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PLANNING AND DESIGNING OF NEW ABATTOIRS AND OPTIMUM UTILIZATION OF BY-PRODUCTS*

SI/CYP/77/802

CYPRUS

Technical report: Animal by-products utilization

Prepared for the Government of Cyprus for the
United Nations Industrial Development Organisation,
executing agency for the United Nations Development Programme

Based on the work of Louis L. Crawford,
expert in animal by-products utilization

United Nations Industrial Development Organisation
Vienna

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ABSTRACT

With the submission of this report, the work of the feasibility study has been completed and action to build a by-products plant should be taken. This two month's work, instigated by an FAO study in 1977, is finalized by this FAO-UNIDO feasibility study.

The report lists data taken, provides detailed layout drawings, elevations and plot plans for a plant with detail costs and equipment lists sufficient for requesting tender documents.

The principal conclusions are that a plant could be built now for $800,000 to operate on 16000k per day average, making a net profit before taxes of between $170,000 and $265,000 annually, depending upon payments for raw material from outside the slaughter house complex. This is a payoff period of 3 to 6 years, which is reasonable. This rapid payoff on investment would be increased to about 8 to 10 years if the new slaughterhouse were not built, but the by products plant could stand alone if government prevented the present desultory, unsanitary, inadequate, partial by-products pick-up and installed a new plant.

The dry rendering hide and casing plant employing 15 people with joint maintenance crews would be an L shaped building at approximately 1900 M^2 under roof on a raised slab, situated on one hectare, of satisfactory property chosen by the meat commission for this work. Of the $450,000 of equipment utilized, about 1/3 of the value of the machines can be locally made. All the finished products, except the casings, could be entirely consumed locally on the island by the soapers and feed mills.

This report makes the strong recommendation that the Cypriot Government should proceed immediately on a by-products and slaughterhouse complex which will benefit almost everyone involved. The biggest remaining problem is the infrastructure, or who is responsible for raising money, building a plant and operating it.

UNIDO could further be involved in the detailed design of the plants, supervision of installation of equipment and startup and operating procedures.

CONTENTS

1. INTRODUCTION

Although the meat and by-products plants and their centralization has been studied for more than 5 years, to the writer's knowledge, the basic previous work is confined to the work of the Cypriot Committee for study of the above of June 1977 and by the FAO, October 1977 Nilsson report. It was decided that FAO and UNIDO would then cooperate in making a feasibility design study of the by-products plant and advise on the design of the slaughterhouse.

For obvious reasons and because of these studies, the needs for a by-products plant, the wasting of by-products of the meat industry and the general worn out, unsanitary conditions of the meat industry and slaughterhouses, are well known.

This terminal report is the result of approximately one month's work in Cyprus. It provides conclusions and recommendations, plus designs and initial costs and the feasibility of a by-products plant centrally located between Limosal, Larnaca and Nicosia.

The terminal report gives basic plant designs, including plot layout and elevations, operating cost, capital investments with a detailed equipment list, cash flow and return on investments, plus an incentive payment system for collection of by-products.

2 CONCLUSIONS

2.1 A centralized by-products processing plant attached to a central slaughterhouse, will generate a net profit, before taxes, of $170,000 or 61,000£ annually if $.01 per pound were paid for all the raw material collected. This gives a 5 to 5.5 year payoff period while still paying more than about 20 times more than what the present highest payment is for this raw material. Since for about 50% of the raw material like blood, bones and dead stock etc., there is no payment, and if this practice were continued, the plant could make an annual profit of $215,000 or 77,500£ or a 4 year payoff. Furthermore, if no payment incentives were paid and pickups were made as a convenience to the by-products supplier, such as the Paphos slaughterhouse, who would save $8,500 or about 3,000£ annually in burial costs, the plant could pay for itself in about 3.3 years with an annual profit of over $205,000 or 96,000£'s.

2.2 The property, plant and equipment, if purchased in 1978 with a 12% annual inflationary increase, would cost $875,000 or 340,000£'s. This includes 3 trucks for pickup and delivery and about $400,000 of specialized equipment of which 25% could be made locally.

2.3 As an alternate conclusion, the central by-products plant could be built on the chosen site even if the central meat plant is not built, as it will provide a needed sanitary service and it will pay for itself in less than 10 years, providing that the central government pass regulations requiring only authorized pickups be made. Besides, it will provide additional income to the farmers and butchers, the soap maker, tanner and casing processor.

2.4 The plant designed would be an L shaped building of approximately 1880 square meters with cement walls 4 meters high plus 2 meters of screened louvers above with a wood joisted tile, peaked roof or a flat cement roof. The plant would be completely fenced in on about one hectare of property with additional room allocated to sewage anaerobic and aerobic ponds. A tarred gravel or asphalt apron of 30 meters would surround the plant which is located within 30 meters of the slaughterhouse and supplies the steam, sewage and maintenance facilities for the main slaughterhouse.

2.5 The plant will employ 14 men plus 5 jointly shared mechanical maintenance specialists. It will use 20,000£ of water per day, 2,500K steam per hour for 8 hours, 140 KWH for 8 hours and will need additional accounting and office facilities in the main slaughterhouse or elsewhere. Sewage will be reduced in BOD content and suspended solids by 98.6% with 5 day anaerobic and 21 day aerobic ponds and then released to a dry river bed.

2.6 Everyone presently involved with the slaughterhouse will gain financially by the new central combined plant, except for the single pig and chicken farmer who is paying 750£ annual for available material of over 2,500,000 pounds annually, worth over 10,000£ on a raw basis, and the slaughterhouse worker, who does a poor job and who now makes over probably 15£ per day, if all payments including meat are considered, which makes him one of the highest paid slaughter men in the world, and better paid by far than the comparable Cypriot skilled worker.

2.7 The actual detailed engineering, supplying and building of such a facility should not take over 1½ years.

3 RECOMMENDATIONS

3.1 It is recommended that the Cypriot government proceed as quickly as possible with a centralized by-products plant on the suggested site, as it is now losing over $275,000 annually of useful by-products and it will cost more each year to build this necessary facility and because of the present danger to public and livestock health, due to mishandling of these by-products.

3.2 It is recommended that the Cypriot government set up, as soon as possible, the proper infrastructure for managing this facility and to raise capital for financing the operation and to purchase the needed property.

3.3 It is recommended that the Cypriot government provide, as soon as possible, or obtain the necessary expertise to make detailed engineering drawings, specifications and tender documents as well as installation and startup help on this project.

3.4 It is recommended (although it is not in the scope of requirements of this study, but because this advisor has worked on slaughterhouse equipment and design for over 30 years in over 50 countries and can not resist one comment on his recent observations of present slaughterhouse operations) that the Cypriot government, for public health reasons to it's own people and it's tourist trade, a major source of foreign income, and principally to it's sausage makers and it's pig and poultry farmers, should proceed as fast as possible on one central slaughterhouse, which could pay for itself in a matter of a few years, only by exporting a small proportion of the present farmer-producers production.

3.5 It is recommended that the by-products operation pay $.01 per pound of raw material picked up from outside it's plant and 3000£ to the central slaughterhouse, if it is built, which is about 4 times more than at present, for all it's inedible material.

4.1.1 **PARAMETERS TABLE I**

SYSTEM OF PAYMENTS FOR SERVICES AND PRODUCTS
IN NICOSIA MEAT INDUSTRY

Type Animal	Farmer Receives	Farmer Pays	Slaughterman Receives	Slaughterman Pays	Butcher Receives	Butcher Pays	Others Receives	Others Pays
CATTLE	Young 1250 Mils/ok Old 800 Mils/ok From: Butcher	£ 5/Head plus meat To: Sl. Man	£ 5/Head plus meat From: Farmer	Labor To: Farmer	Meat Head Carcass Hide Edible offal To Sl.Hse. Hide 200M/ok To Sl. Hse.	15 Mils/ok carcass + 16% wt. for delivery Young 1250M/ok Old Mils/ok 200 Mils/Animal for delivery	Sl.House 15 Mils/ok carcass + 16% From: Butcher Sl.House 750£/year From: chicken farmer For all offal he wants Sl.House 200 Mils/Animal From: Butcher For delivery	Tanner 200M/ok To: Butcher
PIGS	350 to 425 Mils/ok From: Butcher		£ 1.0/Head From: Butcher 50Mils/set From: casing man For: small intest.	Labor To: Butcher	Meat Carcass Except inedible offal To Sl. Hse.	350 to 425M/ok To:Farmer 15 Mils/ok carcass +16% £ 1.0/Head To: Sl man 125 Mils/Animal For delivery	Sl.House 15 Mils/ok carcass +16% wt. 125 Mils/An. for delivery	Casing Man 50 Mils/Set casings
LAMBS KIDS	1400 Mils/ok From: Butcher		100M/Animal From: Butcher		Meat Carcass + Edible offal To Sl. Hse. To Farmer To Sl. Hse. To Sl. Man	15 Mils/ok Carcass + 16% 1400 M/ok for animal 25 Mils/An for delivery 100 Mils/An	Sl.House 15 Mils/ok Carcass + 16% From:Butcher 25 Mils/An For delivery From Butcher	
GOATS & MUTTON	700Mils/ok From: Butcher For: Meat		100M/Animal From Butcher 125M/Set From: Casing man	Labor To: Butcher Set to: Casing man	Meat Carcass Except Inedible offal To Farmer To Sl. Man To Sl.Hse. 700M/ok/sheep 300M/ok/goat	700M/ok 100M/Animal 25M/Animal delivery 15M/ok carcass + 16%	Sl.House 15Mils/ok carcass + 16% from Butcher 25Mils/An from Butcher for delivery	Tanner 700M/ok/sheep 300M/ok/goat Casing man 125M/Set to sl. man

4.1.2 **PARAMETERS AND CONVERSIONS USED**

A. Weight

Oche - 1273 grams - 2.8# - 1.25 K K = Kilogram
OK = Ochs

B. Money

U.S. $1 = .375£ $2.67 = 1 £

C. Based plant design and profit on 1978 kill average for 250 days per year - 8 hour day - one shift

Actual capacity: Double, as could work 2 shifts

Combined Three City Kill Rates

	Year	Sheep-Goats	Cattle	Pigs
Projected	1986	1250/day	33/day	900/day
	1975	607/day	20/day	450/day
	1978	526/day	19/day	430/day
	Max	1250/day	60/day	665/day
	Rated slaughterhouse capacity			
	Daily	1250	40	800
	Hourly	150	5	100
			PAPHOS KILL	
	1978	150	4	75

D. CARCASS WEIGHTS

Limosol	Carcass + Red + Head	13 K	195 K	60 K	1978
Nicosia	Carcass + Red + Head	21.6K	268.58K	94.68K	1975
		16.11K	296.31K	82.7 K	1977
Average live wt. used		32 K	540 K	110 K	

E. By-Products From Slaughtering

	Sheep		Cattle		Pigs		Daily
	Per/An.	/Per/Day	Per/An.	/Per/Day	Per/An.	/Day	Total
Blood	2K	1050K	18K	360 K	3.6 K	1540K	2950K
Paunch Manure Wet	3K	1575K	25K	500 K	2 K	860K	2935K
Hide Fleshing			7K	133K			133K
Hide Trimmings	1K	526K	6K	114K			640K
Inedible Raw Mat.	3K	1578K	30K	522 K	10 K	4300K	6400K
Hide & Skins	10K	5260K	35K	640 K	8 K	3400K	9300K
Casings							

F. Oil 30 to 32 L/Ton
140M/Imp. Gal.

Wages
Skilled workers L 5/day
Unskilled L 3.5 to 4/day
Foreman L 6/day

Electricity 20 Mils/KWH

Building Costs 40 L/Square M

4.2 Plant layout drawings

Detailed drawings of the by-products plant and the slaughterhouse are attached at the end of the report.

