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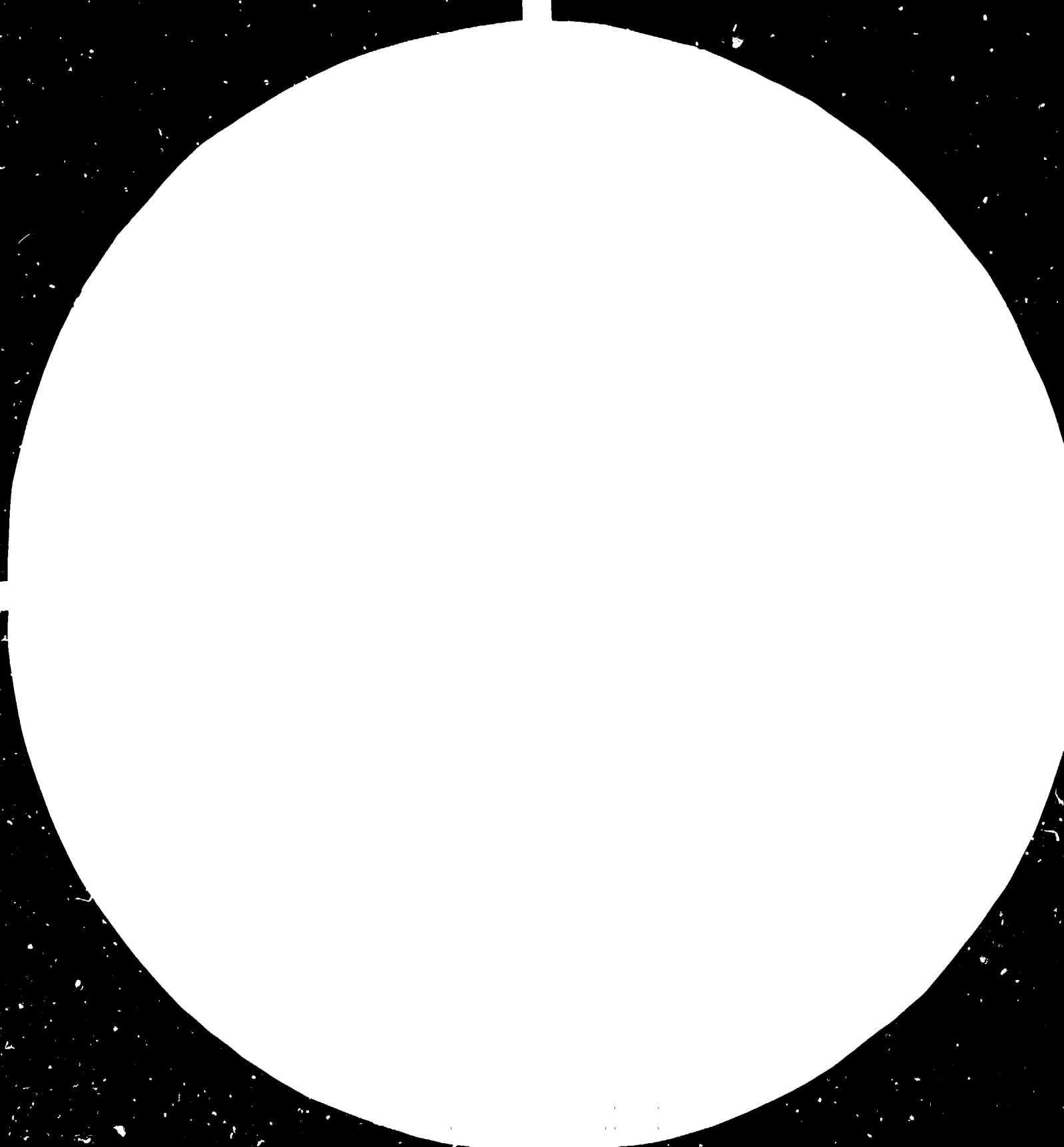

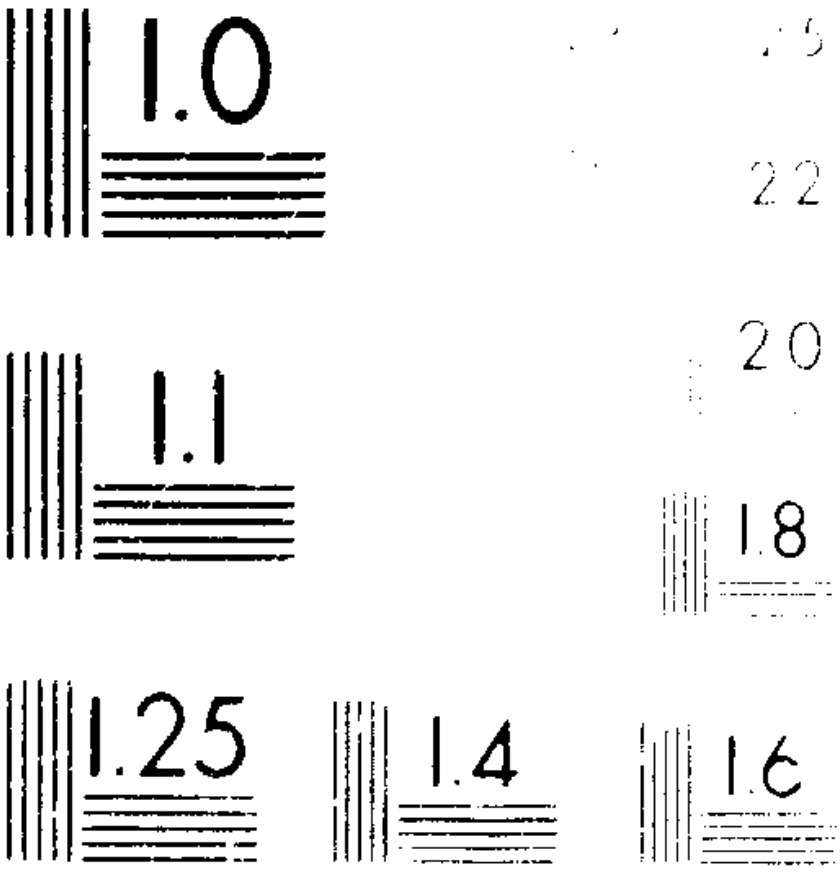
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Explanatory notes

G D S M Q	-	General Department for Standardization, Metrology and Quality Control in Hanoi, 70 Tran Hung Dao St., belonging to State Committee of Science and Technology
C. I	-	Centre I, Quality Control and Testing Centre in Hanoi, belonging to GDSMQ
C. III	-	Centre III, Standardization, Metrology, Quality Control and Testing Centre in Ho Chi Minh City (formerly called Institute for Standardization), belonging to GDSMQ
M T L	-	Metrology and Testing Laboratories at Bien Hoa, 25 km from Ho Chi Minh, laboratory centre + Workshop, belonging to C. III
P D	-	Project Document
N P D	-	National Project Director
C T A	-	Chief Technical Adviser, UNIDO Project Coordinator, Project Manager
VIE/76/013	-	UNDP/UNIDO Project " Institute for Standardization and Quality Control ", previous phase of the actual project, implemented at C. III
Q C	-	Quality Control

Abstract

National Network of Standardization, Metrology, Quality Testing and Calibration Services VIE/81/006/A/01/37. Institution building project, providing industrial development support services for Centre I in Hanoi and Centre III in Ho Chi Minh City (refer to Explanatory notes), belonging to General Department for Standardization, Metrology and Quality Control in Hanoi.

The Principal objective of the project was to provide quality testing, measurement and calibration services to industry by strengthening the existing laboratories and setting up new ones for GDSMQ in Centre I and Centre III. This should enable to meet the current and future needs of a wide range of industries in the southern and northern provinces, in practical implementation of an integrated and efficient national quality control system.

Duration : two years, extended to two and half years.

Conclusion : through the strengthening of physical and human potentials, both institutions have largely increased capability and competence, and are now, in a position to carry out their assigned functions as the strongest regional centres of a national network for standardization, quality testing, metrology and calibration services.

Recommendations: optimally utilize the established laboratory facilities, continue the coordinated training of personnel, organize and upgrade the maintenance and repair services, provide maximum support and transfer of knowledge and experience to industrial and provincial laboratories, intensify and enlarge the scope of testing and evaluation work for the extention of quality certification mark system on possibly greatest number of products, extend and accelerate the activities for formulation and revision of national standard documents, commence preparatory technical and legislative work for introduction of a national accreditation system for testing laboratories in compliance with international recommendations, proceed with the development of industrial and legal metrology, start the implementation of project for National Metrology Centre in Hanoi.

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ANNEXES

INTRODUCTION

Project Background

The country urgently needs to increase its export revenues to cover a larger part of the imported goods and services, required for reconstruction and development of a national economy. It also has the strong parallel objective of improving consumer protection by producing goods of higher quality for the people. To achieve these objectives, industrial production must be both efficient and able to meet quality demands for export markets, that impose increasingly stringent standards of acceptance.

The Government is well aware that the introduction of an accurate and correlated system of measurements, references and national standards is the basic precondition for development of the whole national economy and for progress in industrial efficiency, sciences, national and international trade and commerce.

Through the State Committe of Science and Technology and its agency the General Department for Standardization, Metrology and Quality Control (GDSMQ) the Government is making efforts to improve the situation in this field in the country, by promulgation and enforcing of relevant legal statutes, by introduction of a unified organizational structure of the state agencies, responsible departments and institutions, and by coordination of their activities in standardization, metrology, quality inspection and testing.

Proper development of the GDSMQ's services to industry has been hampered by a lack of reference standards, high precision measuring instruments, and properly equipped testing facilities for quality control and certification. The Government therefore asked for UNDP assistance in this field in 1977-81 Country Programme, to strengthen the GDSMQ Centre III in Ho Chi Minh City, where a high proportion of the country's light and consumer industry is concentrated. Under project DP/VIE/76/013 „The Institute for Standardization and Quality Control " , which was approved in November 1979, the laboratories for civil engineering materials testing, mechanical, food technology, light industrial products (textiles, rubber, paper, paints), chemical products testing, and metrology laboratories have been established or strengthened by the provision of equipment, the recruitment and initial training of staff, and the introduction of measurements and testing procedures.

These laboratories provide the technical support to the Quality Control Division of Centre III, which works directly with industry, collecting samples for testing, conveying the results to the factories and advising them on ways to improve the processes and products in order to meet the standard requirements.

While Centre III, serving the south, needed further assistance largely to consolidate the progress made so far, Centre I in Hanoi, serving the north, needed considerable development. It consisted of four laboratory divisions, two of them in existing large building in the outskirts of Hanoi, two in newly constructed annexes, a staff of 65 engineers, technicians and assistants, and a limited and incomplete

range of equipment. The Centre was thus not able to carry out testing work, but was restricted to quality inspections and evaluations on an advisory basis. The testing facilities in mechanical, electrical/electronics, chemical and light industrial sectors needed to be equipped, the staff needed extensive practical training, and modern testing techniques and quality control procedures need to be introduced and disseminated.

Official arrangements

The UNDP assistance was requested by the Government in 1981 to extend the previous project DP/VIE/76/013, that was accomplished successfully and produced satisfactory results. The second phase of that project, under title : " National Network, of Standardization, Metrology, Quality Testing and Calibration Services " was conceived to cover both toritorial units, i.e. Centre I in the north and Centre III in the south. This project covers considerably greater number and diversification of the laboratory outfits, testing facilities to be organized, personnel involved and equipment to be provided.

Project Document prepared by CTA in the field was reviewed by UNIDO Headquarters, signed on behalf of the Government and approved by UNDP on 8 June 1982. Project became operational since June 1982. It is planned to be basically completed by the end of 1984. The field service of CTA was rendered continually throughout the whole mentioned implementation period.

Contributions

The original UNDP contribution equal to US$ 1,200.000 stated in Project Document was subsequently readjusted in ensuing budget revisions on several occasions to reflect the actual yearly expenditures in particular budget lines, and to cover minor necessities emerging within the scope of project programme.

The most recent Project Revision Number VIE/81/C06/L/01/37 reflecting estimated expenditures for 1984 and 1985 amounts to US$ 1,229,532.

The Government in kind contribution was provided in various forms of allocations, in investments, purchases, supplies and services, that according to available financial records from both Centresfor a period of project implementation amounts to :

	Centre I	Centre III
Building construction, modernization, repairs and furnitures	2.100.786 dg	3.973.265 dg
Equipment purchase and supply	118.250 dg	675.854 dg
Others : personnel, transportation, sundries	1.154.226 dg	2.498.602 dg
Total	3.378.262 dg (= 249.871 US$	7.147.721 dg (529.461 US$)
GENERAL	= 10.520.983 dg (= 779.332 US$)	

Note: US dollars equivalent
in 1984 : 1 US$ = 13,5 VN dongs

Project Personnel

International staff working on the project consisted of intermediate-term appointed Chief Technical Adviser-Expert in Quality Control and Civil Engineering Testing, and of short-term experts and consultants covering various specialized fields of standardization, quality testing and metrology. The list of names and specializations, as well as the post titles and time bar chart of assignments of the international personnel are given in Annex 1.

Senior national staff is represented by National Director of Project Deputy Director General of General Department for Standardization, Metrology and Quality Control, by Directors of Centre I and Centre III, with their Deputies, and Heads of Laboratories at both Centres. The names and functions of senior counterpart staff are listed in Annex 2.

Training

Training of the national staff in largely extensive and diversified aspects of quality testing and evaluation, standardization, metrology and calibration services problems have been the most principal activity and the main task of all international personnel appointed to the project.

Training component was implemented in two general forms : (1) through overseas fellowships and study tours, and (2) as a local in-service training conducted by international experts, contributed by their national counterparts. More detailed description of fellowships and study tour training is given in chapter II. B.3 of this report, and in service training - in chapter II. B.5, and in chapter C. Output 6 and 7. List of fellowship posts, with the names of fellows, countries of studies, duration, and periods, is attached as Annex 3.

Equipment

Testing and measuring equipment delivered to the project consist of a variety of laboratory instrumentation, machines, measuring tools, standards, accessories, fittings, chemicals, spare parts and attachements, required for 13 multidisciplinary quality testing laboratories of various branches and scopes at both Centres, for 6 different metrology laboratories, and for project workshop at Centre III.

The enclosed Annexes 7 a and 7 b represent the specification of all main equipment items requisitioned for the actual project, separated for Centre I (Annex 7 a containing 159 main sorts of items), and for Centre III (Annex 7 b containing 184 main types of items). Most of these items include several , sometimes few decimals or even more than hundreds (ex. : chemicals) sub-items.

Annex 7 c include 40 sorts of items that were additionally delivered for previous project DP/VIE/76/013, and Annex 7 d contain the remainder received from requisitions prepared in 1982 for that project.

Procurement of above mentioned equipments has been covered by about 175 UNIDO Purchase Orders, among them 121 orders for the actual project, and the remainder 54 for VIE/76/013. About 81 percent of the total component of actual project have already been delivered to Centre I and about 71 percent delivered to Centre III. Several other shipments are actually in transit at the ports of destination on the way to project.

More details concerning the equipment selection and ordering are given in chapter II. B.2 ; delivery and installation are accounted in chapter II.B.4 of this report.

Subcontracting

In order to assist in identification of the needs and technical requirements for various existing and new laboratories at Centre I and III, and in preparation the work and training programmes of the project, including the detailed specification of equipment required for particular jobs and assisgnments in different sections and laboratory divisions, the subcontract has been awarded by UNIDO to Polytechna Prague.

Subcontractor's service performance has however been much delayed and prolonged in time. Polytechna's consultants visited project from 25 January to 24 February 1983, and the second visit was paid from 8 to 16 June 1983. Uncomplete equipment requisitions were submitted to UNIDO in July 1983 and the Final Report received on project in March 1984.

The cost of subcontractor's service amounted to US$ 34.254.-

RECOMMENDATIONS

1. In order to enhace the progressing process of build-up and development of a national network for standardization, after a considerable extension and strengthening of the quality testing and measurements facilities at both Centre I and III of GDSMQ, as a result of implementation of two UNDP assisted projects, the attention of the Authorities and Management be should be focused on proper utilization of established outfits, as well as on subsequent strengthening of the weakest points of the chain of industrial and provincial quality testing and metrology services.

2. Improved and consolidated capability of both Centres in quality testing and inspection, and particularly in application of instrumental methods to industrial quality control, should be used to carry out the major and more complex testing work required for the extention of a national quality certification mark system, for preparation and revision of numerous standard specifications, and for special tasks like pilot tests, prototypes, arbitration etc.

   The provision of training, and possibly widest transfer and exchange of knowledge and experience with industrial and provincial laboratories and quality inspection groups should also be considered as a primary function of the Centres.

3. Further development of the industrial and territorial units of a national system of quality testing, including metrology and calibration services, should go along with successive steps of implementation of a long-term programme. It should commence with a sound inventory and evaluation of all existing facilities in industrial branches and provincial units, be followed by precise determinations of functions and responsibilities, and then pass on through technical upgrading of the outfits and staff training. The sort of the actions have already been undertaken successfully on the south of the country by the Association of Testing Laboratories " Vinatest " in Ho Chi Minh City.

4. Respective national standards as well as legal statutes and regulations being enforced in the country, need to be reviewed and modified to enable to introduce the national accreditation system of testing laboratories, based on international ISO/CERTICO guidelines, recommendations and general requirements (ex. ISO guide 25-1982, BS 6460, etc.)

5. Local production of measuring tools and instruments, length, volume and mass standards, laboratory gadgets and fittings, simple testing machines and devices, chemicals and glassware, has to be developped and extended, with a contribution of greater number of specialized manufacturers controlled by a State Authority for Standardization - GDSMQ.

6. The stock of equipment delivered to project has been selected from the most advanced manufacturers of laboratory instrumentation in highly developped countries. This impose the obligation and responsibility for attentive use, necessary care in operation, proper maintenance routine and servicing.

The maintenance and repair services should therefore be organized and upgraded in both Centres. The servicing and repair divisions should be able to provide attendance not only for their own institutional laboratories but also to render a wide scope of remedies to external industrial and provincial testing organizations.

7. Comprehensive and uniform policy is needed to be adopted in the field of formulation of national standard specifications, and in respect of adaptation of foreign standards, to reduce the excessive diversification and discrepancies in technical codes, rules and practices.

National standard specifications actually missing in some important branches like textiles, rubber, plastics, electrotechnique, electronics, chemistry, civil engineering, food products, etc., ought to be prepared and promulgated before long, to relieve still existing drawbacks, and to prevent from undesirable economical losses, waste of materials and resources, as well as to protect the consumers health, property and public interests.

8. Significant improvement of physical resources in field of metrology on national level, considered as a basic tool for progressing of technological development, is required urgently in industrial and legal metrology as a first priority. It will be followed by a gradual amelioration in metrological infrastructure, that provides the systematic verification and calibration services in the whole country. The UNDP assisted project for National Metrology Center in Hanoi, planned to start in early 1985 should certainly alleviate the circumstances, and therefore deserves due attention and support.

9. Legislative regulations in the field of metrology in Viet Nam should be in some aspects amended and revised to go along with recent international recommendations. The revisions are required before all in metrological terminology to conform the standards (SEV, BS 5233 etc.), in definitions and classification of units according to internationally approved documents (e.g. CMEA Standard 1052 - 78), in classification of etalons, adaptation of standard hierarchy levels, schemes of calibrations, etc.

10. For the improvement of quality of production, the self-motivating factors should be utilized in a greater extent, and in particular : (1) bonus system in salaries awarding better quality of products, (2) respectively elastic pricing policy, sensitive to quality factors, and (3) quality certification mark system covering possibly greatest number of commodities, stimulating manufacturer's interest in quality.

11. Due attention ought to be paid by CDSMQ to a problem of coordination of quality testing activities on provincial, industrial branch and national levels, as a way to increase the efficiency and reliability of testing methods, application of the instruments and personnel involved. All forms of cooperation and association of testing laboratories (example : " Vinatest ") should continue to develop and be supported permanently by all possible means.

12. Local polytechnical education system may be improved by focusing more attention to problems of instrumentation design, servicing and applications, and by introduction of the courses specializing the candidates in laboratory testing techniques, engineering measurements, instrumentation and metrology.

