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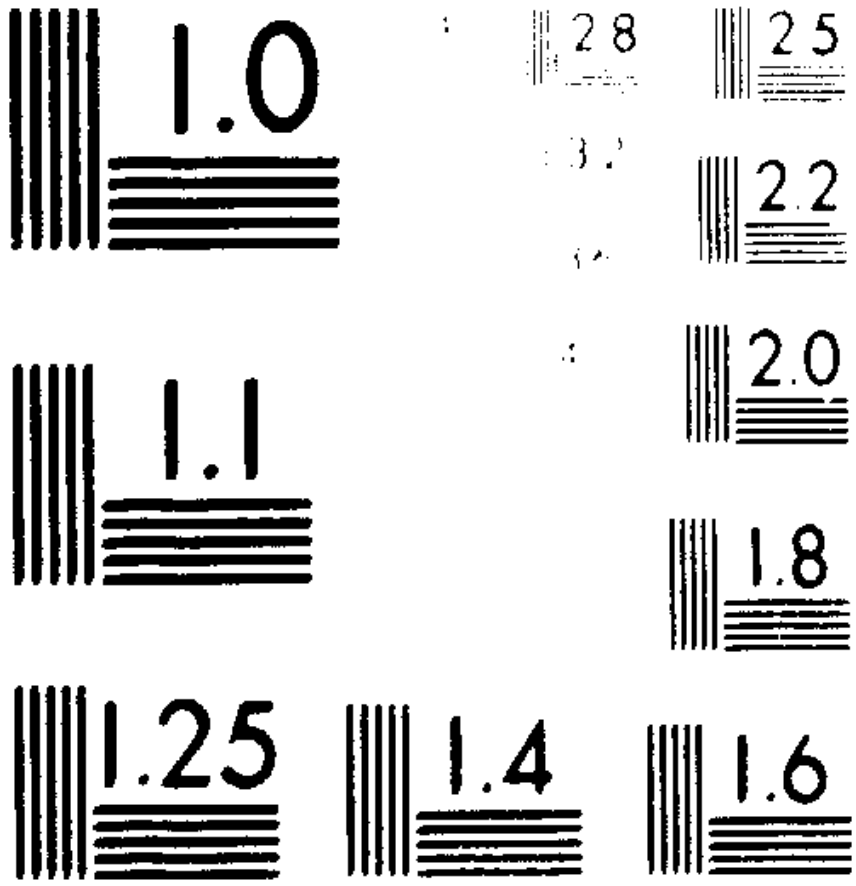

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RESTRICTED
JANUARY 1980

# INDUSTRIAL STANDARDIZATION AND QUALITY CONTROL

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

(IS/PDY/78/803/11-01)

PROJECT FINDINGS AND RECOMMENDATIONS

TERMINAL REPORT PREPARED FOR THE GOVERNMENT OF

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN



BY

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ACTING AS EXECUTING AGENCY FOR
THE UNITED NATIONS DEVELOPMENT PROGRAMME

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# INDUSTRIAL STANDARDIZATION AND QUALITY CONTROL
# P.D.R. YEMEN
# (IS/PDY/78/803/11-01)

## PROJECT FINDINGS AND RECOMMENDATIONS

Terminal Report prepared for
the Government of P.D.R.Yemen

By
Dr. E.M.A. SELIET
(Industrial Standardization And Quality Control)
Expert Of The United Nations Industrial Development Organization
Acting as Executing Agency For
The United Nations Development Programme



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## EXPLANATORY NOTES

References to dollars ($) are to United State Dollars Unless otherwise stated.

The monetary unit in P.D.R.Yemen is the DINAR (YD).

During the period covered by this report, the mean value of the DINAR in relation to the United States Dollar was $ US1=0.343 YD

References to "tons" are to metric tons.

The Following abbreviations used in this report are explained in the order in which they appear:-

ASMO: Arab Organization for Standardization and Metrology.

IDCAS: Industrial Development Centre for Arab States

ISO : International Organization for Standardization.

SIS : Standard Information Service of the National Bureau of Standards.

NBS : National Bureau of Standards

BSI : British Standards Institution

IEC : International Electrotechnical Commission.

OIML : Organisation International de Metrologic legale.

ISONET:Information Network

CAC : Codex Alimentarius Commission.

ILO : International Labour Organization.

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## SUMMARY

This mission is on the fund of special Industrial services. The expert was assigned 6 months to the Ministry of Industry in P.D.R.Yemen as an expert in Industrial Standardization and Quality.
The duty station is ADEN.
It was found that at present there are no standards available nor do any accepted facilities exist to enforce testing and inspection of procedure.
The immediate needs are:

1. Promulgation of the law for the establishment of the Democratic Yemen Organization for Standardization and Quality.
2. Approval for the three years plan sub-project running of the national organization for standardization.
3. Approval for the three years plan sub-project for the erection of the central quality control laboratory.
4. Permanent premises for the organization.

Advise is given in:

1. The Stipulations necessary for the site of the laboratory.
2. The programme of running the organization
3. The building programme of the laboratory
4. The laboratory equipment.
5. The laboratory Organization.
6. The priority of different activities.
7. Training courses.

Recommendations:
The main recommendations of the project were that:

1. A law be issued on the basis of draft law elaborated by the expert entitled the "Democratic Yemen Organization for Standardization and Quality"
2. Running this organization on the base of the proposed sub-project.

3. Urgent establishment of the Quality Control Laboratory on the basis of the proposed sub-project.
4. Enforcement of the standardization documentation.
5. Sharing in the regional and international activities in the concerned field.
6. Taking care for training on National, regional and international levels.
7. Taking care of Metrology activities.
8. A public relations officer be engaged.

CONTENTS

ANNEXES

# INTRODUCTION

## A. Preface

The expert, after his arrival in P.D.R.Yemen on 30 September 1979, met with Mr. Ahmed Hussein General Director of Production, in his office in the Ministry of Industry. The broad lines of the project were discussed, especially the law of Standardization and Quality. Then the expert was introduced by the Team Leader of the Advisory Unit to Mr. Abdulla Saeed Abaddan, Deputy Minister of Industry, where a briefing took place. During this meeting he was informed by the Deputy Minister, that beside the Job-description, they are also waiting from the expert for recommendations for any constructive suggestions in connection with the existing industrial factories.

## B. Project Background

The economy of the People's Democratic Republic of Yemen is primarily agricultural. Industrialisation being a recent feature of the economy, the government's policy in the current development programme is to raise the industrial development level aiming at the diversification of the economy.
The strategy of the second plan (1979-1983), has undergone a fundamental change. The emphasis and priorities earlier placed on agricultural and fisheries and social sectors, has now been shifted to Industrial sector, and other production sectors. The Industrial Sector has now been assigned a leading position with biggest allocation of 85.5 million Dinars claiming 23.12 % of the total outlay of 369.8 million dinars. At the same time onerous responsibility has been assigned to this sector to serve as a model sector,

Unlike other sectors which have a social aspects overshadowing economic viability, the Industrial Sector is expected to develop projects, economically and technically sound.

Since after independence on 1967, industrial public sector comprising a large textile factory, soap factory, tannery, diary and dairy products factory, oil-mill, agri-implements, salt factory, public bakery, flour mill, plastic factory, oxygen-acytelen factory, leather shoes factory, tomato paste, aerated water, ice factories, have come into operation. This is beside mixed sector which comprises paint factory, sandal factory, match factory, perfume factory and foam plastic factory.

Private sector factories also exist comprising ready-made garments, ice cream, nails, plastics factories. There is heavy pre-fabricated houses factory belongs to Ministry of Constructions.

New projects are now under investigation: viz., cement, beer, macaroni, expansions in safety match soft drinks and textile factories.

On general the structure of Industry in P.D.R.Y. is indicated in annex I.

As a result, the industrial sector is predected to sharing about 40% of the total National Income at the close of the second five year plan (1983). The law number 37/1969 was promulgated which established, for the first time in the Republic, a Ministry for Economics and Industry, then with the growing importance of the Industrial sector another law number 26/1971 was issued for establishment independent Ministry for Industry which organizes, supervises and supports the industry in the Republic.

In 1972 a law number 23 on industrial investments and the organization of the industry was promulgated.

The Ministry of Industry was given the responsibility to implement and supervise the application of the law in conjunction with a consultative inter-ministerial committee, are to entertain requests for permits from the public, mixed or private sectors for industrial enterprises, to consider applications for the various grants and privileges provided for the law and to work out policies for the application of such grants and privileges.

This law applies to all industrial enterprises. Thus industry in P.D.R.Yemen has not only diversified, but also is a rapidly-growing sector of increasing importance in the National Economy.

A sector of such growing importance should be safeguarded and protected by providing it with the necessary means for its healthy development. In this respect, the important role played by standardization cannot be overlooked. The wide adoption of in-plant and national standardization, and quality control activities, through proper machinery and procedures, would be an important factor towards reaping all the benefits that accrue from:

- The elimination of waste.
- The better and efficient use of local raw materials.
- The increase of productivity of manpower and equipment.
- The reduction of production and distribution costs.
- The internal organization of enterprises.
- The raising of the quality of goods and services
- The building up of public confidence in local production
- The protection of consumers
- The fairness in commercial transactions
- The development of import substitution industries.
- The control of imports.
- The promotion of exports.
- And hence the improvement of the national economy.