4.3.1

EQUIPMENT - GENERAL COST
SPECIFICATIONS
SUPPLIERS

No.	Quant.	Description	Supplier	Cost Factory	Cost Installed
1	1	Tank fuel oil storage 10,000 L capacity, mild steel, 1 draw off, one man hole approx 6' dia.x 10' high	1	$ 2,700	$ 3,000
2	1	Condenser - Air for 2000K condensate per hour S.S tubes *alternate S.S. shell and tube heat exchange	1-2 1-2	20,000 10,000	22,000 14,000
3	1	Tank tallow storage with 6 draw off connections, divider cell and top opening + h.p. pump	1	6,000	7,000
4	2	Boilers, 1200K steam/hour bunker coil 7 atm pressure with condensate pressure return from cookers with stacks	3	40,000	50,000
5	1	Softner - boiler feed water treatment system 2 tanks 400L and pumps, valves	3	3,000	4,000
6	5	Screen conveyors with motor starters 1 .75m dia x 8 m 3 HP 2 . 5m dia x 7.0m 2½ HP 3 . 3m dia x 9.0m 1 HP 4 .25m dia x 8 m 1 HP	1	12,000	15,000
7	2	Storage bins - meal metal or concrete or painted wood with sloping bottom and front swing gate attached	1	8,000	10,000
8	1	Mill hammer for meat and bone meal with motor starter 40 hp 24 hr	2	8,000	10,000
9	1	Mixer bagger vertical with 4 ton capacity 5 hp motor starter	1	8,000	10,000

No.	Quant.	Description	Supplier	Cost Factory	Cost Installed
10	1	Scale - floor on wheels 100 kg up in .10 kg increments	4	$ 500	$ 1,000
10[1]	5	Lavatories hard wash, foot pedal operated + soap dispenser S.S. 16" x 20" x 10" deep	1	1,800	2,000
11	17	Drains floor 4" gooseneck 7" grill cast iron	1	1,700	2,000
12	6	Hose stations for wash up 20.0 m 3/4" neoprene braided hose with nozzle bronze, 2 valves plus tee and S.S rack	1	2,000	3,000
13	2	Platforms 5 x 1.5m and 5 x.8m metal frame with concrete platform	1	3,000	4,000
14	2	Pumps grease gear type cast iron no brass 1 hp motor starter	2	2,000	3,000
15	6	Grease settling units - pyramid bottom - platform 3 - 6'x6'x6' on straight side + pump 1 hp starter steam coils and swing suction plus valves	1	10,400	13,000
16	1	Screw press for Crax 7" with 75 hp motor starter, hydraulic control plus spare shaft and parts	2	50,000	60,000
17	1	Filler weigher for drums of tallow cap 500 kg in .250 kg platform scale plus valves	1	1,500	2,000
18	2	Cookers 200 ft cube capacity 40 hp motor jacketed non-heated 37 rpm shaft - plus steam traps condensate pressure return system 6" insulation with galvenized metal cover compled gauges vent lines	2	70,000	90,000
19	1	Electrical panel	In electrical contract		

No.	Quant.	Description	Supplier	Cost Factory	Cost Installed
20	2	Perc pans perforated bottoms, end gates, mild steel 6' x 8' x 4' deep	1	8,000	10,000
21	1	Blood bagger scale plus sewing machine 100kg cap. plus conveyors in and out	2	2,000	3,000
22	1	Coagulator blood - 12" dia screw with steam inlets, 1hp motor starter 8.0m long plus vibrating screen dewater	1	5,000	7,000
23	1	Blood cyclone 2.0m dia 2.0m straight side cone bottom .33m opening with simple slide gate		5,000	7,000
24	2	Blow tank cone bottom 10,000# capacity + 1 blood blow tank for 3000# capacity in slaughter house with valves on man holes	1	10,000	12,000
25	1	Prebreaker - 75hp motor and starter 15" dia. with 8 spoke orifice	2	18,000	23,000
26	2	Scale floor type 500kg in .500kg	3	4,000	6,000
27	1	Station drum washer	1	500	500
28	6	Casing truck S.S. 6" neoprene wheels	1	3,000	3,000
29	2	Tables casing cleaning S.S. .9m high .5m x 3m with drain	1	1,000	1,000
30	2	Sinks casing cleaning with hot and cold valves, drain S S. 1.5m x .6m x .3m	1	1,000	1,000
31	1	Crusher stripper crusher finisher - with galv. tanks all motors and starters for sheep and hog guts	4	5,000	6,000
32	1	Table casing grading sorting S S tee shaped 5m tops, drain plus gauge	1	500	500

No.	Quant.	Description	Supplier	Cost Factory	Cost Installed
33	2	Salt bins pine 3m x 2m x 1m	1	1,000	1,000
34	2	Table hide pelt flesh, trim mild steel 2m x 3m x 1m	1	2,000	2,000
35	8	Drums plastic lined, 55 gal.	1	1,000	1,000
36	2	Table hide pelt grade and salt, same as above but S.S.	1	4,000	4,000
37	2	Truck salt - S.S. hopper 12" wheels	1	1,000	1,000
38	1	Truck wash station	1	500	500
39	1	Work bench plus tools	3	10,000	10,500
40	1	Bone hopper mild steel	1	10,000	10,000
			Sub-total		30,000
			Total		425,000
			with contingencies		430,000

$260,000 to $300,000 imported

No.	Supplier
1	Local manufacturer
2	Dupps, Anco, Atlas, Maskinfabrik
3	Local distributor
4	Stridh, Koch

4.3.2 CAPITAL COSTS - SUMMARY

Land and civil improvements	30,000
Equipment - see 6.3.1	430,000
Building 1872m^2 x 40L/m^2 x 2.75	206,000
Plumbing	35,000
Electrical	65,000
	766,000
Engineering	34,000
Contingencies	75,000
Total	$875,000 or 318,200L

4.4.1 OPERATING COSTS

By-Products Plant
Labor chart and costs*

Hides - Skins	-	2 men		
Casings	-	3 men		
Rendering	-	5 men		
		10 men	@ $5/Day	50
Foremen	-	1	5/Day	5
Office	-	1	6/Day	6
Truck drivers	-	3	6/Day	18
Total by-products.				80
Master mechanic		1	8/Day	8
Maintenance		4	5/Day	20
Men		16	Total plant payroll	28

By-products share of maintenance 8
Total charged to by-products 88 Day or $242/Day
$60,500/Year

Maintenance are for entire meat plant plus the by-products plant and 20 trucks combined.

4.4.2 ELECTRICAL REQUIREMENTS

LIST OF EQUIPMENT

No.	Quant.	Description	Horsepower
1	1	Fuel Oil storage	-
2	1	Air condenser	50
3	1	Tallow storage tank	1
4	2	Steam boiler	10
5	1	Boiler water softner	-
6	5	Screwer conveyors	10
7	2	Meal storage bin	5
8	1	Hammer Mil	40
9	1	Mixer	10
10	1	Scale	-
10[1]	5	Hand wash lavatories	-
11	17	Floor drains	-
12	6	Hose wash stations	-
13	2	Platforms	-
14	2	Grease pumps	5
15	6	Grease settling units	2
16	1	Press for Crax	50
17	1	Drum filler weigh	-
18	2	Cookers	80
19	1	Electrical panel	-
20	2	Perk pans	5
21	1	Blood bagger	-
22	1	Blood coagulator	2
23	1	Blood cyclone	-
24	1	Blow tank	-
25	1	Prebreaker	75
26	2	Scales	-
27	1	Drum wash	-
28	6	Casing trucks	-
29	2	Casing-cleaning tables	-
30	2	Casing-cleaning sinks	-
31	1	Casing crush strip finish	5
32	1	Grade sort table	-
33	2	Salt bins	-
34	2	Hide Pelt skin table	-
35	4	Drums	-
36	2	H de Pelt skin salt table	-
37	2	Salt truck	-
38	1	Truck wash	-
39	1	Work bench	-
40	1	Bone hopper	-
		Total h.p. connected	356 say 400
		kw connected	300 kw

20m/kwh x 50% x 8 $\frac{\text{hrs}}{\text{Day}}$ x 400 x.75 kw/hp - 24L/Day
250 days 6000L/yr.

4.4.3 **OPERATING COST - ANNUAL**

Direct labor	see 6.4.1	61,000
Electricity	see 6.4.2	15,000
Steam	$4/1000k x 16,000 k/Day x 250 days	16,000
Oil for trucks	300m/day ÷ 10m/gal x $1.00 gal x 250 & 500 Lub Oil	8,000
Parts maintenance		4,000
	Total	$104,000
Indirect:		
Interest on investment @ 10%		76,000
Loan payoff	20 years	40,000
Professional & miscellaneous		10,000
	Sub-total	$126,000
	Total	$230,000

4.5 **YIELDS** Of By-Products

	Rendering Material	Yield	Price	from	Slaughterhouse
Dried blood	3000K x	20% x	$220/ton	-	$144.00/Day
Crax	7175K x	25% x	$200/ton	-	358.00/Day
Tallow	7175K x	10% x	$.40/k	-	287.00/Day
					$ 789.00/Day

Inside $197,500 year from slaughterhouse

from Paphos

Based on kill of about 20% or about $160/Day - $40,000/yr
* 1500k/Day

from Butcher Shops + 2 Markets

Crax	2000K x	30% x	200/ton	$120/Day $30,000/yr
Tallow	2000K x	15% x	$.40/K	$120/Day $30,000/yr

from 5 Regional slaughterhouses

Crax	2000K x	25% x	$200/ton	$100/Day $25,000/yr
Tallow	2000K x	10% x	$.40/K	80/Day $20,000/yr

from Chicken Processors from 5 largest 1,000,000 birds/yr at 1#/bird plus dead birds

Mixed meal	4000# from 4000 birds/day			
	2000K x	12% x	$220/ton	$ 50/day $12,500/yr

from soap maker

Crax	900K x	27% x	$200/ton	$ 48/day $12,000/yr
Tallow	900K x	20% x	.40/K	$ 72/day $18,000/yr

from Dead Stock - 2 hogs parts/day

	500# x	18% x	$200/ton	$ 18/day	$ 4,500/yr
Grease	500# x	25% x	.18/lb	22/day	5,500/yr
	16,000 K	Day total		Outside	$200,000/yr

		Day	Year
Casings	Hogs 40 mils/hog set x 430 x 2.75	- $ 60	$15,000
	Goats/Sheep .50% x 125m x 526 x 2.75	- 73	18,000
			$ 32,000

Hides Cattle

20% increase in value due to no scores

6.00L/Hide x 20% x 25 cattle/day x 2.75 - $82. 21,000

Hogs 20% of Hogs

20% x 500mils/skin extra x 430 x 2.75 - $118. $30,000
(another 500 mils to slaughterhouse)

Sheep/Goats

No change

Sub-total	$ 83,000
Total	$480,000

4.6 PROFITABILITY

Plan	I	II	III
Gross Profit	$480,000	$480,000	$480,000
Less direct costs	104,000	104,000	104,000
Less indirect costs	126,000	126,000	126,000
Profit before raw material	$250,000	$250,000	$250,000
Cost of raw material	-0-	48,000	95,000
Profit before taxes	$250,000	$202,000	$155,000
In £	91,000	73,000	55,000
Pay off period	3.1 yrs	4 yrs	5 yrs

Plan I - Pay for no raw material - pick up as a convenience

Plan II - Pay for $.005 per pound for all the material or $.01 per pound for half the raw material.

Plan III - Pay $.01 per pound for all raw material picked up or from the slaugherhouse

5 DESCRIPTION

5.1 Description of Plant

The by-products plant is built on a concrete slab, 24m x 60 m with a concrete slab at a right angle of 18m x 24 m for the boiler and maintenance areas for both the by-products and slaughtering plant. This slab is a .20m above grade on the South side and about 1.00m on the North side so that trucks can unload at dock level. The floor has drains in every 6m x 6m bay to which the floor slopes at 1:50. All drain lines are 4" plastic pipe with a slope of 1;100. There is a 3" cove where floor and wall meet.

The walls of the building are concrete brick with cement plaster smooth on the inside of the building for ease in washing down. Walls are 4.0m high with 2.0m screened, movable louvers above. The roof is peaked tile with wooden joists or cement, both with a 3 meter overhang. Steel should not be used for joists as it tends to corrode.

There is bathroom and lockeroom for changing clothes for 25 people and office space for 3, but there is no eating room or food service as it is expected that these workers could use the slaughterhouse facilities.

The property for the by-products plant is completely fenced in so no meat can be removed and the 1 hectare of land graveled and oiled to keep down dust.

5.2 DESCRIPTION SEWAGE DISPOSAL

The process is one of taking all waste water from both the plants, by-products and slaughterhouse, screening them, the putting them through a fat skimming tank with a 2 hour retention time and then ponding. The Anaerobic pond is 2.0m deep and will have a yeast fat mold cover on the water, preventing O_2 from getting to the water. It is made by bull-dozing a 1 meter high bream by 6 meters wide, and filling with water, giving a 3 meter total depth with a 6 day retention time. The overflow from the anaerobic pond will flow into a 2.0 meter deep or less aerobic pond with a 21 day retention time, giving a total BOD reduction of 98.6 with the two ponds. If less clean water is needed, the second and even first pond could be eliminated, but it is not recommended from an environmental standpoint. The cost of the lagoons is in earth moving and should be less than $5,000 and give water suitable for irrigating fields of johnson grass, for cattle and sheep fattening.

5.3 DESCRIPTION OF PLANT OPERATIONS

5.3.1 Hides, pelts and skins are tagged as to owner when removed from the animal in the slaughterhouse and dropped in a chute to the floor below where they are dropped on the floor - hourly the push truck man comes to the slaughterhouse and brings these skins to the by-products plant where they are weight and separated by owner, defatted on a flat bench and trimmed. The fat and trimmings are put in drums and taken to the rendering department. The hides and skins are spread out on a bench where they are graded, lightly salted, folded and placed onto pallets where they are removed each following morning by the tanners. The tanner will pay the same price to the butcher which is the going competitive price at the time, plus a charge to the slaughterhouse for grading, salting, trimming and defating, plus a charge for first quality of 20% above that now for the poor quality.

