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MT BISCHOFF PROJECT  
 RE-ESTIMATE OF MINIMUM PRODUCTION  
 CASE FOR THE MINING AND TREATMENT OF  
 MT BISCHOFF DSL ORE

MICROFILMED

G G JONES  
 JUNE 1988

OPEN FILE

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**SECTION ONE****INTRODUCTION**

The Mt Bischoff Project describes the exploration and development by the Mt Bischoff Joint Venture, comprising Metals Exploration Ltd, Comstaff Pty Ltd/Preussag Aust Pty Ltd, for the establishment of mining and treatment operations at Mt Bischoff, near Waratah in north-west Tasmania.

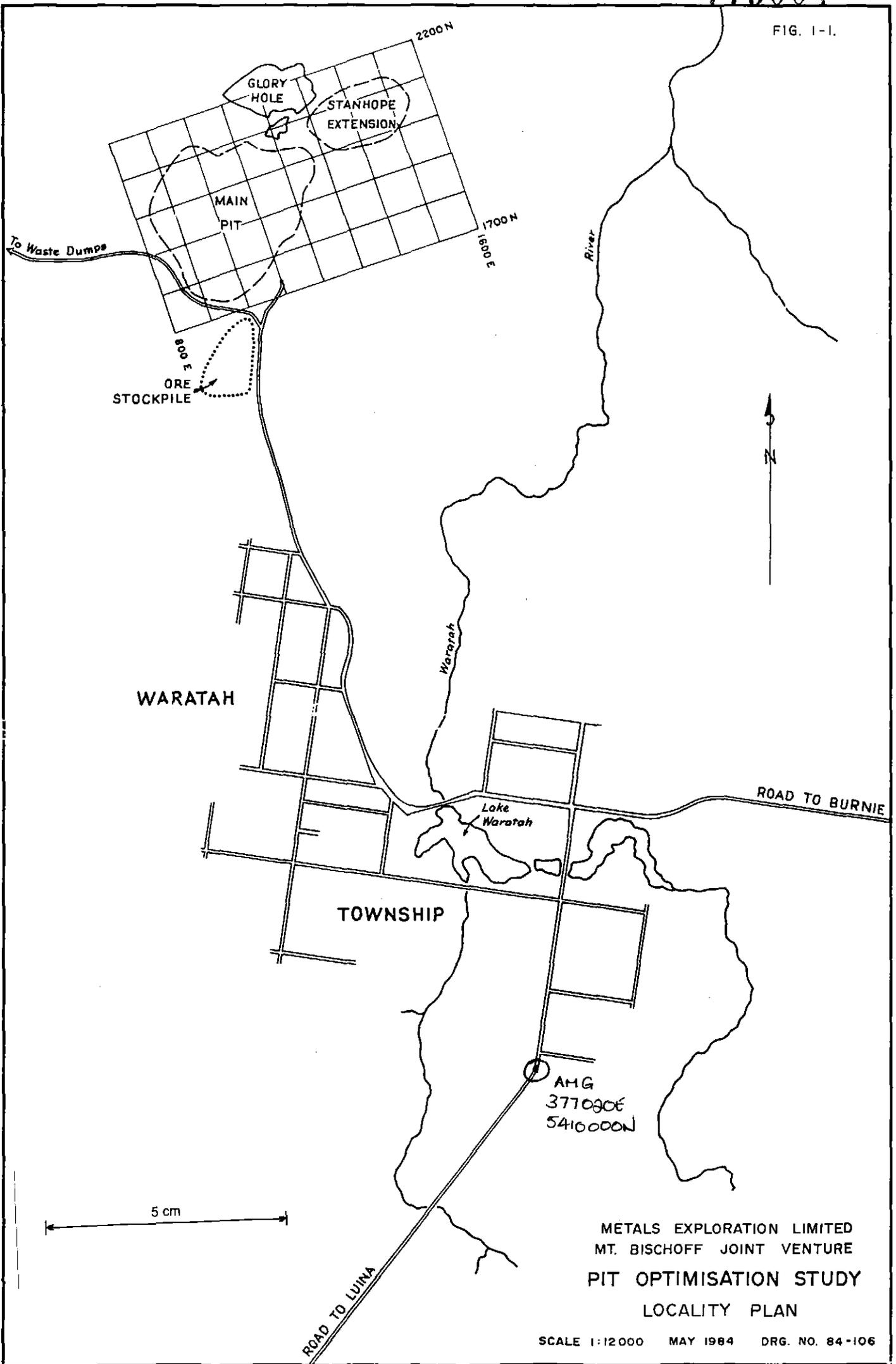
The occurrence of tin in the Mt Bischoff area was discovered in December, 1871, by James Smith. Mining and processing operations commenced in 1873 with sluices and hand jigs producing saleable tin concentrates. Initially, the operation was worked as an alluvial mine with underground prospecting commencing in 1897. Mining and processing continued by private companies until 1929 with the Mt Bischoff Tin Mining Company Registered being the most significant producer.

From 1929 to 1942, the area was mined by tributors, with the Mt Bischoff Tin Mining Company Registered providing the processing facilities on a rental/payment basis. The Company ceased operations in 1942 with the Commonwealth Government acquiring the mine and plant. The Government worked the area until their withdrawal in 1947. The area has been worked on a small scale from 1947 to date by a number of tributors.

The Mt Bischoff tin deposit comprises a patchy and variable cassiterite mineralisation within a more widespread but variable (massive to disseminated) sulphide mineralisation (pyrrhotite and pyrite), which replaces a Pre-Cambrian dolomite in the zone of its contacts with underlying Pre-Cambrian siltstone/sandstone and a transgressive Devonian porphyry dyke set. Cassiterite mineralisation also occurs in association with disseminated sulphides within the dykes, which are themselves slightly griesenized. The material replacing dolomite has been named the Dolomite Sulphide Lode (D.S.L.) and the sulphide-bearing porphyry simple Porphyry.

The major tin mineral in the D.S.L. ore is cassiterite with traces of stannite. This is associated with sulphide (predominantly pyrrhotite), talc, serpentinite or quartz/carbonate.

The major tin mineral in the porphyry ore is cassiterite, with a significant fraction occurring as stannite. These are associated with quartz, topaz, carbonate, fluorite and sulphide orebody.



METALS EXPLORATION LIMITED  
 MT. BISCHOFF JOINT VENTURE  
 PIT OPTIMISATION STUDY  
 LOCALITY PLAN

## SECTION TWO

## EXECUTIVE SUMMARY

## 2.1 Background

Numerous engineering studies and mine planning exercises have been carried out with the intention of establishing the most cost effective means of mining and processing the ore from the Mt Bischoff tin deposit. A brief history of the more recent studies is as follows:

1981 - Austin Anderson were commissioned by the Joint Venture manager (Metals Exploration Ltd) to carry out a preliminary engineering study. This study dealt with three individual mining production rates, namely:

Case 1

Mining and concentrating at Waratah with one "pre-production" year followed by an initial annual production of 200,000 tonnes of D.S.L. ore increasing to an ultimate annual production rate of 550,000 tonnes combined D.S.L. and Porphyry ore.

Total ore	3.82 x 10 <sup>6</sup> tonnes
Combined Head Grade	0.48% Sn
Life of Mine	8 years
Overall Stripping Ratio	1:5.9 (ore t:waste t)

Case 2

Mining and concentrating at Waratah with one "pre-production" year followed by an initial annual production of 150,000 tonnes of D.S.L. ore increasing to an ultimate annual production rate of 400,000 tonnes combined D.S.L. and Porphyry ore.

Total ore	3.82 x 10 <sup>6</sup> tonnes
Combined Head Grade	0.48% Sn
Life of Mine	8 years <i>? 5 years</i>
Overall Stripping Ratio	1:5.9 (ore t:waste t)

Case 3

Mining and stockpiling operations at Waratah with transport to custom milling at Aberfoyle's "Cleveland" concentrator. One "pre-production" year would be followed by an initial annual production of 150,000 tonnes of D.S.L. ore

increasing to an ultimate annual production rate of 260,000 tonnes of D.S.L. ore only.

Total ore	0.89 x 10 <sup>6</sup> tonnes
Head Grade	0.80% Sn
Life of Mine	4 years
Overall Stripping Ratio	1:3.8 (ore t:waste t)

In all cases the mining operations were to be carried out by J.V. personnel.

### 1982

As a result of the Austin Anderson study the Joint Venture decided that a modified Case 3 operations plan would be the most acceptable. The modifications to the plan were broadly set as follows:

- a) D.S.L. ore to be mined in Years 1 and 2 and from then on blended together with Porphyry ore, the ultimate tonnage to be made up of -
  - i) Approximately 270,000 tonnes of Porphyry ore to be mined per annum, this to be stockpiled, transported to Cleveland then fed into a pre-concentrator which would reject 50% as tailings, the remainder delivered to the concentrator as an upgraded flotation feed.
  - ii) 130,000 tonnes of D.S.L. ore to be mined, stockpiled, transported to Cleveland and fed directly into the concentrator.
- b) A complete reassessment of the geological information and updated drilling results would be carried out.

When the new ore reserves were examined and a new mining design completed the following ultimate production rates were set.

D.S.L. ore	155,000 tonnes per annum
Porphyry ore	245,000 tonnes per annum

These production rates were to be preceded by one "pre-production" year. Year 1 would only yield 67% of ultimate production to allow for a "settling-in" period.

Mining operations were to be carried out by J.V. personnel.

Total ore mined	3.564 x 10 <sup>6</sup> tonnes
Combined head grade	0.73% Sn
Life of Mine	10 years
Overall Stripping Ratio	1:5.3

Contractors were to be used in the "pre-production" year and to assist in waste removal thereafter.

Unfortunately due to tin quotas, low market prices etc the feasibility study indicated that this option was not viable at that point in time.

When it became obvious that the latter option was nonviable the Joint Venture resorted to minimum option as follows.

The 1978 Comstaff Joint Venture - Metals Exploration Ltd Agreement called for a Decision to Mine to be made at a minimum rate of 100 tonnes per annum contained tin. In order to be assured that this would be possible, the Mt Bischoff Joint Venture performed several studies incorporating the use of a small modular plant at Waratah and contractor mining of high grade DSL ore at low stripping ratios. The first such plan called for mining in the Greisen face area. The second plan called for mining in the Pig Flat area, as follows:

Total Ore	0.238 x 10 <sup>6</sup>
Head Grade	0.98 %Sn
Life of Mine	8 years

The mining and treatment of Mt Bischoff DSL ore from the Greisen Face area is feasible at a rate necessary to produce a minimum of 100 tonnes of saleable tin into concentrate. The area considered for mining is planned to provide a minimum of 7 years of high grade DSL ore for processing. The potential for additional ore in this area and the "pig flat" area would extend the project life to beyond 10 years at the planned throughput.

The mine will be developed as an open pit operation with the use of contractors under our supervision for all the mining activities.

The Process Plant will consist mainly of "caravan mill" components interconnected to build up the mill with only the concentrate treatment housed in a fixed structure. The "caravan mill" consists of 5 units, containing all the equipment necessary, mounted on to mobile trailers for the crushing, grinding flotation and tabling section of the plant (refer to appended specifications).

The minimum of infrastructure necessary to support the operation is planned.

The Process Plant throughput is 34,375 tonnes per annum and from average head grade of 0.9% tin the overall plant recovery will be 45% to a concentrate grade of 55% tin. At this tonnage the annual

*Sick*

production of saleable tin will be 138 tonnes in 260 tonnes of concentrate.

The total capital for the project will be A\$3,733,600 as summarized in Section 2.2.

The operating cost at the average throughput of 34,375 tpa will be \$37.40 per tonne.

The above costs are expressed in terms of third quarter 1988 cost.

The development programme indicates a 6 month period for mine and plant development prior to commencing production.

## 2.2 Capital Cost Summary

(Refer to Section 5 for details)

	A\$000
Mine - Development (prestripping)	214
- Equipment (light vehicle)	20
Process Plant and Infrastructure	2,673
Installation and Commissioning	50
Housing	<u>175</u>
SUB TOTAL	<u>3,312</u>
Engineering (5% of sub total less Prestripping)	145,8
Contingency (15% of sub total less Prestripping)	<u>455,8</u>
	3,733,6

## 2.3 Operating Cost Summary

### 2.3.1 Unit Operating Costs

Operating costs are expressed in A\$ per tonne of process plant feed.

	<u>\$/tonne</u>
Mining (including Secondary Break)	11.36
Process	22.44
Administration and Infrastructure (including Head Office input)	<u>3.60</u>
	<u>37.40</u>





Mount Bischoff  
Production and Cash Flow Projections  
Base Case

<u>Production</u>	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Ore Mined t '000		17	34	34	34	34	34	34	11			232
Head Grade % tin		0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9			7.2
Tin Production		67	134	134	134	134	134	134	45			916
Tin Price @ 31/5/88 \$A10851												
Revenue		727	1,454	1,454	1,454	1,454	1,454	1,454	488			9,939
Op. Costs A\$37.40/t milled		635	1,272	1,272	1,272	1,272	1,272	1,272	411			8,678
Con. handling \$350/t conc		44	88	88	88	88	88	88	29			601
State Royalty		2	4	3	3	3	3	3	1	(1)	(9)	11
Capital Development	(234)											0
Tax Payable				36	36	36	36	36	36	15	194	425
Operating Surplus	(234)	46	90	55	55	55	55	55	11	(14)	(185)	224
Capital-Treat/Housing	(2,898)									725		(2,173)
-Eng./Contin.	(602)											
Cash Flows	(3,734)	46	90	55	55	55	55	55	11	711	(185)	949
Discount Factor @ 15%	1.0000	0.8696	0.7561	0.6575	0.5718	0.4972	0.4323	0.3759	0.3269	0.2843	0.2472	
Net Cash Flows	(3,734)	40	68	36	32	27	24	21	4	202	(46)	
N P V	(3,326)											

**SECTION THREE**  
**OPERATING DESCRIPTION**

**3.1 Ore Reserves**

The Ore Reserves used in this study are from the Greisen Face are above the 620 m level of the total Mt Bischoff DSL Reserves. Based on the December, 1981 Ore Reserve calculations, which were revised in April 1983 by Douglas McKenna & Partners. The ore selected contains a total 236,780 tonnes at an average grade of 0.98% tin. The table below outlines these reserves.

<u>Section</u>	<u>Tonnes</u>	<u>Grade (% Sn)</u>	<u>Tonnes x Grade</u>
940	39,760	1.49	59,242
	39,460	0.51	20,124
960	44,100	0.83	36,603
980	44,850	0.97	43,505
	6,160	0.33	2,033
1000	<u>62,450</u>	1.12	<u>69,944</u>
<b>TOTAL</b>	<b><u>236,780</u></b>	<b><u>0.98</u></b>	<b><u>231,451</u></b>

**3.2 Mining**

**3.2.1 General**

The mine plan developed for this study outlines an open pit to extract the ore reserves detailed in Section 3.1. The extraction rate of 34,375 tpa was based on the following parameters.

1. Minimum of 100 tonnes of contained tin at the specified mill recovery rates and calculated mine head grade.
2. 20% oversize material ex the primary feed grizzly, which is to be stockpiled for secondary breaking.
3. Operating time of one 8 hour shift per day, 5 days per week, 50 weeks per year.