I. PROJECT OBJECTIVES

A. Programme Objective

The long range sectorial development objectives stated in Project Document are the following :

1. The national development orientations outlined in the 1981-85 Plan include the development of the manufacture of quality products for both export and domestic use, the increased application of scientific and technical research results in production, and increased efficiency in industrial management. These orientations are reflected in paragraph 9 b), e), g) and i) of the approved 1982-86 UNDP Country Programme for Viet Nam.

2. This project, which constitutes the second phase of assistance in this field, aims by further development and strengthening of the standardisation, metrology and quality control facilities throughout the country, at the following,

(a) Increasing export potential and volume, through improvement and stabilisation of quality of products and matching them with the world market standards.

(b) Providing augmented and more reliable protection for Vietnamese domestic consumers, through higher quality and greater durability of local products.

(c) Promoting modernisation in production techniques in all branches of industry and national economy, through introduction and expansion of precise standardised measurements and laboratory testing methods.

3. The project is included in the approved 1982-86 Country Programme under paragraph 67.

Here again, as in previous phase of UNDP assistance, the programme goals are directed toward the industrial organizations, production units, technology research and development institutions, that are considered to be the expected indirect beneficieries of the project impact. The ultimate beneficiary is the population, the Vietnamese domestic consumers, for when the greater protection and improvements in economy are being sought.

B. Project Immediate Objectives

Conforming to a primary function of project as an institution - building, the Project Document formulates the following immediate objectives :

1. The principal objective of the project is to provide measurement, quality testing and calibration services to industry by strengthening existing laboratories, metrology and testing facilities and setting up new ones. This will be done through the General Department for Standardization, Metrology and Quality Control (hereafter abridged as GDSMQ) in Centre I in Hanoi and Centre III in Ho Chi Minh City, to enable them to meet the current and future needs of a wide range of industries in the southern and the northern provinces, in practical implementation of an integrated and efficient national quality control system.

2. To serve this principal objective, the immediate objectives the project is to attain are as follows:

(a) Set up newly equipped laboratories for light industry, mechanical, chemical, electrical and electronics testing in Centre I in Hanoi;

(b) complete the electrical/electronics and seed testing laboratories in Centre III in Ho Chi Minh City;

(c) supplement existing metrology and testing laboratories at Bien Hoa Metrology and Testing Centre (MTC) with the necessary secondary standards, to provide metrology services for industry, and comprehensive testing possibilities for quality certification, and research testing for new and revised standards;

(d) train qualified staff in industrial metrology problems, engineering measurements and instrumentation as well as in contemporary product testing procedures and advanced laboratory techniques;

(e) afford management officials the opportunity of studying and adopting certification and quality control procedures in other developing and industrialised nations;

(f) improve the integration of efforts between the GDSMQ, industry, universities and associated state bodies and institutions;

(g) ensure full coordination between the Centre I metrology and testing laboratories and Centre III Bien Hoa MTC, as the country reference centres and quality control institutions for the export and consumer protection drive of the country.

The objectives stipulated above reflect the functional emphasis, which is to strengthen the capacity of two centres : Centre I in Hanoi and Centre III in Ho Chi Minh City belonging to the General Department for Standardization, Metrology and Quality Control, in the following key aspects :

- enlarge the physical resources of both centres through procurement of equipment and accessories to existing laboratories at Centre III, and setting up the new labs at Centre I.

- upgrade and strengthen the human resources by provision of additional training opportunities, local in-service, overseas fellowships and study tours

- adopt organizational improvements in management and cooperation between GDSMQ metrology and testing centres, industrial laboratories, and provincial committees for science and technology

- intensify and extend the activities in development and application of standards, in quality testing, inspection, metrology and calibration services

- improve the internal structure and adopt the measures to realise the closer integration with industry, educational and research institutions, and state administration departments

II. PROJECT ACTIVITIES AND OUTPUTS

A. Work Programme Outline

The framework of the project work programme have been outlined in Work Plan attached to Project Document (PD) as Annex II. The principal activities described and scheduled in time in PD have been further developed in some details, with certain extentions and necessary modifications, related to external factors and actual conditions.

The Work Programme consist in general in the following groups of problems :

(a) Extention of testing laboratories at both centres, and metrology laboratories at Centre III, through planning, construction and equipping of new additional buildings, and through procurement and installation of laboratory instrumentation, with accessories complementary to existing outfits

(b) Fellowships and study tour training, as well as in-service training, conducted by international experts in operation of laboratories and instruments, in introduction of advanced quality standards, testing methods and measurement techniques

(c) Development of industrial testing services by both centres, and metrological verifications and calibrations at Centre III, including quality certification system, standard specifications, promotion, consultancy, advisory services and technical information

The laboratories included in project programme are the following:

- at Centre I

(1) Chemical and Food Testing Laboratory
(2) Mechanical Testing Laboratory
(3) Electrical Testing Laboratory
(4) Light Industry (Textile, Rubber, Paper and Paints) Testing Laboratory

- at Centre III

Testing

(5) Chemical Testing Laboratory
(6) Physio - Chemical Analytical Laboratory
(7) Mechanical Testing Laboratory
(8) Civil Engineering Testing Laboratory
(9) Textile, Paper and Paints Testing Laboratory
(10) Rubber Testing Laboratory
(11) Food Testing Laboratory
(12) Electrical Testing Laboratory
(13) Cereal Seeds Testing Laboratory

Metrology

(14) Geometrical Dimensions (length, angle, surface finish)
(15) Mechanical Parameters (force, pressure, hardness)
(16) Physical Parameters (mass)
(17) Physio-chemical Parameters (volume, viscosity, pH)
(18) Electrical Parameters and Temperature (resistance, voltage, current, capacitance, frequency).
(19) Workshop

Originally, project activities were planned to start with subcontractor consultancy service for determination of the work programmes and equipment requirements, scheduled for May - July 1982.

In view of prolonged process of engaging the subcontractor and retarded commencement and completion of his job, the detailed work programmes and equipment draft specifications were prepared in the field by CTA with Counterparts, and then subsequently adopted for implementation

B. Analytical Account of Activities

1. Planning and construction of laboratories

In order to increase the working area needed for laboratories, two additional new buildings have been planned and constructed as the extentions of existing facilities :

(i) at Centre I, laboratory annex building of 200 m sq, to accommodate the metallographical, non destructive and metallic coating testing sections of mechanical laboratory, as well as electrical power motor testing system

(ii) at Centre III, laboratory building of 490 m sq. for electrical/electronics testing including climatic, high voltage and plastic materials testing

General functional plans have been prepared and discussed on project. After completion of the design by planning bureau, the construction work started in July 1982 at Centre III, and in March 1983 at Centre I. The finishing works have been completed in March 1984, and some additional installations, airconditioning and furnitures in May 1984.

Reconstruction work, including errection of new laboratory benches, water lines and basins, electrical service lines, furnitures, painting etc, was executed in chemical laboratory rooms located in existing building at Centre I.

Detailed plans for the arrangement of light industry materials testing (textile, rubber, paper and paints) in the same building, including the structural modifications and strengthening of floor slabs, construction of concrete bases for testing machines, laboratory benches, partitions, electric and water lines, have been prepared on project, adopted for construction and executed at Centre I.

The establishment of modern enlarged rubber testing laboratory of the area about 172 in sq, including chemical section for natural rubber blocks and latex testing was undertaken at Centre III at the beginning of 1984, and executed with entire structural and internal reconstruction of existing rooms adjoining to Civil Engineering Testing Lab.

The new administration building with 2.5.0 m sq area has been constructed at Bien Hoa in 1984 to provide an additional space for offices, conference hall etc., and release some rooms for laboratories in existing complex.

An additional small annex building was completed to accomodate masonry cutting machine and stores for civil engineering and rubber testing samples.

Further modifications and extention have been implemented in physiochemical laboratory (additional analytical room, sample preparation room with new benches and fume hood), mechanical (arrangement of bicycles testing section) food testing (partitions, benches, ventilation, rearrangement) and in workshop.

The new Cereals Seed Testing Laboratory with the area 73 m sq have been planned and arranged by modification and reconstruction of existing rooms, previously occupied by rubber section at Centre III.

The breakdown disposition of entire laboratory area at both Centres, with above mentioned extentions completed are given in Annexes 6a and 6b. The total final working areas of laboratories amount to 773 m sq at Centre I and 2360 m sq at Centre III.

2. Work planning and equipment specification and ordering

Extensive scope of work and largely diversified technical subjects and specialized fields being covered by the activities of both standardization centres, required careful analysis to be made in advance to identify the priority needs, that could be best assisted by the project. In aspect of strengthening of laboratories the problem was approached through the following actions consequently performed in each laboratory at Centre I at first, and then at Centre III :

- meetings and interviews with managing personnel and the staff to assess the qualifications and professional experience
- inventory and evaluation of existing equipment, verification of technical parameters and operational characteristics
- technical discussions and review of actual tasks being performed, methods applied, results a obtained and hampering problems faced
- discussion of proposals for future development
- determination of actual and future planned working capability for each laboratory, including the lists of products and tests to be performed, and standard specifications followed.

The accomplishment of mentioned subactivities was followed by identification of the function and determination of a long-term framework programme for each laboratory. The detailed specifications of additional instrumentation and accessories required were drafted afterwards.

All above materials and information, supplemented by comments, explanations, indication of priorities, references to standards, technical literature and catalogues were given to the subcontractor consultants during their first visit in the field in February 1983. Long and detailed technical discussions were held in presence of subcontractor and afterwards, until the priorities among and within the laboratories were established and final selection decided, during the second visit in June 1983.

The following priorities were given to the laboratories for further strengthening and development :

Centre I

1. Chemical and Food Testing
2. Light Industry Materials Testing
3. Mechanical Testing
4. Electrical Testing

Centre III

1. Metrology Laboratories
2. Rubber Testing
3. Food and Chemical, including Physio-Chemical
4. Civil Engineering
5. Light Industry Materials
6. Cereals Seed Testing (establishment)
7. Mechanical Testing
8. Electrical Testing

The draft specifications and requisitions were prepared by the subcontractor for precedingly selected equipment items and for approximate allocations of funds agreed upon.

All 31 requisitions, containing 376 different sorts of items (see Annexes 7a and 7b - for details), some of them in tens or hundreds variations and subitems (ex.: chemicals), were verified and finalized by CTA during his work at UNIDO Vienna in August 1983.

Additional 5 requisitions containing 28 sorts of items have been prepared on project in 1984, partially as the replacement for nonavailable instruments and accessories, and also for some others supplementary indispensable items.

It was originally planned that all project equipment would be ordered, in 1983. However, because of multidisciplinary aspects and high sophistication of the instrumentation required,as well as due to some other external factors, the process of ordering turned out to be more prolonged than previously expected. Not more than only 40 percent of the total equipment component could have been ordered up to the end of 1983.

The remaining portion has been processed in 1984. Up to present time, about 95 percent by value of project equipment have already been ordered.

3. Fellowships and study tour training

Overseas training programme outlined in Project Document comprises the training in various kinds of testing problems, in metrology and calibration procedures, in planing and organization of testing laboratories, and in maintenance and repair of laboratory instrumentation. It consists of fellowships for laboratory and quality inspection staff, and of study tour for managing personnel of both Centres in a total amount 48 man/months on the whole.

The above original programme was extended by additional overseas training in form of second study tour in amount of 4 man/months, for managing personnel,to afford to get acquaintance with the organization and operation of quality certification systems of export/import products in developing and developed countries of Asia and Pacific Region.

The extention was proposed and agreed upon during Tripartite Monitoring Review on 3 July 1984. Study tour is foreseen to take place in first quarter of 1985.

3.1. Fellowships

For the implementation of a fellowships training programme, the selection of candidates have been made at first, then nomination form completed with the individual training programmes outlined for each candidate. Placement proposals were adjusted during CTA's consultation visit at UNIDO in Vienna. Corresponding arrangements were made by Training Branch with some modifications adopted according to availability of training opportunities in host countries.

Training was arranged for small groups of 2-3 persons or for individuals in GDR, CSSR, Hungary and India. The host institutions, that were the standardization and metrology institutes and offices, research and testing centres, national standard laboratories, industrial inspection and quality control departments, had in general prepared useful and interesting programmes and provided satisfactory working and living conditions for trainees.

Fellowships programme has been entirely fullfilled. with 3 m/m training granted for everyone of 13 fellows, 6 persons from Centre I, and 7 from Centre III, totally 39 m/m.

All fellows have elaborated their own individual reports, that were forwarded successively to UNIDO, Vienna.

The list of participants, posts, names, countries of study and time is enclosed in Annex 3.

3.2._ Study tour

Study tour training programme for managing personnel of GDSMQ involved in project activities was discussed in advance and outlined on project, and afterwards arranged by Training Branch of UNIDO.

Six persons participated during one and half months, November and December 1982, in tour through GDR, Czechoslovakia, Hungary and India. Participants had visited the following institutions :

- Office for Standardization, Metrology and Testing Materials in Berlin, GDR

- Metrology Institute in Bretislava, CSSR

- Hungarian Office for Standardization in Budapest, Hungary

- National Test House, Calcutta, India,

and few other national offices, laboratories and plants.

Programme of study tour was in general well prepared, interesting and useful. Participants were able to learn, compare and verify many aspects and specific problems, concerned with standardization, metrology, quality testing and certification activities in other countries, in view to adopt prospectively the advanced methods, experiences, and ideas in Vietnam. More detailed observations have been recorded in Final Report of Study Tour dated 6 January 1983, forwarded through UNDP Hanoi to Vienna.

4. Installation of laboratory equipment

All project supplies composed of extreme variety of laboratory instrumentation, accessories, fittings, chemicals, spare parts and attachments, have in all possible means been duly inspected and checked up for completness and technical compatibility, before or after transfering to respective laboratories. In labs the operating instructions have usually been referred to, studied and translated where necessary. The ways of use and application of the new devices, including necessary preparations and precautions have as a rule been consulted with CTA, and then the instruments again examined and put into trial operation.

4.1._ Centre_ I

Before the equipment supplies from the project started to arrive, the attention has been drawn to installation and proper use of the instruments and machines already existing in laboratories or newly supplied from foreign bilateral cooperation sources.

(i) In chemical laboratory the UV-Vis Spectrometer has been serviced and brought into use. The operation and application of the instrument were explained and demonstrated during special seminar (refer to item 4 of Annex 4). The program for installation and trial test by existing Gas Chromatograph was prepared by CTA, but after some attempts not implemented due to internal defects discovered in the machine.

(ii) In electrical laboratory the Climatic Testing Machine and Vibration Tester were checked up, assembled, used in trial tests and finally put into operation. High Voltage Testing Assembly was installed, and Injection Pump Testing Machine inspected and prepared for work.

(iii) In mechanical laboratory the emphasis was placed on use of all existing instruments for nondestructive testing (NDT) and particularly Ultrasonic Thickness Gauge; Magnetic Defectoscope and Ultrasonic Flow Detector. The principles and scope of application of the instruments were explained and demonstrated during special seminar organized on project of NDT methods applied to metals testing (refer to item 5 of Annex 4).

(iv) In light industry materials testing laboratory, after reconstruction of rooms and floor slabs, the machines and existing apparatus were installed according to the planned locations and function. Three strength testing machines, namely, Tensile Strength Tester for rubber, Yarn Tensile Tester and Paper Tensile Tester were set up on a specially designed reinforced concrete slab bases.

The delivery of project instrumentation for Centre I (refer to Annex 7a) started in January this year, with balances and scales for textile laboratory, the portion of chemicals and culture media for microbiological analysis.

It was followed by instruments for paper testing, few machines for physical properties of textile fabrics and yarns, balances for rubber testing, two optical instruments i.e. Colony counter and Microscope for microbiology, and full set of paint testing apparatus.

Electrical testing equipment was received the next, and then the main portion of mechanical laboratory instruments, with some more supplies for chemical and food testing.

Three laboratory divisions have at present been equipped either entirely as planned (electrical, light industry), or almost entirely (mechanical), while chemical laboratory and rubber testing section are still expecting to receive their about half amount of ordered instrumentation (rubber), or chemicals, accessories and glassware (chemical).

4.2. Centre III

Equipment delivery commenced with the additional supplies for project VIE/75/013 (refer to Annex 7c), comprising variety of accessories, attachements, expendable components and spare parts for existing

machines, as well as some complementary instruments. They were transferred to respective laboratories and to workshop, to serve for normal operation and testing work.

The above included:cutters and attachements to mechanical milling machine, abrasive belts for polishing metallic specimens, measuring tools for threads, electrical measuring instruments like multimeters, precision digital volmeter, insulation testers and high voltage testing unit. The last unit has been delivered incomplete. Claimed lacking parts have been additionally shipped to project afterwards.

Supplies of equipment for actual project VIE/81/C06 (refer to Annex 7b) started to arrive in November 1983 and were progressing successively at increased rates. They comprise firstly some additional measuring tools for length metrology and mechanical testing, electrical metrology and frequency measurements, civil engineering testing instruments and accessories, complementary textile, paper and paint testing instruments, glassware chemicals and additional chemical laboratory outfits.

It was followed by delivery of the rubber testing equipment physio-chemical analytical instruments and accessories, mechanical testing machines, engineering metrology standards and measuring tools.

All the deliveries have been checked up before or after transfering to respective laboratories. Instructions were then given by CTA or by branch experts, if present on project, for preparation, installation, trials and operation. Missings or damages were recorded promptly when discovered, then claimed and processed accordingly.

5. In service staff training

Three phases of on-the-job training activities may in general be distinguished as they were implemented on the project.

5.1. In the early phase, before delivery of equipment and arrival of the branch consultants, the preparatory training guided by CTA was carried on, with the emphasis on theoretical background of selected more important quality testing problems, instrumental methods and standard procedures.

Preliminary training programme outline worked out by CTA had in view to prepare the staff for more advanced and extended activities after delivery of instrumentation, when the experts start their specialized training in particular fields. The packages of problems were discussed in sections, preselected and thereafter accepted for group or individual studies. The scheme of an individual or group specialization of the staff members was introduced to enable the concentration on certain problems and find the way to upgrade the skills and qualifications. Some more important or complex problems were adopted for intensive group study and designated as topics for seminars (refer to Annex 4).

In the first phase of training the following subjects were assigned :

(a) at Centre I :

- in chemical laboratory : UV spectroscopy, gas chromatography and colorimetry applied to analyses of chemicals and food products

- in mechanical laboratory : ultrasonic and magnetic non-destructive testing methods, flaw detection and gauging, metallic and nonmetallic coating measurements and gauging, microscopical examination of metal structures, microhardness testing

- in electrical laboratory : insulation testing, high voltage, climatic testing, noise and vibration

- in light industries laboratory : statistical methods in sampling and testing, test conditions and interpretation of the results, accelerated simulators for weathering testing

(b) at Centre III.

- In chemical and food testing sections : development of chromatographic and colorimetric methods for determination of vitamins, standard testing methods for heavy metals contaminations, toxic substances and residues, gas chromatographic methods of testing alcohols and beer, spectrophotometri methods of metals analysis, colorimetry

- in mechanical laboratory : qualitative and quantitative methods of microscopical examination of metal structures, physio-chemical and metallographical methods of determination of metallic components, coating tests and gauging, development of nondestructive methods

- in civil engineering laboratory : unification of testing methods of cement, revision of standard specifications and methods for ceramic products, concrete mix design, proportioning, and testing; introduction to nondestructive methods in civil engineering

- in rubber testing : development of natural dry rubber and latex testing methods, chemical testing of additives of additives to rubber

(c) Apart from that, some other forms of training have been organized as beneath :

- three months English Language, UNDP supported course for project staff and candidates for fellowships at Centre I, repeated subsequently twice on intermediate and advance level

- series of 3 - 6 weeks training courses organized by Centre III and Vinatest in cooperation with Polytechnic or University, participated by project personnel, in :

  - analytical chemistry
  - electronics in chemical instrumentation
  - food testing
  - textile testing

- lecture on standardization problems, prepared by CTA and presented on meeting at the Committee of Science and Technology in Hanoi (see Annex 4)

5.2. During the second reporting period of project implementation, some of the selected group training subjects, were the following :

- statistical analysis and interpretation of tests results
- optical methods applied to textile testing
- climatic testing of electrical/electronic components
- liquid penetration method combined with chemical methods for surface flow dectection
- microbiological hygienic standards requirements for food products in Vietnam
- laboratory techniques of microscopical examinations applied in microbiological analyses

(a) Series of internal seminars for laboratory staff were organized at Centre III at intervals 2 - 3 weeks, prepared successively by different laboratories on various problems of testing standards, methods and procedures, for rubber, food products, construction materials, bicycles, as well as application of the instruments in : calorimetric measurement, freezing point determination, rotavapor operation, etc.

