufacturing compact tiles, mosaics and trims. The MARTINELLI's aim is to supply pressed material all over obviating the difficulty to evenly distribute the clay unloaded by the feeding trolley in the mould holes.

NEW MOULD GENERATION

TOP EJECTING (patented)

The third MARTINELLI's generation double box mould, allows through oildynamic control the pressing of face tile on upper side of all type of tiles with spacer. Base technology is passage of clay from lower mould box to upper mould box where tile developes.

SINK TRIM

Entering die mould or mirror mould for automatic production of trim pieces (moulding trails and firing can be carried out to guarantee quality of finished product).

HPS 250

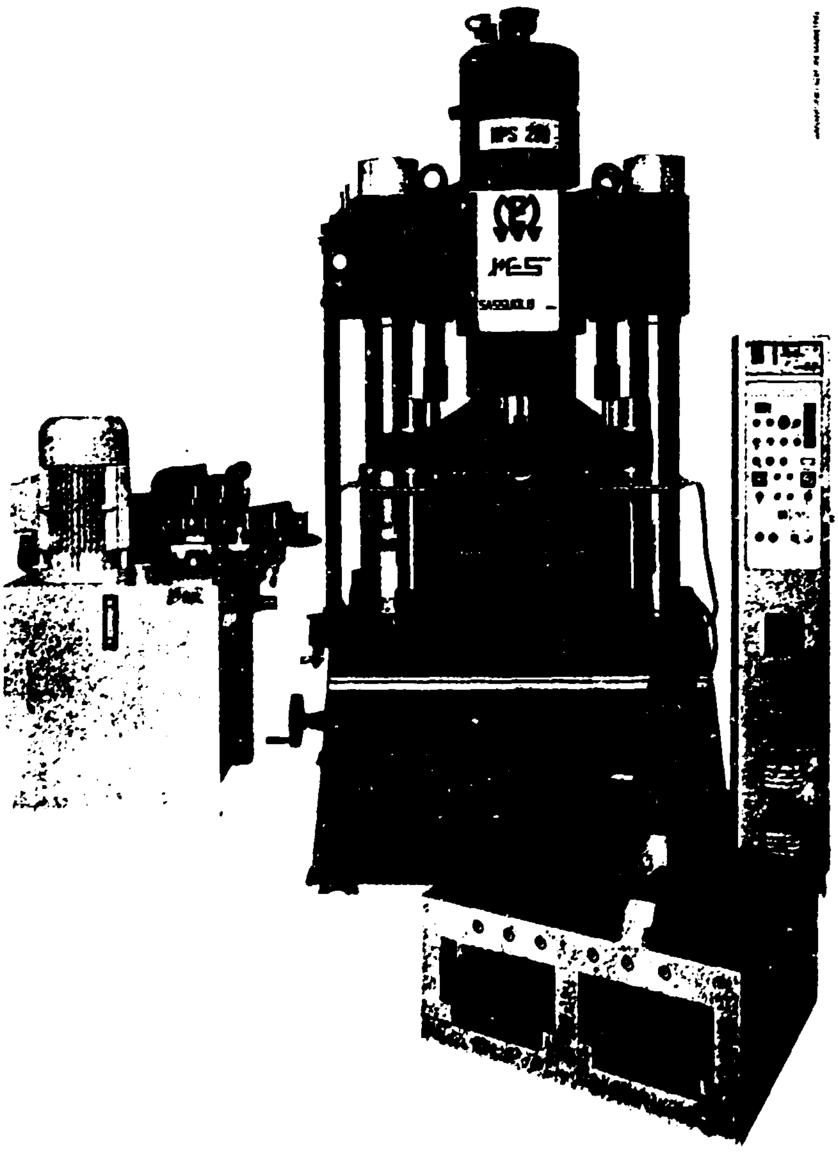
Hydraulic press, vertical, automatic, specific for trim and mosaic production

This new press has been studied to satisfy an entermediate band production; very versatile, automatic cycle, oildynamic planned for trims, but can also be used for normal production or mosaics. No foundation needed for installing as hydraulic extractor, having first and second stroke, has small dimensions and is incorporated in press bed.

Technical advantages
- possibility to locate press anywhere in plant,
- press with programmable logic control,
- electronical thickness control gauge,
- hydraulic mould stop,
- electronic manometer for pressure adjusting,
- visual checking of operations by automatic system,
- special trolley for quick regulation of loading system,
- easy adjusting of lifting for extraction and return with hydraulic spring.

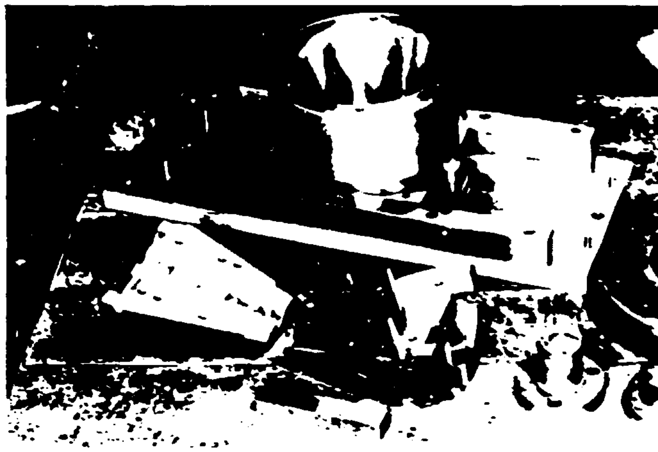
TECHNICAL DETAILS

Pressure force	ton	250
Space between columns	mm	685
Max. soft clay loading	mm	[illegible]
Max. run ... spindle guide	mm	[illegible]
Strokes per minute	n	20
Max. power extractor	ton	1
Electrical power installed heating excluded	kW	25
Water for oil cooling (20 °C)	lt/min	8-10
Oil for hydraulic system	lt	230
Net weight	kg	6200
Length	mm	1600
Width	mm	2160
Height	mm	2850

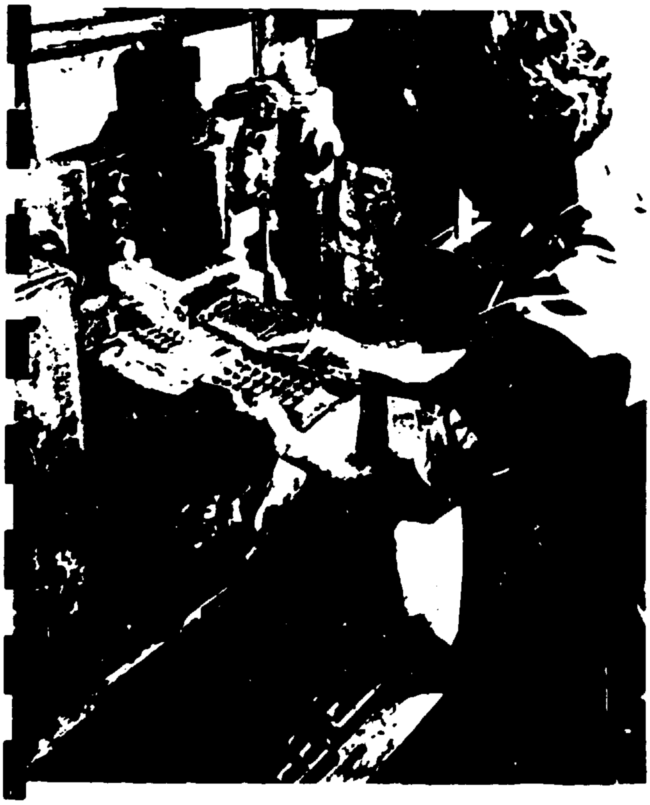


GRUPPO MARTINELLI 41049 SASSUOLO (MO) ITALY VIALE CAROTO 61
TELEF. (0536) 800214 TELEX 224672 MECMAR I TELEFAX 0522 32190

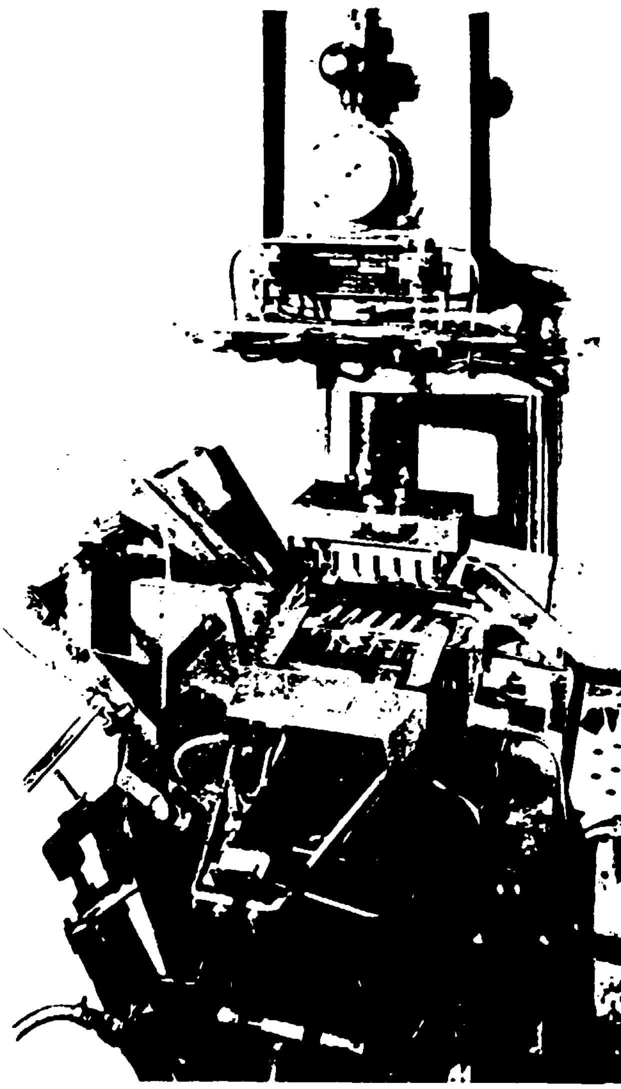
A double die-set for 6"x 6" floor tiles. The carbon steel machined box is fitted with hardened and ground high carbon high chromium alloy steel liners and knife. The panelled bottom dies and the cushion edge top dies are also in alloy steel.



Plastics Moulding Tool designed by and supplied to the British Ceramic Research Association

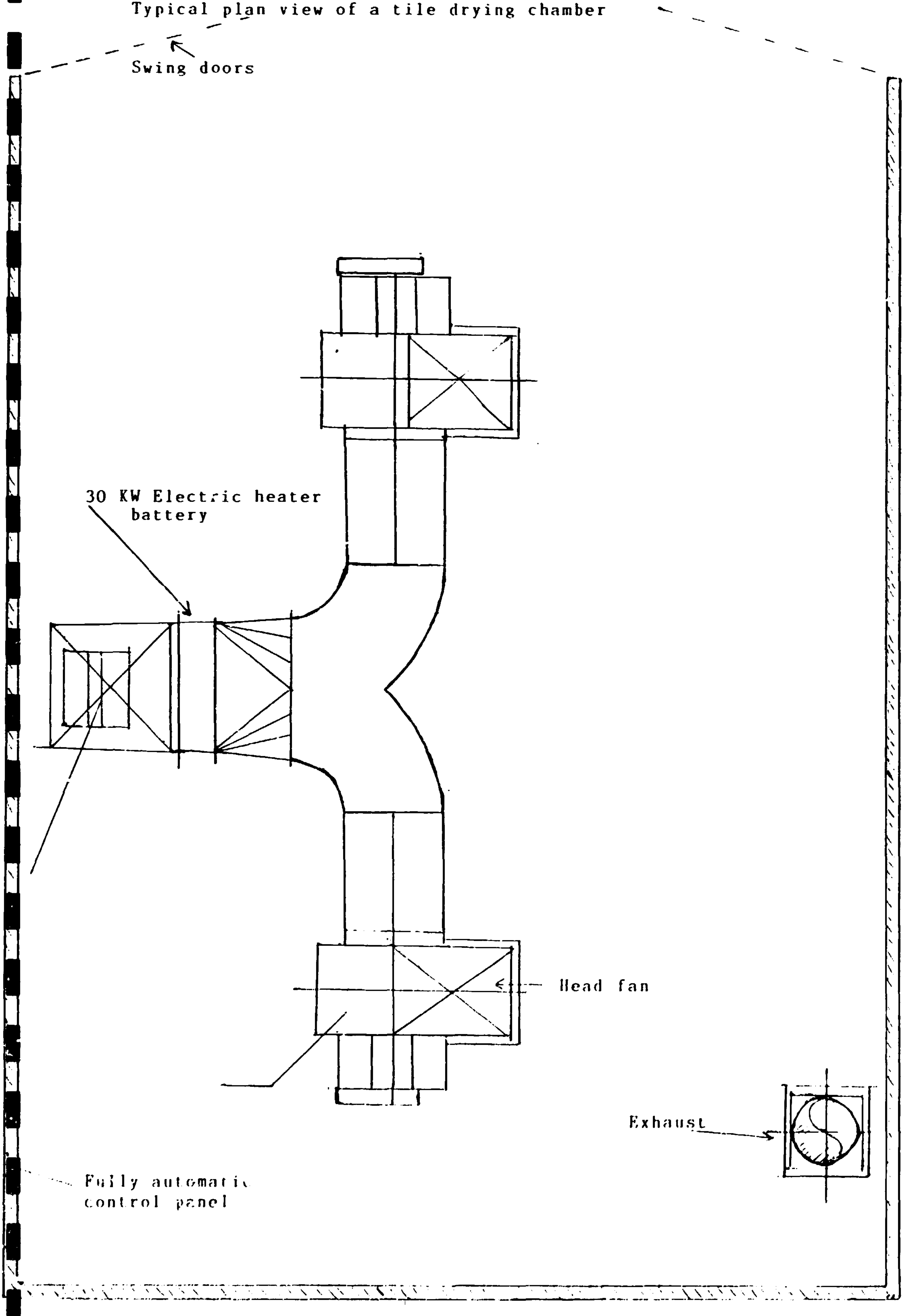


A gas-fire radiant front section die-set, with a hardened and ground alloy steel box and dies



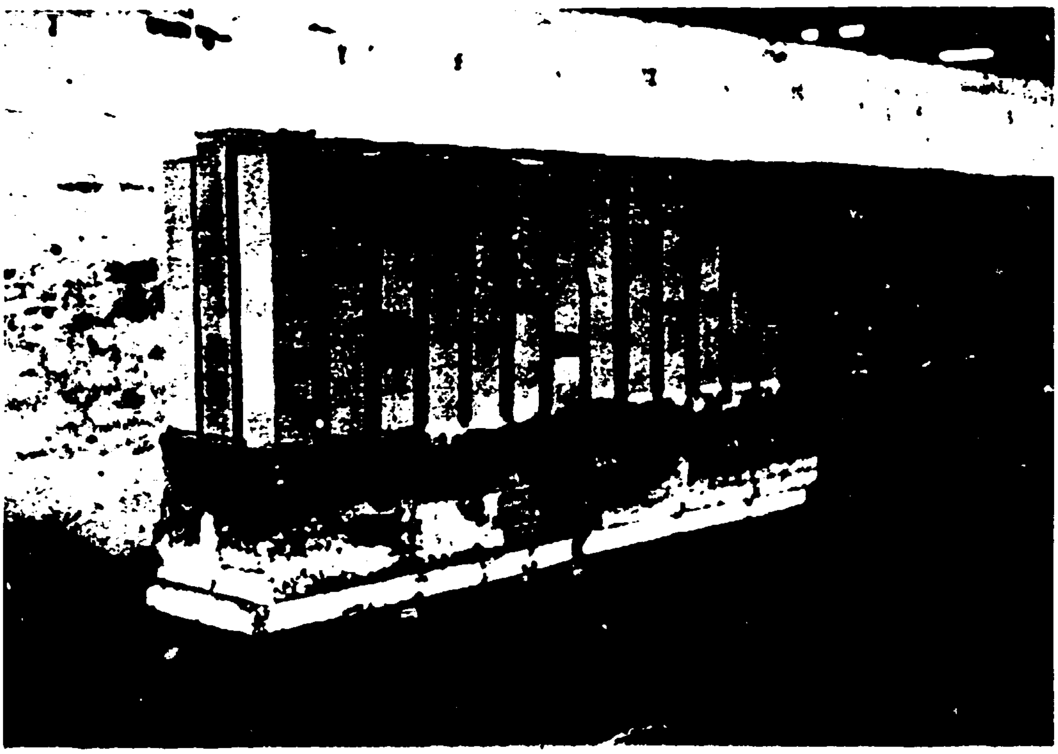
A multiple die-set for pyrometric cones, with all wearing parts in hardened ground abrasion resistant alloy steel. The special equipment, pneumatically actuated, to convert the hand-operated press to fully automatic operation was also designed and fitted by us.

Typical plan view of a tile drying chamber



Typical setting of pressed tile prior

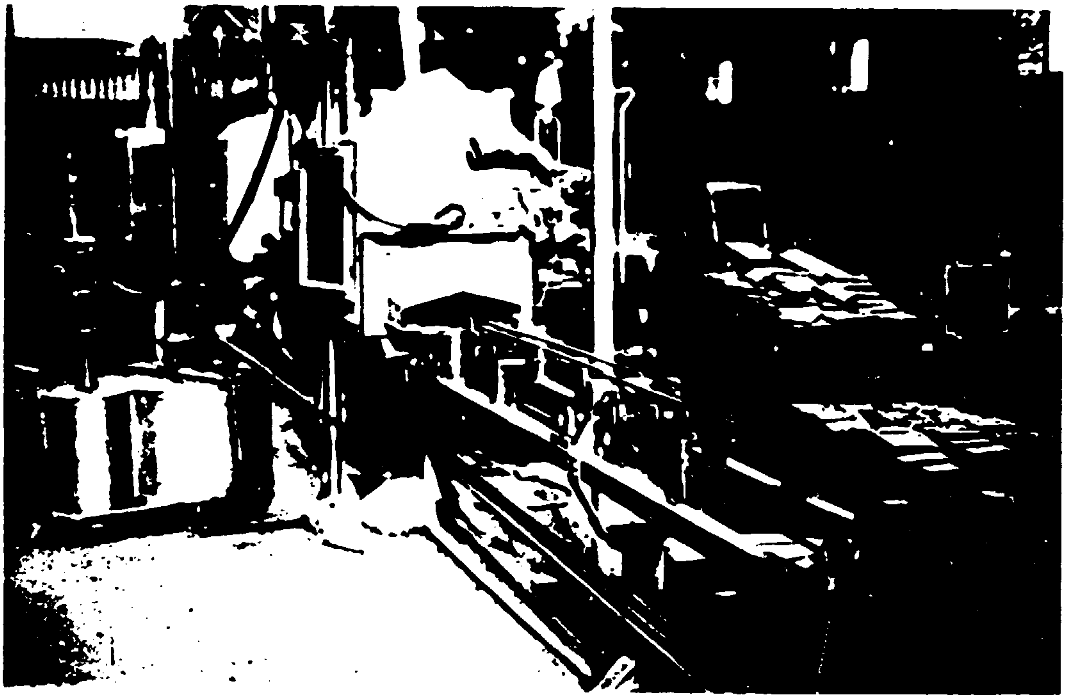
to biscuit firing



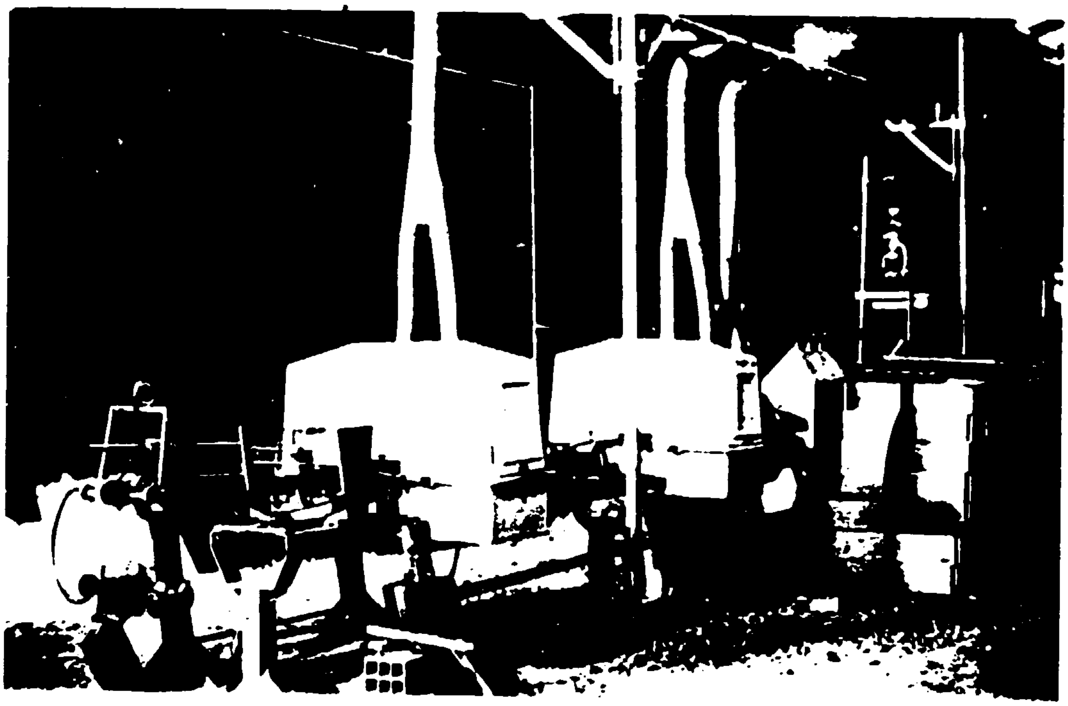
TILE GLAZING

Typical tile gauging line (biscuit and glazed)