**3.2.2 Diluted Mining Reserves**

The Geological reserve has been modified to give a Mineable Ore Reserve using:

- i) 90% mining recovery of the ore reserve.

- ii) 10% dilution at a nominal grade of 0.1% Sn.

**The Mineable Ore Reserve is 234,412 tonnes at an average grade of 0.90% tin.**

3.2.3 Production Schedule

The production plan was based on average annual production rate of 34,375 tonnes at a grade of 0.90% tin. This rate gives a mine life of 6.8 years.

3.2.4 Mining Plan

An overall pit plan was developed (refer attached Drawing) giving a total volume of material to be mined.

BANK CUBIC METRES

ORE	67,651
WASTE	193,761
TOTAL	261,412

The average stripping ratio is 2.33:1 (waste:ore:tonnes).

The pit design was based on:

- i) wall angle of 45 degrees overall.
- ii) bench height of 10 metres with temporary ramps and benches at various heights dependent on one configuration.

Pre-production stripping will be carried out above the 650 m level, resulting in an average waste:ore ratio (tonnes) of 1.42:1 for the production period.

Access to the ore body will be via the "pig flat" area at the 930 m level with immediate ore production from existing exposed faces. The majority of the ore above this level will be blasted and dozed over this face for loading at the 930 m level.

Ore will be loaded by Front End Loader and transported to 200 tonne coarse ore bin off highway haul track.

An Ore stockpile capacity of 1 weeks live capacity at average mill throughput will be maintained to augment feed to coarse ore bins as required. Waste disposal will be via a haul road to an area west of the Pit.

### 3.2.5 Mining Method

Two methods of operation were considered:

- i) Owner purchase, operation and maintenance of equipment for the mining phase with contracted prestripping.
- ii) Contracted mining and prestripping with owner supervision of contractors activities.

#### Method i):

Due to the small annual tonnage, equipment size was kept to a minimum and the use of secondhand equipment was envisaged.

The small tonnage to be produced resulted in a high cost per tonne due to:

- a) the support staff and equipment that was necessary.
- b) the effective use of equipment on a capacity time basis.

#### Method ii):

A contracted prestripping and mining operation is proposed to include the supply of all labour, equipment and materials necessary for the operation. The control of the contractor will be carried out by a mining supervisor to ensure satisfactory mining performance.

The contractor will service the operation from Burnie with a minimum of onsite personnel.

The costs used in this study, were based on the parameters developed from Method i) with quoted rates from a Tasmanian earthmoving/mining contractor.

### 3.3 Metallurgy

The flowsheet shown in Sk3 was developed from the current knowledge of the DSL ore and the requirement

of simplicity of operation. The following parameters were the basis for process development.

Feed Grade	-	0.9 Tin, 18% Sulphur
Grind Product Size	-	80% passing 160 microns
Ball Mill Work Index	-	12 kwh/tonne
Sulphide Circuit	-	Recovery 90% Sulphur to 35% a grade of one cleaner stage
	-	Weight Split Sulphide Conc. 45% Sulphide Tail 55%
	-	Residence Time Rougher - 12 mins Cleaner - 15 mins
Gravity Section Feed	-	Weight split + 100 micron 23% 75-100 micron 23% 38-100 micron 9% - 38 micron 45%
Concentrate dressing	-	Feed 40% tin by weight Recovery 95% to final concentrate grade of 55% tin.
Overall Recovery of Tin into Concentrate	-	45%

### 3.4 Process Plant

#### 3.4.1 General

The plant was developed to take advantage of equipment available, in "caravan mill" components, consisting of all the necessary equipment for the relevant section mount on mobile units suitable for towing by road to site, to reduce transport and set up costs and have maximum resale value. The crushing, grinding, flotation and rougher tables are in modular form with cleaner tables, concentrate treatment and bagging housed in a fixed building.

### 3.4.2 Operation Schedule

The plant was designed to operate to the following parameters.

Feed rate: 6.75 tonnes per hour  
 Plant Availability: 85%  
 Operating Times:  
     Concentrate  
     Treatment: 1 shift/day ) for 5  
   ) days/wk  
     Other: 3 shifts/day) and 50  
   ) wks/yr

### 3.4.3 Process Description

Run of Mine ore will be dumped onto a grizzly over a 200 tonne capacity coarse ore bin. The oversize being stockpiled for secondary breaking for new feed. The coarse ore will be feed via apron feeder and conveyor to a double deck screen closing the crushing circuit. The crushing circuit will consist of a 2415 single toggle jaw crusher and a 560 mm standard cone crusher. The crusher product will be 100% minus 6 mm.

The crusher product will be fed via a 12 tonne surge bin and conveyors to a 60 degree DSM screen, with a screen aperture of 300 micron, closing the 1.8 m diameter x 2.4 m long ball mill. Ball mill drive will be 100 kw wound rotor induction motor. The Ball Mill product will be pumped to a conditioner and two stages of flotation to remover the sulphides.

Classification of the gravity feed will be via a desliming cyclone, hydrosizer and cyclone to produce 3 product streams for gravity concentration will be by 3 rougher tables and 3 cleaner tables. The gravity concentrate is screened and stored in an agitated storage tank for the day shift concentrate treatment.

The concentrate will be batched via a single stage sulphide flotation and a screw dewatering feeder to a kieve for final upgrading. The kieved product will be bagged and weighed ready for shipment.

The tailings will be disposed of in 3 separate area:

- 16
- a) Sulphide flotation tailing will be pumped to the final tailings disposal area.
  - b) The gravity tailing will be thickened and pumped to a separate tailings dam to enable the tailings to be available for future treatment.
  - c) The Kieve tailing will be stockpiled in an area adjacent to the plant for future treatment.

### 3.5 Infrastructure

#### 3.5.1 Plant and Mine

The infrastructure associated with the plant and mine will be:

Plant Buildings- A building will be provided for the cleaner tables, concentrate treatment and bagging. The building will be steel frame and clad with a concrete floor and overhead monorail beam for concentrate and Kieve handling.

Each of the mobile units will have a semi enclosed structure built over them after positioning.

The concentrate treatment building will have sufficient space for reagent and spare parts storage.

Administration Office - Transportable unit with space available for Site Manager, Plant Foreman and Mine Foremen.

Change Rooms - Transportable unit to cater for the planned workforce. No provision has been made for the contractors personnel.

### Services

- Power - Power will be taken from the existing HEC grid within Waratah town.
- Water Supply - Water will be pumped from the Waratah River above the falls via a pipeline to a fresh water storage tank in the plant area.

#### 3.5.2 Housing

Provision of three 3 BR houses for the senior operations and a single mens quarters capable of accommodating 10 people, will be made on land within the existing Waratah town area.

#### 3.5.3 Site Works

The area for the stockpile and process plant will be cleared and graded for adequate drainage and optimum equipment location.

#### 3.5.4 Light Vehicles

Four light vehicles will be provided to cater for the activities associated with the operation.

### 3.6 Operating

#### 3.6.1 Mine

The open pit mine will be operated by a Contractor under the supervision of the Mine Foreman. The Contractor will be responsible for all phases of the mining operation including the stockpile maintenance, grizzly clearing and secondary breaking. The mine will operate 1 shift per day, 5 days per week for 50 weeks of the year.

#### 3.6.2 Process Plant

The process plant will operate continuously for 5 days per week for 50 weeks of the year. Concentrate treatment and bagging will be carried out in batch operation on day shift only.

The expected consumable and reagent consumptions at the 6.75 tph throughput rate will be:

	<u>CONSUMPTION</u> kg/tonne
Balls	1.0
Sulphuric Acid	1.0
Copper Sulphate	0.1
Xanthate	0.2
Talc Depressant	0.5
Frother (MIBC)	0.03
Hocculant	0.02

Maintenance will be carried out on Saturdays and as necessary during the operating period.

### 3.6.3 Housing

The Single Mens quarters will be operated on a fully serviced basis for the 5 working days and on a casual meal basis for the weekend days.

**SECTION FOUR****ENVIRONMENT**

An Environmental Impact Statement (EIS) will have to be prepared for presentation to the Tasmanian Government prior to proceeding with the operation. The existing data base is sufficient to allow the preparation of the EIS.

There are no foreseeable problems associated with obtaining the required approvals within the development programme envisaged.

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**SECTION FIVE**

**COST DATA**

**DETAILED CAPITAL/OPERATING COST  
ESTIMATE SHEET  
MT BISCHOFF  
PROJECT**

DESCRIPTION	UNIT	NO OF UNITS	UNIT PRICE	TOTAL
<b>Prestipping - Contractor</b>				
Drilling	met.	9560	8.00	76480
Blasting - AMPO	BCM	21224	0.30	6367
- SLURRY	BCM	31836	1.10	35019
Haul to Dump	BCM	75800	1.00	75800
Stockpile Area Formation Unit				<u>20000</u>
TOTAL PRE-STRIP				<u>213666</u>
<b>Vehicles</b>				
Utility	ea	1	20000	<u>20000</u>
TOTAL MINE				<u>233666</u>
<b>Mill and Mill Infrastructure</b>				
Coarse Ore Bin				256000
Crushing Section				324000
Grinding Section				372000
Flotation Section				539000
Gravity Section				369000
Concentrate Treatment				207000
Tailings Disposal				87000
Power Supply				60000
Water Supply				192000
Concentrate Buildings				84000
Unit Covering and Change Room				102000
Vehicles and Equipment				45000
Site Preparation & Miscellaneous				<u>36000</u>
TOTAL				2673000
DESCRIPTION	UNIT	NO OF UNITS	UNIT PRICE	TOTAL
<b>Housing</b>				
Houses 3BR Complete	ea	1	50000	150000
SMQ 10 Man Capacity				<u>25000</u>
				<u>175000</u>

## DETAILED CAPITAL/OPERATING COST

ESTIMATE SHEET  
MOUNT BISCHOFF  
PROJECT

DESCRIPTION	DIRECT \$	ENGINEERING \$	CONTINGENCY \$	TOTAL
<b>Summary</b>				
Mine Pre-strip	214000	-	-	214000
Mine Equipment	20000	500	1500	21500
Mill and Mill Infrastructure	2673000	134000	421000	3228000
Housing	175000	8750	26250	21000
Installation and Commissioning	<u>50000</u>	<u>2500</u>	<u>7000</u>	<u>59500</u>
TOTAL	<u>3132000</u>	<u>145750</u>	<u>455750</u>	<u>3733500</u>

CONTINGENCY % = 15

ENGINEERING % = 5

## SECTION SIX

## MANNING

6.1 Project Manning Disposition

## Site Manager

Head Office  
Professional Input

Part-time Typist/  
Clerk

1 Plant Superintendent	1 Mine Superintendent
1 Clerk/Typist	1 Clerk
1 Purchasing Officer/Stores Controller	2 General Hands
3 Crushing and Grinding Operators*	
3 Flotation and Gravity Operators	
1 Concentrate Treatment Operator	
2 General Hands	
2 Fitters/Boilermakers	
1 Fitters Assistant	

\* Shall be in charge of operation during afternoon and night shifts.

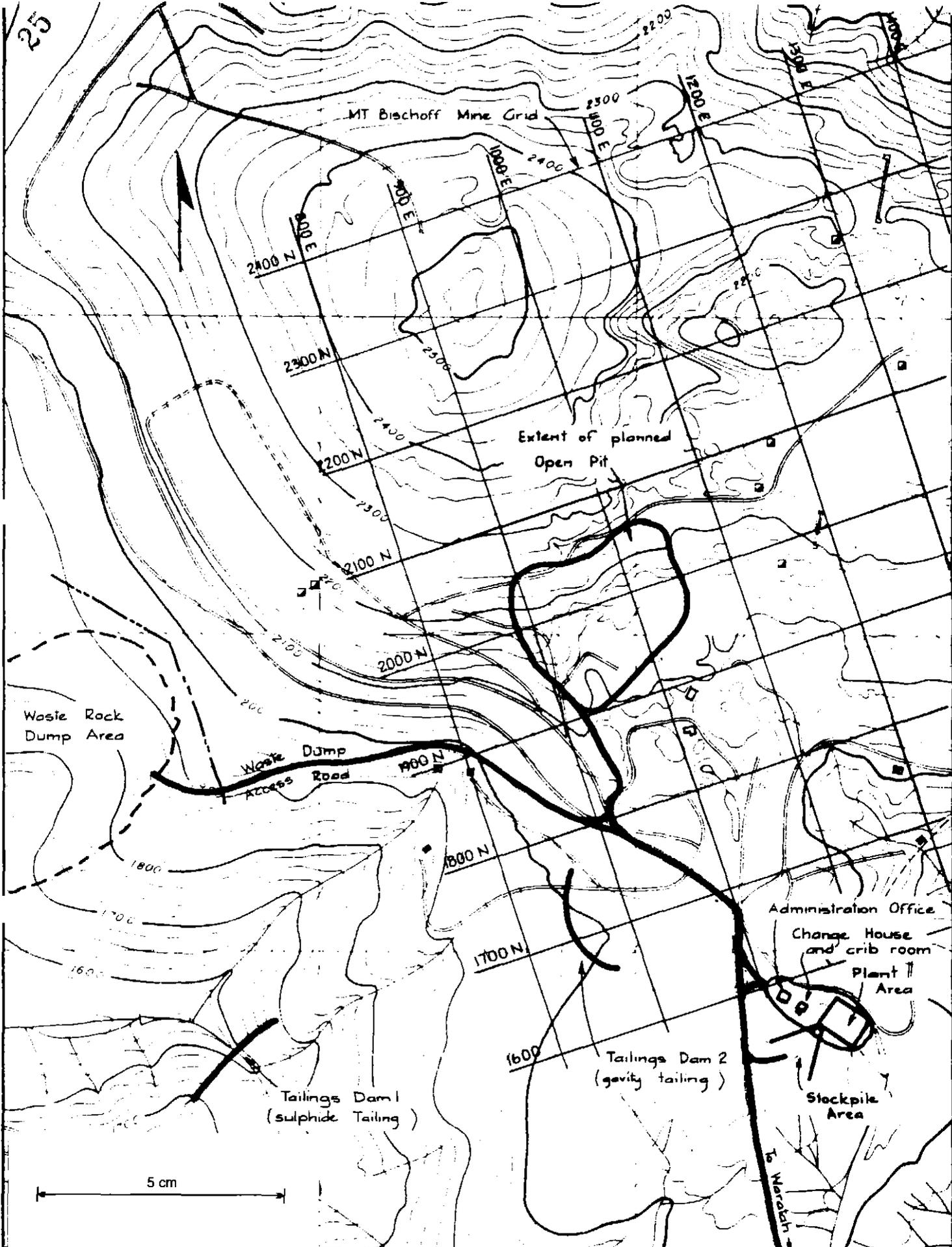
Summary

	<u>STAFF</u>	<u>AWARD</u>	<u>TOTAL</u>
Administration	1	-	1
Mining	1	3	4
Process Plant	3	9	12
Maintenance	-	3	3
	<u>5</u>	<u>15</u>	<u>20</u>

