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PHARMACEUTICALS FROM ANIMAL BY-PRODUCTS

DP/VIE/86/016

VIET NAM

Terminal report*

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

Based on the work of Professor Hoang An, national project coordinator
Reviewed by Professor Oleg Scedrov, chief technical adviser
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United Nations Industrial Development Organization
Vienna

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* This document has not been edited.

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SUMMARY

This is the final revised version of the TERMINAL REPORT presented by the NPD at the 13.12.1993 Closing Tripartite Review Meeting. It had been updated to 30 July, 1994 after fulfillment of all sub-contracts related to the Project implementation.

Chapter I (Introduction) is a review of the Initial Project Document

Chapter II (Implementation of Project) relates the whole course of Project Implementation with major problems occurring in each stage and conjectures about the future of the Project.

Chapter III (General Comments) is an attempt to find out the characteristic features of the Project and most valuable experiences gathered during its implementation.

Comments and suggestions made during discussions at the TPR meeting are integrated in the revised version while conclusions of the meeting are reproduced integrally according to the minutes of the meeting. A follow-up of the meeting ends the Report.

Basic data are updated in the annexes if there are changes since the date of the last Project Performance Evaluation Report (15/4/1993).

TABLE OF CONTENTS

I. INTRODUCTION

1. GENERAL CONSIDERATIONS

Project DP/VIE/86/016, full title:
Experimental Production of Pharmaceutical Raw materials from Animal By-Products Obtained from Slaughterhouses
was signed 6.10.1989 and revised 10.7.91. It started the 1st of August 1990 as planned.

This is an Institution Building Project, with the direct support ofUNDP/UNIDO to the United Pharmaceutical Enterprises of Ho Chi Minh City (UNIPHA). UNIPHA consists of a head office and 12 pharmaceutical, spectacles and other medical supplies and trading companies with a total personnel of 5'425 persons, about 70% of which is women.

The project provides UNIPHA with an opportunity to carry out a developmental project for the establishment of an experimental production unit for manufacture of enzymes, hormones and other bioactive substances from slaughterhouses by-products.

Since the political and economic environment has dramatically changed in Vietnam. In the new market-oriented economy with an "open-door" policy, the experimental production unit established according to project VIE/86/016 should not rely on Government subsidies and must be a sustainable self-financing unit.

Formerly conceived as part of UNIPHA "2nd September Pharmaceutical Factory", after restructuration it became an independant entity,directly affiliated to UNIPHA, named: the *Biopha Company* (Bioproducts and Pharmaceutical Company). The Biopha Company is a state-owned enterprise based on the project Pilot Plant and Biochemical Laboratory for manufacture of bioactive substances, a formulation unit, Quality Control (QC) Laboratory and a Trade Center. This will assure the sustainability of the project unit through further development and technical cooperation with other enterprises.

The project had been adapted in course of implementation to new requirements of the economy and these changes affected the implementation of the project both in time planning as well as in budget increase. However, through the joint efforts of UNIDO officers and consultants along with Vietnamese counterpart, appropriated measures and rearrangement of inputs already agreed had been adopted to assure the project completion as planned.

2. PROJECT EXPECTED RESULTS

2.1. IMMEDIATE OBJECTIVE

The project, understanding the complexity and sensitivity of the technological issues, was designed for creating a Research and Development (R+D) Unit with laboratories and pilot scale facilities for the manufacture of enzymes, hormones and other bioactive substances in HCM City from slaughterhouses by-products which will provide raw materials for the pharmaceutical industry and training facility for professional staff in modern bio-chemical separation techniques.

The most significant immediate results expected are:

1. The collection of by-products from slaughterhouses for the extraction of bioactive substances according to international standards, for the first time in Vietnam.

2. The processing of animal organs and glands and manufacturing bioactive substances used in the formulation of pharmaceutical products presently imported .

3. A new R+D Unit in a multi-storey building of 2'000 m^2 floor space, with laboratories and three pilot scale production lines and other facilities for the development of modern or novel valuable bioactive products from animal as well as other origin.

4. The training of professional staff in the collection, the production and the quality control of bioactive substances, the use and maintenance of the equipment, through study tour, individual fellowships and in-service training and practical works. This is a very specific subsector of the pharmaceutical industry, based on raw materials available locally, which had not been so far developed in Vietnam for lack of adequate knowledge and technology.

5. Technology transfer for the manufacturing of : dry bile, Pancreatin, technical Alpha-chymotrypsin with 10-20 % trypsin, Chymotrypsin and Trypsin purified. These are known typical products choosen as head products for each production line, which could be used in other areas such as processing materials of plant origin or sea animals.

2.2. DEVELOPMENT OBJECTIVE

The long term impact of the project as expected is:

. To help the production of drugs as Government priority need.

. To increase and diversify industrial production by means of increased exploitation of indigenous raw materials.

. The problem addressed is the lack of technological capability in the pharmaceutical industry for the production of enzymes, hormones and other bioactive substances from animal organs available but presently wasted.

3. PROJECT OUTPUTS

According to the approved project document, the project outputs will be:

Output 1. A network for collection, storage and transportation ofanimal organs, glands, etc. in Vissan, Cầu Tre and Mỹ Tho slaughterhouses

Output 2. An architectural and technological layout and a detailed construction and engineering design of the Section for processing of animal organs and glands and manufacturing bioactive substances used as raw materials in the pharmaceutical formulations.

Output 3. The Section with all its laboratories and service facilities of 2'000 m^2 in the Pharmaceutical Factory of "2 September".

Output 4. All professional staff consisting of:

- Head of Section,
- 3 pharmacists / chemical engineers / biochemists for the production of bioactive substances,
- 3 pharmacists/chemical engineers/microbiologists for the chemical analysis and quality control,
- 2 engineers, mechanical and electro/electronic for maintenance, will acquire the necessary additional skills during the project by study tour and individual fellowships.

Output 5. Technology transfer for the manufacturing of : dry bile, Pancreatin, Alpha-chymotrypsin 10-20 % technical grade and purified, Trypsin purified.

4. PROJECT PHASING

4.1. Project Assessment

The project idea was set up in 1986, in the frame of UNIPHA development strategy to provide raw materials for the pharmaceutical industry. The project concept had been defined by [illegible], presently Senior Interregional Adviser,

Backstopping officer of this project, during his mission in Vietnam in 1987, and the project documents completed and signed the 6 October 1989. The project

activities started the 1st of August 1990 with the fielding of the Chief Technical Adviser (CTA), *Prof. Oleg Scedrov*. The revised project document was approved the 10th of July 1991.

4.2. Project Activities

According to the approved project document, the project activities for each output are to be completed by month:

Output 1: Collection of organs network	3 to 6
Output 2: Technological lay out, detailed construction and engineering design of the Section	4
Output 3: Construction and engineering works Equipment procurement and installation	5 to 11
Output 4: Training	4 to 10
Output 5: Technology transfer	12to 24
Final evaluation:	36

II. IMPLEMENTATION OF PROJECT

1. PROJECT INPUTS

1.1. Project budget covering UNDP contribution

	US$	%
Implementation:		
Approved 01.07.1991:	931'580	100.00
Revised 28.10.1993:	959'099	102.95
Phasing:		
Tctal allotment	959'099	100.00
Prior years expenditures	818'152	85.30
Current year phasing	140'948	14.70
Current year expenditures	132'043	
Current year implementation (date 28.10.93)		93.8

Particulars:

International experts	212'070	22.10
Contracts	46'000	4.80
Training	103'920	10.84
Equipment	568'339	59.22

1.2. Project budget covering Government contribution

	1000VND	%
Implementation:		
Approved 01.07.1991:	1'803'474	100.00
Disbursed to date	1'867'974	103.60
Phasing (civil engineering works):		
Total allotment	790'000	100.00
Prior years expenditures(1991)	30'000	3.80
Current year phasing	760'000	96.20
Particulars:		
Personnel	67'050	3.58
Civil engineering works	790'000	42.29
Existing premises	1'010'924	54.13

1.3. UNIPHA contribution for affiliated activities

Total allotment (civil engineering works and equipment)	513'000	100.00

The establishment of an adjacent formulation section, including equipment, and premises for the QC laboratory and Trade Center, referred as affiliated activities, are made available thanks to UNIPHA contribution from its own budget.

2. ANALYSIS OF PROJECT OUTPUTS

Output 1 : network for the collection of animal organs

2.1. Slaughterhouses

The collection of animal organs for the extraction of pharmaceutical bioactive substances is assured by contract and long-term cooperation with slaughter

houses of international standard, with high hygienic conditions, constant supervision of veterinary doctors, own quality control departments and freezing facilities. The Vissan, Cầu Tre and Mỹ Tho slaughterhouses are able to meet these requirements in quality, to supply raw materials for the project operation.

However, the quantity of animals slaughtered depends on contracts for exportation (mainly to the Soviet Union), while the current demand of Hochiminh City is met by smaller slaughterhouses with no freezing facilities. In the last two years, the quantity of pigs and cattle slaughtered at Vissan is much lower than its
slaughtering capacities, while Cầu Tre and Mỹ Tho slaughterhouses are now dealing in export of frozen ducks, shrimps and other sea animals as for timesharing.

The exportation of meat will be resumed soon, since Vietnam, along with the USA and Australia, is participating in the world aid program for the former Soviet Union countries. According to the contract signed recently, Vietnam will supply pork, beef and rice worth US$ 500 million per year in 5 years.

2.2. Collection team

In early 1991, a team of workers with a veterinarian as head of section has been formed and trained by the CTA and UNIPHA technical advisers (video taped procedure used in training is provided by a foreign firm). The collection activity was done only for training purposes since no processing facility for the collected organs was available, due to delays in the project implementation. Meanwhile part of the trained workers, including the veterinarian, had found another job and newly recruited veterinarian and workers have to be trained again.

Sample of 50 kg frozen pig pancreas had been collected in January 92 and sent abroad to test the avaibility of the network (including the collection, freezing, storage and transport by sea-land containers) for future export of frozen organs . This sample had passed quality control of the foreign firm and collection of organs
started again in 1993 for the shipment of a whole container of frozen pig pancreas. However because of too small rate of slaughter, the shipment had been delayed, and the so far collected organs (approx. 800kg) reserved for running in of the project. Cattle pancreas and pig fresh bile planned for the running in started to be collected only in November-December 93.

If the slaughterhouses could work at full capacity, the supply of raw materials for the project operation is assured, with export possibility for the surplus.

Output 2: technological lay out, detailed construction and engineering design

2.3. Design

The technological layout of the experimental production section had been designed by the Plant Engineer (PTE) *Jan Fryda* and detailed drawings for the reconstruction of premises were made by the *Civil Engineering Design Institute (CEDI)* of Hochiminh City under the supervision of the PTE in November 1991.

The construction, erection and installation according to detailed layouts approved by the PTE of locally supplied equipment and local steel structures was assigned formerly to the Rectere Company, which revealed to be an intermediate with no facilities for the manufacturing of equipment and signing only subcontracts with other companies.

For these reasons, it was proposed by the National Project Director (NPD) in August 1991 to hand the contract to the *Bason Shipyards*, and with the help of the PTE, Bason prepared a quotation which was sent to UNIDO Vienna 12.11.1991. However, it was realized later on in 1992 that Bason, being a powerful complex of metal-work factories, is only able to manufacture the equipment but could not prepare the detailed lay out and piping drawings as required.So would be with the installation of foreign equipment.That was the reason why a specialized institution in engineering design for the chemical industry was needed to do the job.

According to good designing practice, *Dr Đỗ Duy Phi*, presently Vice Director of the *Design Institute of Chemical Industry (DICI)* in Hanoi, as national consultant, and the Process Engineer (PE) *Ulf Strenger* were fielded in June-July 1992 to check all the technical documentation and prepare a Second Opinion Report with
Recommendations for the preparation of the engineering flowsheets and design.

Finally (16.12.92), the DICI was contracted for the preparation of complete engineering flowsheet(s), detailed lay out and piping drawings, for the review of Bason's equipment drawing and for the review and correction of electrical system design and layout made by the CEDI.

2.4. Inspection Supervision

DICI was also contracted for the inspection of equipment during fabrication, final tests at Bason, and for the supervision of installation works. The assignment of a competent national design institute, permanently present on the field and technically responsible for the design and engineering works and, along with

UNIDO consultants, for the commissioning trials of the plant, is an assurance for the quality of design and engineering works according to internationally accepted requirements and one of the key issues of the whole project.

However these changes affected the project implementation schedule. Civil engineering works were stopped since December 1991, after the completion of ceilings reinforcement, up to February 1993 when the final lay out was completed by DICI. The manufacture of locally supplied equipment could not start until the drawings had been reviewed and checked by DICI in January 1993.

Output 3 : construction, installation, running in

2.5. Procurement of imported equipment

Meanwhile the procurement of imported equipment was completed, although later than planned, but it did not affect the project implementation schedule. Laboratory equipment had been delivered the last in October-December 1992, while the COCOM embargo delayed the procurement of missing items for the process control system to the end of October 1993.

2.6. Manufacture of locally supplied equipment

The local purchase authorization was issued 25.3.92, with amendments date 23.7.92, and the contract with Bason signed 10.10.92. But the manufacture could start only after award of the DICI contract (16.12.92). Bason had encountered many problems in the fulfilment of its obligations. Delay in the delivery of equipment is due mostly to operational factors:

+ unsatisfactory results during inspection and test runs made it necessary to readjust or replace the fittings (dimensions of vessels, speed of propeller, polishing of internal surfaces, refrigerated truck, cold room, cooling water system...).

+ the quotation was made a whole year before the contract could be signed, and it was necessary for Bason to recuperate invested funds. Stainless steel and fittings reserved for VIE/86/016 project, including the electric generator, were used for another project, with delays and higher prices in their procurement when it was needed again.

+ the electric generator which was priced in Bason 1991 quotation as US$ 2'600 (former soviet prices) is now available only at about US$ 14'000 and Bason is not able to deliver it at quoted prices.

This is the first time an UNDP/UNIDO project in Vietnam relies mainly on locally manufactured equipment .Although there is still much to be improved, this issue

proved to be essential for the project to attain the project objectives and goals with a modest budget.

2.7. Civil engineering works

The reinforcement of ceilings and the demolishment of unwanted partition walls were completed end of December 1991.

The construction of foundations for equipment, partition walls, doors, started only after the completion of the final lay out by DICI (March 1993)

The final paving and tiling was delayed to the end of August, after completion of installation works. Each phase of civil engineering works was therefore assigned to three different companies and the water supply system to a fourth one.

2.8. Installation

The Bason contract did not include the installation of imported equipment. It was assigned to DICI for the pilot plant and the process control system and to *Prof. Việt (University of Hanoi)* as for the laboratory equipment.

The installation of the Anhydro spray dryer, glass rectification column DN150, rotating evaporator RO20 and water demineralisator unit ID500 had been performed locally, no specialist from the supplier was needed.