The small intestines, with manure intact, of sheep, goats and pigs are collected every 2 hours from basement of the slaughterhouse. They are then stripped by hand or machine of manure, depending upon quality and age of the animals. Real young lambs and goats may not have a strong enough casing

for manure stripping. The casings are then soaked for two hours, then run through a crusher that crushes the inside mucosa and a stripper that flushes the mucosa out of the casing and a slimer finisher which gives the finished casing, which is then graded for thickness and length and salted and put into small plastic drums. The present casing man will pay the same price he is paying to the slaughter man now, but he will pay it to the by-products department, plus a charge for cleaning, grading and salting based on cost.

Finally, the inedible by-products condemned parts and blood will be brought to the rendering plant hourly by the material handling man or by the blood blow system, which will work automatically every hour.

The blood is collected in a blow tank in the basement under the kill floor. The fresh blood is blown to a cyclone tank over the blood coagulator, which is turned on only at the end of all killing when the evaporator is to be loaded. After coagulating the blood goes across the shaker screen where it is dewatered to 50% moisture and then to the dryer where moisture is reduced to 10%, at which time it is cooled

in a pan and bagged in 50K sacks and a month's supply can be stored. No payment is made to the slaughterhouse for the blood and other previously wasted material, except one lump sum of 3000# annually for all the material. This figure could be adjusted annually or monthly, based on kill units or live weights, but no attempt is made to try and pay for these materials based on weight.

The offals or inedibles are collected hourly and dumped into the holding bin - pork, beef and sheep can be kept separate. Every few hours, the pork or sheep material will be crushed and sent to the blow tank and then into a cooker. The jacked, agitated cooker with an atmospheric cook temperature and 5 atmospheres of steam in the jacket will dry the four tons of material to a 10% moisture content in 3 hours. The material is allowed to sit one hour in a percolator pan for the free grease or tallow to drain through. The solids are sent to a screw press where the grease is pressed out so that the finished material is less than 10% fat and 50% or more protein. The fat from the perc pans and that from the press are pumped to a settling, washing tank for 24 hours, and then put into drums for storage in the yard or on the dock or the grease

and tallow can be bulk stored before drumming. There is a 30 day bulk storage. There would be 5 to 6 cooker loads finished off per day. The meat from the press goes to one of two bulk storage bins that will hold 30 days of material. Upon demand, it can be ground, blended and bagged for shipment as 50% meat and bone meal. A few days storage of sacks is provided.

The vapors from the cooker are condensed in a shell and tube heat exchanger from which hot water for the slaughterhouse can be made - it will be clean potable 140°F water. The condensate is sent to the sewer.

The plant sewage system is one of initial screening and a fat float skimming tank with a 3 hour retention time so that these materials can be rendered for value; from here the water should go through a 6 anaerobic digestion and a 21 day aerobic digestion and then be released to the dry river bed. This latter aerobic pond may not be necessary from the present ecology systems, but it is shown as there is very little cost and it will succeed in reducing biological O_2 denhard by 98.6% and solids by 99%, for very little cost. If a slight tablet chlorination were made, the water would be potable.

There are no other effluents from the plant except non-condensable vapors which should be very little because most of the material is fresh.

Pork skins will be saved on demand. The skin sells for about 3 ₤ each in Europe and it is proposed that each skin saved will be removed by 2 workers and a hide puller in the slaughterhouse. It will then be taken to the hide processing room where it will be trimmed and partially delarded. The slaughterhouse will receive 500 mils for its service and the by-products will receive 500 mils for its service. The tanner has 1.5¢ for his further processing and profit. The butcher pays 500 mils for the skin and receives 500 mils for it as he will pay the farmer a premium based on live weight, less skin if the animal has skin leather quality. This saves him the effort of removing the skin and disposing of it.

There is also a boiler room and maintenance department in this by-products plant that will maintain, with a chief maintenance man and 5 workers for the two plants, along with its trucks (23 or so in total). A shade cover for outdoor truck maintenance is provided.

The dressing rooms for 20 persons and offices are in the rendering, receiving area. The office will weigh

in all incoming material by supplier and type of material and pay 1¢ U.S. per pound or 8 mils/k.

All incoming material will be given the same processing as the slaughterhouse material and blended with it, except that the feathers, if any, will be pressure cooked as well, with any horns, hooves, and hair so that they will be hydralyzed and can then be blended into the blood meal, sold as feather meal or blended with the meat and bone meal.

Other inedible by-products were considered such as glands, cattle switches, hog bristles, mucosa, etc. but the processing cost versus the quantity of raw material doesn't warrant the capital investment.

The paunch manure will be dried in a 10 meter by 15 meter x 10cm pile on a cement slab with a plastic roof and screened sides from which it will be removed weekly, sold as fertilizers to local farmers. The selling price will be just enough to cover cost of drying and disposal.

The total volume of the by-products plant is based on average 1978 figures for slaughtering as given by the various municipalities and checked for authenticity. To increase the through put, a longer day to 12 or 16

hours, could be used and another cooker or even two, could be installed without much building charges, if any. The profitability increases sharply with volume.

6 DISCUSSION

In general, it is apparent that a by-products plant on Cyprus is essential to the agricultural economy, with or without the attached combined slaughterhouse. It would be far better with the slaughterhouse attached as 50% of its raw material would not receive much material handling.

6.1 DISCUSSIONS OF CONCLUSIONS

The profitability of this project can be varied considerably, not so much by the cost of the project but what happens to the volume handled and what happens to the payments for raw material. Because of the high investment cost and interest, the indirect cost is more than 50% of total cost, thus a doubling of volume will triple the profit. Conversely, if there is a significant lowering of volume, the plant could just break even. An increase in the annual pork skin take off can mean $80,000 to $100,000 increase in profit. The selling price of the finished product will not have that much effect as the raw material price should vary with the finished selling price. The initial raw material price was picked as fair for all parties - it is much higher than the hog raisers are paying for it, like 20 times so. Most of the raw material from the outside, except the soapers slug is free. Although

the soaper pays the butcher for fat, the butcher is throwing away his bones. If one pick up is made for both bones and fat, this would save economically. It is essential that this plant bring in good material from the outside, primarily as a public service and public health, but perhaps equally so because it is practiced to do so. It pays itself off in less than five years and giving an amount to the supplier to the raw material for his troubles in saving the product but also savings in trouble of disposal.

The casings are profitable also because the 150 mils per set goes to the slaughterhouse, not the slaughter man who will be paid a decent wage, but will receive no "take" as it is called. The processing of the hides, pelts and casings is primarily to get the fat trimming and slimeand also as a convenience for grading to insure a better hide take off. With a hide puller and a line skinning, it is easy to identify where the hide scores are made and steps taken to correct these errors, like better teaching changing men or bonus incentive for better take off.

The plant equipment costs include installation by local labor with specialists instructing. Many of the trucks, tables, hoppers, screw conveyors, bins and tanks could and should be made in Cyprus to save freight and encourage local production, but unfortunately, the cookers, press, bone crusher and one mill would be better to import as they would be too expensive to manufacture one of a kind in Cyprus and would have to be drawn up by a specialist who could give enough details to manufacture in Cyprus, not just tender specifications.

It is difficult to determine how fast a plant would pay itself off if it had to pick up material from the present plants but it would be longer than with a central plant. If it could get enough material for 5 cooks a day without much incentive pay, it could do so in five years but to do this, the help of the government is needed. The government would have to require that the by-products plant make all the pick-ups from the various slaughterhouses, butchers, and pay a little something, 4 mils per kilo for the material. The trucking costs lower the profitability of the operation.

The design of the plant is made for expansion and compactness to save money, yet bring in far more material in the future. The condenser is used primarily to make hot water and to reduce odors. The building is built on a slab to facilitate truck unloading and loading. As little steel as possible is used because of the acid forming qualities of the fumes from the pans and presses. The building is of a sanitary construction with coved, sloped floors to central sewers and smooth concrete plastic walls which can be washed down.

The choice of equipment and design of the processes is made to reduce labor as much as possible without going into complicated continuous systems that are automated, but require maintenance more complicated than warranted for this volume. Also, flexibility is needed in a project of this nature so that dead stock, feathers, blood, etc., can all be processed in the same plant.

There are two groups who stand to lose if the new by-products plant comes into existence and that is the people who sometimes pick up the offal from the slaughterhouse and the present slaughter labor.

The former comet farms intends to render his own dead birds and whatever he can buy for "very little" cost. This is no worry as he only intends to cook not press, so he will only pick up what he can use and much of this will be his own dead stock. The workers, about 100 in number, are another case. With all their incentives, they make from 10 to 20 L per night. Based on the average kill in 1978, the total payments to the slaughter men is over 700 L per night for hard work, but a poor job is done. In a new plant, probably not more than 30 men could do the knife work that 60 or 80 are doing now with less work involved, and a far better job. It would be better to hire all new help and train them from the beginning, but anyway, the law must be laid down, no meat removal from the plant by the workers and no toleration of poor workmanship.

There is no way that this plant can be built without the hiring of the services of an expert or company to make or help the detail drawings, This study is for feasibility, now a building needs to be designed, the equipment designed that is to be made locally, equipment ordered and equipment installed and operated. The local architects or engineers will need help. UNIDO, the machinery manufacturers and

others can be enlisted, but remember that the qualified assistance can save large amounts of money and it seldom is free. There is not sufficient specific specialized help in Cyprus. There must be however, local engineers and architects assigned to this project.

6.2 DISCUSSION OF RECOMMENDATIONS.

The plant is needed desperately, it makes lots of money with a payoff in 3 years and prices of the equipment go up every year so why wait. Cyprus can not go wrong by putting in a by-products plant and a meat complex. Money is available - so do it.

The biggest problem is who is going to own and operate the plant. The ownership should be the Cypriot government, but the operations are not as clear. The department of veterinarians should operate outside and independent as advisors and inspectors. The managing board should select the manager, but who is the managing board? It could be a group in the ministry of agriculture or the ministry of commercial industry or a board selected from both. Also on this board, the butchers should have an elected member, perhaps the farmer producer, a rotating city engineer and an elected member,

of one of the workers. This board should be empowered to hire a manager, to operate a plant, to purchase equipment and sell finished products. It could be the same board as that used to run the slaughter or partially independent but it is better one and the same. This board should be set up immediately.

It is outside the scope of this work, but with all the work in the area, it is impossible not to comment on the slaughterhouse centralization program. It is not possible to over-emphasize the need for the new plant if only to give export possibilities to the farmers, and to the economy. There is little animal disease in Cyprus, true, but there is plenty of smelly, tainted spoiled meat, due to high temperature that is either wasted or eaten. No studies have been made of the amount of enteritis due to bad meat and none need be made because a new joint slaughterhouse will make money while improving the public health and chance of spreading diseases, and will cost less money than a medical study.

The price recommended of $.01 per pound or 6 mils/K is of raw material, mostly bones, is a fair price if

there is 1000 pounds per pick up. Anything less is practical only if there are other stops nearby. Also, there should be some deduction in price for trips of long distances for small amounts of material. In some places such as Paphos, it behooves them to install an inedibal chill room. At present, the soap manufacturer is buying tallow from the butcher at $.06¢ lb., or 36 mils/K, but this is pure fat- bones are not picked up. It is possible and not unagreeable to the soaper that the by-products plant pick up both fats and bones and sell tallow or fat to the soaper. Most of the material that could be picked up now and it is a matter of convenience and not being paid for. Thus the $.01¢/lb. price is an incentive. It is a rather low figure compared to other countries where it could be double or triple, but this is always for 10,000 lbs. per day or more. High prices can be paid for straight fat because of its yield but this should be considered later.

6.3 DISCUSSION OF PARAMETERS, DATA AND FINDINGS

The system of money transfers for services rendered is very complex and is built on faith as there are no printed receipts for much of the transfers but as mentioned before, the slaughtermen have worked themselves into a very strong position by refusing to work.

The kill rates for the 3 slaughterhouses are thought to be 95% accurate - well within the needed range.

Carcass weights are taken from good records and figures for individual take offs of by-products estimated by Dr. Popović and this consultant separately and the figures in Annex V are basically in agreement with the estimates of the author of this report. The yield of dried blood from whole blood and other yields are well known published figures and should be accurate. The selling price of the finished products is the average of the past three years on the international market delivered Chicago USA, which is a fairly well known established scale. It will be less than the European prices. In fact, all the weight yield selling prices are conservative.

The costs of building and oil, wages, electricity, were supplied by the ministry of commerce and industry.