The importance of standardization as an efficient tool for industrialization was not overlooked by the authorities of P.D.R.Y., which asked assistance from UNIDO to prepare a draft standards law and to make proposals for setting up a national standards body. Also a decision of the cabinet number 32/1977 paragraph 3 concerning Standardization and Quality was promulgated to highlight the importance of standardization and quality for local industrialization.

## C - Official Arrangements

The project was requested by the government of P.D.R.Y. in Resident Representative's letter of 17 September'77, United Nations Industrial Development Organization (UNIDO) was designated the executing agency and the Ministry of Industry of P.D.R.Yemen co-operating agency. The project is for 6 months. The project became operational on 26 September 1979 when the UNIDO expert started his assignment. It terminated on 25th.March 1980. The counterpart staff is given in annex II.

## D - Objectives Of The Project

Long Term:

The long-term objective of the project is to improve national economy by strengthening standardization and quality control at the in-plant and national levels which will help to improve the quality of locally - produced goods, achieve higher added value, make the use of local indigenous raw materials more efficient, and reduce production costs. This, in turn, will help to ensure fairness in trade and commerce, control of imports, and promotion of exports.

Short-Term:

The immediate objectives are to study the existing industrial sector of economy and the government industrial policies.
Prepare a draft industrial standards law and any necessary regulations.
Make recommendations for running of a National standards body.

Draw up a complete study for a laboratory facilities for standardization and quality control.
Working out a training programme for national staff required to operate these facilities in the future.

## E - This Mission:

This assignment was undertaken to assist the Government in preparing a draft industrial standards law and in working out proper institutional arrangements for standardization activities in the country with the objective of setting up a National standards body which can provide facilities for studying preparing, issuing and promoting standard specifications and for certifying products which can meet the specifications.

The duty station is ADEN P.D.R.Yemen.
The Job-Description is attached as Annex III.

## I. FINDINGS

To provide a sound basis for the proper planning and execution of project activities, the following studies were carried out:

a) A general study of the educational and social structure of PDR Yemen.

b) A detailed study of the economic structure with emphasis on the industrial sector its history, growth and prospects;

c) A detailed study of industrial laws relating to the promotion and encouragement of industry namely:

   i) The law number 37/1969 concerning nationalization of foreign institutions working in the field of foreign trade; according to this law it was established for the first time a Ministry for Economics and Industry.

   ii) The law number 4/1970 concerning nationalization of all factories working in the field of exploitation of salt.

   iii) The law number 30/1970 concerning the taxation for all imports in variable percentages as custody for the newly born industry.

   iv) The law number 23/1972 on industrial investments and the organization of the industry.

   v) The law number 26/1975 for establishment of independent Ministry for Industry.

   vi) The law number 13/79 for organization of the institutions of the Republic.

d) Field studies of the standardization

e) Field studies of quality control.

f) Field studies of the functions of testing.

laboratories in P.D.R.Yemen

g) Careful study of the following reports:
   i) IDCAS report about the reorganization of the Ministry of Industry in P.D.R.Yemen.
   ii) IDCAS General report on the industrial survey in P.D.R.Yemen.
   iii) IDCAS specific reports concerning the following industries in P.D.R.Yemen:
      - Food industries
      - Chemical industries
      - Engineering industries
      - Engineering industries
      - Building material industries.
      - Leather and shoe industries.

h) Field studies of technical information relating to standard specifications, testing, quality control, and certification marking.
Annex IV lists the field visits and studies carried out during the period of the assignment. To complete and support the above studies, a survey was conducted by the expert in the form of questionnaires sent by the Ministry of Industry to all industrial sector factories. The contents of this questionnaire is given in annex V.

Another questionnaires were sent to the governmental departments, institutions, the university. List of these places is given in annex VI. This questionnaire on the status of standardization and quality control is refered to in annex VII. Both questionnaires aimed at collecting data on present status and future needs in standardization quality and the facilities concerning the qualified cadre and texts in the field of standardization and quality control.

## A- Standardization

At present there are no standards available nor do any accepted facilities exist to inforce testing and inspection of procedure. The main objective of this project is to introduce the standardization activities.

Standards Departments:

To strengthen the in-plant standardization, a proposal was done:

a. To enable the standards and quality control departments in industrial factories to report directly to the General Director of the Factory.

b. For the functions of these departments . di-

Standardization Consciousness:

In an effort to establish standardization Consciousness among industries and the public:

a. The expert prepared a working paper in Arabic language on "Standards and Quality of Production", English summary is given in annex VIII.

This working paper had been widly circulated with a covering letter signed by the Deputy Minister of Industry, to the industrial sector, whether state, mixed or private, and also among the senior officers in the Ministry of Industry (annex IX.) The target of this paper was looked at as a material of discussion during councils meetings.

b. The expert seized the opportunity of holding an industrial seminar in ADEN during April 1980, and presented 2 papers in Arabic language which were approved by the local government to be discussed during the above mentioned seminar.

These papers are on:

i) Role and importance of standardization in realization of development requirements (in 70 pages)

ii) Importance of standardization and quality in PDRY (in 30 pages). English summary of each is given in annex X.

C. The expert published after the approval of the government in Arabic language a non periodic bulletin, written on typewriter, with the title "News of standardization and quality". The preface essay was written by the Deputy Minister of Industry. The contents in English language is given in annex XI.

Legislations

The expert made a comprehensive study on the situation of standardization and its legislation. At present there are no standards available nor do any accepted facilities exist to enforce testing and inspection of procedure. The expert prepared in Arabic language - recommended draft law for the establishment of the "Democratic Yemen Organization for standardization and Quality". Which includes industrial standard law (English summary in annex XII).

## B. Quality Control

Quality is an indispensable attribute to the product of any industry. Without it, no industry is really secured, much less can it be expected to prosper. It is only through the co-operation of the manufacturer the consumer and the government that quality consciousness can be developed. Failure to meet these requirements can result in serious economic losses.

The expert carried out a study to fix the dimensions of the quality control aspect in the industrial sector. The study was carried out through a quality control survey and assessment in the form of questionnaire. In the meanwhile field survey was done in the factories to evaluate the situation in connection with the laboratories, qualified cadre and texts in connection with this topic.

The conclusion is that general modest capabilities were found in these respects In conducting consciousness activities:

a. A lecture on quality control was included in the training course which was carried out by the expert

b. Trials were made with local authorites to obtain a film on quality control entitled "Right First Time" published by ILO

Conclusion:

a. No company in PDRYemen has ever evaluated its quality costs. In consequence, there is no reliable information on what the real losses are to the P.D.R.Y. economy in terms of lost industrial production costs;

b. Although quality control is considered an efficient and helpful management tool, management lacks understanding of the requirements and techniques of quality. This must be changed if quality is to be one of the major objectives in local and export markets.

## C. Information

The existance of information and text in connection with standardization and quality control is modest in P.D.R.Y.

It is impossible to carry out standardization activities in developing countries, or even in developed countries, without having ready and rapid access to standardization documents which are the basis of any national or even international standardization. This is why in the proposed project of the quality control laboratory, the expert proposed an information centre for the dissemination of technical information relating to standard specifications testing quality control and certification marking.

## D. Manpower

Typical of developing countries P.D.R.Y., also suffers from shortage of skilled and semi-skilled manpower. In fact there is a shortage of unskilled manpower as well. Appreciable efforts have been made in overcoming this problem through augmenting education. Technical education was given due emphasis. It will take some time before the graduates from these institutes will adequately meet the needs.

The problem in industrial sector is particularly acute where there is shortage of qualified personnel at all levels-skilled, semi skilled, engineers, accountants and leaders such as general managers. This has a direct relationship to not only the existing enterprises but also for the establishment of new enterprises. In fact, some industries remain with idle capacity because of shortage of technically qualified and experienced personnel. Besides the distribution of the qualified personnel inside the industrial sector is inadequate.

## E. Training

Training of the staff of a National standards body is vitally important and is governed by the following factors:

a) Standardization is not normally taught as a separate branch of science and technology;

b) The shortage in standards engineers;

c) In developed countries, the role of standards engineers in the actual standardizing processes is not dominant. This is not the case in developing countries where standards engineers often have to prepare the draft standards. In some cases, it may be necessary for the standards engineers to educate the members of the technical committee.

Vocational Training:

Vocational training is available in P.D.R.Y., in the form of in-service training, in training centers. The training centre located in Sheikh Othman (Aden) was established in 1972 with a staff of 50, of whom 5 instructors are qualified from abroad and 20 assistants trained locally. The centre has 5 departments, viz.

1. Mechanical department.
2. Auto mechanic department.
3. Carpentary department.
4. Building department.
5. Electro-Mechanical department.

The duration of the course is 18 months which is administered to students having already received secondary level education.