Typical tile glazing booth

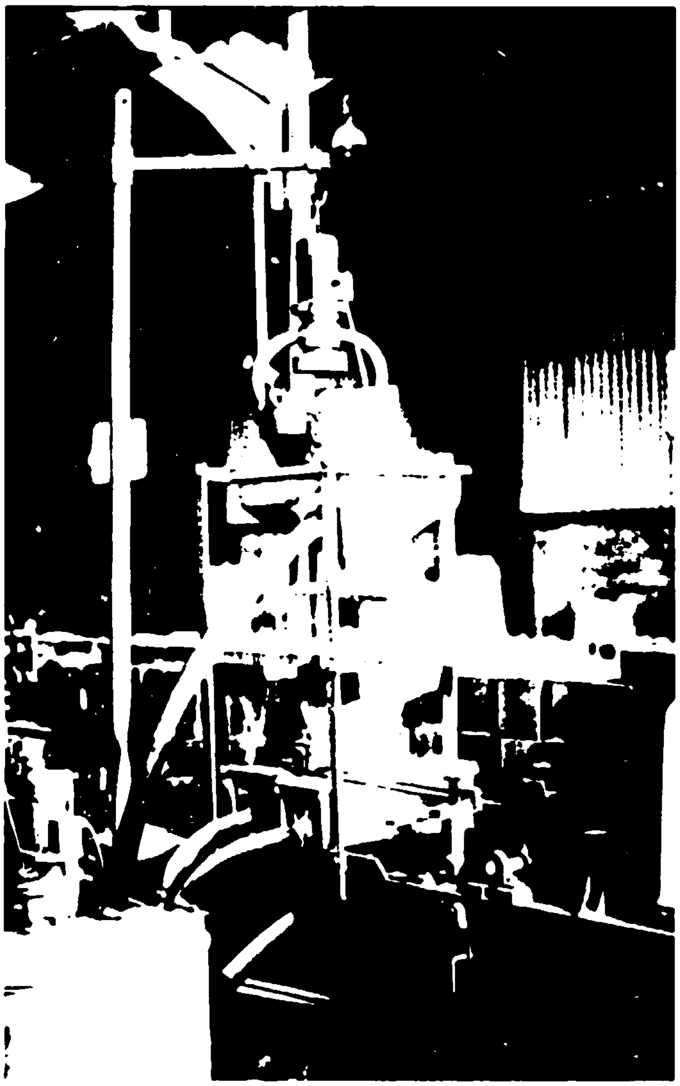


Typical tile glaze line



Typical tile glazing line edge cleaning units

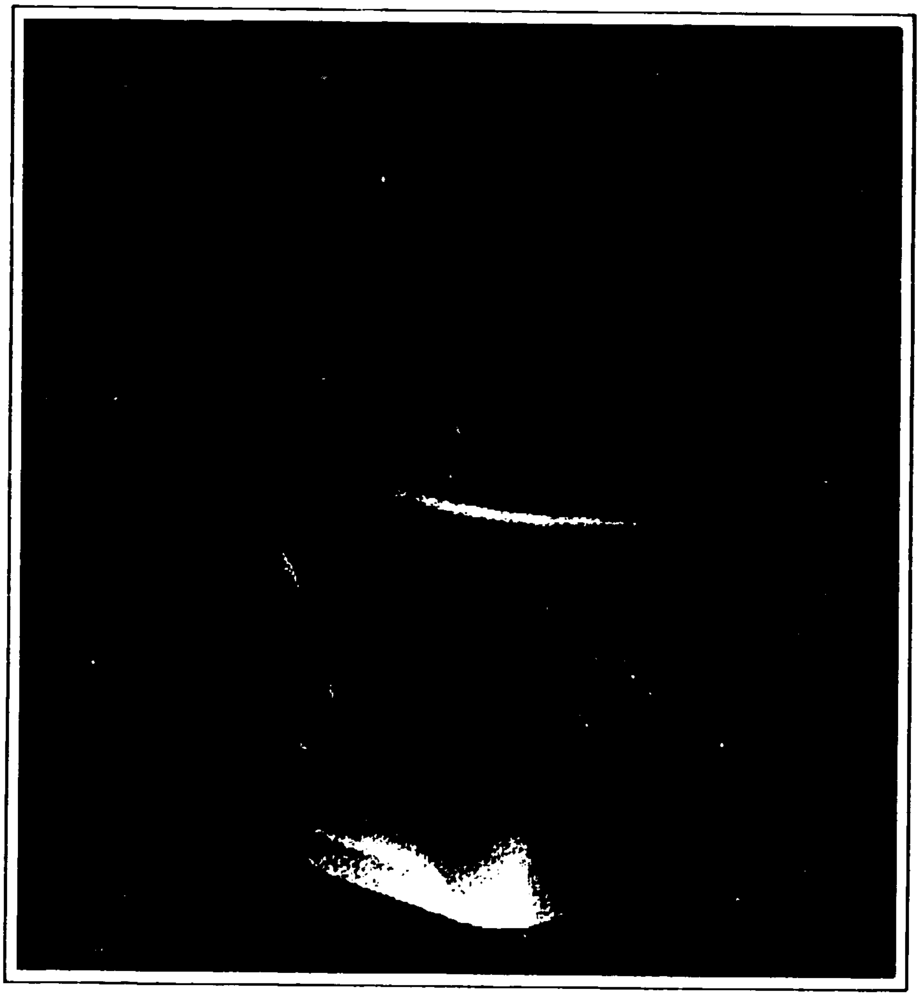
Typical tile glazing line waterfall



SANITARYWARE MODELLING,

CASTING & GLAZING

COMPUTER AIDED DESIGN AND MANUFACTURING SYSTEM FOR SANITARY WARE AND FITTINGS

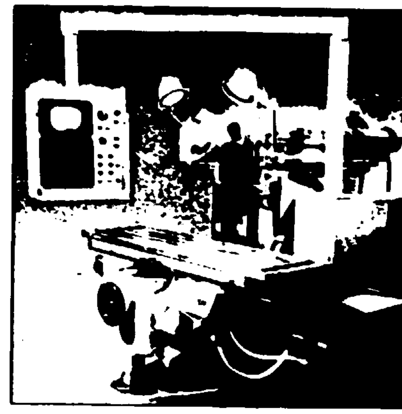


A dramatic reduction in the time taken to design and bring new models of sanitaryware on the market is made possible by the DUCT/CERAM surface modelling system with its benefits of:

scope for a greater variety of design concepts
reproduction of the modeller's skills
incorporation of shrinkage and distortion allowances
ease of learning and application
using BCRA's* ceramics experience

*British Ceramic Research Association Ltd

EQUIPMENT NEEDS



DUCT/CERAM is available on most 32 bit computers and engineering workstations. It will drive most graphic screens and plotters.

For manufacture, a CNC milling machine is necessary but the work can be sub-contracted. Conversion of design data to machine tool language requires post processor software and the data can be transferred to the machine tool controller by paper or magnetic tape or by direct link from the design computer.

DUCT/CERAM can be supplied and installed as a complete working package including full staff training and support.

Minimum system for product design and generation of machine tool data

- 32 bit processor and screen
- DUCT/CERAM 3D Software
- Plotter A2 size
- Post processor for machine tool
- Links to machine tool by paper tape, magnetic tape or direct line
- Cost from £30K

Optional Extras

- Hardware for colour shaded pictures (cost depends on screen size, resolution and speed)
- High speed A1 or A0 plotter
- Detail draughting software
- Additional workstation complete with software

Machine Tool

A CNC machine tool capable of machining a wash basin or toilet costs £40-70K but the work could easily be sub-contracted.

This new [illegible] [illegible] could contract such an organization for design of a new sanitaryware range.

available from

Deltacam Systems Ltd
Aston Science Park
Birmingham B7 4ET
Tel 021 359 3659 Telex 334535

British Ceramic Research Association Ltd
Queens Road, Penkhull
Stoke on Trent ST4 7LQ
Tel 0782 45431 Telex 36228

also distributors world wide

ODELS

Typical models produced by traditional hand-moulded methods

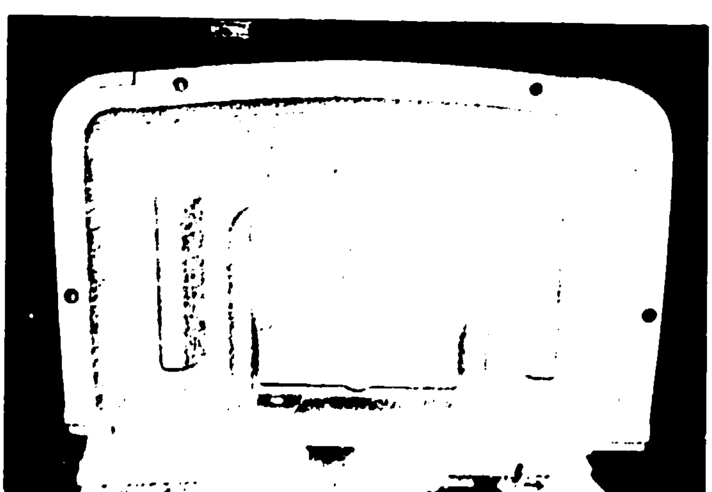
Model of a basin
for an overseas client

Model of a closet
for an overseas client

BLOCK MOULDS

Typical sanitaryware block
(master) mould

Block mould of a closet
for a UK client



Block mould of a basin
viewed from the rear, for
an overseas client

ASE MOULDS

Typical case moulds

(These can also be made out of hard Plaster-of-Paris)

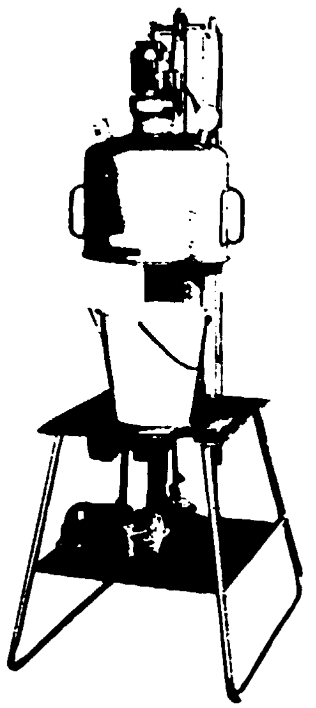
Resin case mould of a basin

Silicon rubber case mould

Alternative Plaster Blending Schemes

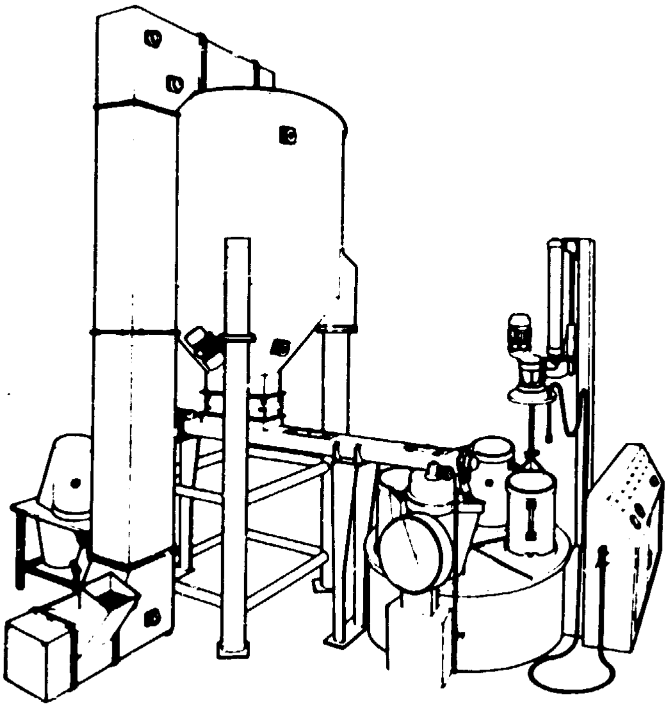
Type DE 15 Vacuum Plaster Blender

A small compact plaster blending unit. Giving a de-aired homogeneous mix. Comes complete with De-Airing Equipment. The mixings provided by a marine type propeller in stainless steel, driven by a ⅓ h.p. motor. Max load 25 k.g. This unit can also be supplied without the de-airing equipment.



Automatic Plaster Blending System Type 350

Consisting of Eccn-O-Lift elevator, with vibratory feed regulator, complete with loading hopper and grid to support sacks. 3 cubic meter plaster storage hopper in stainless steel with compressed air homogenizer. Screw conveyor metering device in stainless steel Blending unit constructed from fabricated mild steel plate, circular in design, and having dimensions: – Overall outside diameter 1400 mm., total heigh including vertical column carrying mixing head 2500 mm., working level height 600 mm. Unit supplied complete with circular conveyor housed on working surface with four locating stations. Three containers required for gypsum mixing process, each 320 mm internal diameter × 450 mm. in height constructed from stainless steel complete with handles for manual pouring, alternatively coupling bolts for pouring with hoist. Each container having a capacity of 25 litres and weighing when empty 8 kgs. One vertical column with pneumatically operated system for raising and lowering motorised propellor mixer. Automatic weighing device, load limit 50 kgs. Two mobile phot-electric cells for regulating correct proportion water and gypsum. Clean water valve diameter of passage 1.0 mm. Electric console for automatic and manual operation. (optional), Jug cleaning unit. (optional) variable speed control on mixer. (optional) Flexible case filler hose with tap. Dust extractor unit over bag slitting area.



CERAMIC ENGINEERS

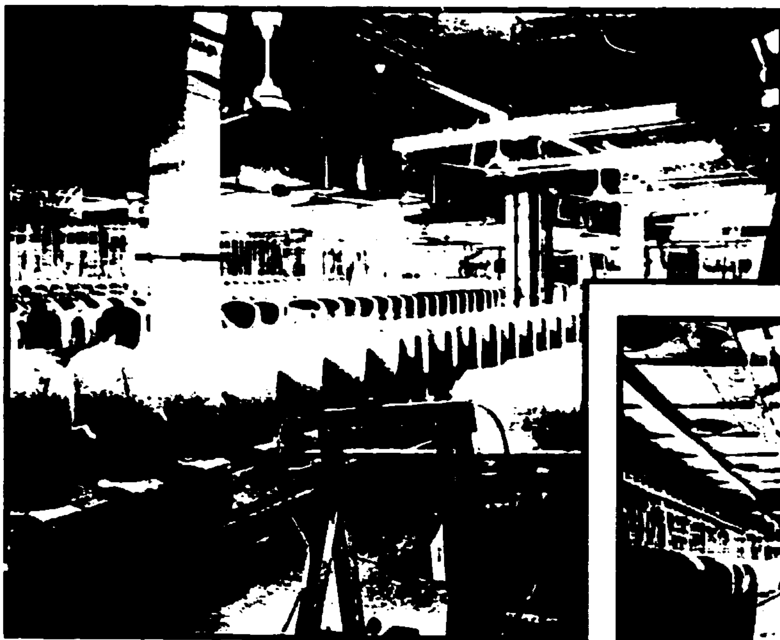
RAW MATERIAL STORAGE AND PREPARATION : GLAZE STORAGE AND PREPARATION

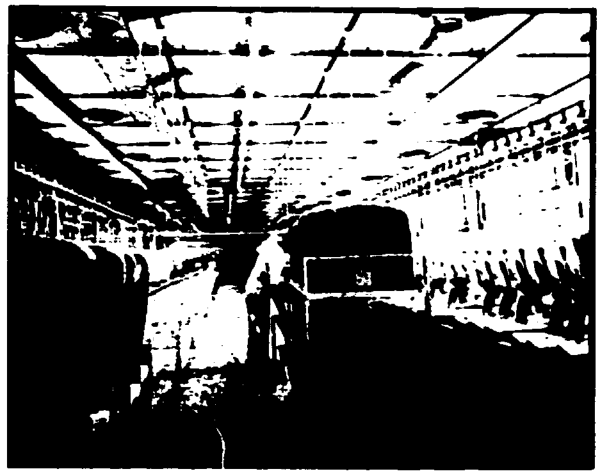
SLIP PREPARATION, STORAGE AND DISTRIBUTION : SANITARYWARE CASTING SYSTEMS

CERKEMEC LTD
4 ALBION STREET
HANLEY
STOKE-ON-TRENT
STAFFS. ST1 1QH
TELEPHONE: 0782-287854
TELEX: 36274 TLXCHG

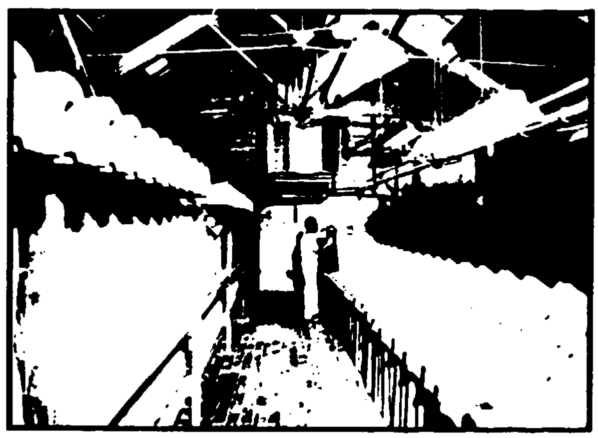
CERKEMEC

Dryers for Sanitaryware





Both ware and moulds being dried 'In-Situ' in the Casting Shop. Close control over environmental conditions enable moulds to be thoroughly dried overnight and ware to be dried to an optimum condition for finishing and spraying.



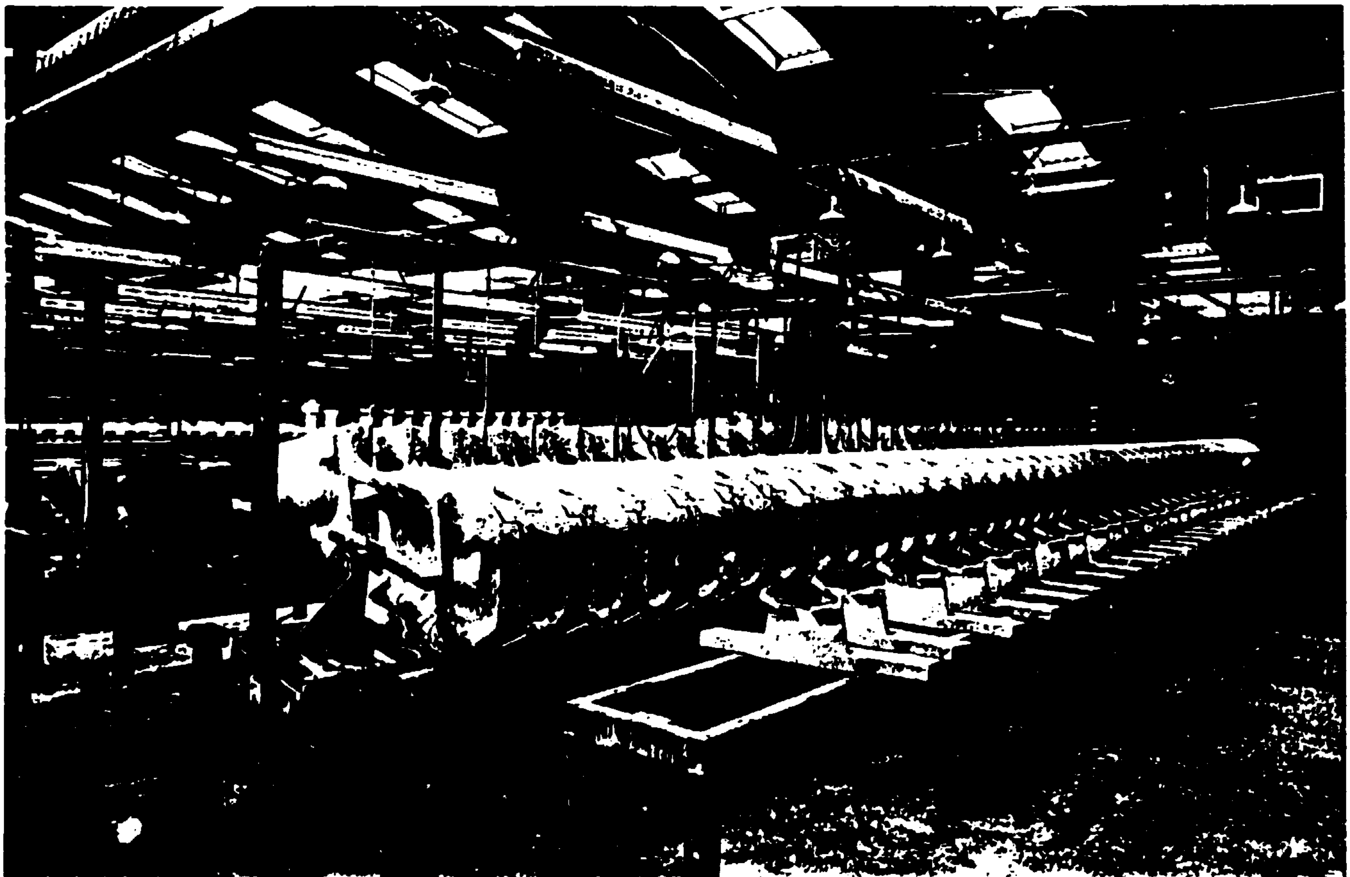
The system offers many advantages including high thermal efficiences, good operative working conditions, dust control, individual caster control, reduced handling and, above all, dry moulds and ware.