The main area for variance is in the amount of raw material picked up from the outside - half the total - and who should get credit for the improvements in hides, casings and the pork skin? Under the system in this report, the by-products department gets credit for the improved hide because this is where the final processing and grading is made. There is a case in point which the slaughterhouse should be credited with this value for improvement in quality because they can make or break a hide value by how they remove it. Also, the casing payment is being credited to the by-products department because that is the end processor. The casing man pays to the slaughterhouse by-products department, the operating cost of the by-products casing department plus what he used to give these slaughter men. Part of this could be credited the slaughterhouse, but if the two are operated as one, this is merely a bookkeeping exchange and not significant. What is also undeterminable is the

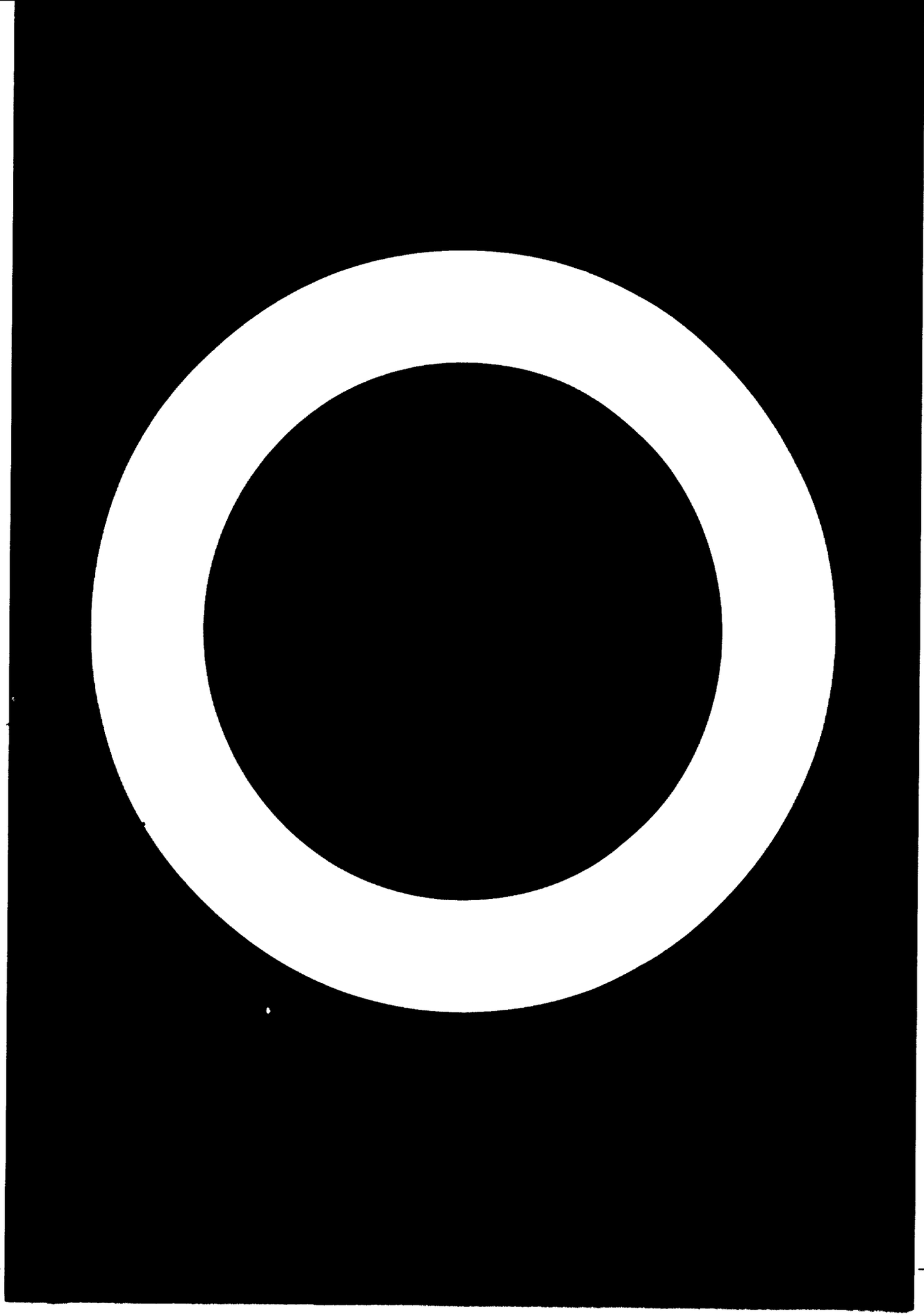
amounts of material to be picked up from the markets; it is thought to be bones and dirty fat - about 1K per sheep and goat, 5K per pig and 18K per steer with over 50 butchers being large enough for daily pickup, 2000K figures could be conservative as the total kill of the three slaughterhouses would indicate about 3000K coming out of the butcher shops, not counting the district kill and picking up less than half of the total shops.

The amount from the chicken processors is a vague estimate based on total killed by the 5 largest raisers and eliminating Comet farms, the largest as they may have their own plant. The amount from the soap maker, district plants, and Paphos, are accurate figures. So in general, the volume figures are conservative and probably fairly accurate within ± 20% to start with, but these figures could easily double with other variable materials such as shark fishing, dead stock and increased kill rates. It is hard to believe that with an aggressive incentive pick up system, this plant couldn't do 50% more material than indicated from outside the complex within 3 years of beginning operation. Volume and profit could only drop below break even with disasterously low

kill rates, or too high a payment rate for raw material.

Maintenance labor was divided up between the slaughterhouse and by-products, but no attempt was made to subtract the money paid from the farmer and casing house, who must pay for this service from the total labor cost.

No attempt was made to make a cash flow chart at this time as more information on financing, internal charges and infrastructure is needed to do so with any kind of meaningful results. It is apparent that operating capital has not been taken into account and should be at a later date. Also, no depreciation of the plant is accounted for because after 15 years, if properly maintained, the plant equipment will be worth what is paid for it if the past 25 years of history is any guide for the next 25 years. Some accountants may disagree with this policy but can hardly disagree with the facts. The real problem lies in replacement value which is impossible to predict, but after the plant is paid for a replacement fund could be built up without hurting profits and raw material payment price.



Annex I

OFFICIAL VISITS *

1 Nicosia Meat Slaughterhouse

2 Limosol Meat Slaughterhouse

3 Larrcea Meat Slaughterhouse

4 Nicosia Sausage Plant

5 Procupis Soap Manufacturing Ltd.

6 Municipal Planning Organization in all 3 cities.

7 Cypriot Planning Organization

8 Nicosia Old Market + Supermarkets - 3

9 Leather Tannery

10 Casing Processors - Apos Assad

11 New Plant Site

12 Comet Farm Ltd. - Poultry Producer

13 Meat Markets

14 Ministry of Agriculture

15 Department of Veterinary

16 Sausage Plant - Larnaca

17 Department of Fisheries

18 Ministry of Commerce and Industry

* Multiple visits not noted

Annex II

ACKNOWLEDGEMENT

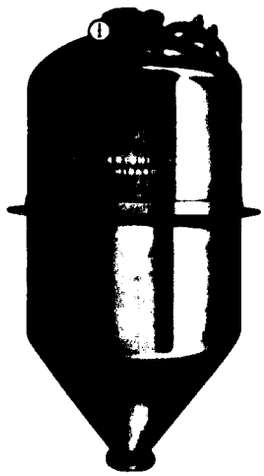
This is to note and thank especially George Michaeloudes of the Ministry of Commerce and Industry, for immense help and advice, without which, this feasibility study could not have been completed in such a short time and to the degree of understanding of the situation.

Also, I wish to thank Dr. Dimitrije Popović, my fellow UNIDO project expert, on the slaughterhouse complex, for his information and help which saved weeks of work and duplication of effort.

Annex III

EQUIPMENT CATALOGUE AND ILLUSTRATIONS

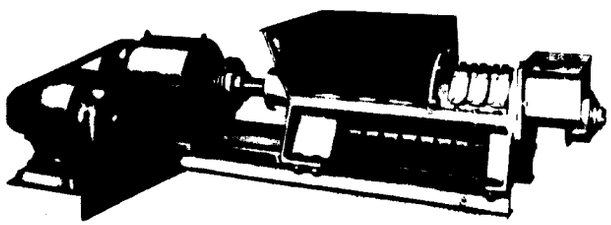
No. 634 VERTICAL BLOW TANK



The Blow System provides a convenient and economical method of transporting ground materials where long distances or complicated path must be used. The Blow Tank accumulates and measures materials for each cook. Washed and washed offal and ground up bones and carcasses are put directly into the tank. Blowing is done by either steam or air pressure. Usually 50 lbs. per square inch is sufficient. 10,000 lbs. load can be blown 200 ft. with 20 ft. rise in about two minutes.

Standard equipment includes tank, made in accordance with A.S.M.E. code for 125 lbs. pressure, with safety valve and pressure gauge. Gate valve, 6" up to 12", and blow piping are extra. Remote controlled air operated gate valves can be furnished.

No. 1045 PREBREAKERS

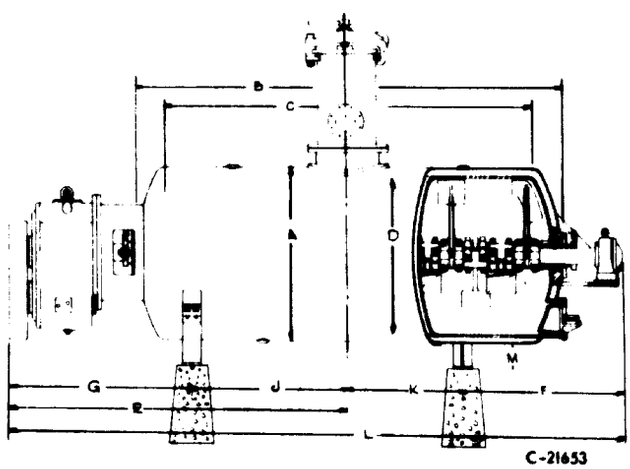


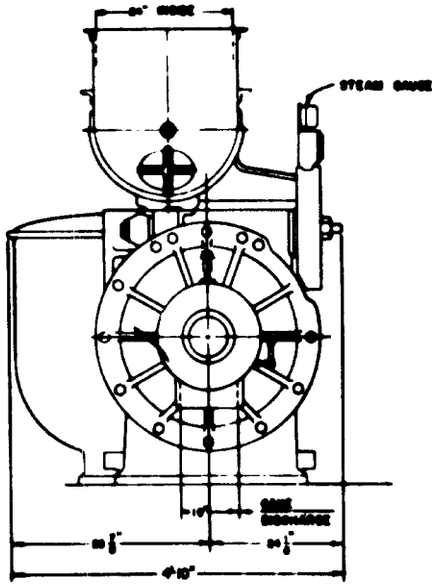
Unique crushing and breaking action of the Prebreaker reduces many difficult materials such as condemned stock, bones and packinghouse offal to a desired uniform particle size. They are noted for their high capacity and low maintenance. Whole carcasses can be fed into this machine due to the tremendous power obtained thru high torque at slow speed. Particle size is controlled by interchangeable orifice plates.

No. 603-G AUTOPERC

Bottom of pan pitched toward cooker discharge aids in draining of free fat. A thick filter bed is formed for catching fines due to bulk of cracklings piling at deep end. A slight movement of dragbars a few inches can be used to expedite percolation. Ac drag moves the load out to the screw conveyor, it picks up fines that collect in low end of pan and mixes them with the meat scraps, leaving pan clean. Weight, 6' x 10'8", 70 cu. ft. cap., 2830 lbs.