One branch of this centre also exists at Mukalla (fifth governorate), with three departments i.e. Mechanical, auto-mechanical and electro-mechanical. The stength of students in about 150.

By 1978, it was as many as 300 students, had been trainai, in 1979, 600 is the capacity of the centre with the introduction of evening classes. The Ministry of Industry has carried out an assessment of the needs of training facilities for the industrial sector, which indicates that in the next few years, the requirements of personnel for the existing industries and projects in pipeline would be of the order of 660. Of this 50% would represent the public sector needs followed by 38% needs of mixed sector and 12% of the private sector.

This is however, a dynamic process. The needs would change and go up with the generation of activity towards new projects in the second five year plan, corresponding with the advancement of new projects and expansions, balancing and modernisation of the existing factories during the plan period.

Training Courses

The following training course was included by the expert in Arabic language during February 1980 in the Work Plan, Standardization & Quality Control.
This course aimed at spreading of standardization and quality control consciousness, between the industry people.
It gives clear idea about the levels, some utilizations of standardization & globular idea in connection with quality control & its connection with the 8 Ms (Machine, Material, Man, Money, Management, Market, Method and Miscellaneous) This course was a good chance to traine the counterparts on giving lectures.

On the whole, the time table, the subjects, the number of the trainees and summary of the lectures in English language is given in annex XIII.

## F. Regional and International activities

It is essential for national standards bodies to participate in regional and international activities. A part from having useful contacts and co-operating with other national bodies, participation in regional and international activities will ensure that the views and particular local circumstances of the national body will be taken into consideration when elaborating regional and international standards.

### Regional Activities

P.D.R.Yemen is a member of the Arab Organization for Standardization and Metrology (ASMO). To strengthen the participation of PDRY in regional activities, the working papers of ASMO meetings were thoroughly studied with the P.D.R.Y. representative to the twelfth meeting which was held during 12-25 October 1979 in Amman-Jordan, and matters to be raised for discussion in the meetings were decided.

An effort was made to render the participation of P.D.R.Y. in the technical activities of ASMO more effective.

## G. Other Activities

1. Activities carried out by the expert:

   i) The expert arranged a training course in Arabic language in Standardization and Quality Control, annex XIII.

   ii) The expert during his visits to the Ministries try to collect the publications which were found in concern of Codex Alimentarius Commission (CAC), to be as a nucleus for national food standards.

2. Activities carried out according to the request of the Ministry of Industry:-
Suggestions and studies had been performed by the expert as a response of the request of the Ministry of Industry in the briefing meeting.
These studies are mentioned in item "general" in the Recommendations.

## II. RECOMMENDATIONS

Based on the previous findings the following recommendations are presented in order of priority

### A. Standardization

It is recommended that:

1. To strengthen the status of the National Standards body from the technical, legal, financial and administrative viewpoints and enable it to contribute to the national economy, measures should be taken as soon as possible to promulgate a new law for establishment national PDRY Organization for standardization and quality on the basis of the draft law elaborated in Arabic language by the expert (English summary annex XII.

2. For running of the National body for standardization, the expert prepared a 3-year-plan for the physical requirements, operational procedures, budget as well as the technical assistance and training programme for the national staff required for this organization annex XIV.

3. In order to cope with the ever-increasing need for national standards with limited available technical staff, they should be based on established priorities.

It is strongly recommended that standards plans should be realizable, should fit the social and economic context of PDRY and should leave room for the periodic revision of national standards in order to keep with advances in science and technology.

Considering that the adoption of industrial standardization is the sole responsibility of industry and that in-plant standardization should constitute the basis of national activities in this field, the standards engineers should orient part of their activities to stengthening in-plant standardization in relatively large industrial enterprises. Close cooperation between the national organization for standardization & industry in the field of training courses for engineers would greatly help in achieving these objectives.

5. Attention should be paid to the application of national standards as well as what is adopted of the Arab and international standards in the local production, government purchases imports, exports in order to guarantee the quality & efficiency of performance and guarantee the optimum benefit from investments, also the adoption, whenever possible the sampling and testing methods issued by specialized international organization, such as ISO, IEC, OIML, and Codex Alimentarius in order to facilitate international dealings.

6. The national organization for standardization and quality should give priority in its annual programme to exports, strategic commodities, foodstuffs. It should benefit as far as possible from the international standards set for those commodities and other products which may be considered by Arab countries as equally important.

## B. Quality Control

1. Owing to the modest facilities in quality control laboratories in the country, the expert drew up proposals for a 3-year-plan for detailed design of a laboratory for standardization and quality control including lists of equipment and their detailed prices, estimate of costs of the buildings and equipment, training programme for the national staff, assistance of UNIDO required for the laboratory (annex XIV).

2. To put the recommended laboratory into operation, it is strongly recommended that the required number of chemists, analysts, engineers, laboratry assistants and other ancillary staff should be recruited immediately.

3. As a product is not improved by testing but only by the intelligent evaluation and use of the test results by the manufacturers, the national organization of standardization and quality should aim at offering technological services to industry.

4. In view of the role played by certification, persuading manufacturers to adopt national voluntary standards and thus obtain the benefits that accure from standardization, the national organization for standardization and quality should take immediate steps to put the scheme for certification marking into operation once the quality control laboratory starts its activities.

## C. Information

1. In view of the important role played by standards information in promoting standardization activities, the national organization for standardization should establish standards information centre to support the elaboration of national standards and adequate quality control system.

To strengthen and consolide these documentation services cooperation should take place between the national body for standardization and other specialized organizations, either on regional or international levels.

The expert in the role of the 3-year plan which is proposed for the running of the Democratic Yemen Organization for Standardization and Quality asks for the assistance of an expert in the field of standards information and documentation for 6 months period and also for external training for 3 months period (annex XIV)

2. It is recommended for the newly built organization for standardization and quality control to become a member of the information network (ISONET) set up by the International Organization for standardization (ISO), and contacts should be done with standards Information Service (SIS) of the National bureau of standards (NBS) of the states, and also other national organizations like the USSR National Organization for Standardization (GOST), BSI...etc.

## D. Training

1. The expert arranged a training course in Arabic language in standardization and quality control (annex XIII). It is recommended that benefit can be taken from utilizing the material included in the lectures of this course for future courses.

2. To carry out their assignments most efficiently, standards and quality engineers should be given special technical and administrative training. It should be emphasized that this training is essential not only to give them the necessary skill to properly perform their duties, but also to enable them to guide, direct, supervise and, at later stage, train the technical staff of industrial enterprises.

3. It is recommended not to miss any opportunity offered by overseas bodies to train its staff in standardization, quality control and metrology.

4. Particular attention should be paid to the development of the educational systems and methods of teaching science, so as to include curricula on standardization, metrology and quality control in all stages of education, with particular concentration on these items in the technical faculties and institutions, in order to meet the local needs for specialists technicians and inspectors.

5. Benefit should be derived by the educational cultural and information bodies from the potentialities of the national standardization bodies in developing the programmes so that they may commensurate with the concepts of quality and precision.

6. When nominating for training fellowships and courses offered by international organizations and national standardization bodies of the industrially advanced countries, not to confine the nomination to personnel of the national standardization bodies, but to extend to those personnel responsible for standardization activities in the industrial enterprises and others in order to guarantee the dissemination of standardization experience among all concerned levels in the country.

7. Aden Refinery laboratories are good place for training on some chemical analyses and sample planning.

## E. International Activities

A positive role in co-operation and participation of the national body in the activities of the technical committees of the international organizations for standardization, in order to realize the common objectives aimed from the standards issued by these organizations.

## F. General

1. When requesting services of international experts, it is recommended to pay attention to preparing before hand the necessary data and studies that facilitate the performance of their jobs as soon as they arrive, and to provide them with local counterparts to derive the maximum benefit from their services.

2. The technical staff is the pivot of any national standards body since it is the machinery responsible for carrying out its functions. The expert feels that there will be difficulty in recruiting new graduates. Although a remedy for this cannot be suggested, an improved salary structure is of great importance.

3. Many activities of the national body for standardization have to be carried on outside its premises. Standards engineers have to visit industrial enterprises to study their processes and specifications before elaboratory national standards. Quality engineers have to make frequent surprise visits to mark licensees to inspect their control systems and to ensure that they abide by the terms of licences to use the quality mark. Quality inspectors have to take samples from licensees plants, and from markets as well, to be tested in the central quality laboratory to check their conformance with the relevant standards. They also have to take samples of products covered by mandatory standards to be tested to verify their compliance with these standards. It is therefore strongly recommended that good transportation facilities should be provided.

4. None of the activities of any national standards body can be carried out without having direct contacts in many circles, such as governmental departments, technical and scientific societies and institutes, industry, trade and the public. For these activities

to be successful, the national standards body will have to be made known through public relations especially in developing countries where standardization in a new and unknown, part of the society. By helping to present the national standards body activity, the public relations department makes a major contribution to the implementation of standards. It is for such reasons that public relations has become an established, vital and even respectable part of the national standards body in many countries.

Therefore the national organization for standardization should have on its payroll a highly qualified and energetic public relations officer.