The installation of the process control system could start only in November 1993 after the delivery of the missing items affected by the COCOM embargo

The electrical lighting system had been installed by Bason according to CEDI drawings before award of the DICI contract and must be readjusted according to DICI final lay out, specially in explosion hazard premises, where aceton vapours can be expected. Since Bason quotation for the electrical system was based on CEDI drawings, additional works were needed to comply with the DICI final layout.

The piping system in Bason contract was a rough evaluation based on the PTE's technological layout with reserve funds for possible increase according to the detailed final layout. The value of 2 items cancelled in the contract rejoined this reserve. Agreement was reached between UNIDO and Bason to include this reserve to Bason contract , to cover part of the increase required by Bason.

The DICI detailed layout did not include electrical wiring and piping system for the biochemical laboratory of the project, since it had not been mentioned in Fryda's layout and Strenger's report. With the help of the CTA, the missing drawings were done by the project civil engineer and funds are made available from Prof.Việt's contract in replacement of the installation of small laboratory equipment which could be done by the project personnel.

2.9. Affiliated activities

Meanwhile the premises for an adjacent formulation section, the Quality Control laboratory and a Trade Center had been completed on UNIPHA funds. The formulation section is operational since October and the Trade Center in December 1993.

QC laboratory and formulation section were not included in the original project, because it was advisable to use existing facilities of the "2nd September Pharmaceutical Factory".

2.10. Inspection and Commissioning

The inspection of individual equipment made by Bason started in May-June 1993, during the fielding of the PTE Ulf Strenger (replacing J.Fryda) and continued afterwards by DICI and the CTA. Special attention had been paid to the cooling facilities and satisfactory results were obtained finally after months of multiple trials and readjustment.

Under DICI supervision, pressure test of the piping system and test under load of the electrical systems had been performed in August-September 1993.

The test run of imported equipment was performed partly under the super-vision of the CTA in NOV93-JAN94, while safety test of explosion proof equipment and systems had to be done by a specialized organization.

The plant maintenance and operating manual was prepared by DICI and Prof.Việt (as for laboratory equipment) and the guiding performed during the test run.

Many operational problems encountered made it necessary to prolong the inspection and run test with load of individual equipment and systems and the final commissioning trials of production lines and facilities was delayed. Additional 2 m/m allocated to the PTE and 2 month mission of the CTA for this purpose were not sufficient and commissioning trials are continuing in 1994..

2.11. Running in

Preparations for the trial run of the pilot plant started during the CTA's mission in May-July 1993. Requirements for raw materials, acetone and other chemicals and reagents had been defined and project funds for the first trial batches disbursed.

Trial batches of dry bile and chymotrypsin are in preparation during the return mission of the CTA while pancreatin production using acetone is delayed until safety measures are approved by the authorities. However the running in stage is expected to last many months until a stable yield was reached.

2.12. Project management

According to project management principles, a project groupincluding a team of specialists from DICI, Civil Engineering Works, Bason Co, along with the project personnel, is working on the project site since January 1993. With the help of the CTA and PTE many unforeseen problems occurring in practice are solved at once on the spot. Amendments and rearrangement of inputs already agreed had been adopted with an exceptional quick response from UNIDO's Headquarters.

However too long lasting delays in outputs 2 and 3 and additional funds required hampered the implementation of the whole project, with no time and money left for other activities.

Output 4 : training

2.13. Fellowships, study tour

All study tours and fellowships have been completed in 1992. Combined with in-service training, professional personnel will be able to manage, operate and maintain the production section.

2.14. Project permanent staff

However, due to practical and financial difficulties related to the delay, the project permanent staff personnel had to be recruited step by step.New veterinarian, maintenance engineer, quality control pharmacists had been recruited and process engineer and biochemists were interviewed. The newly recruited personnel did not benefit by fellowships and project in-service training and have to rely mainly on their own experiences in practical works.

Output 5 : transfer of technology

2.15. In-service training courses

In-service training courses and laboratory experiments in the manufacturing of bioactive substances had been conducted in November 1991 by Prof. Scedrov, *Prof. Dr Nguyễn Đinh Huyên* and his colleagues, in the biochemical laboratory of the Hochiminh University. Samples of products obtained during training courses
had passed analitical control in Yugoslavia according to USP. These experiments had been repeated by trainees during fellowships in Cuba, and compared with the technology used in Cuba which might also be used for the project.

Training courses in quality control of products and in-process control are conducted by the Quality Control expert (QCE) *B.Pavelic* during her 1 month mission in November 1993.

2.16. Process elaboration

The process elaboration, conducted in the project biochemical laboratory, started in July 1993 at the end of Prof. Scedrov's mission and Prof. Nguyễn Đinh Huyên was contracted as national consultant to replace him during his absence. The samples prepared passed analitical control made by the QCE during her training courses.

Up to the end of the CTA's mission (13.01.94), test run with load of production line for chymotrypsin and trypsin had been conducted on pilot scale. Therefore the transfer of technology will end with the process elaboration in labscale and the transfer of detailed technology description worked out by the CTA. That is why the participation of Prof. Huyên is one of the key issues assuring the continuation of project activities after its completion.

2.17. Experimental production

One can not expect a stable yield during the first months of production in 1994. The improvement of the process will require funding and new sources of funds should be identified in the frame of Hochiminh City budget for Science and Technology.

3. OUTLOOK

3. OUTLOOK

The original immediate objective of the project focussed its experimental nature which will provide raw material and a training facility for the pharmaceutical industry. No specific manufacturing capacities with significant results and working places to be created were mentioned. These cannot be achieved in such a short period of time and with such a small budget.

However, an adjacent formulation section had been created thanks to UNIPHA contribution from its own budget. The production of finished pharmaceutical products, partly from project's bioactive substances, along with the exportation of frozen organs still not used by the project, will assure the sustainability of the whole unit after project completion.

Through technical cooperation with other enterprises, new valuable products could be developed, based on new sources of raw materials such as sea animals, silworms or medicinal plants.

Transfer of technology and know-how should be considered by direct purchase, long-term support programme, joint-venturing, etc. New technical cooperation programmes, in addition to UNDP funding, new sources of funds should be identified.

III. GENERAL COMMENTS

1. TECHNOLOGICAL COMPLEXITY OF THE PROJECT

Project DP/VIE/86/016 is not a large-scale project, but significant by its technological complexity.

This is a development project pioneering into a new, very specific subsector of the pharmaceutical industry which has had no equivalent in Vietnam so far. The newly created Research and Development (R+D) Unit with laboratories and pilot scale production lines, will provide research workers, most of them women, with facilities to develop their scientific works, from bench scale up to industrial production, not only in the pharmaceutical but also in other branches of biotechnology.

It deals with very sensitive raw materials of animal origin, using highly inflammable solvents and its product is endangered by contamination, requiring strict quality control in all stages of its elaboration.

It is one of the first UNDP/UNIDO projects in Vietnam that had been essentially designed, fabricated and erected by local expertise under assistance of international experts, and with a limited number of imported most up-to-date equipment.

The complexity is also reflected in the project management, by the diversity of the local task force mobilized: 2 specialized national institutes for design and supervision, 1 contractor with many subcontractors for equipment manufacturing, 3 contractors with many subcontractors for equipment installation, 4 civil engineering companies, 1 national consultant for the transfer of technology, along with the whole project staff and other personnel and contractors involved in affiliated activities.

Many competent scientific and managerial specialists had been involved in the project such as Prof. Dr Nguyễn Đình Huyên, Dean of the Faculty of Biology, Hochiminh University, and Dr Đỗ Duy Phi, presently Vice Director of the Design Institute of Chemical Industry (DICI) in Hanoi, as project national consultants, *Prof. Hoàng Ân*, as National Project Coordinator (NPC), *Prof.Dr Lê Minh Chi*, Head of the Veterinary Department, Ministry of Agriculture and Food Industry, as Project Veterinary Adviser, *Pharm.Trần Tựu*, Director General of UNIPHA and Director of Biopha, as NPD, *Pharm.Hoàng Phúc Tuấn* as NTA, *Eng Trương Quốc Hoa*, as assistant of the NPD for equipment reception, and many others.

2. KEY FACTORS FOR SUCCESSFUL PROJECT IMPLEMENTATION

2.1. The project concept

Although the sweeping political and economic changes in Vietnam and worldwide have created a very challenging business environment for such a project, the project concept remains totally valid. It was to train professionals in a very specific subsector of the pharmaceutical industry, which could be used in other areas such as processing materials of plant origin or sea animals.

Taking account of the complexity of the whole problem addressed, it is not too ambitious in its objectives. It has been on the verge of being cancelled, but its capacity to adapt to changing business environment is an assurance for its survival, which is not the case with many other projects undertaken in Vietnam during the last ten years.

However the phasing of the project , as planned in the initial project document and in the relevant work plan, had to be revised twice during its implementation.

2.2. Scientific and technological knowledge

The lack of scientific knowledge and technological capability is the main reason why this subsector of the pharmaceutical industry had not been developed and available raw material wasted. The project provides UNIPHA with an opportunity to acquire it and facility to develop it.

Under the coverings of the *Comittee of Science and Technology (CST) of Hochiminh City*, as a R+D Unit, it should develop technical cooperation with other scientific and educational institutions to consolidate its sustainibility. This is the main source of revenues for a stable business in the future, and a basis for seeking joint- ventures, long-term support programmes and other sources of funds.

As most of project personnel are pharmacists, it would be more profitable for them to have supplementary courses in biochemistry, while entering this new field of activity. Biochemists have to be recruited for future activities of the project.

2.3. Engineering knowledge

As in many cases of UNDP assisted institution building projects with pilot plants, besides specific scientific and technological expertise, it will be very hard to solve practical engineering problems occurring during the project implementation without sufficient specialized engineering knowledge from the project counterpart .This is the main reason why the project implementation had been delayed for more than one year until appropriate remedial measures adopted by the TPR meeting in July 1992 had been fully implemented.

On the other hand, in solving practical engineering problems occurring during the project implementation with the assistance of UNIDO recruited specialists, the project personnel and contracted designers, engineers could acquire useful experiences very needed in designing and engineering similar projects and equipments for future large scale production plants This is one of the most significant unforeseen long-term effects the UNDP project had brought to the recipient country

2.4. Project management skill

Although all parties concerned show enthusiasm and great efforts, as a rule, taking account of the complexity of the project, their cooperation had not been always smooth and the project management always effective.

The implementation of a project, whether large-scale or pilot-scale, always follows a sequence of actions to be undertaken in strict logical order. Any attempt to avoid or short cut this sequence will lead to losses of time and

money. That is at the origin of many problems encountered by the project during its implementation, such as time-limits constantly post-poned afterwards and unforeseen conflicting situations.

Although there is still much to be improved, the NPD management skill and the great efforts deployed by the Project Group on the field, along with the great flexibility shown in UNDP/UNIDO managerial system, including budget funding, is a great advantage without which the project should not come to a happy ending. The effective support of town authorities, CST and *Health Service*, in solving difficulties in fulfillment of government commitments is also a key factor without which the project could not survive. Everyone working for the project, specially in the project group on the field, confirmed that "they have been learning a lot from their own experiences". And it is advisable that the skill acquired in the management of this UNIDO project should be used for other projects in Vietnam.

3. NEW DEVELOPMENT POLICY

The development policy of Vietnam had to take account of the sweeping changes occurring in to day's world. UNDP's policy is also relevant to these new trends in global development with drastic changes in United Nations system. Project DP/VIE/86/016, in its concept since 1987 and during the whole course of its implementation, had to comply with these changes.That is at the origin of all the problems but also of the main achievements gathered, which are overriding the objectives as originally planned in the project document.

4. ASSESSMENT OF PROJECT ACHIEVEMENT

4.1. Closing Tripartite Review Meeting

The recommendations of the 13.12.1993 Closing Tripartite Review Meeting are:

+ to highly appreciate the efforts of UNIDO and counterpart in assuring the project completion as planned;

+ to agree with the idea that problems and delays occurring during the project implementation are due mainly to the fact that this is is one of the first UNDP/UNIDO projects in Vietnam that had been essentially designed, fabricated and erected by sub-contracts with local engineering agencies;

+ to agree that the commissioning trials should be successfully completed to the end of the year, and the project financially closed the 31st of December 1993.

+ to agree that the last instalment to Bason and DICI contracts should be released after the closure of the project; and the CTA's mission to be completed as planned up to January 13th, 1994.

+ to recommend as useful for the pilot plant production, a spare generator to be supplied for the project and to be funded by UNDP and the Government.

+ to recommend that improvement problems should be solved after completion of the main task, for which the allocation of 60 million VND for trial runs after project closure was announced by the CST of HCM City.

The TPR Meeting appreciates as very useful the experiences gathered during the project implementation and hopes that it would be profitable for other UNDP/UNIDO projects in Viet Nam

4.2. Follow up of TPR meeting issues

Commissioning trials

Pilot scale production lines were tested under load during the running in of batch 1 of each product: chymotrypsin-trypsin (7/12/93 to 4/1/94), dry bile (9/12/93 to 27/1/94) and pancreatin (17-18/2/94). As a rule for "cleansing batches", the products obtained were spoiled by rust, sand dust, soluble iron or by too long lasting processing time, and the yield was low.

The technology had been successfully tested during the running in of batch 2 and batch 3 of above products from January to April 1994. Chymotrypsin-trypsin gave a good yield (up to 3,5kg per batch of 35kg pig pancreas) and the quality of the raw product is acceptable.Dry bile is a very light green powder, which has no analogue so far if prepared by another technology and the yield was acceptable (2,5kg from 25kg filtered fresh bile). However the second batch of pancreatin was still spoiled by iron.

Individual equipments had been readjusted during operation (vacuum-pressure, solvent flowmeter, cooling unit, demineralizator unit, rectification column...) and additional works had been performed by DICI and Bason to solve minor unforeseen problems (conducts for exhaust air from vacuum pump and spray dryer to avoid bad smell, fittings to be replaced by stainless ones, vessels encumbering the front panel of steam-boiler to be displaced...). To operate the rectification column, at least 1000kg aceton 50% was needed and the test run had been postponed until enough solvent to be recuperated had been worked out (after 3 batches of pancreatin), in May, June and July. The column is now working properly, the average capacity is 35 liters per hour. The whole pilot installation had been tested under charge of all three production lines in operation (except the rectification column), After this successful run test, attestation was issued for the fufillment of Ba Son and DICI sub-contracts.

Additional equipment had been received (3 air conditioners and 1 bidistillating apparatus).

Meanwhile all civil engineering works had been completed before the inauguration date (26/1/1994).

Last instalment to Bason and DICI contracts

A ripartite review meeting of the pilot plant commissioning was held at the project site on 10 March 1994 and project equipment inventory had been checked. Finalization of Bason and DICI contracts and last instalment are planned to the end of April. In fact, it had been fulfilled in the 2nd quarter of 1994. However Bason and DICI are still bound to the project during the guarantee period of the contract.

Spare generator

The spare generator recommended by the TPR meeting as useful for the pilot plant production had not been supplied for the project, since no funding by UNDP and the Government. was available.