No. 600 RENDERING COOKER—No. 12 DRIVE



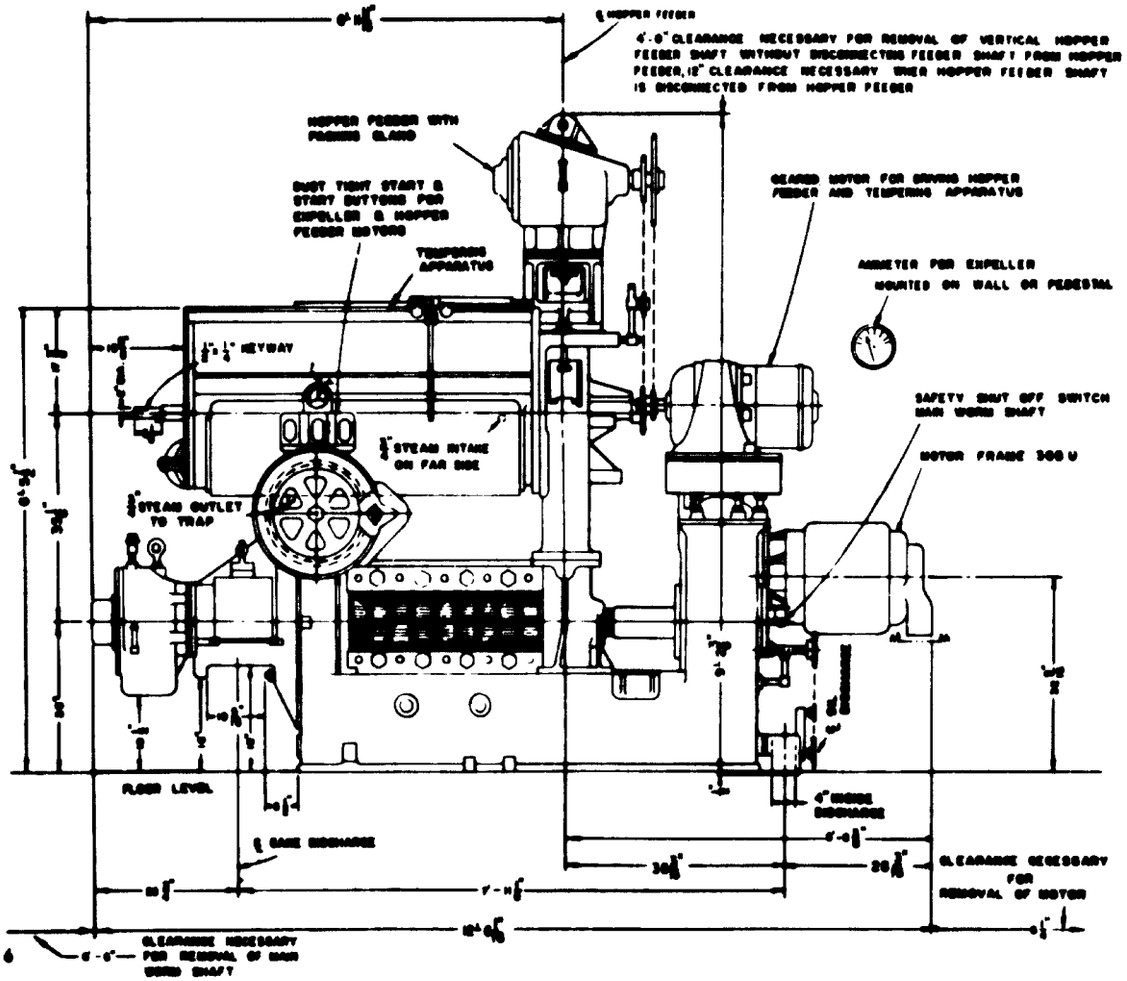


I. H. F. DRIVE

SPECIFICATIONS

APPROXIMATE CAPACITIES, DIMENSIONS, POWER REQUIREMENTS AND SHIPPING WEIGHTS

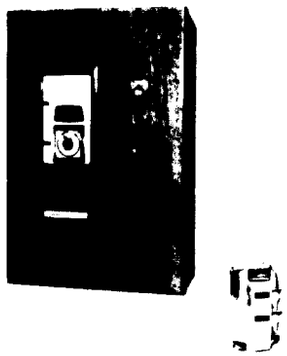
Capacity Lbs. Per Hour of Pressed Cracklings	% RESIDUAL Grease Content	Approx. Floor Space	Overall Height	ELECTRICAL HORSEPOWER Horizontal	ELECTRICAL HORSEPOWER Independent Hopper Feeder Drive	Steam Boiler H.P.	APPROXIMATE SHIPPING WEIGHTS Unit	Domestic	Export	Cubic Feet
Full Press 1200-2200	6-10	12'9" x 5'0" to 5'10"	9'2"	40 to 75	10 to 20	4	EXPELLER Including Motor Drive	15,500-17,000 Lbs.	19,000-20,500 Lbs.	410



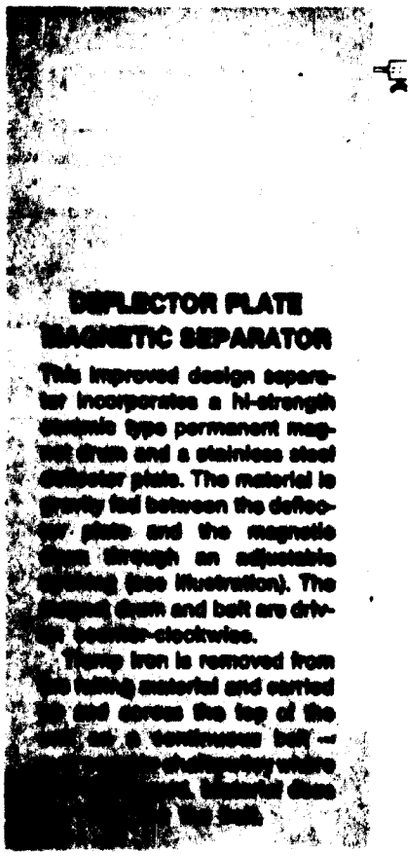
KPELLER® PRESS PROCESS

MOTORIZED CHOKE

POWR-JUST: PUSH BUTTON—with this motorized unit, operators of Duo Expeller presses can push a button to make quick and easy adjustment of the patented "lens type" choke mechanism to immediately relieve sudden or excessive motor overloads. Also saves time and labor for routine adjustment of choke.



AUTO-TROL: AUTOMATIC—combines all the features of Powr-Just plus providing operational control of the "choke" by sensing the motor load condition and automatically making adjustments as required. Frees operator for other duties. Selector switch permits manual push button control when desired.



DEFLECTOR PLATE MAGNETIC SEPARATOR

This improved design separator incorporates a hi-strength ceramic type permanent magnet drum and a stainless steel deflector plate. The material is evenly fed between the deflector plate and the magnetic drum through an adjustable opening (see illustration). The magnetic drum and belt are driven counter-clockwise.

Tramp iron is removed from the flaking material and carried up and across the top of the drum on a "continuous belt"—

INDEPENDENT HOPPER FEEDER DRIVE

The high capacity Duo Expeller press is equipped with an independent motor for driving the hopper feeder, vertical shaft and tempering apparatus. It consists of a separate gear motor, motor starter and electrical relays for operational control of this motor. This feature allows all of the horsepower developed by the main drive motor to be applied to the main worm shaft. Its main advantage is that it enables the Expeller press to be operated to its full capacity without the danger of stalling the motor if too much material is fed into the downspout. This may occur when the operator is trying to "push" the Expeller press beyond its capacity, or when a "slug" or change in consistency of the material is suddenly encountered.

Function of the control relays as used in conjunction with the independent drive are as follows. When pressure being exerted by the main worm shaft produces an overload condition on the main worm shaft motor, the overload control relay will "cut out" the hopper feeder motor, thus stopping the hopper feeder, vertical shaft, tempering apparatus and any supplementary equipment driven from the tempering apparatus shaft. Normally, the relay is adjusted to "trip" at from 100 to 110% of the full load ampere rating of the main drive motor. When the load condition is relieved, the operational control relay will automatically restart the hopper feeder motor, and normal operation is resumed.

Annex IV

RAW WEIGHT FIGURES

CARCASS YIELD ANALYSIS: CATTLE
(Live weight: 491 kg)

		PER PIECE		TOTAL FOR 20 PIECES (kg)	MATERIALS FLOW THROUGH PRODUCTION				COMMENTS
					CHILLING		BY-PROD PLANT	OTHER	
		%	kg		CARCASS	MEAT			
1	2	3	4	5	6	7	8	9	10
1	Blood	3'20	15'71	314,27			314		
2	Horns and hoofs	0'26	1'27	25'53				25	DRYING
3	Hide	7,97	39'13	782'65				782	Salting
4	Feet	1'75	8'59	171'8		70	100		edible
5	Empty stomach	1.8	8'83	176,6		50	126		edible
6	Empty intestines	3.9	19.14	382'8				382	Salting
7	Stomach contents	6.2	30'44	608'8				608	Fertilizer
8	Testes or mammaries	0'10	0'49	9'8		4	5		edible
9	Condemned parts.	2.85	13'99	279'8			279		
10	Slaughter loss	9'89	48'55	971'2					
	TOTAL: 1-10	37'92	186'18	3723'74				1.797	
11	Head	2'68	13'15	263,17		263			
12	Lungs	0'75	3'68	73'65		73			
13	Heart	0'30	1'47	29'46		29			
14	Liver	1'05	5'15	103,00		103			
15	Spleen	0'15	0'73	14'73		14			
16	Kidney	0'20	0'98.	19'67		19			
17	Tile	0'25	1'22	24'55		24			
18	Tallow	2'60	12'76	255'32			255		
19	Tongue	0'20	0'98	19'67		19			
	TOTAL: 11-19	8'18	40'16	803'27		668	1,078		
20	Carcass, hot	53'9.	264'67	5.292'98	5.292				

CARCASS YIELD ANALYSIS: PIGS
(Live weight: 91 kg)

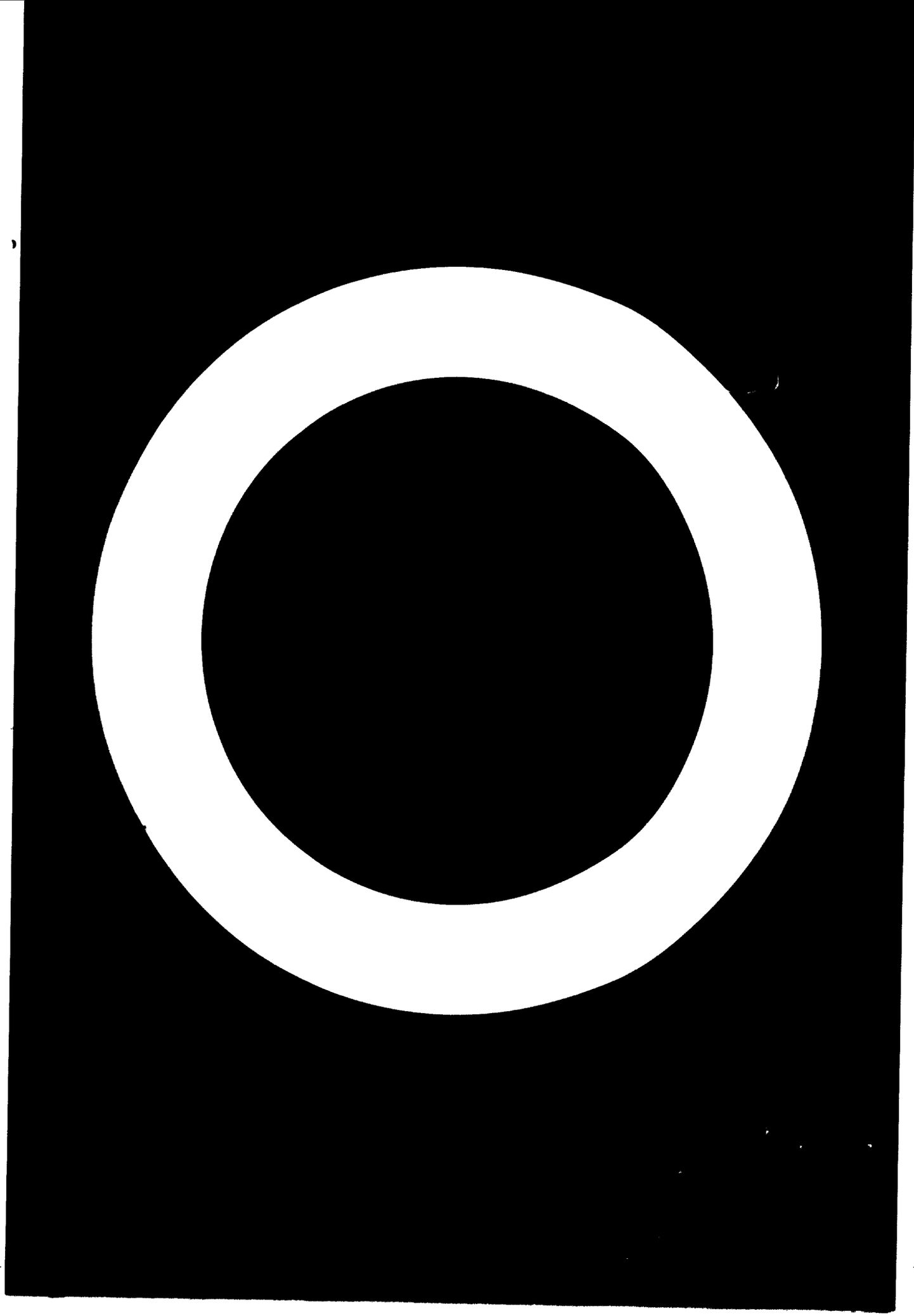
		PER PIECE		TOTAL FOR 430 pieces (kg)	MATERIALS FLOW THROUGH PRODUCTION				
					CHILLING		BY-PROD PLANT	OTHER	COMMENTS
		%	kg		Carcass	Offal			
1	2	3	4	5	6	7	8	9	10
1	Blood	2,70	2,45	1.056'5			1.056		
2	Bristles	0'20	0'18	78,2				78	Drying
3	Hoofs	0'40	0'36	156,5				156	Drying
4	Stomach and large intestines	2'30	2.09	900.0			900		
5	Small intestines	1'40	1,27	547,8				547	Processing
6	Stomach contents	4.0	3,64	1,565,2				1.565	Fertilizer
7	Condemned parts	4,30	3,82	1.673,4			1.673		
8	Slaughter loss	2,29	2,08	896,0			—		
	TOTAL: 1-8.	17'49	15,91	6.843,8			3.599	2.376	
9	Lungs	0'72	0'65	281'7		281			
10	Heart	0'25	0'22	97.8		97			
11	Liver	1,00	0'91	391,3		391			
12	Kidney	0'22	0'20	86,1		86			
13	Spleen	0'15	0'13	58,6		58			
14	Brain	0'06	0'05	23,4		23			
15	Tongue	0'17	0'15	66,5		66			
	TOTAL: 9-15	2'57	2.38	1.005,6		1.002			
16	Carcass, hot	80,00	72'8	31.307	31.307				

