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16667

Distr.
RESTRICTED

IO/R.66
27 January 1988

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ENGLISH

**ASSISTANCE TO THE EXPERIMENTAL CENTRE FOR
APPLIED ENZYMOLOGY AND MICROBIOLOGY (ECAEM)**

UC/MON/87/126

MONGOLIA

**Technical report: Technological Profiles for Manufacture
of Biochemical Products***

Prepared for the Government of the Mongolian People's Republic
by the United Nations Industrial Development Organization

**Based on the work of Mr. Fryda Jan, Mechanical and Plant Engineer
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PROJECT

UC/MON/87/126

Introduction

The work is a result of a logical continuation of the Project DP/MON/82/002 "Assistance to the Experimental Centre of Enzymology and Microbiology /ECAEM/". During implementation of this Project it became quite clear, that no further development could be made in the present facilities of EACEM and it was decided by Mongolia Government to create an independent institution for developing of biochemical industry in Mongolia. This institution will be established in January 1988/Monenzym/ .

For the purposes of establishing of the institution, the Project UC/MON/87/126 was implemented, to prepare all the necessary technological profiles, including specifications of equipment and essential services for the planned new production building. It was emphasized at this stage, that the architectural and engineering design should be flexible enough to be easily adapted to any new technologies, developed at later stages.

Immediate activities

Within the frame work of the Project UC/MON/87/126, two experts from UNIDO were fielded to prepare all of the basic technological profiles required for the new building of Monenzym. According to the needs of projecting of this experimental biochemical production building it was required to prepare the flow-charts for all the future planned production units, to select the suitable equipment with detailed specifications to determine the requirements for electricity, steam and water and to draw up the layout of the individual production units and essential services.

After arrival to the ECAEM in Ulan Bator the experts acquainted themselves with the production programme, planned by the Mongolian partner and with technologies which would be utilized in the future institution. The whole technical documentation has been prepared, based on the data received from the Mongolian counterpart.

For preparation of individual chemical-engineering specifications and flow-charts, the numeric code used in ECAEM for individual production units has been kept for numbering of the documents prepared. From this work several units has been excluded owing to different reasons: A-07 Production of dry bile; this production unit is in operation in the premises of ECAEM and it is well equipped with all necessary equipment, including Anhydro film-evaporator and anhydro spray-dryer. The available existing equipment shall be transferred to the new building and therefore no specifications are needed. However this production unit has been involved in the summary of energy consumption in Anex I. A-08 Manufacture of tablets; the tablet production is still in question since it has been emphasized several times, that final formulation of several biochemical substances from animal origin should be carried out in a pharmaceutical factory, already equipped with all necessary equipment-granulating machine, tray dryer, tableting machine, coating machine and packing machine. The production capacity of a tableting machine can be never fully utilized by projecting biochemical drugs only. A-09 Manufacture of sterile substances; this unit is equipped

with a Rota filling line, which should be transferred to an aseptic suitable space in a pharmaceutical production for better utilization. The line is used for production of sterile enzymes in vials at about 15% of its capacity. The whole line is equipped with two freeze-drying machines Leybold for drying of the final sterile products in vials, with the capacity of 4400/6 hours on both machines.

A-10-Quality control laboratory; no technological specifications are required at the present stage.

The above technical work has been done without any further reference to the Feasibility Study 1981 and therefore changes in designing of the new building can be done according to the Mongolian projecting organisation needs and decisions. Documentation has been prepared in such a way, that it can be immediately utilized as a base of the detailed engineering documentation by any construction and engineering company specialized in projecting of chemical production plants.

Comments and recommendations.

With regard to the elaborated technical documentation the following recommendations and comments for starting of a projecting work in a project organisation have been prepared:

1/The data for mechanical-technological part of project are laid out in technological schemes for individual production and auxiliary units. The equipment is designed in scale 1:100 and the arrangement follows the technological steps and correspond to supposed levels in the building.

The pipe connections between equipment and main pipe distributions, leading through the building, are specified with inside diameters of pipe, material used for the pipe and fittings and eventual heat insulation necessity.

Specification sheets contain all essential description of the equipment, including dimensions and weights, energy and water consumption and prices for year 1987. In prices for piping and fittings, stated in individual specification sheets the price for main distribution lines of all media into the building is not included.

All these data may be used for elaboration of the equipment layout in the projected building, for static calculations of floor constructions and auxiliary steel constructions and for elaboration for plans for pipe conduits.

The data should be used for contacting proposed manufacturers for getting more technical details of individual items of equipment necessary for starting of the project work.

2/For measuring and regulation needs the lay-out schemes are specified with international signs all the places, where it is proposed that needs for M+R are expected. The M+R system used is a combined electro-pneumatic system without central control-board room. For the pneumatic part of the system is one compressor unit equipped with automatic air-drying device installed.

3/For electrical installation of motors, values of installed electricity and number of motors are given in the specification sheets. In the summary/annex I/maximum contemporary electricity consumption per hour are introduced for all the produc-

tion and auxiliary units. Out of these informations the main and subsidiary swichboards for instalation of electric motors should be designed.

For the auxiliary unit A-18 a transformer 630 kW is recommended. This value corresponds to the expected consumption of electricity for production and auxiliary units A-01 to A-07 and A-11 to A-19 and to astimated electricity consumption for laboratories and building civil services.

4/Ventilation in Ex-rooms and air conditioning for sterile rooms are introduced in auxiliary unit A-19, where all necessary data are stated. Other possible claims for ventilation /in laboratories or civil services/ should be taken into the project of building.

5/For determination of sizes for main pipes for steam and water supply from outside into the building the data given in Annex I. should be used. In these data the consumption of laboratories and civil services is expected.

6/For the building construction it is recommended to use a reinforced-concrete skeleton with modul 6x6 m and with classical filling with bricks or similar material. For the production part of the building it is recommended to use conception of a hall, devided into separate parts for Ex-rooms and non-explosive rooms.

7/The cooling unit A-17, determined for raw material store, includes such equipment, that can be ordered only as a whole. The equipment is then delivered by the supplier with a detailed documentation. Therefore this unit shall be set up by a specialised subcontractor.

The cooling unit for raw material store will not be a part of the main building, but it should be adjacent to the store.

8/The ethanolic liquids used in processing are rather acid and corosive; therefore it is recommended to use acidoresistant piping/polypropylen pipes/and enameled vessels for ethanol regeneration. The liquid waste of processing is also corro-

sive and therefore the piping between the processing unit and the neutralisation unit A-14 should be made of acido-resistant materials.

9/The specification for enamelled, steel and stainless steel vessels, chosen for production and auxiliary units, correspond to valid czechoslovak producers' standarts No. ON 691104, PNC 69 8533 and PNC 69 8510.

10/If there is no experience in projecting of chemical production plants in Mongolia, experts recommend to contact a foreign engineering company, specialized in this field to propose the detailed technical drawings. The preparation of such technical documentation in cooperation with any Mongolian construction company or company for civil works would provide the base for preparing the project documentation for the building construction. The period of time required for this phase would be approximately 8 months. At this phase close cooperation would be required with manufacturers of proposed equipment as it has already been mentioned in paragraph 1 of these recommendations.

LIST OF ABBREVIATIONS, used for mechanical-technological schemes

S	-	Steam
CO	-	Condensate
CW	-	Cooling water
CWO	-	Cooling water outlet
TW	-	Technological water
HW	-	Hot water
NW	-	Warm water
W	-	Water
DW	-	Distilled water
DEW	-	Demi-water
LW	-	Liquid waste
SEW	-	Sewage
V _g	-	Vacuum
CV	-	Central vacuum
CCA	-	Central compressed air
DCA	-	Dry compressed air
N ₂	-	Nitrogen
COU	-	Condensate usable for steam production
MS	-	Main stream
RM	-	Raw material
R	-	Reflux
ET	-	Ethanol
EtoR	-	Ethanol to regeneration
ER	-	Ethanol regenerated
EtV	-	Ethanol vapours
Ac	-	Acetone
actoR	-	Acetone to regeneration
AcR	-	Acetone regenerated
OA	-	Oxalic acid
S	-	Steel
SS	-	Stainless steel
G	-	Glass
PP	-	Polypropylene
A	-	Out to atmosphere

A-01 PRODUCTION OF PEPTONE-Technology

According to Mongolian Production Plan, production of 32 tons of Peptone per year is expected. The production shall be carried out in 3 shifts and it was decided to divide the daily production into two batches so, that the capacity of production unit can be easily changed, according to existing demand and market possibilities, from 16 tons up to 32 tons per year. With this in respect the equipment has been chosen and it seems even advisable to start the whole trial production in one batch per day only, because of lack of experience on the side of Mongolian workers.

For one batch 1200 kg of beef paunch and ventricals is used. The material is minced on mincing machine /3/ and divided into 4 jacketed vessels, equipped with anchor-stirrers/2/ so, that 300 kg of material comes into one vessel. Transport of the minced material is realized through worm-transporter/4/, with help of certain amount of water added, the amount of which is measured on installed volumeter. To the minced material in vessel water is then added up to the volume of 300 lt, the mixture is heated to boiling point and then cooled to the temperature of 40-45°C. To each vessel then 15 kg of previously minced and activated pancreas is added and pH of the mixture is adjusted to 8,0-8,5, with help of lime solution, from reservoir/17/. The hydrolyze of protein now continues for 7 hours at constant temperature 40-45°C and constant pH 8,0-8,5. After 7 hours phosphoric acid from reservoir/16/ is added to adjust pH to 6,6-7,0 and the mixture is then through plate filter/5/ with help of piston pump filtered. About 400 kg of waste product is there from one batch of 1200 kg of raw material separated. The clear solution of peptone is in a vessel /7/ collected where from it is sucked into a vacuum film-evaporator /8/. The solution/about 2000 lt/ is to about 1/20 of the original volume concentrated and it is in a jacketed vessel-reservoir/11/ collected. There it is to the prescribed concentration with demineralized water diluted, through plate filter/13/ filtered and with help of piston pump /12/ pumped into a collecting vessel/14/, from which it is continuously

pumped through pump/19/ into a spray dryer/15/.The dry final product is collected and in barrels with plastic bags inside, packed.From one batch of 1200 kg of raw material about 70 kg of Peptone is obtained.

A - 01 PRODUCTION OF PEPTONE - Specification sheet

No	Equipment	Manufacturer	Pic	kW		Steam		Water		Price/piece		Total, price	
				inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	RBL
1	2	3	4	5	6	7	8	9	10	11	12	13	
1	Balance up to 1000kg	CHEPOS - CSSR	1	/	/	/	/	/	/				
2	Vessel jacketed, enameled, 1000 lt, with anchor-stirrer D=1300mm, H=3225mm isolation covering w=2000 kg	CHEPOS-Chotěbořské strojirny - CSSR	4	4x 4,0	320	0,4	1,6	6	16	16000	22400		89600
3	Mincing machine RM 1000, stainless steel, 1000kg/h L=1095mm, W=758mm, H=1072mm w=350 kg	Strojárne potravin. priemyslu-Bratislava CSSR	1	7,5	18	/	/	/	/	2500	3500		3500
4	Worm-transporter for minced meat, stainless steel	Transporta-Chradim CSSR	1	3	7	/	/	/	/	1780	2500		2500
5	Plate and frame press filter, autom. frames 630x630mm, thickness 45mm, filter surface 24m ² pressure 0,9mPa electric drive L=4200, W=1200mm, H=1100mm	Tschmashimport Moscow, USSR	1	0,3		/	/	/	/	32140	45000		45000
6	Piston pump PAX 64 stainless steel, max. pressure 2mPa 700 lt/h	VEB-SALZWEDEL, GDR	1	1,7	13,6	/	/	/	/	1210	1700		1700
7	Vessel collecting, without stir. stainless steel, 1000 lt, D=1000mm, H=1930mm w=550 kg	CHEPOS-FEROX Děčín CSSR	2	2x 4,5	9,0					5900	8200		16400

A - 01

1	2	3	4	5	6	7	8	9	10	11	12	13
8 Vacuum film-evaporator FRO 4-P, stainless steel, 368kg evap. water per hour D=750mm, H=5100mm, w=2200kg	CHEPOS-KSB Brno CSSR	1	10	120	0,42	5,0	/	/	25000	35000		35000
9 Condenser horizontal stainless steel, F=10m ³ D=600mm, L=4000mm w=750kg	CHEPOS-FEROX Decin CSSR	1					9	108	8500	12000		12000
10 Barometrical seal, steel, 100 lt, D=500mm, H=870mm w=253 kg	CHEPOS-KSB Brno CSSR	1							1080	1500		1500
11 Vessel jacketed, stainless steel, with stirrer, 250 lt D=700mm, H=2050mm w=490 kg	CHEPOS-FEROX Decin CSSR	2	2x 1	2			0,15	0,15	6050	8460		16920
12 Piston pump PAX 32 with safety valve, stainless steel, max. pressure 2mPa 180 lt/h	VEB-SALZWEDEL, GDR	1	1,2	9,6					12101	1700		1700
13 Plate and frame press filter, autom., frames 315x315mm, thickness 25mm, filter surface 5,6m ³ work pressure 1,1mPa frame volume 70 lt L=2480mm, W=750mm H=590mm	TECHMASHIMPORT Moscow, USSR	1	0,2						20000	28000		28000

A - 01

1	2	3	4	5	6	7	8	9	10	11	12	13
14 Vessel collecting stainless steel 250 lt D=600mm, H=840mm w=350 kg	CHEPOS-FEROX Decin CSSR	1							2800	4000		4000
15 Spray-dryer URS-20 20 lt/h, stainless steel L=2500mm, W=2800mm, H=2066mm electrical heating	VVZ-Nove Mesto nad Vahom CSSR	1	37	740					28500	40000		40000
16 Glass vessel with outlet, 100 lt D=560mm, H=850mm	Kavalier, Sazava CSSR	1							107	150		150
17 Glass vessel with outlet, with stirrer, 100 lt D=560mm, H=1050mm	Kavalier, Sazava CSSR	1	0,25	0,5					178	250		250
18 Glass-pump with teflon piston	Kavalier, Sazava CSSR	1	0,3	0,15					107	150		150
19 Piston-pump PAX 32 with safety valve, stainless steel, 0-180 lt/h	VEB-SALZWEDEL, GDR	2	2x 1,2	24					1210	1700		1700

TOTAL

90,7 1265 082 6,6 15 124

300070

Pipings and fittings mounting included

66000

Regulation and measuring, mounting incl.