Improvement problems

After the inauguration day (26/1/1994), many scientific institutions related to biotechnology had visited the unit, and plans for future technical cooperation were set up, whether bilateral or in the frame of national R + D programs. Improvement of existing technology, full use of existing facilities and new sources of raw materials had been considered.

In July 29, 1994, the first Symposium on the Development of Biotechnology for Human Health, under the Auspices of the MOH of Vietnam and the National Program of Biotechnology, was held at the Project site and Biopha Company is acknowledged as a member of the National Program responsible for the Development of enzyms, hormons and other bioactive products from animal and other origins.

This is another step towards the attainment of Project VIE/86/016 development objectives.

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ANNEXE 1

PROJECT DP/VIE/86/016

MINUTES

Closing Tripartite Review Meeting

December 13,1993

The Closing Tripartite Review Meeting of Project DP/VIE/86/016 was held the 13.12.1993 in HCM City.

Participants

HCM City Committee of Science and Technology:
Pr.Dr.Hoàng Anh Tuấn, Chairman, Presiding at the meeting
UNIDO : Chemical Industries Branch , UNIDO Vienna
Preben Hjortlund, Country Director and
Nguyễn khắc Tiệp,Program Officer,UNIDO Hànội
Pr.O.Scedrov, Project Chief Technical Adviser
UNDP : Nguyễn văn Thuần, Director, UNDP Liaison Office in HCM
State Planning Committee, Department of Economic Relations:
Phan Thu Hương, Vice-Director
Ministry of Finance: Lễ, AIDRECEP
Project: Trần Tựu, UNIPHA DG, NPD
Pr.Hoàng Ân, NPC
Nguyễn quang Thiệu, Head of Unit

Summary of Discussions

Opening Allocution: Pr. Hoàng Anh Tuấn, Chairman of the meeting

Terminal Report: Pharm.Trần Tựu, National Project Director

Prof. O.Scedrov, Project Chief Technical Adviser:
UNIDO intention is: 1) to introduce new technology, a new type of production of pharmaceutical raw materials from animal origin. The involvement of national manufacturers and designers (DICI) is another achievement.2) To train young specialists (in training courses, fellowships...) with the participation of Prof. Huyên as National Consultant in modern biochemical separation techniques and the utilization of indigenous natural resources from other origins such as.chitin, chitosan from sea animals (the Vietnamese Government asked UNIDO for a new project in this field)

Dr. Z.Csizer, BSO, UNIDO Vienna:

The Original Project Concept as presented by the CTA is still valid The technology is unknown for Vietnam and UNIDO intention is to develop scientific and technical knowledge. Since 1989 there were tremendous politic and economic changes globally, and drastic changes in UN system. Many projects could not change up to the new requirements. As a response to life, the Project Pilot Plant is a new element for developing new, low volume products with high value-added. One could have a good impression in visiting the Project Unit. If totally designed and equipped abroad, it would cost many times more. The design is correct UNIDO is seeking an industrial foreign partner for the Project. After completion of civil engineering works, foreign companies might come and visit the Unit .

Mr Preben Hjortlund, UCD, UNIDO Hanoi:

We agreed that the Project had to be redesigned according to DICI detailed layout. As requested by Bason, a settlement was reached as follows: to the 160'000 USD contract amount, 19'000 USD increase is available, as authorized by UNIDO for unforeseen additional works, . So that no extra fund was needed.

Mr. Nguyễn văn Thuẩn, UNDP representative:

Outstanding characteristics of the Project: 1) Human resources aspect of development, with training as main achievement. 2) Sub-contract component of the project: this is the first UNDP/UNIDO project in Vietnam that had been essentially designed, fabricated and erected by sub-contracts with local engineering agencies (2 other projects had been iplemented by local sub-contracts but designed abroad). Problems and delays are normal for such projects.

According to pre-TPR meetings, commissioning trials could be completed to the end of the year; and so, the project should be financially closed the 31st of December 1993. Last instalments to Bason and DICI contracts could be released after the closure of the project; and the CTA's mission completed as planned to the beginning of January , 1994.

Lessons learned:

1) The subcontract was signed with Bason on the basis of pre-design basic datas. Detailed lay out was prepared afterwards by DICI. But Bason was not enough experienced and real costs overran the proforma prices. Bason should pay more attention for future contracts.

2) To help the NPD in the supervision of engineering works, the participation of a specialized institution like DICI is appreciated.
3) Information exchange between project authorities, UNIDO Hanoi and Vienna Headquarters have to be improved for a better project management.

Ms Huong, SPC:

Shares UNDP point of view. Time limit for remaining activities to be defined. Review of Pilot Plant commissioning to be planned before release of last instalments.

Mr Lễ, AIDRECEP:

Sustainability is the main problem after project completion. The Government will define favourable conditions for Pilot plants, will identify new sources of funds for its development and will ask UNDP/UNIDO to help in seeking market, joint-venture cooperation and bilateral aid programs.HCM City Committee of Science and Technology will actively find out opportunities.

NPD:

Points out the experimental nature of the Pilot Plant. Government policy concerning scientific institutions should be applied to the Pilot Plant. Bason and DICI responsibility will end only after the fulfillment of all works defined by the contracts. If funds are still available, the supply of a spare generator is very useful for the future production of pilot plant

Prof. Hoàng Anh Tuấn, closing the meeting:

The recommendations of the 13.12.1993 Closing Tripartite Review Meeting are:

+ to highly appreciate the efforts of UNIDO and counterpart in assuring the project completion as planned;

+ to agree with the idea that problems and delays occurring during the project implementation are due mainly to the fact that this is is one of the first UNDP/UNIDO projects in Vietnam that had been essentially designed, fabricated and erected by sub-contracts with local engineering agencies;

+ to agree that the commissioning trials should be successfully completed to the end of the year; and the project financially closed the 31st of December 1993.

+ to agree that the last instalment to Bason and DICI contracts should be released after the closure of the project; and the CTA's mission to be completed as planned up to January 13th, 1994.

+ to recommend as useful for the pilot plant production, a spare generator to be supplied for the project and to be funded by UNDP and the Government.

+ to recommend that improvement problems should be solved after completion of the main task, for which the allocation of 60 million VND for trial runs after project closure was announced by the CST of HCM City.

The TPR Meeting appreciates as very useful the experiences gathered during the project implementation and hopes that it would be profitable for other UNDP/UNIDO projects in Viet Nam.

Project Number
DP/VIE/86/016

FINAL LIST OF EQUIPMENT

Project Title : PHARMACEUTICALS FROM ANIMAL BY-PRODUCTS

Period ending : APR-94

Prodoc ItemNo	Description	Qty	Price	Rcpt date	Remarks
01.01	Meat grinder model RM-82 and spares 1.1KW CSFR	1	1'550	5.92	
01.02	Vessel 200lt ss D600 anchor type stirrer 60rpm exproof motor 3.5kW VN	1	*		* incl in 01.7
01.03	Sieve ss D1200 VN	1	*		* incl in 01.7
01.04	Vessel 400lt ss D800 jacketed opened propel. 200rpm exproof motor 3.5KW VN	1	*		* incl in 01.7
01.05	Pressure filter glass enameled type SB-M with steam jacket D630mm Hungary	1	3'600	29.1.92	
01.06	Vessel 50lt ss D400 jacketed opened propel. 200rpm exproof motor 1.5kW VN	1	*		* incl in 01.7
01.07	Vacuum-tray dryer 10 trays x 0.6 m²	1	167'605	03.93	BASON sub.ctr.
01.08	Hydraulic platform hand operated platform 1190x 740mm H 510 - 1800mm charge 500kg Germany	1	47 719	28.1.92	PO 15-1-00918P
01.09	Vessel 100lt ss D500 jacketed VN	1	*		* incl in 01.7
01.11	Heat exchanger D420 91 tubes 25x2 L1400 F=9m2	1	*		* do
01.12	Vessel 50lt ss D400 propel.	1	*		* do
02.01	Glass rect.column DN150 50lt/h CSFR	1	33'900	07.92	PO 15-1-0648P
	Glass vessel 50lt	2			
	Dosing pump var.13	1			
02.02	Nonpressure vessel 100lt D500 VN	1	*		incl in 01.7
02.03	Water cooling unit (36KW) VN	1	*		incl in 01.7
02.04	Nonpressure vessel 1m3 D1000 VN	3	*		incl in 01.7
02.05	Centrifugal pumps selfpriming side channel pump for handling of aceton 3M3/h H=4.5kg/cm2 exproof motor 2KW Ger.	2	*		incl in 01.8

NOTE : item No with an N are newly added or changed - * = Price included in other item's price

03.01	Vessel 250lt ss D600 jacketed anchor type stirrer 60rpm exproof motor 3.5kW VN	1	*		incl in 01.7
03.02	Sieve ss D1200 VN	1	*		incl in 01.7
03.03	Vessel 250lt ss D700 jacketed open propel. 200rpm exproof motor 3.5kW VN	1	*		incl in 01.7
03.04	Centrifuge Rina type 100U-500, filter basket with filtering bag of polypropylene, decanter basket, extractor device, frequency converter and electric control panel D500 1500rpm charge 31kg d: 1.25 kg/dm3 exproof motor 3KW 1400rpm SPAIN	1	42'160	18.2.92	
03.06	Vessel 250lt ss D700 jacketed open propel. 200rpm exproof motor 3.5kW VN	1	*		incl in 01.7
03.07N	Vac.nuchtfiltre D600 VN	1	*		incl in 01.7
03.08	Nonpress.vessel 200lt ss D600 VN	1	*		incl in 01.7
03.09	Centrifugal pump selfpriming side channel pump for handling of ammonium sulphate 3M3/h 1.5KW Ger.	1	*		incl in 01.8
04.01	Nonpress.vessel 100lt D400 VN	1	*		incl in 01.7
94.02N	Rotating evaporator RO 20 20lt/h (5.5KW) CSFR	1	*		incl in 02.1
04.03N	Vessel 20lt ss D250	1	*		incl in 01.7
04.04N	Laboratory Spray-dryer No.1 including centrifugal atomizer,air compressor and feed pump 3-7kg/h (12KW) Den.	1	27'430 3'742	27.8.91 .11.91	

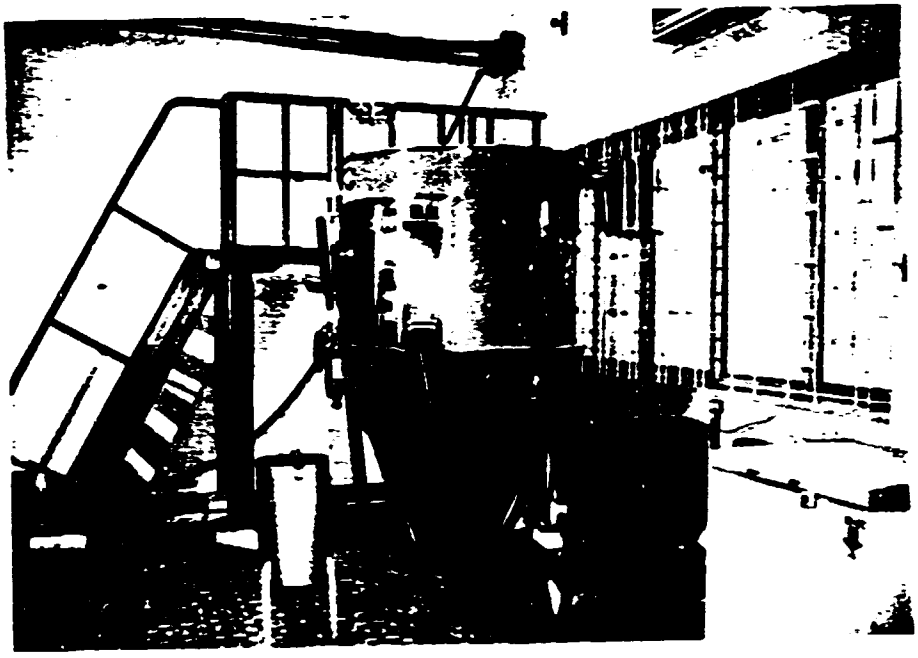
05.01	Chest type freezer Westinghouse FC-26V 742lt 0.212KW HgKg	3	*		incl in 08.3
05.02	Refrigerated truck VN	1	*		incl in 01.7
05.03	Refrigerated room 20m3+4°C (18KW) VN	1	*		incl in 01.7
06.01	Pistoncompressor 650 lt/min 8 bar 5.5KW GER	1	*		incl in 01.8
06.02	Centrif.vac.pump 120M3/h 150mbar 5.5KW GER 220 400 4.8 210 900 3.0	1	*		incl in 01.8
06.03	Compressed air refrigeration drier 45M3/h GER 0.245KW	1	*		incl in 01.8
06.04	Nonpress.vessel 400lt D800 VN	1	*		incl in 01.7
06.05	Waterboiler German pool GP-80 6KW 300lt HgKg	1	*		incl in 08.3
06.06	Steam gen. 0.2-0.3t/h (240KW) 6KG/cm2 VN	1	*		incl in 01.7
07.01	Transf.station VN	1	*		incl in 01.7
08.01	Airexch.unit 8000M3/h 0.736KW CSFR	2	4'117	09.91	PO 15.1.0796P
08.02	Local exh.unit 900m3/h 0.90KW CSFR	2	*	28.3.92	
08.03	Air conditioner National CW-2402QH	10	12'579	25.5.91	PO 15-1-00463
08.03N	Air conditioner	3	1'980		
09.01	Water dist.app. IDPE 10 25lt/h CSFR	1	*		incl.in 02.1
09.02	Waterdemin.unit ID 500 PP 500lt/hCSFR	1	*		incl.in 02.1
09.03	Vessel 250lt D650 VN	1	*		incl.in 01.7
09.04	Vessel 1000lt D1000 VN	1	*		incl.in 01.7
09.05	Centrif.pumps, selfpriming side channel pump for handling of distilled and demineralized water 2m3/h 3.5kg/cm2 1.1KW CSFR	2	*		incl.in 01.8

it 01	Refrigerator 255lt SANYO SR260VC	1	724.1	10.91	
it 02	Refrigerator 240lt with freezer of 40lt	1	470		
it 03	Pipings and fittings Germany	1	12 072	27.2.92	PO 15.1.0918P
it 04	Process control instrumentation Austria	1	27'835	23.1.92	PO 15.1.0853P
	(resistance thermometer,level meter,control unit,digital indicator,PID-controller,on/off valve,control valve,pH measuring loop)		4'117.8	14.3.92	PO 15.1.0853P
it04N	Solvent flow-meter 1,S-1Sm3/hr model Y-40-C-6.T2 work.temp. 4-60oC USSR		1'530	15.10.93	
	Water flow-meter Dy25 China	1	*		*incl.in it.1
	Vent valve Dy-50 incl.fire barrier,valve USSR		*		*incl.in it.1
	Electropneumatic converter No DQ-3,input 4-20A,output 20-100KPa,China	1 1	1'950	22.10.93	
	Power supply for PH transmitter, output 2x24V,input/output isolation 220V/50Hz China	3	*		*incl.in it.4
	Three-way magnetic valve E-T-A DN16/PN14 220V/50Hz French	1	*		*incl.in it.4
it 05	Diaphragm pressure gauges Di60mm,spare parts	2	8'919	28.9.92	PO 15.2.0356P
it 01	Desk-top computer Sanyo model MBC-16 LX-5 HGKG	1	1'475	24.5.91	PO 15-1-00405
	Monitor dual monochrome Sanyo model CTW-14 14"	1	*		do
	Printer Epson model LX-800 9-pin DOT matrix	1	*		do
it 02	Typewriter OLIVETTI	1	550	11.90	
it 03	OH projector	1	800	11.91	PO 19-1-09309
it 04	Screen	1	*		do
it 05	Slide projector	1	*		do
it 06	Minibus TOYOTA HIACE commuter 12-seater	1	11'100	10.91	
it 07	Books, journals (total)	9	5'000	02.8.91	
			*	20.1.92	
			*	7.12.92	
			*	16.1.93	