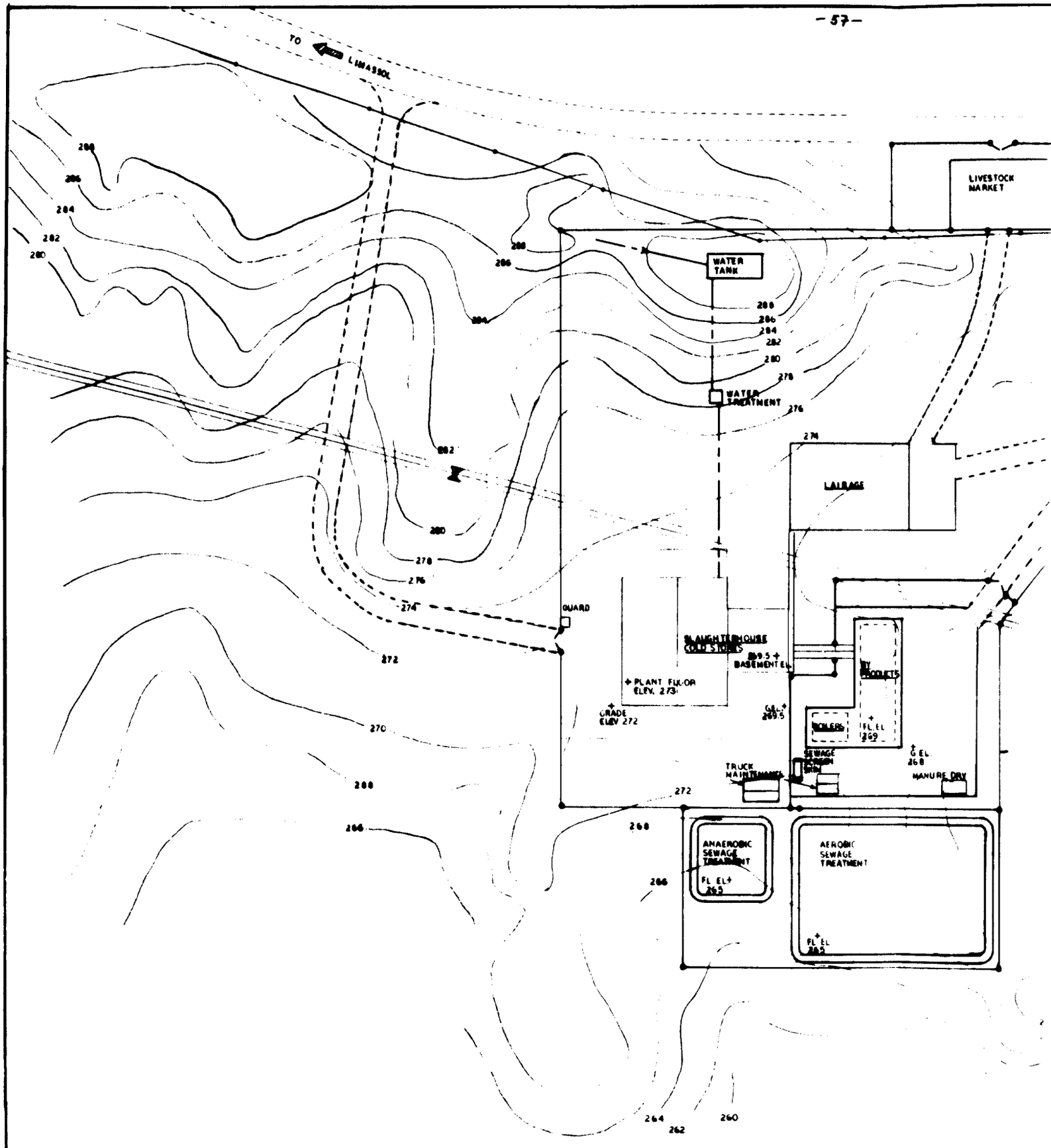
CARCASS YIELD ANALYSIS: SHEEP AND GOATS - AVERAGE
(Live weight: 25 kg)

		PER piece		TOTAL for 526 pieces (kg)	MATERIALS FLOW TROUGHS PRODUCTION				
					CHILLING		BY-PROD PLANT	OTHER	COMMENTS
		%	kg		Carcass	OFFAL			
1	2	3	4	5	6	7	8	9	10
1	BLOOD	3.30	0'82	431.32			431		
2	Feet	1.60	0'40	210'40			210		
3	SKIN	12,40	3.10	1,630'60				1.630	Salting
4	HORNS	1,20	0'30	157'80				157	Drying
5	STOMACH & LARGE intestines	12,95	3'23	1.698'90			1.698		
6	SMALL INTESTINES	2,08	0'52	273,52				273	Processing
7	Condemned parts	5.60	1'40	736,40			736		
8	Slaughter loss	2.80	0'70	368,20				—	
	TOTAL: 1-8	47'93	10'48	5.512,11			3.075	2.060	
9	Lungs	1,40	0'35	184,10					
10	Heart	0'45	0'11	57'86					
11	Liver	0'70	0'17	89'72					
12	Spleen	0'10	0'03	13'78					
13	Tallow (OMENTUM)	0'60	0'15	78'90					
14	Head	3'70	0'92	483'92					
15	Carcass, hot	51,12	12'78	6.722'28					
	TOTAL: (9-15)	58'07	14'51	7,632.26	7.632				

COMPARISON IN CAPACITIES OF MATERIALS FLOW TROUGH PRODUCTION RELATING TO EXISTING AVERAGE AND MAXIMUM DAILY SLAUGHTERING AND PROJECTED SLAUGHTERING IN 1986

	kg PER PC.	EXISTING AVERAGE				EXISTING MAXIMUM				Projected slaughtering for 1986			
		CHILLING		BY-PR. PLANT (kg)	SALTING (kg)	CHILLING		BY-PR PLANT (kg)	SALTING (kg)	CHILLING		BY-PROD. PLANT	SALTING
		pcs.	kg			pcs.	(kg)			pcs.	kg		
Sheep and goats:													
CARCASS	14.51	526	7.632			1.250	18.137			1278	18.108		
SKINS	3.10				1.630				3.875				3.868
BY-PRODUCTS	5'87			3,075				7.300				7.288	
PIGS:													
CARCASS	72'8	430	31.304			665	48.412			951	69.232		
OFFALS	2'33		1.002				1.549				2.215		
BY-PRODUCTS	3'37			3.599				5.566				7959	
CATTLE:													
CARCASS	269'64	20	5.292			60	15.878			33	8.733		
OFFAL	33'4		668				2.004				1.102		
HIDES	39'13				782				2.347				1.291
BY-PRODUCTS	53'95			1.079				3.237				1.780	
TOTAL:			45.898	7.753	2.412		85.980	16 103	6.222		89.390	17.027	5.159
				~ 8 tons				~ 16 tons				~17 tons	





COMMENTS	DRAWING NO	BY PRODUCTS PLANT. SITE SLAUGHTERHOUSE : DRAWING	CYPRUS MUNICIPAL MEAT PROCESSO
	A1		

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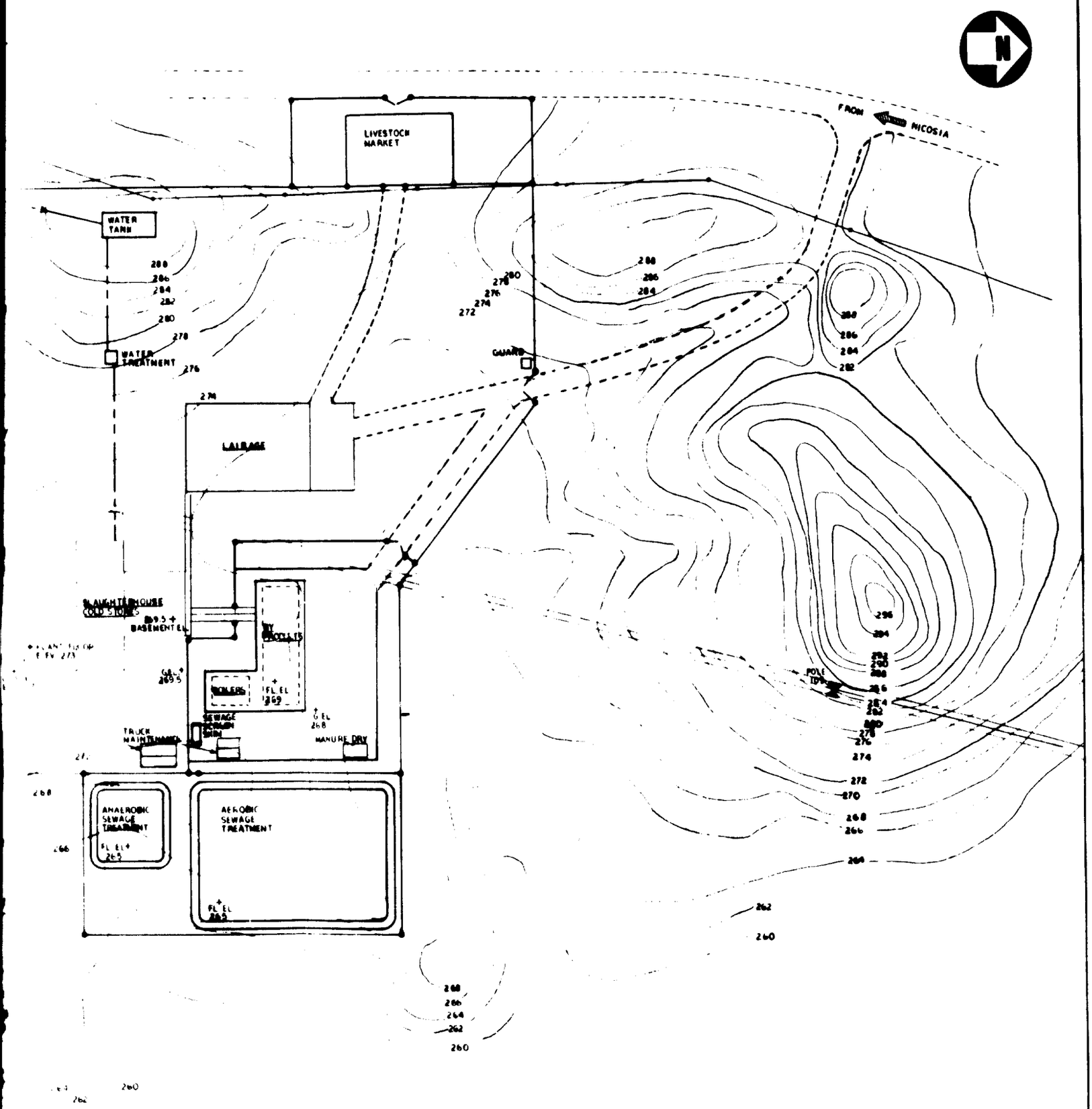
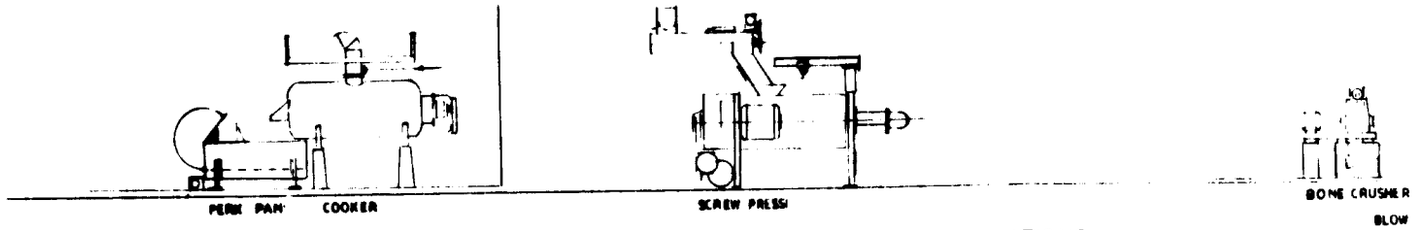
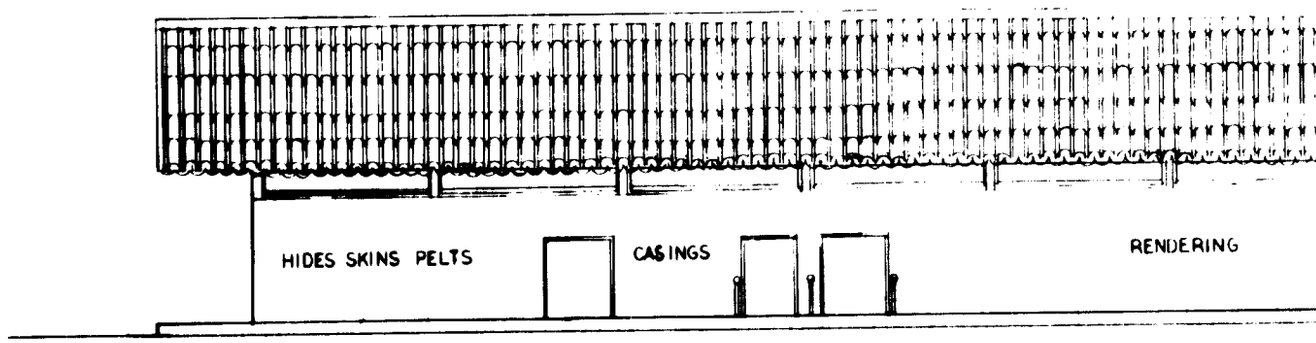