15000

Electrical installation for motors

16000

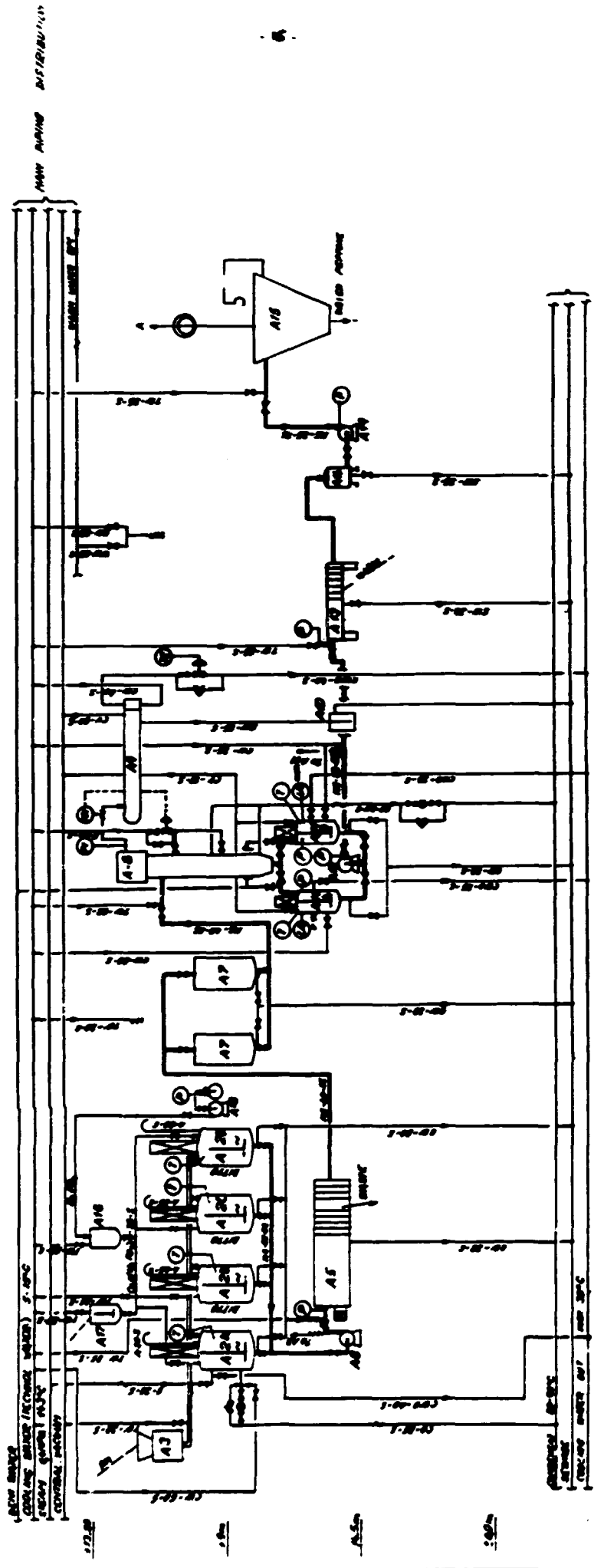
Auxiliary steel constructions

5000

A-01 TOTAL

402070

A - 61 PRODUCTION OF PETROLEUM REFINERY - REFINERIES - TECHNICAL DRAWING



MAIN PIPING DISTRIBUTION

COOLING WATER SYSTEM
STEAM SYSTEM
GAS SYSTEM

1:1

1:1

1:1

1:1

1:1

1:1

1:1

1:1

1:1

1:1

1:1

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1:1

1:1

1:1

1:1

1:1

A-02-PRODUCTION OF PEPSIN-Technology

The Mongolian Production Plan expects the production of 100 kg of Pepsin for medical use and 1000 kg of Pepsine for food industry/for clotting milk in cheese production/.Such equipment, which can be utilized for both technologies,which do not greatly differ has been chosen for the production unit.According to the given technologies the production processes differ only in the purification step,where for the production of Pepsin for medical use precipitation with ethylalcohol is used,while Pepsin for food industry is from the solution with salt salted out.

For the planned production of 100 kg of pharmaceutical Pepsin will be 5,5 tons of pig stomach mucose processed in an year.

100 kg of this raw material will be processed daily.

This raw material is minced on a mincing machine /2/ and placed into one of the three vessels /3/,where it is with 100 lt of water and 3,6 lt of hydrochloric acid mixed together.The auto-lyse of the tissues now takes place for 48 hours at the temperature of 40°C,with slow stirring over day period only.After that the obtained solution is sieved and transported into a vessel/6/, where the impurities are with ethylalcohol precipitated.The precipitate is filtered off on the press-filter /9/ and the solution goes into the second vessel/6/,where the final product is by increasing the ethanol concentration up to 85% precipitated.It is then filtered and separated on the press-filter /9/,put on stainless-steel trays and dried in the vacuum trydryer /7/ at the temperature of 60°C.The dry product is finally ground on a vibrating mill /8/,sieved and stored in glass or plastic containers.

For the production of Pepsin for food industry 100 kg of cattle stomach mucose is used daily,and the autolyse with hydrochlorid acid is done without addition of water.After 48 hours of autolyse the obtained solution is filtered through the vacuum filter /4/ and finally dried in a vacuum-dryer /7/.The dry product is ground on a mill /8/ and after sieving is stored in containers with plastic bags inside.For the expected production of Pepsin for food industry about 20 tons of raw material should be processed.

A - 02 PRODUCTION OF PEPSIN - Specification sheet

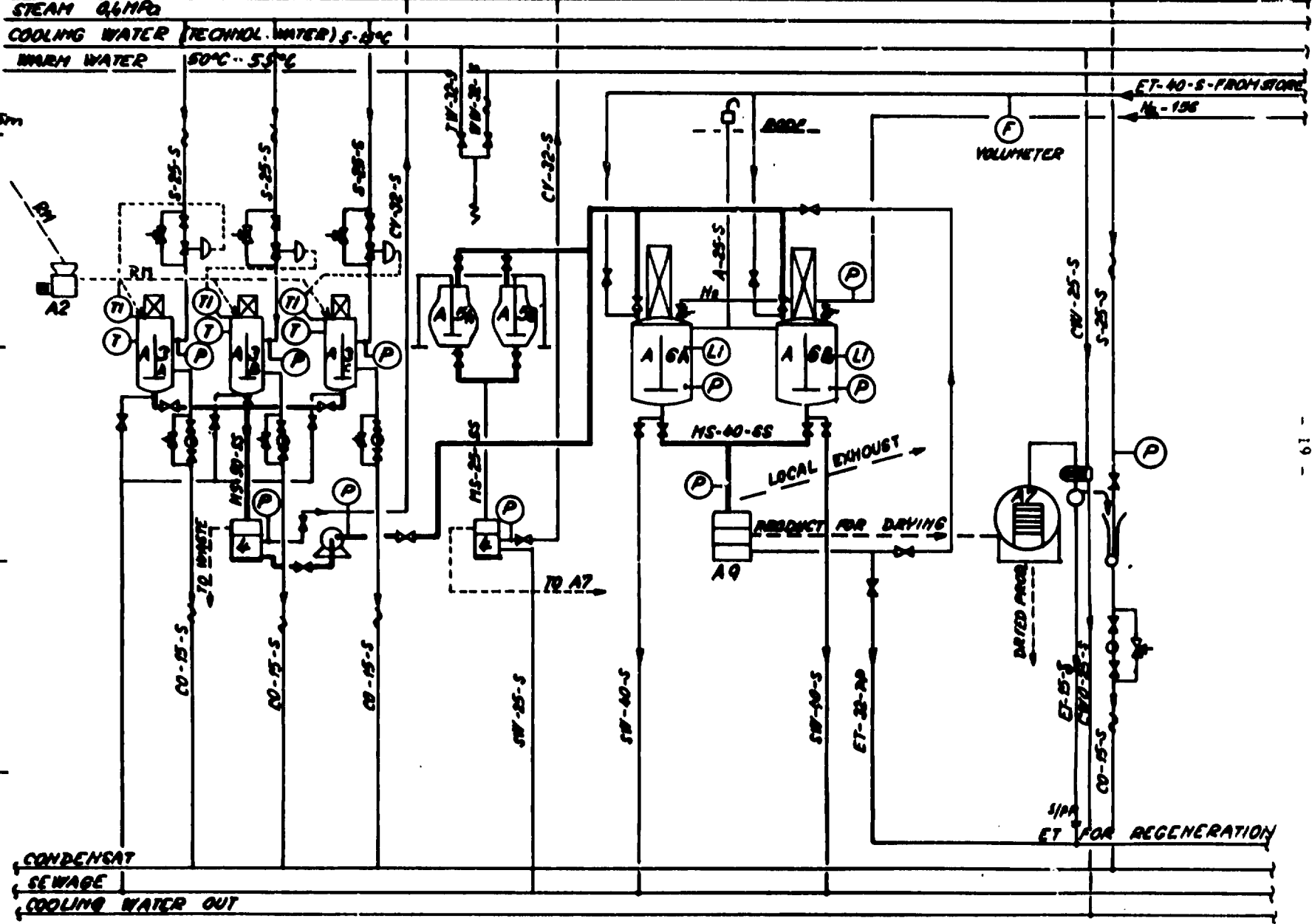
No	Equipment	Manufacturer	Pieces	kW		Steam		Water		Price/piece		Total price	
				inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Balance up to 1000kg	CHEPOS - CSSR	1							570	800		800
2	Mincing machine RM 100A L=740mm, W=330mm, H=400mm, w=60kg	Strojarné potravin. priemyslu Bratislava CSSR	1	0,75	0,75					320	450		450
3	Vessel jacketed, ena- melled, 250 lt, with anchor-stirrer, w=680kg D=600mm, H=2200mm	CHEPOS-Choteborské strojirny CSSR	3x 3	1,2	86	0,03	0,06			8000	11300		33900
4	Vacuum filter, stain- less, steel, D=600mm, H=800mm	Produced by Mongolian side, according to the transferred drawings											
5	Glass-vessel with outlet and stirrer and auxiliary constr. 100lt, D=800mm, H=850mm	Kavalier Sazava CSSR	2x 2	0,12	0,5					360	500		1000
6	Vessel enamelled, with stirrer, 1600 lt, D=1200, H=3225mm w=1600kg	Chepos-Choteborské strojirny CSSR	2x 2	2,2	4,4					10000	14000		28000
7	Vacuum tray-dryer, with steam-stream va- cuum device, 5m ² L=2500mm, W=1500mm H=2000mm, w=cca 1000kg	VEB-Vakuumtechnik Sangerhausen, GDR	1			0,1	2,4			20000	28000		28000
8	Vibrating mill VCM 3	Labora, CSSR	1	1,5	4,5					1330	1850		1850

A - 02

2

1	2	3	4	5	6	7	8	9	10	11	12	13	
9 Press-filter SA, cata- Lampart, Hungary log number S 21, without jacket, 100 lt D=800mm, H=1200mm		1		.					8500	12000		12000	
TOTAL			10,5 96,15 0,13 2,46									106000	
			Pipings and fittings, mounting included									19000	
			Regulation and measuring, mounting incl.									3000	
			Electrical installations for motors									7200	
			Auxiliary steel constructions									<u>1600</u>	
			A-02 TOTAL									136800	

A - 02 PRODUCTION OF PERSIN - MECHANICAL-TECHNOLOGICAL SCHEME



A-03 PRODUCTION OF PANCREPSIN, TRYPSIN, CHYMOTRYPSIN-Technology

The Mongolian Production plan for the three enzymatic products expects production of 87,5 kg of Pancypsin, 12 kg of Trypsin and 20 kg of Chymotrypsin per year. For this production 38 tons sheep and goat pancreas and 20 tons of beef pancreas in one year will be processed.

Production of the enzymes shall be on one equipment performed, because the first production steps, extraction, purification and salting of crude proenzymes are similar for all mentioned products.

In one day 200 kg of raw material shall be elaborated. The material is into two vessels divided, each containing 100 kg of raw material. 100 kg of pancreas is on the mincing machine/1/ minced and into one of the vessels/2/ transferred, where the extraction with cold water for 5 hours at the temperature 10-15°C proceeds. Then the mixture is through stainless steel sieves sieved and the extract is in one of the vessels/4 A,B/ collected. The obtained tissues from the sieve/3/ are once again in the same extraction vessel/2/ extracted/one hour/ and after second sieving the extracts are in vessel/4 A,B/ gathered. The impurities are from the extract by addition of calculated amount of ammonium sulfate salted out and the precipitate of impurities is then on the separator /5/ separated. The clarified extract coming from the separator is again on vacuum filters /6 A,B/ filtered and the clear filtrate in one of the vessels/6 A,B/ collected. After collecting off all the solution, the crude product of proenzymes is from the collected solution by further addition of calculated amount of ammonium sulfate salted out. After over night sedimentation and decantation is the product by filtration on stainless steel vacuum filters /6C,D/ collected. The obtained product of crude proenzymes is then transferred for laboratory treatment, where the purification and finalisation take place. The laboratory is with refrigerators /7/ and all necessary glass equipment equipped. For the purification of enzymes distilled water is used. This is on apparatus /10/ produced. The final enzyme products

are obtained on freeze-drying machines Lyovac-Leybold /9/ by drying. The location of that machine has not been decided yet, therefore it has not been involved into mechanical-technological scheme drawings.