The expert, as he deeply believes in the importance of such activities, proposes an expert in standards propagation and a fellowship for 3 months for every one, in the proposals for running the national organization for standardization (annex XV).

4. An adequate plan for the distribution of the qualified personnel inside the industrial sector should be drawn up.

5. In order to provide a sound nationally based metrological service in P.D.R.Yemen, measures should be taken as soon as possible to issue a law of legal metrology, and the necessary staff of a higher educational level should be recruited. In choosing the place of central quality control laboratory care should be taken to fit the probable expansion for Metrology laboratory in the same site.

6. The following recommendations and studies had been performed by the expert according to the request of the Ministry of Industry during the briefing meeting with the Deputy Minister of Industry:

a. International marketing of the stock of the shoes produced by the local leather shoe factory.

b. How to solve the increase percentage of rejected bread produced by the national Public Bakery.

c. How to get benefit from the scrap of cotton in the local Textile Mill in producing medical cotton.

d. How to solve the problem of marketing washing soap produced from the national Soap Factory.

e. Some proposals for using the glycerin produced locally as a by-product from Soap production.

f. A detailed study for the industrial sector in the light of the reports made by IDCAS and a number of proposals for some lacunae were introduced by the expert.

9. Recommendation for removal of the very fine waste collected in the Textile Mill to avoid ignition.

10. The quality control charts in the Textile Mill are well designed, but they are not worked in the proper way, some rearrangements should take place to gear them.

../N.D.

Annex 1

STRUCTURE OF INDUSTRY IN PERU

| Kind of Activity | Number of Factories | Important industries |
|---|---|---|
| Food industry | 9 | Dairy and dairy products, canned fish, canned vegetables, edible oil, flour, bakery, soft drinks cigarettes etc.; |
| Textile industry | 11 | Textile, textile garments, cotton ginning factories. |
| Chemical and leather industries | 23 | Extraction of salt, tanning leather, paints and emulsion, saftey match, perfumes, detergents, oxgen and acetylene, carbon dioxide, plastics products, batteries, soap, printing. |
| Non metallic building material industries | 15 | Cement products, ready made houses, pottery, extraction of blocks for building. |
| Engineering and furniture metallurgical industries | 7 | Furniture, caniers, cooking stoves boys bycles hoes, spare parts, agri-implements, wire rod, metal net (wire netting) steel wool, nails, aluminium products. |
| Total number | 65 | |

Annex II

COUNTERPARTS STAFF

| Name | Qualifications | Full time | Assumed Duty | Remarks |
|---|---|---|---|---|
| 1. Mohamed Saeed Noman | B.Sc. degree in Analytical Chemistry from USSR | F | 1 Oct.79 | |
| 2. Anwar Abdul Kayoom | Diploma in Food Technology from USSR | F | Nov.1979 | |
| 3. Ekbal Yaseen | Diploma in Metallurgy | F | Jan. 1980 | |

Annex III

JOB DESCRIPTION

Country; People's Democratic Republic of Yemen
Project Title; Expert in Industrial Standardization and Quality Control
Project Number; SI/PDY/78/803/11-01/31.3A
Description of the Project;

An expert in industrial standardization and quality control is required for a duration of six months in order to;

1- Study the industrial sector of the economy and the government industrial policies; including a study of any existing industrial laws relating to the promotion and encouragement of industry;

2- Prepare a draft industrial standards law and any necessary regulations;

3- Make recommendations for the physical requirements, operational procedures, budget, as well as the technical assistance required for the organization and running of the national standard body.

4- Draw up a detailed design of a laboratory facilities for standardization and quality control; including lists of equipment and prepare estimates of costs of the building and equipment required for the testing laboratory.

5- Work out a training programme for the national staff required to operate these facilities in the future.

Annex IV

FIELD VISITS AND STUDIES

Ministries:

- Cabinet of Ministers
- Ministry of Foreign Affairs
- Ministry of Planning
- Ministry of Supply and Home Trade
- Ministry of Agriculture
- Ministry of Finance
- Ministry of Fish Wealth
- Ministry of Labour and domestic service
- Ministry of Constructions
- Ministry of Health

Industrial establishments:

In life Sector

- Soap Factory
- Tanner
- Myrtre Tailoring
- Dairy Project
- Agri-implements
- Public Salt corporation
- Revolution Workshop
- Public Bakery
- Flour Mill
- Algundi Plastic
- Oxygen and Acetylene Factory
- Leather Shoe Factory
- Ice Factory
- Carbon dioxide Factory
- Textile Mill
- Tomato Paste
- Ready made houses (Ministry of Constructions)

Mixed Sector:

- Paint
- Sea Sandel Factory
- Aluminium Factory
- Cigarette Factory
- Battery Factory
- Match Factory
- Perfume Factory
- Foam Factory

Private Sector:

- Saba Clothing
- Van Zan
- Al-Aidrous
- Bags and Belts
- Woolen Garments
- Ice Cream
- Nail Factory
- Printing and paper Bags
- Aljazira for paper Bags
- Middle East Plastic
- Mirror Factory
- Insectioides
- Spices

Cooperative Sector:

- Women cooperative for ready made cloths leather goods cooperative

Other bodies:

- The training institute in Mansourah (Aden)
- Industrial Information Services Centre (Ministry of Industry)

- Naser Agriculture Faculty. (Aden Refineries University).
- Places not visited due to lack of time;
- Canned Fish Factory (Ministry of Fish Wealth)
- Cotton ginning Factories (Ministry of Agricultural)
- Faculty of technology (Aden University)
- General Organization of Water.
- Fish Wealth Institute.
- Training Fish Institute.
- Faculty of Medicin(Aden University)
- General Institution for manufacturing and trade of ships.
- Khormaksar Mechanical Workshop.
- Geological Research Institute
- Agricultural Research Centre
- Fish Laboratory (Fifth Governorate)
- Institute of Animal Wealth.

Annex V

CONTENTS OF THE QUESTIONNAIRE SENT TO THE INDUSTRIAL SECTOR

1- General information
2- Information about products
3- Information about raw and intermediate materials
4- Information about production
5- Quality control
6- Future projects
7- Present and future needs for national standards
8- Miscellaneous

Annex VI

LIST OF THE GOVERNMENTAL DEPARTMENTS, INSTITUTIONS, AND THE UNIVERSITY TO WHICH QUESTIONNAIRE ON THE STATUS OF STANDARDIZATION AND QUALITY CONTROL WAS DISTRIBUTED

- Faculty of technology
- Naser Agriculture faculty
- Vocational Training Institute
- General Organization of Water
- Institute of Animal Wealth
- Institute of Fishery Training
- Faculty of Medicine
- General Institution for manufacturing and Trade of Ships
- Company of ship basins - Aden
- Khormaksar Mechanical Workshop
- Workshop of the Chief of the engineers (Aden Port Administration)
- Geological Research Institute
- Fish laboratory (Fifth Governorate)
- Ministry of Constructions.

Annex VII

QUESTIONNAIRE

ON THE STATUS OF STANDARDIZATION AND QUALITY CONTROL IN GOVERNMENTAL DEPARTMENTS, INSTITUTIONS & THE UNIVERSITY

1; General Information

1.1. Name of Establishment;
1.2. Name of Ministry
1.3. Address
1.4. Tel. No.

2; Laboratory Facilities;

| Apparatus | Maker | Date of Purchase | Test Performed | Present State | Remarks |
|---|---|---|---|---|---|
| | | | | | |

3- Technical Staff working in the Laboratory:

| Name | Qualifications | Date of graduation | Past experience | Date of present employment | Present post |
|---|---|---|---|---|---|
| a. | | | | | |
| b. | | | | | |
| b. | | | | | |
| d. | | | | | |
| e. | | | | | |
| f. | | | | | |
| g. | | | | | |
| h. | | | | | |
| i. | | | | | |
| j. | | | | | |
| k. | | | | | |
| l. | | | | | |
| m. | | | | | |
| n. | | | | | |
| o. | | | | | |
| p. | | | | | |
| q. | | | | | |
| r. | | | | | |
| s. | | | | | |
| t. | | | | | |

4- Where are test results recorded?

5- Are test results submitted in periodical reports? Yes/No

6- In the affirmative, mention the periodicity of the report; every day/week/month/year.

7- To whom or to which division is this report submitted?

8- Is there any decision based on these reports? Yes/No

9- What are the apparatus and chemicals needed in the laboratory;

| Apparatus | Its purpose | Manufacturer | Name of substance | Its use | Remarks |
|---|---|---|---|---|---|
| a. | | | | | |
| b. | | | | | |
| c. | | | | | |
| d. | | | | | |
| e. | | | | | |
| f. | | | | | |
| g. | | | | | |
| h. | | | | | |
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| s. | | | | | |
| t. | | | | | |

10- Are there standards used? Yes/No

11- In the affirmative, what are these standards?