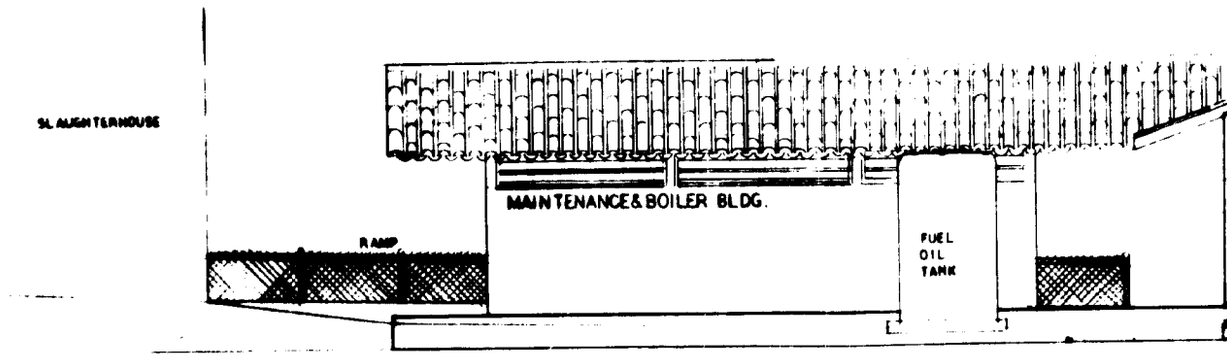
US MUNICIPAL MEAT PROCESSORS	DATE JUNE '78		DRAWN BY LLC	CHECKED BY	DESIGNED BY LLC DP



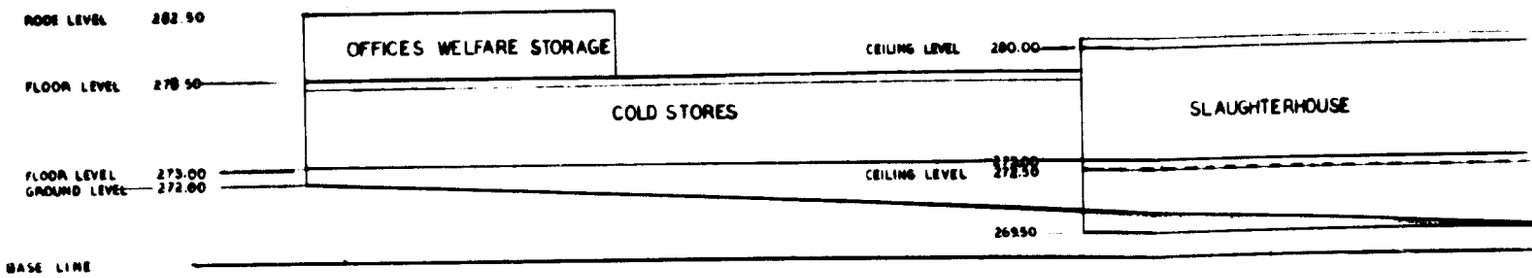
MACHINE ELEVATIONS
TYPICAL ILLUSTRATIONS



BY PRODUCTS PLANT SOUTH FACE



BY PRODUCTS PLANT EAST FACE



RELATION OF LEVELS
SCALE 1:200
EAST FACE

COMMENTS:	DRAWING NO. A2	BY PRODUCTS PLANT ELEVATIONS	CYPRUS MUNICIPAL MEAT PROGES

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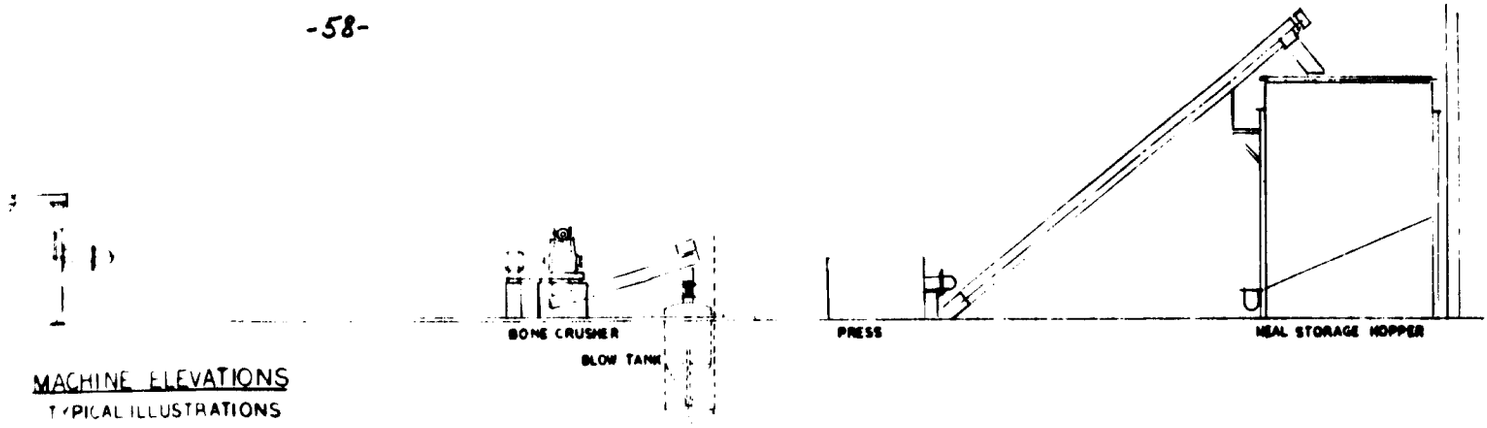
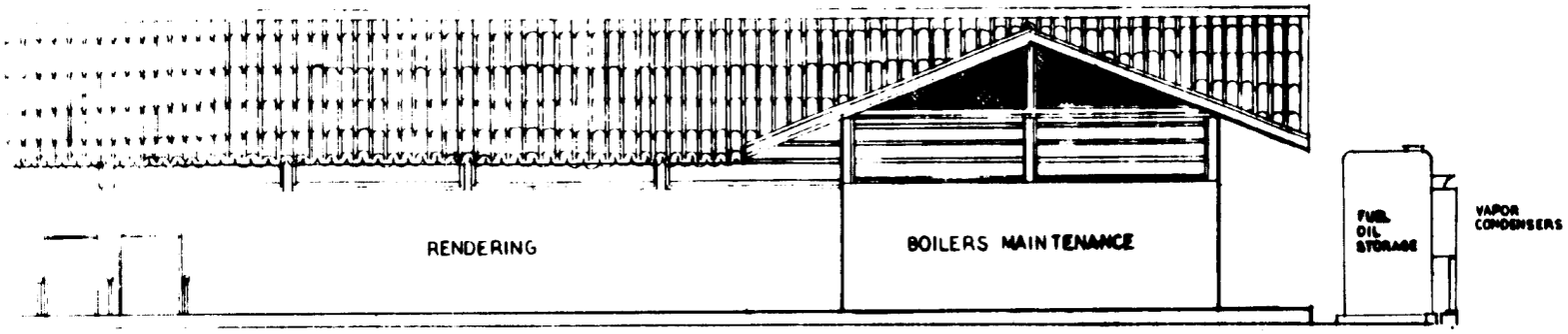
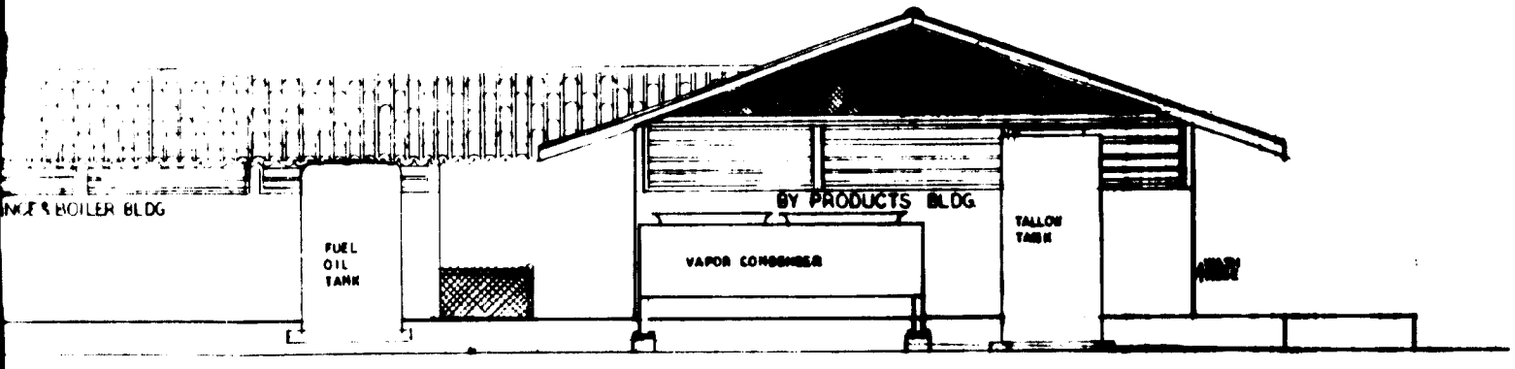