The sytem is a combination of drying, space heating, ventilation and dust control.

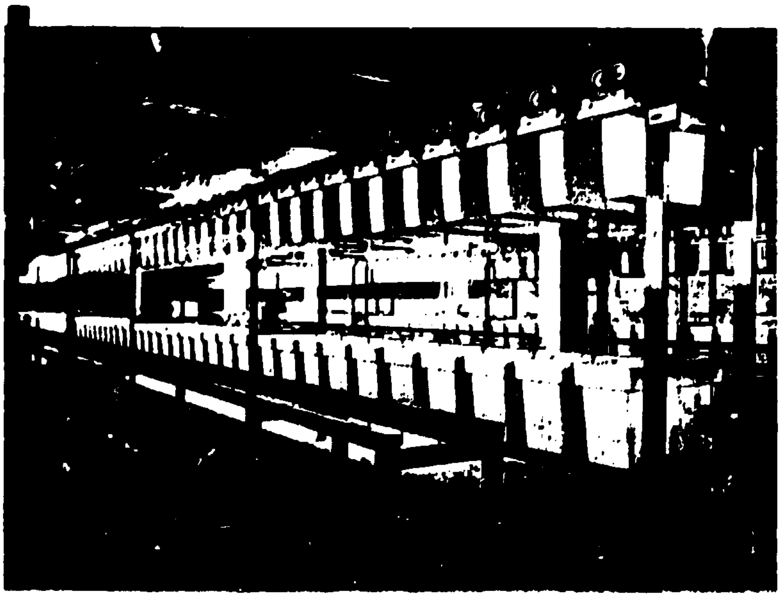
Under-bench drying for Battery casting machine.

CERKEMIC

Battery Casting



[B]asin casting



Cistern tank casting

Available for the casting of:

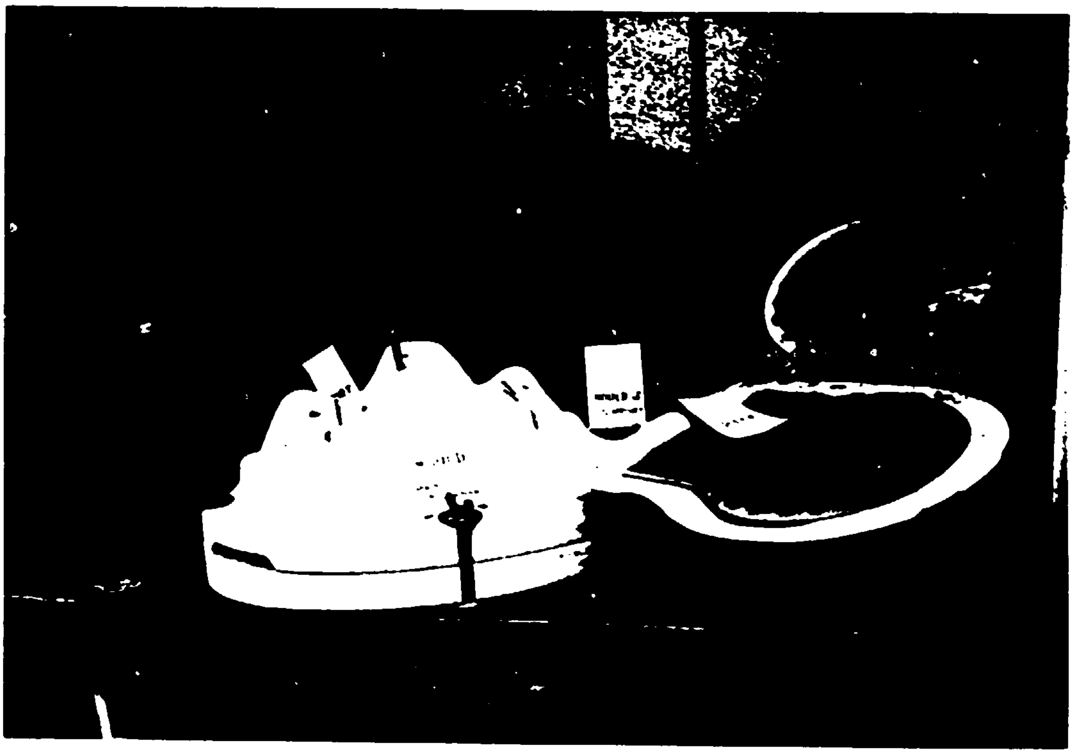
Basins
Pedestals
Cistern tanks
Cistern lids
Closets

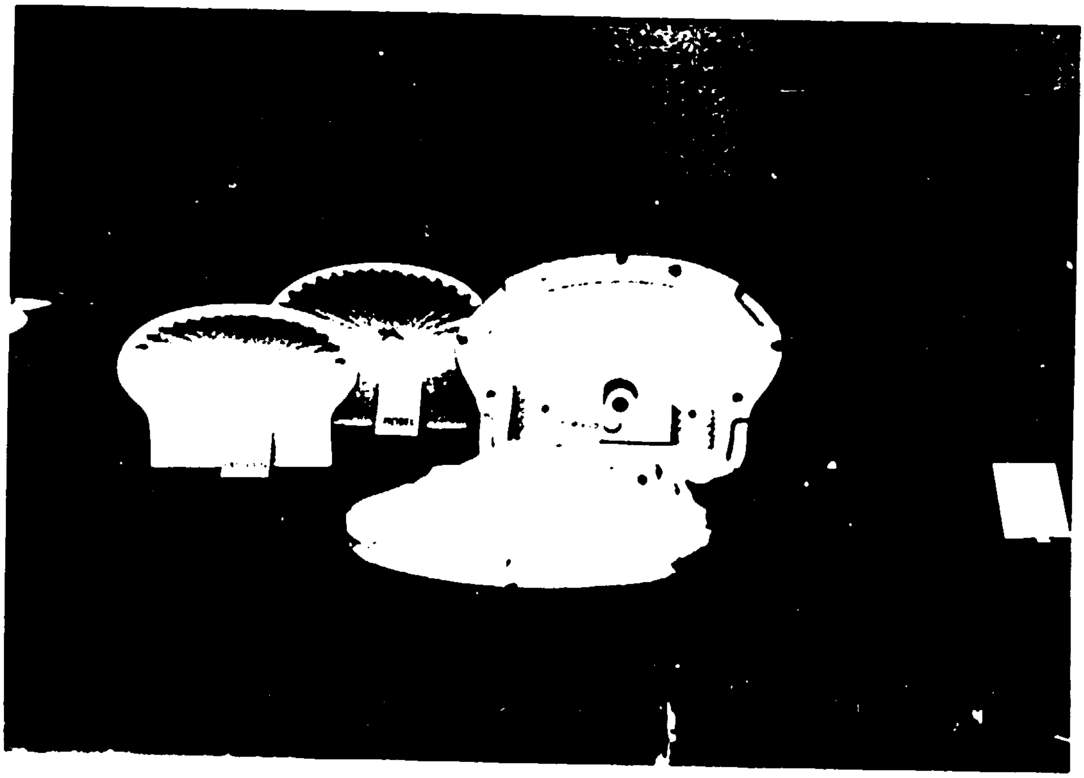
NOTE: battery casting has NOT been chosen for the new factory in Uganda, due to the low output required. Traditional bench casting is recommended.

Typical sanitaryware bench casting hall
(Bangladesh)

Glazed sanitaryware after firing (Bangladesh)

Typical French sanitaryware moulds

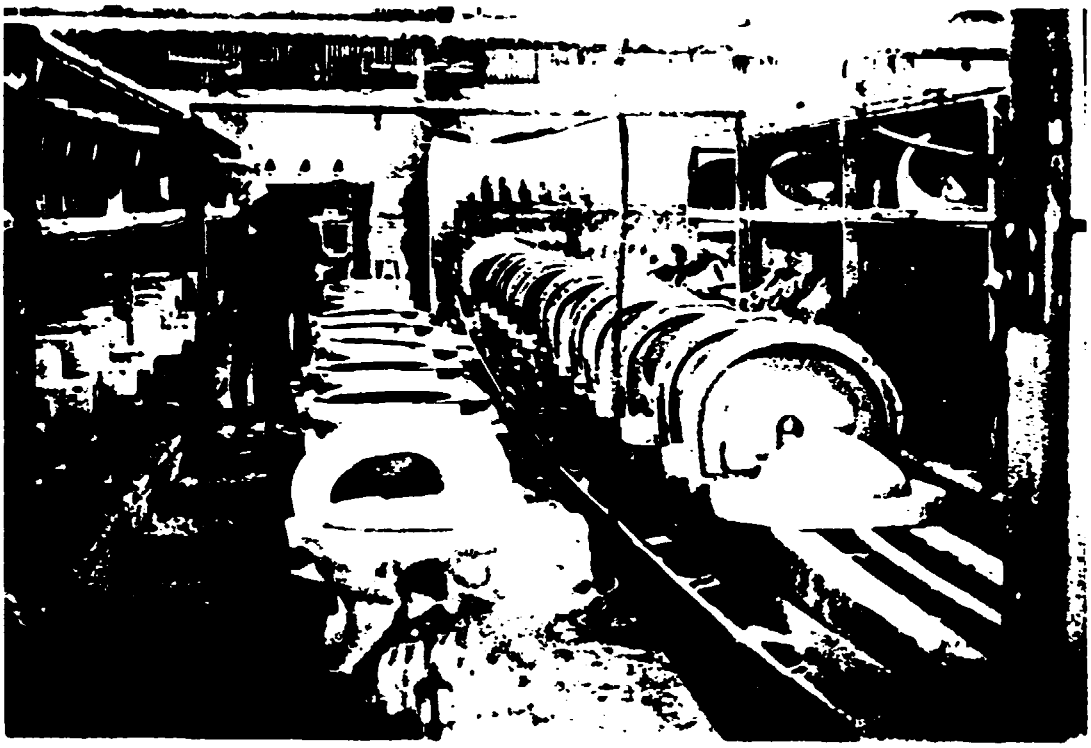




Manual spray booth for sanitaryware
(Bangladesh)

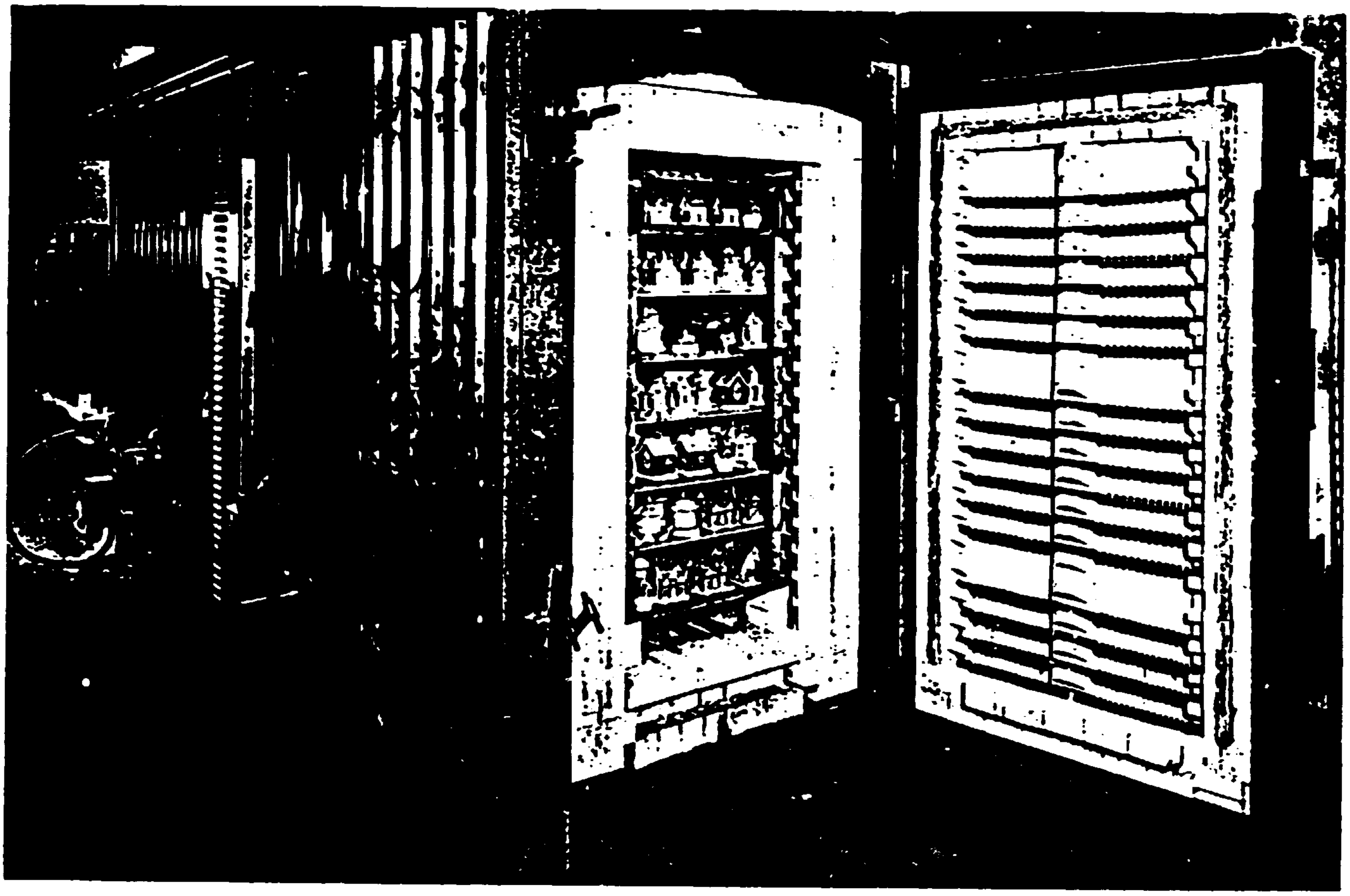
bench casting
Sri Lanka

Bench casting in Sri Lanka



TILE & SANITARYWARE KILNS

ACE ASSOCIATED COMBUSTION ENGINEERING LTD. KILNS, FURNACES, DRYERS
Actif House, Garner Street, Stoke-on-Trent ST4 7BE
Tel: (0782) 287327 Fax: (0782) 264073 Telex 367158 Actif G

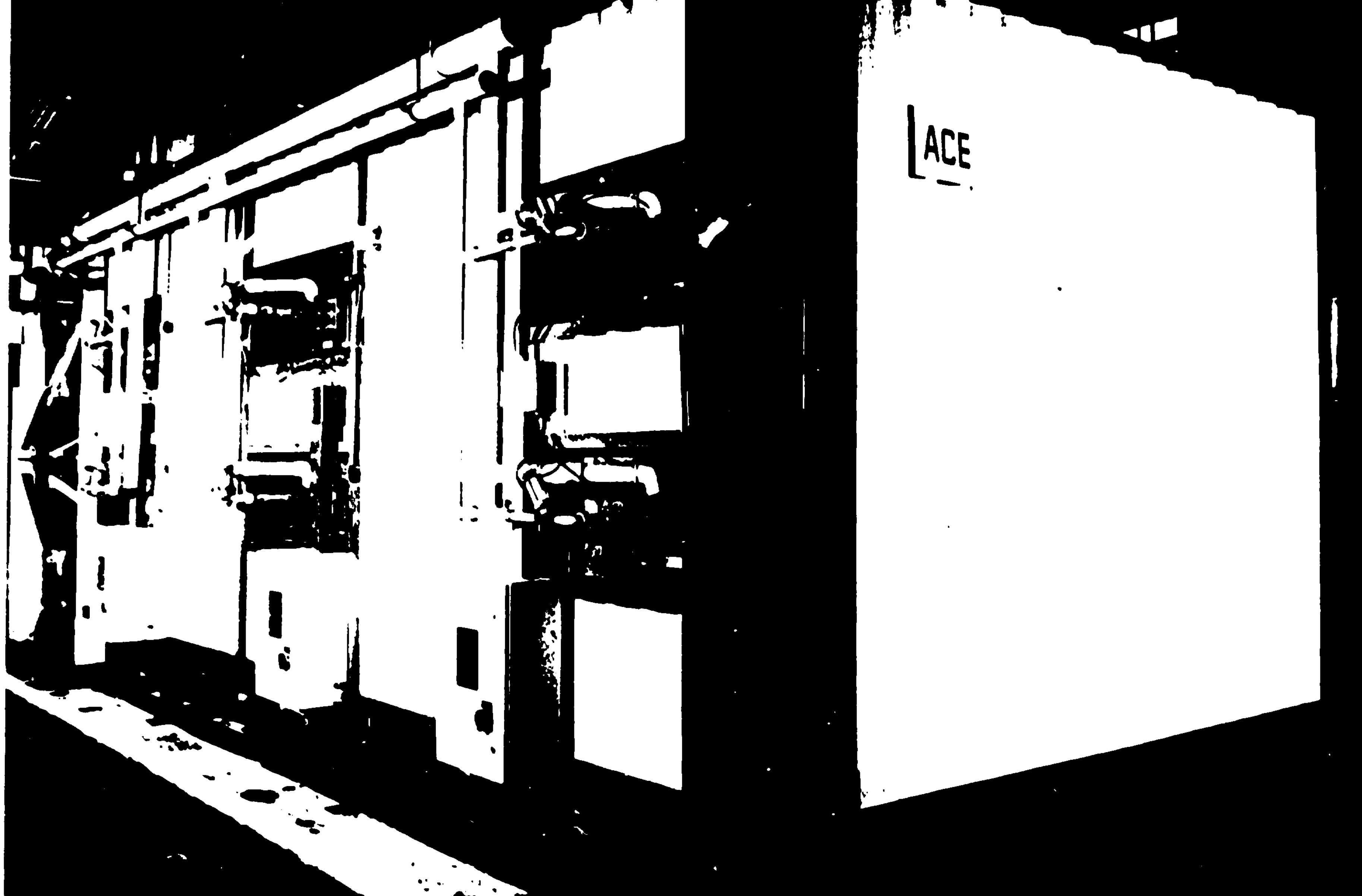


Truck Type Electric Kiln

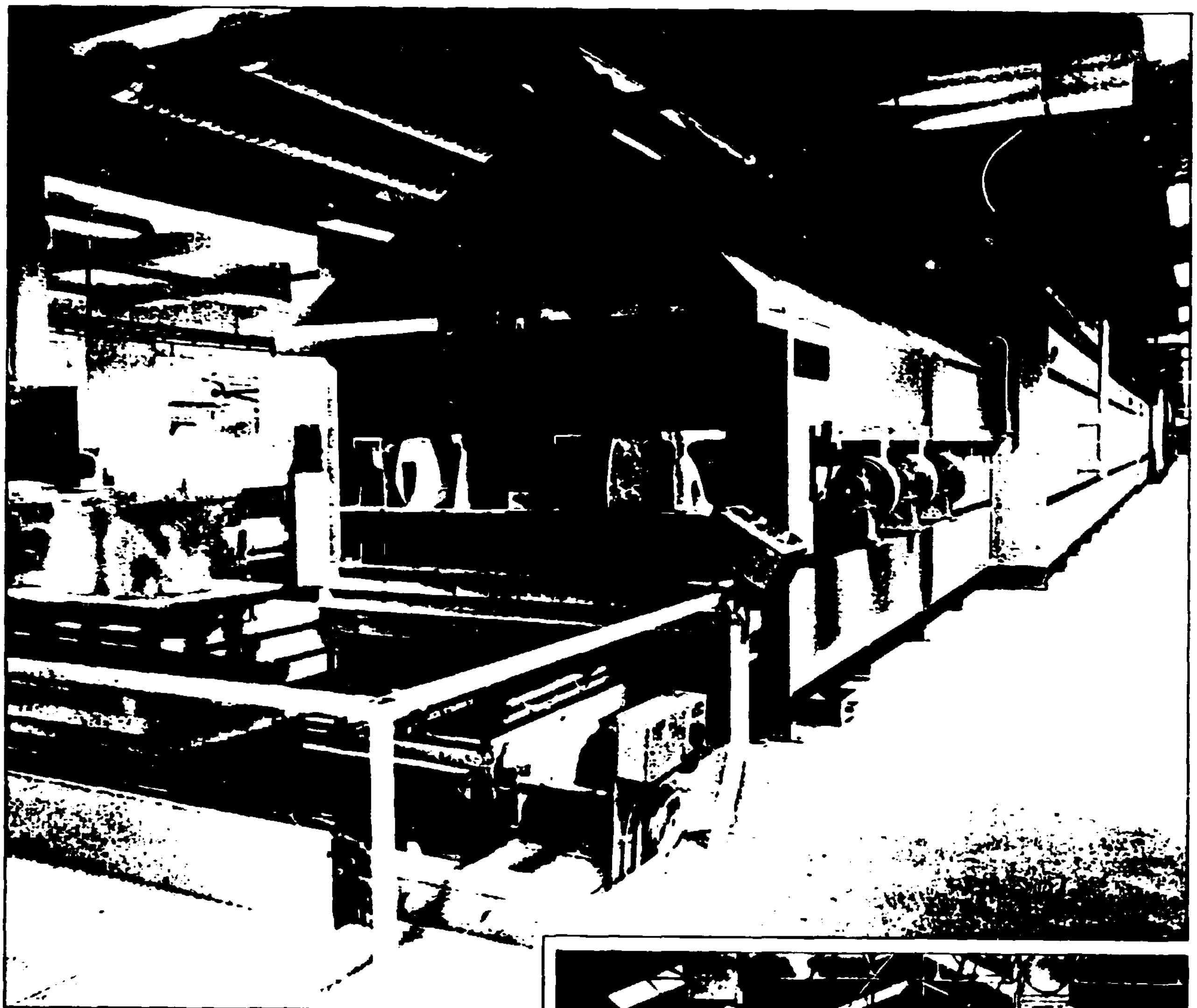
This kiln was developed specifically for the pottery industry, firing bisque ware, glost ware and decorated ware.