12- Do you wish to have some of your technical staff be trained in:

a) Standardization? Yes/No

b) Quality Control? Yes/No

c) Testing ? Yes/No

13- Any other comments?

| Date | Name of person who has filled in this questionnaire | Post | Signature |
|---|---|---|---|

## Annex VIII

WORKING PAPER ON
STANDARDS AND QUALITY OF
PRODUCTION

This working paper comprises the following items;

Standardization and standards;

One of the main targets of standardization is laying down standards for different produots, and commodities in different industrial categories with the aim of raising their quality.

First; Advantages of applying standards;

1- raising production capabilities
2- improvement of the production quality
3- reducing of the costs
4- more efficient use of indigenous raw materials

Second; The items of standards

Third ; Production quality

## Annex IX

DISTRIBUTION OF WORKING PAPER OF
STANDARDS & QUALITY OF PRODUCTION

Public Sector:

- Soap Factory
- Tannery
- Myrtrs Tailoring
- Dairy Project
- Agri-implements

- Public salt corporation
- Revolution workshop
- Public Bakery
- Flour Mill
- Algundi Plastic
- Oxygen and Acetylene Factory
- Leather Shoe Factory
- Ice Factory
- Carbon dioxide Factory
- Textile Mill
- Tomato Paste
- Mixed Sector

- Paint
- Sea Sandal Factory
- Alumunium Factory
- Cigarette Factory
- Battery Factory
- Match Factory
- Perfume Factory
- Foam Factory

Private Sector:

- Saba Clothing
- Van Zan
- Al-Aidrous
- Bags and Belts
- Woolen Garments
- Ice Cream
- Nail Factory
- Printing and Paper Bags
- Aljazira for Paper Bags

- Middle East Plastic
- Mirror Factory
- Insectioides
- Spices

Ministry of Industry:

- General Director of Planning
- General Director of Production
- General Director of Investments
- Senior Officer of Planning and Statistics
- Technical Senior Officer of Production
- Senior Officer of studies and executing of projects
- Senior Officer of the Cader
- Secretary of Socialist Party in Ministry of Industry
- Senior counterpart

Annex X

SUMMARY OF THE FIRST PAPER:
ROLE AND IMPORTANCE OF STANDARDIZATION IN
REALIZATION OF DEVELOPMENT REQUIREMENTS;

The paper comprises the following topics;

1- Standardization and;
   Commerce with Field of export
   Commerce in the Field of import
2- Creation, transportation and distribution of electric energy.
3- Industry
4- Agriculture
5- Labour
6- Administration
7- Vocational safety

8- Environment Pollution
9- Food Safety
10- Health and Medical services
11- Flow and transportation of technology
12- Cooperation in the Field of technology, between Arab laboratories and technical inspection organizations.
13- Mining and Petroleum Wealth
14- Services;
    a- Communication and transportation
    b- Money, bank services and financial procedure
    c- Scientific research
    d- Tourism
15- Housing and infrastructures
16- Modifying of educational and training programme
17- Consumers problems

SUMMARY OF THE SECOND PAPER:
STANDARDIZATION AND QUALITY IN PDRY;

Introduction;-
Standardization; definition, application
Standard specifications,
Quality Control
Importance of standardization
1- Elimination of waste
2- Better and more efficient use of indigenous raw materials
3- Increased productivity of manpower and equipment
4- Reduction of production and distribution costs
5- Internal organisation of enterprises
6- Improvement of the quality of goods and services]
7- Building up Public confidence in national production
8- Protection of consumers
9- Fairness in commercial transactions

10- Development of import substitution industries

11- Control of imports

12- Promotion of exports;

Obstacles which face developing countries in establishing national organizations for standardization

a) The location and structure

b) Budget

c) The technical cadre

d) Text books and references

e) Metrology and testing laboratories

f) Programme of work; Should put in consideration
local import and export commodities,
symbols and definitions.

g) Application of standards

h) Activities with international organizations

i) Spreading of standardization consciousness

The activities of standardization and quality control in PDRY;

1- A decision of the cabinet number 32/1977 paragraph 3 concerning standardization and quality was promulgated to highlight the importance of standardization and quality for local industrialization.

2- A United Nations expert (UNIDO) in Industrial Standardization and Quality Control was present for 6 months, to assist the government in preparing a draft industrial standards law and in working out proper institutional arrangements for standardization activities in the country with the objective of setting up a national standards body which can provide facilities for studying, preparing, issuing and promoting standards specifications and for certifying products which can meet the specifications.

3- The expert had prepared a draft law for the establishment of the "Democratic Yemen for Standardization and Quality".

Annex XI

CONTENTS OF THE BULLETIN " NEWS OF STANDARDIZATION AND QUALITY"

- Opening essay by D/M of Industry
- Standardization news on national level:

1- Presence of UNIDO expert in industrial standardization and quality control.
2- Draft law for establishment of the "Democratic Yemen for Standardization and Quality (DYOSQ).
3- Proposal for establishment of central quality control laboratory.
4- The training course arranged by the expert, in stnadardization and quality control during February 1980.
5- Two papers on standardization in the first industrial seminar arranged by the Ministry of Industry during April 1980.
6- A circular paper on standardization was sent the factories for studying.
7- The PDRY representative attends the training course in industrial stnadardization which will be held during February 1980 in MOSKO.

Standardization news on the regional level:

PDR Yemen shared in the annual meeting of ASMO in Amman JORDAN during October 1979.

Standardization news on the international level:

The Ministry of Industry studies the international activities which concern standardization and quality.

Annex XII

CONCISE OF THE RECOMMENDED DRAFT LAW FOR THE ESTABLISHMENT OF THE DEMOCRATIC YEMEN FOR STANDARDIZATION AND QUALITY

The draft law comprises 53 articles which deal with the following topics;

I- Citation and interpretation
II- Installation of the organization
III- Duties of the organization
IV- The council of the organization
V- Duties of the council
VI- Budget of the organization
VII- Structure of the organization
VIII- Standards, preparation, issuance....etc.
IX- Quality mark
X- Legal affairs offences and penalities.

Annex XIII

THE TRAINING COURSE

SCHEDULE OF LECTURES

| SUBJECT | DATE | SPEAKER |
|---|---|---|
| 1- Standardization | 4.2.1980 | The expert |
| 2- Standardization on regional level | 6.2.1980 | The counterpart (Saeed) |
| 3- Standardization, packaging storing transportation | 9.2.1980 | The expert |
| 4- Standardization on the national and international level | 11.2.1980 | The counterpart (Saeed) |
| 5- Standardization, its principles, scopes and targets | 13.2.1980 | The expert |
| 6- Company specifications | 16.2.1980 | The expert |
| 7- Standardization and safety | 18.2.1980 | The expert |
| 8- Standardization and agriculture | 20.2.1980 | The expert |
| 9- Quality control | 23.2.1980 | The expert |
| 10- Quality control of imports | 25.2.1980 | Deputy Minister of Industry |
| 11- Documentations and technical information | 27.2.1980 | The expert |

## 1- STANDARDIZATION

This lecture begins with the meaning of standardization and that it is generally realizing the "OPTIMUM Overall Economy."

The following items were also included in this lecture;

1- Standardization and Nature.
2- Standardization and Animals.
3- Standardization and Man.

Some Fundamental Features for stnadardization;

a- The language
b- The writing
c- The Communications and Transportation
d- The Money
f- Standardization in life and social relations.

The lecture was concluded by indicating that it is fortunate for hummanbeing that standardization occupies its place beside the mind of the man supporting what the latter gained from experiences, and knowledges which push him forward towards progress and development.

## 2- STANDARDIZATION ON REGIONAL LEVEL

This lecture comprises the following topics;

First; Standardization in the regional relations.
Second; Regional organizations for standards and metrology;

1- American - British - Canadian Conferences on Unification of Engineering Standards (ABC Conferences)
2- Commonwealth Standards Conferences.
3- Commission on Standardization of the council for Mutual

Economic Assistance of the Socialist Countries (CEMA).

4- La Communaute Europeenne de Charbon et de L' Acier (CECA).

5- Organization of American States (OAS)

6- Communaute Economique Europeenne (CEE)

7- International Commission on Rules for the approval of Electrical Equipment.

8- Standards Association of Central Africa (SACA)

9- Asian Standards Advisory Committee (ASAC)

10- Comite' Europeen de Coordination des Normes Electriques (ENEL)

11- Comite' Europeen de Coordination des Norms Electriques des Pays de la Communaute Economique Europeenne (ENELCOM)

12- Regional Cooperation for development (RCD)

## 3- STANDARDIZATION, PACKAGING, STORING AND TRANSPORTATION OF AGRICULTURAL CROPS.

Introduction about the importance of packaging storing and transportation of agricultural crops. Raw materials used in manufacturing packaging. Then the connection between standardization and every kind of packaging, and the standard specifications of these kinds.

The lecture ends by discussing standardization and transportation of agricultural crops.

## 4- STANDARDIZATION ON THE NATIONAL AND INTERNATIONAL LEVELS

This lecture starts by consice idea about standardization in old civilizations. Then the industrial development, the problems of mass production and the national, and international organizations for standardization and metrology

Also the following topics are explained;

- The activities of Arab countries in applying standardization systems.

- Standardization on national level.
- Standardization on international level (IEC, ISO, O.I, OIPM ETC.....
- Standardisation and developing countries.