**SECTION SEVEN**

**DRAWINGS**

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MT. BISCHOFF JOINT VENTURE  
 MININIUM PRODUCTION CASE  
 MINE AREA LAYOUT

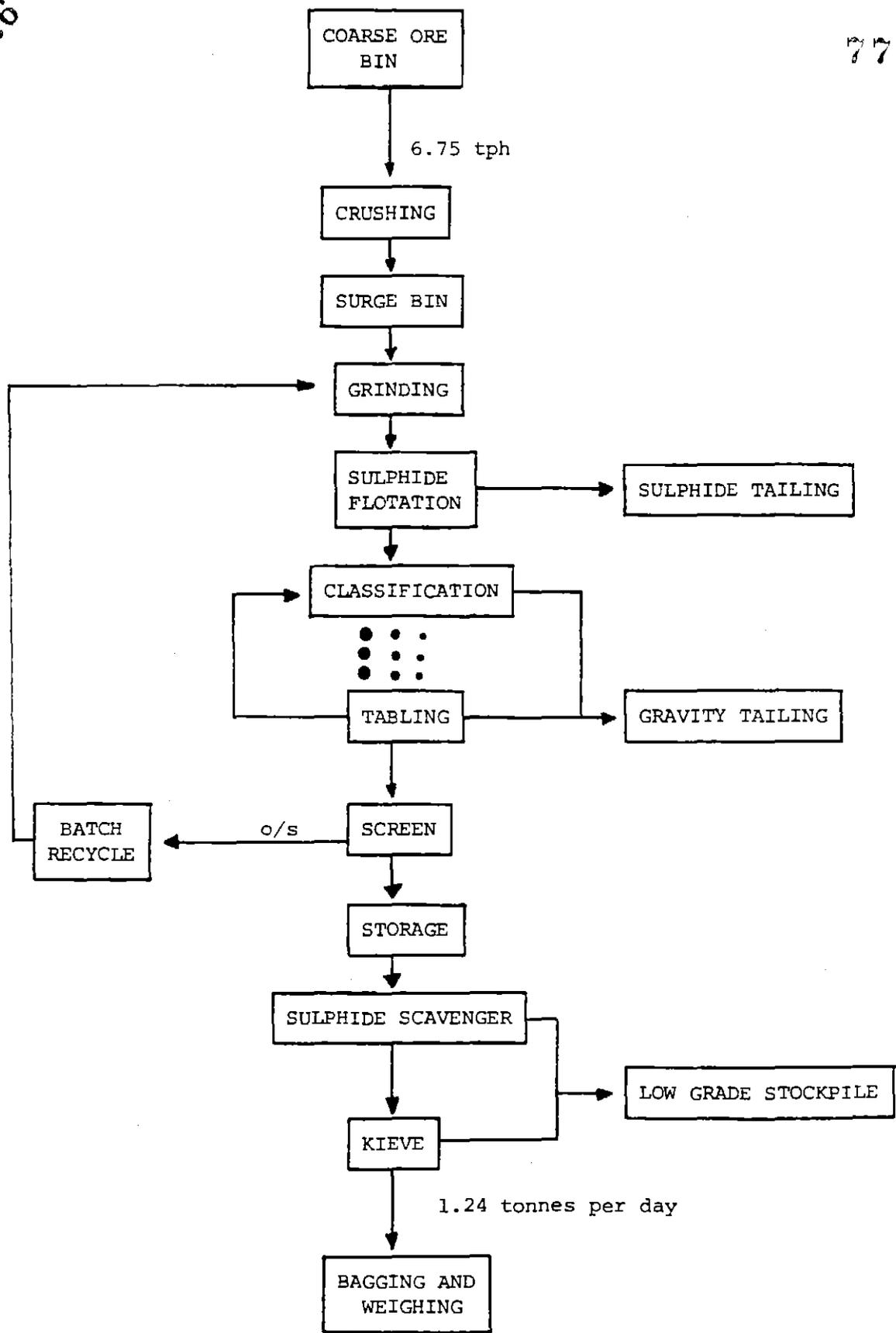
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Sketch 2



MINIMUM PRODUCTION CASE  
FLOWSHEET FOR MT. BISCHOFF DSL ORE

**Caravan Mill,  
a mobile plant  
from Sala**

### THE SALA CARAVAN MILL

The original mobile ore dressing plant, wellknown under the name SALA CARAVAN MILL, consisted of a 4-trailer unit with a nominal capacity of 100 TM/24 hours. It was designed for flotation of one single concentrate. This CARAVAN MILL design has now been on our product line since 1970.

Recently minor modifications have been made on various requests from customers.

The two factors that determine the capacity of the unit are the size of the grinding mill and the energy input to the grinding mill. Slight modifications to the SALA CARAVAN MILL has allowed the total capacity to be raised up to 200 TM/24 hours. The capacity will, however, vary depending on such properties as grindability of the ore and other characteristics. This has been accomplished by standardizing on a  $\varnothing$  1800 x 2400 mm grinding mill powered by a 110 kW electric drive motor. The size of the power generator has consequently also been increased. Where electric power is available locally the power generator may be excluded. Electric control cubicles will remain on each of the other trailers.

Also the flowsheet for the crushing unit has been modified to accomodate the increased capacity. The ore feed is first allowed to pass over a two-decked screen. The +25 mm material is taken to the jaw crusher. Material 6 - 25 mm is fed to the cone crusher and the -6 mm material is taken directly to the grinding mill.

In those application where a selective floatation process is contemplated a second floatation unit must be included. Please see the enclosed specification for this alternative.

Drawing 148 971 shows the CARAVAN MILL arranged for a single product floatation.

To further enhance the adaptability of the SALA CARAVAN MILL two gravimetric trailer units have been developed. Available is either a concentrating table unit or a spiral concentration unit.

For most applications a combination of those two units will be needed to give the best metallurgical results.

Drawing 148 930 shows the CARAVAN MILL arranged for gravimetric separation.

The concentrating table unit is equipped with a tripple deck concentrating table of Deister-Concenco design with outlets for tailings, middlings and concentrate.

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The spiral concentration unit is equipped with primary as well as secondary spirals plus two concentrating tables for final control. The spirals are Sala-Trelleborg 5-turn units arranged in two groups for primary and one group for secondary separation, each group consisting of 6 spirals.

Details on the gravimetric units are attached.

To handle the final concentrate our experience shows that the concentrate is best pumped to a sedimentation pond for de-watering. A suitable arrangement of such a pond is illustrated on drawing A4-139-958. After de-watering the final product is taken out by a front end loader or equivalent equipment to storage or further transport.

Since first introduced the SALA CARAVAN MILL has been subject to modifications and improvements called for field testing and experience. Today the CARAVAN MILL represents a sturdy design capable to meet any exhausting and rugged demand in the field.

Reference List

Customer	Delivery year	No. of concentrates containing
Omlev Mining and Industrial Corp., Philippines	1970	1 Cu, Au
Ministry of Mines, Iran (Colle Maaden)	1972	1 Cu
Ministry of Mines, Iran (Colle Maaden)	1973	1 Cu
Felezafe Yazd, Iran	1973	2 Zn, Pb
Hindustan Zinc Ltd., India	1974	2 Zn, Pb
Mindeco, Zambia	1974	1 Cu
Korea Equipment Import Corp., D.P.R. of Korea	1974	1 Pilot plant, various minerals
Jugometal, Jugoslavljen (Zajaca)	1975	2 Sb, Zn

31

FLWSHEETS	1
<del>POWER UNIT</del>	2
CRUSHING UNIT	3
ROD MILL GRINDING UNIT	4
BALL MILL GRINDING UNIT	5
FLOTATION UNIT	6
CONCENTRATING TABLE UNIT	7
SPIRAL CONCENTRATION UNIT	8
COMMON FOR EACH PLANT	9
MISCELLANEOUS	10
WEIGHT AND AXLE PRESSURE	11

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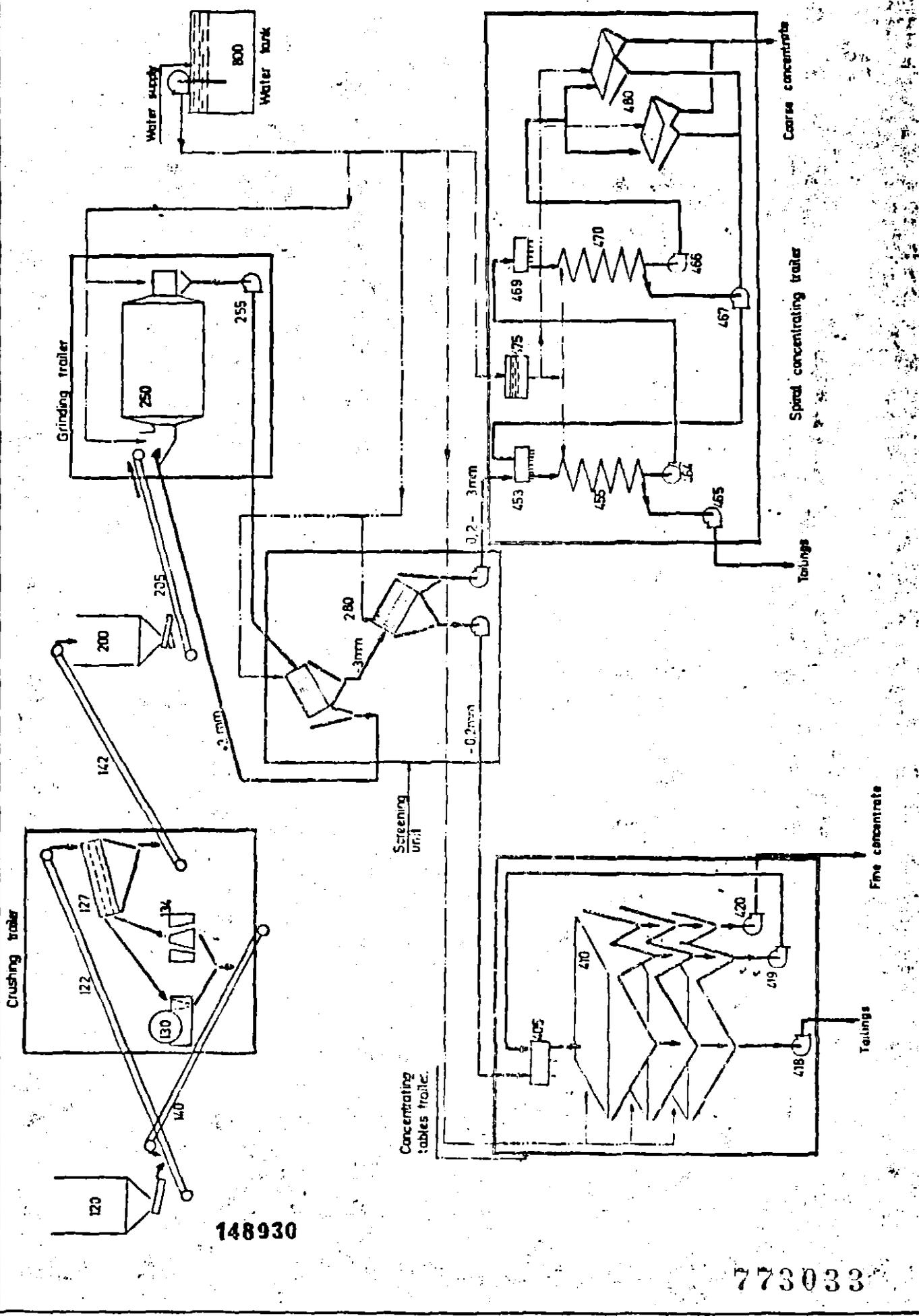
**SALA**