(b) Two seminars were organized at Centre I : on UV Spectrophotometry application in analytical chemistry and on nondestructive testing methods (NDT) for metals, with CTA's introductory lecture. Both seminars were participated by external personnel from various institutions, state departments and factories.

(c) On-the-job training courses were conducted by CTA in construction materials testing laboratory on timber sampling and testing methods, and testing procedures for cement, sands and aggregates.

(d) Training in sensory evaluation principles and practice was conducted by UNIDO Expert as a series of lectures followed by practical testing exercises arranged for groups and test panels both at Centre III and I

(e) Project staff participated in training courses organized by Association of Testing Laboratories, Vinatest" , and also in courses by other external institutions, namely :

- Academy of Science HCM City Branch, one monthly course on gas chromatography - 1 project personnel trained
- Institute of Higiene, six weeks course on food standards, quality and testing - 2 project personnel trained
- L'ecole d'été on Chimie Abalytique, one month course-series of lectures and seminars conducted by French and Vietnamese scientists, professors and specialist - 5 project personnel trained
- Rubber Research Institute at HCM City, three months training in natural rubber testing methods - 1 project personnel trained

(f) Project's Testing Centre at Bien Hoa has provided laboratory training for several persons or groups from outside, e.g.:

- six months training in physic-chemical laboratory for 2 students before graduation from Polytechnical University
- three months training in food testing for 3 persons from Tay Ninh provincial committe of science and technology
- two months training in construction materials testing laboratory for 3 persons from Dong Nai province.

5.3. In the last period of project implementation i.e., in 1984, except of continuation of some previously adopted forms of training like English Language third term course at Centre I, or Vinatest + Centre III plus Polytechnical University courses in metallography and construction materials (refer to Annex 4, item 15), the emphasis was placed on training conducted by UNIDO experts in their specialized fields, with the application of existing or newly acquired laboratory instruments.

The training sessions were organized in the form of lectures, seminars with practical demonstrations, or as laboratory workshops, in the following fields :

(1) chemical and food testing
(2) electrical metrology
(3) metals testing
(4) civil engineering testing
(5) statistical methods
(6) textile testing
(7) cereals seeds testing
(8) electrical testing
(9) non-destructive testing methods
(10) testing equipment maintenance and repair
(11) engineering metrology
(12) metallography
(13) rubber testing

The specific subjects were covered as beneath :

- reliability and environmental testing of electrical/ electronic components
- organization of chemical testing laboratory operation
- laboratory requirements for pesticides residues control in foodstuffs
- problems of control of food additives

- applications of UV - Vis spectrometry in chemical analysis
- principles of gas chromatography
- basic measurements in electricity and temperature
- calibration systems for quality assurance
- metals welding techniques and inspection
- nondestructive testing testing methods in civil engineering
- application of statistical methods in practice of quality evaluation and testing
- standard atmospheres for textile conditioning and testing
- determination of colours and colour differences
- assessment of physiological properties of clothing materials
- moisture determination of seeds
- principles and methods of seeds testing
- electrical testing of insulating materials, components and appliances
- principles and organization of Laboratory instruments maintenance services
- power supply conditioning for laboratories and instruments
- recent developments in non-destructive testing methods and their applications
- application of correlation analysis in quality testing problems and calibration of NDT instruments
- fundamentals of metrology
- modern methods of investigation of metal structure
- techniques of heat treatment of steels and alloys

Training sessions listed above were usually well prepared by the international experts and in most cases contributed by the national specialists. Lectures were always attended by many persons invited from external institutions, received with interest, and frequently lively discussed. The titles, date, places and number of participants are listed in Annex 4 item 10 to 31.

The texts of the lectures prepared in written form were typed, copied and distributed as technical papers. They are listed as documentary outputs of the project in Annex 5.

6. Development of industrial testing and metrology services

Development of industrial testing services by both centres, and metrological verifications and calibrations by Centre III, including quality inspection and supervision, development of quality certification system, introduction of standard specification, relevant technical information, consultancy and advisory services was a principal activity carried on continually and implemented through the several kinds of subactivities as described beneath.

6.1. Testing and metrology verification and calibration services

During the project implementation from July 1982 to November 15, 1984 the following numbers of tests were performed in Centre's III laboratories

(i) Testing services

metallic test	2065	tests
chemical	1203	"
physio-chemical	2739	"
food	1572	"
light industry (textile, paper, paint)	1670	"
rubber	1942	"
construction materials	737	"
electrical	329	"

Certain important testing programmes, as for instance alcohol programme at Centre III have been coordinated in broad scale among several institutions like :

- Laboratory for Domestic Trade Products
- Laboratory of HCM City Committee of Science
- Pasteur Institute at HCM City
- Alcohol Factory Binh Tay
- Institute of Hygiene
- Laboratory for testing of Export Products

The results obtained, have been compared and verified, the discrepancies studied, and following-up adjustment of methods and joint training.

(ii) Metrology verification and calibrations

pressure gauges	5478	units
mass : balance and scales (from analytical up to truck scales)	10159	"
hardness and force machines	102	"
volume standards	1456	"
electrical and temperature standards	766	"

Testing services performed by Laboratories at Centre I in 1983 and 1984 are the following, in number of specimens tested :

	1983	1984
electrical and electronics	1185 specimens	1070 specimens
mechanical testing	612 "	556 "
light industry (textile, paper, rubber, paints)	105 "	450 "
chemical and food products	753 "	1062 "

6.2. Quality inspection and supervision

The activity has been carried out by the Inspection Sections of both Centres, and concentrated on : (1) control and quality supervision of certain number and sorts of most important internal market and export products, (2) testing and evaluations for granting quality certification mark, (3) issuance of standard quality certification mark.

The activity has been performed more effectively at Centre I by greater number of quality inspectors involved (about 35 persons in 5 Inspection Sections), and bigger amount of products covered, such as electric motors, electric ceiling and table fans, bicycles, bicycle tires and tubes, frozen shrimps, liquors etc.

Type and magnitude of the inspection and supervision services provided by Centre I in 1983-84 is summerized beneath in table

No	Description	1983	1984
1.	Quality supervision of selected priority products	132 products in 65factories	174 products in 73 factories
2.	Quality inspection, guidance and training of industrial QC staff	215 factories in 18 provinces	155 factories in 18 provinces
3.	Evaluations for granting quality certification mark	13 products	26 products
4.	Quality evaluation of products for export	13 products	29 products
5.	Quality arbitration services	10 instances	6 instances

Quality control and supervision conducted by Centre III have been extended in recent year and is actually concentrated on the following main products :

- frozen fishery products
- rice for export
- concentrated milk
- liquors for export
- beer for export and domestic consumption
- textiles
- washing powder
- tooth paste
- insectisides
- plastic products
- cement
- asbesto - cement
- building bricks
- diesel motors 6 and 9 HP with accessories
- electric fans ceiling type for export
- bicycles, spare parts and accessories
- arc-welding electrodes
- galvanized wire
- galvanized wire nets
- electric conduits wire
- plastic coated (PVC) electric wire
- plywood
- reinforced concrete electric line poles

Commodities being at present under series of testing and examinations for granting quality certification mark are the following :

(1) Man's bicycles " Saigon " and " Huu Nghi "
(2) Woman's bicycles " Saigon " and " Huu Nghi "
(3) Mini - bicycle " Huu Nghi "
(4) Bicycle tires 650
(5) Natural rubber blocks
(6) Textile fabrics KT, satine
(7) Washing powder " Saigon "
(8) Tooth paste P/S
(9) Galvanized stell barbed wire
(10) Galvanized wire nets B 40
(11) Electric wire PVF
(12) PVC coated wire
(13) Plywood

Six operational programs are being carried out by Centre III to develop and strengthen quality assurance systems in industries manufacturing :

(I) Bicycles for export
(II) Electric fans for export
(III) Fishery products for export
(IV) Natural rubber blocks
(V) Liquors
(VI) Bicycles tires

The contracts and agreements have been concluded with some factories and industrial companies on the South for long term services in quality testing, as beneath :

- asbestos cement factory, for permanent testing or products, improvement the technology on production line and introduction the factory standards

- canned food production company, for testing the heavy metals contamination in canned food with AA Spectrophotometer

- beer production and alcohol export company, for testing alcohols with Gas Chromatograph

- rubber manufacturing company, for testing of rubber products, formulation and introduction of standards specifications and new testing methods.

- Chemical industrial company, for testing of detergents and cosmetics, and for formulation of standard specifications.

6.3. Manufacturing and supply of standard tools, weights and measures

Production of weights, graduated length standards, volume standards, scales etc. have been carried out either in project workshop at Centre III or in specialized factories, and then supplied to and distributed in provinces. This kind of services have been recently extended especially at Centre III and include manufacturing of sets of bicycle testing machines, according to own design, following new national standard specification.

The quantity of the standard tools produced and distributed recently by Centre III in 1984 amounts to :

- 28 tons of dead weights, class 4, distributed to provinces

- 141 pcs of length standard 1 m graduated

- 800 pcs of alcoholometers

- 40 pcs of standard scales capacity 50 kG

- 15 sets of standard volume flasks (5, 10 and 20 liter)

- 1 set of bicycle testing machine containing 6 smaller testing outfits

The verification, validation and approval of technical documentation and complete designs of new kinds of measuring devices like balances, length measures, volume measuring apparatus etc, is also one of the metrological services provided by the centres. Few sorts of balances, dial type spring type scale, plateform scale, folding measures and gasoline pump have been processed recently at Centre III and approved for serial production.

Repair and maintenance services for various types of laboratory testing and measuring instruments, are continually being provided by maintenance section at Centre III, staffed by skilled local specialists trained on the project.

6.4._ Industrial_visits

In order to boost cooperation between GDSMQ and industrial companies and research institutions, and also to promote the indirect impact of the project on industry, a large number of visits have been arranged to the factories, to industrial testing laboratories, research laboratories, institutes and technical universities in Hanoi and Ho Chi Minh City. At several occasions GTA was invited to take part in industrial branch conference as well as in yearly conference for quality and metrology problems.

Many visits from factories, industrial departments, scientific centres and provincial committees were received frequently in the laboratories of both centres, and especially at Centre III.

Various aspects of quality problems, organization of testing, production process control, methods of quality evaluation, application of standards and instruments, maintenance and services problems were discussed during visits with the aim to encourage different sorts of gradual improvements.

The numerous lectures and seminars organized on project (refer to Annex 4) were also the occasions to invite many people from industry to discuss the current technical problems, establish working contacts and provide consultancy, information or advise.

6.5._ Association and coordination of testing laboratories

The promotion of development of the Association of Testing Laboratories " Vinatest " which was created with the initiative undertaken from the project, with the guiding role of Centre III, have been one of activity, aimed at establishment and maintaining liaison among various industrial and research laboratories. It serves for coordination of certain testing problems, exchange of technical information, equipment maintenance and servicing, as well as to facilitate the organization of training activities.

A number of training courses prepared in cooperation with " Vinatest " (refer to Annex 4 item 8 and 15) have been well conducted and significantly contributed in upgrading the knowledge and qualifications of the groups of young people, in various fields of laboratory testing work.

The Association unifies 160 laboratories organized in branch sections. Full inventory of all facilities have been made and published as Vinatest Directory in 1983. Monthly Bulletin is being issued periodically.

A guidebook, containing the lists of tests and capabilities of associated laboratories for analysis of more than 120 products with about 1300 technical requirements and characteristics, was elaborated jointly by the Association members and published by Centre III - Vinatest in 1984.

CTA have rendered his best advice and full support to the Association, especially in its preliminary phase of operation, taking part in several meetings, conference, visiting the training courses, delivering the lecture and technical instruction on problems of applied statistics and on NDT methods in civil engineering testing.

7. Verification and preparation of standard specifications

National standard documents are as a rule being prepared by standardization centre, consisting of several technical sections in GDSMQ in Hanoi.

Verification of applicable standard documents, specifications and testing methods on a laboratory level have been an activity carried on especially in instances when the new products were examined and the most appropriate methods searched for and adopted, or when the new testing instruments were supplied and put into use.

At Centre I the activity was emphasized in preliminary phase of project implementation, before delivery of equipment and final set up of laboratories. It helped to determine detailed working programmes more clearly and to identify the need for specific instrumentation required. As such the activity contributed to programming of the extention of testing laboratories.

The work was conducted separately in each laboratory and summerized in written form, as testing programmes or testing capacities, specifying the methods and refering to particular standards reviewed.

Quite extensive plan of preparation of new laboratory standards was undertaken by Centre III in 1982 and is being continued up todate.

In 1983 this standardization plan called for preparation of about 55 new draft documents, mainly for testing methods and procedures, of which 20 in chemical and physiochemical section, 21 for food testing, 7 for construction materials and 7 in electrical, mechanical and light industry testing and inspection sections. Fifteen of new laboratory standards have been prepared in 1984, in textile branch, paint testing, chemical, rubber, physio chemical analysis, etc., and another forty five are under way of preparation.

The new laboratory standards are dealing mainly with the testing and analytical procedures or adaptation of some more general international recommendation specified by ISO, AOAC, IEC, GOST, IS, ASTM, BS.

Except of above, the specifications of methods of quality evaluation were elaborated for 18 products, and comments prepared on following number and types of drafts :

- national standards TCVN	:	33
- branch standards TCV	:	17
- regional standards TC N	:	28
- factory standard TC	:	1
	=	79

Certain important national standards, like for example new methods of bicycle testing, natural rubber blocks testing, cement puzzolan specifications etc., were explained and discussed on special seminars, before introduction into laboratory practice.

C. Evaluation of Outputs

The estimation of final results set forth beneath is based on comparison of planned outputs as they appear in Project Document and the description of the results actually produced through project.

Output No 1

Laboratories in the following fields in Centre I in Hanoi, adequately staffed and equipped for the priority needs :

(a) Light Industry Products Laboratory

(b) Mechanical Laboratory

(c) Chemical Laboratory

(d) Electrical and Electronic Laboratory

The output is almost completed. Modification and adaptation work has been performed in existing building to transform the rooms into laboratories and increase the working area for Chemical and Light Industries Products Testing Lab. Arrangement of Mechanical and Electrical sections in existing building was completed. Construction of annex building for extention of the last two laboratories completed, including airconditioning units, water system and electric power supply.

Project equipment have been deliveredcompletely to electrical laboratory, textile, paint and paper sections, and majority of instruments to mechanical laboratory and chemical. Remaining supplies, including rubber testing section are to be delivered in coming 1 to 3 months.

Originally requested equipment for Centre I have been supplemented with several additionally ordered machines, instruments and accessories for ultrasonic testing in mechanical laboratory, and considerable amount of chemicals, glassware and accessories, as well as analytical instruments like Flame photometer, Thin Layer Chromatography Kit etc., for chemical laboratory.

Training and consultancy have been provided in greater extend than originally planned, and namely :

- in mechanical laboratory, three consultants have been covering the subjects of mechanical testing, NDT methods and metallography separately, in lieu of one consultancy foreseen previously
- in light industries laboratory, one 3 m/m consultancy has been split up and extended for 3 consultants working separately in textile, rubber and paper testing, each one 3 or 2 m/m for both Centres.

The number of personnel in laboratories at Centre I ought to be increased, especially in textile and rubber section, in order to perform the testing work with greater efficiency.

Output No 2

Improved performance of existing laboratories at Centre III in Ho Chi Minh City :

(a) Chemical Laboratory
(b) Food Testing Laboratory
(c) Civil Engineering Materials and Mechanical Laboratories
(d) Special Testing Laboratory for Cereal Seeds
(e) Electrical/Electronic Laboratory

Output is almost fully completed. Existing and already operating laboratories like chemical, physio-chemical , food testing, civil engineering, mechanical and light industries (textile, paper, paint) have been further strengthened and consolidated by necessary modifications and extentions, by additional supplies of instrumentation and accessories, and by in-service training provided by international experts.

Testing programmes of all above laboratories have been extended in number of tests and characteristics being examined.

New procedures, like for instance metal composition analysis, microhardness testing,ultrasonic and rebounded hammer tests in civil engineering, timber testing, paints testing, calorimetry, thin layer chromatography, electrophoresis, heavy metals contamination of food, and several others, have been introduced, most of them added now to routine performance.

Rubber testing laboratory has been given the priority and undergone considerable extension in the area, scope of work and equipment. Textile and paint testing was developed in greater extention than originally intended.

Cereals Seeds testing laboratory has been newly arranged in spacious room, furnished and basically equipped. Comprehensive training has been provided by UNIDO/FAO expert to the staff engaged.

Electrical/Electronics testing laboratory has been arranged in large building constructed anew, and the advice and training conducted by electrical consultant. Proper earthening and screening systems have been installed, testing cabine made as required, and high voltage tester, among other instruments put into operation.

Output No 3

Metrology reference centre at Bien Hoa for southern province of the country, including calibration laboratories at Ho Chi Minh City with secondary standards for lower accuracy verification of industrial and commercial measuring tools and instruments.

Output is almost completed. Metrological services have been extended in force and pressure calibrations and also in mass, volume, geometrical dimensions, as well as in some electrical and temperature measurements.

Time and frequency measuring units are being procured and will be installed in consultation with National Metrology Centre in Hanoi.

Training and consultancy have been implemented in planned amount. Pending suplementary instrumentation supplies are expected to be delivered in coming nearest months.

Output No 4

Workshop at Centre III in Ho Chi Minh City equipped with tools and machines operated by skilled workers to serve for preparation of testing samples, manufacturing of lower class gauges and maintenance and repair services.

Except for some minor tools ordered and not yet delivered, the workshop is well equipped and employ qualified personnel, actually 6 persons, 2 of them are engineers, 3 technicians and 1 worker. More skills and practical experience have been gained by the staff and workers during the time of project implementation. Workshop is providing satisfactory services in repair and maintenance of local laboratory equipment and in manufacturing of standard weights, as well as some tools and testing machines for bicycle testing (refer to para 6.3.). Output is completed.

Output No 5 and 6

Laboratory staff trained in modern testing methods and measuring procedures via overseas fellowships and on-the-job training conducted by UNIDO experts.

Thirteen persons have completed the overseas fellowships training in total amount 39 m/m according to programme. Six other persons participated in one and half month study tour through GDR, CSSR, Hungary and India. Additional one month study tour for four persons to Far Eastern countries is planned to take place in first quarter of 1985. For more details refer to description in chapter II.B.3 and Annex 3.

Training on-the-job conducted by international experts and consultants working on project has been provided as specified beneath in table :

No	Subject	Number of persons trained	
		Centre I	Centre III
1.	Civil engineering testing		7
2.	Sensory testing and evaluation	5	6
3.	Chemical and food testing	4	5
4.	Electrical metrology		4
5.	Welding techniques and inspection	4	3
6.	Statistical methods in quality evaluation and testing	8	12
7.	Textile testing	2	2
8.	Cereals seeds testing		4
9.	Electrical testing	4	4
10.	Nondestructive testing methods	3	3
11.	Correlation analysis applied to calibration of NDT instruments		4
12.	Maintenance and servicing of lab. equipment		3
13.	Engineering metrology		6
14.	Metallographical examination of steels and alloys	3	
15.	Rubber testing	3	4
16.	Paper testing (planned in 1985)	2	2
		38	69

Owing to considerable extension in number and duration of several specialized consultancies, and due to provision of an additional study tour, the originally planned amount of training has been fairly exceeded. Respectively, the number of personnel trained as well as the level and quality of training have been better than anticipated.

Output No 7

Training instruction and consultation materials prepared by experts; operating manuals verified for practical routine application, including comments and translations.

Operating instructions for more complex instruments have been in most cases translated and adapter for practical use in laboratories. Many descriptions, testing and measuring procedures, recommendations and draft standards were prepared by consultants, discussed on seminars or included as subject in lectures. Texts of the lectures or summaries of seminars have been prepared by the experts as the reference material for future use and training. More important or advanced papers were printed in many copies and distributed to participants and all parties concerned (refer; Documentary Outputs in Annex 5). Many charts, schemes, drawings and diagrams for operating certain instruments, or explaining the subjects of lectures and seminars have been prepared and left for use in laboratories as the training aids.