## 5- STANDARDIZATION, ITS PRINCIPLES SCOPES AND TARGETS

This lecture starts with definitions, then the fields of the standardization activities on the following three poles;

1- Standardization subject

2- Standardization aspects
   - Communication standards
   - Standard classifications
   - Material standards
   - Standards of quality
   - Dimensional standards
   - Standards of manufacturing process.
   - Standard methods
   - Code of practice

3- Standardization levels;
   - Company standards
   - Association or trade standards
   - National standards
   - Regional standards
   - International standards

Then the lecture speaks about the principles of standardisation;
   - Simplifications (variety or type reduction)
   - Unification
   - Specification

And it finishes by the targets and benefits of standardization.
A figure for the three dimensional spare of standardization is attached.

## 6- COMPANY SPECIFICATIONS

-This lecture starts with an introduction comprising the definition of standards.

-Then the varieties of specifications as follows;

1- Individual specifications
2- Company, specifications
3- Association or Idustry specifications
4- National Standards
5- International Standards

- The importance of company specifications
- The purpose of company specifications
- Benefits and characteristics of company specifications
- Organizations of standards divisions in the companies
- Planning of standards programme in the company

## 7- STANDARDIZATION AND SAFETY

Introduction about safety.
Then the importance and scopes of standardization in the field of safety, and security. The lecture ends by a number of examples for different standards in safety and security.

## 8- STANDARDIZATION AND AGRICULTURE

The lecture clarifies the role of Standardization in the field of processed agricultural products, agricultural crops and techniques.

## 9- QUALITY CONTROL

This lecture starts with the following topics;

1- What is quality
2- The origin of quality
3- Quality circuit
4- Stages of quality circuit
   a) Market
   b) Objective
   c) Programme
   d) Design
   e) Manufacture
   f) Distribution
   g) After sales services
4- Quality of packing
5- Quality of handling
6- Quality of storing in the factory
7- Quality of exposing in the selling shops
8- Methods of control the quality in the distribution stage.

Annex XIV

PROJECT

FOR

A- Running of the "Democratic Yemen Organization for Standardization and Quality" (DYOSQ)

B- Establishment of Central Quality Control Laboratory (CQCL)

CONTENTS

## SECTION I INTRODUCTION

The ultimate objective of this project is to contribute substantially to the improvement of the national economy through the wide application of standardization and quality control principles and techniques which will lead to;

- Elimination of waste
- Better and more efficient use of indigenous raw materials
- Increased productivity of manpower and equipment
- Reduction of production and distribution costs
- Internal organisation of enterprises
- Improvement of the quality of goods and services
- Buildings - up public confidence in national production
- Protection of consumers
- Safeguarding the health interests and safety of consumers
- Fairness in commercial transactions
- Development of import substitution industries
- Control of imports
- Promotion of exports

The importance of standardization as an efficient tool for industrialization was overlooked. This leads to the existance of inferiority in some domestic industrial products. This is also because the majority of industrial enterprises have no laboratories or technical apparatus to help them cope with quality control requirements.

The absence of a competent body responsible for quality inspection and the setting up of national standards and specifications aimed at consumer protection has encouraged local producers to neglect the improvement of their products.

To remedy this, the government decided to carry out the policy measure of setting up and enforcing national standards aiming at ensuring the good quality of local products in order to protect the consumer and earn a good

.....2

reputation in foreign markets.

A decision of the cabinet number 32/1977 paragraph 3 concerning standardization and quality was promulgated to highlight the importance of standardization and quality control for local industrialization.

The UNIDO EXPERT had prepared a draft law for standardization and quality control in an effort to promote standardization activities.

To ensure the efficient operation of standardization and quality control, this project includes also the setting-up of Industrial Testing and Quality Control laboratories to provide the necessary facilities for analysis and testing of industrial products, exports and imports.

## SECTION II

### A. FUNCTIONS OF THE DEMOCRATIC YEMEN ORGANIZATION FOR STANDARDIZATION AND QUALITY (DYOSQ)

The organization shall, with a view to attaining its objective make use of all possible means and, in particular it shall;

a) Prepare, adopt, publish, revise, alter, modify and amend the standards of raw material, industrial products, ways of technical inspection, quality control, process, code of practice, codings packing, transportation, handling, storage of raw material and products, issue technical definitions, unified symbols and application of Metric System.

b) Specify standard certification marks of conformity to standards and issue control licences for the use of affixing of these markets to commodities, goods or materials or in other ways control the use of such marks or other distinctive marks related to specification requirements and institute such quality control

.....3

service as is required for this work as well as take steps to increase quality consciousness and quality control knowledge in various levels of production personnel.

c) Promote standardization, quality control and simplification in industry, commerce, and services and issue national standards with a view to improving product quality, industrial efficiency and productivity and the promotion of trade so as to achieve optimum benefits for the community including the health, safety and welfare of the public and the protection of the consumer.

d) Encourage or undertake promotional work through education and other means in connection with standardization in all its aspects, including establishment of a library or documentation centre for standards and standards matters. Also takes role of training in the field of all standardization activities and industrial quality control, and acknowloging of standardization and quality and their application specially in educational stages, general, workers and vocational training programmes.

e) Coordinate the efforts of producers and users for improvement of materials, products, appliances, processes and methods.

f) Represent the Republic in regional and international discussions on standardization and further regional and international cooperation in the field of standards.

g) Co-ordinate all activities relative to its objects throughout the Republic and co-operate accordingly with other departments and organisations that may be engaged in such fields of activity so as to achieve a

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unified approach to standards work and representation, and the unification of standards specifications.

h) Study and investigate the complaints and suggestions of consumers, users, and producers in concern of the standards and the qualityof the products.

i) Print, publish, distribute and exchange information, studies and tests concerning the activities of the counterpart standards organisations in Arab countries, regional and international organisations.

j) Do all such other lawful things as the organisation may think expedient or conducive to the attainment of any or all of the objectives of the organisation mentioned above.

k) The organization for Standardization and Quality shall be the sole authority for the representation of the Republic in negotiations with other countries on standards matters and in the regional and international standards organizations and a representative of the Republic at regional and international standards meetings shall derive his authority as a delegatefrom the organization.

l) The organization shall have the exclusive authority to designate a specification as a standard. The organization shall publish the standard and provide for its indexing and availability for public sector.

m) The organization may endorse any regional international or other overseas standard specification as an adopted standard.

n) The organization may become a member of or affiliate to any regional or international body concerned with standardization or any related matter.

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B. IMMEDIATE OBJECTIVES:

1- To consolidate the activities of DYOSQ in the elaboration of national standards.

2- To promote in plant standardization being the very roots of national standardization by assisting in the establishment organisation and operation of standards departments.

3- To assist in the setting up, organisation and operation of testing facilities for various types of products in order to carry out tests needed for the elaboration and amendment of national standards, the operation of certification marking scheme, the checking of product conformance to national standards and the control of imports and exports.

4- To assist in the wide adoption of quality technology and in the setting up, organization and operation of quality control departments in the factories.

5- To assist in developing standardization and quality consciousness among the industrial enterprises.

6- To assist in the planning, organization and operation of a national certification marking scheme as an efficient means for the adoption of national standards.

7- To assist in establishing libarary, comprising information and documentation unit in the field of standardization, testing and Quality Control.

8- To train local staff on carrying out their activities in the field of standardization, testing and quality control and assist (DYOSQ) in setting up and operating a training unit in these fields.

9- To assist in the planning of a national system for standardization, testing and industrial quality control and in drafting the relevant legislation.

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C. BACKGROUND AND JUSTIFICATION:

The economy of the People's Democratic Republic of Yemen is primarily agricultural. The governments' policy in the current development programme is to raise the industrial development level aiming at the diversification of the economy. Thus, the industrial sector has recently emerged as a rapidly growing sector which acquires steadily increasing importance in the national economy.

At present there are no standards available nor do any accepted facilities exist to enforce testing and inspection of procedure. In this respect, the important role played by standardizatinn cannot be overlooked. The Government is becoming conscious of the need of organize laboratory testing facilities and introduce standardization and quality control in order to improve the quality of industrial products and which will lead to the full and efficient utilization of indigenous raw materials, reduction of production costs, increase of efficiency, raising of quality of locally produced goods, ensuring fairness in commercial transactions safeguarding the health, interests and safety of consumers, control of imports and promotion of exports.

D. FEATURES OF THE PROJECT:

The project is planned to be executed in 3 years starts from July 1980 uptill June 1983. The expert put in mind to let the two sub-projects run parallel to each other to get benefit from the experts in both sides and also the same thing for the counterparts due to shortage of qualified cadre locally. A three year plan is the shortest period in view of the expert, for the project.

E. PROJECT MANAGER:

i) The project manager will be responsible for the 2 sub-projects viz;

1- Running of the Democratic Yemen Organization for STANDARDIZATION AND QUALITY (DYOSQ).