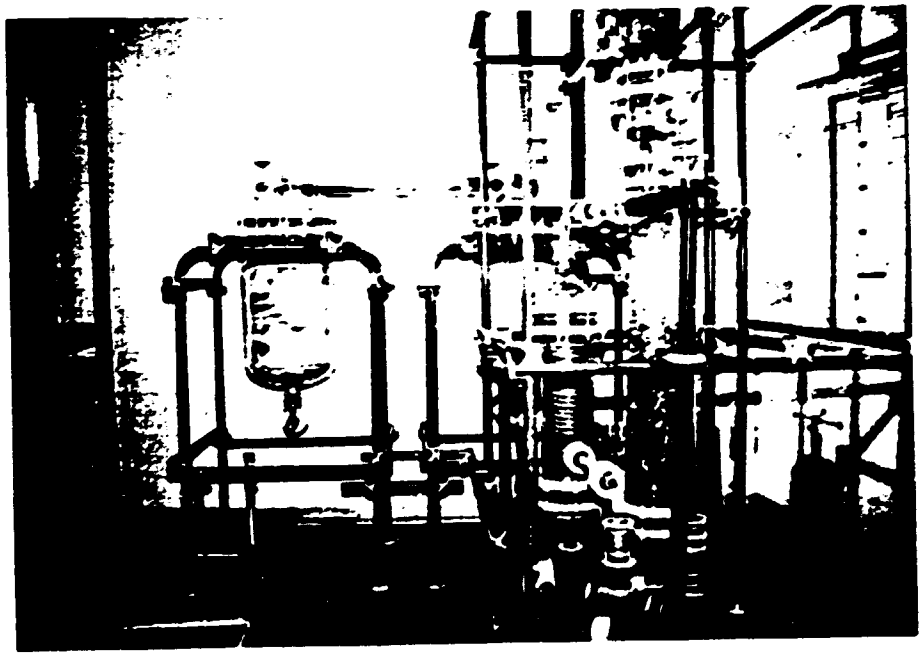
it 1	Refrig.centrifuge HERMLE TYPE ZK-510 1.5ltGer. swing-out rotor, 4-place, W/O wind shield	1	14'690	JUL91	PO 15-1-00654
it 2	Ultrafiltr.app.5-10lt/hDen DDS MINI-LAB 10 system complete with heat exchanger(option F1)	1	8'925	AUG91	
it 3	Spectrophot.UV/VIS PHILIPS PUS625/00 complete S/NO.GE 414965 Engl	1	15'960	AUG91	
it.4	pHmeter AUTOCAL PHM83 complete GK2401C Den.	1	3'386	JUL91	
it.5	Analyt.balance METTLER AE200-S EL. Switz.	1	2'926	JUN91	PO 15-1-00403
it.6	Basic TLC kit, incl. UV cabinet II,220vSwitz.	1	2'467	JUN91	PO 15.1.0396P
	CAMAG TLC package plate coating,manual		1'062	APR92	
it.7	UV lamp Switz.	1	*		incl in it.6
it.8	Rotavapor ROT-M-STD 220-240 &HB-140 250mlSwitz.	1	1'541	APR91	
it.9	Multidosimat titrating stand with 649 magnetic stirrer, with microprocessor control, digital read-out, autom. stopcock, Switz.	1	2'702	JUN91	
it10	Karl Fischer titrator CPL Den.	1	6'030	NOV91	PO 15-1-1148P
it11	Soxhlet extr.app. Ger.	1	*		incl in it.1
it13	Glass vessels	1	*		incl in it.10
it14	Buchner funnels	1	*		incl in it.10
it15	Microscope, oven, furnace, CAMAG UV lamps	1	7'433	OCT92	
	Glasswares, various lab. equipment,		4'529	NOV92	
it16	Chemicals	1	8'825	DEC92	
		1	1'565	AUG92	
		1	1'163	OCT92	
it17	Reference samples (free of charge)	1	0.00	APR92	
it18	Bi-distillierapparat Typ 2104	1	10'817	MAR94	

Based on : 1. Project Document
2. Project Equipment Reception Reports
3. UNIDO Non-expendable Property Control Report DEC93
4. Local Purchase Authorization (BASON sub-contract)
5. DICI Equipment Inspection Report

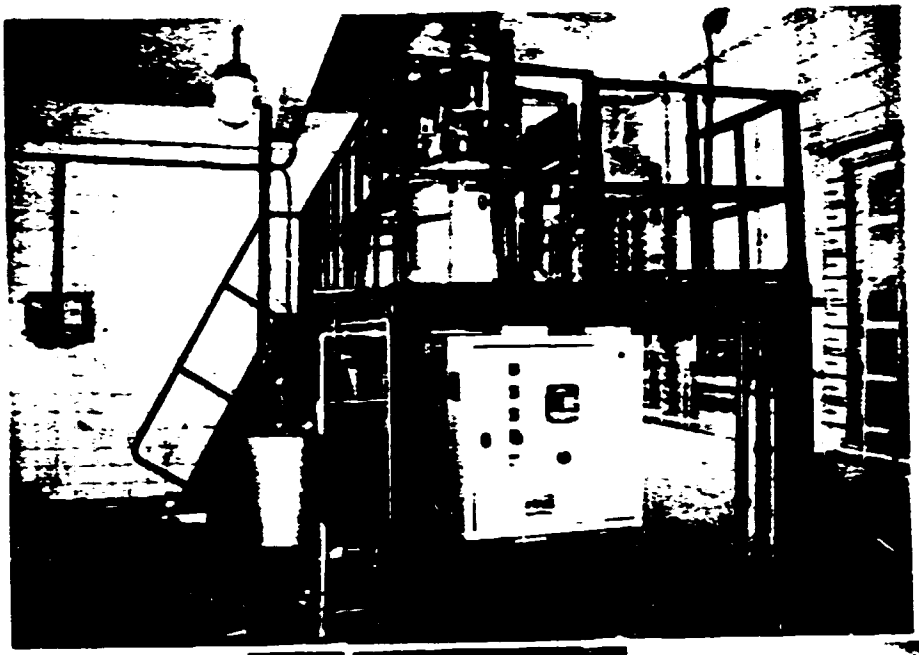
● *SPRAY - DRYER*

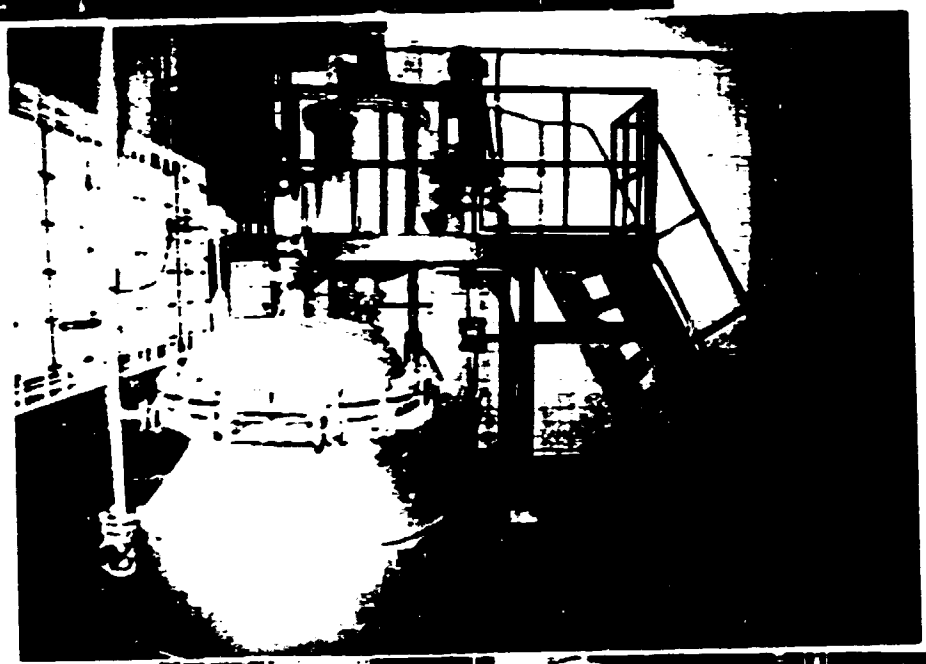


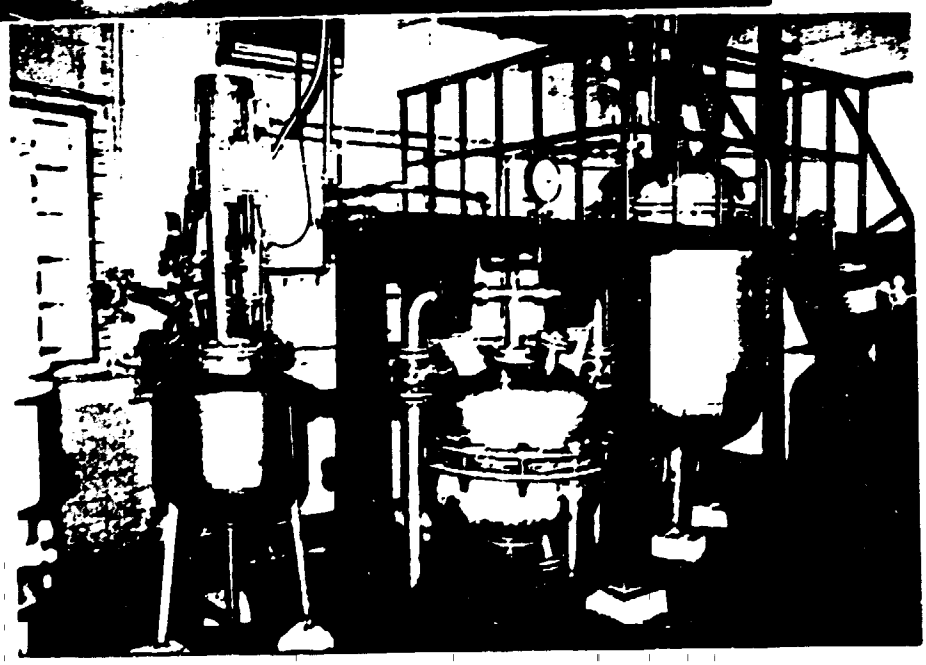
● *RECTIFICATION COLUMN*



• *TRYPSIN AND PANCREATIN PRODUCTION*







DP/VIE/86/016

P.E.R.T. PLANNING

Final Schedule — Schedule to date: 04-Apr-94
Week 1 = 21-Dec-92 — Last schedule (H): 06-Sep-93

Scope of works	Duration	Starting Date	Complet. Date	Delay	Advance
STAGE I					
DESIGN	**8**	**21-Dec-92**	**15-Feb-93**		
Engineering flowsheet by DICI	5	21-Dec-92	25-Jan-93		
Equipment drawing review	3	21-Dec-92	11-Jan-93		
Equip.drawing finalization	2	11-Jan-93	25-Jan-93		
Detailed layout, piping drawings	8	21-Dec-92	15-Feb-93		
Electrical layout	6	04-Jan-93	15-Feb-93		
Design of equipment foundations and ceiling reinforcement by CEDI	3	*22-Feb-93*	29-Mar-93	*2*	
STAGE II					
ENGINEERING	***9***	**15-Feb-93**	***13-Dec-93***	***34***	
A. CIVIL ENG. WORKS					
A *corridors walls*	3	31-May-93	*05-Jul-93*	*2*	
A found roof	1	28-Jun-93	05-Jul-93		
A found.aceton store,room 3-4,1-2	1	05-Apr-93	12-Apr-93		
A *found.room 5-6*	2	21-Jun-93	19-Jul-93	*2*	
A holes drill.roof	1	28-Jun-93	05-Jul-93		
A holes drill.rooms 8,9,11,12,14	1	05-Apr-93	12-Apr-93		
A room to room	1	21-Jun-93	28-Jun-93		
A *.Sewage ditch*	2	21-Jun-93	02-Aug-93	*4*	
A *.Steel constructions*	2	*05-Apr-93*	03-May-93	*2*	
A .Steel doors construction	2	05-Apr-93	19-Apr-93		
A *.Steel doors installation*	2	*21-Jun-93*	13-Sep-93	*10*	
A *.Tiling*	2	*27-Sep-93*	08-Nov-93	*4*	
A *. Final replastering*	2	08-Nov-93	*20-Dec-93*	*4*	
A *. Paving*	5	08-Nov-93	*27-Dec-93*	*2*	
A . Painting,	2	27-Dec-93	24-Jan-94	*2*	
A. Reconstruction of toilets	3	27-Dec-93	17-Jan-94		
B. AFFILIATED ACTIVITIES					

Scope of works	Duration	Starting Date	Complet. Date	Delay	Advance
B. AFFILIATED ACTIVITIES LABORATORIES					
B premises QClab by UNIPHA	4	23-Nov-92	21-Dec-92		
B premises biochemlab by Prof.VIET	2	21-Jun-93	05-Jul-93		
B electr.wirings biochemlab by VIET	2	05-Jul-93	19-Jul-93		
B electr.wirings QClab by UNIPHA	2	07-Jun-93	21-Jun-93		
B equipment install. biochemlabVIET	1	12-Jul-93	19-Jul-93		
B equipment install. QClabVIET	3	21-Jun-93	12-Jul-93		
B tap water biochemlab VIET	2	21-Jun-93	05-Jul-93		
B tap water QClab UNIPHA	2	19-Jul-93	02-Aug-93		
RELATED PRODUCTION by UNIPHA					
B .Formulation Unit (premises,instal)	6	15-Mar-93	26-Apr-93		
B .Formulation Unit (run. in)	24	26-Apr-93	11-Oct-93		
FACILITIES/UTILITIES					
B .Transfomer station	2	15-Feb-93	01-Mar-93		
B .Water supply (temporary)	*3*	26-Jul-93	02-Aug-93		*2*
B .Water supply new system	*4*	08-Nov-93	13-Dec-93	*1*	
C. EQUIP.CONSTR., ERECTION by BASON					
C 02.2,02.4,06.4,06.6 equip.BS	*1*	12-Apr-93	03-May-93	*2*	
C 09.3,09.4 equip.	1	05-Jul-93	12-Jul-93		
C chymotrypsin product. equip.	*2*	28-Jun-93	19-Jul-93	*1*	
C dry bile production equip.	*1*	28-Jun-93	19-Jul-93	2	
C Pancreatin production equip.	2	28-Jun-93	26-Jul-93	2	
C steam boiler,cooling room	1	07-Jun-93	14-Jun-93		
C watercooling unit	2	19-Jul-93	02-Aug-93		
C electr. generator					
D. IMPORTED EQUIPMENT INSTALLATION by DICI					
D air compressor	1	07-Jun-93	14-Jun-93		
D aircond.boiler	2	14-Jun-93	28-Jun-93		
D airducts	3	05-Jul-93	26-Jul-93		
D centrifuge	2	05-Jul-93	12-Jul-93		*1*
D demin.water	*3*	30-Aug-93	06-Sep-93		*2*
D dist. water	1	05-Jul-93	12-Jul-93		