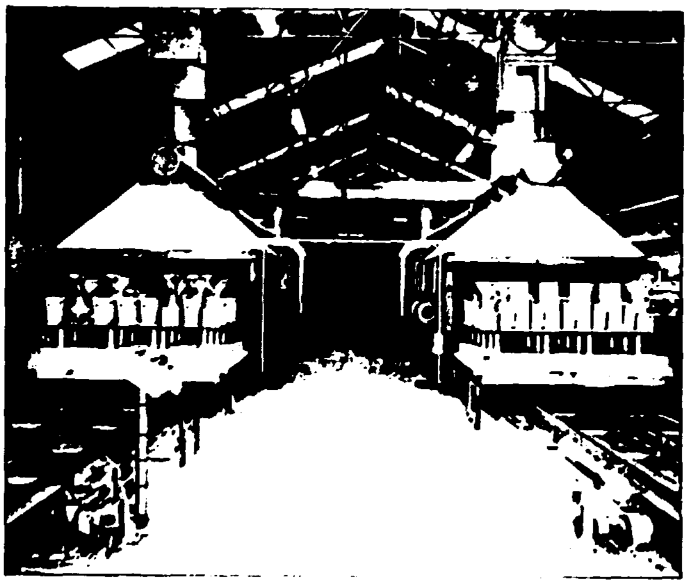
Advantage is taken of the most up-to-date technology using materials of proven performance. To accommodate the variety of products, kilns with limiting temperatures of up to 1,000°C., 1,100°C. and 1,260°C. are produced.

This type of kiln can also be used for the firing of biscuit tile and glost tile. The kiln would be equipped with the necessary biscuit tile and glost tile setters and cranks.



Sanitaryware shuttle kiln (gas). This type can also be electric





DRAYTON at the Forefront of Sanitaryware Firing

Recent installations for Ifo Sanitar and Stelrad highlight Drayton's leading position in tunnel kiln firing technology. Advanced combustion and instrumentation systems provide optimum fuel efficiency and flexibility of operation. Special features include fully-automated micro-processor controlled kiln car movement; 24 hour closed circuit TV monitoring; computer-controlled switching between day and night, weekday and weekend modes and RotaKars™, Drayton's unique easy wide-load placing facility. All manufactured to the highest quality standards.

Send for our video of the Ifo installation

***We call it* Innovation in Operation**

DRAYTON

Drayton Kiln Company Ltd

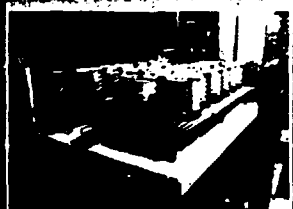
Newstead Trading Estate, Trentham, Stoke-on-Trent, Staffordshire ST4 8HX, England
Telephone (0782) [illegible] Telex [illegible] Drayton G Fax (0782) [illegible]

KILNS FOR THE WORLD OF CERAMICS

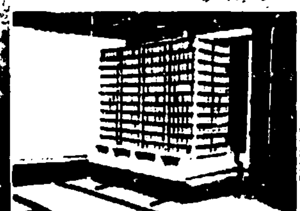
Harnessing the power of fire for any ceramic applications in Whiteware, Sanitaryware, Heavy Clay or Technical Ceramics is our business.

Bricesco Kilns — Fixed Hearth, Shuttle, Belt, Top Hat, Moving Hood, Tunnel and Skate kilns are working for the world of ceramics in Europe, North and South America, the Middle East, Asia and the Far East.

Heavy Clay Shuttle Kiln



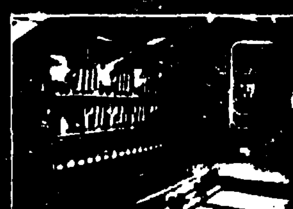
Whiteware Skate Tunnel Kiln



Whiteware Shuttle Kiln

Heavy Clay Tunnel Kiln

Skate Shuttle Kiln



Sanitaryware Shuttle Kiln

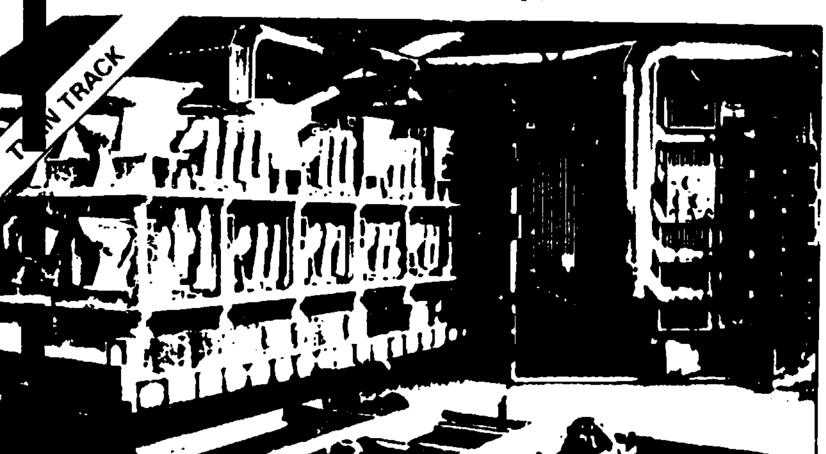
BRICESCO

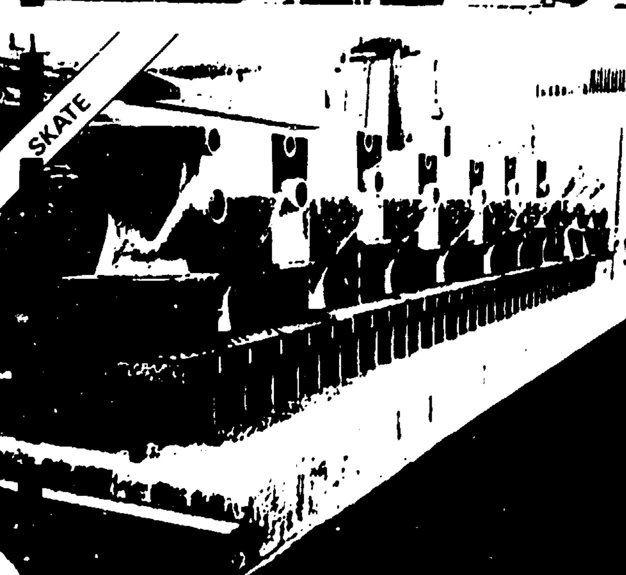
Bricesco, Bricesco House, Park Avenue, Wolstanton, Newcastle, Staffs ST5 8AT
Tel No 0782 566921/0782 626204. Telex 36272. Fax 0782 562792

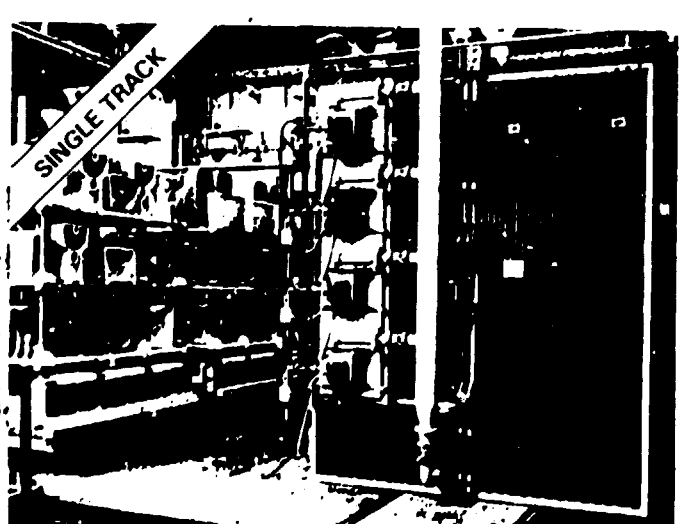
BRICESCO

KILNS·DRYERS·COMPLETE PLANTS

SANITARYWARE SHUTTLE KILNS







BRICESCO

TECHNICAL SPECIFICATIONS

SANITARYWARE SHUTTLE KILNS

TRIPLE TRACK

Kiln Type:	Triple Track 3-Car Shuttle
Product:	Vitreous China Sanitaryware
Car Setting:	6750mm Long
	1550mm Wide
	2200mm High
Kiln Capacity:	69 M^3
Kiln Output:	506 Pieces per Fire

TWIN TRACK

Kiln Type:	Twin Track 2-Car Shuttle
Product:	Vitreous China Sanitaryware
Car Setting:	6700mm Long
	1500mm Wide
	1500mm High
Kiln Capacity:	30 M^3
Kiln Output:	260 Pieces per Fire

SKATE

Kiln Type:	Single Track 7-Car 'Skate' Shuttle
Product:	Vitreous China Sanitaryware
Car Setting:	1560mm Long
	6000mm Wide
	700mm High
Kiln Capacity:	45.9 M^3
Kiln Output:	420 Pieces per Fire

SINGLE TRACK

Kiln Type:	Single Track 3-Car Shuttle
Product:	Vitreous China Sanitaryware
Car Setting:	2000mm Long
	1370mm Wide
	1830mm High
Kiln Capacity:	15 M^3
Kiln Output:	150 Pieces per Fire

BRICESCO
Bricesco House, Park Avenue, Wolstanton,
Newcastle, Staffordshire ST5 8AT
Tel No 0782 566921/0782 626204.
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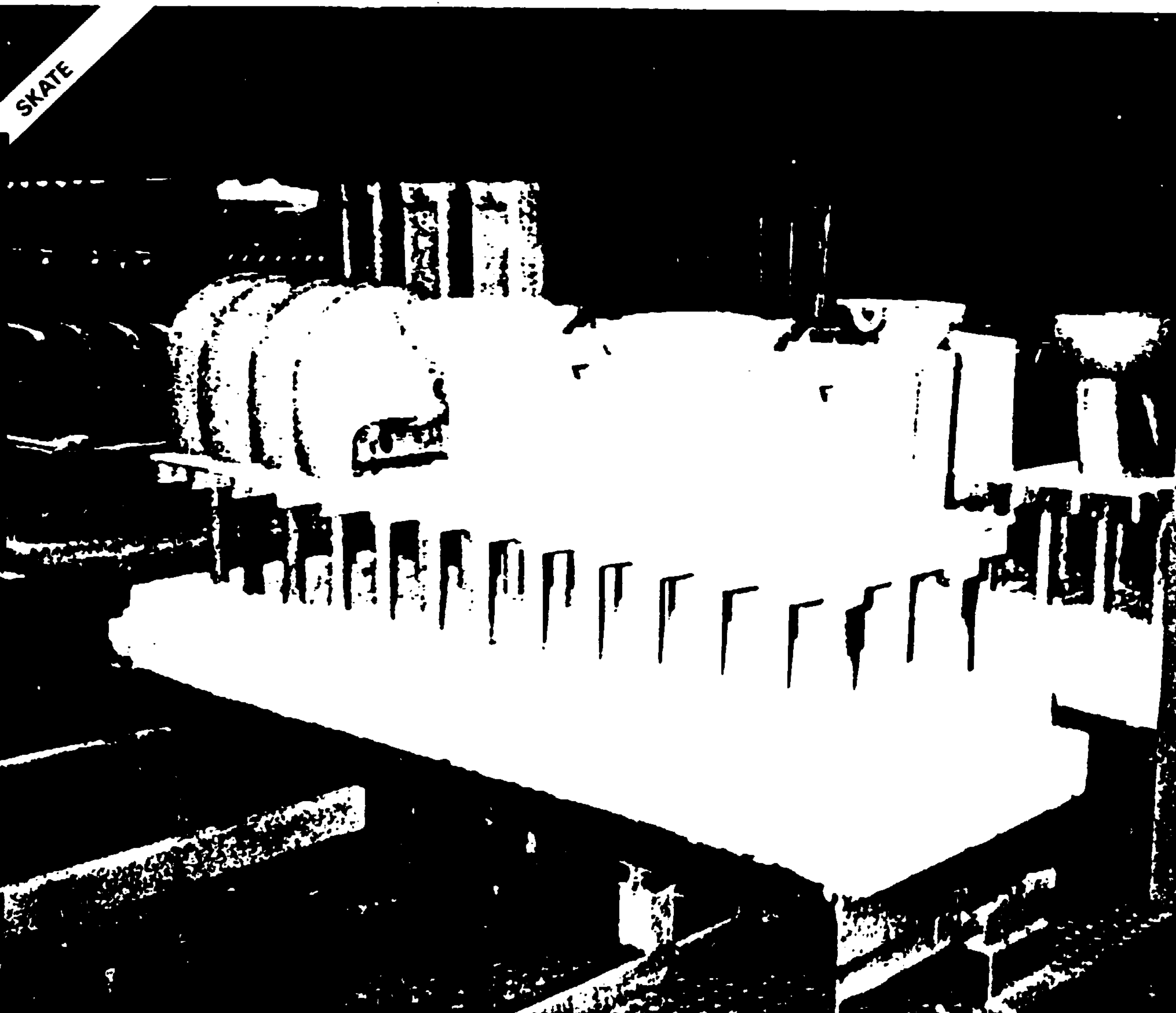
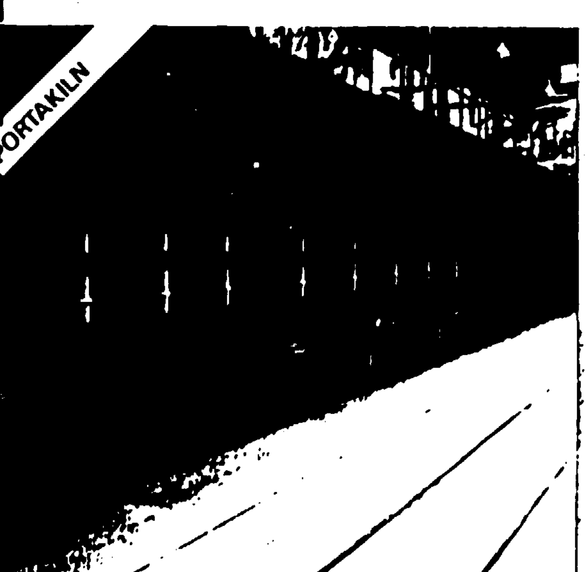
RICESCO

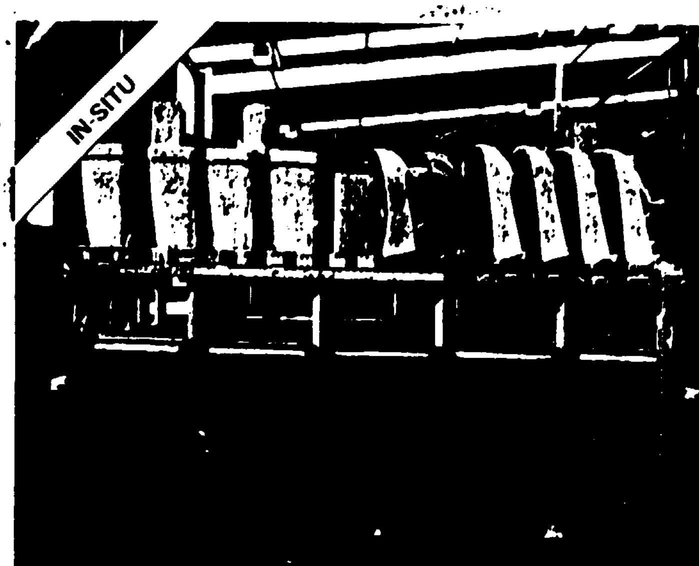
LNS·DRYERS·COMPLETE PLANTS

706

SANITARYWARE TUNNEL KILNS







BRICESCO

TECHNICAL SPECIFICATIONS

SANITARYWARE TUNNEL KILNS

SKATE

Kiln Type:	'Skate' Tunnel Kiln 86.5 M Long
Product:	Vitreous China Sanitaryware
Car Setting:	760mm Long 3000mm Wide
Kiln Capacity:	104 Effective Cars
Firing Cycle:	8/10.5 Hours — Cold to Cold
Kiln Output:	8 Hours — 31,668 Pieces per Week 10.5 Hours - 24,150 Pieces per Week

PORTAKILN

Kiln Type:	Tunnel 'Portakiln' 85 M Long
Product:	Vitreous China Sanitaryware
Car Setting:	1500mm Long 2500mm Wide 800mm High
Kiln Capacity:	52 Effective Cars
Firing Cycle:	16 Hours — Cold to Cold
Kiln Output:	14,742 Pieces per Week

IN-SITU

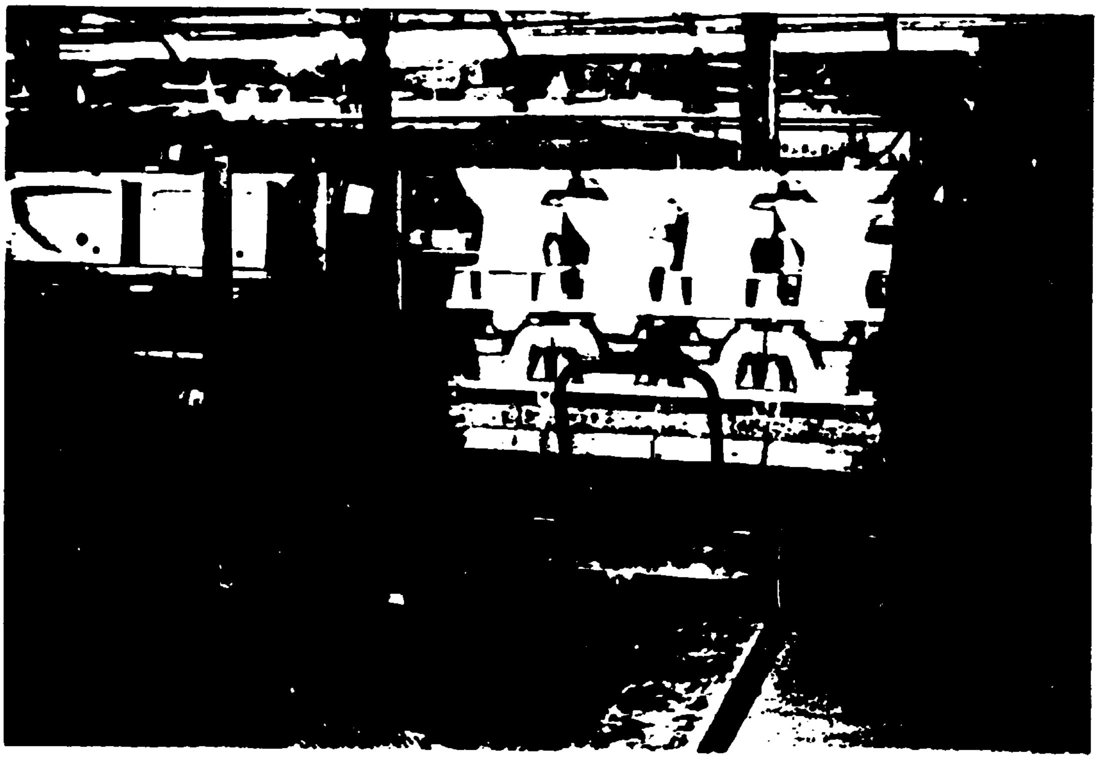
Kiln Type:	'In-Situ' Built Tunnel Kiln 84 M Long
Product:	Vitreous China Sanitaryware
Car Setting:	1500mm Long 2700mm Wide 750mm High
Kiln Capacity:	52 Effective Cars
Firing Cycle:	15 Hours — Cold to Cold
Kiln Output:	15,158 Pieces per Week

BRICESCO
Bricesco House, Park Avenue, Wolstanton,
Newcastle, Staffordshire ST5 8AT
Tel No 0782 566921/0782 626204.
Telex 36272 Fax 0782 562792