SALA · SWEDEN

CARAVAN MILL

Gravity Separation - Flowsheet

06/74



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33

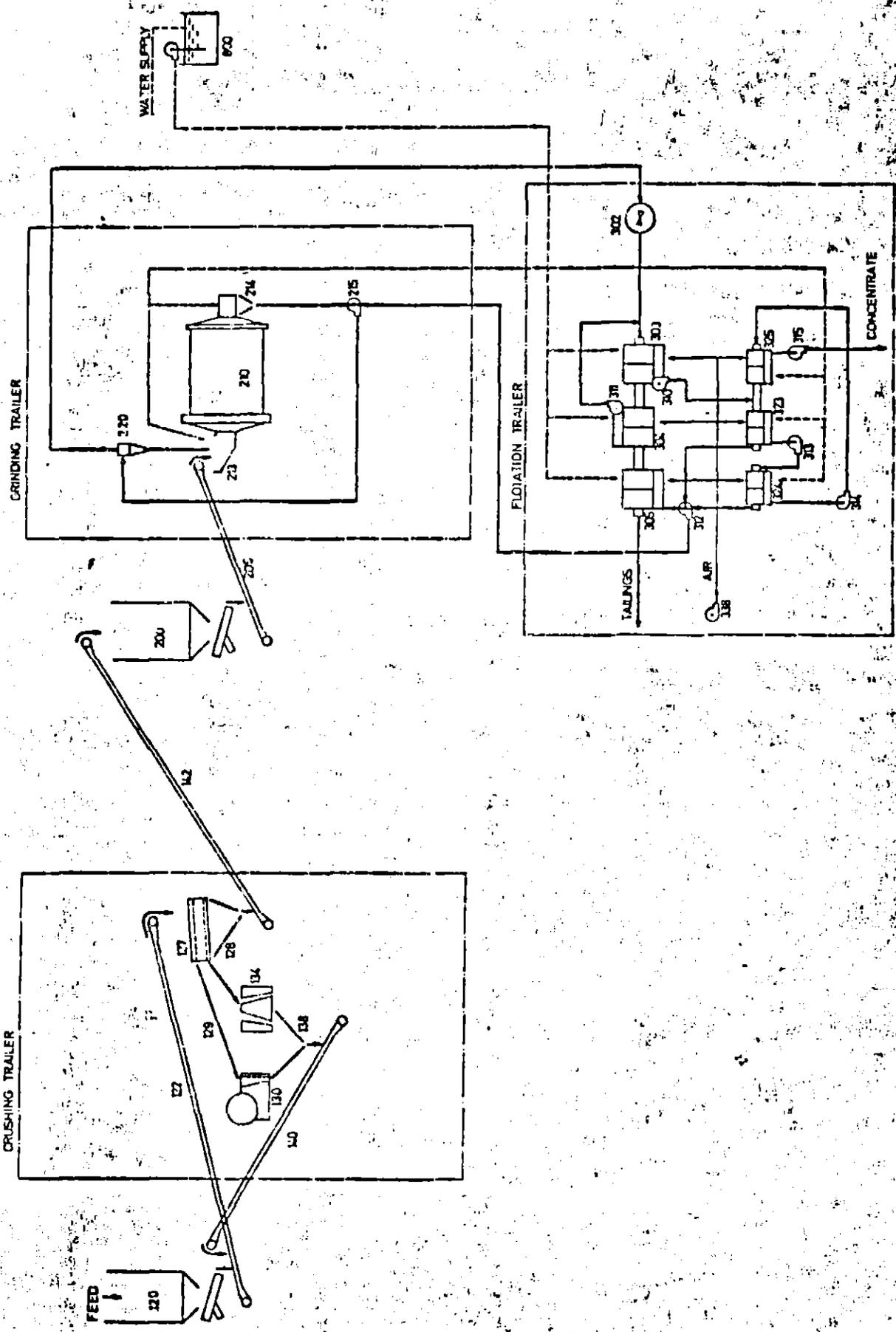
# SALA

SALA · SWEDEN

## CARAVAN MILL.

### Flotation of one product - flowsheet

06/74



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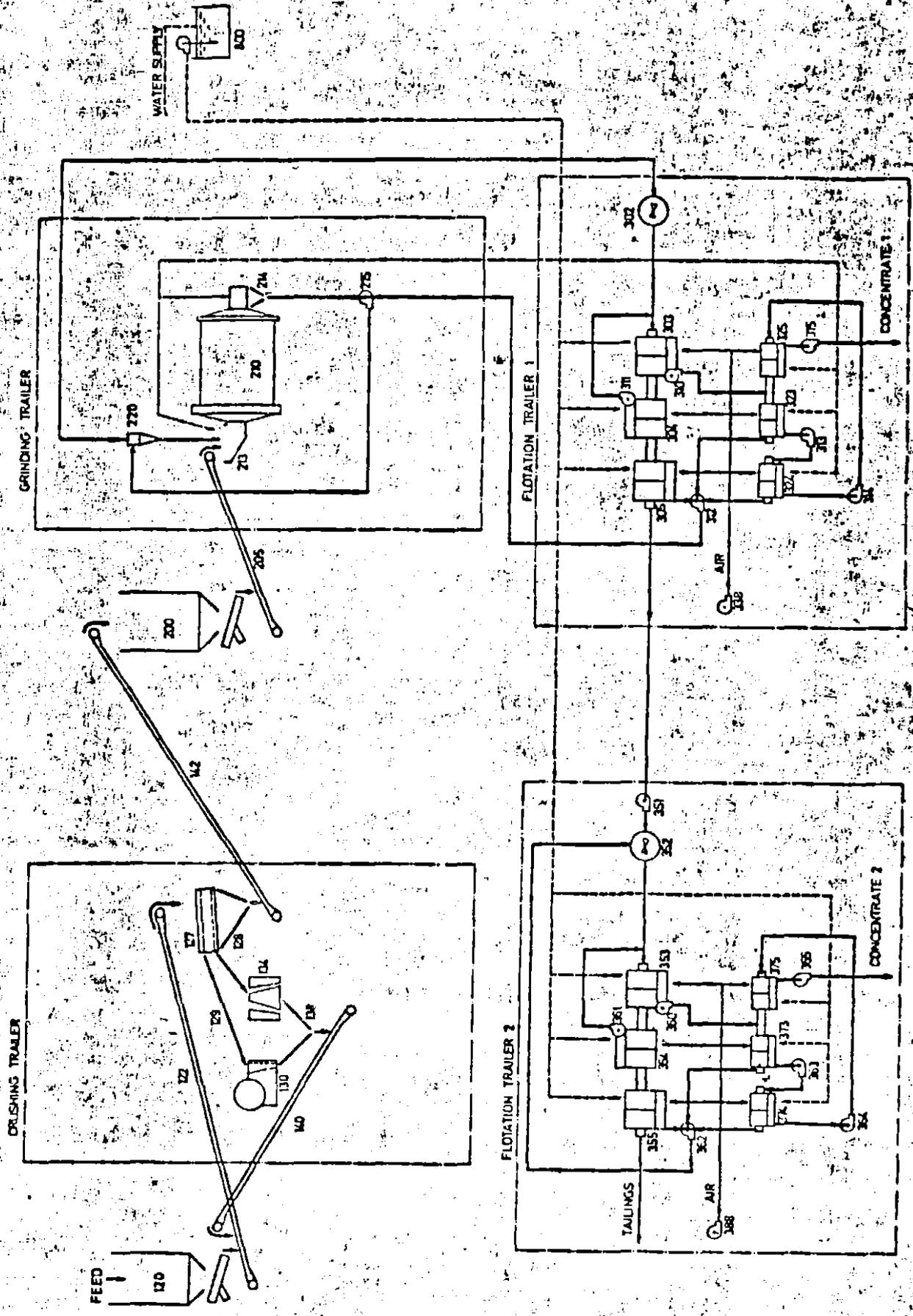
34

**SALA**

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CARAVAN MILL

Flotation of two products - flowsheet



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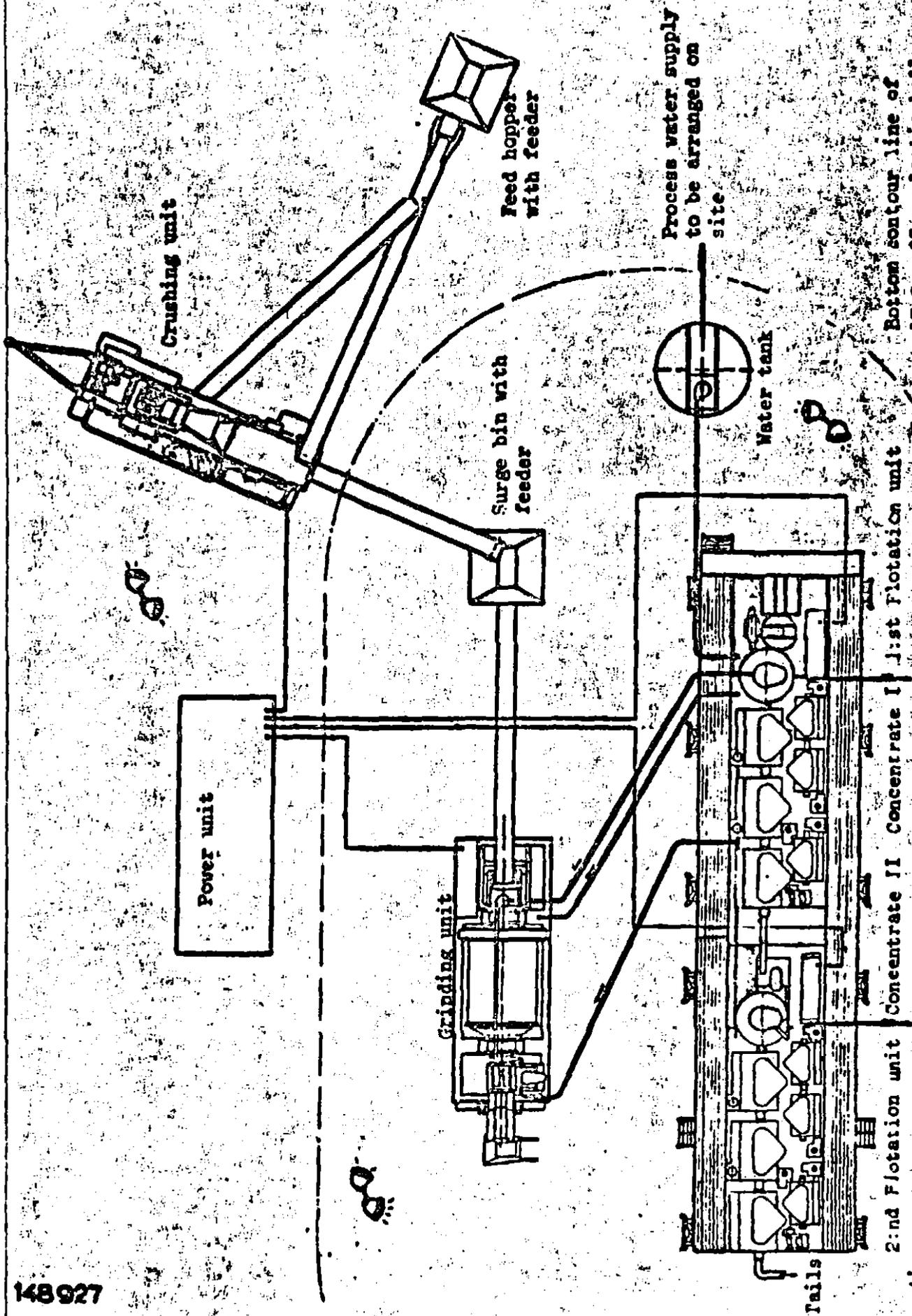
**SALA**

SALA SWEDEN

CARAVAN MILL

Arrangement of a plant with two flotation units

06/74



Crushing unit

Feed hopper with feeder

Process water supply to be arranged on site

Surge bin with feeder

Water tank

Power unit

Grinding unit

1st Flotation unit

Concentrate I

2nd Flotation unit

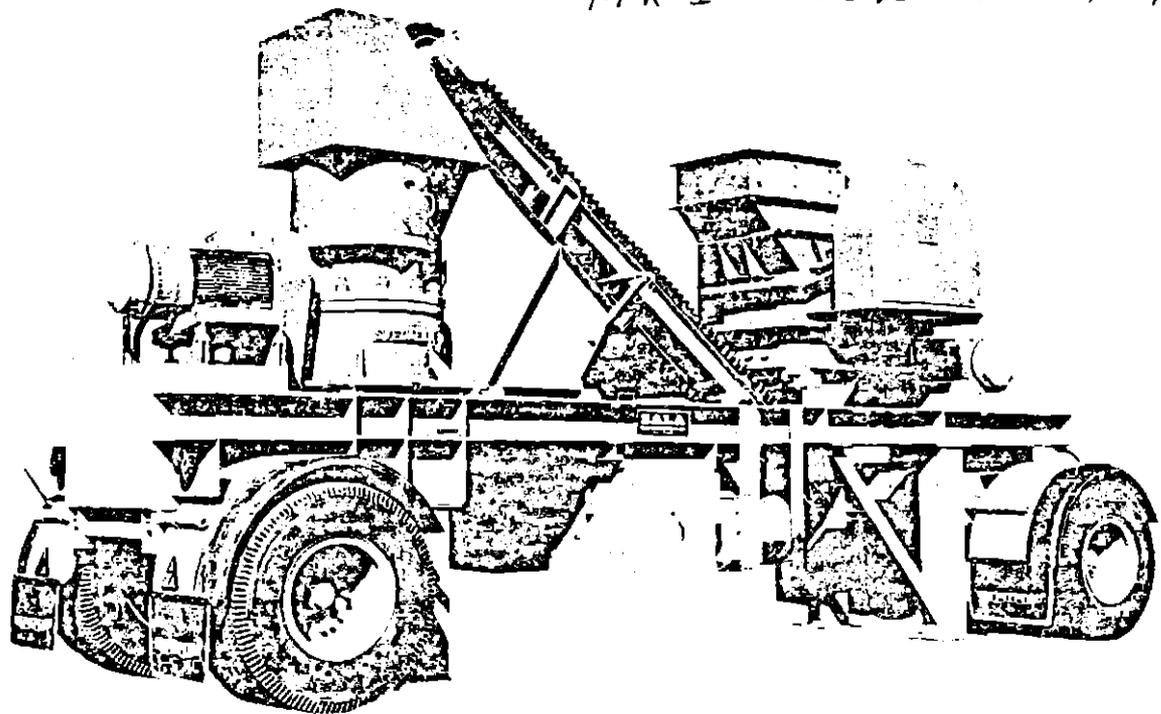
Concentrate II

Tails

Bottom contour line of 17.5 x 35 m plastic hall

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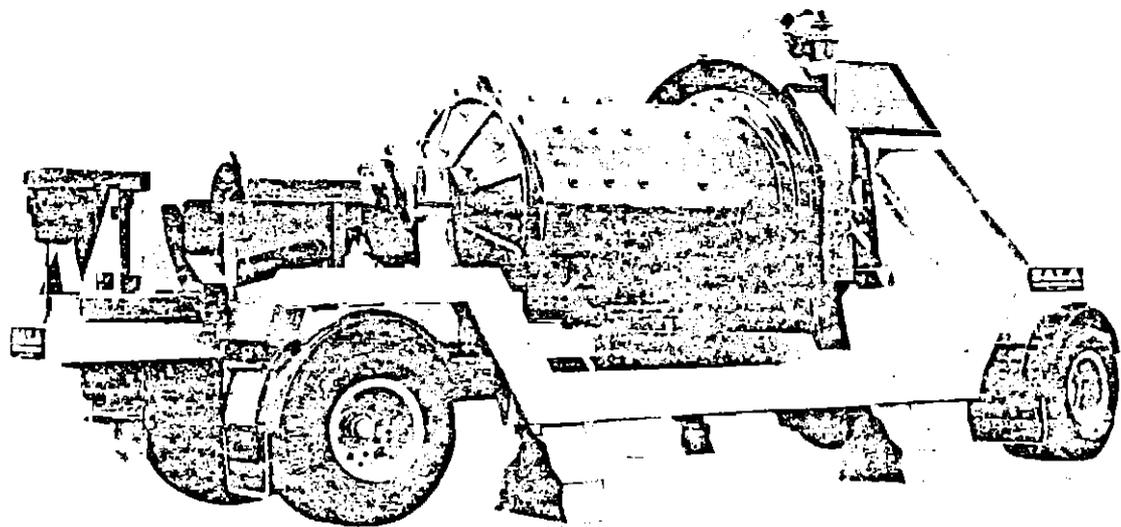
### Crushing unit

The crushing trailer carries a two-stage crushing unit with a primary jaw crusher type Svedala R 4025-60 with feed opening 400x250 mm (16"x10"), max. feed size 200 mm (8") and a capacity of about 7 MT/h when crushed to -25 mm (1").

The ore from the primary crusher is fed via a rubber pan belt conveyor to a 22" hydrocone crusher with a capacity of about 7 MT/h at a discharge of -5 mm (3/16").

All equipment can be operated from a central panel in a box containing contactors, transformers, fuses, indicating lamps and push buttons. This box is readily connected to the electric power station trailer.

Overall length 7.0 m (23 ft)  
 Overall height 3.6 m (12 ft)  
 Weight 14.8 MT



### Grinding unit

This grinding and classification unit consisting of a ball mill dia. 1500x2000 mm length (5 ft x 6 1/2 ft), overflow type, with 75 hp motor and a hydraulic coupling. Charge weight 6 MT of steel balls.

For classification a 6" hydrocyclone type Krebs D6B is installed.

Feeding the cyclone is done by an SPV-260 vertical pump (3"). All electric equipment is arranged in the same way as for the crushing unit.

Overall length 8.0 m (26.4 ft)  
 Overall height 3.4 m (11.2 ft)  
 Weight 16.7 MT

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CARAVAN MILL

06/74

TECHNICAL SPECIFICATION

Crushing unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
120	1	Feeding station consisting of feed hopper and reciprocating feeder. On top of the feed hopper is a screen to prevent too big lumps to be fed to the jaw crusher. Incl. motor 1,1 kW and cable for connection to the contactor cubicle on the crushing trailer.
122	1	Belt conveyor. Belt width 500 mm, length 16 m, incl. feeding chute and discharge chute. Incl. motor 4,0 kW and cable for connection to the contactor cubicle on the crushing trailer.
125	1	Chassis consisting of frame, wheel units and under-carriage. Incl. mountable support legs.
127	1	Vibrating screen for screening off fines below 6 mm. Motor 4 kW. Double deck's size 800 x 2000 mm.
128	1	Supporting frame and trough for fines from screen.
129	1	Feed hopper for crushers.
130	1	Jaw crusher, feed opening min. 500 x 260 mm, incl. motor 42,5 kW and V-rope transmission.
134	1	Secondary crusher, 22" cone crusher. Incl. motor 21 kW, V-rope transmission and oil circulation unit.
138	1	Trough below crusher outlet.
140	1	Belt conveyor. Belt width 500 mm, length 11 m. Incl. feed chute and transfer chute between this conveyor and the ore feeding conveyor. Also incl. motor 2,2 kW and cable for connection to the contactor cubicle on the crushing trailer.
142	1	Belt conveyor. Belt width 500 mm, length 8 m. Incl. feeding chute and motor 2,2 kW with cable for connection to contactor cubicle on crushing trailer.
150	1	Contactoer cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps. Incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 35 kW.
160	1 set	Spare parts according to separate list.