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2- Establishment of Quality Control Laboratory.

ii) The salary of the project manager can be put on the sub-project budget of running the organization.

iii) Qualifications;

A highly qualified and experienced expert with ability to lead, guide and supervise a team of internationally recruited experts. He should also possess adminstrative abilities. B.Sc and Ph.D or M.Sc degree, and preferable post graduate diploma in Marketing, and diploma in Public Administration with experience in the planning organization and operation of standardization, testing and quality control activities at national level for at least 20 years.

iv) Duties;

- Responsible with DG of DYOSQ for the overall implementation of the project's work plan and serves as the Chief Technical Adviser of expert team to the Director General of DYOSQ.

- Responsible for supervising and coordinating the work of the international experts and through them as regards technical matters the work of counterpart personnel.

- Responsible for all contacts with the DG of DYOSQ as well as UNDP/UNIDO for all matters related to the execution of this project.

- Responsible for the control of the proper use of UNIDO inputs as well as to ensure the development of the project in line with the described objectives.

- Responsible for reporting to UNIDO.

- Advise the DG on all aspects of technical organisational and operational matters related to the discharge and development of DYOSQ activities.

- Advise the DG on the selection of;

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i) international experts.

ii) DYOSQ professional staff.

iii) candidates for fellowships and other kinds of training.

- Assist in the assessment, organization and operation of activities in all of the technical departments of the DYOSQ.
- Assist in detailed timing and / or budgeting various operations.
- Assess the present requirements and assist in planning and equipping the standards and quality control laboratores.
- Assist in planning the future needs for standards and quality control laboratories.
- Advise and assist on organizational and managerial aspects of the laboratories activities.
- Assist in the formulation and implementation of training programmes for the professional staff.
- Prepare a final report setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

F. SCHEDULES OF MONITORING AND REPORTS:

1 - Monitoring / technical reviews:

The project will be subject to periodic reviews, preferably onces in a year by designated representatives of the DYOSQ, UNDP and the UNIDO.

2 - Progress and terminal reports:

The Project Manager will prepare project programme report every 6 months with the first report due in December 1980.

All experts will prepare Progress Reports every three months and a final report at the end of their assignments. The consultants will prepare their mission reports before leaving PDR Yemen on completion of

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of their respective assignments and hand them over to the Project Manager.

The Project Manager and the experts will be responsible for the preparation of technical reports, as defind in their respective job descriptions.

Each national fellowship trainee will prepare a final report.

## SECTION III

### A- SUB — PROJECT

### RUNNING OF THE DEMOCRATIC YEMEN ORGANIZATION FOR STANDARDIZATION AND QUALITY (DYOSQ)

CONTENTS

A. Introduction:

The importance of standardization as an efficient tool for industrilization was not overlooked by the Government which asked for the assistance of the UNIDO in order to prepare a draft standards law and to make proposals for setting up a national standards body.

B. Outputs:

1- a) 3 year plan for the elaboration of national standards.

b) National standards issued on established priorities.

2- Manual for the establishment and operation of in-plant standards departments.

3- Manual for the establishment and operation of quality control departments.

4- a) Quality Mark, certification and licence.

b) Legal provisions for the operation of the certification marking scheme.

c) Manual on the procedures and methods for the certification marking scheme.

5- Lectures, seminars, articles, pamphlets, booklets, posters etc.

6- Initiation of information and documentation activities in the fields of standardization testing and quality control.

7- a) Training course on national standardization.

b) Training course on in-plant standardization.

c) Training course on industrial quality control.

8- Draft laws and regulations for the organization of national system for standardization, testing and quality control.

C. Activities:

1- a) Conducting a comprehensive survey of the status and needs of concerned bodies in the field of standardization.

b) Working out a 3 - year plan for the elaboration of national standards.

c) Formation of technical committees.

d) Holding the technical seretariat for committees and preparing technical documents.

e) Elaboration of national standards based on established priorities.

f) Preparation of the internal rules of procedure for the standardization and quality control department of (DYOSQ).

2- a) Preparation of manual on the establishment and operation of standards departments in industrial enterprises.

b) Operation of standards departments in some industrial enterprises.

d) Advising industrial plants on all matters pertaining to standardization.

3- Maintaining national standards within SI Units.

4- a) Preparation of the technical specifications for testing equipment and instruments in the domains of chemical and bacteriological analyais, testing of paints, textiles, packaging, leather, building material, plastics, electrical and non - destructive testing.

b) Installation and operation of equipment.

c) Conducting analysis and tests needed for the elaboration and amendment of national standards, the operation of certification marking scheme and the control of import and exports.

d) Advise industry and other sectors on improving their testing methods.

e) Participation in the elaboration and amendment of national standards on standard methods of testing.

5- a) Study of the quality control activities in the industrial enterprises.

b) Preparation of a manual on the operation of quality control departments in industrial enterprises.

c) Establishment and operation of quality control in industrial enterprises.

d) Advising industrial enterprises on all matters pertaining to quality control.

6- a) Selection of a suitable design for the standards Mark.

b) Formulation of Quality Certificate and Licences.

c) Issuance of legal provisions for the certification marking scheme.

d) Preparation of a manual on the procedures and methods for the certification marking scheme.

e) Investigation of the quality control systems in manufacturing plants applying for the standards mark.

f) Taking samples of finished products and their subsequent testing in DYOSQ laboratories.

g) Assessing the quality capabilities of manufactures.

h) Assessing the degree of conformity of products and goods to national standards.

i) Granting the standards mark and licence to those applicants producing goods conforming to national standards.

j) Making surprise visits to licensees to ensure the maintenance of their production quality and adherence to the conditions of granting the standards mark.

7- a) Preparation of specifications of equipment needed for the Information and Documentation Unit.

b) Installation and operation of equipment.

c) Acquiring the necessary books, standards and other

publications in the fields of specifications, testing and quality control.

d) Applying for membership in relevant scientific and technical societies.

e) Subscribing in specialized periodicals in the fields of specifications testing and quality control.

8- a) Training the PDR Yemen counterparts through association with the international staff.

b) Conducting training courses for PDR Yemen specialists in;

- National standardization
- In-plant standardization
- Statistical quality control

c) Training the PDR Yemen specialists in foreign countries in the fields of specifications, testing and quality control.

d) Issuing training manuals on;

- National standardization
- In-plant standardization
- Practical quality control

9- a) Conducting a critical study of the existing systems, legislation and activities in the fields of specifications, testing and quality control.

b) Elaboration of comprehesive and integrated system for national quality control.

c) Drafting of the relevant legislation, and its subsequent approval.

d) Operation of the system.

D. Inputs:

Government inputs will be;

a) Staff

The Director General of DIOSQ (or his designate) will be the counterpart of the Project Manager.

The Government will also provide counterparts for the international staff as follows:-

1 Counterpart to the expert of Food standardization methodology and practices expert.

1 Counterpart to the expert of textile standardization methodology and practices.

1 Counterpart to the In-plant standardization expert.
1 Counterpart to Quality Control technology expert.
1 Counterpart to the certification Marking expert.
1 Counterpart to the standards Information and documentation expert.
1 Counterpart to the standards propagation expert.

In addition, the government will provide other staff and support personnel for the operation of the various departments of the DIOSQ.

E. Facilities:

- Adequate office space and furniture for the international staff.
- Appropriate clerical assistance for experts.
- Adequate laboratory premises for carrying out project activities.

Executing Agency Inputs will be:

a) Experts.

1. Project Manager
2. Expert in Food Standardization methodology and practices; Will help in introducing the basic principles of standardization, to make food standards for national industrial produots in the field of food.

Qualification: University degree in engineering, technology or science with extensive experience in the methods of laying

out and methodology of food standards.

3. Expert in textile standardization methodology and practices;
Will help in introducing the basic principles of standardization to make textile standards for national industrial products in the field of textile.

Qualifications; University degree in engineering technology or textile technology or science with extensive experience in the methods of laying out and methodology of textile standards.

4. Expert in In-plant standardization will assist in the establishment and operation of standards departments in some of the leading industries.

Qualifications; University degree in engineering, technology or science with extensive experience in the establishment, organization and operation of standards departments in industrial enterprises.

5. Expert in Quality Control Technology;
Will assist in the establishment of quality control departments and systems in some of the leading industries.

Qualifications; University degree or equivalent in engineering or science with extensive experience in quality control technology and management.

6. Expert in Certification Marking;
Will be responsible for the organisation and operation of a national certification marking scheme.

Qualifications; University degree or equivalent in engineering, technology or science with extensive experience in the implementation of certification schemes at the national level.

7. Expert in Standards Information and Documentation;
Will be responsible for the organization and operation of a standards information and Documentation Unit within the (DYOSQ).

Qualifications; University degree or equivalent in science,

technology, engineering or information science with extensive experience in the provision of information and documentation services in the fields of standardization and quality control.

8. Expert in standards propagation;
Will assist in the establishment and operation of a continuous programme or campaign for the propagation of standards.

Qualifications; University graduates with extensive experience in standards propagation in national standard body.

9. Consultant services for 6 m/m will be provided in area to be determined by the project manager in agreement with the Director General of the (SYOSQ).