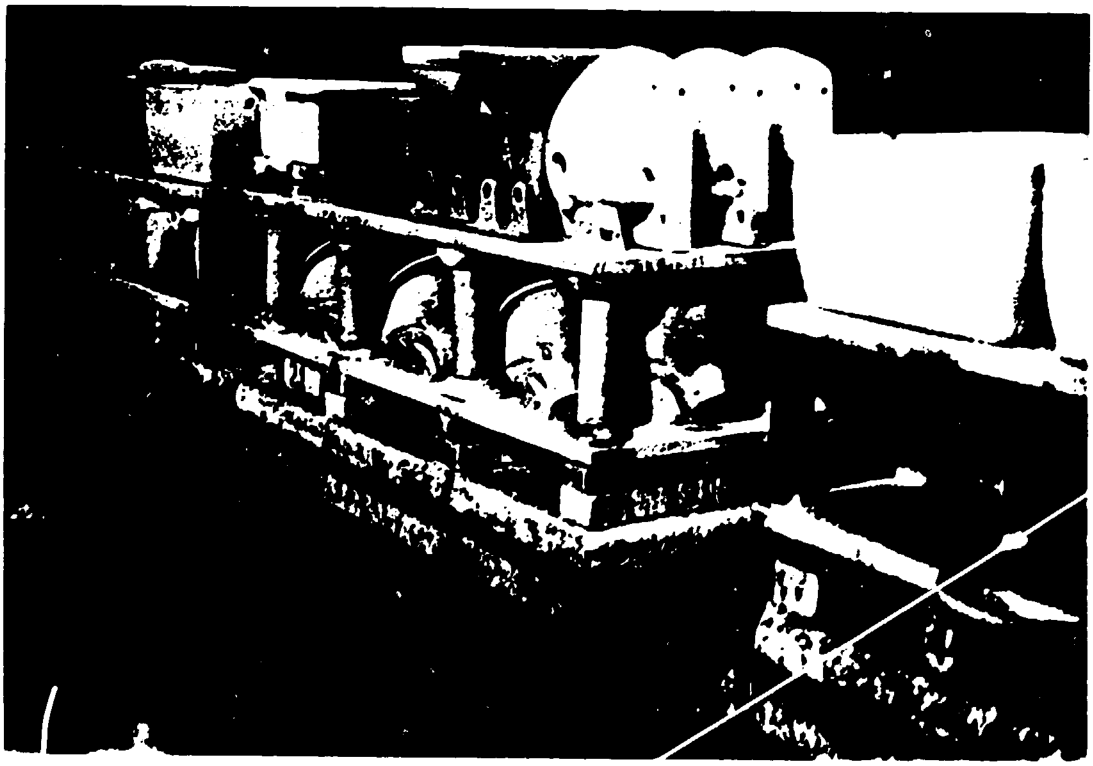
Typical sanitaryware refractories

Typical hand operated transfer car

Sri Lanka



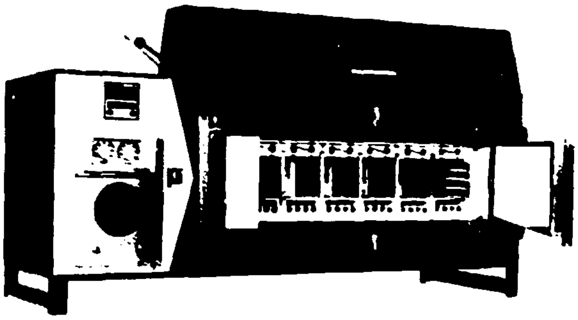
Kiln car setting - Sri Lanka



LABORATORY & OTHER EQUIPMENT

KF INDUSTRIAL

6 CHAMBER TEMPERATURE GRADIENT KILN TYPE TG 6



*Bench mounting
*6 Measuring points
*125°C gradient.
*Fast firing cycle.

Purpose
To obtain a series of temperature readings from samples *during a single firing cycle.*

Scope of Usage
Ideal for trials of ceramic glazes, gold, colours, clay bodies etc., etc.

Maximum Operating Temperature
1300°C.

Gradients
Approx. 25°C between each measuring point.

Controls Available
Modern sophisticated temperature controllers and recording equipment fitted in adjacent panel against customers specific requests.

General Description

The temperature gradient kiln is now recognised to be an important contributor to the efficient working of a ceramic laboratory. During a single firing cycle, which if necessary can be as short as 5 hrs. up to 1300°C, it is possible to record a series of different temperatures (with the aid of a *multipoint switch) directly where samples occur within the chamber, and finally when the samples have been withdrawn, make accurate comparisons and observations as required. Listed below are some typical examples of how a gradient kiln can be used:

During Single Firings the following information can be obtained

a. Vitrification Curves.
b. Underglaze prints on a clay body trial strip can be evaluated or compared.
c. Assessments of metal release can be obtained and plotted on a graph.
d. Gold and colours of different frits or glazes can be compared.
e. Fusability of flux pellets can be checked.

Operation

The TG.6 bench mounting gradient kiln allows for the introduction of large test pieces e.g. vessels measuring up to 80mm diam. x 80mm tall. There are six individual firing chambers each measuring 114mm x 150mm x 114mm into which the test pieces can be placed.

The maximum permitted temperature at the hot end (No. 1 chamber) is 1300°C therefore the temperature reading at the cold end (No.6 chamber) would be approximately 1175°C producing a gradient of approximately125°C across the 6 chambers. A special hand operated cam arrangement located above the kiln allows for the lowering of 6 thermocouples simultaneously into the vessels before firing, so that temperature readings obtained via the 6 point (multipoint) switch through the potentiometric digital indicator during the firing are as accurate as possible. The chambers are sealed during the firing by two doors semi recessed to provide an effective air seal.

The firing cycle can be retarded as desired, by the heat input regulator fitted as standard. This regulator is wired in circuit with a mercury contactor affording silent operation.

The indicating equipment together with the heat input regulator, lights and secondary circuit fuse, all are all mounted on an attractive facia panel adjacent to the kiln.

Spiral type elements have been carefully calculated to produce a gradient of approximately 125°C across the 6 thermocouples when the temperature at the hot end is at 1280°C. Power Rating 5.0 kW.

Temperature Controller

No form of automatic temperature control is fitted as standard. Details of automatic controller available will be found overleaf.

Temperature Recorder

A recorder can be installed in lieu of the multipoint switch/digital indicator system fitted as standard. See overleaf for details.

KILNS & FURNACES LTD
INDUSTRIAL DIVISION
Keele Street Works, Tunstall
Stoke on Trent ST6 5AS England
Telephone: 0782 813621 Telex: 36638
Cables: Kilnfurn

Agent

PERMEABILITY TO AIR APPARATUS

Measures the permeability to air at pressures near to atmospheric. Test normally confined to bricks.

Type L9

DIAL GUAGE THICKNESS TESTER

Gives accurate glaze thickness measurement of un-fired bisque flatware items.

Type L10

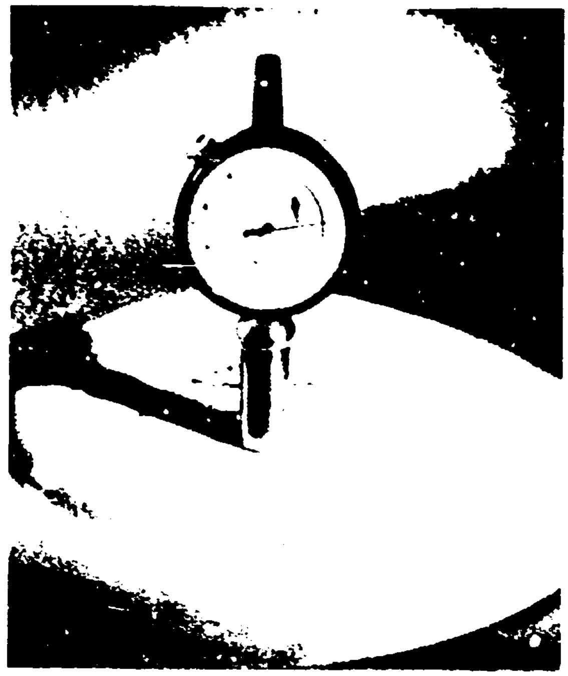
VISCOMETER

Simple rotational measuring instrument specifically designed for use in the Pottery Industry to control glazes and slips in aqueous suspension.

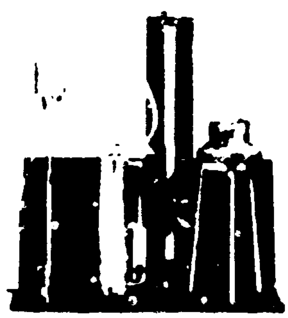
Type L11

Also supplied but not illustrated:—

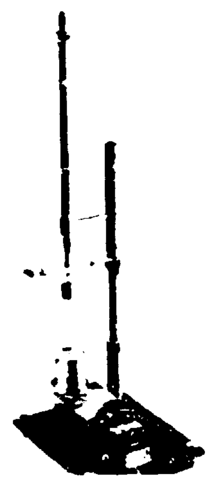
- **Penetrometer** – compares the hardness of mould plaster or un-fired bodies. Also used for testing the density of dust pressed tiles.
  Type L12
- **Disc Harrow Glaze Thickness Tester** – designed to give swift max-min indications of glaze thickness.
  Type L13
- **Ball Mill** – electric motor-driven planetary type laboratory Ball Mill for fast grinding of ceramic materials. Complete with porcelain pot of approximately 200 grams capacity.
  Type L14



L10



L9



L11

★

The complete range of Malkin Laboratory Equipment

is designed, tested and calibrated

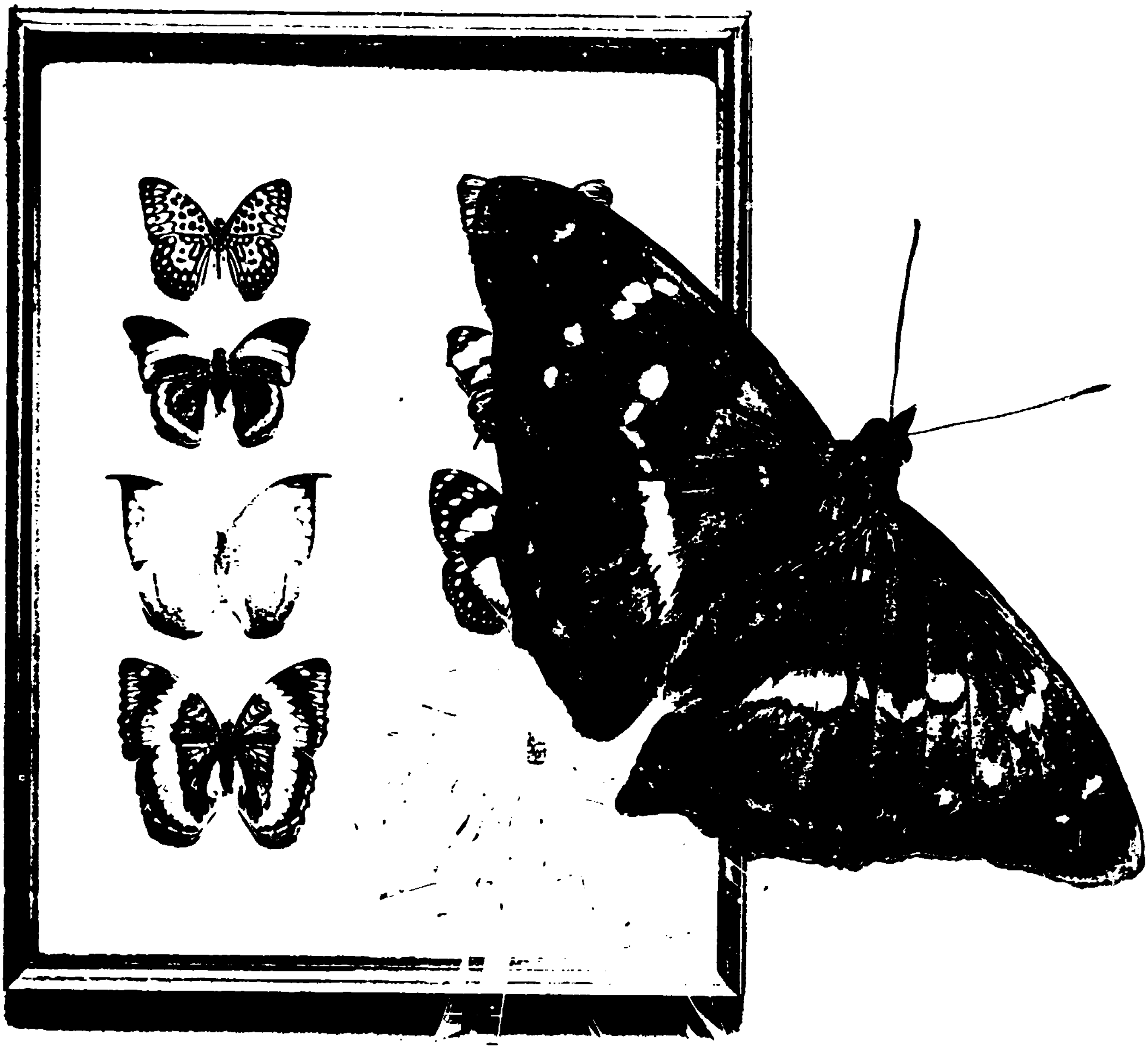
by the British Ceramic Research Association

★

MALKIN

Malkin Ltd., Campbell Road, Stoke-on-Trent, Staffs
Telephone: 0782 [illegible] Telex: 36613 Malkin G
Cable: Malcanco [illegible]-on-Trent

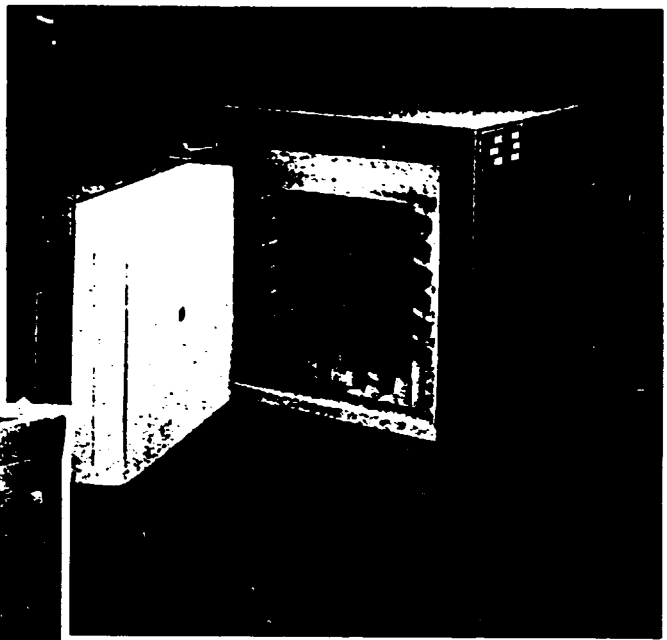

Coat it with many co

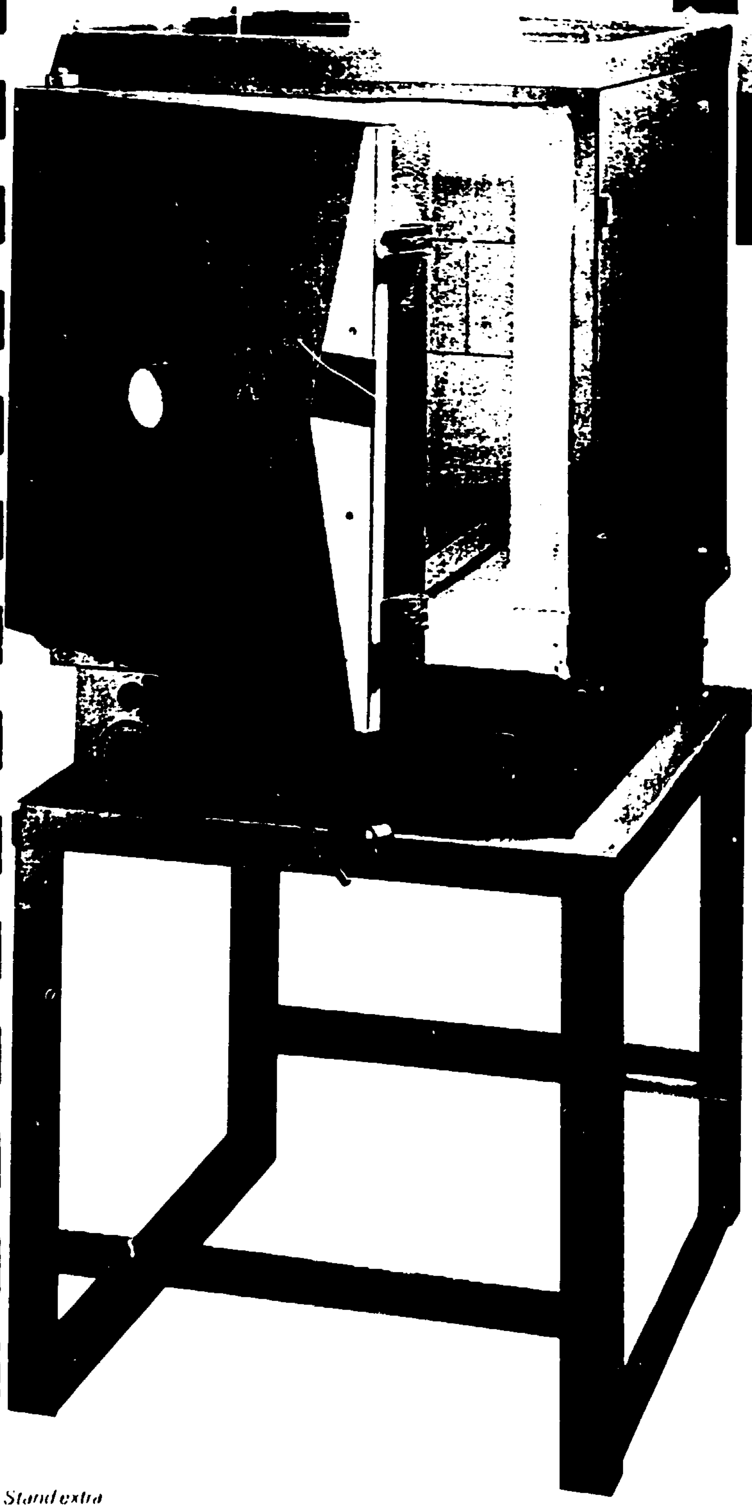


5. Kilns

A P5040 1200 °C 'Energysave' Kiln
This new kiln incorporates the same energy saving design as featured in our new potterycraft range. The kiln chamber is lined with hard-wearing hot faced refractory fire brick with ceramic fibre secondary insulation and around the door edge which significantly improves the thermal efficiency. The kiln has been designed to appeal to the beginner requiring a practical chamber size with 1200 °C firing capability at a moderate outlay.

B P5001 Test Kiln
This small electric test kiln is particularly suitable for the home hobby potter or use by schools and craftsmen potters for firing small articles. It is also ideal for experimental test firings up to 1300 °C. Its small chamber size means that this kiln is extremely economical to fire and its large-scale production makes possible a very attractive sales price.





Stand extra

Type No.	Firing Chamber Dimensions		
	Width mm/in	Depth mm/in	Height mm/in
B P5001	152	152	229
	6	6	6
A P5040	381	381	370
	15	15	14½
	Overall Dimensions		
	Wide	Deep	High
P5001	368	330	495
	14½	13	19½
P5040	610	760	685
	24	30	27
	Power Rating kw	Electrical Supply 1 phase 220 240 volts	Batts Size per Shelf mm in
P5001	[illegible]	13A	P5360 11 215 · 140 · 13 (8½ · 5½ · ½)
P5040	4.5	20A	P5360 18 362 · 362 · 18 (14¼ · 14¼ · ¾)

Little Sister Front Loading Automatic Autoclaves

Comply with all current U.K. safety requirements and approved by the D.H.S.S. Suitable for sterilizing unwrapped instruments, utensils and glassware.

- 10 litre capacity stainless steel chamber.
- Fully automatic once filled with water.
- Microcomputer controlled functions.
- Self-diagnosis of simple operator errors.
- Audible and visual signals at end of timed sterilizing cycle.
- No plumbing or special installation required.
- Choice of models with either pre-set or variable cycles.
- Commissioning and first year's service at no extra cost (for the U.K. only) from a nationwide service team.

Construction

Chamber and door facing Stainless steel. A thermocouple entry point is provided. The chamber accepts and is supplied with three stainless steel trays each 280 x 180 x 15mm deep.

Outer case Sprayed steel panels on a strong steel frame.

Door closure O-ring seal with a recessed screw lock. The door cannot be opened whilst the chamber is pressurised and the heater cannot be switched on with the door open.

Controls and fitting Pressure and temperature indicators, pressure safety valve, cycle counter, cycle status display, reservoir level indicator and cut-out, overheat protection and 'failed cycle' warning. A reservoir drain tube is provided.

Dimensions Capacity 10 litres. Chamber 200 x 348mm dia. x depth. Overall 360 x 492 x 400mm h x w x d. Reservoir 2 litres capacity. Packed weight 45kg.

Sterilising time cycles

Basic model (AU300).
Three pre-set sterilization time/temperature programmes can be selected.
134 C (2.03 bar) for 3.5 min.
121 C (1.04 bar) for 15 min.
115 C (0.67 bar) for 30 min.
There is a preheat period of approximately 9 min. to produce drier instruments in the 134 C programme.