Scope of works	Duration	Starting Date	Complet. Date	Delay	Advance
D freezer	1	19-Jul-93	26-Jul-93		
D hydraulic platform	1	19-Jul-93	26-Jul-93		
D meat grinder	1	19-Jul-93	26-Jul-93		
D pressfilter	1	07-Jun-93	14-Jun-93		
D pumps	1	31-May-93	07-Jun-93		
D rectif. column	*7*	05-Jul-93	09-Aug-93		*2*
D rotary evaporator	*1*	05-Jul-93	19-Jul-93	*1*	
D spray drier	1	28-Jun-93	05-Jul-93		
D vacuum-pump	1	07-Jun-93	14-Jun-93		
E. ELECTRICAL SYSTEM by BASOI					
E driving power mainlines	4	24-May-93	21-Jun-93		
E lighting system	4	24-May-93	21-Jun-93		
E outdoor main cabling	1	24-May-93	31-May-93		
E switchboard	*1*	07-Jun-93	19-Jul-93	*5*	
G. PIPINGS SYSTEM by BASON					
G .Outdoor main pipings	2	*12-Apr-93*	03-May-93	*1*	
G .Indoor main pipings	4	03-May-93	31-May-93		
G 02.2,02.4,06.4,06.6 pipes	1	*03-May-93*	24-May-93	2	
G 09.3,09.4 pipes	1	28-Jun-93	05-Jul-93		
G chymotrypsin production pipes	2	19-Jul-93	02-Aug-93		
G dry bile production pipes	1	19-Jul-93	26-Jul-93		
G Pancreatin production pipes	2	26-Jul-93	09-Aug-93		
G steam generator pipes	1	21-Jun-93	28-Jun-93		
G water cooling unit pipes	1	02-Aug-93	09-Aug-93		
G.Pressure test, insulation pipes	*3*	09-Aug-93	27-Sep-93	*4*	
H. PROCESS CONTROL SYSTEM by DICI	*7*	25-Oct-93	13-Dec-93		
I. INSPECTION, COMMISSIONING					
I. Inspection of individual equipment and systems	*5*	*10-May-93*	02-Aug-93	*7*	
I. Final commissioning of production lines and facilities	*1*	*15-Nov-93*	10-Jan-94	*7*	

Scope of works	Duration	Starting Date	Complet. Date	Delay	Advance
STAGE III RUNNING IN	**48**	***02-Aug-93***	**04-Apr-94**		***13***
A. Labscale process elaboration	16	*19-Jul-93*	22-Nov-93	*2*	
B.Cleaning	2	*22-Nov-93*	06-Dec-93		
C.Test run with load of equip. for					
+ Chymotrypsin. trypsin (1)	3	06-Dec-93	03-Jan-94	*1*	
+ Dry bile (1)	2	06-Dec-93	24-Jan-94	*5*	
+ Pancreatin (1)	1	14-Feb-94	21-Feb-94		
D.Trial batches of					
+ Chymotrypsin (2)	1	10-Jan-94	17-Jan-94		
+ Chymotrypsin (3)	1	14-Mar-94	21-Mar-94		
+ Dry bile (2)	1	24-Jan-94	31-Jan-94		
+ Dry bile (3)	2	14-Mar-94	28-Mar-94		
+ Pancreatin (2)	1	14-Mar-94	21-Mar-94		
+ Pancreatin (3)	1	*28-Mar-94*	04-Apr-94		
E.Experimental Production					
Prepared by the NPC: Prof. Hoang An		**Ref.:**	PERT_FIN.WB2		

INSTRUCTIONS

Scope of works	*italics:* works affected by delay or advance
Duration (in weeks)	based on contracts (Stage I,Stage II) or initial project document (stage III)
Starting date	planned starting date
Completion date	real completion date
Delay/Advance (in weeks)	delay or advance due to: + planned duration affected by additional or cancelled works + planned starting date affected by delay or advance in prior operations + real completion date depending from other related operations *(printed italics in each specific case)*

ANNEXE 6

TECHNICAL CO-OPERATION PERSONNEL

Nationally recruited professional project personnel

Post No	Post title	Name,sex and nationality of incumbent	Entry on duty (date) Sched.	Actual	Departure (date) Sched.	Actual
17-00	Techn. Adviser	Prof.Nguyễn đinh Huyên, male, VN	21.07.93	21.07.93	22.12.93	22.12.93

Internationally recruited professional project personnel

11-01	Chief Techn. Adviser	Prof.Oleg Scedrov male, Yugosl.	1.08.90	1.08.90	1.08.93	JAN94
11-02	Plant Eng.	Jan Fryda,male, Csech.	1.10.90	1.10.90	NOV91	NOV91
21-02	Process Eng. Revision	Ulf Strenger, male, Sweden	8.07.92	8.07.92	23.07.92	JUL92
11-02B	Plant Eng.	Ulf Strenger, male, Sweden	6.05.93	6.05.93	9.07.93	9.07.93
11-03	Q.C. Expert	B.Pavelic	1.06.93	10.11.93	10.12.93	10.12.93
11-50	Industrial Pharmacist		(cancelled 28.05.93)			

ANNEXE 7

GOVERNMENT PROJECT PERSONNEL

Post No	Post title	Name and sex of incumbent	Full or part time	Entry on duty (date) Sched.	Entry on duty (date) Actual	Departure (date)
01	National Project Director	Trần Tựu (male)	Full time		1.08.90	
02	Project Coordinator	Hoàng Ân (male)	Full time		16.11.91	16.01.94
03	National Technical Adv.	Hoàng Phúc Tuấn (male)	Full time		1.08.90	
04	Veterinary Adviser	Lê Minh Chí (male)	Part time		1.08.90	
05	Assistant of the NPD for equipm.reception	Trương Quốc Hoa (female)	Part time		28.04.91	28.04.93
06	Project Secretary Assistant Chief of the Unit	Lê thị Liên (female)	Full time		1.08.90	
07	Professional staff of Prod.	Phạm văn Đào (male)	Full time		13.11.90	
		Nguyễn thị LanHương (female)	Full time		13.11.90	
08	Quality Control (professional staff)	Phạm Cao Thanh (male)	Full time		13.11.90	
		Lưu Thanh Thủy (female)	Full time		13.11.90	
09	Maintenance Engineer (nam)	Bùi xuân Tùng (male)	Full time		13.11.90	13.04.93
		Lê văn Thu	Full time		20.04.94	

10	Chief of animal Organs Collect.	Đinh xuân Hương (female)	Full time	13.11.90	13.04.93
		Dương Phương Dung (female)	Full time	.93	
11	Interpreter	Trần ngọc Ẩn (male)	Full time	01.08.90	
12	Chief of Bio Unit	Nguyễn Quang Thiệu (male)	Full time	20.07.92	
13	Assistant Chief of QC/QA	Nguyễn Công Lân (male)	Full time	10.05.93	
14	Assistant Chief of Pharma Unit	(not included in project personnel)			

ANNEXE 8

REPORTS

Title of report, paper etc.	Remarks
Mission Report of CTA, 26.9.90, 29.12.91 and 6.5.91 (1stmission report)	English, acc.to workplan, final vers. UNIDO Vienna, UNDP Hanoi, NPD.
Mission Report of CTA, 27.9.91 and 29.12.91(2nd mission report)	English, acc.to workplan, final vers. UNIDO Vienna, UNDP Hanoi, NPD.
Mission Report of CTA, 21.10.93 (3rd mission report)	English, acc.to workplan, final vers. UNIDO Vienna, UNDP Hanoi, NPD.
Technical Report of PtE, JAN91 and MAR91 (1st mission report)	English, acc.to workplan, final vers. UNIDO Vienna, UNDP Hanoi, NPD.
Technical Report of PtE, 27.6.91 (2nd mission report)	English, acc.to workplan, final vers. UNIDO Vienna, UNDP Hanoi, NPD.
Technical Report of PtE, 20.11.91 (third mission report)	English, acc.to workplan, final vers. UNIDO Vienna, UNDP Hanoi, NPD.
Document prepared by the PtE, on 04.06.92	English, working paper unsched. in workplan,UNIDO Vienna,UNDP Hano NPD
Project Coordinator Report (15.11.91 - 15.2.92)	English, working paper unsched. in workplan, UNIDO Vienna, UNDP Hanoi
PPER, 20.3.92	English, acc.to workplan, final vers. Government,UNDP Hanoi, UNIDO Vienna
Summary of Report on Project Performance, 21.7.92	English, acc.to workplan, final vers. Government,UNDP Hanoi, UNIDO Vienna, Tripartite Review Meeting 21.07.92
Summary of Tripartite Review Report, 18.08.92	English, acc.to workplan, final vers. Government,UNDP Hanoi, UNIDO Vienna, NPD

Second Opinion and Recommendations on VIE/86/016. 24.08.92	English, acc.to workplan, final vers. Government,UNDP Hanoi, UNIDO Vienna, NPD
PPER, 15.4.93	English, acc.to workplan, final vers. Government,UNDP Hanoi, UNIDO Vienna
Terminal Report 13.12.93	English, acc.to workplan, presented by the NPD at the Closing Tripartite Review Meeting 13.12.93
Terminal Report (final revised version) 30.07.94	English, acc.to workplan, final vers. Government,UNDP Hanoi, UNIDO Vienna, NPD

-1)

1. COOL WATER 5°C
2. STEAM
3. WATER
4. ACETONE
5. VACUUM
6. WARM WATER

+11500

MATERIAL

+7600

+4000

Z.NITƠ

±0.000

LIFT

PANCREAS

8. CONDENSATE COLLECTION
9. COOLING WATER CIRCULATION
10. ACETONE FOR RECUPERATION
7. SEWAGE

Q1.1 MÁY XAY
Grind . Mach.
. Năng suất . 100 Kg/h
. Động cơ 1.5 KW

Q1.2 THÙNG KHUẤY
vessel With stirrer
Dung tích : 200 L
φ 600 x H 700
. Động cơ : 3,5 KW

Q1.3 MÁY LỌC
Sieve
φ 1200 x 11500
13 : 5 mm

Q1.4 THÙNG KHUẤY
Vessel With stirrer
. Dung tích 400 l
φ 800 x 1170
Động cơ : 3,5 KW

Q1.5 MÁY LỌC ÉP
Press Filter
φ 630

Q1.6 THÙNG KHUẤY
Pressure vessel With stirrer
. Dung tích 50 L
φ 320 x 1150
. Động cơ : 2.5 KW

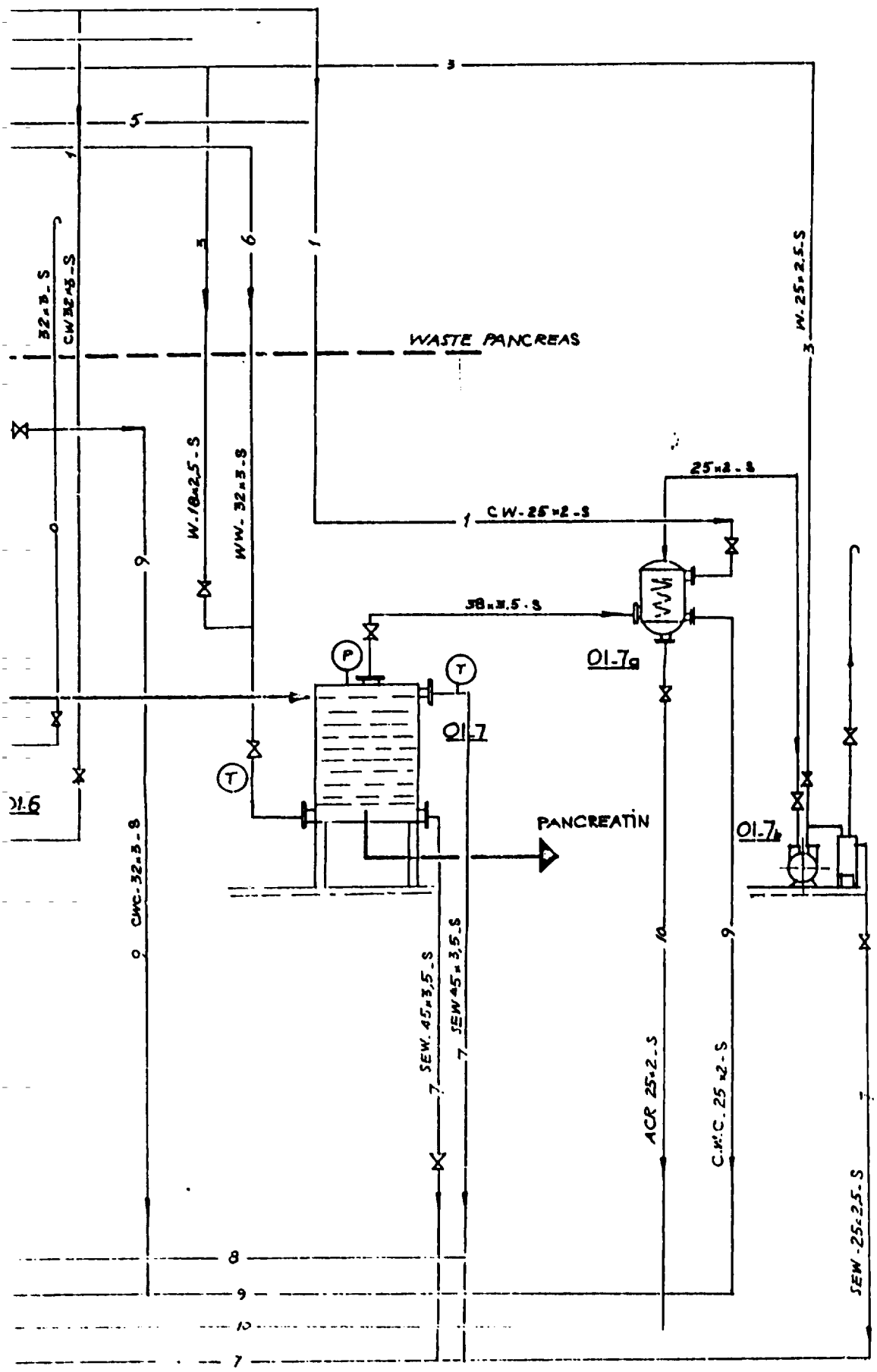
Q1.7 BUỒNG SẤY KHAY
Tray Drier
. Capacity : 8.10 Kg/h