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CRUSHING UNIT

06/74

1 (2)

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
<u>Jaw crusher AR60M</u>		
3	Jaw plate, fixed	217911-1
3	Jaw plate, moveable	217912-1
2	Toggle plate	28389-C
1	Rod	427231-A
1	Fixing bar	34303-A
1	Fixing bar	323289-1
4	Screw	323290-A
1	Fixing plate upper	323957-A
1	Fixing plate lower	323965-A
3	Cheek plate, left, upper	323958-1
6	Cheek plate, left, lower	323958-2
3	Cheek plate, right, upper	323962-1
6	Cheek plate, right, lower	323962-2
12	Screw for cheek plate	
4	Adjustment screw	422974-1
4	Spherical washer	416510-1
1	Spring	223205-22

Cone crusher 22"

1	Seal	214501-1
8	Spring	44056-2
8	Spring sleeve	44056-1
1	Eccentric bushing, outer	317385-1
1	Eccentric bushing, inner	317386-1
3	Top shell	23219-1
3	Bottom shell	23218-A

Vibrating screen FV-0820-22

1	V-belt pulley $D_d=257$	32975
1	V-belt pulley $D_d=187$	43116
2	Distance tube	32972-4
8	Washer for compression spring	42538-1
8	Compression spring	42538-3
16	Cross support	44030-5
8	Screw	49960-C
4	V-rope B-97	430056-15
3	Screen cloth, upper deck	42135
3	Screen cloth, lower deck	42135
6	Tension bar	32963

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<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
-------------	--------------------	-------------------

Electric Spares

1	Slipring unit for jaw crusher motor	
1	Ditto for cone crusher motor	
1	Carbon brush set jaw crusher motor	
1	Ditto for cone crusher motor	
1	Contacto coil for DEG 160	4189112
1	Ditto for DEG 80	4159212
1 set	Contact fingers for DEG 160	5309560-A
1 set	Ditto for DEG 80	5309559-A
1 set	Resistor spiral for jaw crusher starter	
1 set	Ditto for cone crusher starter	
1	Oil pump motor	
1	Motor circuit breaker DEG 20	4325183
1 set	Fuses	

Belt conveyors

40 m	Conveyor belt, width 500 mm	
5 set	Carrying rollers	
4 set	Return rollers	
1	Gear box TV 52	
1	V-belt transmission	
12 set	V-belts	
2	Belt scraper	
20 m	Rubber rim for belt sides	

Reciprocating feeder

1 set	Bearings	
1	Eccentric drive	
3 set	V-belts	

40

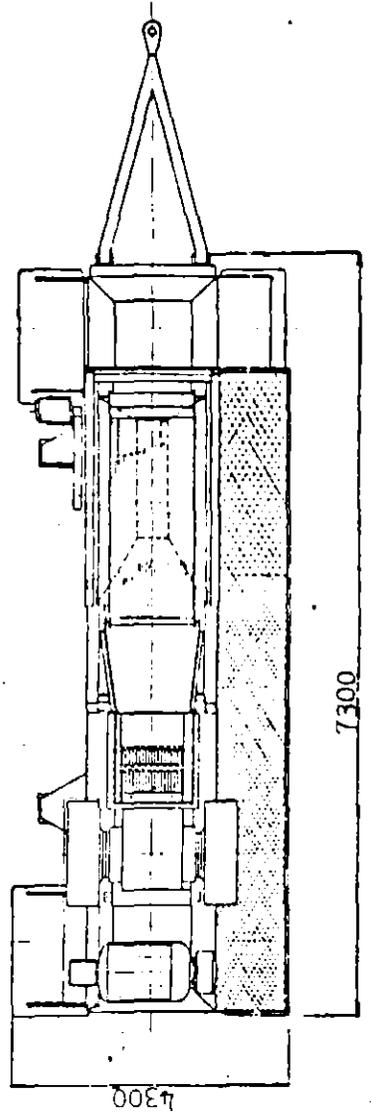
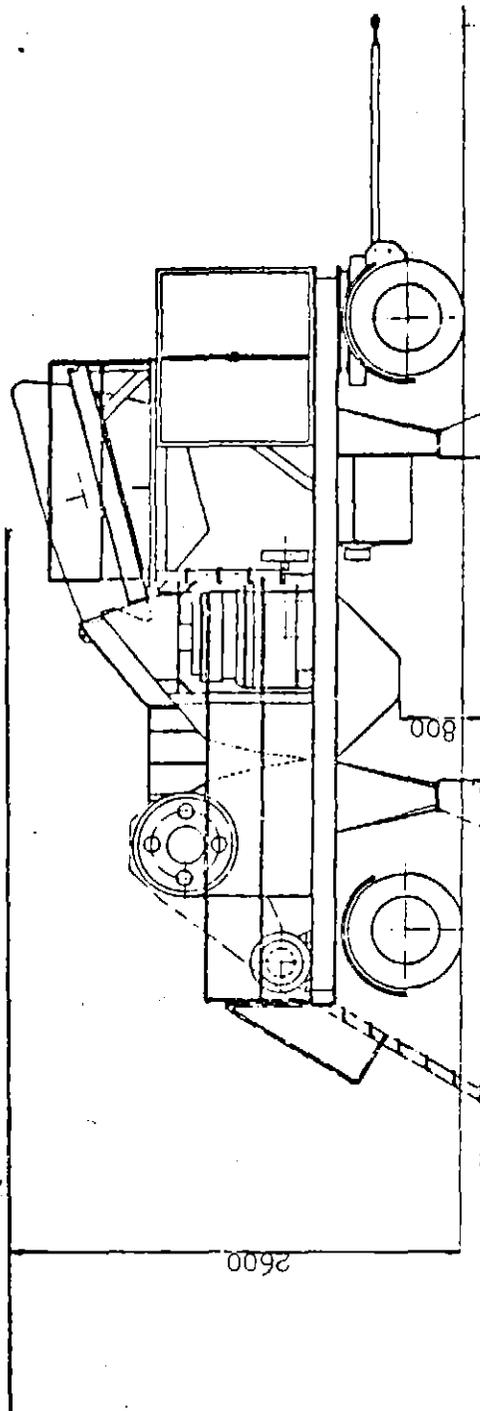
**SALA**

SALA · SWEDEN

CARAVAN MILL

Crushing units

06/74



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**SALA**

SALA · SWEDEN

CARAVAN MILL

TECHNICAL SPECIFICATION

06/74

Rod mill grinding unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
200	1	Surge bin, volume 4 m <sup>3</sup> with vibrating feeder incl. cable for connection to contactor cubicle on grinding trailer.
205	1	Belt conveyor. Belt width 500 mm, length 10 m incl. feeding chute and discharge chute. Also incl. motor 2,2 kW and cable for connection to contactor cubicle on grinding trailer.
208	1	Chassis consisting of frame, wheel units and under-carriage. Incl. mountable support legs.
250	1	Rod mill size $\emptyset$ 1800 x 2400 mm inside shell, with rubber shell lining and steel head lining, excl. rod charge. Motor 110 kW and transmission.
253	1	Rod mill inlet chute.
254	1	Outlet trough.
255	1	Vertical pump, type SPV-260, incl. 7,5 kW motor.
260	1	Contactor cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps. Incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 125 kW.
270	1 set	Spare parts according to separate list.
280	1	Separate Screening unit consisting of 1 single drum trommel screen with screen openings 3 mm, 1 double drum trommel screen with double cloth for separation at 0,2 mm, two only sump pumps, type VASA GS 2" with sumps, launder for +3 mm material to rod mill inlet, steel frame work with internal pipe lines and electrical equipment. Plug-in socket for external power supply. The screening unit will be delivered separate to be placed close to the rod mill grinding unit for operation. Total installed power ca 10 kW.

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CARAVAN MILL - SPARE PARTS

06/74

GRINDING UNIT

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
-------------	--------------------	-------------------

Rod Mill Ø 1800 x 2400

- |       |                            |  |
|-------|----------------------------|--|
| 1     | Drive pinion               |  |
| 5     | V-ring for feed trunnion   |  |
| 5     | Trommel screen cloth       |  |
| 1     | Rubber shell lining        |  |
| 1     | Manganese steel head liner |  |
| 1 set | Lifter bars for shell      |  |
| 1     | Feed trunnion liner        |  |
| 1     | Feed spout elbow           |  |

Pump SPV-260

- |       |                       |         |
|-------|-----------------------|---------|
| 2     | Pump housing, Ni-hard | 55489-A |
| 4     | Impeller, Ni-hard     | 21435-C |
| 2     | Inlet, Ni-hard        | 70258-A |
| 1 set | V-ropes               |         |

Electric spares

- |       |                                 |             |
|-------|---------------------------------|-------------|
| 1     | Slipring unit for motor MARF 27 | 4371017-A   |
| 1     | Carbon brush set                | 43910873415 |
| 1     | Contact coil DEG 315            | 4189212     |
| 1     | Contact coil DEG 315            | 4129112     |
| 1 set | Contact fingers for DEG 315     | 5309561-A   |
| 1 set | Resistor spiral PBG-100         | 543011      |
| 1     | Motor for ASSA lubricator       |             |
| 1     | Motor circuit brake DEG-20      | 4325193     |
| 1 set | Fuses                           |             |

Vibrating Feeder for Item 200

- |   |               |  |
|---|---------------|--|
| 1 | Vibrator unit |  |
|---|---------------|--|

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SALA - SWEDEN

CARAVAN MILL - SPARE PARTS

06/74

SCREENING UNIT

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
<u>Trommel Screen</u>		
3	Screen cloth 3 mm apertures	
3	Screen cloth 1 mm apertures	
10	Screen cloth 0,2 mm apertures	
4	Carrying roller	TF6Z SKF
1	Complete drive end bearing	
	bearing housing	SKF SN 520
	bearing	SKF 122CK
	clamping sleeve	SKF H220
	felt sealing	SKF FS 370
	retaining ring	SKF FRB 18/180
1	Complete speed reducer	SALA TV-52

Sump pump VASA GS 2"

4	Pump housing, Ni-hard	
8	Impeller, Ni-hard	101840-M1
4	Inlet, Ni-hard	110059-M1
4	Pipe elbow	138603-M1

Electric spares

1	6p-motor, 1,5 kW, disp. 217	
1	4p-motor, 2,2 kW, disp. 214B	
1 set	Fuses	
1	Motor circuit breaker DEG 20	

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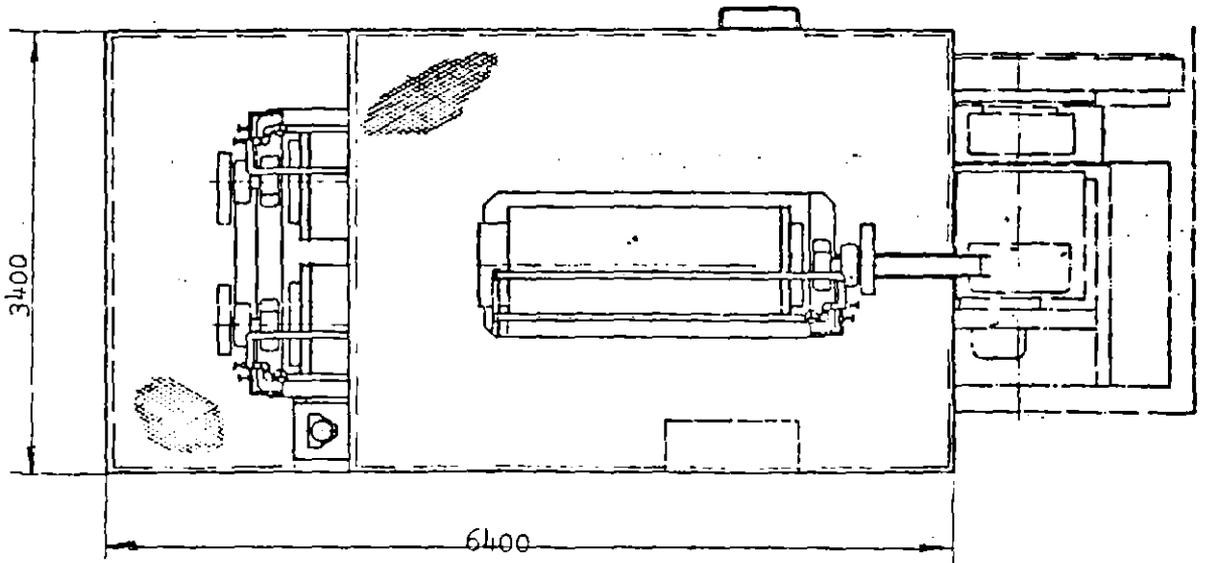
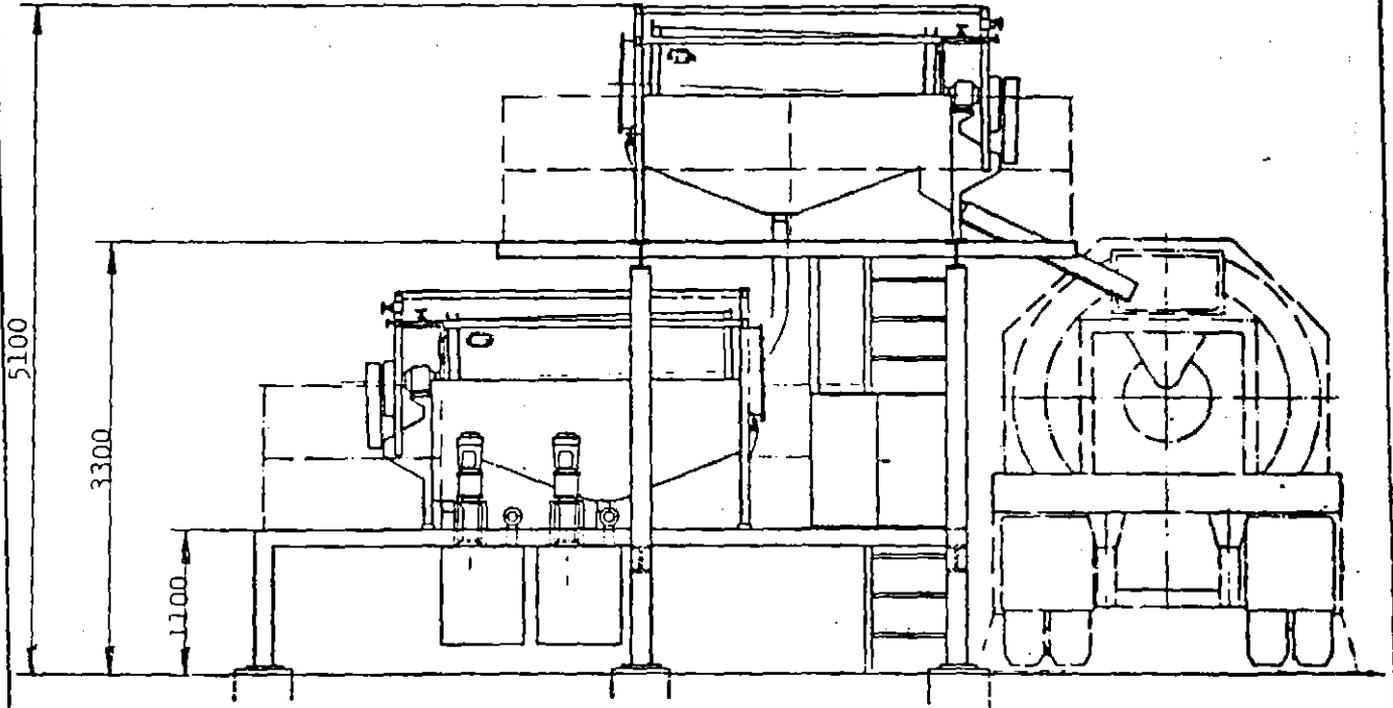
**SALA**