A - 03 PRODUCTION OF PANCYPSIN, TRYPSIN AND CHYMOTRYPSIN - Specification sheet

No	Equipment	Manufacturer	Pieces	kW		Steam		Water		Price/piece		Total price	
				inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Mincing machine RM-1000, stainless st. L=1095mm, W=758mm H=1072mm, w=350kg	Strojarné potrávin. priemyslu, Bratislava CSSR	1	7,5	2,0					2500	3500		3500
2	Vessel jacketed with stirrer, stainless st. 630 lt D=800mm, H=2825mm w=830kg	CHEPOS-FEROX Decin CSSR	2	2x 8,5	30			0,24	24	9480	13260		26560
3	Stainless steel sieves	Produced by Mongolian side											
4	Vessel pressure-less stainless steel, with stirrer, 400 lt D=700mm, H=2100mm w=450kg	CHEPOS-FEROX Decin CSSR	4	4x 1,5	6,0					5780	8100		32400
5	Separator Alfa-Laval K 212, stainless steel D=900mm, H=1200mm w=850kg	Alfa-Laval, Sweden	1	22	132					178000			178000
6	Vacuum filter, stainless steel D=800mm, H=800mm	Produced by Mongolian side according to transferred drawings	4										
7	Refrigerator Calex 600 lt	Labora, CSSR	2	2x 0,5	8,0					1070	1500		3000
8	Glass vessel with outlet, with stirrer and auxiliary constr. 100 lt	Kavalier Sazava CSSR	3	3x 0,12	0,5					360	500		1500

A - 03

2

1	2	3	4	5	6	7	8	9	10	11	12	13
9	Lyovac GT-20 with Lyo- Process-control unit, L=600mm, W=450mm, w=900kg +hydraulic drive incl. L=1860mm, W=1050mm, H=1980mm, w=2480kg	LEYBOLD - West Germany	1	16,5	80		0,6	5	133000		133000	
10	Glass-apparatus for production of destil. water, with fuse-case W=500mm, H=1500mm	KAVALIER-Sazava CSSR	1	20	60		0,5	1,5	2850	4000		4000
TOTAL				78,36	318,5		1,34	30,5			311000	70960

Pipings and fittings, mounting included

12600

Regulation and measuring, mounting incl.

200

Electrical installations for motors

12000

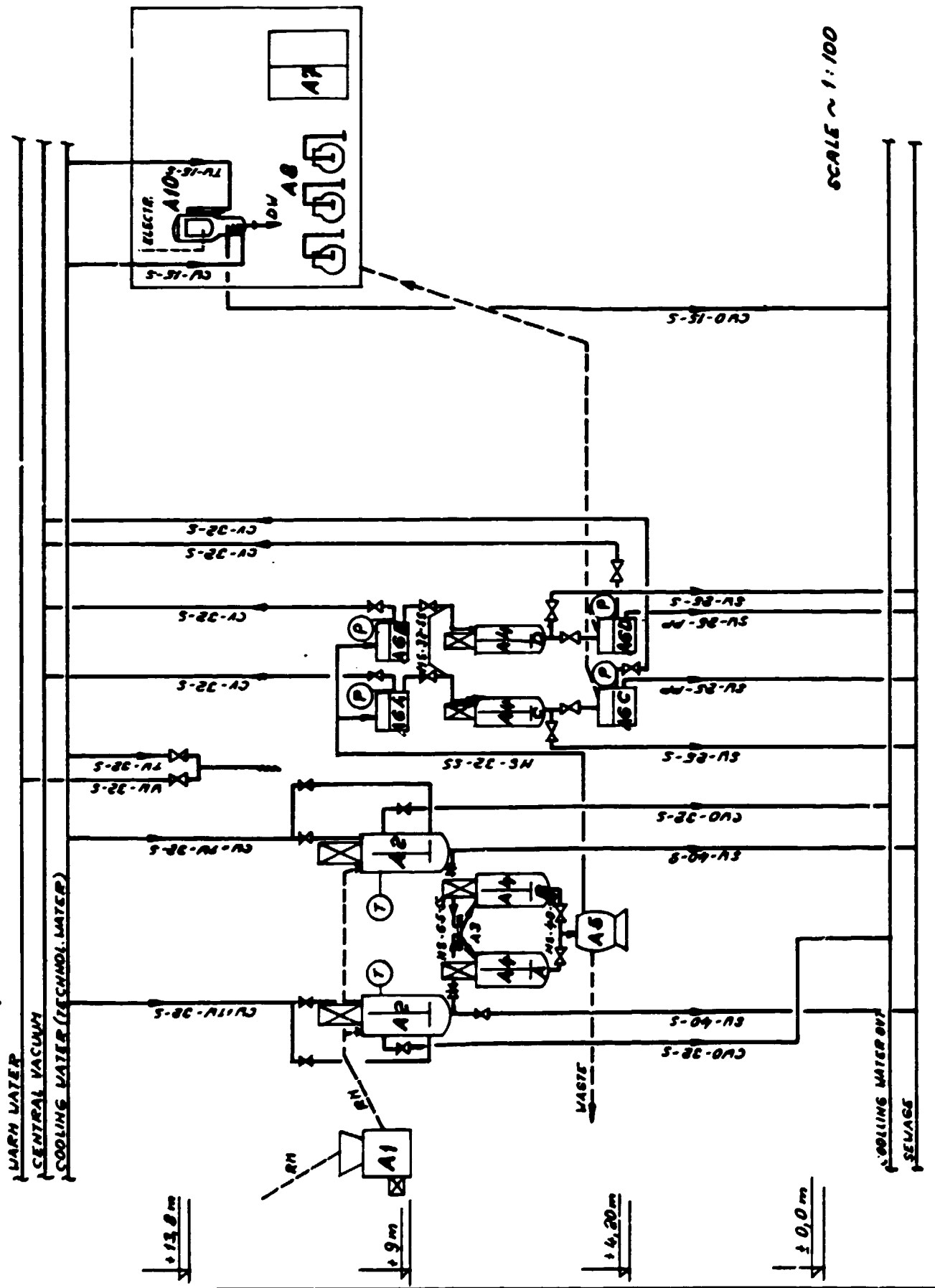
Auxiliary steel constructions

3000

A - 03 TOTAL 311000 98760

- 23 -

A - 03 PRODUCTION OF PANCREIN, TRYPSIN, CHYMOTRYPSIN - MECHANICAL-TECHNOL. SCHEME



SCALE ~ 1:100

A-04 PRODUCTION OF CHOLESTEROL -Technology

According to the technology given by Mongolian side, 15 kg of dry spinal cord will be processed daily and for the planned year production of 700 kg of cholesterol about 18 tons of fresh beef spinal cord from slaughterhouses is needed.

The raw material, the spinal cord, is first minced on a mincing machine /1/, put onto stainless-steel trays and dried in vacuum tray-dryer /2/, at max. temperature 80°C. The dry product is then stored in paper bags for the following processing. For the production of cholesterol itself, 15 kg of dry raw material will be processed daily. The material is into extraction vessel /3/ transferred and by means of 45 lt of acetone extracted. The acetone is taken from the reservoir /8/. The extraction takes place for 3 hours under slow stirring; after that time the mixture is on the press-filter filtered and the extract is in the vessel /5/ collected. After collecting that extract from 6 batches/representing 90 kg of dry raw material/, the extract is pumped through a pump /6/ on the film-evaporator /7/, where it is thickened to about 1/10 of the original volume. The thickened product goes into the vacuum-blade-dryer /9/, where it is dried. The vapours of acetone from the film-evaporator are condensed in a cooler /7/ and acetone obtained returns to the reservoir /8/.

The dried product from the drier /9/ in amount of about 20 kg is into a vessel /10/ transferred, where the extraction by means of 75 kg of ethanol proceeds. Simultaneously 6 kg of sulphuric acid added. The extraction proceeds for 5 hours at the temperature of 80°C. The hot extract is then filtered through a heated pressfilter /12/ and is in the vessel /13/ collected. Here the crystallization of the product takes place during constant cooling with water in the vessel jacket. The obtained product is filtered off on a pressfilter /14/ and is once again recrystallized on the same equipment. At the end the final product is dried on the vacuum tray dryer /pos. 7, scheme A-02/.

The ethanol, used during the production is at the plant A-11

regenerated; acetone used in the production is just circulated from the evaporator /7/ into the reservoir /8/ from which it is taken once again into the production.

A - 04 PRODUCTION OF CHOLESTEROL - Specification sheet

No Equipment	Manufacturer	Pie		kW		Steam		Water		Price/piece		Total price	
		ces	inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl	
1	2	3	4	5	6	7	8	9	10	11	12	13	
1	Mincing machine RM 100A L=740mm, W=330mm, H=400mm, w=60kg	Strojarné potra- vín. priemyslu Bratislava CSSR	1	0,75	1,5					320	450	450	
2	Vacuum tray-dryer, with steam-steam va- cuum device, 5m ² L=2500mm, W=1500mm, H=2000mm, w=oca1000kg	VEB-Vakuumtechnik Sangerhausen, GDR	1			0,1	2,4			20000	28000	28000	
3	Vessel jacketed 100 lt stainless steel, with stirrer D=500mm, H=1795mm, w=320kg	CHEPOS-FEROX Decin SSSR	1	0,75	4,5			0,1	0,6	4114	5760	5760	
4	Press-filter SA, cata- logue number S 21, without jacket, 100 lt. D=800mm, H=1200mm w=450kg	LAMPART, Hungary	1							8500	12000	12000	
5	Vessel collecting, 400 lt, stainless steel D=800mm, H=1330mm, w=400kg	CHEPOS-FEROX Decin CSSR	1							5140	7200	7200	
6	Piston-pump PAX 32 stainless-steel 0-180 lt/h	VEB-SALZWEDEL, GDR	1	1,2	7,2					1210	1700	1700	
7	Film-evaporator, FO - 03, 60 lt/h, without oil-pump, 1640mm, W=1140mm, H=3000mm, w=400kg	PIS-SPOFA, Prague CSSR	1	0,5	2,5	0,07	0,35	1,6	8	7850	11000	11000	
8	Vessel collecting, steel, 630 lt, L=1690mm, D=800mm w=450kg	CHEPOS-KSB Brno CSSR	1							1920	2700	2700	

	1	2	3	4	5	6	7	8	9	10	11	12	13
9 Vacuum blade-dryer, VEB-Vakuumtechnik 0,5m ³ , with condenser, Sangerhausen, GDR and vacuum-pump 1200mm, W=800mm, H=1200mm			1	1,3	7,0	0,05	0,25	0,2	1	8500	12000		12000
10 Vessel jacketed, ena- CHEPOS-Choteborské melled, 250 lt, with strojirny, CSSR stirrer anchor, D=600mm, H=2200mm, w=680kg			1	1,2	6,0	0,1	0,16			8000	11300		11300
11 Reflux condenser for CHEPOS-FEROX Decin item 10, F=5m ² CSSR D=324mm, L=1100mm w=260kg, stainless steel			1					1,5	7,5	1300	1820		1820
12 Press-filter, jacketed LAMPART, Hungary SA, S-21, enamelled 100 lt D=1000mm, H=1200mm			1			0,03	0,06			10000	14000		14000
13 Vessel jacketed, ena- Chepos-Choteborské melled, with stirrer strojirny 250 lt, CSSR D=600mm, H=2200mm, w=680kg			1	1,2	8			0,5	2,5	8000	11300		11300
14 Press-filter, enamelled, LAMPART, Hungary D=800mm, H=1000mm			1							5700	8000		8000
15 Piston-pump PAX 32 VEB-SALZWEDEL, GDR see item 6			1	1,2	1,2					1210	1700		1700

TOTAL

8,1 37,9 0,35 3,22 3,9 19,6

128930

Pipings and fittings, mounting included

28360

Regulation and measuring, mounting incl.