Lab Model (AU302)
Variable temperature from 115 to 135 C (0.67 to 2.1 bar) and variable time 3 to 120 min. can be selected. Repeat cycle options are provided.

Services
Electricity 230-240V 50-60Hz single phase supplies, 2kW.
Water 2 litres of distilled water are required to fill the reservoir.

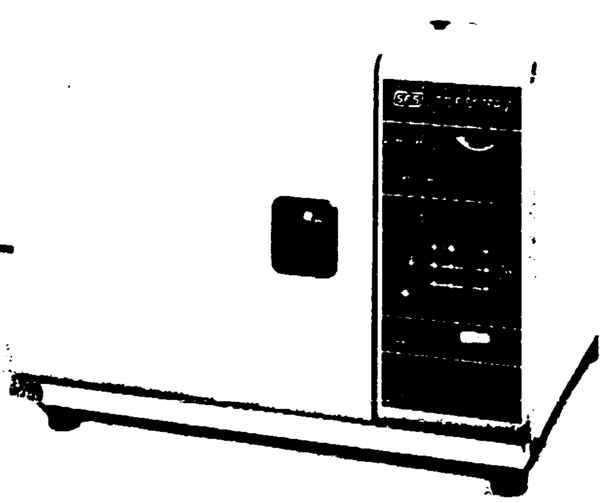
Little Sister Automatic Autoclaves
With front loading chamber, microcomputer controlled functions and three stainless steel trays, 230-240V 50-60Hz single phase supplies.

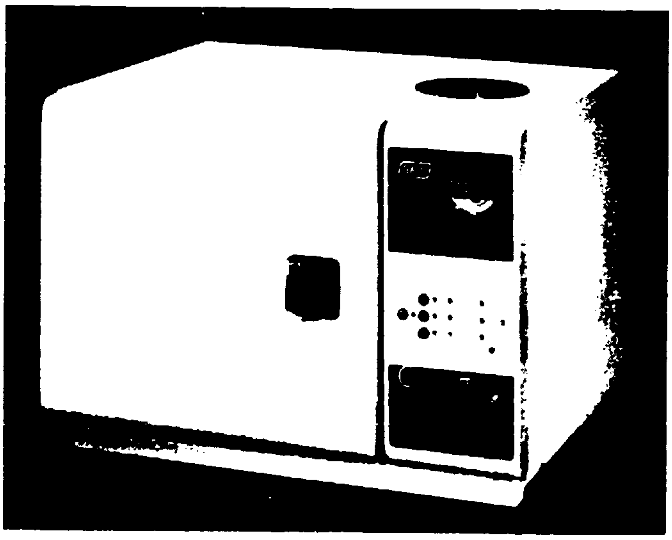
basic model, fixed cycles

lab model, variable cycles

Autoclave Deodoriser Capsules – *see AU600*

Autoclave Tape – *see AU630.*





Drying Cabinets

For general warming and drying purposes including drying of drained glassware.

- Maximum temperature is approximately ambient + 50°C
- Sliding toughened glass door
- Stoved enamel paint interior and exterior
- Chromium plated wire mesh shelves
- Simmerstat heat control

Catalogue No.		OV100-10	OV100-20
Model capacity	*litres*	110	225
Internal, H x W x D	*mm*	430 x 750 x 340	530 x 990 x 390
Overall, H x W x D	*mm*	530 x 760 x 360	630 x 1000 x 410
Shelves		3 supplied with both models. Can be adjusted for height at 19mm centres.	
Power rating	*W*	500	750
Voltage		For 220-240V 50Hz single phase supplies.	

110 litres
225 litres

Glassware Dryer
For drying flasks, cylinders by hot air blowing – *see DY150 in the Drying section.*

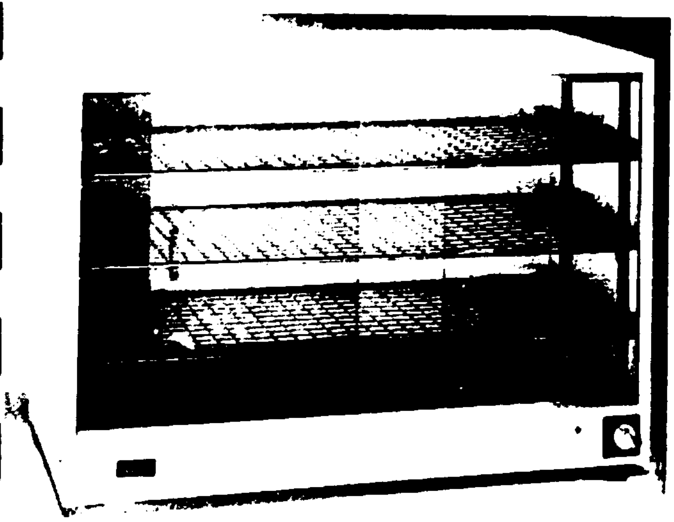
Economy Range: 250°C

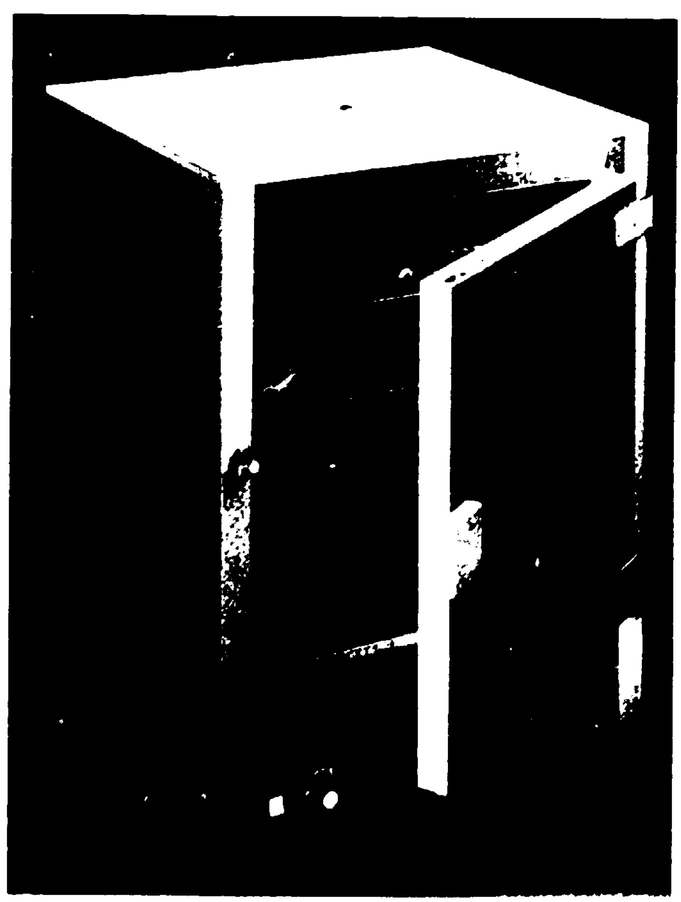
- Maximum temperature 250°C
- Stainless steel interior
- Fan convection
- Hydraulic thermostat control with locking device
- Zinc coated galvanised mild steel exterior finished with tough PVC coating.

Catalogue No.			OV140-15	OV140-25	OV140-35
Model			050	055	060
Usable volume		*litres*	33	113	185
Overall	*h*	*mm*	580	760	1040
	w	*mm*	420	600	690
	d	*mm*	430	580	800
Internal	*h*	*mm*	350	500	710
	w	*mm*	310	480	510
	d	*mm*	300	460	510
Power rating		*W*	650	1300	1500
Shelves supplied			2	3	4
Shelf positions			3	4	6
Fluctuation			± 0.75°C all models		
Weight		*kg*	20	40	60

Ovens, Status 250°C
As described. With stainless steel interior and shelves. For 220-240V 50Hz single phase supplies.

Model 050
Model 055
Model 060





Glass One-Mark Pipettes to BS1583

- Colour coded to BS3996
- Calibrated for delivery
- 1ml and 2ml sizes are straight pattern without bulb
- 3ml, 4ml and 15ml sizes are supplementary to the BS1583 range

Colour code

1ml	Blue	15ml	Green
2ml	Orange	20ml	Yellow
3ml	Black	25ml	Blue
4ml	2 Red	50ml	Red
5ml	White	100ml	Yellow
10ml	Red		

One-Mark Pipettes, Morbank
Soda-lime glass.

	Ref	Capacity ml
Class B		
PM100-10	PRA058	1
PM100-13	PRA060	2
PM100-16	PRA062	3
PM100-19	PRA064	4
PM100-22	PRA066	5
PM100-25	PRA068	10
PM100-30	PRA070	15
PM100-35	PRA072	20
PM100-40	PRA074	25
PM100-45	PRA076	50
PM100-50	PRA078	100
Class A		
PM104-10	PRA080	1
PM104-13	PRA082	2
PM104-22	PRA088	5
PM104-25	PRA090	10
PM104-30	PRA092	15
PM104-35	PRA094	20
PM104-10	PRA096	25
PM104-45	PRA098	50
PM104-50	PRA100	100

Class A Works Certified
Works certificate stating actual volume delivered.

	Ref	Capacity ml
PM106-10	PRA114	1
PM106-13	PRA116	2
PM106-22	PRA122	5
PM106-25	PRA124	10
PM106-30	PRA126	15
PM106-35	PRA128	20
PM106-40	PRA130	25
PM106-45	PRA132	50
PM106-50	PRA134	100

One-Mark Pipettes, E-Mil
Soda-lime glass.

	Ref	Capacity ml
Class B		
[illegible]	G905	1
[illegible]	G904	2
[illegible]	G903	3
[illegible]	G902	4
[illegible]	G901	5
[illegible]	G898	10
[illegible]	G896	15
[illegible]	G895	20
[illegible]	G894	25
[illegible]	G890	50
[illegible]	G884	100
Class A		
[illegible]	G905A	1
[illegible]	G904A	2
[illegible]	G903A	3
[illegible]	G902A	4
[illegible]	G901A	5
[illegible]	G898A	10
[illegible]	G896A	15
[illegible]	G895A	20
[illegible]	G894A	25
[illegible]	G890A	50
[illegible]	G884A	100

Class A Works Certified
With works certificate stating actual volume delivered.

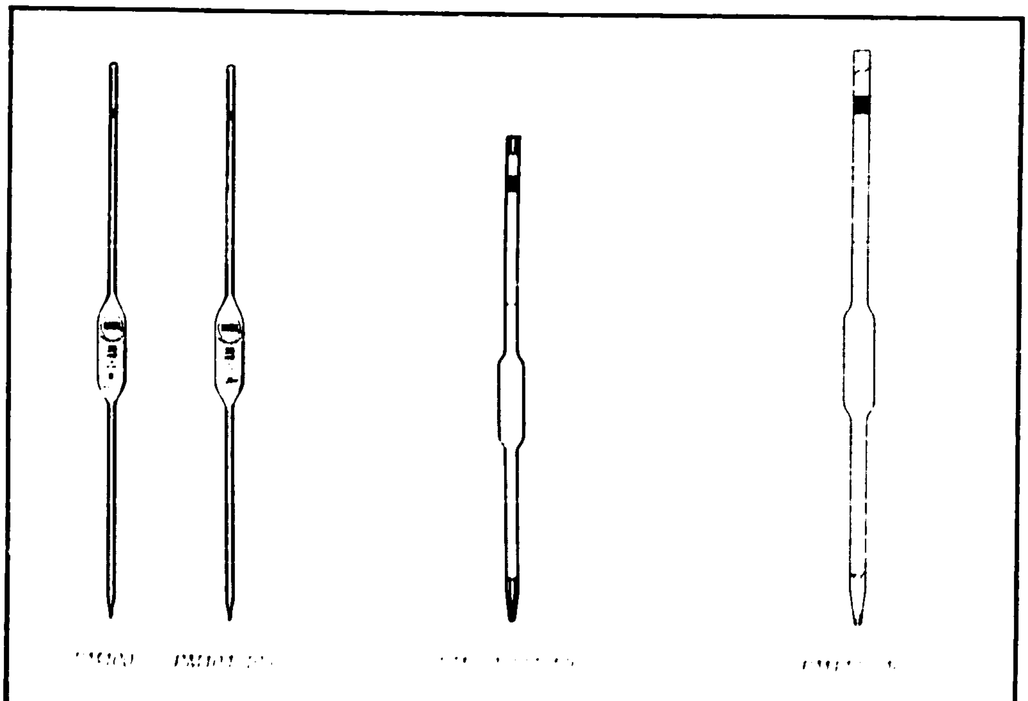
	Ref	Capacity ml
[illegible]	G905WC	1
[illegible]	G904WC	2
[illegible]	G903WC	3
[illegible]	G902WC	4
[illegible]	G901WC	5
[illegible]	G898WC	10
[illegible]	G896WC	15
[illegible]	G895WC	20
[illegible]	G894WC	25
[illegible]	G890WC	50
[illegible]	G884WC	100

One-Mark Pipettes, Pyrex
Borosilicate glass.

	Ref	Capacity ml
Class B		
PM140-10	3230/02	1
PM140-13	3230/04	2
PM140-22	3230/06	5
PM140-25	3230/08	10
PM140-40	3230/16	25
PM140-45	3230/24	50

Class A Works Certified
With works certificate stating actual volume delivered.

	Ref	Capacity ml
PM146-10	3230/40	1
PM146-13	3230/42	2
PM146-22	3230/44	5
PM146-25	3230/46	10
PM146-40	3230/54	25
PM146-45	3230/62	50



Silverson Mixer/Homogenisers

High Speed Mixers
r homogenising and disintegrating fibrous and powdered materials solution. All contact parts are stainless steel except the bush and can dismantled easily for cleaning. Supplied with:

- emulsor head
- square hole screen
- disintegrating head
- axial flow head
- slotted disintegrating head
- pump head
- adjustable bench stand

Catalogue No.		MT200-10	MT200-30
Model		Standard	Heavy duty
*pacity**	*litres*	9	12
Motor speed	*rev/min*	8000 variable	6000 variable
Immersion depth	*mm*	240	290
aft width	*mm*	57	57
Voltage		For 220-240V 50Hz single phase supplies	

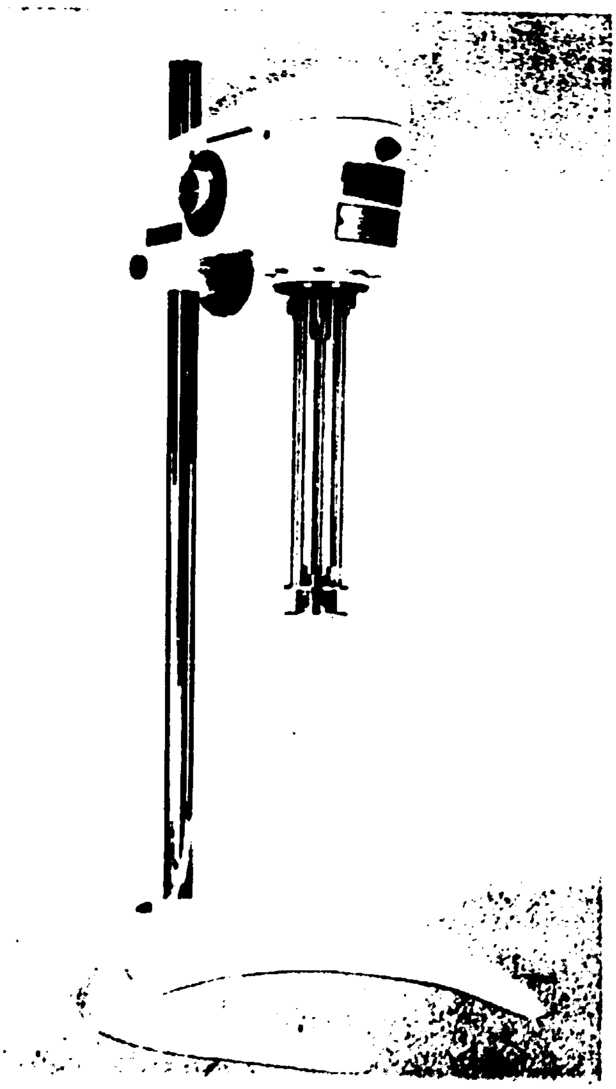
* Actual capacity depends upon the viscosity of the material being ocessed.

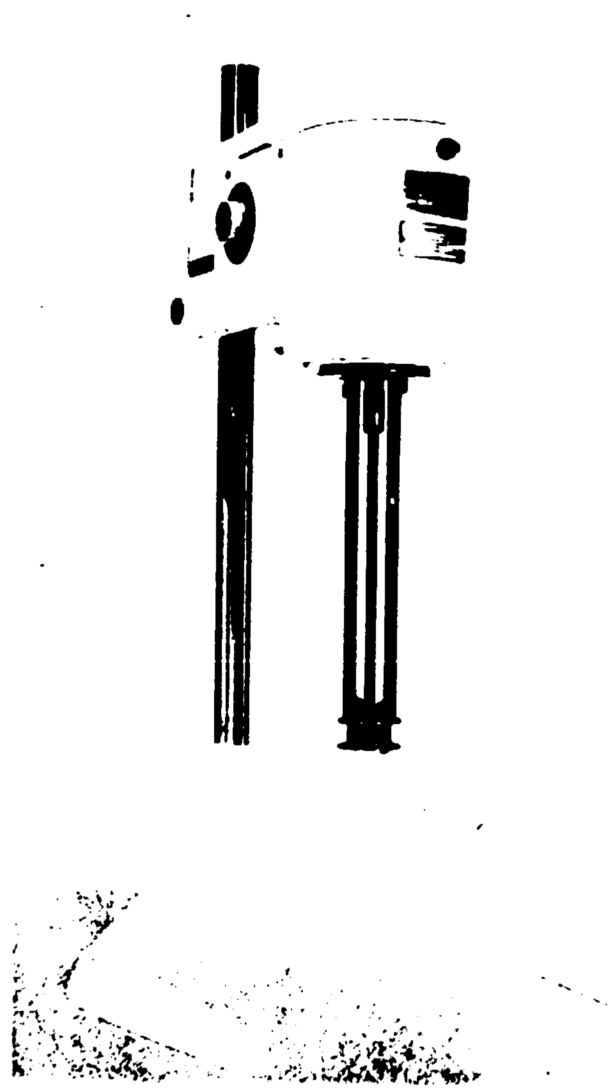
Standard Model
Heavy Duty Model L2R

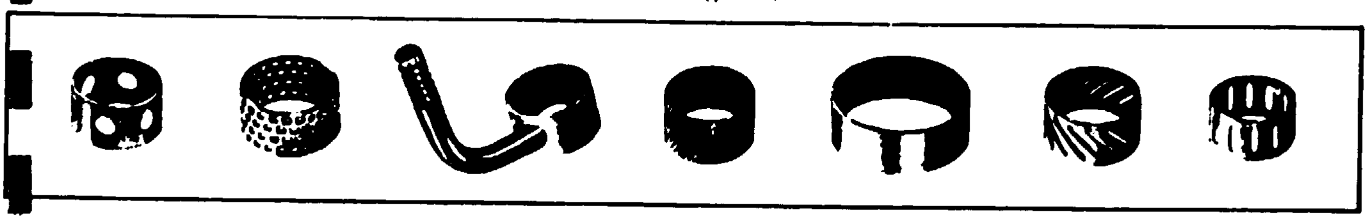
Silverson Mixer/Homogenisers
A wide range are available including:
In-line models
Compressed air models
Sealed unit models
High capacity models
Details on request.

Stainless Steel Containers
Capacities up to 150 litres. Suitable for storing and mixing a wide range of materials – *see Storage section.*

Stirrers
For mixing low/medium vicosity liquids – *see SR500 et seq in the Stirrers section.*







Advanced Microscope 1005D
Magnifications:
400X to 1000X Brightfield
100X to 1000X Phase contrast
40X to 400X Darkground.
With inclined binocular head, rotatable through 360°, calibrated mechanical stage, built-in 6V 20W high intensity illuminator, rack and pinion focusing with slip-clutch and disc diaphragm condenser NA1.15. Eyepieces and objectives are flat field DIN standard

Eyepieces — W10X 18.5mm paired.

Objectives — 4X. Phase P10X, P40XR, P100XR

For 220-240V AC single phase supplies. With dust cover.

1005D

Accessories

Carrying case, satchel type.

Inclined monocular head with vertical viewing tube for attaching camera or TV camera. With W10x eyepiece.

Television camera mounting tube

Stereo Microscope M85B
Magnification 10X and 30X.
With inclined eyetubes, detachable stereo head, rotatable through 360°, rotating objective turret, stable base with frosted stage plate, built-in light source providing incident and transmitted illumination and rack and pinion focusing. Free working distance 65mm. Eyepieces are high eyepoint for maximum viewing comfort with or without spectacles. Produces upright image.

Eyepieces W10X 15.5mm

Objectives — 1X and 3X

For 220-240V AC single phase supplies. With dust cover.

M85B Stereo

Accessories

Carrying case, satchel type.

Eyepieces, paired W15X 13mm.

Eyepieces, paired W20X 14mm.

Amplifying lens, 1.5X.

Micro attachment for 35mm camera. Without camera and T-mount.