SALA · SWEDEN

CARAVAN MILL

Screening unit

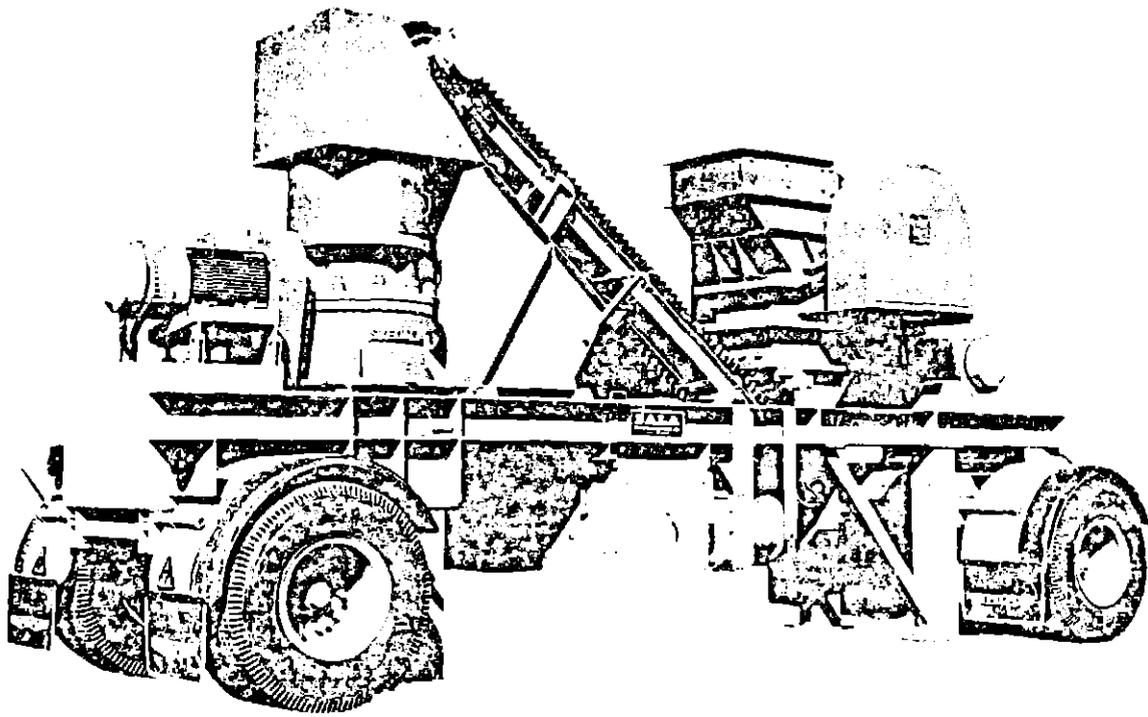
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### Crushing unit

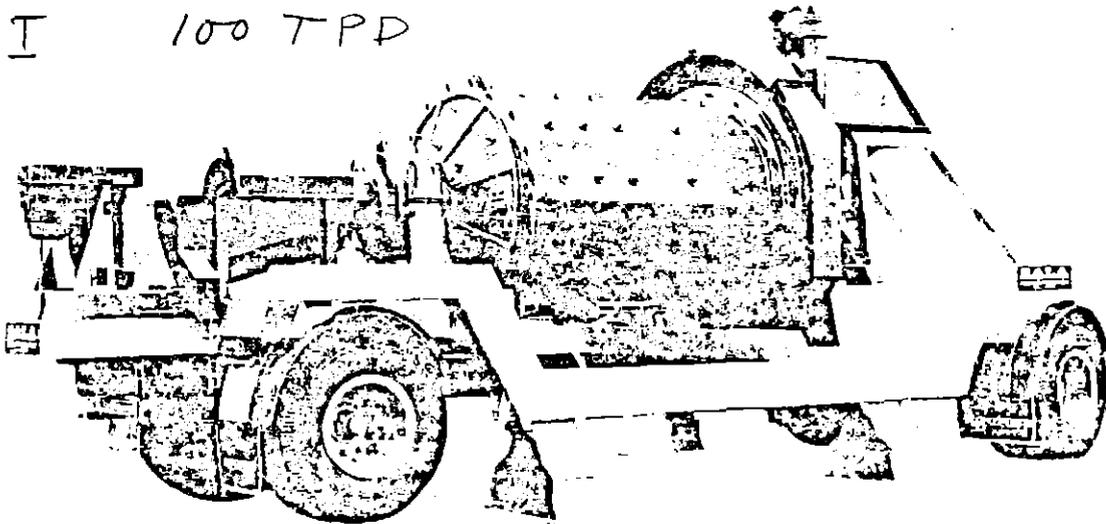
The crushing trailer carries a two-stage crushing unit with a primary jaw crusher type Svedala R 4025-60 with feed opening 400x250 mm (16"x10"), max. feed size 200 mm (8") and a capacity of about 7 MT/h when crushed to -25 mm (1").

The ore from the primary crusher is fed via a rubber pan belt conveyor to a 22" hydrocone crusher with a capacity of about 7 MT/h at a discharge of -5 mm (3/16").

All equipment can be operated from a central panel in a box containing contactors, transformers, fuses, indicating lamps and push buttons. This box is readily connected to the electric power station trailer.

Overall length 7.0 m (23 ft)  
 Overall height 3.6 m (12 ft)  
 Weight 14.8 MT

Mk I 100 TPD



### Grinding unit

This grinding and classification unit consisting of a ball mill dia. 1500x2000 mm length (5 ft x 6 1/2 ft), overflow type, with 75 hp motor and a hydraulic coupling. Charge weight 6 MT of steel balls.

For classification a 6" hydrocyclone type Krebs D6B is installed.

Feeding the cyclone is done by an SPV-360 vertical pump (3"). All electric equipment is arranged in the same way as for the crushing unit.

Overall length 8.0 m (26.4 ft)  
 Overall height 3.4 m (11.2 ft)  
 Weight 16.7 MT

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**SALA**

SALA · SWEDEN

CARAVAN MILLTECHNICAL SPECIFICATION

06/74

Ball mill grinding unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
200	1	Surge bin, volume 4 m <sup>3</sup> with vibrating feeder incl. cable for connection to contactor cubicle on grinding trailer.
205	1	Belt conveyor. Belt width 500 mm, length 10 m incl. feeding chute and discharge chute. Also incl. motor 2,2 kW and cable for connection to contactor cubicle on grinding trailer.
208	1	Chassis consisting of frame, wheel units and under-carriage. Incl. mountable support legs.
210	1	Ball mill size $\emptyset$ 1800 x 2400 mm inside shell, with rubber lining, great discharge type, excl. 9 tons ball charge. Motor 110 kW and transmission.
213	1	Ball mill inlet chute.
214	1	Outlet trough.
215	1	Vertical pump, type SPV-260, incl. 7,5 kW motor and mechanical variator for manual speed regulation.
218	1	Internal pipe system.
220	1	Hydrocyclone, type Krebs D6B, incl. hydraulic apex regulation.
230	1	Contacto cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps. Incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 125 kW.
240	1 set	Spare parts according to separate list.

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**SALA**

SALA - SWEDEN

CARAVAN MILL - SPARE PARTS

06/71

GRINDING UNIT

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
-------------	--------------------	-------------------

Ball Mill Ø 1800 x 2400

1	Drive pinion	
5	V-ring for feed trunnion	
5	Trommel screen cloth	
1 set	Rubber lining	
1 set	Lifter bars for shell, head and grate	
1	Feed trunnion liner	
1	Feed spout elbow	

Pump SPV-260

2	Pump housing, Ni-hard	55489-A
4	Impeller, Ni-hard	21435-C
2	Inlet, Ni-hard	70258-A
4	Nut for impeller	CPB75-C6
1	V-rope	

Hydrocyclone D6B

1 set	Rubber linings, complete	
-------	--------------------------	--

Electric spares

1	Slipring unit for motor MARF 27	431017-A
1	Carbon brush set	43910873415
1	Contactator coil DEG 315	4189212
1	Contactator coil DEG 315	4129112
1 set	Contactator fingers for DEG 315	5309561-A
1 set	Resistor spiral PBG-100	543011
1	Motor for ASSA lubricator	
1	Motor circuit braker DEG-20	4325193
1 set	Fuses	

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**SALA**

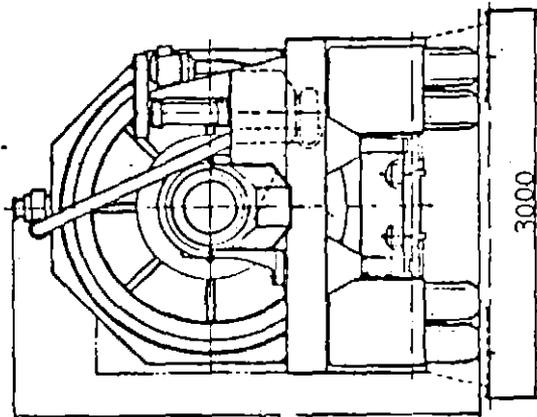
SALA · SWEDEN

CARAVAN MILL

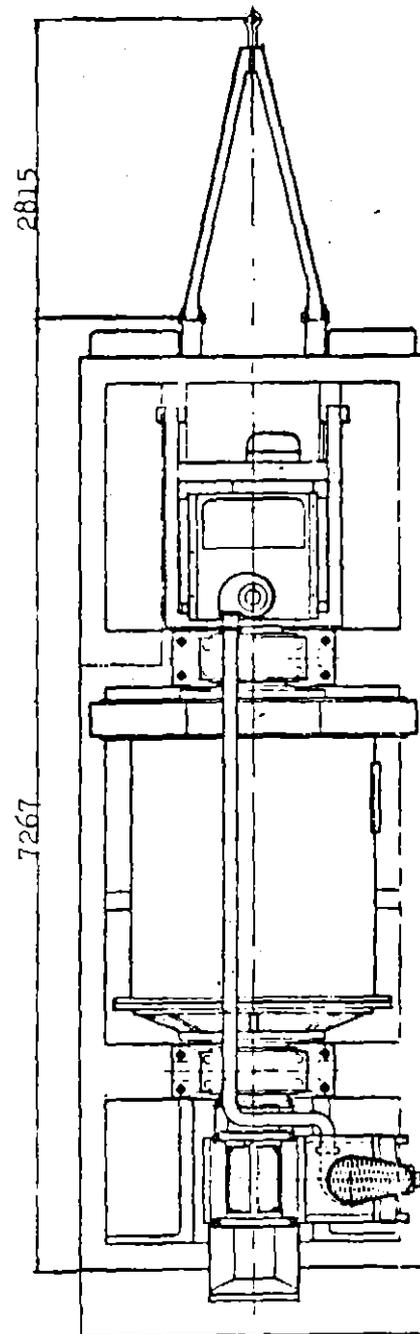
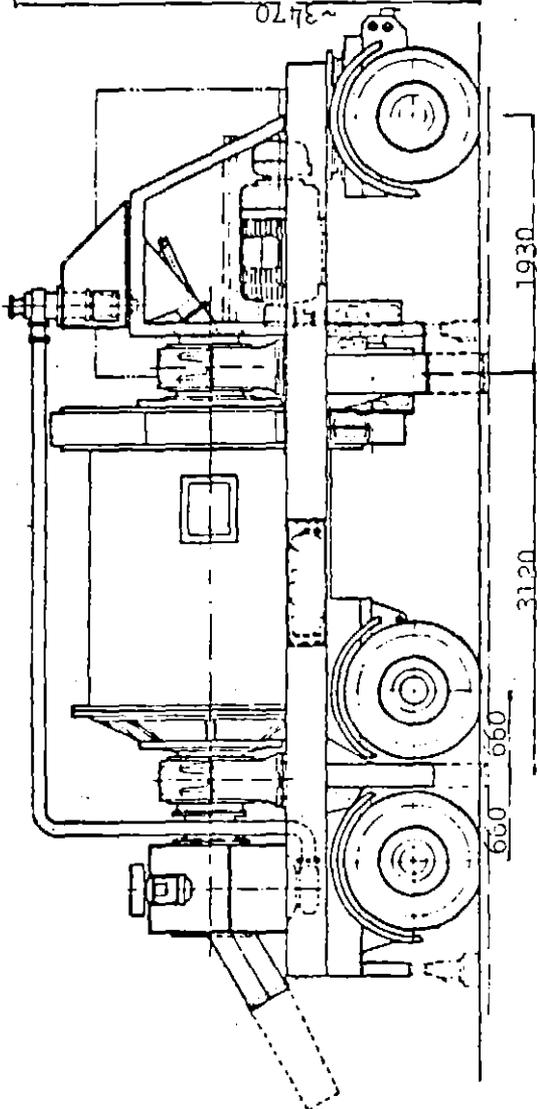
Grinding unit

Trailer number 2

06/74



02.78~



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For practical reasons we have standardized on the mill dimension  
 $\emptyset 1.8 \times 2.4$  m.

The reasons for this are many, but the most important are:

1. This is the maximum diameter mill that usually can be transported on public roads without special precautions.
2. Weight of the mill less grinding media will permit the use of a 2-axes wagon without any bogie within the international rules for axial and wheel pressures.

This is provided rubber lining is used, otherwise the weight of the mill will be too high.

We have also designed a wagon with bogie permitting steel linings.

3. Capacity of such a mill will match the capacity of the other units for medium hard ores and permit the use of a generator unit of about 400 kVA, which can also be mounted on one wagon.

The capacities listed apply under following conditions.