Output can be considered as completed.

Output No 8

Detailed technical requirements for the new laboratories at Centre I and III drawn up by specialized institute under subcontract, together with realistic work plan for implementation.

The output have been completed, with delay of about one year in comparison to original time schedule, due to lengthy procedure for selection of subcontractor and his prolonged comportment in formulation of expected results.

Practically the output was produced earlier on the project, and then adapted and complemented by subcontractor (Polytechna Prague).

Output No 9

Direct association and self-motivated cooperation with industry to promote and monitor quality control activities and to render technical consultancy services.

Active liaison with industry is maintained by Centre III through diversified forms of activities, testing and calibration services, contracted testing programmes, joint training activities, quality inspections, industrial visits, personal and professional contacts etc. Centre I maintains the links with industry mainly through quality inspection and supervision activities.

Output No 10

liaison with universities, institutes, colleges, scientific and technical bodies on problems of measurements and testing as well as on preparation, verification and formulation of new standard specification.

Permanent links have been established by Centre III through Vinatest activities, CTA's and other international experts visits, joint training courses for laboratory staff, project lectures and seminars, in addition to frequent personal interlaboratory contacts, consultations, and periodical meeting of standardisation commissions. Liaison established during the previous phase of the project is maintained and continued. At Centre I the more close contacts and cooperation in certain testing problems (chemical, electrical, climatic) have been initiated in course of project implementation.

III. ACHIEVEMENT OF PROJECT OBJECTIVES

A. Principal Objective

The principal objective of the project is to provide quality testing, measurement and calibration services to industry by strengthening the existing laboratories and setting up new ones for General Department for Standardization, Metrology and Quality Control in Centre I (Hanoi) and Centre III (Ho Chi Minh City). This will enable to meet the current and future needs of a wide range of industries in the southern and northern provinces, in practical implementation of an integrated and efficient national quality control system.

B. Indicators

The results of the project as an institution - building, may be measured by improvements and extention of :

- physical resources
- human resources
- programme of activities to produce the outputs
- organization and management

C. Assessment

Although certain project activities, the subcontractor consultancy service in particular, have been considerably retarded at the outset of implementation, and caused subsequent delay in delivery of inputs exceeding the original expectations, the satisfactory rate of progress has been achieved afterwards, and especially in 1984.

The results produced by project activities are briefly described and evaluated in preceeding chapter, in reference to each of ten programmed outputs specified in Project Document. The project results are outlined beneath in reference to mentioned above programme indicators.

1. Overal capability of Centre I and III

The original assumptions laid out in project design proved to be reasonable and were maintained throughout the whole process of implementation. Both Centres have been largely strengthened by setting up and extention of their testing facilities, as described earlier, (refer to rating of the ourputs No 1,2,3 and 4, in chapter II.C.).

Center I in Hanoi has been modernized and undergone a considerable transformation by reconstruction, equipping and furnishing of existing laboratories for chemical, food, electrical, and mechanical testing. By construction and arrangement of new building an additional laboratory area for electrical and mechanical sections has been provided. New laboratories for textile, paper and paints testing have been arranged and after period of training commenced their work.

Centre III in Ho Chi Minh City has been consolidated and extended its testing and metrology laboratories at Bien Hoa, as well as calibration sections in the City. The new buildings and annexes have been constructed (refer to chapter II.B.1). Reconstruction, modifications and rearrangements were adopted in most of the laboratories (physio-chemical, food testing, rubber testing, civil engineering), and new laboratories established and undertook their work for electrical, and cereals seeds testing.

2. Programme of activities

As a result of increased capabilities, the programme of activities in quality testing, certification and standard measurements has been extended, among others, in the following major fields :

2.1. Centre I

- instrumental methods of textile fabrics, paper and paint testing
- non-destructive methods (ultrasonic, magnetic particle, radiographic, eddy current) in mechanical testing and inspection
- environmental testing (climatic, vibration) of electrical and electronic components
- development and application of physio-chemical analysis (UV-Vis spectrophotometry, flame photometry, thin layer chromatography) in testing of chemicals and food products.
- metallographical analysis of steels and alloys

2.2. Centre III

- non-destructive methods in civil engineering testing
- cereals seed testing (purity, vigour, germination, etc.)
- microhardness tests of metals
- physio-chemical and metallographical methods of determination of metallic components
- raw rubber testing
- instrumental methods of textile fibres and paints testing
- supplementary physio-chemical methods (thin layer chromatography, electrophoresis, calorimetry, polarography) applied to analysis of food and chemical components
- development of length, mass, force, pressure metrology and calibration methods

2.2. Various forms of cooperation and liaison have been initiated or developped with industry, administration departments, universities, research centres and provincial committees (refer to Output 9 and 10 in chapter II.C.) as for example :

(a) Strengthening of the organization of provincial subcommittees for science and technology in 18 southern provinces, including :

- organizational structure
- guidance of activities in standardization
- procurement of basic types of standards and instruments for length, mass and volume measurements
- distribution of technical documentation and publications
- staff training

(b) Setting up the territorial metrological calibration service units : 5 - for mass, 1-for pressure, 1-for electrical parameters

(c) Verification and approval of QC programmes for state industrial plants (central plan)

(d) Cooperation with QC departments of ministries :

- Foreign Trade
- Internal Trade
- Public Health
- Agriculture

(e) Cooperation with laboratories associated in " Vinatest "

(f) Frequent participation in newspapers publications on quality problems.

2.4. Routine testing, quality inspection, supervision and calibration services provided for local and provincial clients from different sectors have been extended in scope and number (refer to chapter II.3.6.)

2.5. Training activities, conducted by both Centres have been developped and expanded in different forms like :

- Courses 4-6 weeks organized by Centre III in cooperation with " Vinatest" and University (example : construction materials testing, basic analytical chemistry, metallographical analysis of metals, basic electronics)
- Courses 2-3 weeks conducted by laboratory staff members at Centre I for industrial personnel (example : non-destructive detection of metal flaws, welding techniques and non-destructive inspection)

- laboratory training 2-3 months for industrial QC personnel (mechanical), for provincial testing personnel (food and chemistry), or for certain number of students from university, polytechnical and agricultural faculties (physio-chemistry), at Centre III.

- numerous short-term training courses on various subjects of standardization, QC, instruments verification and repair for industrial or provincial personnel.

3. Physical resources

Working area of the laboratories has been enlarged from 495 to 773 m sq at Centre I, and from 2003 to 2360 m sq at Centre III. Numerous extentions modifications, reconstructions, arrangements, installations and furnishings resulted in considerable modernization of Centre I and in physical setting up of its testing capability. Additional improvements and extentions have been adopted at Centre III, that brought about to on establishment of the modern quality testing and metrology complex, the best of its kind in the country.

Large quantity of the most advanced laboratory instrumentation have been procured, installed and put into operation. It amounts to about 159 major items of total value around 415 thousands US dollars at Centre I, and about 299 major items of total value around 493 thousands US dollars at Centre III, including in both cases some equipment still in processing or on the way to project (refer to Annex 7a to 7d).

All equipments, carefully selected during initial phase of project, including many very specific items and standards, acquired with great effort and patience, are in general, very suitable to programmed work and meet the specification and technical requirements.

4. Human resources

Project objective in aspect of strengthening of human resources has been achieved in general, in extent originally assumed. The following changes expressed in qualitative and quantitative terms have been attained :

(a) Thirteen persons from project national staff have passed 3 months training programmes abroad. All of them resumed and continue their jobs in maternal institutions (C.I or C.III), utilizing the upgraded knowledge and practice.

(b) Six management personnel participated in one and half month study tour in foreign countries, that permitted them to get acquaintance with organization of standardization, metrology, quality testing and certification activities, and then adopt some more advanced patterns in home institutions and departments.

(c) About 38 persons in C.I and 69 persons in C. III from project staff, including several persons from quality inspection, had passed different forms of in-service training conducted by international experts (refer to chapter II. C. outputs 5 and 6). The practical aspects of problems and direct applications were emphasized in on-the-job training courses. The results were utilized in trial tests and measurements, and then practised and mastered in course of laboratory work.

(d) The number of personnel employed in Centre III have been increased in last two years from 136 to 155 persons, having the following educational background :

- 65 university graduates or equivalent, six of them with doctor degree
- 13 technicians
- 46 laboratory assistants and workers
- 31 administration and support personnel

5. Organization and management

The role of both Centres as the reference establishments for the problems concerned with quality assurance, evaluation, standards and testing, has also been elevated as a result of organizational and structural improvements adopted internally in different technical and administrative sections, especially at Centre III.

The active, dynamic approach to all tasks has been adopted by managing personnel of Centre III, and explicitly positive changes in attitudes and relationships have been observed as a result of project impact.

IV. UTILIZATION OF PROJECT RESULTS

Enlarged capability of both Centres attained as a result of project implementation have been utilized in the following forms:

- testing and calibration services provided for the clients
- technical services in standardization problems, quality inspection, supervision and certification for industrial companies and factories
- manufacturing of some standards, simple measuring tools and testing machines components and attachments in project workshop
- cooperation, supervision and support rendered for provincial organizations (subcommittees) for standards, quality control and metrology
- laboratory training and various kinds of short-term and intermediate courses provided for local, industrial and provincial personnel

- repair and maintenance services for instrumentation stock of own as well as of external industrial laboratories

- dissemination activities through Testing Association " Vinatest" , technical conferences and seminars, press publications, film shows, industrial visits, library services and personal contacts

Much of this work is undirectly related to the programme objectives stated in Project Document. Testing works carried out for export products such as bicycles with their components, electric portable and ceiling fans, canned fruit products, frozen shrimps, cement, some textile fabric, mechanical tools, have been given a priority attention in laboratories. This work contribute directly toward development objective (a) (refer to chapter I.A.), i.e. increasing export potential and volume through improvement of quality.

It will be extended in nearest future on new products designated for export like natural rubber blocks, liquors, frozen seafood products, more mechanical tools, electrical motors, electronic components, etc.

Other kind of tests, like those of chemicals, foods products, construction materials, seeds, electrical and mechanical components, serve for determination of actual qualities, for classification of products, certification of quality, pricing, and for improvements of production processes. They work by the same for a wider common purpose, that is potection of the users, Vietnamese people-domestic consumers, as stipulated in Project Document development objective (b).

All above mentioned types of testing and metrology services, combined with remaining activities of the Centre in quality inspection and supervision for industries. with the introduction of quality assurance systems in certain plants, provision of standard documents, measures, specifications etc, stimulate the modernization in production techniques, and by the same conform to PD development objective (c)

V. RECOMMENDED FOLLOW UP ACTIONS

The reported project, supporting the development of a national standardization system, that constitutes the fundamental priority component for modernization and progress in all industrial branches and economical sectors, as well as in science and technology, should be considered as having a special importance for the whole national economy.

With the purpose of ensuring that the project outputs are fully and properly utilized, and will continue to be available to intended beneficiaries in future, the follow-up actions are necessary to be undertaken and carry out as beneath :

(1) by the UN system :

- provide a full possible assistance for the new project in metrology, planned to commence at National Metrology Centre in Hanoi, in early 1985

- support the preparation of a new project for maintenance and servicing of laboratory testing instrumentation on the South

- continue the assistance to the project started recently on the North for maintenance and repair center of electronic and optical equipment

(2) by the Government :

- continue the long term training programme, for testing laboratories and quality inspection personnel, in wide coordination with the other national institutions, universities and training centres

- extend and accelerate the activities concerned with formulation, adaptation and revisions of the national and branch standard documents, to fill the gaps existing at present in different industrial and sectorial branches

- commence preparatory technical and legislative work for introduction of a national accreditation system for testing laboratories in compliance with international recommendations

- intensify and enlarge the scope of testing and evaluation work to extent the quality certification mark system on possibly greatest number of products.

- undertake or itensify and coordinate the local manufacturing of simpler type of laboratory instruments and machines like drying ovens, air purps, laboratory fittings, glassware, chemicals measuring tools, etc.

- review the actual pricing systems in view to introduce modifications where feasible, correlating the quality grades of products with respective differences in cost and prices

(3) by industry

- reinforce and improve the organization and effectiveness of production process control departments in factories, by upgrading the qualifications of personnel, supplying more measuring tools and inspection instruments, making systematic analysis of the results, and undertaking proper corrective measures

- introduce modern quality assurance systems in more advanced and important industrial plants

- increase the role and improve the arrangements, furnishings and personnel of industrial testing laboratories, with consultancy and technical advice due to be rendered by both standardization Centres

- develop and extend an effective motivation systems in industrial companies, like for example bonus system in salaries, awarding better quality of production, stimulating improvements, and involving personnel engaged in all phases of production process.

VI. F I N D I N G S

1. Both institutions, i.e. Centre I and Centre III of the GDSMQ, through the strengthening of their physical and human potential, have largely increased capability and competence, and are now in a position to carry out their assigned functions as the strongest regional centres of a national network for standardization, quality testing, metrology and calibration services.

2. Full awarness of the Government Implementing Agency, and agreement of the Government Personnel on project objectives have been realized and utilized as a positive fundamental factor of project implementation process.

3. Better than anticipated attitude of project local staff have been observed, although not ever fully available in required number and specializations, but always sincerely dedicated to the job, integrated and friendly.

4. Greater demand in industry and trade rather than among consumers exists for improved quality of products, for the development of modern instrumental methods of testing and evaluation of properties of materials and products, and for extention of metrological verifications in all industrial branches and economical sectors.

5. Defficiency of a long time experience and tradition, in different kind of precise and sophisticated analytical laboratory work and measurements, call for augmented insistence on all forms of continuous training and practice required for personnel.

6. Motivation system for quality improvements in industrial production plants, has started to be reviewed by the responsible State Authorities. Gradual amelioretions have already been adopted, and new economical incentives, including stimulating legislative measures have been tentatively introduced to some industrial manufacturing plants, as a result of project indirect impact.

7. Positive response have been received from industry, administration and local authorities to all kinds of improvements suggested, or project servi·es (services) offered.

8. Keen interest and participation of scientific and educational institutions have been eminently remarked in joint training, testing programmes and professional activities of the Association of Testing Laboratories " Vinatest ", conceived by the project.

9. The arduous economical conditions of the country reflect on the rate of progress in the field of science and technology. It is hoped however, that the problems concerned with the development of educational and scientific infrastructure, that are highly ranked by the State Authorities, will be preserved among the country's priorities, and will continually be stimulated by all available means.

A C K N O W L E D G E M E N T S

Author wishes to express his profound appreciation and thanks to his Counterparts, and to all National Personnel of the project, for a sincere cooperation that has been offered to him continually from the outset of the assignment in Viet Nam in 1981, up to its completion in 1984.

Special words of gratitude are credited to Mr Van Tinh - Deputy Director General of GDSMQ, Dr Nguyen Huu Thien - Director of Centre III, with his Deputies - Dr Huynh Van Quang and Dr Nguyen Ngoc Tho, and to Dr Nguyen Ngoc Duyet - Director of Centre I, for their sheer interest, permanent care and comprehensive response to all matters related to the Expert's tasks, and to the advancement of project. Without their efforts, and immediate contribution, the project could not had been realized.

Author is especially indebted to Mr Karl H. Englund, Resident Representative of UNDP Hanoi, for his support and assistance rendered throughout the whole period of project implementation. The words of thank for kind cooperation are owed to UNDP Hanoi programming and administration Personnel.

The Expert wishes to convey his thanks to all laboratory staff members of both Centre I and III, for their sincere attitude, devoted work, and sympathy they have been offering him all the time.

Finally, the words of thank are due to all administrative and supporting personnel, and especially to Mr Nguyen Van Chien, for his helpful care of numerous administrative and personal affairs related to project.

A N N E X E S

ANNEX 1

INTERNATIONAL STAFF

1. CEKIERA, J.J., Poland	- Chief Technical Adviser, Expert in Quality Control and Testing of Civil Engineering Materials
2. STOESTREM, G. Sweden	- Sensory Testing Expert
3. POOS, L., Hungary	- Chemical and Food Testing Consultant
4. OHLON, R., Sweden	- Electrical Metrology Expert
5. VOGEL, R., FRG	- Consultant in Mechanical Testing
6. SCHACHL, R., Austria	- Cereal Seeds Testing Expert
7. NACSA, N., USSR	- Textiles Testing Expert
8. MUCHAIDZE, G., USSR	- Electrical/Electronics Testing Expert
9. SURI, S.K., India	- Maintenance and Repair of Lab. Equipment
10. SRIVASTAVA, K.C., India	- Consultant in Non Destructive Testing
11. EL - TAWIL, A.B., Egypt	- Engineering Metrology (mechanical) Expert
12. KHERODINASHWILI, Z., USSR	- Consultant in Metallography
13. PATEL, M.M., India	- Rubber Testing Expert
14. DORRIES, D., FRG	- Paper Testing Expert

The durations of assignments, with beginning and ending dates of services, are shown in bar chart on the following page.

ASSIGNMENTS OF INTERNATIONAL STAFF

ANNEX 1 (continued)

Code	Expert Post Title \ Time	1982 J	J	A	S	O	N	D	1983 J	F	M	A	M	J	J	A	S	O	N	D	1984 J	F	M	A	M	J	J	A	S	O	N	D
11-01	Chief Technical Adviser																															
02	Chemical and Food Testing																					24/2			16/5							
03	Mechanical Testing																						11/3		20/4							
04	Sensory Testing Training													21/6				14/10														
05	Electrical/Electronic Testing																											3/8		26/10		
06	Electrical Metrology																						11/3		25/4							
07	Textile Testing																									20/5			17/8			
08	Rubber Testing																													7/11		
09	Engineering Metrology (mechanical)																													19/10		13/12
10	Maintenance and Repair of Lab. Equipment																												12/9		7/11	
11	Cereal Seeds Testing																									1/6						
12	Metallography																													19/10		4/12
13	Non-Destruction Testing Methods																													4/10		2/11
14	Paper Testing																									planned			in	1985		

Note : dates mark the arrival in and departure from the field

ANNEX 2

SENIOR COUNTERPART STAFF

1.	VAN TINH,	National Director of Project, Deputy Director General of Gen. Department for Standardization, Metrology and Quality Control
2.	NGUYEN HUU THIEN,	Director of Centre III of Gen. Dept. for Standardization, Metrology and QC (formely called the Institute for Standardisation) in HCM City
3.	NGUYEN NGOC DUYET,	Director of Centre I of GDSM&C in Hanoi
4.	HUYNH VAN QUANG,	Deputy Director of Centre III, Head of Metrology and Testing Laboratoriesat Bien Hoa
5.	NGUYEN NGOC THO,	Deputy Director of Centre III, Head of Metrology and Calibration Services at HCM City
6.	DO VIET TINH,	Deputy Director of Centre I
7.	TRAN MANH QUAN,	Deputy Director of Centre I
8.	NGUYEN VAN CHIEN,	Secretary of Project
9.	DIEP NGOC SUONG,	Head of Physio-Chemical Lab (C.III)
10.	NGUYEN NGHIA,	Head of Mechanical Lab (C.I)
11.	NGUYEN DUC DANG,	Head of Civil Engineering Testing Lab (C.III)
12.	PHAM NGOC THANG,	Head of Electrical Lab (C.I)
13.	DINH VAN TRU,	Head of Mechanical Lab (C.III)
14.	NGUYEN XUAN HIEN,	Head of Rubber Testing Lab (C.III)
15.	PHAM VIET NGA,	Head of Chemical and Food Testing Lab (C.I)
16.	TRAN THI KIM ANH,	Head of Light Industrial Lab (C.I)
17.	LE ANH TUAN,	Engineer in Mechan. Lab (C.I)
18.	MAI XUAN CANH,	Head of Chemical Lab (C.III)
19.	DINH THI HUONG,	Head of Metrology Lab (C.III)
20.	DO THI MAI,	Head of Electrical Metrology Lab (C.III)
21.	PHAM QUOC TAM,	Engineer of Lab Equipment Servicing and Maintenance (C.III)
22.	HUYNH THANH DAM,	Head of Food Testing Lab (C.III)

ANNEX 3

FELLOWSHIPS

No.	Fellowship post	Duration (mos)	Name of Fellow and Country of study	Training period started (mo/yr)	Training period completed (mo/yr)
1.	Electrical metrology and testing	3	TRAN VAN HOA - CSSR	1/83	4/83
2.	Paper testing	3	NGUYEN THI NGA - CSSR	1/83	4/83
3.	Mechanical metrology	3	DINH THI HUONG - GDR	2/83	5/83
4.	Legal metrology	3	LE THANH VAN - GDR	2/83	5/83
5.	Laboratory planning and organization	3	PHAM NGOC THANG - GDR	2/83	5/83
6.	Maintenance and repair of lab equipment	3	NGUYEN DINH LONG - GDR	2/83	5/83
7.	Food testing	3	LE CAM NHUNG - HUNGARY	4/83	7/83
8.	Food testing	3	TRAN THI TAN - HUNGARY	4/83	7/83
9.	Textile testing	3	HUYNH THI MAN - HUNGARY	4/83	7/83
10.	Textile testing	3	TRAN THI KIM ANH - GDR	9/83	12/83
11.	Electrical testing	3	DANG VAN SUU - GDR	10/83	1/84
12.	Construction materials testing	3	TRAN VAN DUNG - INDIA	6/83	9/83
13.	Laboratory planning and services	3	HUYNH VAN XUAN - INDIA	6/83	9/83

ANNEX 4

SHORT - TERM TRAINING COURSES

No	Training activity	Duration	Date started	Date completed	Number of participants	
					Started	Completed
1.	UNDP supported English Language course at an intermediate level for project national staff and candidates for fellowships, hold at Centre I (Hanoi)	3 months	1.10.82	17.12.82	12	12
2.	Review and refinements of standard testing procedures for cement, sands and concrete agregates	10 days	5.4.83	14.3.83	5	5
3.	Introduction and practice of sampling and testing methods of timber	14 days	16.4.83	29.4.83	5	5
4.	On-the-job training ended by seminar on UV-Vis spectroscopy analysis, methodology and application (Centre I)	seminar	24.5.83			25
5.	Metallic MD testing methods, principles and application (Centre I)	seminar	2.6.83			30
6.	Sensory evaluation of food					
	a) lectures :					
	- at Centre III HCM City	4 days	19.6.83	22.6.83	45	40
	- at Centre I Hanoi	4 days	9.83	9.83	120	100
	b) testing exercices					
	- at Centre III	3 days	25.6.83	28.6.83	12	12
	- at Centre I	4 days	9.83	9.83	62	62
7.	Weekly seminars at MTL Bien Hoa (Centre III) on rubber, food, bicycles and constr. materials (2 seminars) testing problems and development	series of seminar	5 seminars hold on Nov. and Dec. 83		average attendance about 30 lab personnel	
8.	Training courses participated by Project personel organized by Centre III and Vinatest in co-operation with University and Institutes in: - analytical chemistry - electronic in chemical instruments - food testing - textile testing	4-6 weeks each course	permanent activity realized at intervals		average attendance 25-40 persons includes usually 2-4 persons from project lab. staff.	