Q1.7a NGƯNG TỤ
Condensator

Q1.7b BƠM CHÂN KHÔNG
Vacuum pump

Q1.9 THÙNG CÓ ÁO
Vessel With jacket
. Dung tích : 100 L
. φ 500 . H 500

2)



1. CW.	COOLING WATER 5°C	(Blue block)
2. ST.	STEAM	(Red)
3. W.	WATER . 25°C	(Blue)
4. AC.	ACETONE	(White)
5. V.	VACUUM	(Brown)
6. W.W.	WARM WATER	(ORange)
7. SEW.	SEWAGE	
8. CC.	CONDENSATE COLLECTION	(Rose)
9. C.W.C.	COOLING WATER CIRCULATION	(Green)
10. ACR.	ACETONE FOR RECUPERATION.	
11. DCR.	DRY COMPRESSED AIR	(Yellowish)

VALVE

CONDENSATED VALVE

FLOW METER

PI — PRESSURE INDICATER

TIC / 01 — TEMPERATURE INDICATE CONTROL (Position number)

1 — 37 - 45×3,5 - S

1. Flow number.
37. Flow name.
45×3,5 outside diameter × thickness
S. Material.

ISOLATE

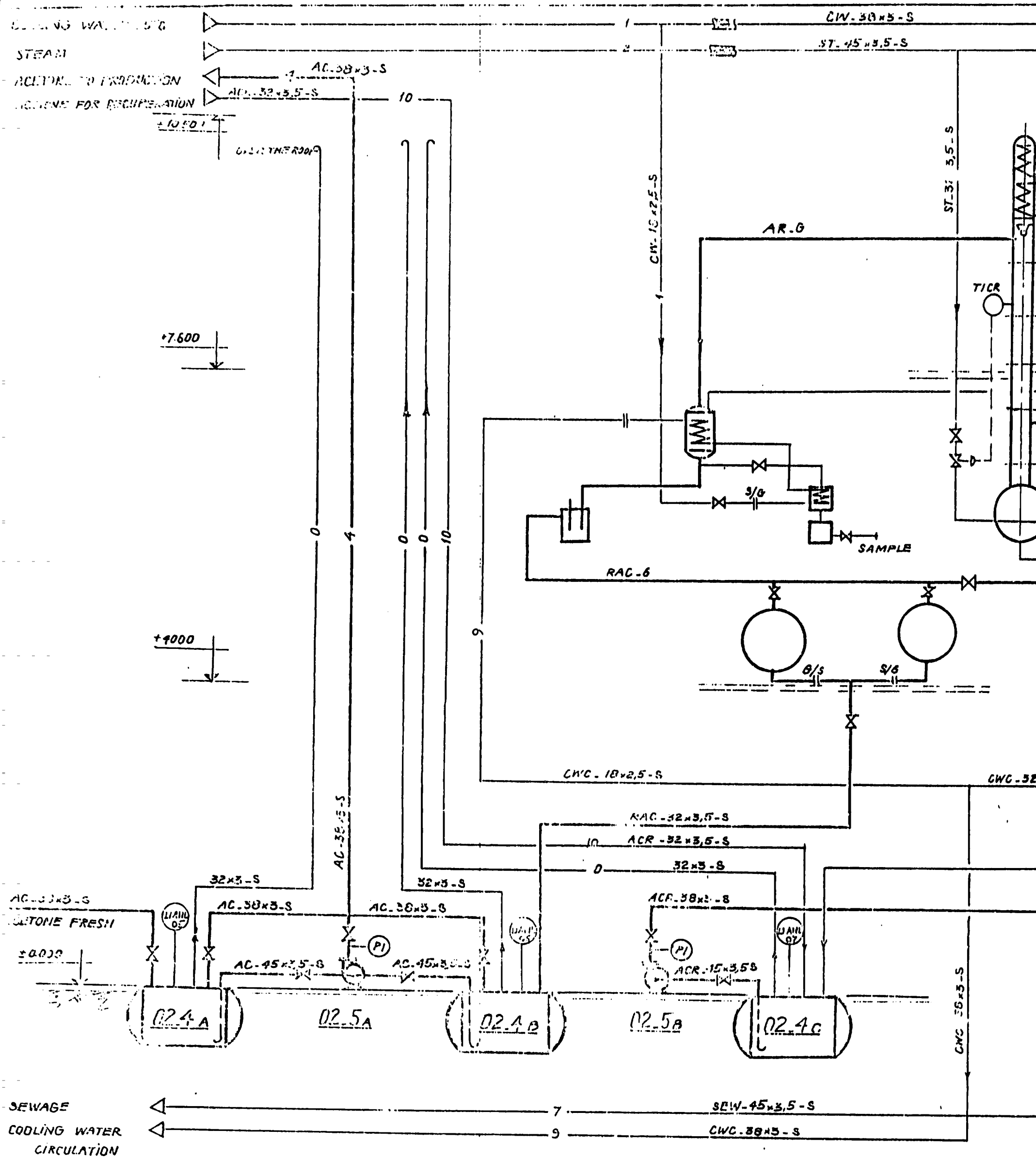
HÀN THÔNG

O BAO HỘ

01.11 T.B TRAO ĐỔI NHIỆT
Heat Exchanger
. F = 9 m²
. ϕ 400 × L 1650

01.12 THÙNG KHUẤY
Vessel with stirrer
. Dung tích 50 L
. ϕ 400 . H 450
. Động cơ 1,5 KW

U.I.P.I	MINISTRY OF HEAVY INDUSTRY DESIGN INSTITUTE OF CHEMICAL IND		UNIPHA PROJECT. DP/VIE/86/016	
C.N.D.A	Đỗ duy Phi		FLOW SHEET OF PANCREATIN PRODUCTION	
Thẩm tra	Đào kim Ngọc		10.1.95	FS-01



02-1. RECTIFYING COLUMN

- Capacity : 50 lt/h.
- Φ - 150 mm - L - 5000 mm.

02-2. VESSEL

- Capacity : 100 Lt
- Φ500 x L900 mm.

02.4 VESSEL

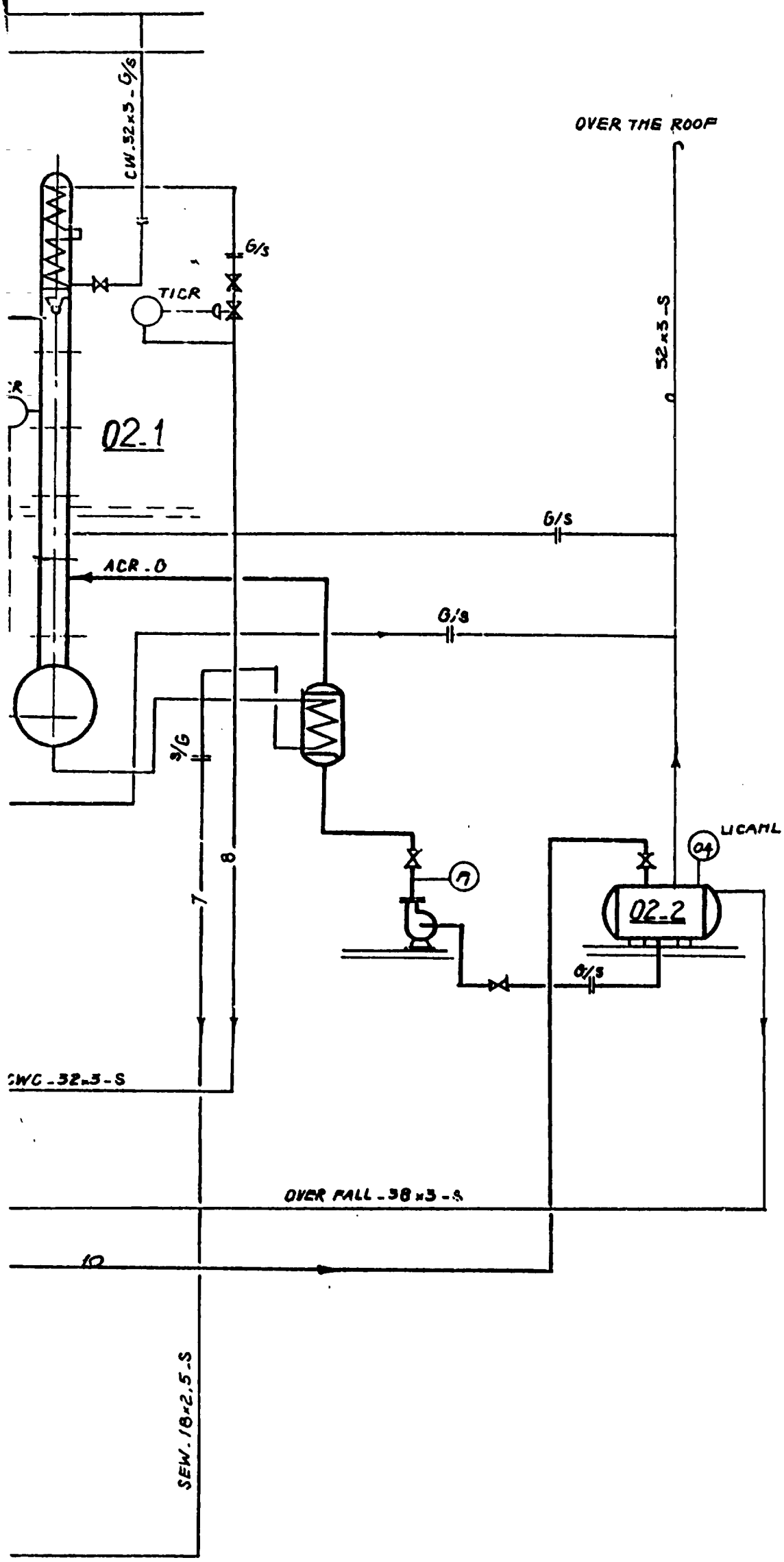
- Capacity : 1000 Lt
- Φ 1000 mm. L 1750 mm.

02.5 CENTRIFUGAL PUMP

- Capacity : 3 m³/h.
- H - 0.45 MPa.
- Electric motor : 2 KW
  1450 rpm.

TYPE AKHQ - 3102 ON13420

1)



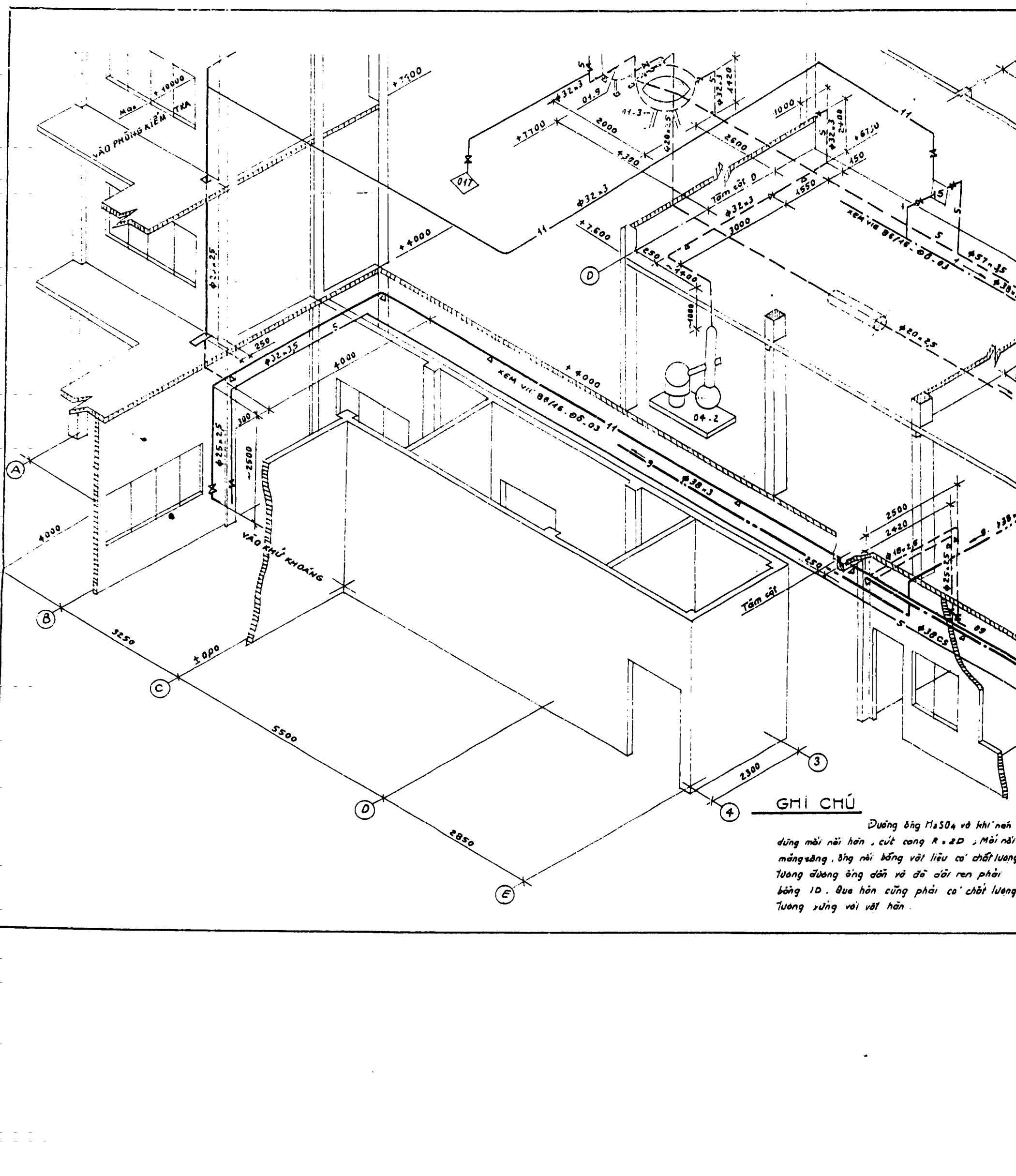
TICR — TEMPERATURE CONTROL

LIAHL / 4 — LEVEL CONTROL, Position Number

G/S — collar GLASS / STEEL

D.I.C.I	MINISTRY OF HEAVY INDUSTRY DESIGN INSTITUTE OF CHEMICAL IND		U N I P H A PROJECT _ DP/VIE/86/016
C.N.Đ.A	Đỗ duy Phi		FLOW SHEET OF ACETONE REGENERATION, AC STORAGE
Thẩm kế	Đặn Kim Ngọc		10 / 93 — FS 02

1)