2500

Electrical installations for motors

8000

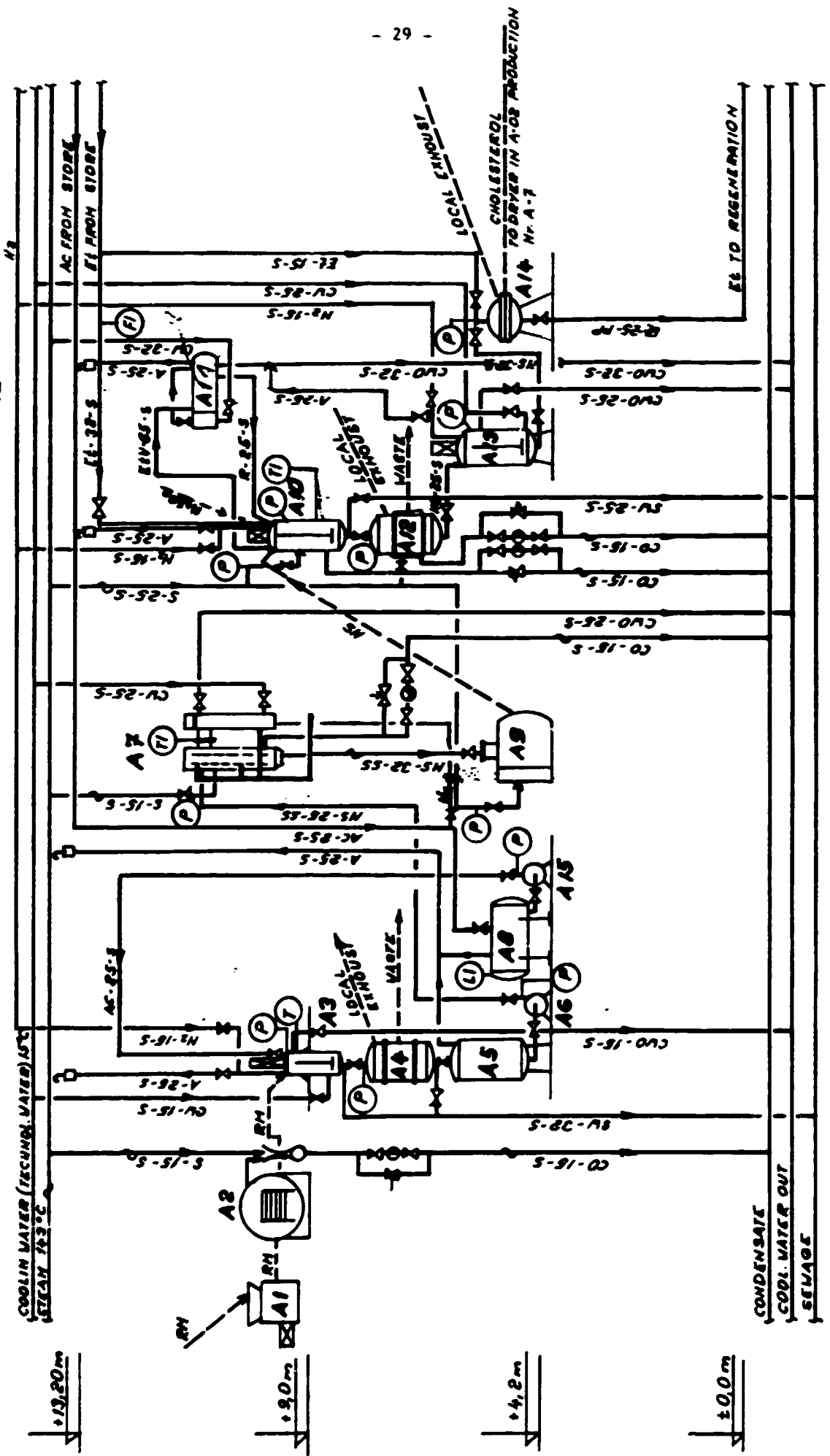
Auxiliary steel constructions

2000

A-04 TOTAL

169790

A-04 PRODUCTION OF CHOLESTEROL - MECHANICAL-TECHNOLOGICAL SCHEME



SCALE ~ 1:100

A-05 PRODUCTION OF PANCREATIN -Technology

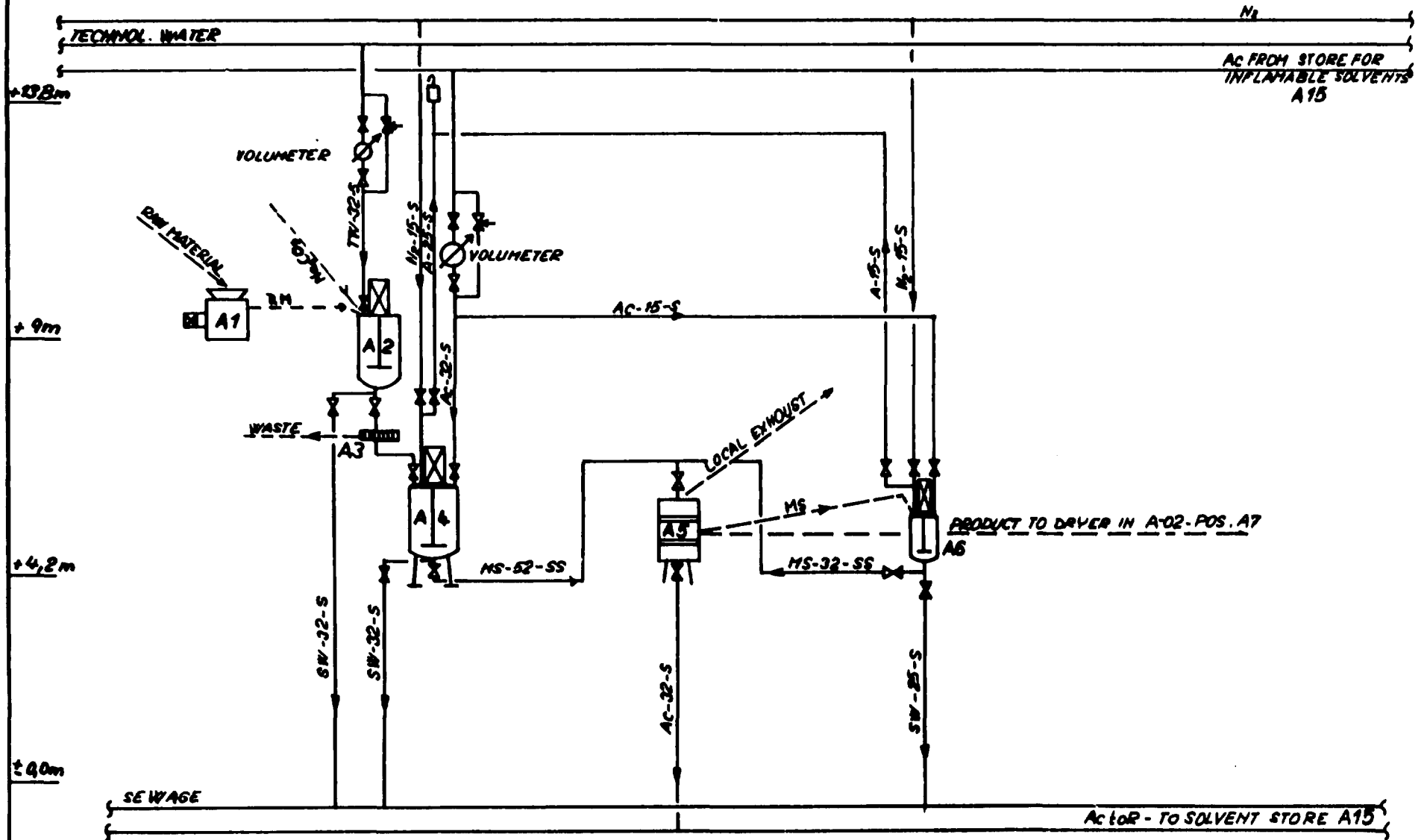
The Mongolian Production Plan expects the production of 3 tons of pancreatin in one year, and for this amount 30 tons of pancreas from goats and sheep will be elaborated. The production of pancreatin will be realized according to the technology prepared in ECAEM.

100 kg of pancreas are minced on the mincing machine /1/ and transferred into the extraction vessel /2/, where it is by means of 200 lt of water extracted, with addition of 2,5 kg sodium bicarbonate. The extraction takes place for 3 hours at the temperature 20°C. Then the mixture is put through a stainless steel sieve /3/ and the extract is collected in a vessel /4/, where pancreatin is by adding a calculated amount of acetone/about 500 lt/ precipitated. After 10 minutes of stirring the precipitate is collected on the pressfilter /5/. The obtained wet product from the filter is transferred into the vessel /6/, where it is mixed with about 50 lt of fresh acetone and then the mixture is once again filtered through the press-filter /5/. The final product is then put onto stainless steel trays and dried in the tray dryer /pos. 7, scheme A-02/. About 10 kg of pancreatin are obtained from the said amount of raw material.

A - 05 PRODUCTION OF PANCREATIN - Specification sheet

No	Equipment	Manufacturer	Pie		kW		Steam		Water		Price for piece		Total price	
			ces	inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl	
1	2	3	4	5	6	7	8	9	10	11	12	13		
1	Mincing machine RM 100A L=740mm, W=330mm, H=400mm, w=60kg	Strojarna potravin. priemyslu Bratislava CSSR	1	0,75	1,5					320	450		450	
2	Vessel stainless steel 400 lt with stirrer, D=800mm, H=2090mm, w=490kg	CHEPOS-FEROX Decin CSSR	1	2,5	7,5					5600	7800		7800	
3	Sieve stainless steel	Produced by Mongolian side												
4	Vessel stainless steel with stirrer, jacketed, 1000 lt D=1000mm, H=2400mm, w=1220kg	CHEPOS-FEROX Decin CSSR	1	3,2	3,2					14800	20740		20740	
5	Press-filter SA, S21, without jacket, 100 lt D=800mm, H=1200mm, w~450kg	LAMPART, Hungary	1							8500	12000		12000	
6	Vessel stainless-steel with high-speed stirr, 100 lt, D=500mm, H=1740mm, w=250kg	CHEPOS-FEROX Decin CSSR	1	1,1	1,1					3200	4500		4500	
TOTAL				7,55	13,3								45490	
												Pipings and fittings, mounting included	6900	
												Regulation and measuring, mounting incl.	1200	
												Electrical installations for motors	3200	
												Auxiliary steel constructions	500	
												A-05 TOTAL	57290	

A- 05- PRODUCTION OF PANCREATIN - MECHANICAL-TECHNOLOGICAL SCHEME



SCALE ~ 1 : 100

A-06 PRODUCTION OF BLOOD HYDROLYSATE -Technology

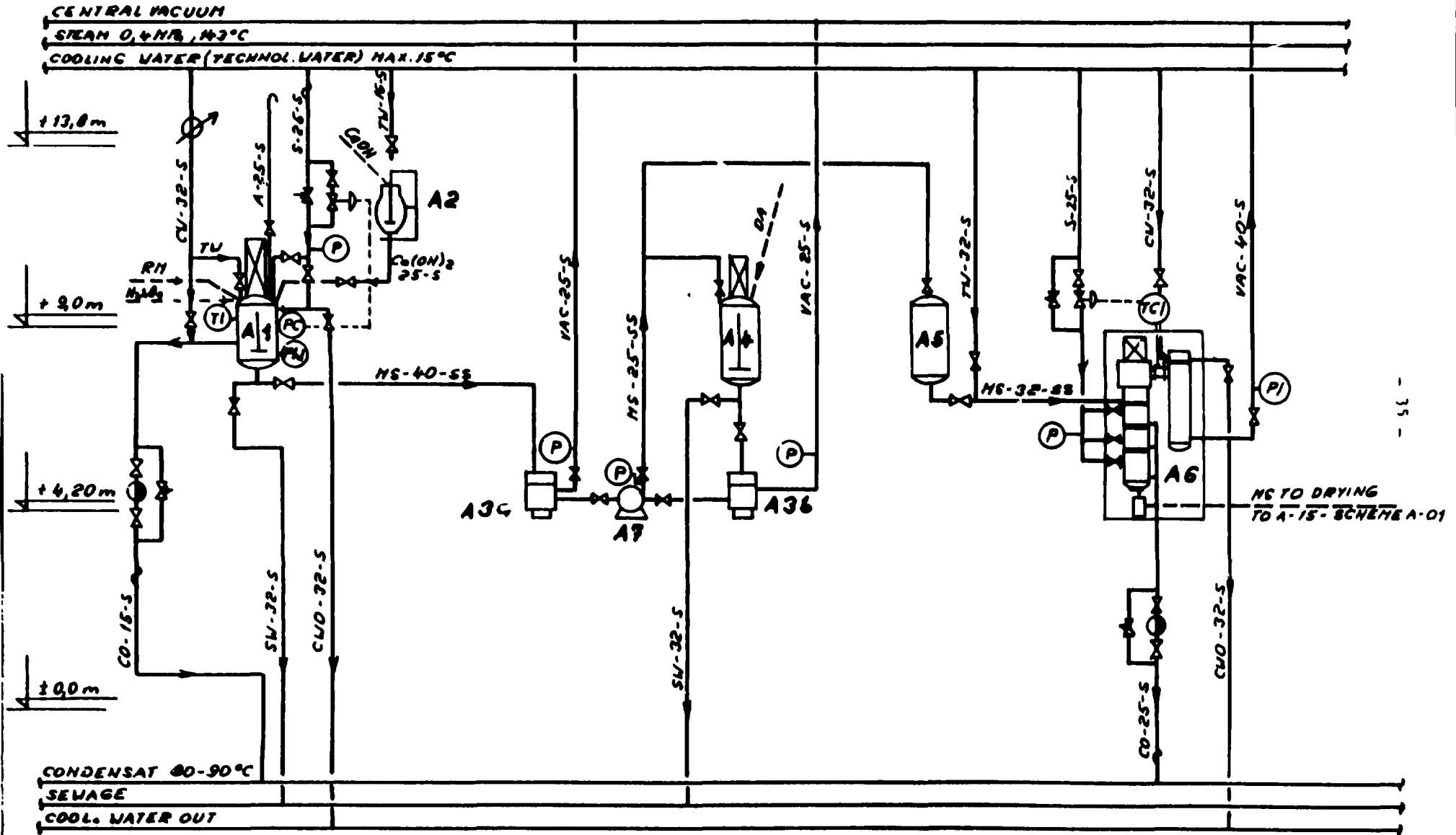
The blood hydrolysate is expected to be used in Mongolia as an additive to child's nourishment products. According to the Production Plan 1860 kg of the product should be produced per year. According to the transferred Mongolian technology, 90 tons of beef blood should be processed to obtain the above mentioned amount of the final product.

The production should be performed in a two shift working process with processing of 175 kg of blood in one shift, which means, that 350 kg of blood will be elaborated daily. 175 kg of blood is transferred into jacketed vessel /1/, where it is mixed to 175 lts of water and 3,5 lts of sulphuric acid. The mixture is then hydrolyzed at the temperature of 120°C and a pressure corresponding to that temperature. The process lasts 3 hours, then the mixture is cooled and neutralized by means of lime milk from the reservoir /2/. The slurry is then filtered on a vacuum stainless steel filter /3a/ and the filtrate is cooled in the collecting vessel /4/. There some amount of oxalic acid is added and the solution is once again filtered on the vacuum filter /3b/ and collected in the collecting vessel /5/. From there the filtered solution is sucked into the vacuum film-evaporator /6/, where it is thickened to about 1/20 of its original volume. The obtained product, in amount about 30 lts in one day, is stored in plastic cans in a cooling box; after collecting of a sufficient amount for further processing it is dried on the spray-dryer /pos. 15., scheme A-01/. The obtained product is collected in plastic bags.

A - 06 PRODUCTION OF BLOOD HYDROLYSATE - Specification sheet

No	Equipment	Manufacturer	Pie		kW		Steam		Water		Price/piece		Total price	
			ces	Inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl	
	1	2	3	4	5	6	7	8	9	10	11	12	13	
1	Vessel jacketed, enamel- led, with stirrer, 630 lt, D=1000mm, H=2650mm, w=1250kg	CHEPOS-Chotěbořské strojířny CSSR	1	1,5	9	0,1	0,3	0,6	1,2	12800	18000		18000	
2	Glass vessel with out- let and stirrer 100 lt D=560mm, H=1050mm	KAVALIER Sazava CSSR	1	0,125	0,35					107	150		150	
3	Vacuum filters, stain- less steel D=600mm, H=800mm	Produced by Mongolian side according to the transferred drawings												
A,B			2											
4	Vessel, 630 lt, stain- less steel with stirr. D=800mm, H=2780mm w=560kg	CHEPOS-FEROX Děčín CSSR	1	1,5	1,5					7200	10000		10000	
5	Vessel stainless steel 630 lt, without stirrer D=800mm, H=1830mm, w=430kg	CHEPOS-FEROX Děčín CSSR	1							5500	7700		7700	
6	Vacuum film-evaporator with condenser, 120 lt/h FO-07.3 L=1800mm, W=1650mm, H=3833mm, w~350kg	PIS-SPOFA, Prague CSSR	1	3,5	28	0,13	1	4	32	10700	15000		15000	
7	Piston pump PAX 64, stainless-steel 0-179 lt/h	VEB-SALZWEDEL, GDR	1	1,7	1,7					1210	1700		1700	
TOTAL				8,3	40,55	0,23	1,3	4,6	33,2				52550	
												Pipings and fittings, mounting included	11560	
												Regulation and measuring, mounting incl.	5800	
												Electrical installations for motors	4800	
												Auxiliary steel constructions	900	
												A - 06 TOTAL	75610	

A-06 PRODUCTION OF BLOOD HYDROLYSATE - MECHANICAL-TECHNOLOGICAL SCHEME



A-11 REGENERATION OF ETHANOL AND ACETONE-Technology

The capacities of the equipment for regeneration unit have been chosen so that the regeneration can be completed during one , at most during two working shifts. Spare capacity of the equipment is therefore available in case of any change of the production programme.