Stereozoom Microscope M788
Magnification 7X to 30X.
With inclined eyetubes, detachable stereozoom head, rotatable through 360°, stable base with frosted stage plate, built-in low voltage light source providing incident and transmitted illumination and rack and pinion focusing. Free working distance 110mm. Eyepieces are high eyepoint for maximum viewing comfort with or without spectacles. Diopter correction on both eyepieces. Produces upright image.

Eyepieces — W10X 18mm

Zoompower — 0.7X, 1X, 2X, 3S

For 220-240V AC single phase supplies. With dust cover.

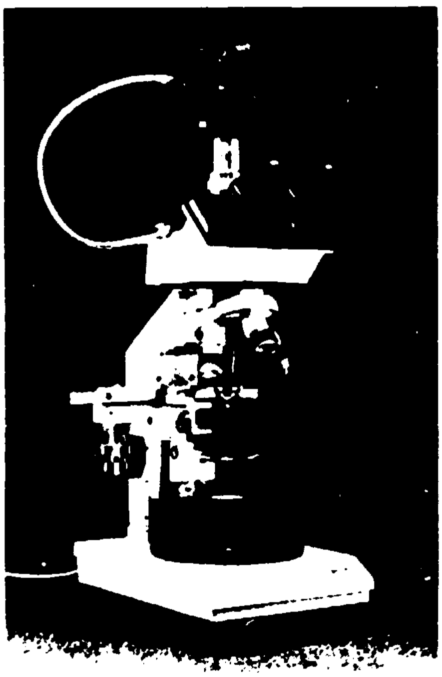
M788 Stereozoom

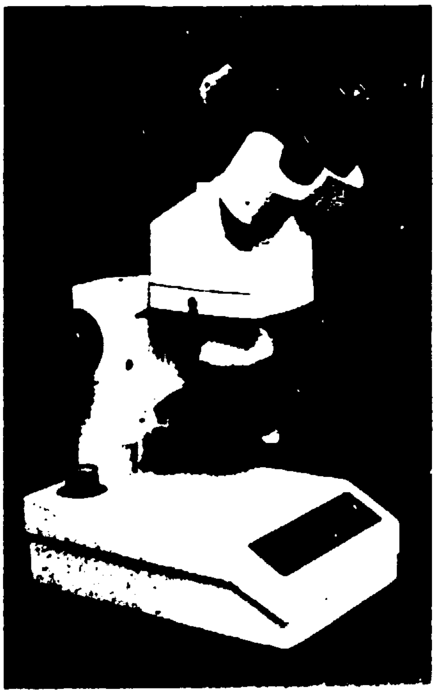
Accessories

Carrying case, satchel type.

Eyepieces W15X.

Eyepieces W20X.





Glass

Desiccators
Borosilicate glass. Dimension given is the diameter at the flange. Without disc.

Knob lid

DE200-10	100mm
DE200-20	200mm

Scheibler/Knob lid

DE205-15	150mm
DE205-25	250mm

Scheibler/Vacuum
With 24/29 cone stopcock.

DE207-15	150mm
DE207-20	200mm

Spare Rotaflo vacuum stopcock with 24/29 cone – *see DE258-10*

Desiccator Discs
Perforated metal.

DE220-12	115mm
DE220-15	150mm
DE220-18	180mm
DE220-20	200mm
DE220-24	240mm

Desiccators, Pyrex glass
Dimension given is the diameter at the flange. Without disc.

Knob cover

DE260-15	150mm, 1590/02
DE260-20	200mm, 1591/02
DE262-15	spare cover 150mm
DE262-20	spare cover 200mm

Vacuum, 24/29 socket
Without stopcock.

DE265-15	150mm, 1593/02
DE265-20	200mm, 1594/02
DE267-15	spare cover 150mm
DE267-20	spare cover 200mm

Rotaflo stopcock assembly 1612/03, 24/29 for above.
DE268-10

Perforated metal plates

DE268-15	for 150mm desiccator
DE268-20	for 200mm desiccator

Plastic

Desiccators, Azlon, Vacuum
Tough transparent polycarbonate top with O-ring seal, polypropylene base desiccant tray and perforated plate. With stopcock which accepts 6mm bore flexible vacuum tubing and PTFE plug in the top which turns to allow controlled admission of air.

DE400-15	150mm, DWA150
DE400-20	200mm, DWA200
DE400-25	250mm, DWA250
DE402-10	spare stopcock DWA500

Desiccators, Azlon, Vacuum
Tough transparent polycarbonate top and base with O-ring seal. With polycarbonate/PTFE stopcock and a perforated ceramic plate.

DE410-22	215mm, DWA216
DE410-25	245mm, DWA246
DE410-10	spare stopcock DWA510

Cabinets

Desiccator Cabinet, Azlon
Clear polystyrene with door secured by catches. Can be stacked. Door opening 188 x 110mm. Overall 225 x 200 x 168mm high. With silica gel.

DE425-10 Ref DWA301

Desiccator Cabinets, Azlon
Transparent acrylic, with downward opening door, secured by catches. With desiccant tray, four shelf positions and two perforated shelves. A dial hygrometer is fitted. Overall 510 x 365 x 350mm high.

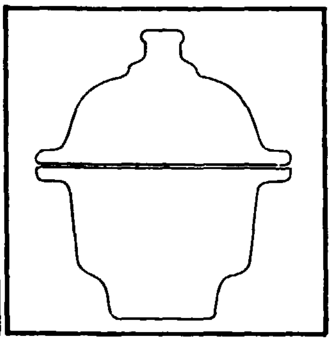
DE430-10 Ref DWA400

With gas inlet for filling cabinet with inert gas such as nitrogen.

DE430-25 Ref DWA402

Desiccator/Humidity Cabinet, T&M
For dry storage of specimens under humidity using saturated salt solutions. Solid state temperature control to 50°C ±1°C. Stainless steel interior with sealing gasket, glass door and shelves and stainless steel desiccant tray. Dial hygrometer is fitted. Overall 460 x 355 x 215mm h x w x d. For 220-240V 50Hz single phase supplies, 175W.

DE450-10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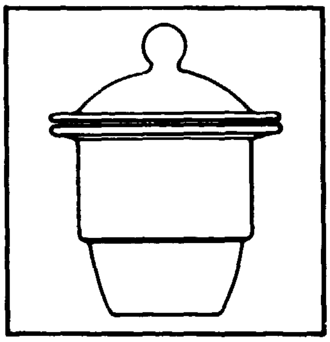
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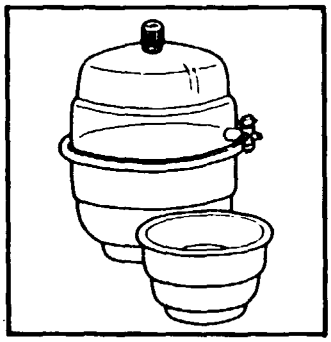
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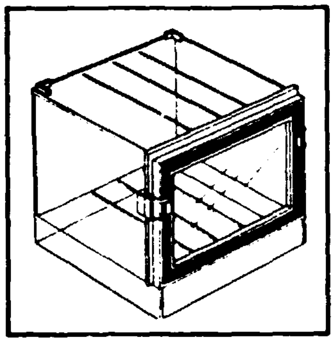
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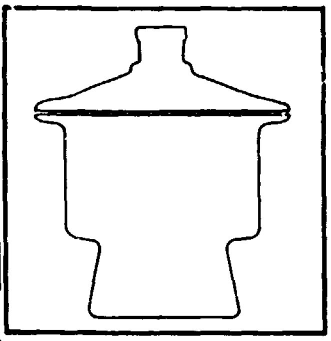
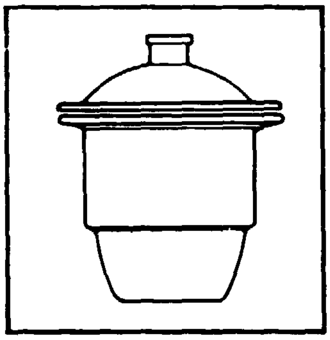

DE205 DE207 is similar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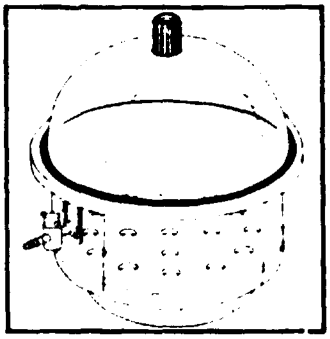
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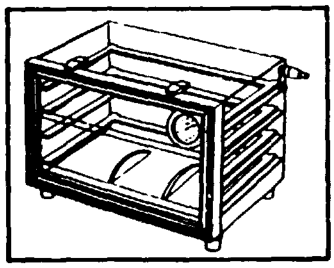
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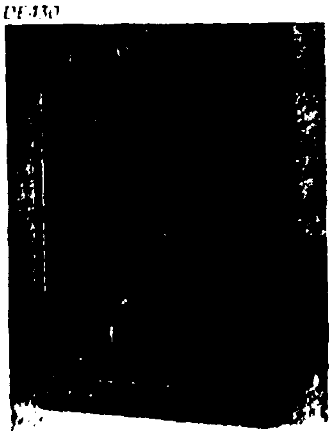
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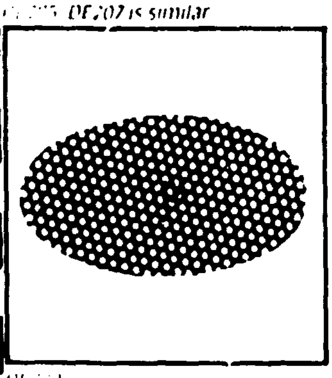
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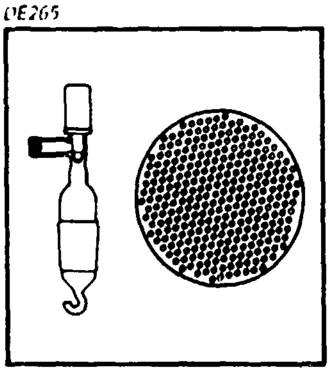

DE268-10 DE268-15

Port-O-Gram Electronic Balances

OHAUS

Economically priced, portable balances with selectable readout and RS232 compatibility on most models.

- Liquid Crystal Display in grams, ounces, pounds, troy ounces pennyweight as specified.
- RS232 compatible interface (except C301P)
- Push button tare
- Stainless steel platform (except C10)
- Automatic shut-off conserves battery
- Negative readout sign on checkweighing model

A wide variety of systems, software and appropriate connecting cables is available for use with Port-O-Gram balances. Details on request.

Port-O-Gram® Series

Battery/mains operation. Supplied with stainless steel platform, calibration mass, weighing scoop and mains adapter for operating the balance on 240V 50/60Hz single phase mains supplies. Requires but not supplied with 8 x 1.5V AA alkaline batteries for battery operation.

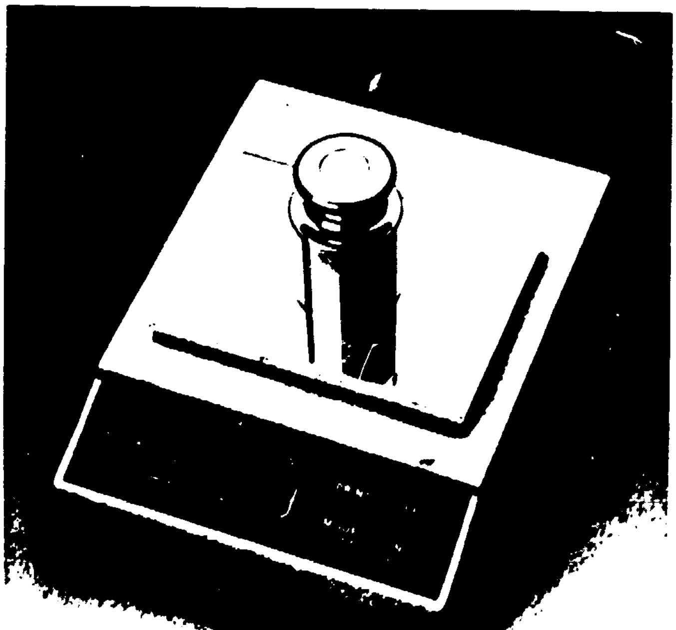
	Model	*Description*	*Capacity*	*Parts Counting*	*Readability*	*Platform size*
RR400 10	C151	An ideal balance for chemistry education and for jewellery applications	150g 5oz 100dwt	Yes	0.05g 0.005oz 0.05dwt	89mm x 121mm
RR400-50	C501	Lightweight and portable microprocessor-controlled with instant full-range tare and automatic self-calibration	500g 18oz 330dwt 1lb 16ozt	Yes	0.1g 0.01oz 1dwt 0.0002lb 0.005ozt	89mm x 121mm
RR402 10	C3001	High capacity model, ideal for portable checkweighing and counting applications (3999pcs). Minimum piece weight 0.5g	3000g 110oz 2000dwt 6.8lbs 100ozt	Yes	1g 0.1oz 1dwt 0.002lb 0.05ozt	121mm x 140mm
RR404 10	C301P	For wholesalers and manufacturers of precious metals and fine jewellery	300g 200dwt 10ozt	No	0.1g 0.1dwt 0.005ozt	89mm x 121mm
RR404-50	C10	A small lightweight model specially designed for the jeweller	50 carat 10g 6.43dwt	No	0.1 carat 0.002g 0.002dwt	89mm x 121mm

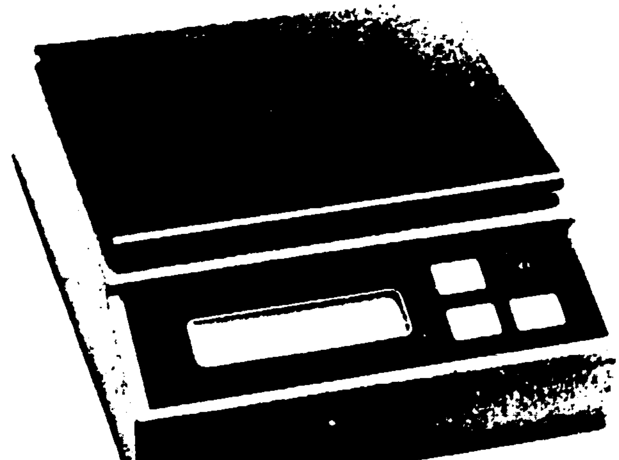
Accessories

RR410 06 Carrying case 76525-01 comprising the vinyl outer case only for models C151, C501, C3001 and C301P

RR410 08 Carrying case 76526-00 for C10 only.

RR410-10 Anti-theft lock and cable





Mechanical Beam Single and Double Pan Models

OHAUS

Series 505
Capacity 50.5g. Sensitivity 0.01g with single notched beam, two sliding poises and zeroing foot. Model 505M has a removable pan; Model 505-10 has a removable scoop and a gram-to-grain conversion chart.

[illegible] 505M; pan
[illegible] 505-10, scoop

Model 1010-10
Capacity 101g. Sensitivity 0.01g with suspended pan, magnetic damping, graduated beam with micrometer and sliding poise; 50g attachment weight and plastic cover. An ideal precision balance for field work in biology, geology and environmental studies. Overall dimensions 250 x 105 x 80mm; mass 1.35kg.
[illegible]

Model 2400-11
Capacity 16kg. Sensitivity 4.5g with top loading pan 248mm diameter, graduated beam with sliding poise and hanging weights. Overall dimensions 565 x 248 x 251mm, mass 13kg.
BB190-10

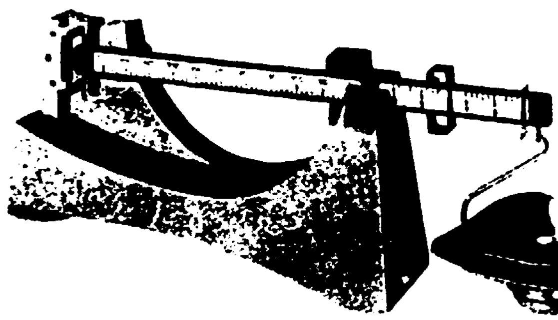
Model 1119D
Capacity 20kg. Sensitivity 1g with top loading stainless steel pan 280mm diameter, magnetic damping, graduated beam with sliding poise, 2270g tare and auxiliary weights. A very robust balance for heavy duty laboratory and industrial weighing. Overall dimensions 860 x 280 x 270mm, mass 17kg.
BB200-10

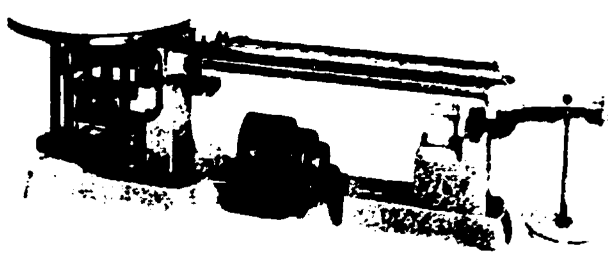
Accessory
Scoop 126, 530 x 300 x 160mm, stainless steel, with foot and counterweight.
BB202-06

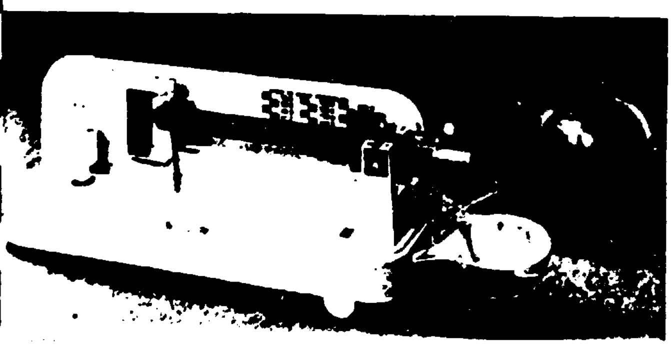
Harvard Trip Series 1400/1500
Top loading, with magnetically damped beams. Model 1450 has a single beam. Other models have two beams. Alternative pans and facilities as listed below.

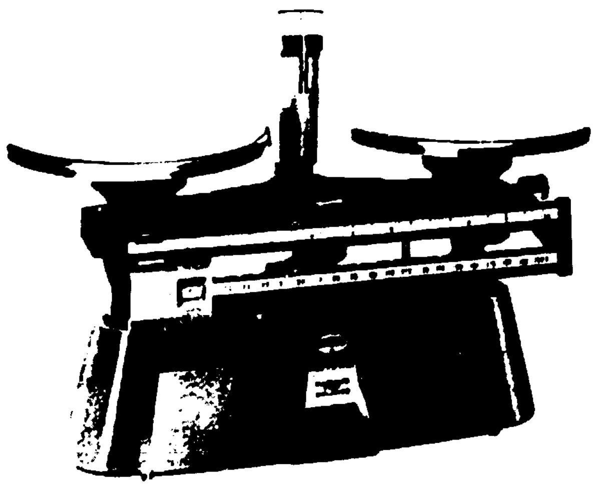
Accessory weights are necessary for weighing above 210g. Tare where specified is 225g. Readability is 0.1g.

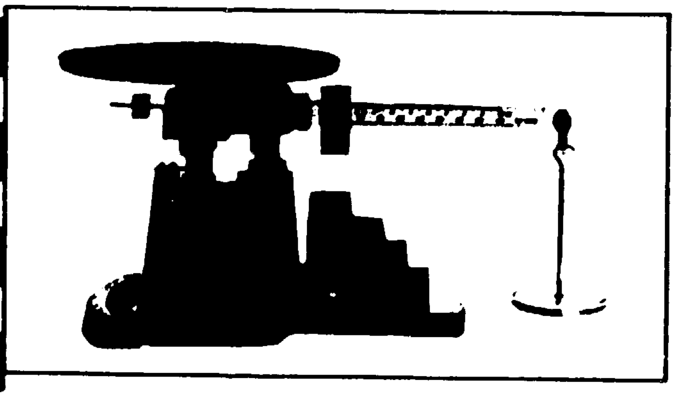
	Model	*Capacity*	*Tare*	*Pan*
[illegible]	1450-SD	2000g	No	Stainless steel plate 150mm dia.
[illegible]	1550-SD	2000g	No	
[illegible]	1560-SD	2000g	Yes	
[illegible]	1510-DO	2000g	No	Stainless Steel removable pan 150x20mm deep
[illegible]	1510-DT	2000g	Yes	
[illegible]	1520-SD	2000g	No	Stainless steel scoop 300x150x70mm
[illegible]	1520-DO	2000g	No	Polypropylene scoop 300x150x70mm











Student Balances

Sturdy and inexpensive beam balances for elementary and secondary school use but with applications in industry for simple weighing.

Ohaus Primer
Capacity 2kg sensitivity 1g. Manufactured from polypropylene and ABS. With pivoting buckets which accept solids or liquids.

RA700 10

Ohaus School 1200
Capacity 2kg sensitivity 1g. With zero adjustment, mechanical damping, recessed beam indicator, steel knife edges, polystyrene pans and specific gravity facility.