- A. Ball mill feed (= crushing unit product) should be 100% - 6 mm ( $k_{80} = 3600$  microns).
- B. Ore should be medium hard with a grindability corresponding to Bond's Work Index 15 kWh/tonne.
- C. Two different product sizes are considered:
  1. "coarse" = 80% - 200 mesh ( $k_{80} = 200$  microns)
  2. "fine" = 70% - 200 mesh ( $k_{80} = 95$  microns)

By applying the Bond formula:

$$W = W_i \times 10 \left( \frac{1}{\sqrt{P}} - \frac{1}{\sqrt{F}} \right)$$

we can then calculate the following specific energy consumptions: "coarse" 8.1 kWh/tonne, "fine" 12.9 kWh/tonne.

The mill motor will pull a maximum of 85 kW at 45% charge level and 24,3 rpm (75% of critical speed).

Maximum capacities for the above grinding duties are then  $85/8.1 = 10.5$  tonnes/h and  $85/12.9 = 6.6$  tonnes/h respectively.

For all other conditions we are only guaranteeing the above mill power of 85 kW on a specified capacity after grindability tests at our laboratory.

773050

Replacement ball size is determined by the following formula published by Bond:

$$B = (F/350)^{0.5} \left[ S \times W_i / C \times D^{0.5} \right]^{0.333}, \text{ in.}$$

With relevant figures inserted in this formula we get 2 in. or 50 mm balls for the above conditions.

Note that for harder ores capacity is proportional to  $(15/W_i)$  (for the same grind), but this will influence the ball size by the ratio  $\left(\frac{W_i}{15}\right)^{0.333}$ .  $W_i$  above should be calculated per tonne.

It should be noted that if bigger balls must be used (either due to coarser feed sizes or harder ores), this will influence the lining thickness, which will reduce mill power and thus further decrease mill capacity.

While usually the mill is likely to determine the capacity of a Caravan Mill on any potential duty, other component units should also be checked when giving capacity forecasts.

Flotation unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
300	1	Chassis consisting of frame, wheel units and under-carriage incl. mountable support legs.
302	1	Conditioner, type FLB 2,5 m <sup>3</sup> , incl. motor 4 kW.
303 304 305	3	Flotation machine, type BFP 60-2L, double cell, volume 2 x 0,62 m <sup>3</sup> , incl. motor 4 kW.
308	1	Internal pipe line system.
310- 315	6	Vertical sump pump 2", incl. motor 1,5 kW.
317- 320	4	Pump sump
323 324 325	3	Flotation machine, type BFP 30-2L, double cell, volume 2 x 0,22 m <sup>3</sup> , incl. motor 2,2 kW.
327	1	Lime mixer REB 0,7 m <sup>3</sup> , incl. motor 0,75 kW.
328	1	Reagent tank divided in 4 cells, each with volume 0,2 m <sup>3</sup> .
329	1	Portable propeller mixer for reagents, motor 0,75 kW.
330	1	Reagent distribution system consisting of 1 pump, type VASA, for lime water distribution, incl. motor 2,2 kW and 3 only diaphragm pumps for reagent distribution. Incl. reagent distribution pipe lines.
335	1	Frother distributor with 4-8 outlets, incl. motor 0,25 kW.
338	1	Air blower for flotation machines, capacity 420 m <sup>3</sup> /h at 1350 wg, incl. motor 7,5 kW.
340	1	Contacteur cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps. Incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 50 kW.
345	1 set	Spare parts according to separate list.
348	1	Tailings pump SPV-260 incl. motor 7,5 kW.

Second flotation unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
350	1	Chassis consisting of frame, wheel units and under-carriage, incl. mountable support legs.
351	1	Vertical pump, type SPV-260, incl. motor 5,5 kW.
352	1	Conditioner, type FLB 2,5 m <sup>3</sup> , incl. motor 4 kW.
353 354 355	3	Flotation machine, type BFP 60-2L, double cell, volume 2 x 0,62 m <sup>3</sup> , incl. motor 4 kW.
358	1	Internal pipe line system.
360- 365	6	Vertical sump pump 2", incl. motor 1,5 kW.
367- 370	4	Pump sump
373 374 375	3	Flotation machine, type BFP 30-2L, double cell, volume 2 x 0,22 m <sup>3</sup> , incl. motor 2,2 kW.
388	1	Air blower for flotation machines, capacity 420 m <sup>3</sup> /h at 1350 mm wg, incl. motor 7,5 kW.
390	1	Contacto cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps. Incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 55 kW.
395	1 set	Spare parts according to separate list.

**SALA**

SALA - SWEDEN

CARAVAN MILL - SPARE PARTS

06/74

FLOTATION UNIT

1 (2)

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
<u>Flotation machine type BFP-60-2L</u>		
6	Wearing disc, Ni-hard	51018-A
12	Guide segment, Ni-hard	52069-A
6	Impeller, Ni-hard	51017-M1
6	Cup nut	UHM 5/8
2	Roller bearing	SKF 6309
2	Shaft nut	SKF KM9
2	Lock washer	SKF MR9
3 sets	V-ropes	

Flotation machine type BFP-30-2L

2	Wearing disc with guide segment	53390-A
2	Impeller, Ni-hard	53391-M1
20	Wedge bolt	48617-1
1 set	V-ropes	

Conditioner

1	Impeller	58592-M1
1 set	V-ropes	

Reagent mixer

1	Impeller	12025-M6
1 set	V-ropes	

Sump pump SALA 2"

1	Complete pump incl. motor	
6	Impeller	138600-M1
1	Pump housing	138601-M1
3	Inlet cover	138602-M1
6	Pipe elbow	138603-M1
2	Strainer	138604-M1

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**SALA**

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CARAVAN MILL - SPARE PARTS

06/74

FLOTATION UNIT

2 (2)

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
<u>Lime Water Pump VASA 161-1</u>		
1	Pump housing	101917-M1
1	Impeller	101918-M1
1	Wear disc	101919-M1
1	Shaft sleeve	101924-1

Diaphragm pump for reagents

1	Complete pump	
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Air blower Bahco type FKC 015-347

1 set	V-ropes	
1	Fan wheel	7425.0150
1 set	Fan parts	7435.0210
1 liter	Seal compound	

Electric spares

1	4p-motor, 2,2 kW, disp. 217	
1	4p-motor, 4,0 kW, disp. 217	
1	4p-motor, 1,5 kW, disp. 214B	
1	2p-motor, 7,5 kW	
5	Motor circuit breaker DEG 20	
1 set	Fuses	

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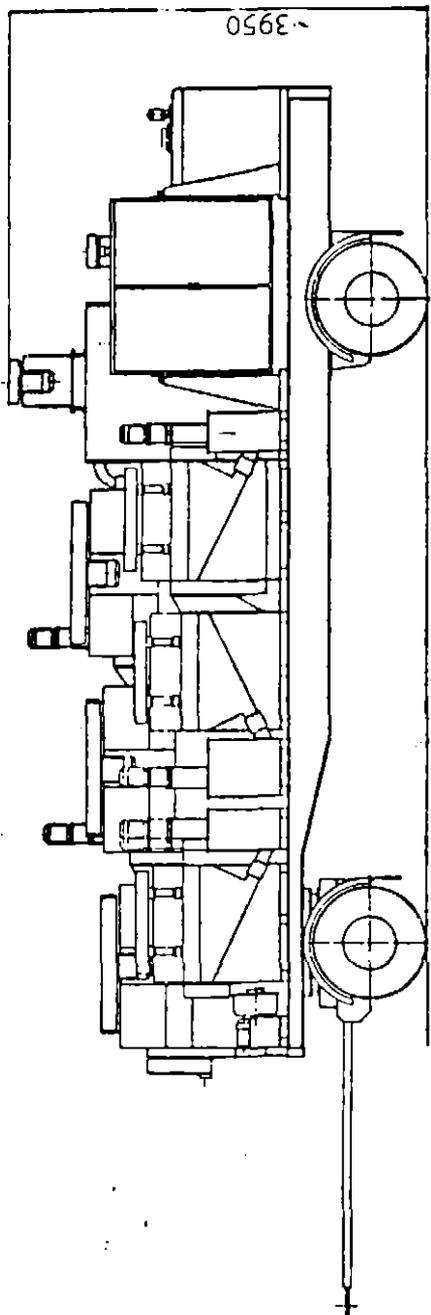
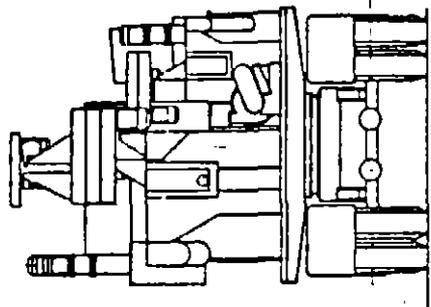
**SALA**

SALA · SWEDEN

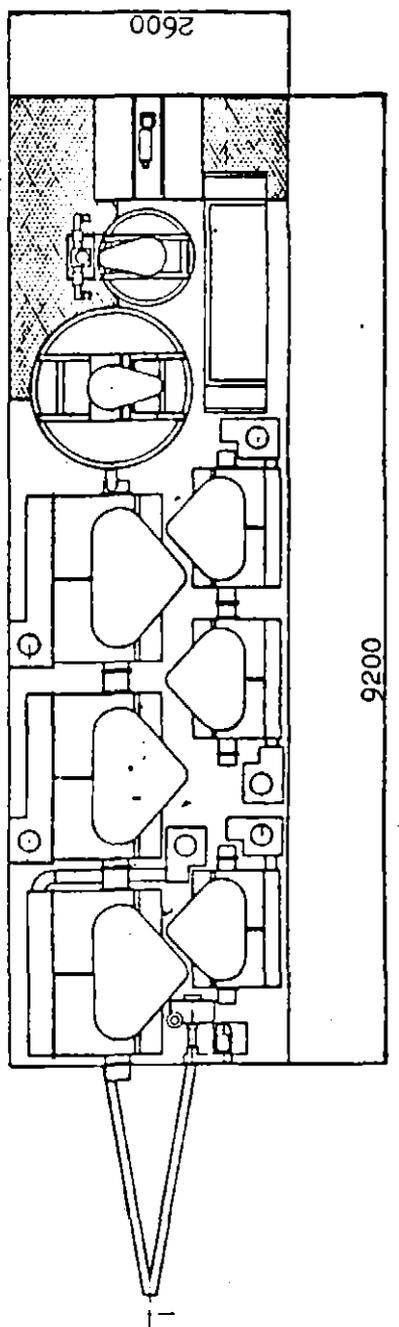
CARAVAN MILL

Flotation unit

06/74



~3950



2600

9200

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**SALA**

SALA - SWEDEN

CARAVAN MILLTECHNICAL SPECIFICATION

06/74

Concentrating table unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
400	1	Chassis consisting of frame, wheel units and under-carriage, incl. mountable support legs.
402	1	Frame work for suspension of the concentrating table.
405	1	Pulp distributor with 3 outlets.
410	1	Trippel deck concentrating table incl. product launders with outlets for tailings, middlings and concentrate. Complete with motor 2,2 kW and V-rope drive.
418	3	Sump pump, type VASA GS 2", incl. motor 2,2 kW.
419		
420		
425	1	Internal pipe line system.
430	1	Contactore cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps. Incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 15 kW.
435	1 set	Spare parts according to separate list.

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**SALA**

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CARAVAN MILL - SPARE PARTS

06/74

CONCENTRATING TABLE UNIT

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
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Concentrating Table

3	Ball and socket bearing drive end	SKF GE60ES
3	Ball and socket bearing concentrate end	SKF GE25ES
1 set	V-ropes	

Sump Pump VASA GS 2"

6	Pump housing, Ni-hard	
12	Impeller, Ni-hard	101840-M1
6	Inlet, Ni-hard	110059-M1
6	Pipe elbow	138603-M1

Electric Spares

1	Motor, 2,2 kW, disp. 214B	
1 set	Fuses	
1	Motor circuit breaker DEG 20	

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**SALA**

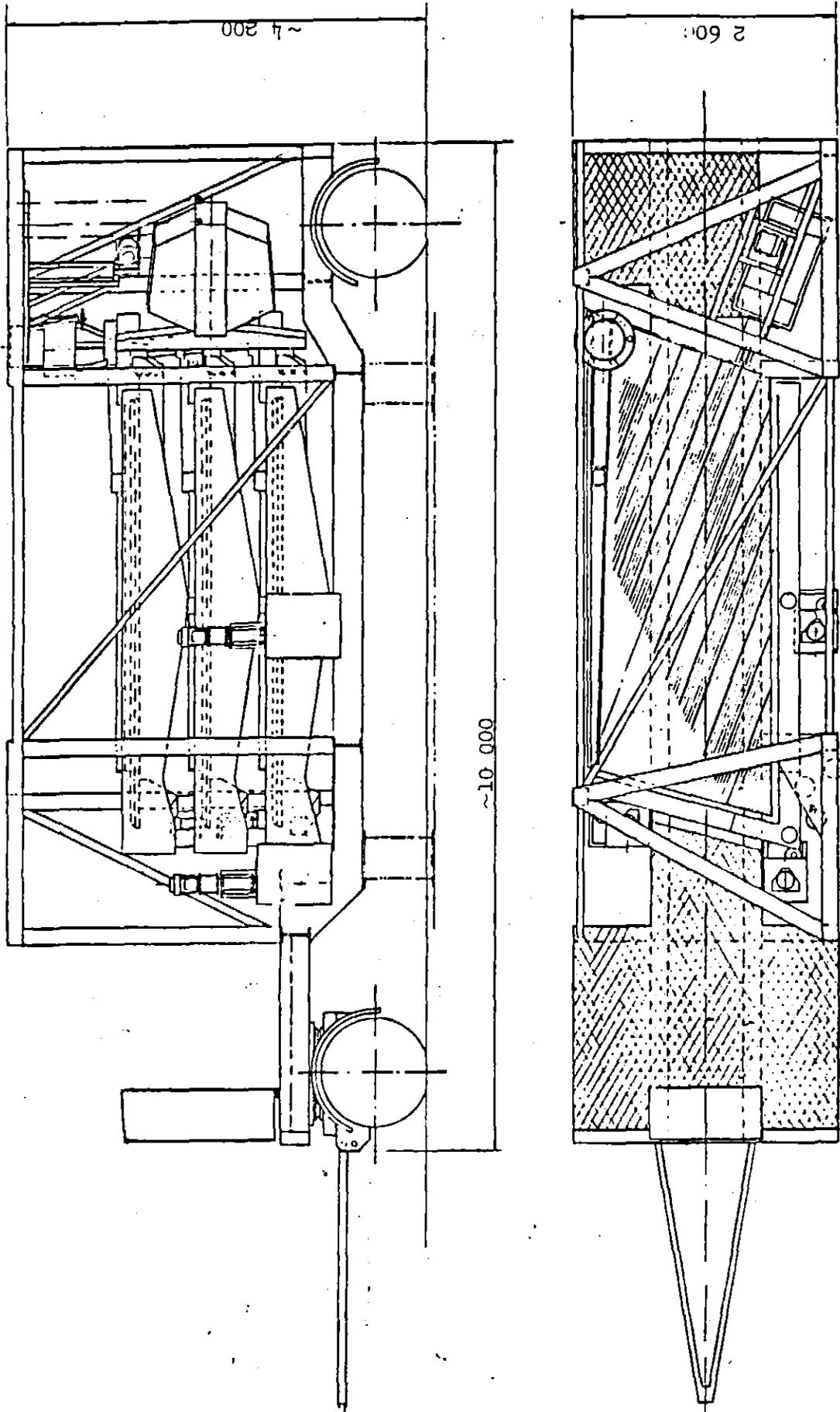
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CARAVAN MILL

Shaking table unit

06/74

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**SALA**

SALA · SWEDEN

CARAVAN MILLTECHNICAL SPECIFICATION

06/74

Spiral concentration unit

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
450	1	Chassis consisting of frame, wheel units and under-carriage, incl. mountable support legs.
453	1	Pulp distributor with 12 outlets.
455	12	Primary spirals. 5-turns spirals arranged in two groups, each consisting of 6 spirals.
460- 463	4	Pump sump
464- 467	4	Sump pump, type VASA GS 2", incl. motor 2,2 kW.
469	1	Secondary pulp distributor with 6 outlets.
470	6	Secondary spirals. 5-turns spirals arranged in one group of 6 spirals.
473	1	Internal pipe line system.
475	1	Steady head tank for process water. Volume 0,8 m <sup>3</sup> .
478	1	Supporting frame work for pulp distributors and water tank.
480	2	Concentrating table size 0,6 x 1,2 m. Incl. common frame work for both tables arranged on rubber dumpers, product launders and motors 0,18 kW.
490	1	Contactor cubicle containing contactors, control voltage transformer, fuses, push buttons and indicating lamps, incl. plug-in socket for external power supply and auxiliary drives. Total installed power ca 15 kW.
495	1 set	Spare parts according to separate list.