The solvent regeneration units are technologically connected with A-15-underground inflammable solvent store, where the solvents are collected and stored and from where solvents for regeneration are transported through pumps /pos.2b,3b/scheme A-15, into vessels /3/ for ethanol and /4/ for acetone. The pumps are switched on and off automatically from the minimum-maximum level control unit, placed in the vessels. From the vessel /3,4/ are the solvents determined for regeneration pumped on the rectification columns /1 or 2/, where regeneration of ethanol or acetone continually proceeds. The condensed purified solvents are collected in glass-vessels, which are part of the equipment, and from there they are distributed to the solvent store /A-15/ into reservoirs for pure solvents.

Capacities of the rectification units are 80-170 lt/h of the solvent mixtures fed into the columns.

A - 11 SOLVENT REGENERATION PLANT - Specification sheet

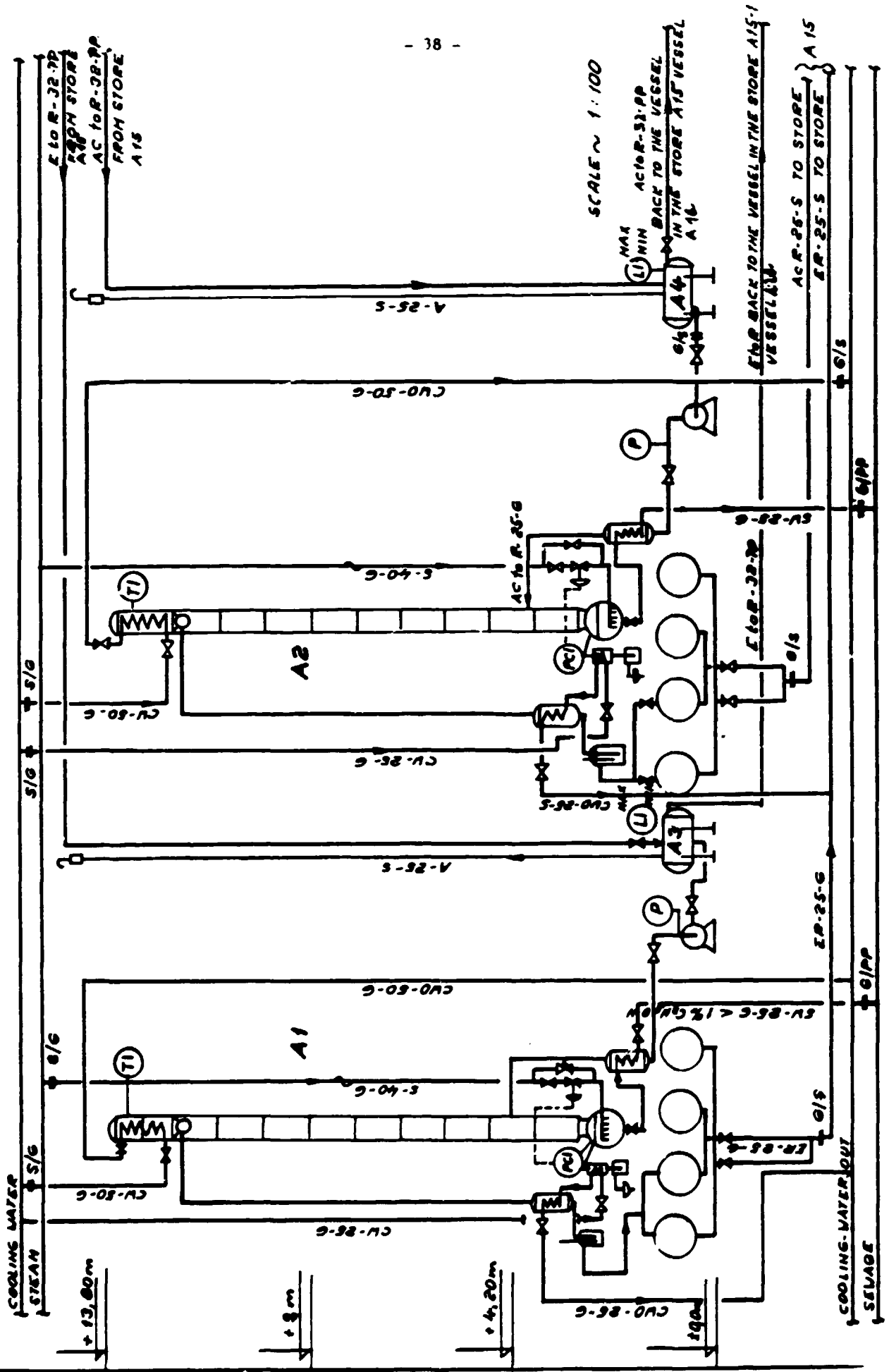
No Equipment	Manufacturer	Pie ces	kW		Steam		Water		Price/piece		Total price	
			inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1 Glass rectification column for ethanol regeneration, 150 lt/h with interreservoirs, coolers, condensers and glass-pump with teflon piston. Filling Rashig rings 18x20mm L=5000mm, W=2500mm, H=12500mm, reservoirs including.*	KAVALIER, Sá zava, CSSR	1	0,3	2,4	0,34	2,7	10	80	12850	18000		18000
2 Glass rectification column for acetone regeneration, 150 lt/h, dtto as item 1*	KAVALIER, Sá zava, CSSR	1	0,3	2,4	0,34	2,7	10	80	12850	18000		18000
3 Vessel collecting, enamelled, 250 lt, for ethanol regeneration D=600mm, L=1170mm, w=380kg	CHEPOS, Choteborské strojírny, CSSR	1							3570	5000		5000
4 Vessel collecting, steel, 250 lt, for acetone regeneration D=600mm, L=1170mm, w=280kg	CHEPOS, KSB Brno, CSSR	1							1200	1680		1680
TOTAL			0,6	4,8	0,68	5,4	20	160				42680

*NOTE: regulation of feed and steam income must be ordered within the framework of M + R, for both columns.

Pipings and fittings, mounting included 670
 Regulation and measuring, mounting incl. 4000
 Electrical installation for motors 1200

A-11 TOTAL 48550

A-11 SOLVENT REGENERATION PLANT - MECHANICAL TECHNOLOGICAL SCHEME



A-12 PRODUCTION OF DEMI-WATER -Technology

Tap water is coming through reduction valve into the upper part of the column /1A/, filled with cation-exchanger in H cycle and flows downwards through the column. After leaving the column the water comes into the upper part of the second column /1B/, filled with anion-exchanger in OH^- cycle and also flows downwards through the column. At the outlet from the anion-exchanger, conductivity of demi-water coming from the columns is measured continuously. Demi-water is collected in the reservoir /2/, from which it is led to individual places in production units.

The level of demi-water in the reservoir is measured automatically and displayed on the attached connected digit.

When the maximum or minimum level of demi-water in the reservoir is reached the flow of tap water into the demi-station is either stopped or started .

When the prescribed conductivity of demi-water at the outlet from the columns is overpassed, which means, that the ion-exchangers are exhausted, the water from the outlet is automatically led to the sewage, the work of the demi-station is stopped and exhaustion of ion-exchangers is signaled from the control-pannel. The regeneration of both ion-exchangers must take place. The process of regeneration is controlled with press-buttons from the control-pannel. The column with cation-exchanger is regenerated by means of previously prepared 10% hydrochlorid acid solution from the reservoir /1C/, connected with the column, the column with anion-exchanger is regenerated by means of 10% sodium hydroxyde solution from the reservoir /1D/. After the regeneration the columns are washed with water in upward flow and after reaching the prescribed conductivity of washing water the demi-water production can take place.

Note: When ordering the demi-station it is necessary to enclose an analytical test of the water which will be used for the production of demi-water.

A - 12 PRODUCTION OF DEMI-WATER - Specification sheet

No Equipment	Manufacturer	pieces	kW		Steam		Water		Price/piece		Total price	
			inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1 Demineralization-station, type D 400 PP, for interrupted run, automatically running capacity 400 lt/h. L=1400mm, W=1600mm, H=2600mm, w=660kg	Kavalier, Sazava CSSR	1	0,15	0,3					11400	16000		16000
2 Vessel stainless-steel, horizontal, D=800mm, L=1330mm, w=400kg	CHEPOS-FEROX, Děčín CSSR	1							4570	6400		6400

TOTAL

0,15 0,3

22400

Pipings and fittings, mounting included

4400

Measuring and regulation, mounting incl.

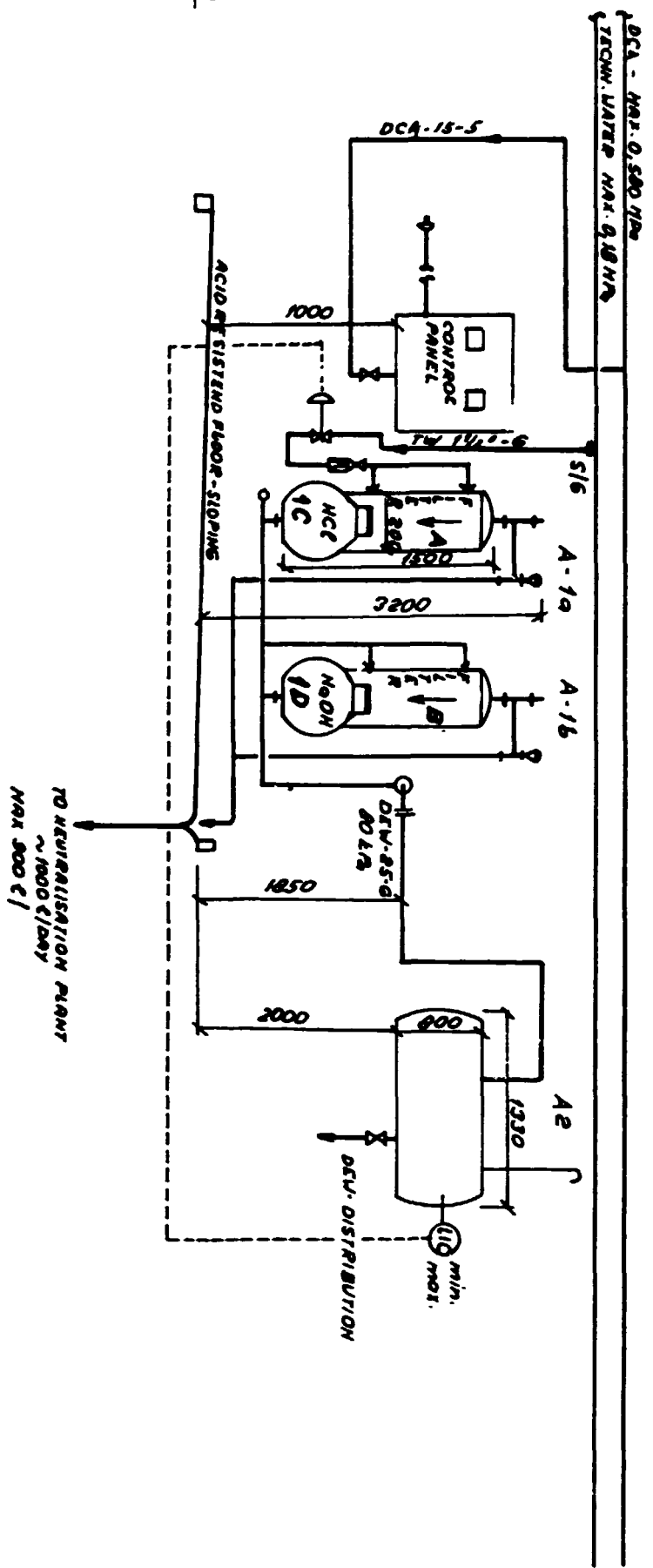
300

A-12 TOTAL

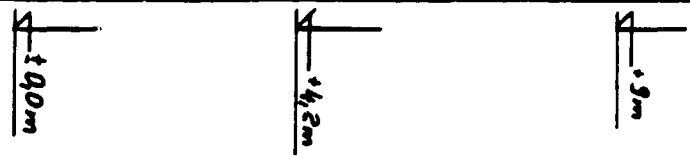
27100

1
05
1

A-12 PRODUCTION OF DEMI WATER - MECHANICAL-TECHNOLOGICAL SCHEME



SCALE ~ 1 : 100



A-13 ENGINE ROOM FOR STEAM, CONDENSATE AND WATER SUPPLY

1/Condensate from the production and from social services of the building is collected in the reservoir /1/, where also the water for production needs is preheated. By means of a pump /4/ the condensate is pumped out for steam production. The pump /4/ is switched on or off automatically by the max. or min. level control-unit placed in the reservoir /1/.

2/Steam 0,8 MPa, from the outside main connection is led to the steam distribution unit, where it is reduced to 0,4 MPa for production needs. Other piping from the steam distribution unit is used for steam which is used for another purposes of the building.

3/Water, from the main outside connection, with the approx. temperature of 5 to 15°C, comes to the distribution unit, from which it is led through the coil in the reservoir /1/ into the reservoir /2/. There the water is heated with steam to temperature 55°C and is led to the production units, to laboratories and for social services. The supply of water to reservoir /2/ is carried out automatically according to the level in the reservoir. A pump is installed in case of interrupted circulation of water in hot water system /3/. Cold water is distributed to the production, laboratories and social services by means of independent pipe distribution.

The total consumption of water is measured on the mains outside. /Connection to the building/.