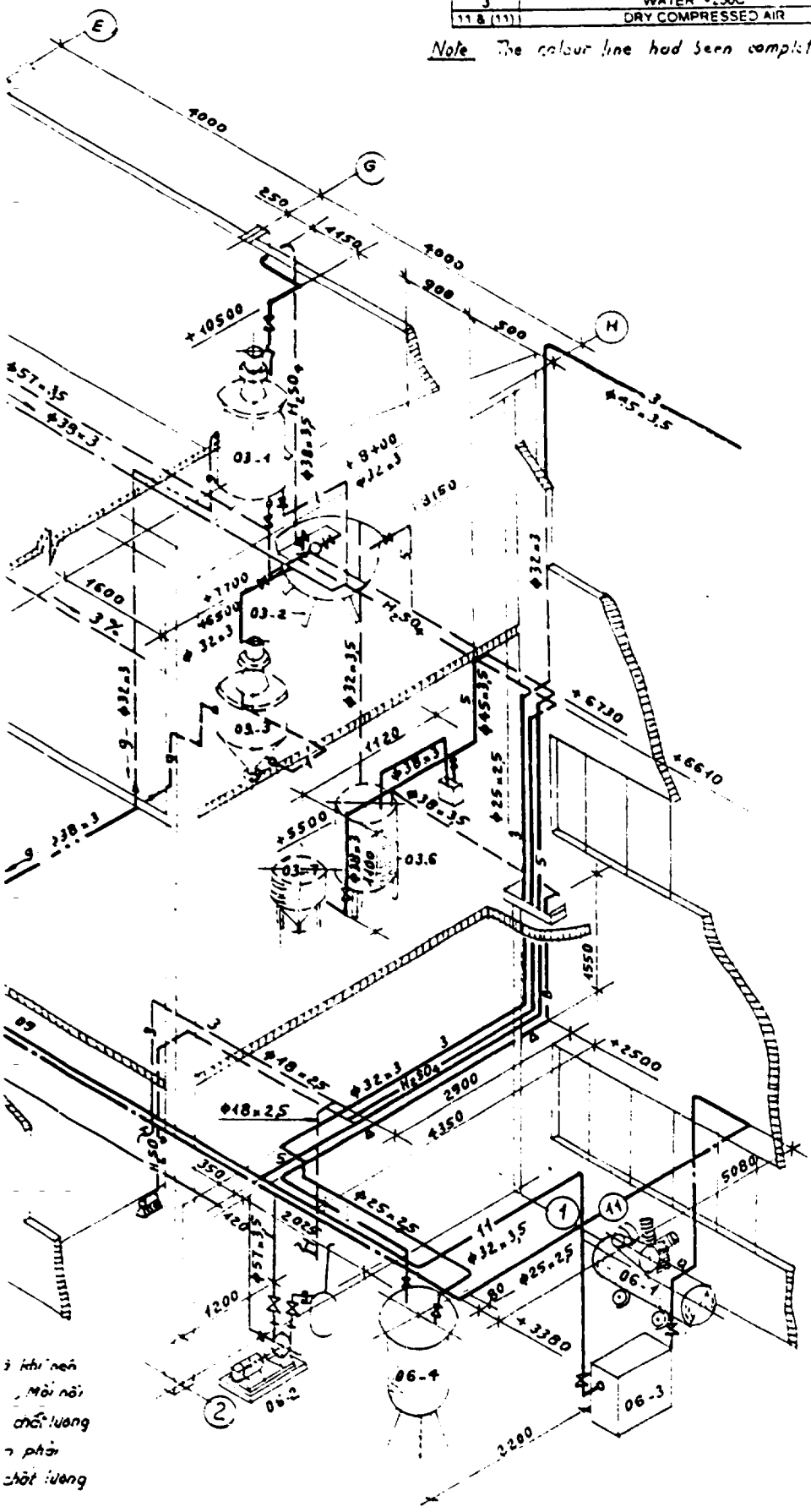
GHI CHÚ

Đường ống H_2SO_4 và khí nén dùng mối nối hàn, cút cong R = 2D, Mối nối mặng sông, ống nối bằng vật liệu có chất lượng tương đương ống dẫn và đã cắt ren phải bằng 1D. Que hàn cũng phải có chất lượng tương xứng với vật hàn.

2)

3	CONDENSATE COLLECTION	CC
5	VACUUM	V
3	WATER +250C	W
11 & (11)	DRY COMPRESSED AIR	DCR

Note The colour line had been completed during installation



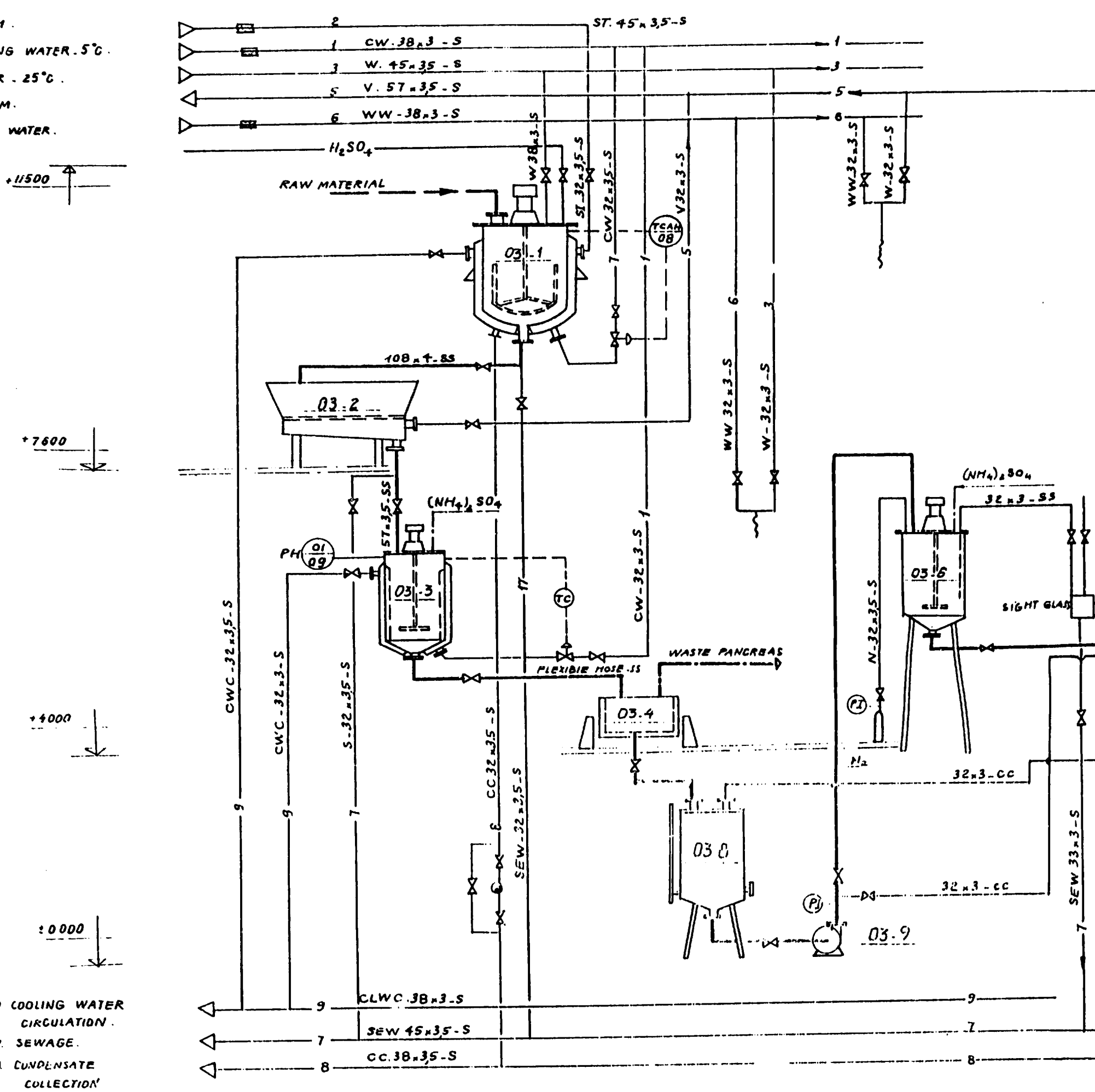
	a	Đệm cao su Amiăng ổ 3	Po nhiệt	m^2	2	
	d	Bu lông, đai ốc, vòng đệm	M8.M10	bộ	40,60,60,12	Thép CT.6
	c	Bu lông vòng kẹp ống Φ57	Φ45, Φ32, Φ25, Φ20	bộ	5,2,4,12,10	
	b	Giá đỡ bơm tường	1 ống	Cái	10	ĐỒ.05
	a	Giá đỡ ngang bơm tường	Dàn 4 ống	Cái	2	- nt -
7		Nhôm lá δ = 0,2 mm		m^2	8	
6		Dây amiăng □ 10×10	Sải bện	Kg	15	1 lớp dây
5		Cốc ngưng dy25 và dy15	Py6	Cái	1 + 1	Kèm 2 bích
4		Van chắn dy32, dy25, dy15	Py6	Cái	1 - 4 - 4	Kèm 2 bích nối
3		Ống ma kẽm Φ1¼" và Φ¾"	Φ32 và Φ20	m	6 và 18	
2		Tê 1½". 1¼" và ¾"	Tê côn gang rèn	Cái	1	
1		Ống thép ma kẽm Φ1½"	Φ38×3,5	m	12	
		8. ỐNG DẪN NƯỚC NGƯNG				
11		Ống thép ma kẽm Φ1¾"	Φ45×3,5	m	1,5	
10		Tê + côn 1¾" . 2 × 1¼"	Gang rèn	Cái	1	
9		Tê + côn 2¼" → 1 × 1¾"	Gang rèn	Cái	1	
8		Van chắn Dy50 . Dy25	Py = 5	Cái	1 x 6	Kèm 2 bích nối
7		Cút 90° . Gang rèn	Ống 1.¼"	Cái	10	
6		Tê . côn 2¼" — 2 . 1¼"	Gang rèn	Cái	2	
5		Chạc 4 Φ2¼" x Φ1¼"	Gang rèn	Cái	1	
4		Cút nối 90° . Gang rèn	Ống Φ2¼"	Cái	5	Mua
3		Ống nối ren . Gang rèn	Ống Φ2¼"	Cái	5	Mua
2		Ống thép ma kẽm Φ1¼"	Φ32×3	m	18	
1		Ống thép ma kẽm Φ2¼"	Φ57×3,5	m	27	
		5. ỐNG HÚT CHÂN KHÔNG				
4		Côn ngạnh tre hiện trên đầu ống	XIBHIOT	Cái	1	Xem ĐỒ.05
3		Ống nối Dy12 Dn = 24	XIBHIOT	Cái	5	ĐỒ.05
2		Van chắn thép không rỉ	Dy32 Py16	Cái	2+1	Kèm 2 bích
1		Ống thép không rỉ XIBHIOT	SAE.30321	m	20	Φ38×3
		ỐNG H_2SO_4 5 %				
6		Van dy20 Py6 ¢ Rôbinê	Dy12 . Py6	Cái	1 ¢ 2	Đồng vàng mạ Niken
5		Côn 1¼/1" ; 1"/¾" ¢ tê 1;1"/¾"		Cái	1+1 ¢ 1+1	
4		Cút 90°	1¼" ; 1" ; ¾"	Cái	3+5+4	
3		Ống ma kẽm Φ ¾"	Φ18×2,5	m	4,5	
2		Ống ma kẽm Φ 1"	Φ25×2,5	m	5	
1		Ống thép ma kẽm Φ1"¼	Φ32×3	m	15	
		3. ỐNG NƯỚC VÀO ĐỒ				
7		Côn ngạnh tre ống nối mềm	Dy20 ¢ 12	Cái	2 ¢ 2	Thép
6		Bích để ống dẫn và đối bơm	cặp	Cái	6 ¢ 6	ĐỒ.05
5		Que hàn điện ASTM	E6103	Kg	2	Tương đương?
4		Van chắn hoặc côn xoay	Dy12 Py6	Cái	1	
3		Van chắn hoặc côn Dy25%	Dy20 Py10	Cái	2 ¢ 6	
2		Ống thép liền Φ18×2,5	SAE 1010	m	6	
1		Ống thép Φ32 và ¢ Φ25×2	SAE 1010	m	34 ¢ 36	
		⑪ ¢ 11 - KHÍ NÉN THÔ ¢ KHÍ SẤY KHÔ				

Thứ tự	Ví tổ	Tên bộ phận	Quy cách	Đơn vị	Số lượng	Ghi chú
D.I.C.I		BỘ CÔNG NGHIỆP NẶNG VIỆN THIẾT KẾ CN HÓA CHẤT	PROJECT N DP/VIE/86/016 ANIMAL BY PRODUCTS . PILOT PLANT			
Viện trưởng		Nguyễn Khuê				
C. N Đồ án		Đỗ duy Phi				
Thẩm tra		Lê quang Minh	ỐNG KHÍ NÉN . NƯỚC . CHÂN KHÔNG NƯỚC NGƯNG % H_2SO_4			
Thiết kế		Ngọc ¢ Khiêm	Tỉ lệ 1:100			VIE 86/016 ĐỒ.0
Vẽ		Nguyễn Nam	2.1995	B.V.T.C		

UNIPHA
PROJECT DP/VIE/86/016
PIPINGS
COMPRESSED AIR, VACUUM,
WATER, CONDENSATE, H_2SO_4
Scale 1:100
2/1993 B V T C VIE/86/016 00 02A

1)

2. STEAM.
4. COOLING WATER. 5°C.
3. WATER. 25°C.
5. VACUUM.
6. WARM WATER.



03.1 VESSEL WITH STIRRER

Volume . 250 l .
Φ600 x H1000 .
Motor 3.5 KW.

03.2. SIEVE

Φ 1200 H 500
Plate sieve with 3mm Holes

03.3 VESSEL WITH STIRRER

Volume : 250 l .
Φ600 x H 1000 .
Motor : 3,5 KW .

03.4. CENTRIFUGE.

Motor : 3 KW.