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**SALA**

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CARAVAN MILL - SPARE PARTS

06/74

SPIRAL CONCENTRATING UNIT

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
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Sump Pump VASA GS 2"

8	Pump housing, Ni-hard	
16	Impeller, Ni-hard	101840-M1
8	Inlet, Ni-hard	110059-M1
8	Pipe elbow	138603-M1

Concentrating Table 0,6 x 1,2

1 set V-ropes

Electric Spares

1	4p-motor, 2,2 kW, disp. 214B	
1	Motor, 0,18 kW, disp. 217	
1 set	Fuses	
1	Motor circuit breaker DEG 20	

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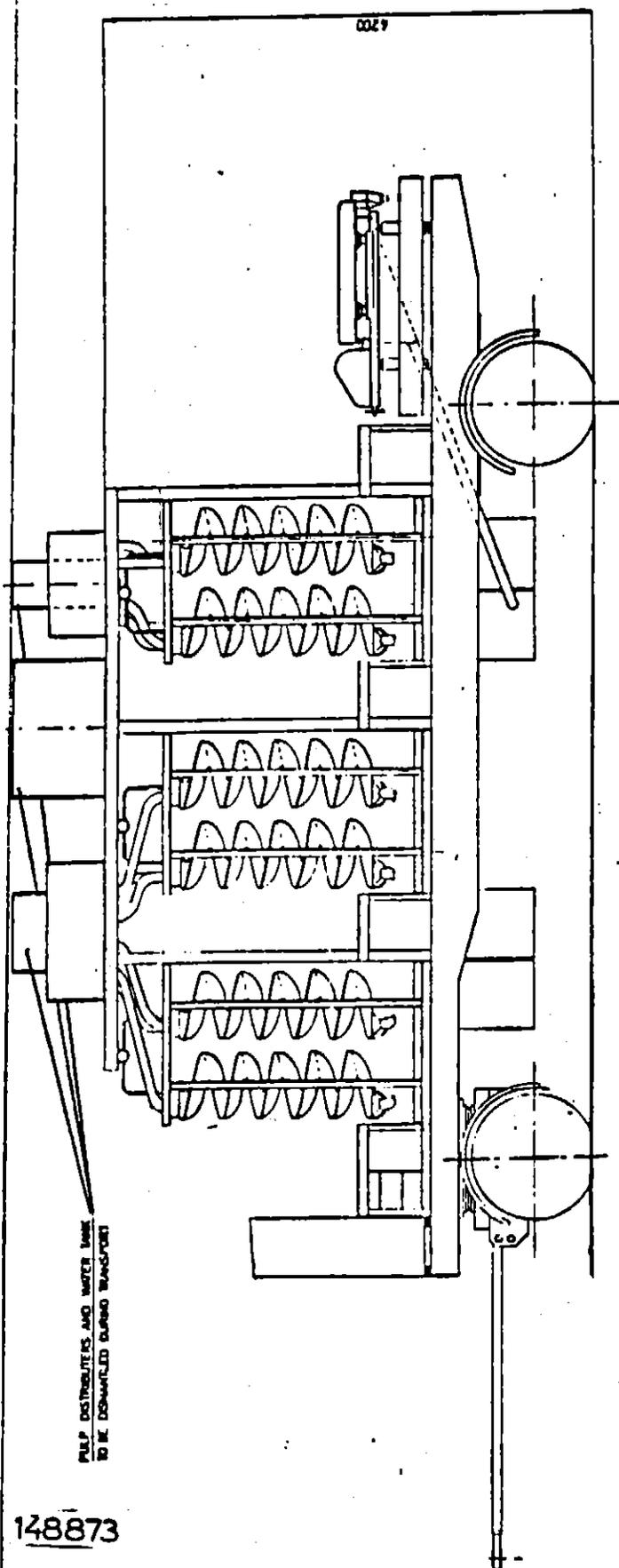
**SALA**

SALA · SWEDEN

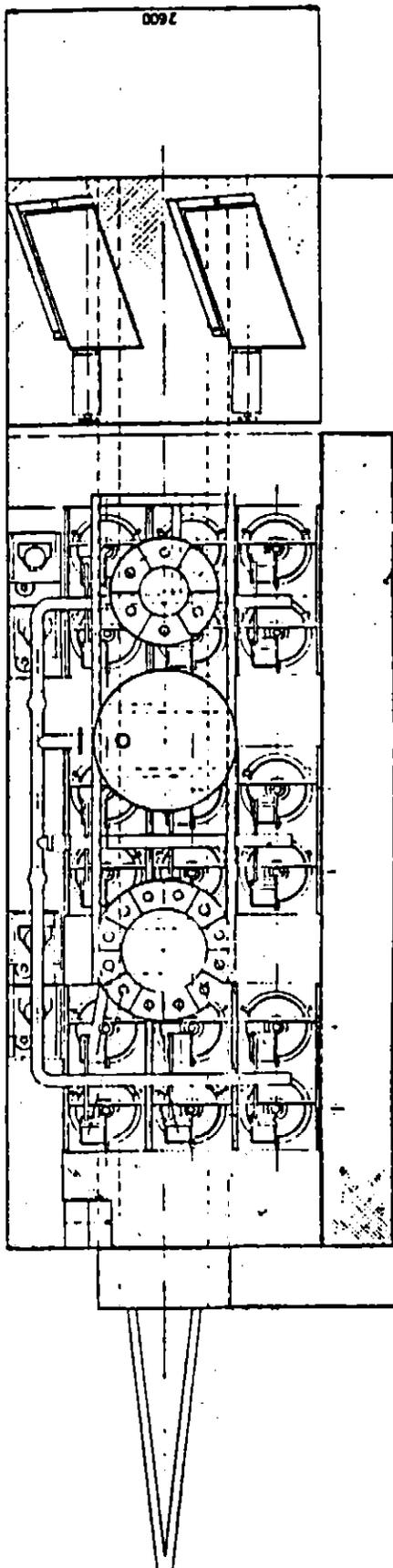
CARAVAN MILL

Spiral concentration unit

06/74



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1500

<u>Item</u>	<u>Number</u>	<u>Equipment</u>
800	1	Water tank, volume 7 m <sup>3</sup> , complete with water pump, type STD-33 incl. motor 2,2 kW, circuit breaker and min. level switch.
810	1	Plastic hall, dimension 17,5 m x 35 m, with 1 conveyor opening and 1 transport door. Incl. complete hot air unit with a capacity of giving a temperature difference between inside and outside the hall of 40 centigrades.
820	2	Hydraulic jack, lifting capacity 20 tons.
825	4	Flood light, each 2 x 1000 W, on tripod stands.
830	1 set	Tools for assembling and service of the plant.
835	1 set	Polythylene tubes for interconnection between trailers.

**SALA**

SALA . SWEDEN

CARAVAN MILL - SPARE PARTS

COMMON FOR ONE PLANT

06/74

1 (2)

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
<u>Trailers</u>		
1	Wheel complete with tyre	3.2610/14H
2	Spring set	3.2220/380
4	Spring clamp	3.2277
2	Radial bar	3.2277
6	Bushing	1003860
8	Nut	M20H
1	Bearing	990.41035
1	Bearing	990.41045
1	Hub	210.21113
1	Brake drum	210.21114
2	Seal	210.20665
10	Wheel bolt	
100	Rivet for brake lining	210.07729
2	Spring	210.06611
4 sets	Bushing for wheel	
1	Brake arm	150.10765
4	Brake lining	210.10751
4	Brake lining	210.10752
2	Lamp	311.166.001
2	Lamp	K 20/6
1	Electric transfer box	2274
1	Brake valve	471.011.510
1	Brake valve	473.502.000
2	Membrane	423.027.900
1 set	Bolts, nuts, washers, cables, cable shoes	

Water pump STD-335

1	Impeller	134414-1
1	Shaft bushing	134421-M1

Electric spares

20	Bulbs for floodlights 1000 W	
75 m	Electric cable 4 x 2,5	RDOT
20 m	Electric cable 4 x 70	RDOT
20 m	Electric cable 4 x 50	RDOT
20 m	Electric cable 4 x 25	RDOT
20 m	Electric cable 4 x 10	RDOT

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**SALA**

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CARAVAN MILL - SPARE PARTS

06/74

COMMON FOR ONE PLANT

2 (2)

<u>Qty.</u>	<u>Description</u>	<u>Detail No.</u>
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Electric Spares

2 sets	Fuses comprising	
	6 x SLA 80	
	12 x SLA 160	
	24 x SLA 200	
	12 x SLA 250	
	6 x SLA 315	
	20 x DSR 563	
	20 x TDNR 525	
	50 x DNR 525	
	10 x TDNR 520	
	100 x DNR 516	
	100 x DNR 510	
	70 x DNR 506	
30	Fuse cap DNH II	
10	Fuse cap DNH III	
20	Pilot lamp BA9S neon	
5	Plug inset 200A	
5	Outlet inset 200A	
5	Plug inset 63A	
5	Outlet inset 63 A	
10	Cable plug 10A, 3p	

Miscellaneous

50 m	Polyethylene tube $\phi$ 50
20 m	Plastic pipe for reagents

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**SALA**

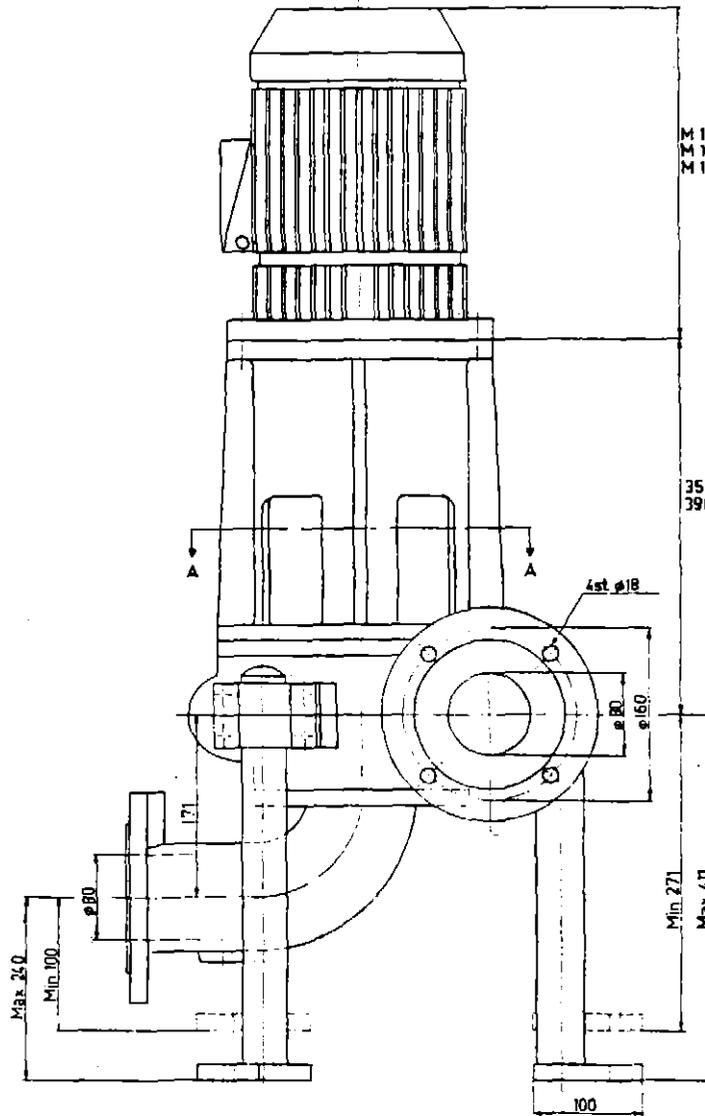
SALA · SWEDEN

**STD 33**

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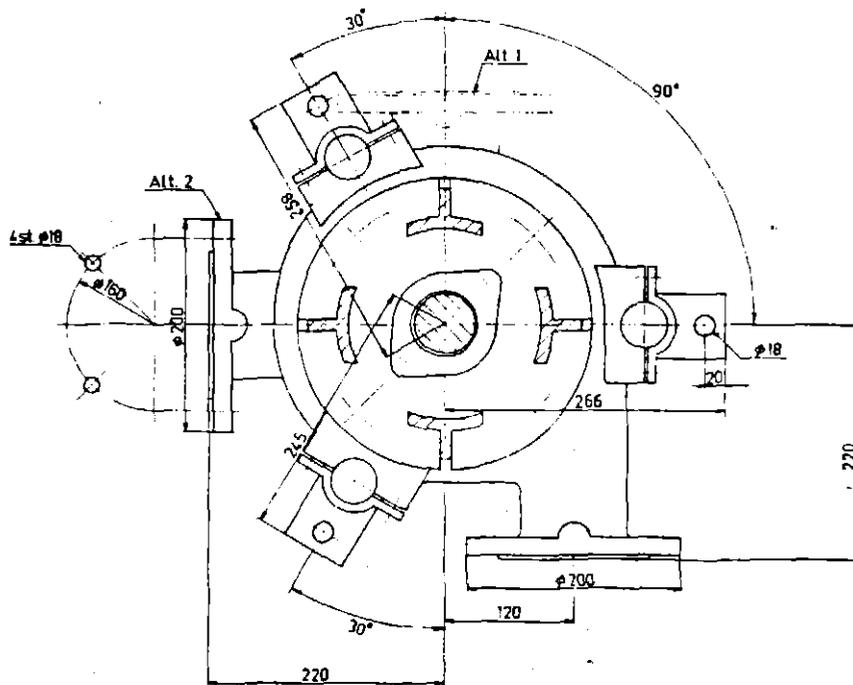
STM-2-269

10/71



M 112  
M 160 eht. motorkatalog  
M 180

352 för M 112  
390 för M 160=180



Snitt A-A

A1-134496