ANNEX 4 (continued)

1	2	3	4	5	6	7
9.	UNDP supported English Language course intermediate level for project staff at Centre I - second term.	3 months	4.9.83	30.11.83	16	14
10.	Environmental and climatic testing of electrical/electronic components. Principles and standard procedures (Centre I)	1 day seminars	16.12.83			12
11.	Workshop on organization of chemical testing lab. operation					
	- at Centre III	2 days	13.3.84	15.3.84	20	20
	- at Centre I	-"-	11.4.84	13.4.84	14	14
12.	National system and lab. requirements for pesticides residues control in foodstuffs (Centre III)	1 day lecture	27.3.84			35
13.	Workshop on problem of control of food additives (Centre III)	1 day	28.3.84			20
14.	Instrumental methods of chemical analysis :					
	(i) Application of UV-Vis Spectrometry					
	(ii) Principles of Gas chromatography (Centre I)	1 day seminar	4.5.84			35
15.	Training courses participated by Project personnel organized by Centre III and Vinatest in co-operation with Polytechnical University in					
	- metallography	4 weeks	March 84	April 84	25	20
	- testing methods for construction materials	3 weeks	2.5.84	29.5.84	30	25
16.	Basic measurements in electricity and temperature; measuring principles with electronic counters (Centre III)	1 day lectures	4.4.84			30

1	2	3	4	5	6	7
17.	Calibration systems for quality assurance; concepts of errors in measurements (Centre I)	1 day lectures	23.4.84			25
18.	Welding techniques and inspection by non-destructive methods	1 day seminar				
	- at Centre III		29.3.84			50
	- at Centre I		13.4.84			28
19.	UNDP supported English Language course, advanced level for project staff at Centre I - third term	10 weeks	12.4.84	20.6.84	16	16
20.	Application of statistical methods in practice of quality evaluation and testing for construction materials	1 day lectures +seminar				
	- at Centre I	30.3.84				35
	- at Centre III	23.5.84				30
		30.5.84				25
21.	Non-destructive testing methods for concrete; classification standardization, principles and practice (Centre III)	1 day lectures +seminar	26.5.84			30
22.	Standard atmosphere for textile conditioning and testing (Centre III)	internal lab. seminar	7.84			18
23.	a) Determination of colours and colour difference b) Assessment of physiological properties of clothing materials (Centre I)	1 day lectures + seminar	6.8.84			35
24.	Moisture determination of seeds (Centre III)	internal lab. seminar	7.84			15
25.	Principles and methods of seeds testing (Centre III)	2 days course	13.7.84	14.7.84	20	20

ANNEX 4 (continued)

1	2	3	4	5	6	7
26.	Electrical testing of insulating materials, components and appliances	1 day lectures + seminar				
	- at Centre I		18.9.84			35
	- at Centre III		13.10.84			30
27.	a) Instrumentation Principles and Organization of instruments maintenance services	1 day lectures + seminar	27.10.84			32
	b) AC Power conditioning for laboratories and DC instrument supplies (Centre III)					
28.	Recent developments in NDT methods and their applications	1 day lectures + seminar				
	- at Centre III		9.11.84			18
	- at Centre I		11.84			~ 30
29.	Laboratory training course on application of correlation analysis to calibration of NDT testing instruments: Rebound Concrete Tester and Pundit Ultrasonic Tester (Centre III)	10 days	2.10.84	12.10.84	4	4
30.	Laboratory training course on Fundamentals of Metrology (Centre I)	9 days	1.11.84	9.11.84	5	4
31.	Modern methods of investigation of metal structure and techniques of heat treatment of steel and alloys	1 day lecture + seminar				
	- at Centre I		[illegible].12.84			~ 35
	- at Centre III		30.11.84			~ 40
32.	Quality testing in rubber, design of compound receipt, and technology of rubber products	4 days workshop				
	- at Centre III		11.12.84	14.12.84		40
	- at Centre I		12.84	12.84		~ 30

ANNEX 5

DOCUMENTARY OUTPUTS

No.	Title of report, paper, etc.	Description
1.	General Problems of the Development of Standardisation Activities in Poland	Technical paper in English presented by CTA on lecture ar the Committee of Science and Technology in Hanoi, in November 1982 (NS)
2.	Preliminary Report on Polytechna Praque subcontractor's service for UNIDO Project DP/VIE/81/006	Brief technical report in English distributed to Government, UNIDO and project management (S)
3.	Project Evaluation Report	Technical appraisal of onging project performance, prepared according to UNIDO Internal Evaluation Systen (S)
4.	Dreft Final Report of Polytechna Prague - subcontractor for consultancy on the development and implementation of the project DP/VIE/81/006	Technical report in English (dreft) submitted unofficially to the Government and CTA. (S)
5.	Final Report on Sensory Testing	Technical report in English, final version (restricted) submitted to UNDP Res. Rep., UNIDO, Government and CTA. (S)
6.	Building Materials : review of application, production development and testing	Technical paper in English presented by CTA as a lecture on seminar at Bien Hoa, in December 1983 (NS)
7.	Sensory Evaluation of Food	Technical paper composed of four chapters in English presented as a series of lectures during seminar hold at Centre III in July, and at Centre I in August 1983 (S)
8.	National system and laboratory requirements for pesticides residue control in foodstuffs	Technical paper in English delivered as a lecture on seminar, distributed to participants, project staff, Government and UNDP Res. Rep. (NS)
9.	Final Report on Chemical and Food Testing	Technical report in English, submitted to UNIDO, UNDP Res. Rep. and Government. (S)
10.	Basic measurements in Electricity and Temperature	Technical paper in English, delivered as a lecture left as reference for use of Counterparts (NS)
11.	Calibration Systems for Quality Assurance ; Concepts of Errors in Measurements	Technical paper in English, delivered as a lecture, left behind for use of Government Counterparts (NS)

ANNEX 5 (continued)

1	2	3
12.	Final Report on Electrical Metrology	Technical report in English submitted to UNIDO, UNDP Res. Rep. and Government (S)
13.	Final Report on Metal Testing	Technical report, submitted as above (S)
14.	Final Report by Polytechna Prague for Consultancy on the Development and Implementation of the National Network of Standardization, Metrology, Quality Testing and Calibration Services in S.R. Vietnam	Technical report in English submitted to UNIDO, UNDP Res. Rep. and Government. (S)
15.	Application of Statistical Methods in Practice of Quality Evaluation and Testing for Construction Materials	Technical paper in English delivered as a lecture by CTA, discussed on seminar, printed as reference for use of Government Counterparts, submitted to UNDP Res. Rep. and UNIDO (NS)
16.	Non-destructive Testing Methods for Concrete; Standardization, Principles and Practice	Technical paper in English delivered as a lecture by CTA. distributed as above (NS)
17.	Final Report on Textile Testing, including four technical papers : (1) ISO, CMEA and GOST Methods for Quality Testing of Cotton Fibres (2) Standard Atmospheres for Textile Conditioning and Testing (3) Assessment of Physiological Properties of Clothing Materials (4) Determination of Colours and Colour Differences	Technical report in English submitted to UNIDO, UNDP Res. Rep. Government, and distributed, as technical reference for testing labs in Textile Industry Branch (S)
18.	Technical Report : Introduction of seed testing certification and quality control according to international standards	Report in English submitted to UNIDO, UNDP Res. Rep. and Government (S)
19.	Final Report on Electrical Testing	Technical report in English, submitted as above (S)
20.	Final Report on Maintenance and Repair of Lab. Equipment	Technical report in English, submitted as above (S)

1	2	3
21.	Final Report on Non-Destructive Testing	Technical report in English submitted as above (S)
22.	Final Report on Engineering Metrology (Mechanical)	Technical report in English submitted as above (S)
23.	Final Report on Metallography	Technical report in English submitted as above (S)
24.	Instrumentation, Instruments and Instrument Maintenance	Technical paper in English prepared for workshop, printed and distributed to participants as reference material. (NS)
25.	A.C. Power conditioning for Instrument laboratories	Technical paper in English prepared for workshop, printed and distributed to participants as reference material (NS)
26.	Quality Control and Non-Destructive Testing in Pressure Vessel Manufacture	Technical paper in English prepared for workshop, printed and distributed to participants as reference material (NS)
27.	Calibration Procedure for Block Gauges	Technical instruction in English prepared for project staff in metrology laboratory (NS)
28.	Calibration Procedure for Screw Gauges	Technical instruction as above (NS)
29.	Application of Correlation Analysis to Quality Testing Problems	Technical guidebook in English prepared by CTA as a reference material for project staff (NS)

ANNEX 6e

DISPOSITION OF LABORATORY AREA AT CENTRE I

No	Description	Working area (m sq)	Remarks
1.	Electrical/Electronics Testing Lab	250	
2.	Mechanical and Metallurgical Testing Laboratory	185	
3.	Light Industry Products Testing Laboratory		
	a) textile section	52	
	b) rubber section	52	
	c) paper section	26	
	d) paint section	26	
4.	Chemical and Food Testing Lab		
	a) chemical section	52	
	b) physio-chemical analysis	52	
	c) food testing section	52	
	d) microbiology section	26	
	TOTAL AREA	773 m sq	

ANNEX 6b

DISPOSITION OF LABORATORY AREA AT CENTRE III

No	Description	Working area (m sq)	Remarks
1.	Metrology : Geometrical Dimensions Section (length, angle surface)	59	
2.	Metrology : Mechanical Parameters Section (force, hardness, pressure)	59	
3.	Metrology : Physical Parameters Section (mass)	40	
4.	Metrology : Physio-Chemical Parameters Section (volume vissosity, pH, humidity)	40	
5.	Metrology : Electrical and Temperature Section	90	located in main office building.
6.	Calibration ancillary rooms	160	" " "
7.	Chemical Testing Laboratory	120	
8.	Physio-Chemical Analytical Lab	120	
9.	Mechanical Testing Laboratory	150	
10.	Civil Engineering Testing Laboratory	144	
11.	Food Testing Laboratory		
	a) food testing section	240	
	b) microbiology section	48	
12.	Light Industrial Testing Lab (textiles, paints and paper)	183	
13.	Rubber and Plastics Testing Lab	234	
14.	Electrical/Electronics Testing Lab	256	
15.	Cereals Seeds Testing Laboratory	73	
16.	Workshop	160	
17.	Maintenance and repair section for laboratory equipment	64	located in main office bldg
18.	Central store of accessories chemicals and glassware	120	
	TOTAL AREA	2360 m sq.	

List of equipment for Project UP/VIE/81/006 - Centre 1 (Ha-Noi)
(Actual on 30.11. 1984)

ANNEX IE

Req. No	Item No	Quant.	Description	Purchase order No	Supplier	Approx cost US ($) as per P.O.	Delivery date	Remarks
1	2	3	4	5	6	7	8	9
83/2	1	1	Folding endurance tester	15-3-BO 913	Ogawa Seiki	11640	2-3-84	
	2	1	Mullen type bursting tester	"	"		"	
	3	1	Digital variable angle gloss meter	"	"		"	
	4	1	Precision sample cutter	15-3-BO 1218	Karl Frank	575	22-3-84	
	5	1	L * W quadrant Scale	15-3-BO 907	AB Lorentzen * wettre	435	12-1-84	
	6	1	Analytic balance with digital indicator	15-3-BO 914	Textest AG	1200	11-1-84	
	7	1	Gurley type S-P-S tester	15-3-BO 913	Ogawa seiki		2-3-84	
	8	1	Gurley type sizing tester	15-3-BO 1169	H.E.Messmer	13353	"	
	9	1	Reflectometer					
	10	1	Tensile surface strength tester	15-3-BO 1169	H.E.Messmer		15-5-84	
	11	1	Bendtsen smoothness and porosity tester	"	"		"	
83/3	1	1	Electric water bath	15-3-BO 1498	Nissei trading	25025	27-8-84	
	2	1	Mercury bath insulation destruction tester	"	"			
	3	1	Constant temperature electric	"	"			
	4	1	360° Turn bending flexibility tester	"	"		27-8-84	

1	2	3	4	5	6	7	8	9
83/3	5	1	Magnot wiro abrasion tostor	15-3-B0 1498	Nissoi-trading		27-8-84	
	6	1	Electric wiro flammability tostor	"	"		9-84	
	7	1	Universal loakago current tostor	"	"		"	
	8	1	Wind indicating syston	"	"		"	
	9	1	Soud lovol notor	"	"		"	
	10	1	Portablo	"	"		"	
	11	1	Digital capacitanco motor	15-3-B0-1524	Labor instru-monts	3/88	8-84	
	12	1 + 1	Electronic galvanomotor	"			9-84	
	13	1	Surfaco temperaturo indi-cator	15-3-B0 1498	Nissoi-Trading		"	
	14	1	Function power notor	"	"		"	
	15	1	Moga ohmotor	"	"		"	
	16	10	Lead Wiros	15-3-B0 1524			8-84	
	17	1	Digital Surfaco thormonotor	"				
	18	1	Powor factor notor with suston transformor	15-3-B0 1498	Nissoi-Trading		9-84	
	19	1	Distortion notor	"	"		"	
	20	1	Direct rosding impondanco bridgo	"	"		"	
	21	1	Digital stop watch	15-3-B0 1524			8-84	

1	2	3	4	5	6	7	8	9
83/5	1	1	Rubbor tost specimon cutting machino	15-4-BO 777	Wallaco	13010		
	2	1	Akron abrasion tostor	"	"			
	3	1	Rubbor hardnoss tostor shoro	"	"			
	4	1	Grindor (buffing machino)	"	"			
	5	1	Donsinotry balanco	15-3-BO 1312	Prolabo	3220	23-3-84	
	7	1	Analytic balanco	15-4-BO 430	Bodo	805	20-8-84	clain
	8	1	Automatic procision balanco	15-3-BO 1312	"	"	"	
	9	1	Set of woights	15-3-BO 1312	"	"		
83/6	1	1	Universal tensilo strongth tosting machino	15-3-BO 1535	Labor-Ins trunonts	38105	30-6-84	
	2	1	Universal abrasion tostor	"			"	
	3	1	Rubbing tostor	"			"	
	4	1	Climato cabinot/conditionor	"			"	
	5	1	Colour difforonco motor	15-3-BO 1540	Ogawa Soiki	5820	23-4-84	
	6	1	Air pormoability tostor	15-3-BO 1539	[illegible]	[illegible]	30-6-84	
	7	1	Wator pormoability tostor	15-3-BO 1539	Toxtost Inc	3405	12-3-84	
	8	1	Xotin ADO woathoring tostor	15-3-BO 1535			30-6-84	
	9	1	Toxtocalor	15-3-BO 1541	Tokyo tos-ting	6836	5-84	
	12	1	Croaso rocovory tostor	15-3-BO 1535	Labor-Ins-trunonts		30-6-84	
	14	1	Sonko typo softnoss tostor	15-3-BO 1541	Tokyo tos-ting		5-84	

1	2	3	4	5	6	7	8	9
	15	1	Measuring rool	15-3-80 1542	Karl Schroder KG	1620	28-3-84	
	16	1	Yarn inspection device	"			"	
83/1	1	1	Zahn Hartung CO_2 Volumeter	15-3-80 1421	Labor-Inst.	9159		
	2	1	Kjoldahl system	15-3-80 1422	Gallonkamp	5804	8-84	
	3	1	Refractometer ablo	"	"			
	4	1	Polarimeter for sugar determination	15-3-80 1421	Labor instrument			
	5	1	Canned products vacuum gauge	15-4-80 669	Budenberg	220	10-84	
	6	1	" Dangoumau" vibratory mill	15-4-80 249	Prolabo	2937	15-5-84	
	7	1	Sievo shaker	15-3-80 1422	Gallonkamp		8-84	
	8	1	Sievo in brass mesh	"	"			
	9	1	Screens	15-4-80 744	Prolabo	755		
	10	1	Soxhlet extraction apparatus	15-3-80 1422	Gallonkamp			
	11	1	Vacuum oven with pump	15-3-80 230			10-84	
	12	1	Electric Furnace	15-4-80 972	Nissei	6075		
	13	1	Fume hood " Dalton "	15-3-80 1421	Labor instrument			
	14	1	Apparatus for determination of arsenic	"	"			
	15	1	Vacuum rotary evapurator	"	"			
	16	1	Sand bath	15-3-80 1421	"			
	17	1	Glass distilled alcohol still	"	"			
	18	1	F.Martin ebullioscope	"	"			
	19	1	Freezing point apparatus	15-4-80 676	Towson-Morc.	168		
	20	1	Hand cord borers	15-3-80 1421	Labor instrument			
	21	1	Sharpener for cord borers	"				

1	2	3	4	5	6	7	8	9
	22	5	Electronic calculators	15-4-80 232	A.Androws + (mail order)	343		Purchased locally
83/8	1	1	Colony counter	15-3-80 1499	Labor Instrument	2025	26.3.84	
	2	1	Anecrobic culture oven	15-4-80 314	Gallenkamp	9445		
	3	1	" Poupinel" Storilisation oven	15-4-80 291	Prolabo	2286	6-84	
	4	2	Thermometer for "poupinel" oven					
	5	3	Filter " seitz "	15-4-80 291	Prolabo		6-84	
	6	1	Dissection kit	"	"			
	7	1	Serological water bath	"	"			
	8	2	Slide glasses	"	"			
	9	2	Square cover glasses	"	"			
	10	2	Glass ware	15-4-80 314	Gallenkamp		11-84	
	11	1	Laboratory alarm timer	15-4-80 291	Prolabo		6-84	
	12	1	Binocular microscope	15-3-80 1499	Labor-Instruments		28-3-84	
	13	5	Pastur Rods	15-4-80 291	Prolabo		6-84	
	14	2	Hypodermic syringes and needles	"	"		6-84	
83/9	1		Spare parts and accessories for gas chromatograph	15-3-80 1325	Svpol co		28-3-84	see 83/10
	2	1	Air generator - chromepack(Cn)	15-4-80 903	K.Botlelt(A)	2749		see 83/10.2
	3		Sge syringes 0,5ml, 1ml, 3ml	15-4-80 709	Hamilton	280		