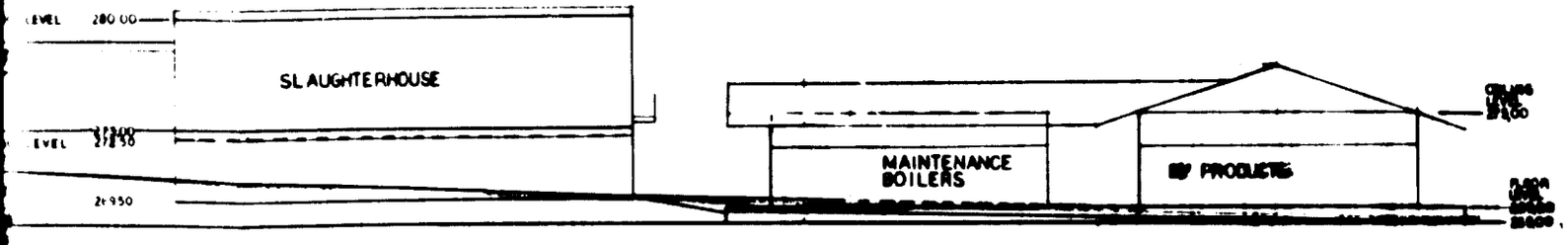
MACHINE ELEVATIONS
TYPICAL ILLUSTRATIONS



BY PRODUCTS PLANT SOUTH FACE



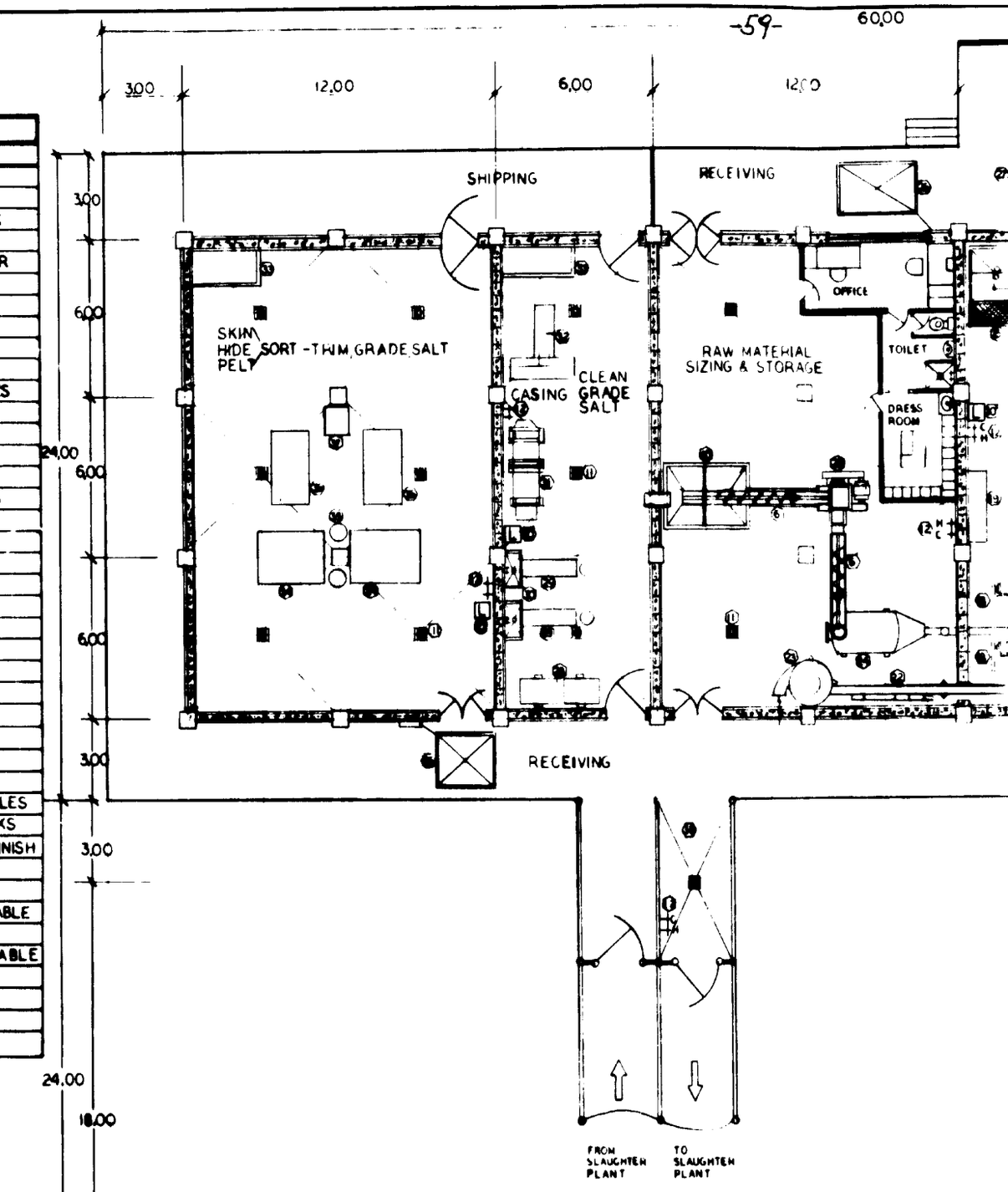
BY PRODUCTS PLANT EAST FACE



RELATION OF LEVELS
SCALE 1:200
EAST FACE

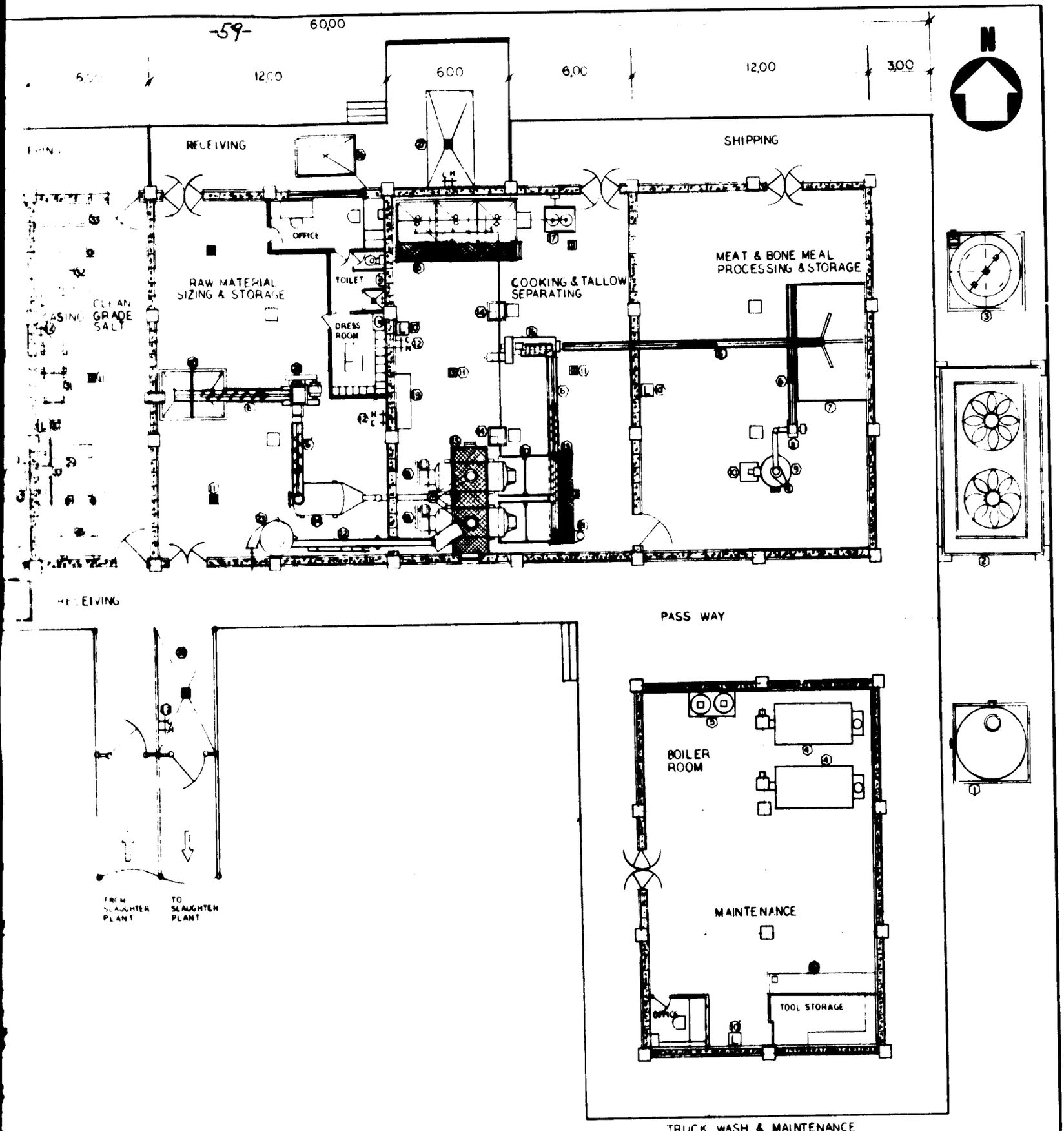
S MUNICIPAL MEAT PROGESSORS		DATE: JUNE 1976	DRAWN LLC	APPROVED:	CHECKED:

SYMBOL KEY		
NO	QUA	DESCRIPTION
1	1	FUEL OIL STORAGE
2	1	AIR CONDENSER
3	1	TALLOW STORAGE TANK
4	2	STEAM BOILER
5	1	BOILER WATER SOFTNER
6	5	SCREW CONVEYORS
7	2	MEAL STORAGE BIN
8	1	HAMMER MILL
9	1	MIXER
10	1	SCALE
10	8	HAND WASH LAVATORIES
11	17	FLOOR DRAINS
12	6	HOSE WASH STATIONS
13	2	PLATFORMS
14	2	GREASE PUMPS
15	6	GREASE SETTLING UNITS
16	1	PRESS FOR CRAX
17	1	DRUM FILL WEIGH
18	2	COOKERS
19	1	ELECTRICAL PANEL
20	2	PERK-PANS
21	1	BLOOD BAGGER
22	1	BLOOD COAGULATOR
23	1	BLOOD CYCLONE
24	1	BLOW TANK
25	1	PREBREAKER
26	2	SCALES
27	1	DRUM WASH
28	6	CASING TRUCKS
29	2	CASING CLEANING TABLES
30	2	CASING CLEANING SINKS
31	1	CASING CRUSH STRIP FINISH
32	1	GRADE SORT
33	2	SALT BINS
34	2	HIDE-PELT-SKIN -TRIM TABLE
35	4	DRUMS
36	2	HIDE-PELT-SKIN SALT TABLE
37	2	SALT TRUCK
38	1	TRUCK WASH
39	1	WORK BENCH
40		BONE HOPPER



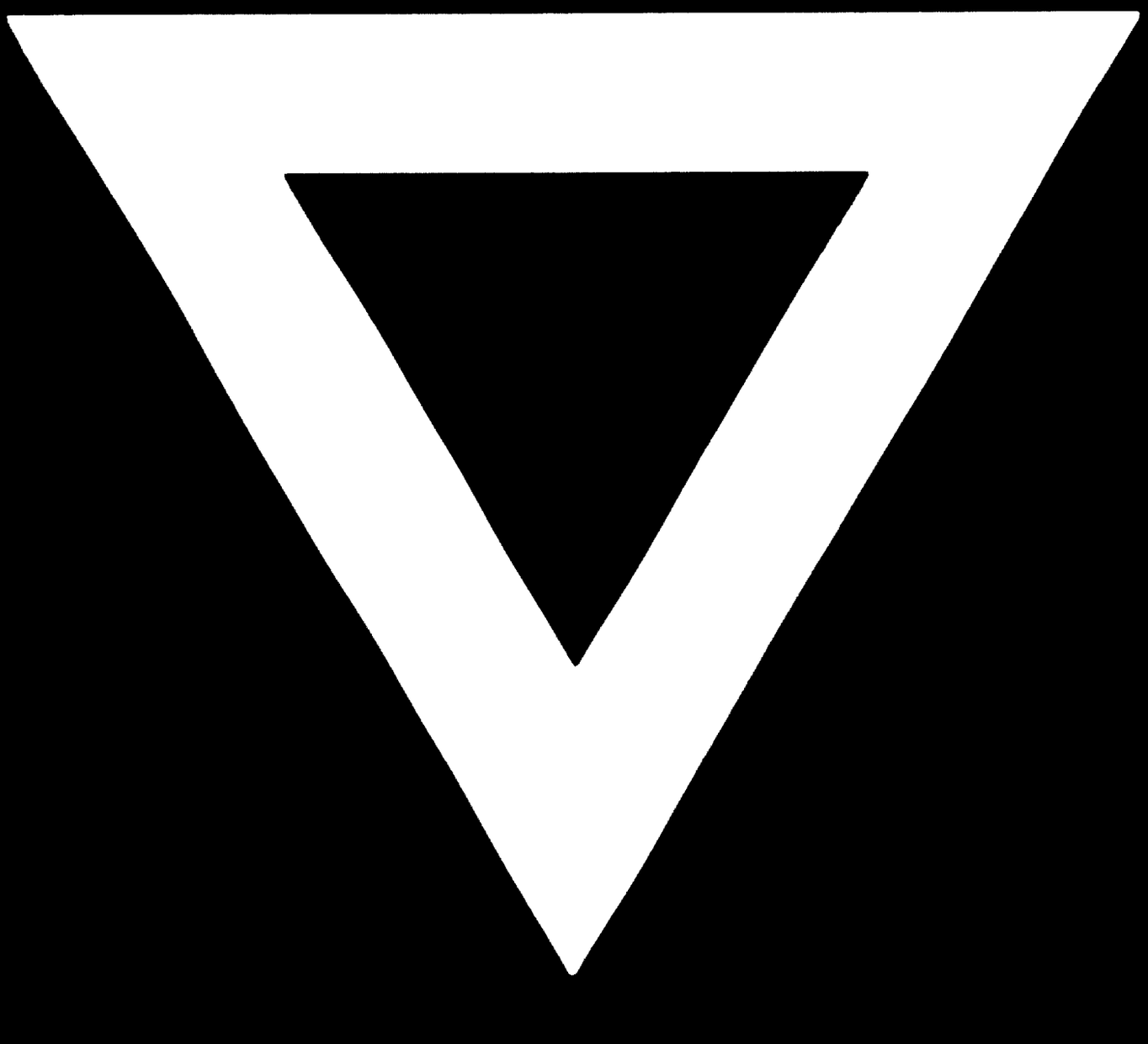
COMMENTS	DRAWING NO.	BY-PRODUCTS PLANT PLAN VIEW	CYPRUS MUNICIPAL MEAT PROCES
	M1		

[redacted]



RUS MUNICIPAL MEAT PROCESSORS	DATE JUNE '78	DRAWN BY LLC	CHECKED BY	APPROVED BY

C-700



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