A - 13 ENGINE ROOM FOR STEAM, CONDENSATE AND WATER SUPPLY - Specification sheet

No	Equipment	Manufacturer	Pieces	kW		Steam		Water		Price/piece		Total price	
				inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1	Vessel-reservoir for condensate, steel, 1600 lt D=1200mm, H=1810mm, w=640kg	CHEPOS-KSB Brno, CSSR	1							2740	3800		3800
2	Vessel-reservoir for hot water, steel, 2500 lt D=1200mm, H=2500mm, w=780kg	CHEPOS-KSB Brno, CSSR	1			0,2	0,6			3340	4680		4680
3	Pump for hot water circulation, Type: PICO for central heating, steel	KOVOSLUZBA, CSSR PRAHA	2	2x	0,3	7,2				115	160		320
4	Pump centrifugal, type META, capacity 5m ³ /h working height 30m of water column, steel class 11.	SIGMA, Olomouc CSSR	1		1,5	6				360	500		500
TOTAL					2,1	13,2	0,2	0,6					9300
												Piping and fitting, mounting included	2300
												Regulation and measuring, mounting incl.	2000
												Electrical installation for motors	2400
												A-13 TOTAL	16000

A - 13 ENGINE ROOM FOR STEAM, CONDENSATE AND WATER SUPPLY - MECHANICAL - TECHNOLOGICAL SCHEME

WATER FROM OUTSIDE CONNECTION 15°C max, 5°C min

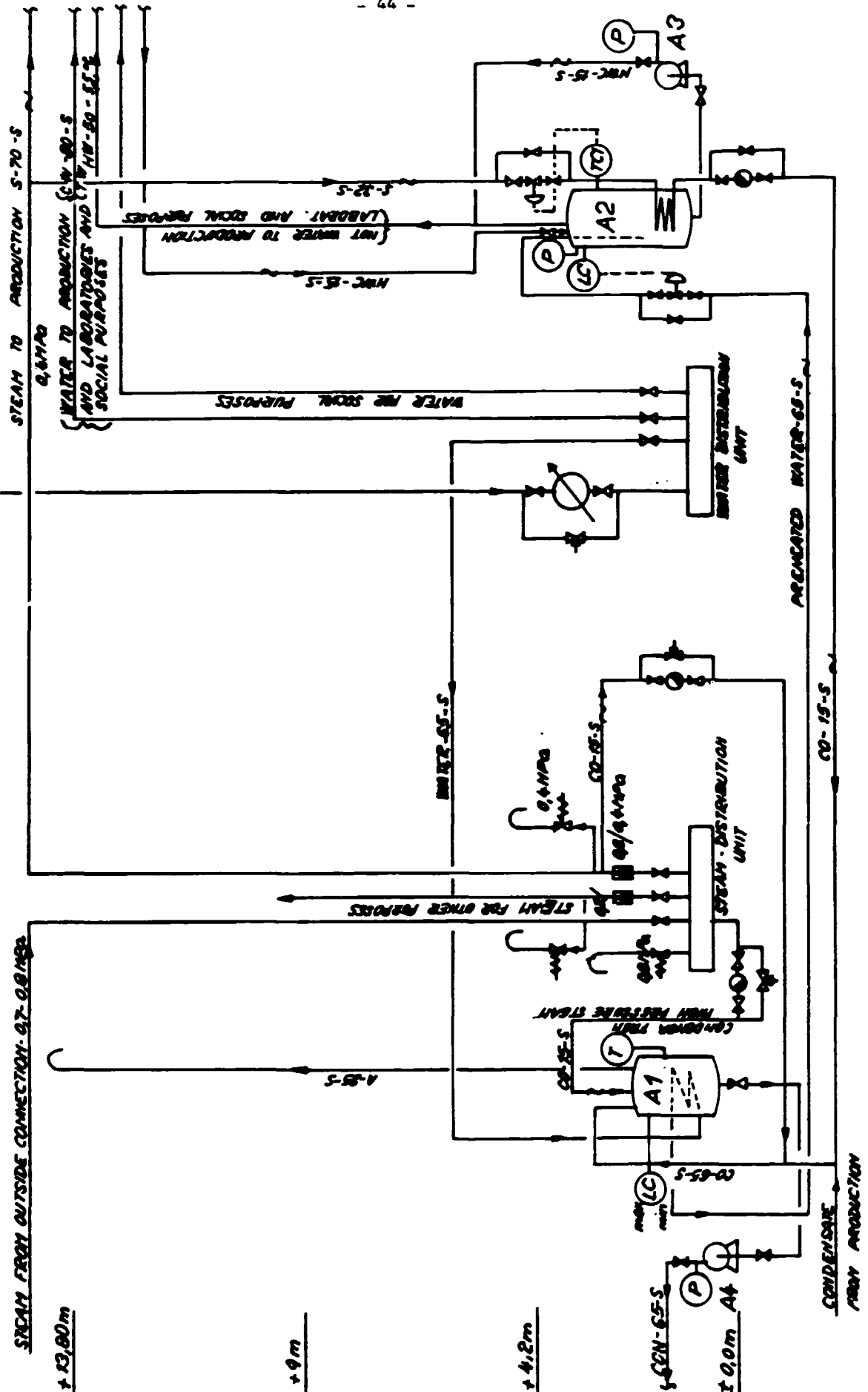
STEAM FROM OUTSIDE CONNECTION 0.7-0.8 MPa

STEAM TO PRODUCTION S-70-S

+13.80m

+9m

+4.2m



A-14 NEUTRALIZATION PLANT

Liquid waste from production units and laboratories, designed for neutralisation flows to the vessel /1/ where it is continuously homogenized with a stirrer. Then it flows to the neutralization-vessel /2/, which is divided into two sections by a partition. In the first section, where the coming liquid is intensively stirred, neutralization takes part either with sulphuric acid solution or with calcium hydroxyd solution, according to the pH of the waste liquid, which is measured automatically. The neutralization proceeds automatically and the neutralized liquid pH 6,5-7,5 overflows to the second section of the vessel /2/ from which it goes to the sewage.

For preparing neutralization solutions two glassvessels are designed. The vessel /3/ is used for preparing 20% calcium hydroxyd/lime/, the vessel /4/, with the cooling coil, for preparing 20% sulphuric acid. Neutralisation solutions are prepared manually, their content in glass-vessels is controlled by min. level control units and the necessity of preparing a new solution is signaled either optically or by sound.

A - 14 NEUTRALIZATION PLANT - Specification sheet

No Equipment	Manufacturer	Pieces	kW		Steam		Water		Price/piece		Total price	
			inst.	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1 Vessel horizontal, enamelled, with stirrer, 2500 lt D=1600mm, L=2040mm, w=1600kg	CHEPOS, Choteborské strojirny, CSSR	1	2,7	54					7800	11000		11000
2 Vessel horizontal, with partition, for neutralization, with stirrer, stainless-steel, 1000 lt D=1000mm, L=1810mm, w=750kg	CHEPOS, Ferox, Decín, CSSR	1	2	40					8500	12000		12000
3 Glass-vessel, 100 lt, with outlet and stirrer D=800mm, H=850mm	KAVALIER, Sázava, CSSR	1	0,12	0,5					360	500		500
4 Glass-vessel, 100 lt, with cooling coil, with outlet and stirrer D=800mm, H=850mm	KAVALIER, Sázava, CSSR	1	0,12	0,5					430	600		600
TOTAL			4,94	95								24100

Piping and fittings, mounting included 2300
 Measuring and regulation, mounting incl. 6000
 Electrical installations for motors 1200

A-14 TOTAL 33600

A - 14 NEUTRALIZATION PLANT - MECHANICAL - TECHNOLOGICAL SCHEME

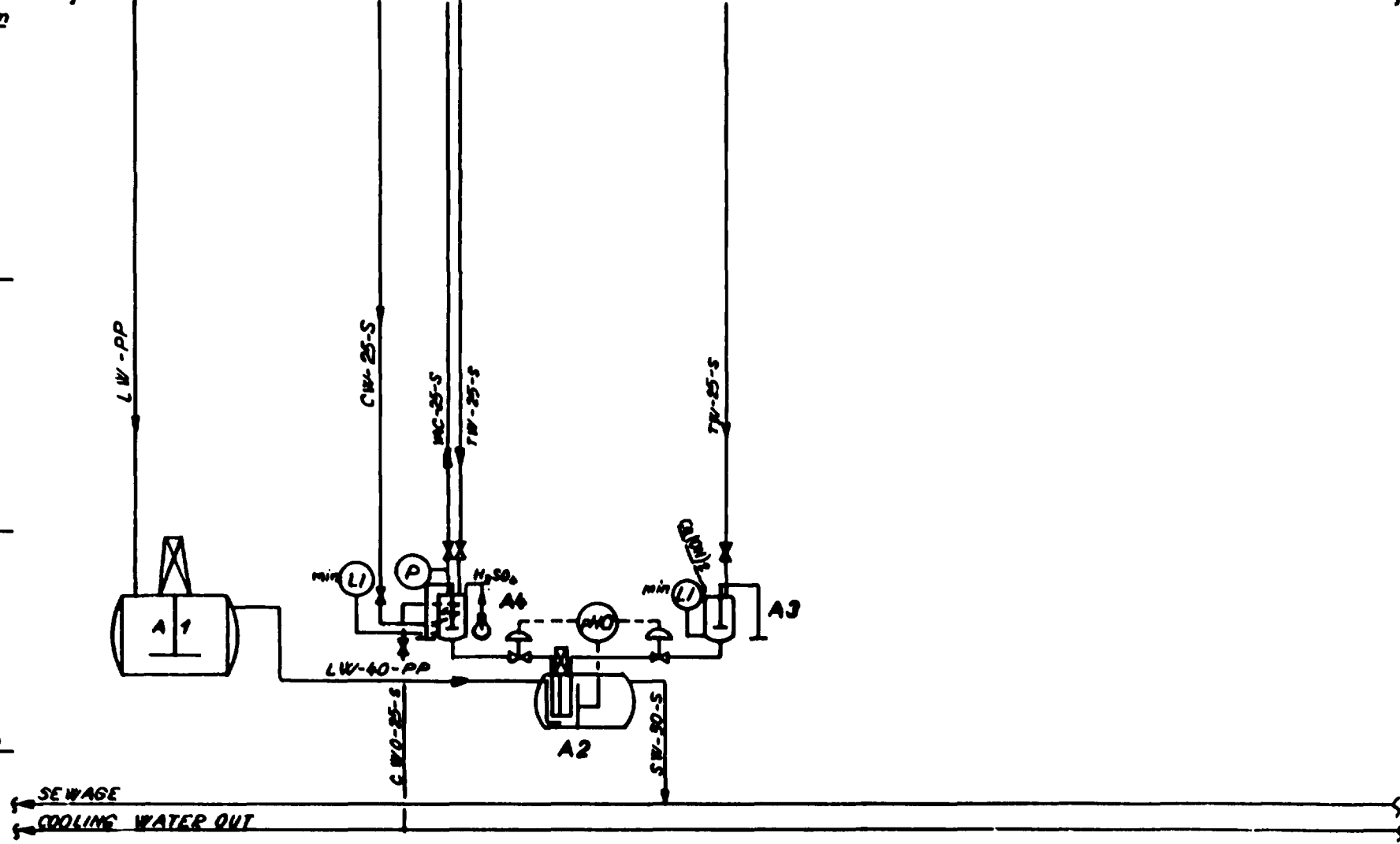
CENTRAL VACUUM
 TECHNOL. WATER - COOLING WATER
 LIQUID WASTE FROM THE PRODUCTION AND LABORATORIES DESIGNED FOR NEUTRALISATION-PP

+ 13.80 m

+ 9 m

+ 4.2 m

± 0.00 m



- 57 -

SCALE ~ 1:100

A-15 STORE FOR INFLAMMABLE SOLVENTS

The underground store serves for storage of fresh, concentrated solvents in vessels/1a,2a/, for storage of solvents, determined for regeneration in A-11 unit in vessels/1b,2b/and for storage of regenerated solvents in vessels/1c,2c/.

For regeneration purposes the solvents to be regenerated are pumped to A-11 unit into vessels /3,4 ,scheme A-11/ through pumps /3b,3c/.

These pumps are switched on and off automatically by maximum-minimum control units placed in vessels /3 ,4 ,scheme A-11/.

Pumps /3a,3d/transport pure solvents into production units.

A - 15 STORE FOR INFLAMMABLE SOLVENTS - Specification sheet

No	Equipment	Manufacturer	Pieces	kw		Steam		Water		Price/piece		Total price	
				inst.	day	t/h	t/d	m/h	m/d	\$	Rbl	\$	Rbl
1a	Vessel, steel cl. 11, for fresh acetone, 10000 lt. D=2000mm, L=3920mm, w=2750kg	CHEPOS, KSB Brno CSSR	1							11780	16500		16500
1b	dtto, for acetone for regeneration	"	1							11780	16500		16500
1c	dtto, for regenerated acetone	"	1							11780	16500		16500
2a	Vessel, steel cl. 11, 10000 lt, for fresh ethanol D=2000mm, L=3920mm, w=2750kg	CHEPOS, KSB Brno CSSR	1							11780	16500		16500
2c	dtto, for regenerated ethanol	"	1							11780	16500		16500
2b	Vessel, enamelled, 10000 lt, for ethanol before regeneration D=2000mm, L=4260mm, w=4000kg	CHEPOS, Choteborské strojírny, CSSR	1							28500	40000		40000
3	Centrifugal pump, a, b type META-HC c, d Q=3m ³ /h, workH=30m w.a.	SIGMA-Olomouc, CSSR	4	4x 1,5	3					714	1000		4000

TOTAL

6 3

126500

Pipings and fittings, mounting included

14700

Regulation and measuring, mounting incl.