03.5 VACUUM NUTCH

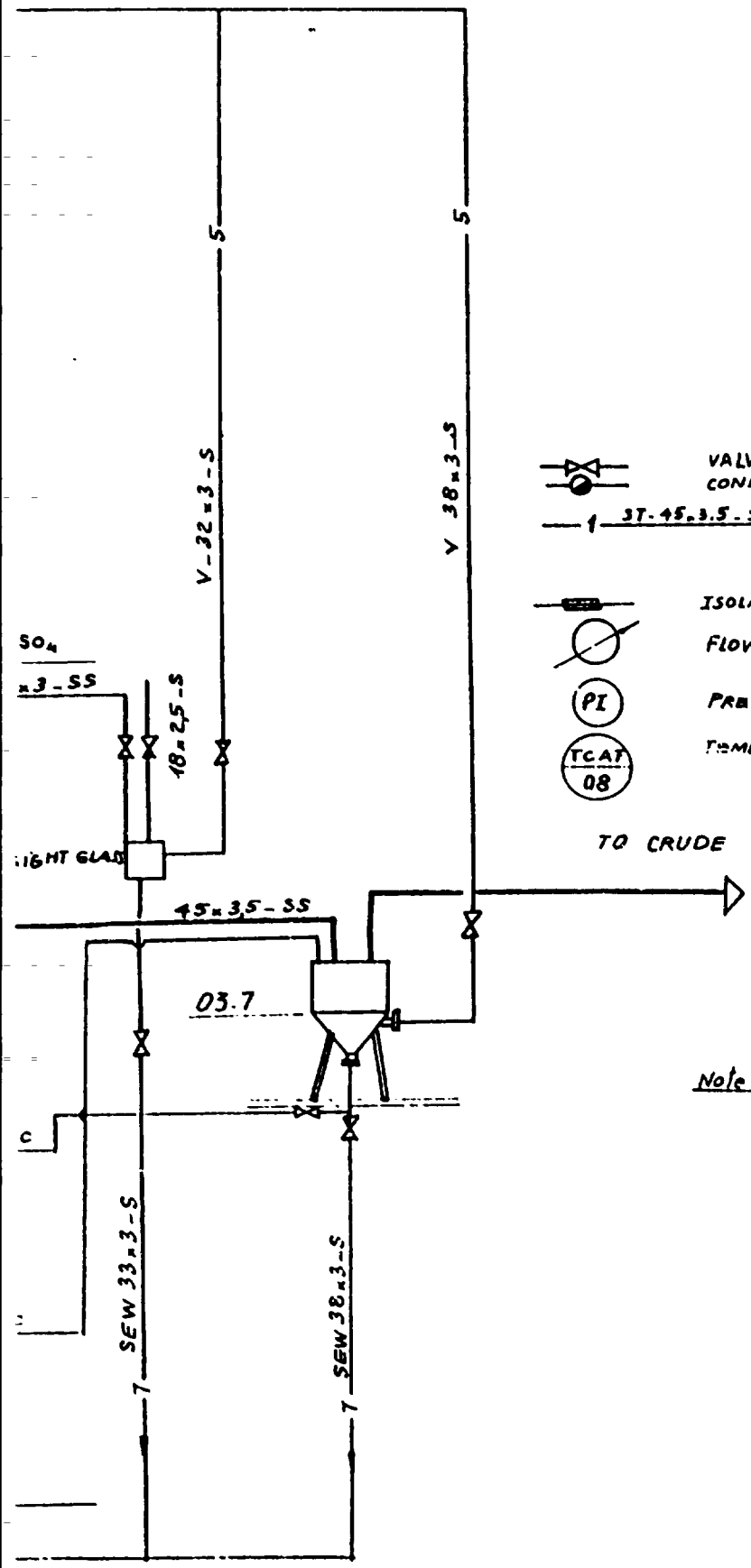
03.7 ... FILTER

Φ 600 x H 400

03.6 VESSEL WITH STIRRER

Volume 250 l
Φ 600 x H 700
Motor 3,5 KW

2)



1. CW	COOLING WATER 5°C	(Blue black)
2. ST	STEAM	(Red)
3. W	WATER . 25°C	(Blue)
4. AC	ACETONE	(White)
5. V	VACUUM	(Brown)
6. WW	WARM WATER	(Orange)
7. SEW	SEWAGE	
8. CC	CONDENSATE COLLECTION	(Rose)
9. CWC	COOLING WATER CIRCULATION	(Green)
10. ACR	ACETONE FOR RECUPERATION	
11. DCR	DRY COMPRESSED AIR	(Yellowish)

VALVE
CONDENSATED VALVE

1 ST-45×3,5-S

1. Flow number
ST. Flow name
45×3,5. out side diameter ×thickness
S. Material

ISOLATE

FLOW METER

PI — PRESSURE INDICATER

TCAT / 08 — TEMPERATURE CONTROL ALARM INDICATER
POSITION NUMBER

TO CRUDE PROENZYMES PURIFICATION

Note : The colour line had been completed during installation .

GH

03.8 VESSEL

Volume 400 L
φ 600 H 800

TIRRER
L

03.9 PUMP

capacity
Pressure
Motor 1,55 KW

H.I.C.I	MINISTRY OF HEAVY INDUSTR. DESIGN INSTITUTE OF CHEMICAL IND.		U.N.I.P.H.A PROJECT. DP/VIE/86/016	
			FLOW SHEET OF CHYMOTRYPSIN. TRYPSIN PRODUCTION	
Chủ nhiệm đồ	Đỗ duy Phi			
Thẩm kế	Đào kim Ngọc		10.1.93	FS .03

DISTILATER WATER

1. COOLING WATER 5°C — 1 — CW - 33x3

3 - WATER — 3 — W. 38x3 - S

5 - VACUUM. — 5 — V - 57x3.5 - S

6 - WARM WATER — 6 — WW - 38x3 - S

04-2

CW. 25x25_S 1

WW. 25x25_S

9 CWC. 32x3_S

3 W 25x2,5_S

FLEXIBLE HOSE

BILE

04-1

MS

04-3

Dy 15_SS

PI

Dy 15_SS

04_4

+4000

SEW - 32 x 2 - S

SEW - 32 x 3 - S

7 SEWAGE — 7 — SEW - 45 x 3,5 - S — 7

9. COOLING WATER CIRCULATION — 9 — CWC - 38x3 - S

DRYPRODUCT

Note : the colour line had been completed during installation

04_1 VESSEL

- Volume : 400 lt
- φ400 x H = 800

04_2 ROTARY EVAPORATOR

- Electricpower. = 5,5 KW.

04_3 VESSEL

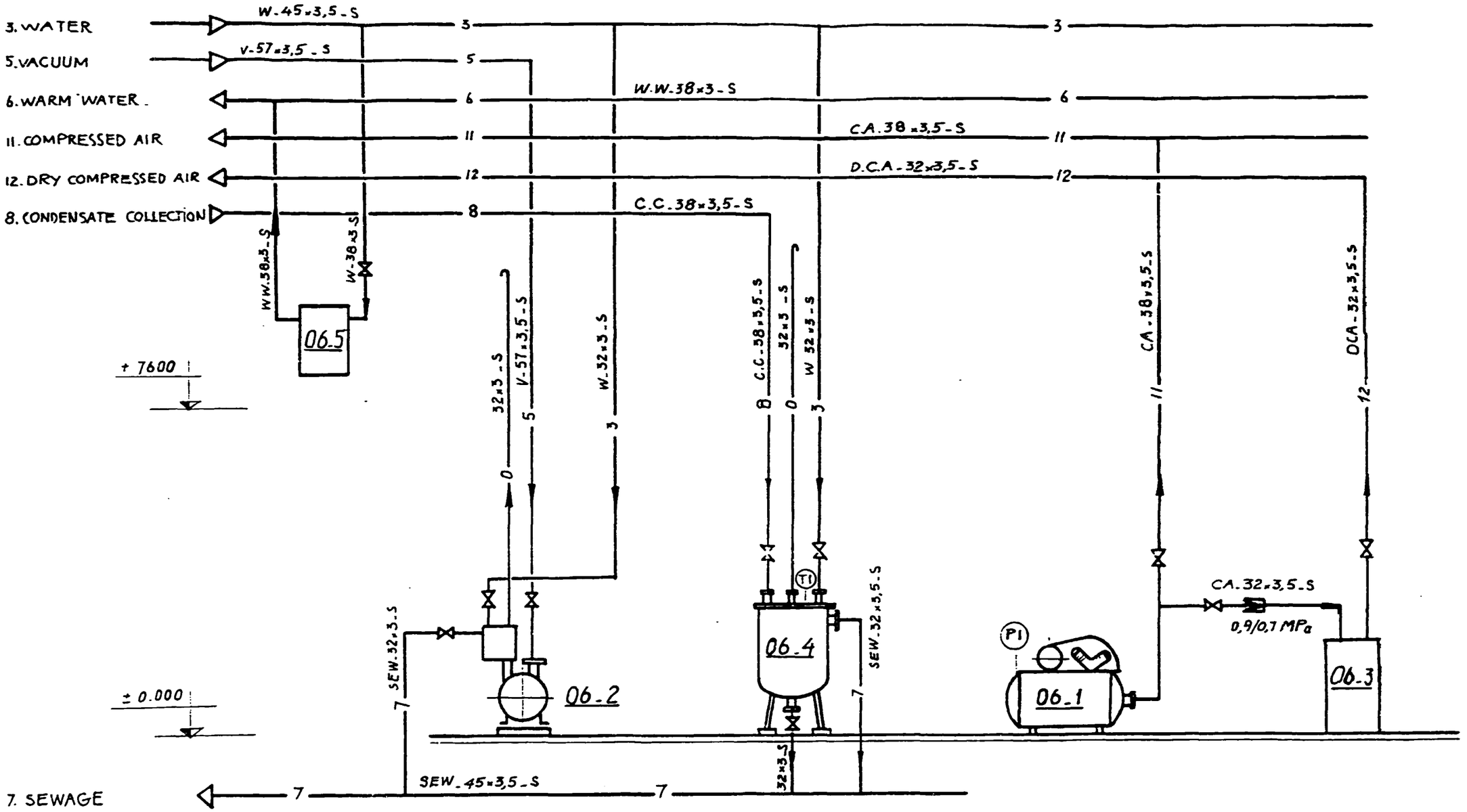
- Volume 20 lt
- φ250 x H = 400

04_4 SPRAY DRIER.

- Capacity 3.7 kg/h.
- Electricpower. 12 KW

04_5 HANDPUMP

D.I.C.I	MINISTRY OF HEAVY INDUSTRY. DESIGN INSTITUTE OF CHEMICAL IND.		U.N.I.P.M.A PROJECT. DP/VIE/86/016
			FLOWSHEET OF DRY BILE PRODUCTION
C.N.Đ.A	Đỗ duy Phi		
Thẩm kê'	Đào kim Ngọc	KT 1h	10-1-93 — FS - 04



06.1. PISTON COMPRESSOR

- Capacity :
- Pressure
- Motor

06.2. VACUUM PUMP

- Capacity : 120 ÷ 210 m^3/h
- Respiration pressure : 150-900 mbar
- Electric motor : 2kw - 1450 rpm

06.3. AIR DRYER

(For compressed air)

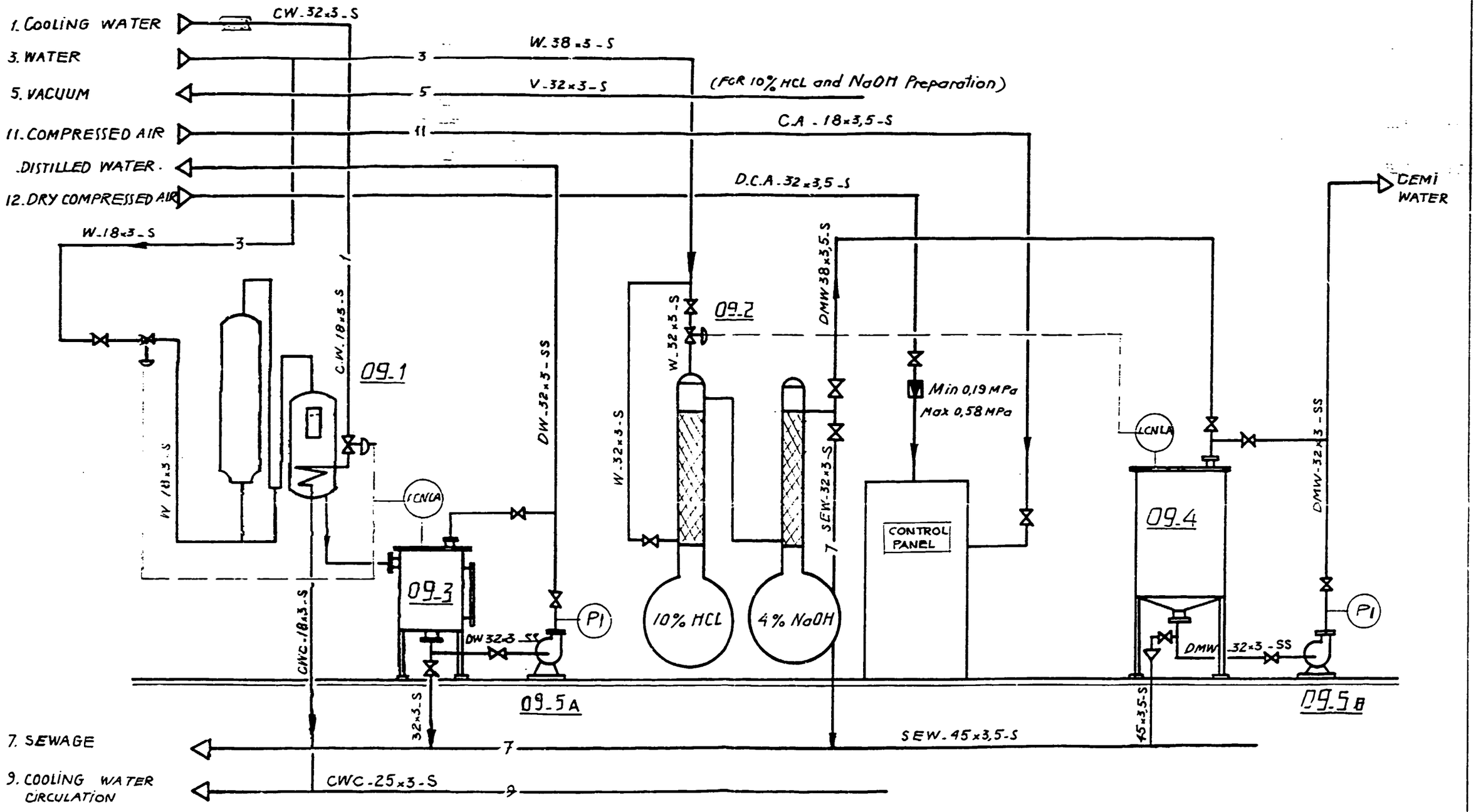
06.4. VESSEL

- Capacity 400 L
- ϕ800 H1000 mm

06.5. WATER BOILER

- Capacity : 300 L

D.I.C.I	MINISTRY OF HEAVY INDUSTRY DESIGN INSTITUTE OF CHEMICAL IND		U N I PHA PROJECT . DP/VIE/86/016
			CENTRAL COMPRESSEDAIR. VACUUM UNIT WARM WATER PRODUCTION. STEAM CON. COLLECTION
C.N.D.A	Đỗ duy Phi		
Thẩm kê	Đào kim Ngọc		10-1-93 — FS-06



09.1. DISTILLED WATER

09.2. WATER DEMI UNIT

- Capacity : 0.5 m^3/h

09.3. VESSEL

- Capacity : 250 L
- Ø650 - H750

09.4. VESSEL

- Capacity : 1000 L
- Ø 1000 - H1270

09.5 (A-B) CENTRIFUGAL PUMP

- Capacity : Q-2 m^3/h
- Pressure H-0.35 Mp
- Electric motor 1.1 KW 1450 r.p.m

D.I.C.I	MINISTRY OF HEAVY INDUSTRY DESIGN INSTITUTE OF CHEMICAL IND	UNIPHA PROJECT - DP/VIE/86/016	
		DISTILLATED WATER & DEMINERALIZED WATER PROD.	
C.N.Đ.A	Đỗ duy Phi		
Thẩm kế	Đào kim Ngọc	10.1.93	FS-09