1	2	3	4	5	6	7	8	9
83/10	1		Chemicals for gas chromato-graph GCHF 18-3	15-3-80 1325	Supelco	11003	26.3.84	
	2	250	Fluoropak 80/100-chromapack. CR) , No 1961	15-4-80 903	K. Bartelt			see 83/9. 2
	3	1	Alcohol solvent	"	"			
	4	1000	Toluol solvent any	15-4-80 744	Prolabo			see req. 83/7 item 9
	5	1000	Chloroform solvent supplier					
	6	1000	Petrolic other solvent					
83/11	1	1	Falling block impact tester	15-3-80 1133	Sheen	9230	15.5.84	
	2	1	Smoothness tester	"	"		"	
	3	1	Scratch tester	"	"		"	
	4	1	Bonding tester	"	"		"	
	5	1	Drying time tester	"	"		"	
	6	1	Magnyfying glass (lens)	"	"		"	
	7	1	Flow cups	"	"		"	
	8	1	Fineness of gring gauges	"	"		"	
	9	1	Wet abrasion tester	"	"		"	
	10	1	Hardness rocker	"	"		"	
	11	1	Elcommenter thickness gauge	"	"		"	
	12	1	Lar applicators (50 n, 75 n , 100 n)	"	"		"	
83/12	1	1	Neophat 21 large incidents light Camera microscope	15-4-80 305	Jenoptik jena	17391	10-84	
	2	1	Xenon lamp DR 150/1/105 947/6	"			"	
	3	1	Halogen lamp 12V 100W/68.801/1/	"			"	

1	2	3	4	5	6	7	8	9
83/12	4	1	Microhardness device	15-3-B0 305	Jenoptik Jena		10.84	
	5	1	Adapter for metal cassettes 9x12	"			"	
	6	3	Metal Cassettes 9x12	"			"	
	7	1	Attachment for photographs	"			"	
	8	1	Set of ovepiece measuring discs	"			"	
	9	1	Interference attachment	"			"	
	10	1	Iltiner 4 electrical Integrator	"			"	
	11	1	Grain size comparison ovepiece	"			"	
	13	1	Tester of nicounting thickness	15-4-B0 829	Aufrich	392		
	14	1	Coating thickness tester	15-4-B0 389	Mittutoyo	4895	7.84	
	15	1	Coating thickness tester	15-4-B0 389	"			
	16	1	Ultrasonic tester	15-4-B0 393	Aufricht	9962	7.84	
	17	1	Frank hardness tester finetest	15-4-B0 395	Karl Frank	6855	7.84	
	18	1	Coordinate measuring machine					
	20	1	Surface roughness tester	15-4-B0 389	Mitutoyo		7.84	
	21	1	Defectometer	15-4 B0 539	Forster	2185		
	22	1	Metal Handbooks	15-4-C4 019	Jonson	700	7.84	
	22a		Metal Handbooks	15-4-C4 036	Jonson	130	"	
	23	1	Energy paper for metasinox	15-4-B 1021	Jenoptik	71		
	24	10	Materials for preparing metallograph Specimen	15-4-B0 834	Struers (D)	752	11.84	
	25	1	Metallograph photolabor					
	28	2	Diamond - cone	15-4-B0 912	VEBN Leiprig	290.-		
	29	10	Magnetic particle powder	15-4-B0 627	Magnaflux	795	10.84	

1	2	3	4	5	6	7	8	9
83/13	1		Glassware	15-4-B1014	Prolabo	3992		
	2		Chemicals	15-4-B1011	Bodo	3245		
				15-4-B1013	Gallenkamp	6825		
83/15	1	1	Chemicals and culture media	15-3-BO 1170	Oxdid	1460	25.1.84	
83/27	1	1	Project Car	15-3-BO 1040	Toyota	8191	9.2.84	Toyota Crown MS 112 R/L SEDGS Plate no 290 52-77
83/28	1	9	Room airconditioning Units	15-4-BO 265	Sanso Co.	7375	15.4.84	
84/2	1	1	Chemicals for food and chemical testing lab.	15-4-BO 873		3744		
	2	1	Glassware for food and chemical testing lab.					
	3	1	Accessories for food and chemical testing lab.					
84/3	1	1	Borosilicate glass distilled water Still					
	2	1	Flame photometer	15-4-BO 684		1888		
	3	1	Membrane compressor					deleted
	4	1	Thin Layer Chromatography	15-4-BO 651		2860	10.84	
84/4	1	1	VCI Hardness tester	15-4-BO 862		16460		
	2	1	Ultrasonic Wall Thickness Gauge	15-4-BO 862 A		4900		
	3	1	Sonic Velocity Gauge			3200		
	4	6	Alluminium Oxid Power			400		
	5	1	Tool Box Set	15-4-BO 649		325		
	6	1	Cutting Machine Portable	15-4-BO 798		535		
	7		Accessories for Frank Hardness tester	15-4-BO 700		630	11.84	

1	2	3	4	5	6	7	8	9
84/4	8		Accessories for Ultrasonic Flow Detector	15-4-B0 901 15-4-B0 901		1862 1633		
	9	1	Electrical Soldering iron	15-4-B0 649				
	10	1	Circuit tester	15-4-B0 803		95	11.84	
	11	1	Episcop projector opaque	15-4-B0 616		1196	11.84	
	159	items						

List of equipment for Project DP/VIE/81/006 - Centre III (HCM City)

(Actual on 30.11.1984)

ANNEX 7b

Req. No	Item	Quant.	Description	Purchase Order No	Supplier	Approx Cost US($) as per PO	Delivery date	Remarks
1	2	3	3	4	5	6	7	8
83/4	2	1	Set of Reference standard weights	15-4-BO 657A	Mettler	2690		
	3	1	Top loading Balance	15-4-BO 657	"	1965		
	4	1	Top loading Balance					
	5	2	Set of Secondary standard weights	15-4-BO 657A				
	6	1	Standard flowmeters for petroleum	15-4-BO 756	BOOP (A)	12215		
	7		Stand flowmeter for water					
			Wazav-Dynamometric-Bridle	15-3-BO 917	Wazo	1421	11.5.84	
	8		Accessories for Gauge blocks calibration	15-3-BO 922	C.E.Johanson	1890	23.1.84	
	9		V. Block with clamp	15-3-BO 938	Mahr	2098	9.1.84	
	10	2	Parallel Block with Four V.	"	"		"	
	11	1	Gauges for Calibration of SIP	15-4-BO 679	SIP	1025	11.10.84	
	12		Setting Ring gauges	15-3-BO 924	SIP	4802	26.4.84	
	13		Line - standard	"			"	
	14	1	Surface plate of Granit	15-4-BO 739	Starrett	1178	21.11.84	
	15	1	Thread Setting plug gauges and thread setting Ring gauges	15-3-BO 938	Mahr		9.1.84	
	16	1	Right Angle standard	"	"		"	

1	2	3	4	5	6	7	8	9
	17	2	Hardened square with knife	15-3-BO 938	Mahr		9.1.84	
	18		Tool maker's knife	"	"		"	
	19	2	Surface thermometer	"	"		"	
	20	1	Precision frequency measurement counter	15-3-BO 1039	Philips	4105	15.01.84 30.3.84	
	21	1	Voltage divider type 1133	15-3-BO 921	Tottex AG	1710	21.11.83	
83/14	1	1	Instrumentation for measurement and calibration of Reservoir tanks	15-4-BO 528	Simons	1742		
	2a	3	Hydraulic gauge testers					
	2b	2	Oil/Water	15-4-BO 361	GAUGE	7940	17.7.84	
	3	1	Pressure gauges					
	4	1	Vacuum gauge					
	5		Screw thread connections Metric Pressure gauges: 5a-5c					
	6	1	Hydraulic comparator Machine					
	7	1	Stereo Microscope for observation	15-3-BO 1462	Feinmechnik	1251	23.3.84	
	11		Accessories for Hilger for 11a-11c	15-4-BO 523	Taylor Hobson	2220	2.8.84	
	13a		Pocket Mechanical Roughness	15-4-BO 680	Dubort (UK)	438		
	14		Accessories for talysurf	15-4-BO 406	Taylor	4192	3.7.84	
	15	1	Ice Bath	15-4-BO 490	Noto	818	6.2.84	

1	2	3	4	5	6	7	8	9
	16	1	Primary Pt Resistance thermometer	15-4-80 691	Tinsley	1756		
	18	1	VIF Receiver/Comparator					
	19	1	Precision current supplier	15-4-80 497	Siemon	4980		
	20	1	Shunt box	15-4-80 973	Fluke	1599		
	21	1	Resistances	15-4-80 554	Tettax	2085	28.8.84	
	22	1	Digital Multimeter	15-4-80 491	Siemens	6915		
	23	1	Phase shifter	15-4-80 497	"			
	24	1	Standard cos Motor	15-4-80 491	"			
	25	1	Standard Frequency meter	"	"			
	26	1	Standard cos meter	"	"			
	27	12	Mercury cell	15-4-80 517	Sullivan	665	23.10.84	
	28	1	Test box	"	"		23.10.84	
	29	1	DC Power supply	"	"			
	30	4	Power supply for DC (batteries)	"	"		23.10.84	
	31	10	Wire connecters	"	"		23.10.84	
	32	2	Set of Alcohol hydrometers	15-4-80 566	Astell Hearson	425	11.9.84	
	33	4	Saccharometers	"	"		11.9.84	
	34	1	Viscometers	15-4-80 729	Gallenkamp	380	15.11.84	compare req.83/2 item 9
83/16	1	1	Universal testing Machine					
	2	1	Compression Device	15-4-80 421	Wallace	20365	7.9.84	
	3	1	Direct reading Density	"	"		"	

1	2	3	4	5	6	7	8	9
83/16	4	1	Shaw Bury curometer	15-4-80 421	Wallace		7.9.84	
	5	1	Four cavity specimen	"			"	
	6	1	Apparatus for Mechanical stability testing	15-4-80 457	Klaxon	2157		
	7	1	Repra total solids content T.S.C/ Apparatus	15-4-80 421	Wallace		7.9.84	
	8	1	Rosilonotor - " Lupko " type (pondulun)	"	"		"	
	8a	6	Six specimen (3 plates)	"	"		"	
	9	2	Test specimen cutting oils	"	"		"	
	10	1	Flexing Machine for 10a, 10b, 10c	"	"		"	
	11	1	Mooney Disc Viscosimeter	15-4-80 951	Labor Instr	10905		
	12	1	Stainless steel sieves					
83/17	1	1	Concrete test harness	15-3-80 1564	ELE	29295	14-3-84	
	2	1	Testing Anvil	"	"		"	
	3	1	Pundit ultra sonic concrete tester	"	"		7.5.84	
	4	10	Coupling Agent	"	"		14.3.84	
	5	1	Field and Laboratory scale	"	"		"	
	6	1	Spatula 200 x 32 mm	"	"		"	
	7	1	Trowel gauging	"	"		"	
	8	1	Small accelerated	15-3-80 1564	"		"	
	9	1	Curony tank					
	9	1	Temperature chart Recorder	"	"		7.6.84	
	10	10	Circular charts	"	"		"	
	11	1	Density spoon	"	"		"	

1	2	3	4	5	6	7	8	9
83/17	12	1	Lime putty Density vessel	15-3-80 1564	ELE		14.3.84	
	13	10	Glass plate 100 mm S	"			"	
	14	2	Le chatelier Flask	"			"	
	15	1	Semi Auto Balance	"			"	
	16	1	Water container	"			"	
	17	1	Air-tight container	"			"	
	18	1	Weight Set	"			"	
	19	1	Water pump " ERBUT "	"			"	
	20	1	Aluminum scoop	"			"	
	21	1	Stainless trowl	"			"	
	22	1	Wax ladle	"			"	
	23	1	Quatering tray	"			"	
	24	2	Stainless steel tray	"			"	
	25	1	Stainless steel tray	"			"	
	26	1	Proctor penetrometer spring type	"			"	
	27	1	Set of needle points	"			"	
	28	1	Pipette	"			"	
	29	1	Case for proctor penetrometer	"			"	
	30	1	Thermometer protected	"			"	
	31	1	Laboratory thermometer	"			"	
	32	2	Mason Hydrometer Zinc scale	"			"	
	33	1	Standard sand 850-600 micron	"			"	
	34	1	Flexural tensile machine	"			7.3.84	
	35	1	Flexural Jaws	"			"	

1	2	3	4	5	6	7	8	9
83/17	36	1	Density Bottle	15-3-00 1564	Ele		14.3.84	
	37	1	Density bottle	"			"	
	38	6	Le chatelier Mould	"			"	
	39	1	Three-gang Mould	"			"	
	40	1	Feeding Hopper	"			"	
	41	1	Scraper - El 39-113	"			"	
	42	1	Cutrock ct 200 Cutting And trimming Machine	"			"	
	43	1	Diamond Cutting wheel	"			7.6.84	
	44	1	Cutrock LMS 100 lapping Machine	"			14.3.84	
	45	1	Polishing Cloth El 78-288	"			14.3.84	
	46	1	Tain Section Slide Holder	"			7.6.84	
	47	1	Silicon carbid carborundum grit 120	"			14.3.84	
	48	1	Silicon carbid carborundum grit 3 F	"			7.6.84	
	49	1	Aluminum oxide aloxide F 600	"			"	
	50	1	Aluminum oxide Alexide F 1000	"			"	
	51	1	Jelting table	"			14.3.84	
83/18	1	1	Microtome	15-4-00 952	Labor Instr.	8121		
	2	1	Fibre cutting Device	15-4-00 428	Labsco	100	18.10.84	
83/19	1	1	Flammability tester	15-3-00 1108	Halifax	7330	29.12.83	
	2	5	Mercury tungsten Fluorescent lamp	"	"		"	

1	2	3	4	5	6	7	8	9
83/19	3	2	Blue wool light fastness testing standard	15-3-DO 1108	Halifax		28.12.83	
	4	2	Grey scales for Assessing change in colour	"			"	
	5	2	Grey scales for A sessing staining	"			"	
	6	3	Glass Globle	15-3-DO 1298	Suga	2485	23.2.84	
	7	20	Carbon electrodes	"			"	
	9	6	Abrading wheels	15-4-DO 837	Textest	610	18.10.84	
	10	1	Analytic balance	15-3-DO 1107	Textest	1666	16.4.84	
83/20	1	1	Viscosity flow cups	15-3-DO 1134	Sheen	6081	23.3.84	paint testing
	2	1	Falling block impact tester	"			"	
	3	1	Salt spray cabinet	"			"	
	3a	1	Oil Free compressor	"			"	
	4	1	Film Applicator	"			"	
	5	1	Wet film thickness Gauge	"			"	
	6	1	Pendulun hardness Rocker for tests	"			"	
	7	1	60° specular Glossmeter	"			"	
83/21	1	1	Gurley type Sizing tester	15-3-DO 1148	Ogawa-seiki	670	9.1.84	paper testing
	2	1	Permeameter	15-3-DO 1147	Labor-Instr.	5312	7.6.84	
83/22	1	1	Air Bath	15-3-DO 1099	Gallenkamp	1228	23.3.84	
	2	2	Desicator	"			"	

1	2	3	4	5	6	7	8	9
83/23	1a	1	Thin Layer chromatography kit	15-4-00 254	Denge	3910	24.4.84	
	2	1	Gerber centrifuge or Milk	15-4-00 251	Astell	2410	29.2.84	
	3a	2	Milk Butyrometer	"			"	
	3b	1	Cream Butyrometer	"			"	
	4	3	Alcoholmeter	15-3-00 1423	Labor Instrument	3995	15.5.84	
	5	5	Babcock bottle	15-4-00 251	Astell			
	6	1	Thermostatic water bath	15-4-00 954	Labor Instr.	626		
	7	2	Labor Instruments	15-4-00 269	Gallenkamp		7.6.84	
	8	2	Ultraviolet dark room	15-4-00 653	Townson+Mercer	2645	7.6.84	
	9	1	Mettler Balance	15-4-00 270	Mettler		"	
	10	2	Air pump	15-4-00 269	Gallenkamp	3945	"	
	11	1	Moisture Extraction	"			"	
	11a	1	Spares Kit	"			"	
	12	1	KJeldahl Apparatus	15-3-00 1423	Labor Instr.		15.5.84	
	13	1	Grand water Bath BDC	15-4-00 290	Townson+Mercer	4490	7.9.84	
	14	1	TCR spray	"			"	
	15	1	Vacuum DO power supply	"			"	
	16	1	Metal- Mixer	15-3-00 1423	Labor Instr.		15.5.84	clnim
	17	1	Device for paper chromatography and Electrophoreric	15-4-00 290	Townson+Mercer		7.9.84	
	18	1	Tube shaker/Stirrer	"			"	
	19	1	Orbital shaker	"			"	
	19a	1	Flask Platform	"			"	

1	2	3	4	5	6	7	8	9
	20	1	Mettler Balance	15-4-80 270	Mettler	4835	7.6.84	
	21	1	Copying Device	15-4-80 351	Nissei	2500		
	21a		Chemicals	"				
83/24	1		Glassware	15-4-80 279	Gallenkamp	7355	7.6.84	
	2		Glassware	15-4-80 280	Tomson	77	3.7.84	
83/25	1		Chemicals/P.A. Grade	15-3-80 1168	B D H	10030	30.5.84 29.8.84	Parcel post (0,73 kG)
	2		Chemicals and ACo Accessories	15-3-80 1163	Pye Unicam	5645	14.3.84	
83/26	1	1	Centrifuge	15-3-80 1164	Gallenkamp	3140	24.2.84	
	2	1	Combustion tube	15-3-80 1343	Fisher	297	14.3.84	
	3	1	Sand Bath	15-3-80 1164	Gallenkamp		24.2.84	
	4	1	Fractional Distillation Apparatus	16-3-80 1164	Gallenkamp	510	"	
	5	1	Gas Analyser					
	6	1	Hydrogen sulphide Generator	15-3-80 1164	Gallenkamp		24.2.84	

1	2	3	4	5	6	7	8	9
83/26	7	1	Heating Mantless	15-3-00 1164	Cullenkamp		24.2.84	
	8	1	Heating Mantel	"			"	
	9	2	Stopwatch	"			"	
	10	1	Glass cutting knife	"			"	
	11	1	Hotplate	"			"	
	12	1	Telve Heating Mack	"			"	
	13	1	Polarograph	15-4-00 464	Towson Mercer	30,000	28.2.84	Claim
	14	1	Heating elements for sulfur analyser	15-3-00 1343	Fisher		14.3.84	

1	2	3	4	5	6	7	8	9
84/1	1	1	Items for Pye Unicam GCD Gas chromatograph	15-4-BO 712		15,667		
	2	1	Stainless steel Analytical Columns					
	3	1	Parts for 529 AA Spetrophotometer					
84/5	1	1	Binoculer Microscope	15-4-BO 1003		2,300		
	2	1	Diaphanoscope					
	3	2	Bell jar, or Jacobson Apparatus					
	4	1	Seed counter	15-4-BO 994		2,910		
	5	1	Refrigimtor					
	6	1	Simple Divider					
	7	1	Laboratory Sieving Machine	15-4-BO 995		1,390		
	184	items						

List of additional equipment for project DP/VIE/76/013
(Actual on 30.11.1984) Centre III (HCM City)

ANNEX 7c

Req. No	Item	Quant.	Description	Purchase order No	Supplier	Approx cost US ($) as per P.O.	Delivery date	Remarks
1	2	3	4	5	6	7	8	9
83/1	2	1	Sample sheller					
	3	1	Magnifier	15-3-BO 1099	Gallenkamp	255	25.3.84	
	4	1	Violet lamp seed trier					
	5	1	Seed Ruler					
	8	1	Moisture meter gr	15-4-BO 353	Towson-Mercer	485	17.7.84	
83/2	1	1	Universal testing Machine	15-4-BO 473	VEB Thuringer	33585	22.11.84	
	2	1	Zwiek hardness tester	15-4-BO 372	K.Frank	6856	9.84	
	3	1	Tester of Metalic conting thickness	15-4-BO 656	Mitutoyo	432	15.11.84	
	4	1	Inside threads Micrometer	15-3-BO 1268	Sampoh	487	23.3.84	
	5	1	Outside thread Micrometer	"			"	
	6	1	Gear teeth vernier Caliper	15-4-BO 379	Mahr	345	5.6.84	parcel post 1 kG
	7	3	Abrasive Belts	15-3-BO 1269	Buehler Met	3,800	7.4.84	
	8	4	Diamond waferzing Blade	"			"	