11000

Electrical installation for motors

3600

A-15 TOTAL

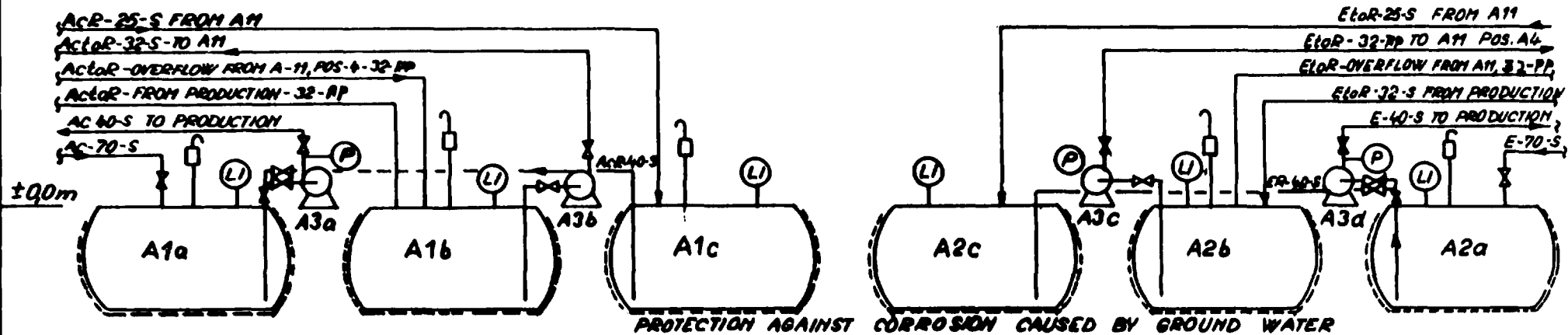
155800

A - 15 STORE FOR INFLAMMABLE SOLVENTS - MECHANICAL-TECHNOLOGICAL SCHEME

+13,8m

+9m

+4,2m



A-16 CENTRAL PRESSURE AIR AND CENTRAL VACCUM UNIT

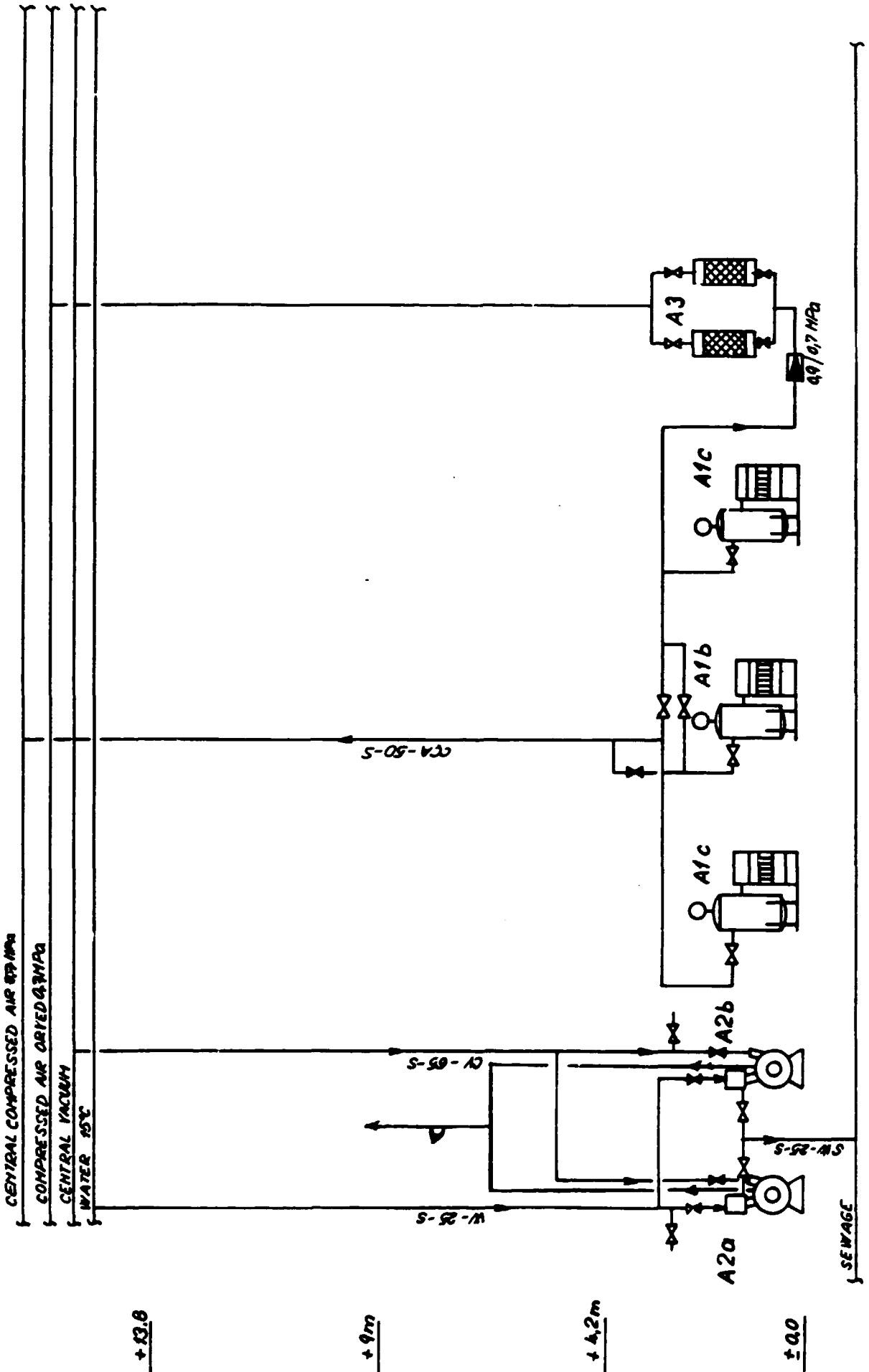
For compressed air production of 0,7-0,9 MPa are three piston compressors /1a,b,c/ designed. One of these compressors will be used for production and laboratory needs, the second one/lc/ for measuring and regulation needs. The compressed air for M + R must be on a silicagel automatic dryer/3/ dried. The dryer works fully automatically. The third compressor/lb/ is a spare one and serves for both previously mentioned needs in case of any disorder. The capacity of each compressor is 75 Nm³/hour.

For central vacuum 20 kPa are two centrifugal vacuum pumps /2a,b/ designed, one of them being a spare one. The central vacuum will be used for production and laboratory needs.

A - 16 CENTRAL PRESSURE AIR AND CENTRAL VACUUM UNIT - Specification sheet

No	Equipment	Manufacturer	Pie ces	kW		Steam		Water		Price/piece		Total price	
				Inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1	Piston compressor, type 3 JSK-75-S, with compressed air reser- voir; max. pressure 0,9MPa capacity 75m ³ /h volume of reservoir 500 lt. L=1650mm, W=790mm, H=1990mm, w=500kg	PRAGOINVEST, Praha CSSR	3	3x 15	180					570	1200		3600
2	Centrifugal vacuum- pump, type: 65-S20-224-80 LC-00 Capacity: 120m ³ /h, at 20kPa. L=405mm, W=360mm, H=620mm, without base, w=70kg	SIGMA-Závodka CSSR	2	2x 3,3	17			0,55	5	1470	2070		4140
3	Silicagel dryer, auto- matically working, for pressure 0,7MPa, type AS 630 L=2000mm, W=500mm, H=2000mm, w=150kg	CHEPOS, Mor. Budějo- vice, CSSR	1							3500	5000		5000
TOTAL					51,6	197		0,55	5				12740
												Pipings and fittings, mounting included	2500
												Electrical installation for motors	4000
A - 16 TOTAL												19240	

A - 10 CENTRAL PRESSURE AIR AND CENTRAL VACUUM - MECHANICAL - TECHNOLOGICAL SCHEME



SCALE ~ 1:100

A - 17 COOLING PLANT - Specification sheet

No Equipment	Manufacturer	Pie		kW		Steam		Water		Price/piece		Total price	
		ces	inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl	
1 Compressor-cooling station NC2-250, consist of: 1A-2 pieces of compressors UKM 812, capacity 290kW, for temper. -20°C, regulation possibility upto 75% of capacity L=4710mm, W=1550mm H=3050mm 1B: Vessel-condenser 1C: Low-pressure collector 1D: Ammoniac pumps 2 pieces 1E: Buffer The system includes all measuring and regulation units.	ČKD-Choceň * CSSR												
	*ordering the equipment it must be expected, that the manufacturer is sending equipment together with elaborated project for instalment.		2x										
			100	2400									
			2x										
			3	72									
		1							53500	75000		75000	
2 Cooling tower SV-24 for water flow 30-130m ³ /h, with ventilator and two centrifugal pumps and collecting vessel vol. 960 lt	Armabeton, Praha CSSR		2x					4	96				
			11	264									
			2x										
		1	15	360					7570	10600		10600	
	TOTAL		258	3096				4	96			85600	

The price includes mounting

Electrical installation for motors

6400

A-17 TOTAL

92000

The A-17 Cooling plant serves for cooling of raw material store to the temperature -20°C and must be situated near the store.

A - 17 COOLING PLANT (RAW MATERIAL STORE EQUIPMENT ROOM)

+ 13,8m

COOLING TOWER FOR WATER-FLOW 30 - 130m³/h CAN BE
PLACED OUTSIDE THE BUILDING : L=3300mm, W=2420mm
H=4680mm, W= 2360kg

+ 9m

GROUND PLAN

ROOM, NECESSARY FOR THE COOLING
MACHINERY EQUIPMENT, WITH REGARD
TO THE SPECIFICATION SHEET A-17

+ 4,2m

CUT

HEIGHT NECESSARY FOR THE COOLING
MACHINERY EQUIPMENT, WITH REGARD
TO THE SPECIFICATION SHEET A-17

± 0,0m

SCALE ~ 1:100

A-18 TRANSFORMER STATION AND The MAIN SWITCHBOARD-ROOM

The electricity consumption balance for production and auxiliary units, according to the summary /Anex I/, taken from all specified units¹⁵, approx. 476 kWh. With regard to the coefficient of maximum simultaneity of contemporarily running equipments 0,8, this represents maximum consumption of 381 kWh/476x0,8/ for all the units.

The supposed consumption of electricity for the illumination of the building/representing space of about 40000 m³/ and for other purposes represents about 137 kWh. These values together give the maximum expected electricity consumption of 511 kWh.

Two air-cooled transformers /1/ 630 kW, 35/0,4 kV will supply the electricity, one of them being a spare one.

For high-tension side is needed a room of 6 x 7 m, for the low tension side 2 x 4 m.

The main switchboard room for low-tension station /2/, for electricity distribution for motors in production and auxiliary units will have 16 fields type UNIBLOK and the station needs a room of 6 x 3 m.

Distribution of electricity to sockets and illumination of the rooms in the whole building is not discussed here, being a part of the building construction project.

A - 18 TRANSFORMER STATION AND MAIN SWITCHBOARD ROOM - Specification sheet

No Equipment	Manufacturer	Pieces	kW		Steam		Water		Price/piece		Total price	
			inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1 Transformer station: Transformer air-cooled 35/0,4 kV, 630kW. High-tension side Low-tension side	Elektromont, Bystrany, CSSR	2							28500	40000	80000	
									5000	7000	14000	
2 Low-tension switch- board room for approx. 120 elmot., 14 fields UNIBLOK	Elektromont, Praha, CSSR	1							14300	20000	20000	
3	TOTAL										114000	
										A-18 TOTAL	114000	

A-19 VENTILATION IN EX-ROOMS AND AIR CONDITIONING FOR STERILE ROOMS

In Ex-rooms, where work with inflammable solvents is performed on the equipment with the character of open equipment, it has been recommended to use a compulsory ventilation with 6 air-changes in a hour, without circulation. Intake of fresh air is performed through 6 preheating units THA 122 /1/, which are hanged on walls, and air exhaust is done through ventilation units NDA 92 /2/, placed on the roof of the building and connected with air-ventilation tubings through tube-openings. The unit ZHA 122 heat up only the air coming through them and do not compensate possible heat losses caused through building construction, which must be compensated by an independent heating device.

The capacities of individual units are stated in specification sheet and the number of units has been estimated for a space of 2000 m³. In case that the production rooms have different dimensions it will be necessary to adapt the number of installed units.

Beside this general ventilation of Ex-rooms it is necessary to ensure the exhaust of solvent vapours from individual equipment with character of open one equipment. This is realized by means of flexible hoses/pipes/, which are connected onto the main ventilator tubes, leading to ventilation units RNE 250 /3/, placed on the roof.

For possible sterile rooms, not yet exactly defined, air conditioner unit BKC-4 /4/, has been proposed, which is filtrating, mixing, and heating the air, working in two stages. The unit produces a small overpressure in the rooms and it fulfills the requirements for air-filtration: The number of dust-particles not larger than 0,5 μ m - less than 3,5 mil/m³ and the number of nonpathogenic microorganisms - less than 200/m³. The unit works with 80% recirculation of air, mixing it with 20% of fresh air from the outside. The unit must be placed in a separate room, the sizes of which are stated on scheme A-19.

Ventilation of all other rooms of the building is part of the whole building construction project.