RA710 10	Without weight set
RA710 12	With weight set 50g x 1g

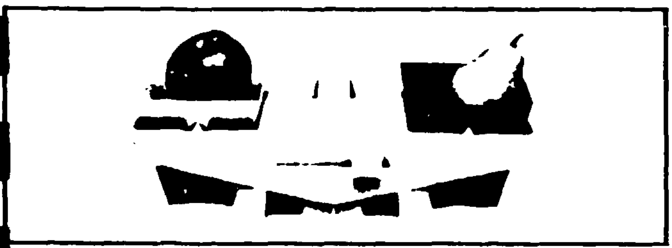
Accessory

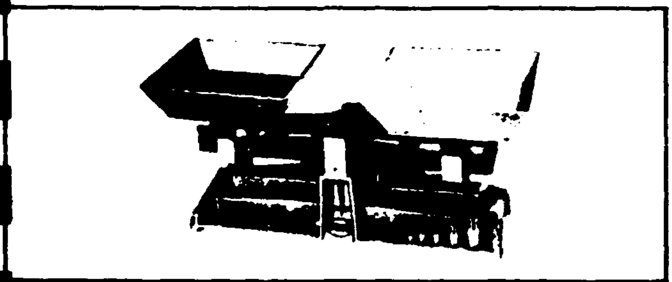
Clamp and rod set for specific gravity measurement for School 1200 Models only.

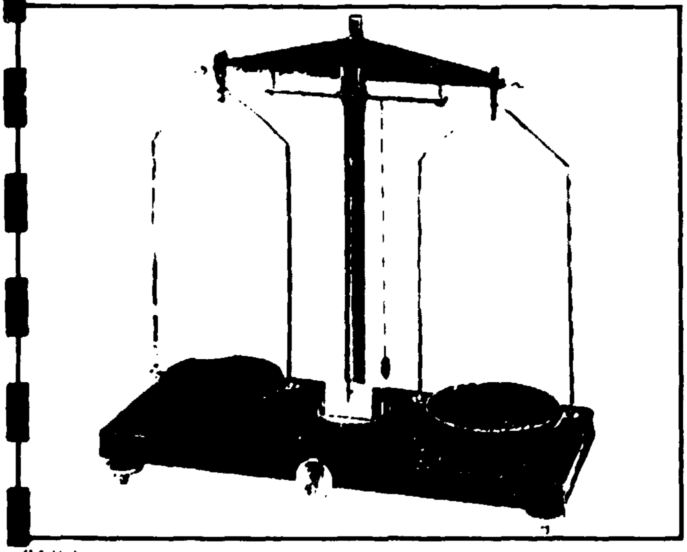
RA714 06

Analytical balance
Capacity 250g sensitivity 2mg. With brass beam, grey stoved enamel finish and two plastic pans. Mounted on base with levelling screws and beam release knob.

RA750 10	Steel knife edges
RA750 12	Agate knife edges







Mechanical Beam Single Pan Models

OHAUS

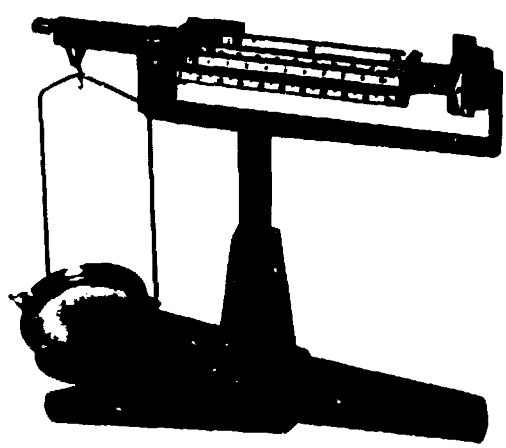
A range of high quality and sturdy sliding mass balances which are easy to operate and suit many applications in both industry and education.

Sliding mass
With single suspended pan, dia. 90mm; height of stirrup 175mm. The beam movement is magnetically damped and zero adjustment is provided. A platform recessed in the case can be positioned for specific gravity measurements. No additional masses are required.

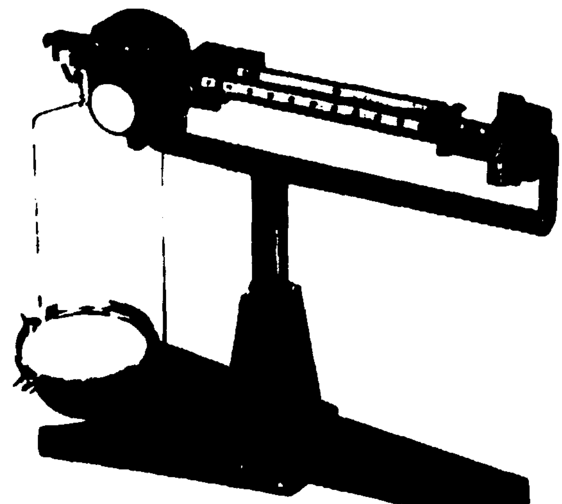
	Model	Capacity	Readability	Calibration
RB100-10	Cent-O-Gram 311	311g	0.01g	4–beams
RB100 50	Dial-O-Gram 310	310g	0.01g	2-beams plus vernier dial reading 10g x 0.01g

Accessories

RB102 06	Dust cover 110, vinyl
RB102 09	Kit 113, for holding small solids for specific gravity measurements.



RB100 10

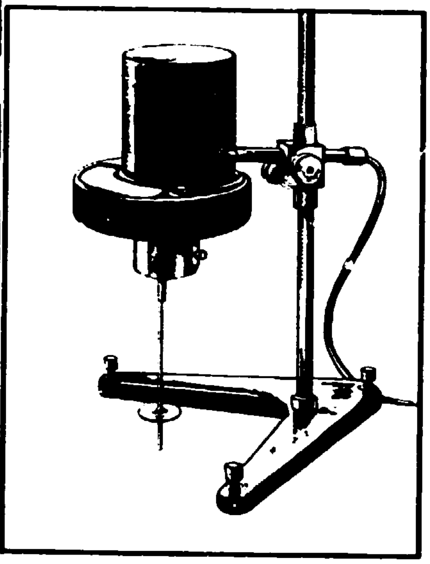


RB100 50

Which viscometer?

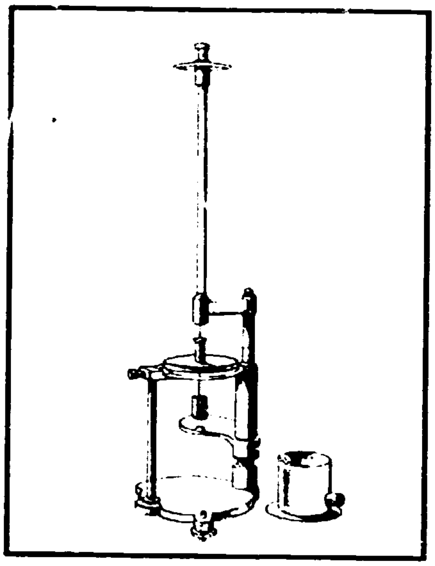
Brookfield

The standard instrument we use for measuring viscosity is the Brookfield, our preference for this being based on the nature of clay slip rheology itself. Since the viscosity of a slip varies with its speed of flow, or 'shearing rate', it is desirable to measure this property at a constant rate of shear, and this is a feature of the Brookfield which is not found in some other instruments.



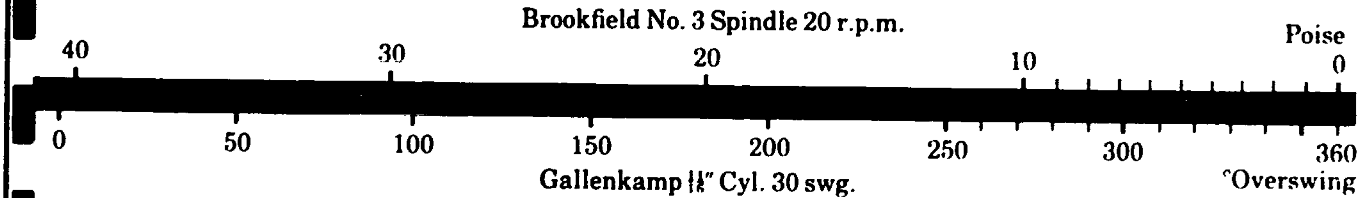
Gallenkamp

The Gallenkamp Torsion Viscometer is widely used in industry and will give acceptable results for routine quality control in the factory environment. However, the fact that is does not operate at a constant rate of shear makes it less useful in the measurement of viscosity.



The conversion chart at the bottom of this page has been formulated from our own data and can be used to compare the results obtained from Gallenkamp and Brookfield viscometers.

Approximate Viscosity Conversion Chart



Lansing

2.0 and 2.5 Specification Data

Chassis
A monocoque chassis of fabricated steel plate gives high strength to weight ratio and full protection to components. Removable fuel tank.

Engine
A Perkins 4.108, water cooled, 4 cylinder diesel, complete with 12 volt electrical starting equipment, develops 31kW (41bhp, at 2 400 rev/min in accordance with BS AUA 141a. Cubic capacity – 1 760cm³ (107.4in³). Compression ratio – 22:1.

Exhaust
Resiliently mounted (vertically) to overhead load guard, the exhaust ensures that fumes are discharged so as to minimise inconvenience to driver and those in the vicinity of the machine.

Driveline
A Brockhouse CA11 transmission complete with hydrokinetic torque converter, and inching control provides single speed forward/reverse through hydraulically actuated multi disc clutches.
Cooling System – cross flow radiator with integral oil cooler.

Drive Axle
A double reduction type drive axle with helical primary and hypoid secondary gears driving through a four-pinion differential gear and halfshafts.

Steering
Full power hydraulic steering. Hydraulic power is obtained from a preferential flow control valve within main hydraulic pump. System reverts to manual operation in the event of engine/pump failure. Cast box section beam steer axle, mounted on bonded rubber bushes to allow sufficient wheel movement over uneven ground. Integral steer cylinder.

Hydraulics
Gear type pump driven from transmission power take-off provides hydraulic power for steering and main services. Control valve – 3 spool, double acting, sandwich construction type. Relief valve – incorporated into the main control valve and set at a pre-determined pressure to prevent overloading. Load lowering valve – directly mounted to the lift cylinder, prevents excessive rate of lowering in the event of a mast hose failure.

Mast
Robust fabricated open centre mast using rolled steel section uprights gives high strength to weight ratio.
Widely spaced angled rollers are used throughout.

Lift and Tilt
Lift Cylinders – two single acting cylinders, with chromium plated rod and honed bore. Twin tilt cylinders – double acting deck mounted to give positive mast control, featuring spherical bearing on rod ends.

Carriage
Heavy duty two plate fabricated construction with 4 roller system, conforms to BITA/FEM (CLASS 11) international standards and offers improved visibility.

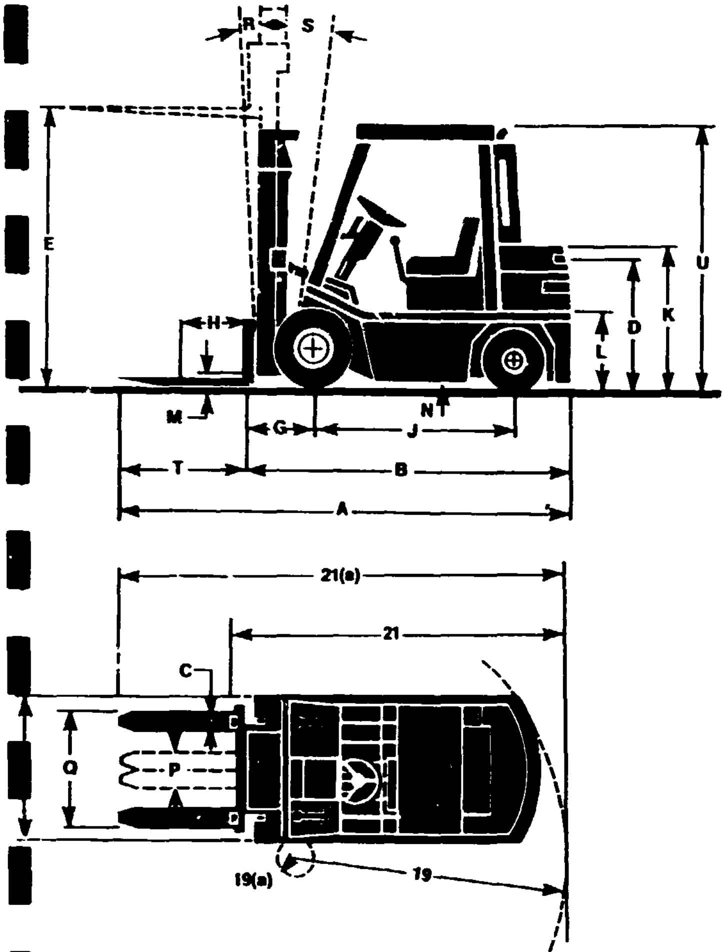
Forks
Fully tapered heat treated forged carbon steel, with international standard BITA/FEM mountings.

Overhead Guard
Heavy duty rectangular section steel tubing. Conforms to FEM safety code.

Driver Position and Controls
Ergonomically designed driver controls permit unimpeded access to driving position from both sides of machine. Foot Brake – hydraulically operated through master cylinder to single leading shoe type brakes on front wheels. Inching Control – inching pedal located to the left of the brake pedal, permits fine inching/braking when in confined spaces, initial pedal travel disconnects drive then progressively applies service brakes. Hand Brake – operates on the wheel brakes through cables and is independent of the foot brake. Seat – a fully upholstered semi-suspension unit mounted to permit fore and aft adjustment for complete driving comfort. Hydraulic Control Levers – mounted close to driver's right hand for ease of handling. Forward/Reverse – control lever mounted to left of steering column. Instrumentation - fuel level, coolant temperature, electric hour meter, ignition and oil warning lights.

Accessibility for Maintenance
A hinged GRP engine cover (removable if required for maximum access) together with removable floor plate allows access to engine, transmission, hydraulics, battery and air cleaner.

1	Manufacturer				Lansing Henley		Lansing Henley	
2	Model		Model designation		7/2.0		7/2.5	
3	Capacity			kg (lb)	2 000	(4 400)	2 500	(5 500)
4	Load centre			mm (in)	500	(20)	500	(20)
5	Type of drive		Electric, diesel, petrol, LPG		Diesel		Diesel	
6	Operator type		Stand on/driver seated		Driver seated		Driver seated	
7	Tyre front/rear		P – Pneumatic, C – Cushion		P/P		P/P	
8	Wheels	* = driven	Number front/rear		*2/2		*2/2	
9	Lift mm (in)	simplex	Standard lift					
10		duplex	Standard lift		2 750	(108)	2 750	(108)
11		duplex	Standard free lift		275	(11)	275	(11)
12		duplex FFL	Special free lift					
13	Fork	thickness		mm (in)	40	(1½)	40	(1½)
		width		mm (in)	100	(4)	100	(4)
		length standard		mm (in)	1 000	(40)	1 000	(40)
		Spacing min		mm (in)	340	(13½)	340	(13½)
		max.		mm (in)	995	(39)	395	(39)
14	Tilt angle, mast		Forward°/backward°		5/10		5/10	
15	Overall dimensions mm (in)		Length less forks		2455	(96½)	2455	(96½)
16			Width		1 170	(46)	1 170	(46)
17			Mast standard lowered		1 980	(78)	1 980	(78)
18			Mast standard raised		3 275	(129)	3 275	(129)
			Over load guard		2 030	(80)	2 030	(80)
			Seat height		980	(38½)	980	(38½)
19	Turning Radius	outer		mm (in)	2 230	(88)	2 230	(88)
		inner		mm (in)				
20	Axle centre to fork face			mm (in)	480	(19)	480	(19)
21	Aisle 90° stacking		Dim without forks	mm (in)	2675	(105½)	2675	(105½)
22	Aisle 90° intersecting		Turn in	(mm (in)				
			Turn out	(mm (in)				
23	Stability factor		BITA/FEM		Satisfied		Satisfied	
24	Speeds	travel	Laden/unladen	km/h (mph)	17.5/17.5	(11/11)	17.5/17.5	(11/11)
25		lift	Laden/unladen	m/s (ft/min)	0.43/0.47	(86/94)	0.37/0.47	(75/94)
26		lower	Laden/unladen	m/s (ft/min)	0.30 – 0.55 (60 – 110)			
27	Drawbar pull		Laden	kN (lb)				
			Unladen	kN (lb)				
28	Gradeability		Laden %		20		20	
29			Unladen %					
30	Weight unladen			kg (lb)	3 290	(7 240)	3 550	(7 810)
31	Axle load laden		Front	kg (lb)	4 880	(10 740)	5 630	(12 380)
			Rear	kg (lb)	410	(900)	420	(930)
32	Tyres		Number front/rear		2/2		2/2	
33			Size front		7.00 × 12		7.00 × 12	
34			Size rear		6.00 × 9		6.00 × 9	
35	Wheelbase			mm (in)	1 530	(60)	1 530	(60)
36	Track Width		Drive	mm (in)	970	(38)	970	(38)
			Steer	mm (in)	950	(37½)	950	(37½)
37	Ground Clearance		Mast	mm (in)	115	(4½)	115	(4½)
38			Centre	mm (in)	140	(5½)	140	(5½)
39	Brakes	service	Pedal		Hydraulic on drive axle			
40		parking	Hand		Mechanical on drive axle			
41	Battery		Type		Lead Acid		Lead Acid	
42			Volts		12 V		12 V	
43			Weight	kg (lb)				
44	Electric motors		Drive 1 h rating	kW (hp)				
45			Lift 15 min rating	kW (hp)				
46	I.C. Engine		Manufacturer type		Perkins 4.108		Perkins 4.108	
47			BS AUA 141 a rating kW (bhp)		31	(41)	31	(41)
48			rev/min		2 400		2 400	
49			Cylinders/cycles/cm^3	(in^3)	4/4/1 760	(107.4)	4/4/1 760	(107.4)
50			Fuel consumption		232 g/kW h (0.40 lb/bhp h)			
51	Clutch/coupling		Type		Torque converter			
52	Speed control		Type of gear change		Mechanical		Mechanical	
53			Number of speeds F/R		1/1		1/1	
54	Drive axle		Type		Heavy duty double reduction			
55	Rated moment			m kg (in lb)	1 960	(171 600)	2 450	(214 500)
56	Steering		Type		Full power hydrostatic			



	7/2.0		7/2.5	
	mm	in	mm	in
A	3 455	136½	3 455	136½
B	2 455	96½	2 455	96½
C	100 × 40	4 × 1½	100 × 40	4 × 1½
D	980	38½	980	38½
E	2 750	108	2 750	108
F	1 170	46	1 170	46
G	445	17½	445	17½
H	500	20	500	20
J	1 530	60	1 530	60
K	1 105	43½	1 105	43½
L	620	24½	620	24½
M	115	4½	115	4½
N	140	5½	140	5½
P	340	13½	340	13½
Q	995	39	995	39
R	5 degree		5 degree	
S	10 degree		10 degree	
T	1 000	40	1 000	40
U	2 030	80	2 030	80
19	2 230	88	2 230	88
19(a)				
21	2 675	105½	2 675	105½
21(a)	3 675	145½	3 675	145½

Load Centre mm (in)	500 20	600 24	900 36
Model	**7/2.0**		
Capacity up to 3 800 mm (150 in) lift	2 000 4 400	1 800 4 000	1 415 3 120
Capacity @ 4 000 mm (158 in) lift	1 960 4 310	1 760 3 920	1 385 3 060
Capacity @ 4 600 mm (161 in) lift	1 840 4 050	1 660 3 660	1 300 2 860
Capacity @ 5 000 mm (197 in) lift	1 760 3 880	1 580 3 480	1 245 2 740
Capacity @ 5 550 mm (219 in) lift	1 650 3 030	1 480 3 300	1 165 2 570
Model	**7/2.5**		
Capacity up to 3 800 mm (150 in) lift	2 500 5 500	2 260 5 000	1 [illegible]20 3 570
Capacity @ 4 000 mm (158 in) lift	2 450 5 390	2 210 4 900	1 620 3 570
Capacity @ 4 600 mm (161 in) lift	2 300 5 060	2 080 4 600	1 620 3 570
Capacity @ 5 000 mm (197 in) lift	2 200 4 840	1 990 4 400	1 550 3 420
Capacity @ 5 550 mm (219 in) lift	2 060 4 540	1 860 4 120	1 460 3 220

Load Centre mm (in)	500 20	600 24	900 36
Model	**7/2.0**		
Capacity up to 4 390 mm (173 in) lift	1 680 3 700	1 510 3 360	1 185 2 610
Capacity @ 4 790 mm (189 in) lift	1 600 3 520	1 440 3 200	1 130 2 490
Capacity @ 4 990 mm (196 in) lift	1 560 3 430	1 400 3 120	1 100 2 420
Capacity @ 5 590 mm (220 in) lift	1 440 3 170	1 300 2 880	1 015 2 240
Capacity @ 5 990 mm (236 in) lift	1 360 2 990	1 220 2 720	960 2 120
Model	**7/2.5**		
Capacity up to 4 390 mm (173 in) lift	2 100 4 620	1 900 4 200	1 485 3 270
Capacity @ 4 790 mm (189 in) lift	2 000 4 400	1 810 4 000	1 415 3 120
Capacity @ 4 990 mm (196 in) lift	1 950 4 290	1 760 3 900	1 380 3 040
Capacity @ 5 590 mm (220 in) lift	1 800 3 960	1 630 3 600	1 270 2 800
Capacity @ 5 990 mm (236 in) lift	1 700 3 740	1 540 3 400	1 200 2 640

The capacities shown above are for machines without attachments. For capacities with attachments refer to the manufacturer.