1	2	3	4	5	6	7	8	9
83/2	9	4	Mounting compund transparent	15-4-80 729	Gallenkamp		15.11.84	see req. 83/14 item 34
	10	10	Powder concentrates	15-4-80 407	Magnoflux	583	15.6.84	
	11	20	Magnetic Inks					received
	12		Abrasive powders for Metallographic polishers	15-4-80 769	Struers (D)	1295	25.9.84	
	13	1	Surface temperature Indicator	15-4-80 670	Yokogawa	160	18.10.84	
	15		Accessories for milling Machine	15-3-80 1266	Bridge port	3414	19.5.84	
	16	20	Band-saw Blades	15-4-80 377	Startrite	665		
	17	1	Torque driver	15-4-80 563	Tochnichi	2850		
	17a	1	Torque wrench	"	"			
	17b	1	Torque wrench checker	"	"			
	18	2	Compressor for air cool unit " carlyle"	15-3-80 1267		1765	15.6.84	
83/3	1	1	Digital Multimeter	15-3-80 1053	Philips	2861	16.1.84	
	2	3	Multimeter for ordinary use			708	9.1.84	
	4	1	Megohmmeter-insulation Tester	15-3-80 1058	Yew	4690	27.3.84	
	5	1	Insulation tester	15-3-80 792	Labsco	4590	23.2.84	

1	2	3	4	5	6	7	8	9
83/3	5	1	Precision Automatic Digital Rol meter	15-3-DO 1053	Philips		16.1.84 30.3.84	
	6	1	Portable thermometer	15-3-DO 1058	Yew		27.3.84	
	7	2	Decade Resistance box	"			"	
	8	1	Slide Resistors	"			"	
	9	1	Portable luxmeter	"			"	
	10	1	Portable frequency meter	"			"	
	11	1	Electronic tachometer revtester	15-4-DO 806	Yokogawa	202		
	12	1	Insulation polyester	15-3-BO 1058	Yew		27.3.84	
	13	1	Standard Incandescent and fluorescent lamps					
	14	1	High voltage testing Unit	15-3-DO 1070	Siemens	12455	9.1.84	
83/4	1	1	Project Car Peugeot	15-3-DO 1041	Sodexa	6740	3.5.84	Peugeot 504 MAO
			Spare parts for Peugeot	15-3-DO 1041A	France	1680		Eng. no 7940102663 plate No 500 32-11
	40	items						

List of equipment Received for project VIE/76/013 - additionally ordered in 1982

ANNEX 7d

Req. No	Item	Quant	Description	Purchase order No	Supplier	Approx cost US ($) as per Req.	Delivery date	Remarks	Actual cost per invoice
1	2	3	4	5	6	7	8	9	10
82/1	1	1	Drying time Recorder	15-2-DO 566	Sheen	650	29.9.82		3192
	2	1	Scratch tester (hand operated)	"	"	490	29.9.82		
	3	1	Standard Bend Test Units	"	"	60	29.9.82		
	4*	1	Adhesion Tester	15-3-DO 258	Erichson	800	22.4.83		3756
82/2	1	2	Outside Micrometer	15-2-DO 580	Mitutoyo	340	4.3.83		260
	2	1	Mini - Microscope			110			
	3	3	Clear Cupes			50			
	4	2	Dual test Indicators			150			
	5	1	Dise type outside micrometer			40			
82/3	1	1	Reciprocater Air Pump	15-2-DO 1016	Gallenkamp	400		Item 1,2,4,5, 6,8,9	1170
	2	6	Refill L.P.G. Contsiner (Cylinder)			540			
	4	1	Clamp electrode/thermometer holder			30			
	5	1	Accessories and spares (colorimeter)			250			
	6	1	Glass adaptor part 13			50			

1	2	3	4	5	6	7	8	9	10
82/3	8	3	Dessicator 200 m/m	15-2-DO 1018		860	8.4.83		
	9	2	Dessicator 219 m/m			500			
82/4	1*	1	Oil Bath MB Thermostatic	15-3-DO 791	F.C. Bode	2300	10.10.83		877
	2	1	Transforstandards 540B	15-2-DO 1335	Kennedy	5000	26.2.82		7844
	3*	1	Insulation Tester SM2	15-3-DO 792	Labsco	7500	23.2.84		4957
	4	5	Calculators EL 506 Sharp	15-2-DO 1132	Facit Addo	350	10.3.83		106
	5	5	Calculators EL 5100 Sharp			650			293
82/5	1	1	Fiber Blender	15-2-DO 913	Textest	3150	16.12.82		6228
	2	1	Micronaire			3720			
	3	1	MRRA Acping Oven	15-2-DO 824		3500			
	4	1	Rapid Plastiometer		HW Wallace	4500	21.5.83		6551
	5	1	Electric Steam Generator			3000			
	6	1	OSK 7199 Actinograph	15-2-DO 588	Ogawa seiki	500	29.9.82		490
82/6	1		Computting intogrator			3650			
	2		Injection head			400	Only Set of absorbance standards		
	3		Stainless steel analytical columns			740	See PO.15-2-DO 916		
	4		Glass to metal seale			50		shipment lost	
	5		Funnel			40		and reordered, covered by insurance	
	6		Hollow cathode Lamps			3600			
	7		Hydride kit			400		see 83/1	
	8		Uptake tubes			40		see Item 14	
	9*		Standards Chemicals of AAS grade	15-3-DO 278		350			2574

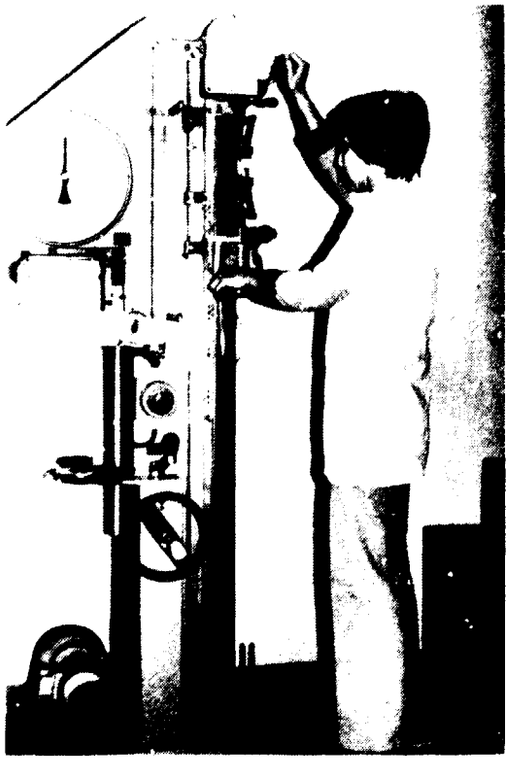
1	2	3	4	5	6	7	8	9	10
	11	1	Flame Photometer standards	15-2-DO 601	Corning	90	18.11.82	Item 11,18,19,20	647
	13	1	Rotary Evaporator	15-2-DO 585	Wallace	1600	25.5.83		1066
	14		Laboratory Chemicals	15-3-DO 278		250	see VIE/81/006	(83/1)- Item 9	
	15	3	Gas Pressure Regulators (O_2, C_2H_2, N_2)	15-3-DO 774	F.G.Bode	860			994
	16	1	Standard chemicals	15-3-DO 774					
	17	1	Rotating sample Holder	15-2-DO 1137	Gallenkamp	120	7.4.83		215
	18	1	Atomiser complete		Corning	550	18.11.82	See Item 11	
	19	2	Nebulizer Assy	15-2-DO 601	"	30	"		
	20	1	Air compressor 856		"	370	"		
	21	1	Literature and Educational Booklets			260			
82/7	1	1	Temperature Calibration Oil Bath	15-2-DO 777	Heto	2300	16.12.83		7048
	2	1	Temperature Calibration Bath			2500			
	3	2	Gradient Thermostat			1600			
	4	13	Standard Thermometers	15-2-DO 828	Gallenkamp	2800	21.7.83		2800
82/8	1*	1	Hardness Testing Indentors	15-3-DO 670	Kennedy	600	14.3.84		4137
	2*	1	Hardness Calibration Indentors	"		700		See 81/006 (83/1)	
	3*	1	Milling Cutters	"	Kennedy	650	28.12.83		9771
	4*	1	Transducers	"		1650			

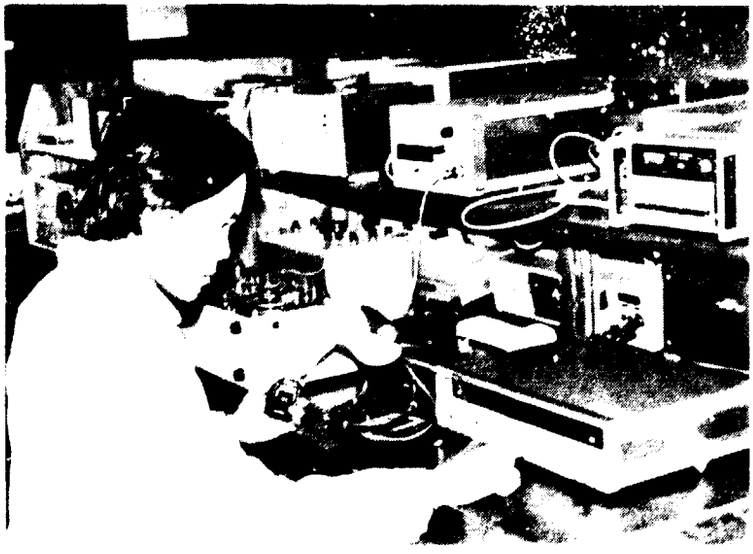
1	2	3	4	5	6	7	8	9	10
	5	3	Probes	15-2-DO 574	Inspection UK	2030	21.10.83		535
	6*	6	Rubber gaskets	15-3-DO 670	Kennedy	60		see Item 3,4	
	7*	6	Ultrasonic couplant	"		90			
82/9	1	1	Barriers	15-2-DO 0778	Ele	650	17.1.83	Item 1 to 12	8595
	2	12	Concrete Cube Moulds			900			
	3	1	Aggregate crushing value Apparatus			150			
	4	1	Organic Impurity Detection set			250			
	5	10	Calcium carbide Powder			150			
	6	1	Manometer "U" Tube			40			
	7	32	Saw Blades			860			
	8	1	Rubber headed Vibrating Tool			180			
	9	1	Tamping Foot			110			
	10	2	B.S. Visa Mould			130			
	11	1	Compressometer			350			
	12	4	Mechanical strain Gauges			880			
82/10	1	1	Comparator stand	15-2-DO 915	Johanson	460	8.2.83		3621
	2	1	Height Adjustor			170			
	3	1	Mikrokator			960			
	4	1	Gauge Blocks (112 Piece)			1600			

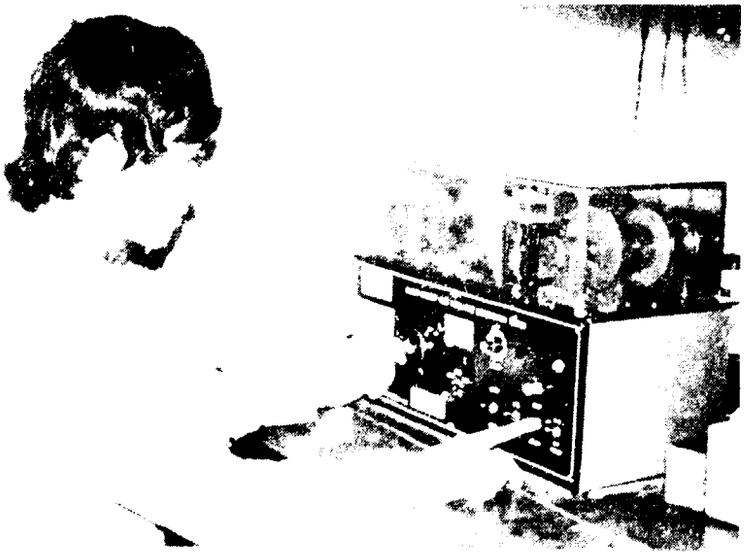
1	2	3	4	5	6	7	8	9	10
	5	2	Inspection Rule stainless lm	15-2-DO 920	Hommol	70	4.1.83		1676
	6	1	Measuring Tape 20 M			90			
	7	1	Halo Thread Micrometer 0 - 25 mm			150			
82/11	1	1	Ip Standard Thermometers (4 each)	15-2-DO 829	Gallenkamp	1200			642
	2	1	Contact thermometers (4 each)	"		900			
82/12	1	1	Digital voltmeter	15-2-DO 571	Datron	1300	29.9.82		1755
	2	1	Portable Thermocouple Potentiometer	15-2-DO 899	Norma	2600	16.12.82		1490
	4	2	Alumith ceramic Tube	15-2-DO 575	Lund	200	18.1.83		
	5	4	Alumina ceramic sheath Tube		Pyrometer				673
82/13	27	27	Handbooks 27 pes	15-2-R 4083	Denmark		1.4.83		1242
	75	items						Equipment delivered	85,216

ANNEX 58

PHOTO DOCUMENTATION - CENTRE I

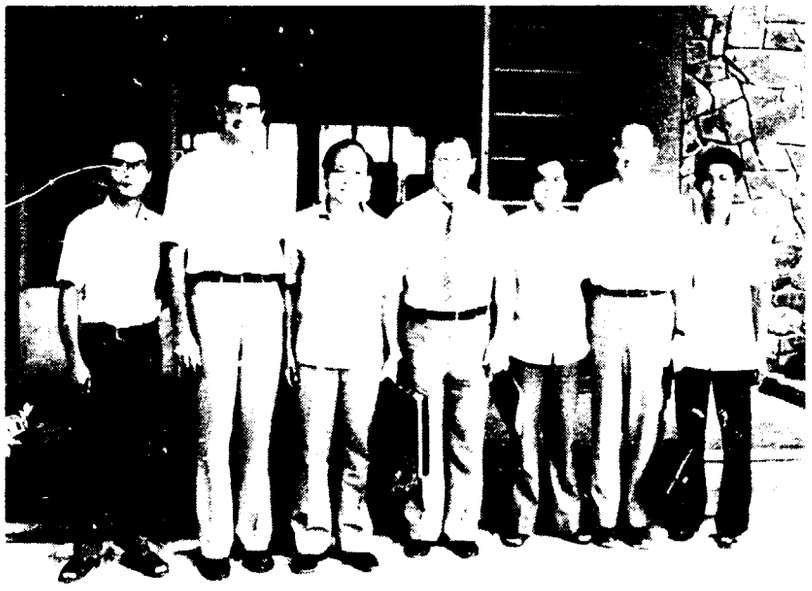






ANNEX 8b

PHOTO DOCUMENTATION - CENTRE III



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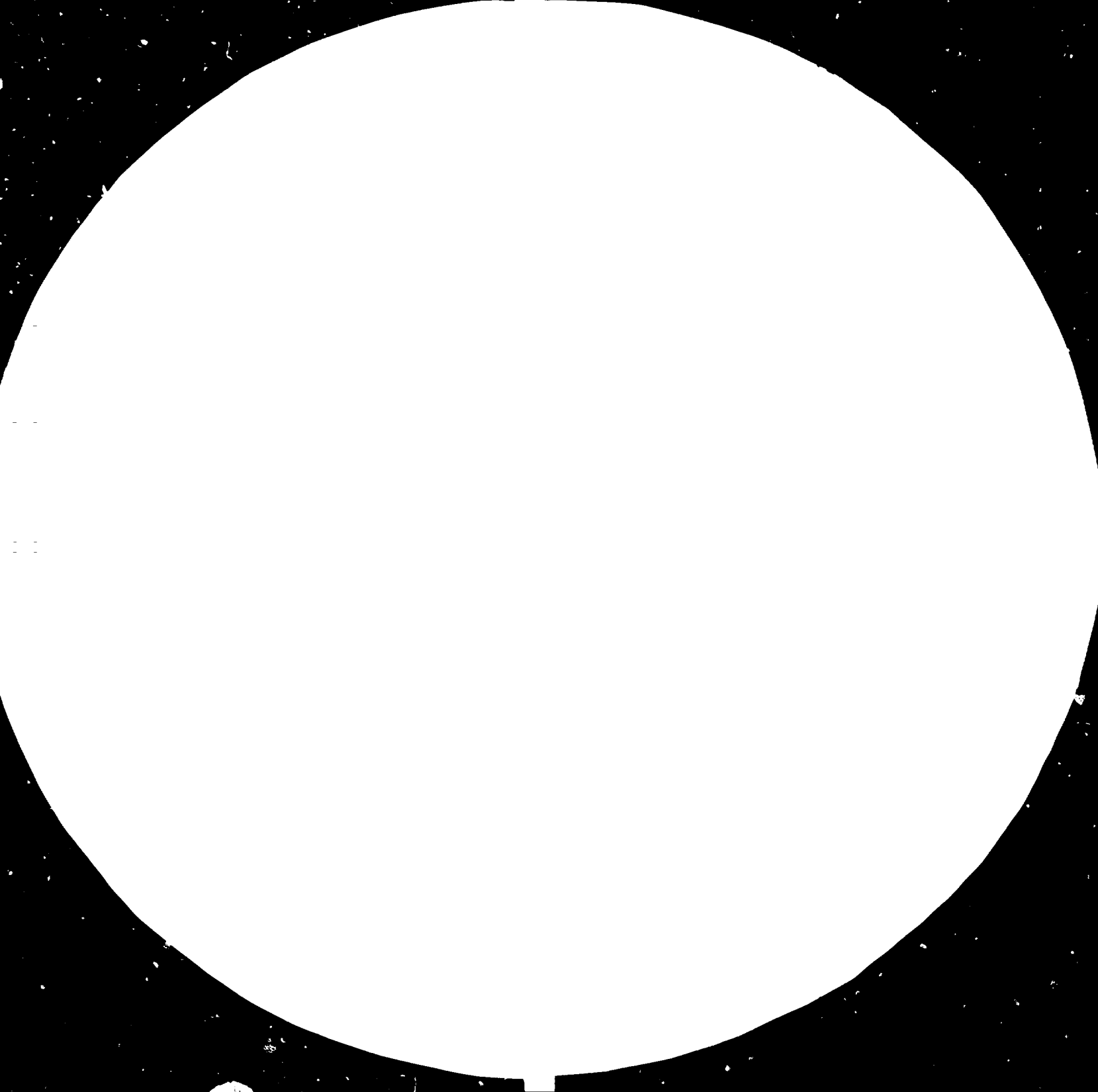