A - 19 VENTILATION IN EX-ROOMS AND AIR CONDITIONING FOR STERILE ROOM - Specification sheet

No Equipment	Manufacturer	Pie	kW		Steam		Water		Price/piece		Total price	
		ces	inst	day	t/h	t/d	m ³ /h	m ³ /d	\$	Rbl	\$	Rbl
1 Unit for air-intake, heated with hot water without air-circulation, type: ZHA 122 PL 127209 capacity=2000m ³ /h, At= -20 +20°C =40°C (to be hanged on wall), heat.performance 30kW*	VZZ Ryde Letnice, Radotin, CSSR	6	6x 0,8	115	*	*			285	400		2400
2 Unit for air exhaust from ex-room, type: NDA-92 PL 127320 (to be placed on roof); capacity=8000m ³ /h.	VZZ Ryde Letnice Radotin, CSSR	2	2x 2,2	52,8					430	600		1200
3 Local exhaust of sol-vents vapours from opened equipments; ventilator RNE 250 No.PK 123158.40 capacity=900m ³ /h (with flexible tube)	VZZ Ryde Letnice, Radotin, CSSR	3	3x 0,75	13					285	400		1200
4 Air-conditioner for sterile room type: BKC 4 capacity=4000m ³ /h. The unit works with 80% air-circulation, with two-steps air-filtration; dust particles 0,5µm max.3,5mil/m ³ , non-pathogen.organ. max. 200/m ³	VZZ Ryde Letnice, Radotin, CSSR	1	3 1,5	36	*	*			4280	6000		6000
TOTAL				15,95	216,8							10800

*NOTE- see page 2

TOTAL from first page

10800

Electrical installation for motors

7000

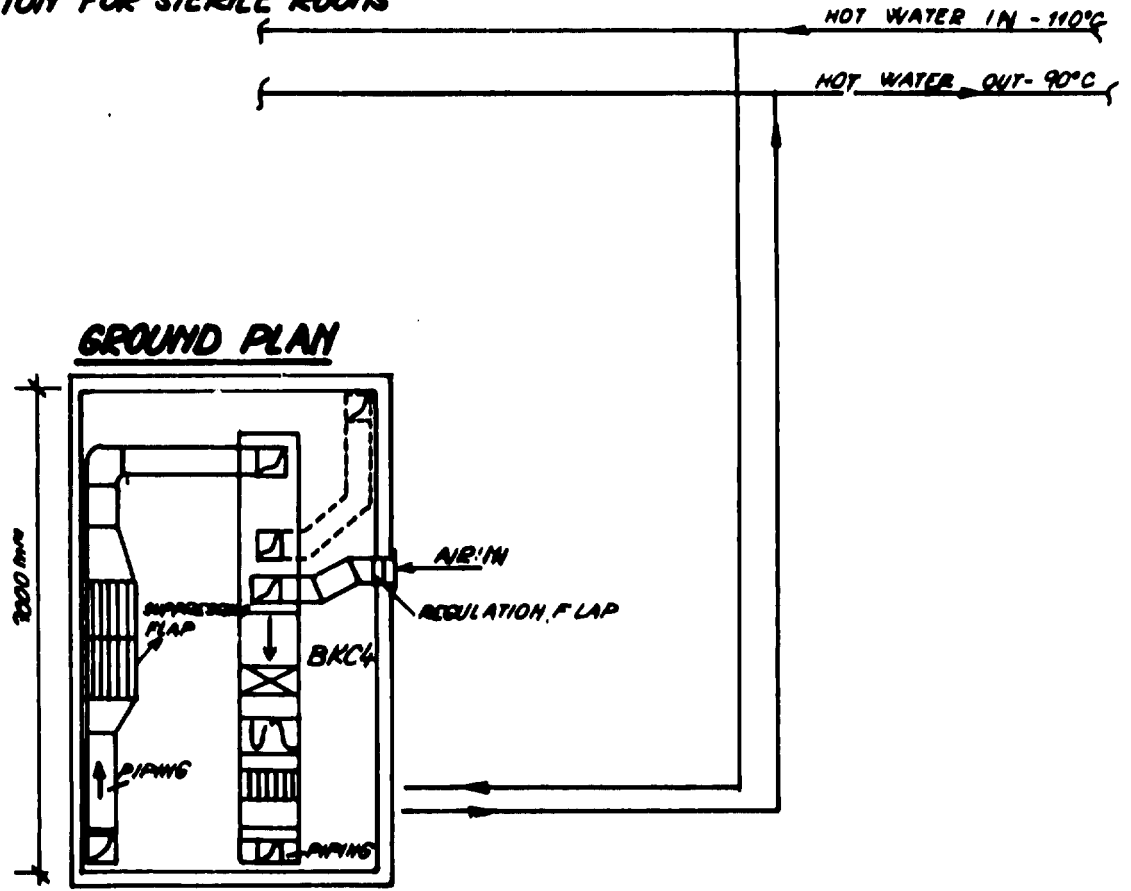
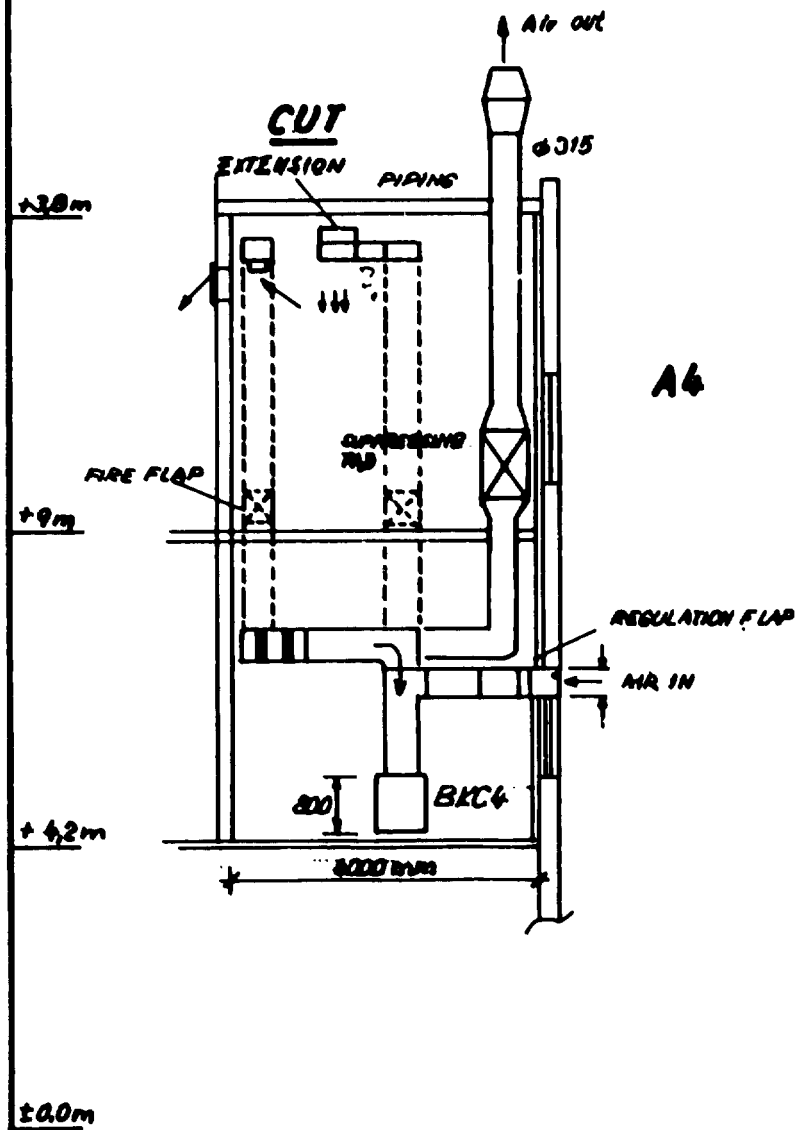
Regulation and measuring, mounting incl.

4000

A-19 TOTAL 21800

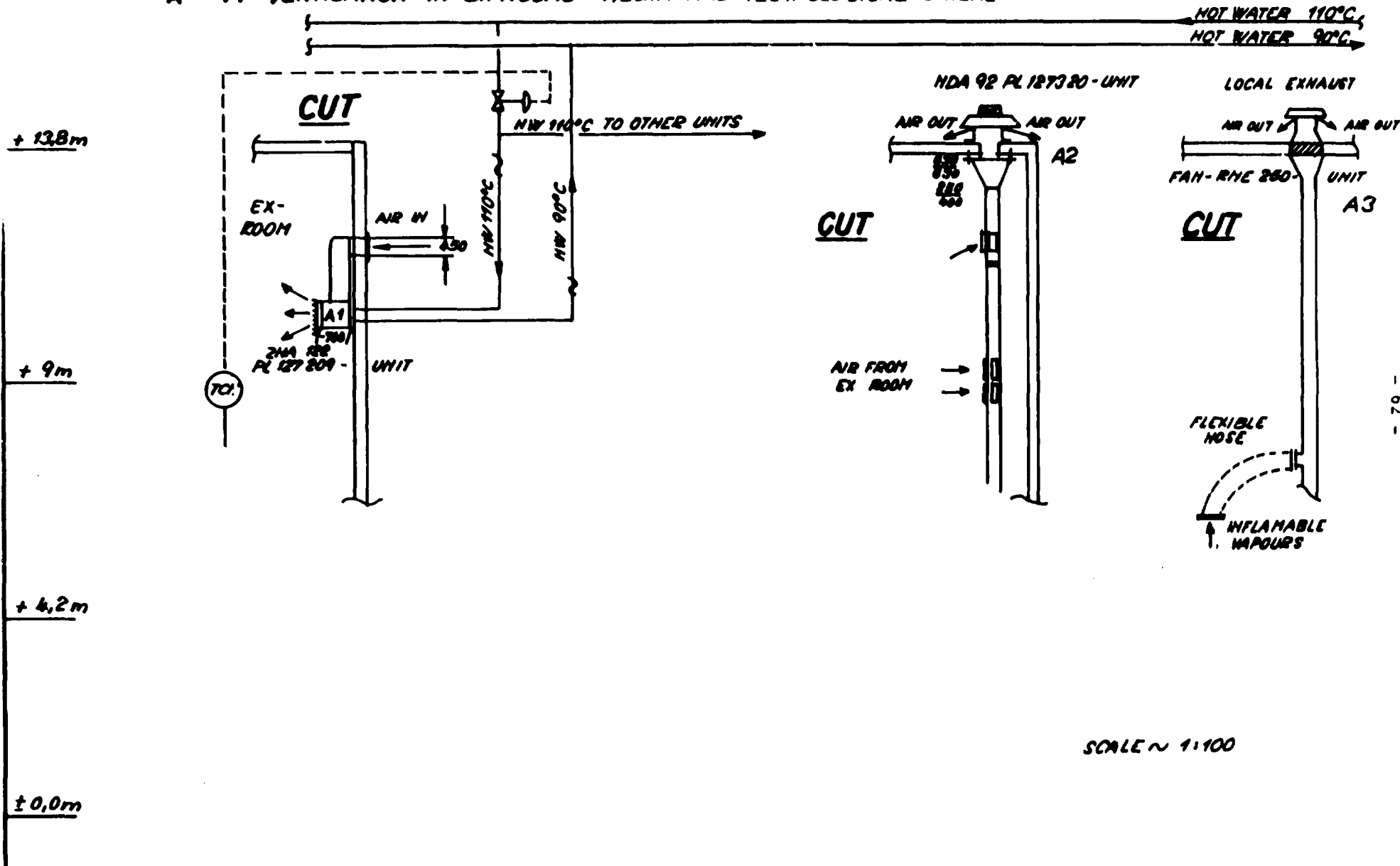
* NOTE: The equipment is heated with hot water 110/90, with consumption of 8m³/hour (for six units No.1) and 1m³/hour for unit No.4. In case the hot water is not available, equipment can be heated with low pressure steam with consumption of 300 kg/hour for six units No.1 and 30 kg/hour for unit No.4.

A - 19 ENGINE ROOM AND AIR CONDITION FOR STERILE ROOMS



SCALE ~ 1:100

A - 19 VENTILATION IN EX-ROOMS - MECHANICAL-TECHNOLOGICAL SCHEME



A - 20 IN-PROCESS TRANSPORTATION - Specification sheet

No	Equipment	Manufacturer	Pie ces	kW inst	Steam day	t/h	t/d	Water m ³ /h	m ³ /d	Price/piece		Total price		
										\$	Rbl	\$	Rbl	
1	High-lift truck, accumulator-powered, hand-driven, type: EV 210.1 max.load 630 kg lifting height 3300mm, L=666mm, W=870mm, H=2200mm, w=700kg	AGROZET-Brno CSSR	2							2740	3840	7680		
2	Accumulator-loading apparatus, type: Kt 3424/60 ypu	Elektropřístroj, Rokytnice, CSSR	1							1210	1700	1700		
TOTAL													9380	

A-20 TOTAL 9380

ELECTRICITY, STEAM AND WATER SUPPLY - Summary

Production unit (Auxiliary unit)	Electricity			Steam max.t/h	Water max.m ³ /h	Hot water 110/90°C max.m ³ /h
	Nr.of motors	inst.kW	max.kW/h			
A-01 Production of Peptone	18	90,7	73	0,82	15,0	
A-02 Production of Pepsin	9	10,5	8	0,13	2,0	
A-03 Production of Pancypsin, Trypsin and Chymotrypsin	17	78,36	40			
A-04 Production of Cholesterol	8	8,1	4	0,20	2,5	
A-05 Production of Pancreatin	4	7,55	6			
A-06 Production of Blood hydrolyz.	6	8,3	4,5	0,13	4,0	
A-07 Production of Dry bile	6	51,89	51,89	0,06	1,5	
A-11 Solvent regeneration plant	2	0,6	0,6	0,68	16,0	
A-12 Production of demi-water	1	0,15	0,15			
A-13 Engine room for steam, condensate and water supply	3	2,1	1,5	0,20		
A-14 Neutralization plant	2	5,0	5,0			
A-15 Store for inflammable solvents	4	6,4	2,2			
A-16 Central pressure air and central vacuum unit	5	51,6	33,3		0,55	
A-17 Cooling plant	8	258,0	229,0		4,00	
A-18 Transformer station						
A-19 Ventilation and air-conditioning	15	17,45	17,45	0,30		8
TOTAL	108	596,70	476,59	2,52	45,55	8

NOTE: For vessels with view-through glasses has to be reckoned with illumination (24V or 220V)

INVESTMENT COST - SUMMARY

Production unit (Auxiliary unit)	Equipment		Piping and fitting	Regulation measuring	Electrical installation	Auxiliary construction
	\$	Rbl	Rbl	Rbl	Rbl	Rbl
A-01 Production of Peptone		300070	66000	15000	16000	5000
A-02 Production of Pepsin		106000	19000	3000	7200	1600
A-03 Production of Pancypsin, Trypsin and chymotrypsin	311000	70960	12600	200	12000	3000
A-04 Production of Cholesterol		128930	28360	2500	8000	2000
A-05 Production of Pancreatin		45490	6900	1200	3200	500
A-06 Prod.of Blood hydrolyzate		52550	11560	5800	4800	900
A-11 Solvent regeneration plant		42680	670	4000	1200	
A-12 Production of demi-water		22400	4400	300		
A-13 Engine room for steam, condensate and water supply		9300	2300	2000	2400	
A-14 Neutralization plant		24100	2300	6000	1200	
A-15 Store for inflammable solvents		126500	14700	11000	3600	
A-16 Central pressure air and central vacuum unit		12740	2500		4000	
A-17 Cooling plant		85600			6400	
A-18 Transformer station		114000				
A-19 Ventilation and air-conditioning		10800		4000	7000	
A-20 In-process transportation		9380				
TOTAL	311000	1161500	171290	55000	77000	13000