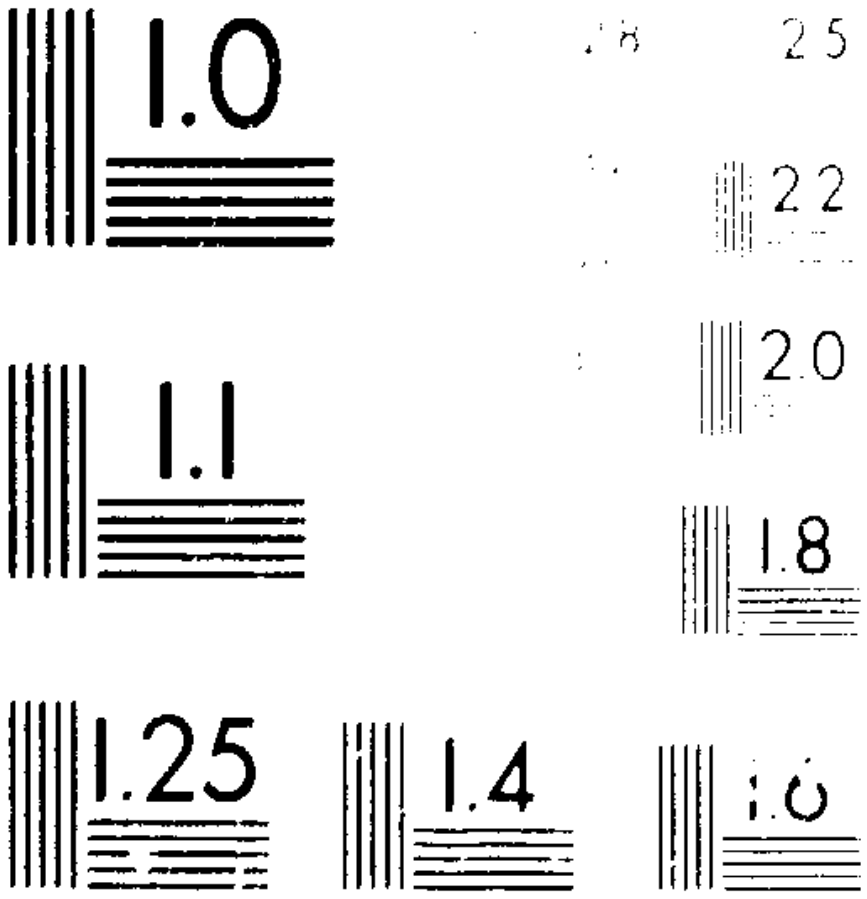
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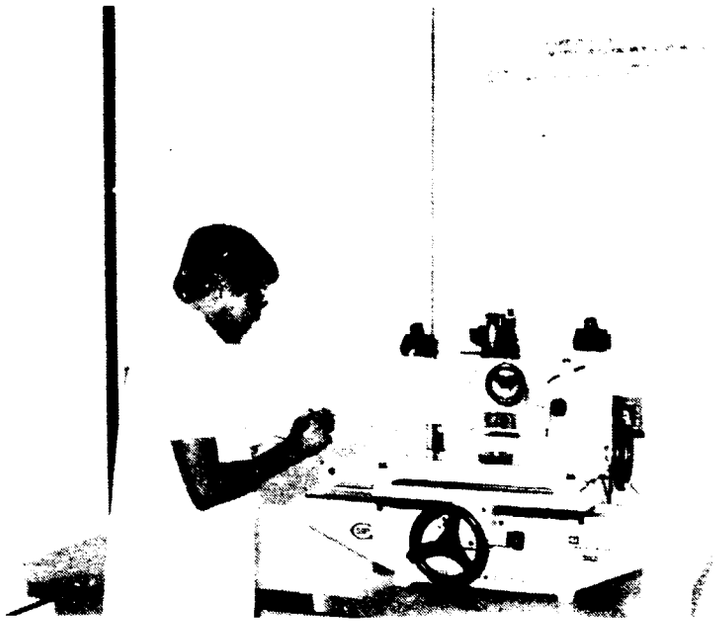
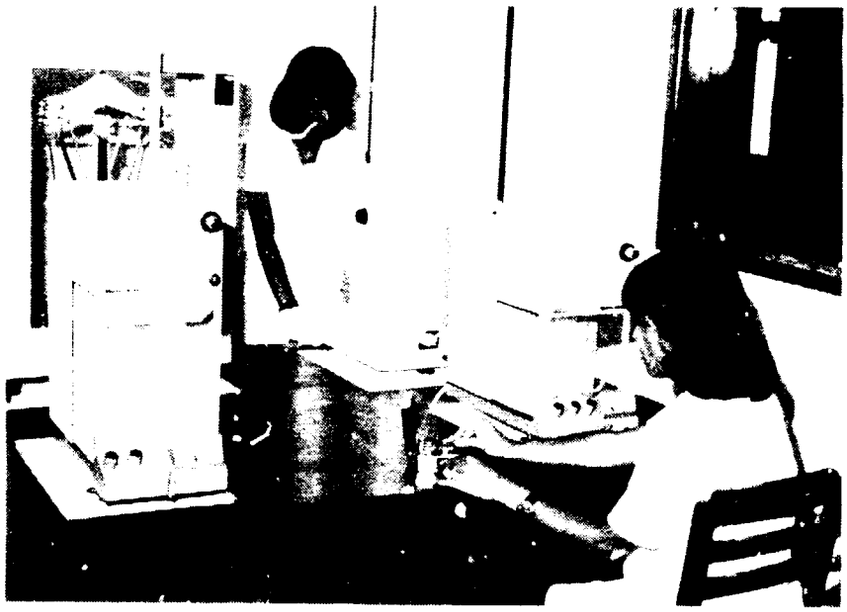
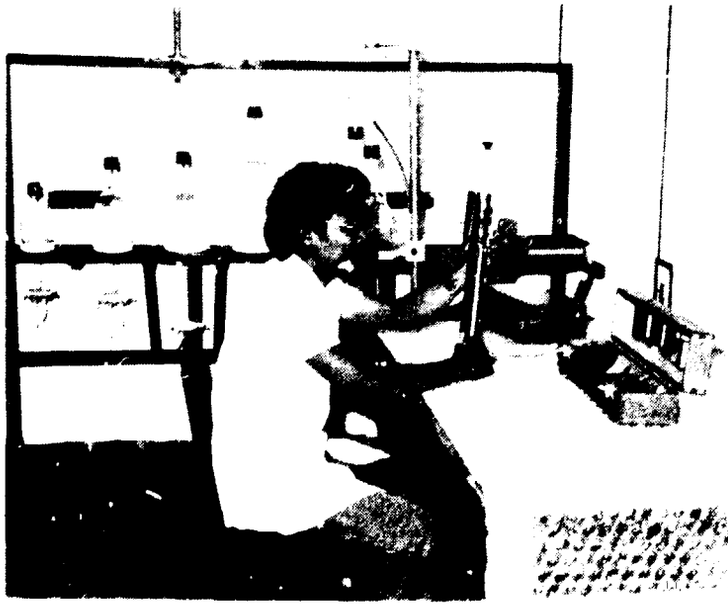
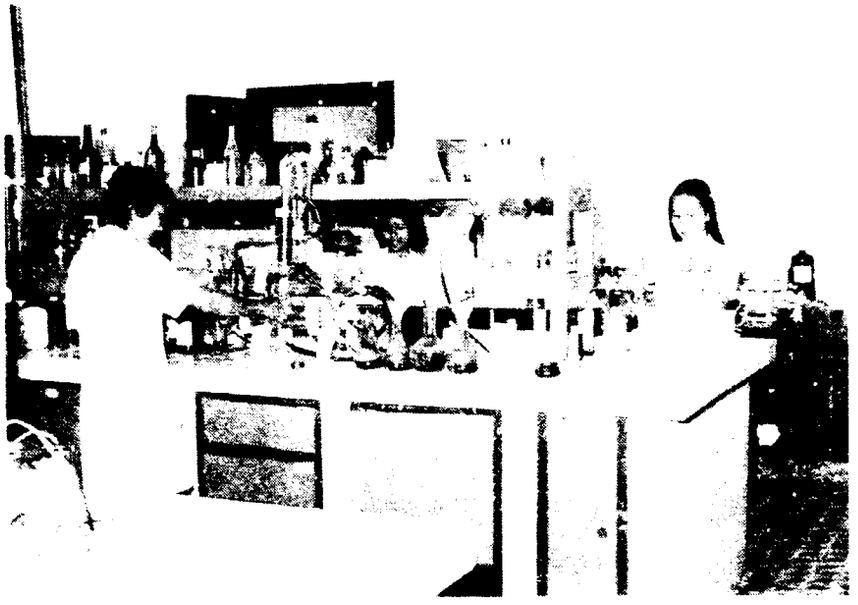
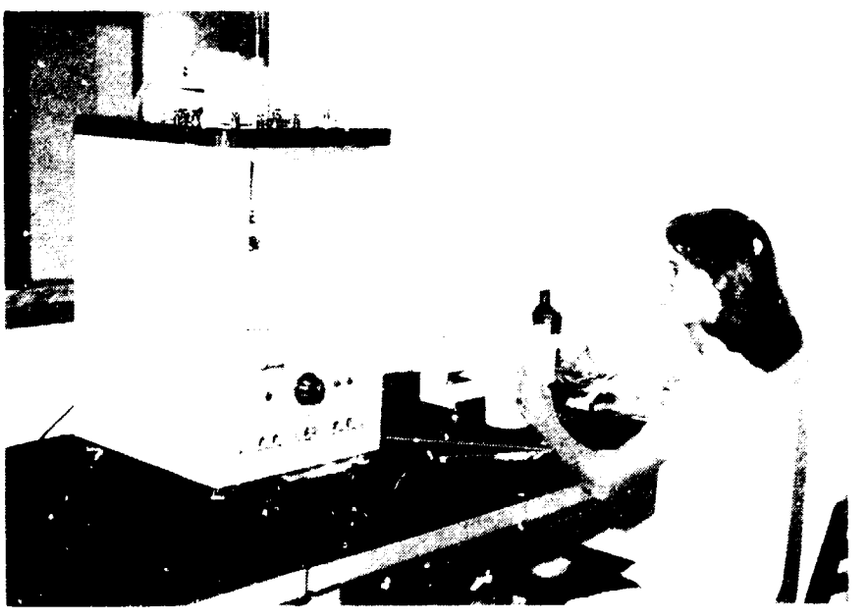
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

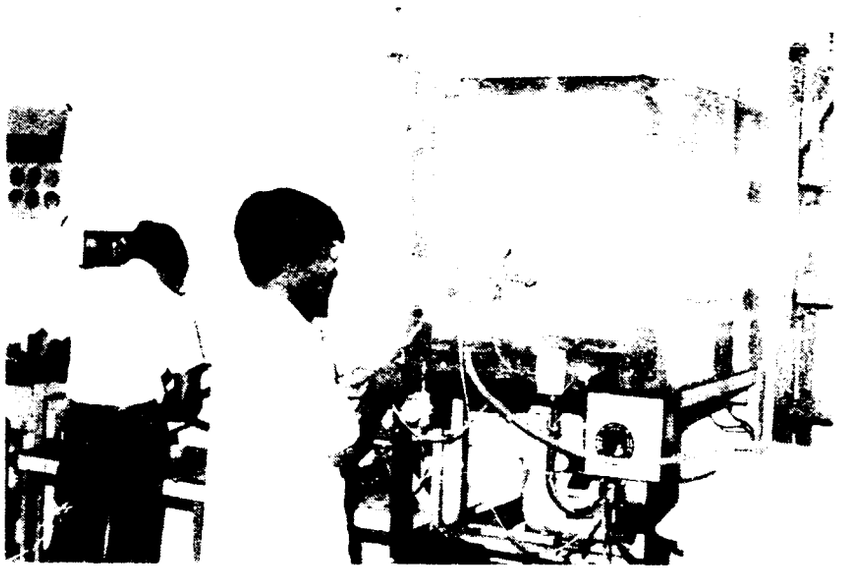


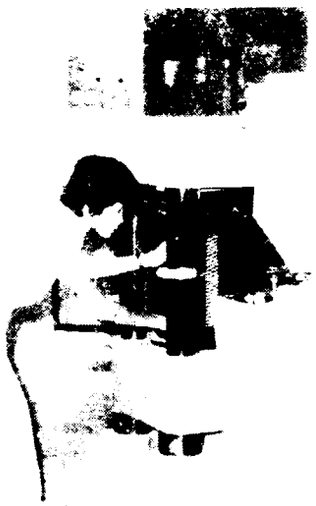


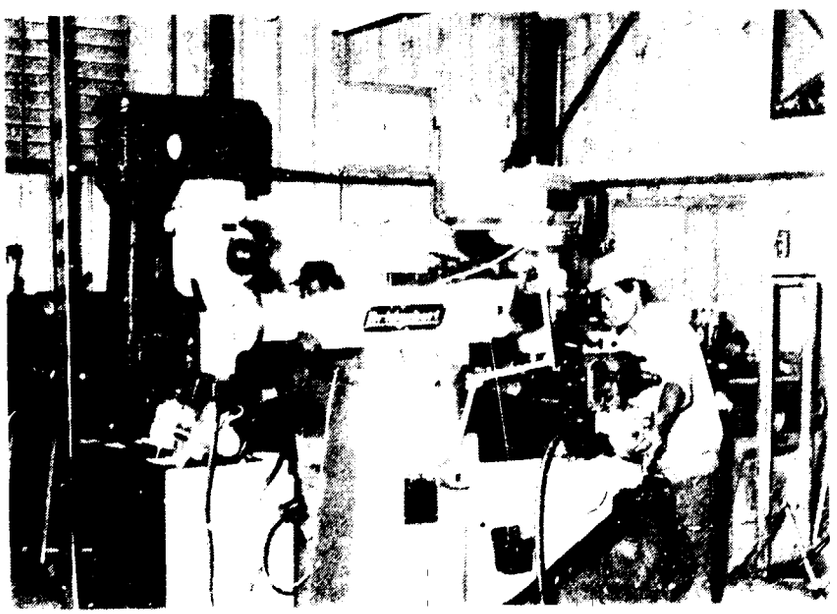


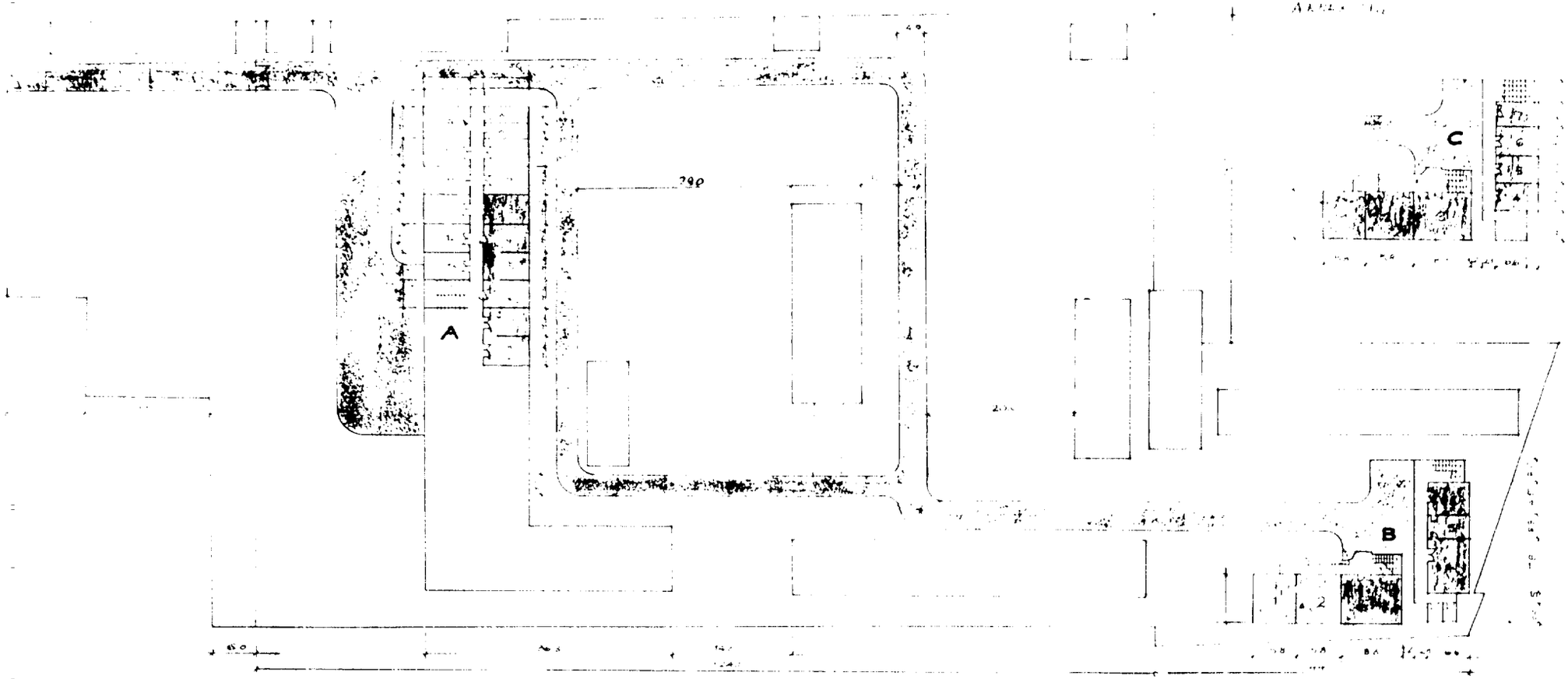










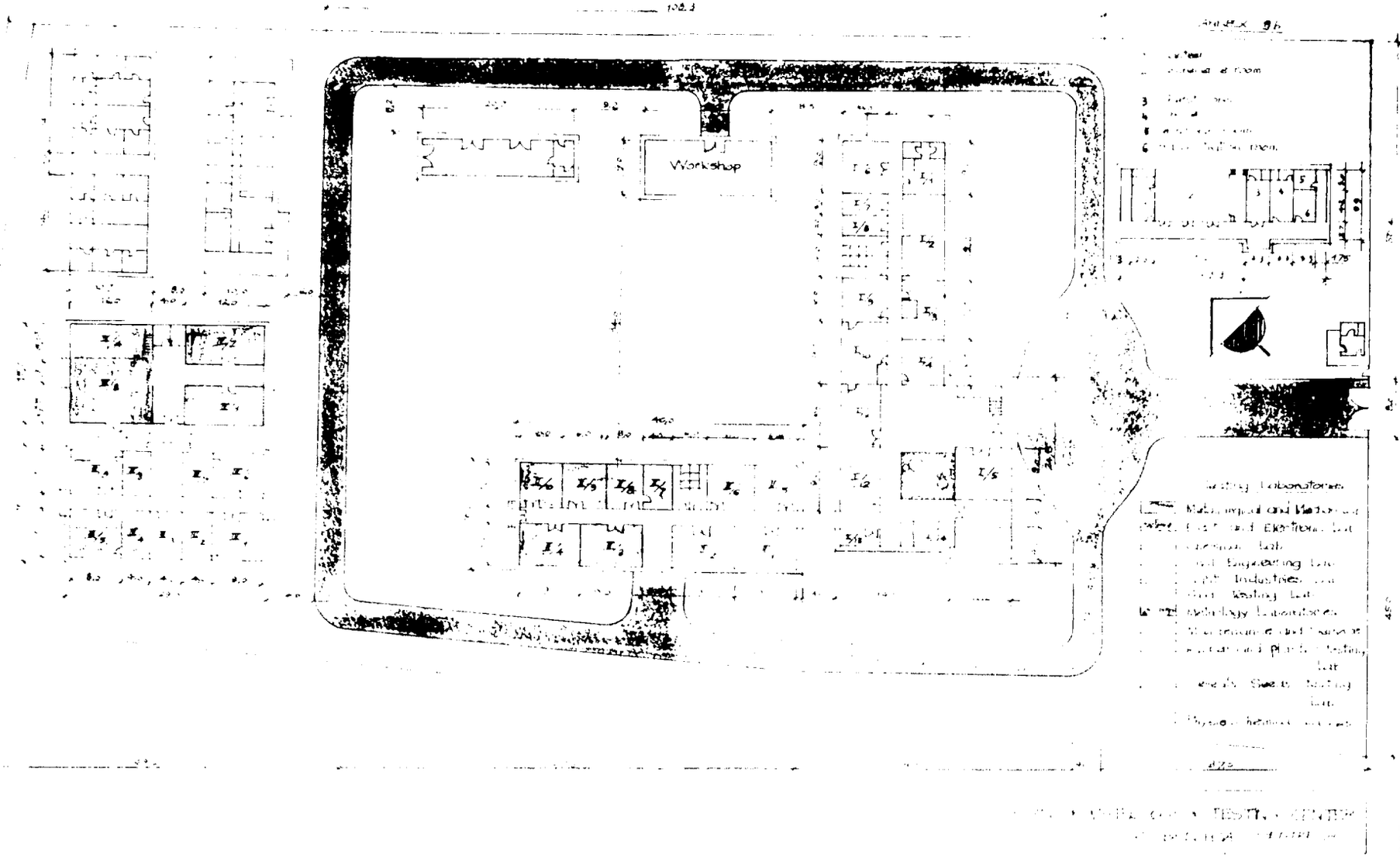


Testing Laboratories

- Chemical and food testing
- Light industry product testing
- Mechanical testing
- Electrical and electronic testing

A [illegible]
B Ground floor
C First floor

PLAN OF TESTING LABORATORIES
(CENTRE I, HANOI)


Workshop