F. Training:

The following 10 fellowships 38 m/m will be implemented;

- Followship for Implant standardization 1 3 m
- Followship for statistical quality control 1 5 m
- Followship for statistical quality control 1 5 m
- Followship for quality control in the Food Industry 4m
- Followship for quality control in the Textile Industry 4m
- Followship for quality control in the Chemical Industry 4m
- Followship for quality control in the Construction Materials Industry 4m
- Followship for certification mark 1 3m
- Followship for standards information and documentation 1 3m
- Followship for standards propagation 1 3m

Study tours:

2 study tours 1.5 month each will be provided for the senior staff of (SYOSQ).

G. Support Personnel:

One secretary or clerk / typist and 2 drivers will be provided for the duration of the project.

H. Equipment:

Equipment for technical documentation, reproduction and other special equipment will be provided as well as two vechicles for the transportation of experts

I. Preparation of Work Plan:

The following timetable shows the overall work plan as regards the required timing of executing agency inputs (see Annex II).

Specific Inputs:

| Experts | | Target date and duration |
|---|---|---|
| 1) | Food standardization methodology | July 1980 12m |
| 2) | Textile stnadardization | July 1980 12m |
| 3) | In-Plant standardization | July 1981 6m |
| 4) | Quality Control Technology & Management | Jan.1982 12m |
| 5) | Standards Information & Documentation | July 80 - Apr.81 3m |
| 6) | Standard propagation | Sept.1981 3m |
| 7) | Certification Marking | Nov. 1982 6m |
| 8) | Short term consultant (to be defined later) | during 1981 2m |
| - | Short term consultant (to be defined later) | during 1982 2m |

Study Tours:

| | | |
|---|---|---|
| - | Study tour for 1 senior | during 1981 1.5m |
| - | Study tour for 1 senior | during 1982 1.5m |

Fellowships:

| | | | |
|---|---|---|---|
| - | Food standardization methodology | August 1981 | 4m |
| - | Textile standardization methodology | August 1981 | 4m |
| - | In-Plant standardization | March 1982 | 3m |
| - | Statistical quality control | August 1982 | 5m |
| - | Statistical quality control | Jan. 1983 | 5m |
| - | Quality control in the Food Industry | Jan. 1983 | 4m |
| - | Quality control in the Textile Industry | Jan. 1983 | 4m |
| - | Quality control in the Chemical Industry | Jan. 1983 | 4m |
| - | Quality control in the Construction | Jan. 1983 | 4m |
| - | Certification Marking | May. 1983 | 2m |
| - | Standards INformation & Documentation | Nov. 1980 | 3m |
| - | Standards Propagation | Jan. 1982 | 3m |

N.B. The Work Plan in the form of a bar chart which cover the whole duration (3 years) and indicates the timing of inputs and activities in shown in annex II.

J. Development Support Communication:

It is of great importance for the effective realization of the proposed project's objectives that, during its implementation, a good communication should be established and maintained between the national organisation for standardization and Quality and the international economy, with special emphasis on industry, on the other hand. It is a specific objective of the project to provide industry with the facilities and means which will enable it to utilize indigenous raw materials in the most efficient way, to reduce production costs, to increase production efficiency and to raise quality of manufactured goods.

Other objectives of the Project are concerned with ensuring fairness in commerce and control of imports and exports. Consequently the project should hold strong communitions with the concerned ministries.

Because of the broad implications of the Democratic Yemen Organization for Standardization and Quality a detailed "Plan for Development support communication" will be prepared jointly by the Project Manager and the General Director of the DYOSQ. This will include list of Government and private bodies and other outside organizations (national, regional and international) to whom relevant project outputs should be communicated.

The key individuals for establishing the necessary channels of communication will be the Project Manager and the General Director of DYOSQ. The active support of other Government officials will be essential.

K. Prior Obligations and Prerequisites:

It is necessary for the timely start and completion of the Project that the Government provides the required national staff specially those who will be candidates for the Project's followships. This is particularly important in order to allow the preparatory steps to be taken to start the training followships which comprise the initial phase of the Project and which, at the same time, is a prerequisite for assigning the remaining international staff. These candidates should be of the required quantity and quality necessary for the implementation of the project and should be made available and released at times stipulated in the work plan.

PROPOSED PROJECT BUDGET

(IN US DOLLARS)

Annex: 1

Country: PDR Yemen

Project No:

Project Title: Running on the DY Organization for Standardization and Quality Control

| PROJECT PERSONNEL | TOTAL | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | $ | m/m | $ | m/m | $ | m/m | $ | m/m | $ |
| PROJECT MANAGER | 36 | 180000 | 6 | 30000 | 12 | 60000 | 12 | 60000 | 6 | 30000 |
| Experts:- | | | | | | | | | | |
| Food Standardization methodology | 12 | 54000 | 6 | 27000 | 6 | 27000 | | | | |
| Textile Standardization methodology | 12 | 54000 | 6 | 27000 | 6 | 27000 | | | | |
| In Plant standardization | 6 | 27000 | | | 6 | 27000 | | | | |
| Quality Control Technology and Management | 12 | 54000 | | | | | 12 | 54000 | | |
| Standards Information and Documentation | 6 | 27000 | 3 | 13500 | 3 | 13500 | | | | |
| Standard Propagation | 3 | 13500 | | | 3 | 13500 | | | | |
| Certification marking | 6 | 27000 | | | | | 6 | 27000 | | |
| Consultants | 4 | 28000 | | | 2 | 14000 | 2 | 14000 | | |
| | 97 | 464500 | 21 | 97500 | 38 | 182000 | 32 | 155000 | 6 | 30000 |

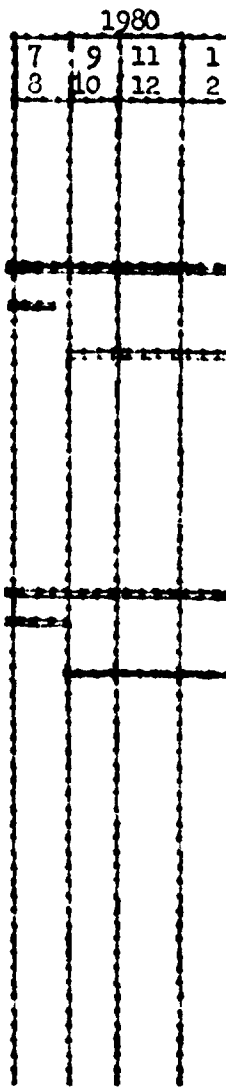
.....2

| | TOTAL | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | $ | m/m | $ | m/m | $ | m/m | $ | m/m | $ |
| Travel | | 6000 | | | | 3000 | | 3000 | | |
| Mission Costs | | 2000 | | | | 2000 | | | | |
| Component Total | | 472500 | | 97500 | | 187000 | | 158000 | | 30000 |
| TRAINING (INDIVIDUEL FOLLOWSHIPS) | | | | | | | | | | |
| Food Standardization methodology | 4 | 4800 | | | 4 | 4800 | | | | |
| Textile Standardization | 4 | 4800 | | | 4 | 4800 | | | | |
| Inplant Standardization | 3 | 3600 | | | | | 3 | 3600 | | |
| Statistical Quality Control | 5 | 6000 | | | | | 5 | 6000 | | |
| Statistical Quality Control | 5 | 6000 | | | | | | | 5 | 6000 |
| Quality Control in Food Industry | 4 | 4800 | | | | | | | 4 | 4800 |
| Quality Control in the Textile Industry | 4 | 4800 | | | | | | | 4 | 4800 |
| Quality Control in the Chemical Industry | 4 | 4800 | | | | | | | 4 | 4800 |
| Quality Control in the Construction | 4 | 4800 | | | | | | | 4 | 4800 |
| Certification Marking | 2 | 2400 | | | | | | | 2 | 2400 |
| Standardization Information and Documentation | 3 | 3600 | 3 | 3600 | | | | | | |

| | TOTAL | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | $ | m/m | $ | m/m | $ | m/m | $ | m/m | $ |
| Standards Propagation | 3 | 3600 | | | | | 3 | 3600 | | |
| Sub - Total | 45 | 54000 | 3 | 3600 | | | 6 | 7200 | 36 | 43200 |
| Study tours;- | | | | | | | | | | |
| | 1.5 | 3000 | | | 1.5 | 3000 | | | | |
| | 1.5 | 3000 | | | | | 1.5 | 3000 | | |
| Sub - Total | 3 | 6000 | | | 1.5 | 3000 | 1.5 | 3000 | | |
| Component Total | 48 | 60000 | 3 | 3600 | 9.5 | 12600 | 12.5 | 16200 | 23 | 27600 |
| Miscellaneous | | 5000 | | 500 | | 2000 | | 2000 | | 500 |
| Other items | | 50,000 | | 20,500 | | 22,000 | | 12,000 | | 500 |
| Component Total | | 55,000 | | 20,500 | | 22,000 | | 12,000 | | 500 |
| GRAND TOTAL | | 587500 | | 121600 | | 221600 | | 186200 | | 58100 |

Annex II

WORK PLAN




1- To establish Food Standards covering the national products as Food is very import topic.

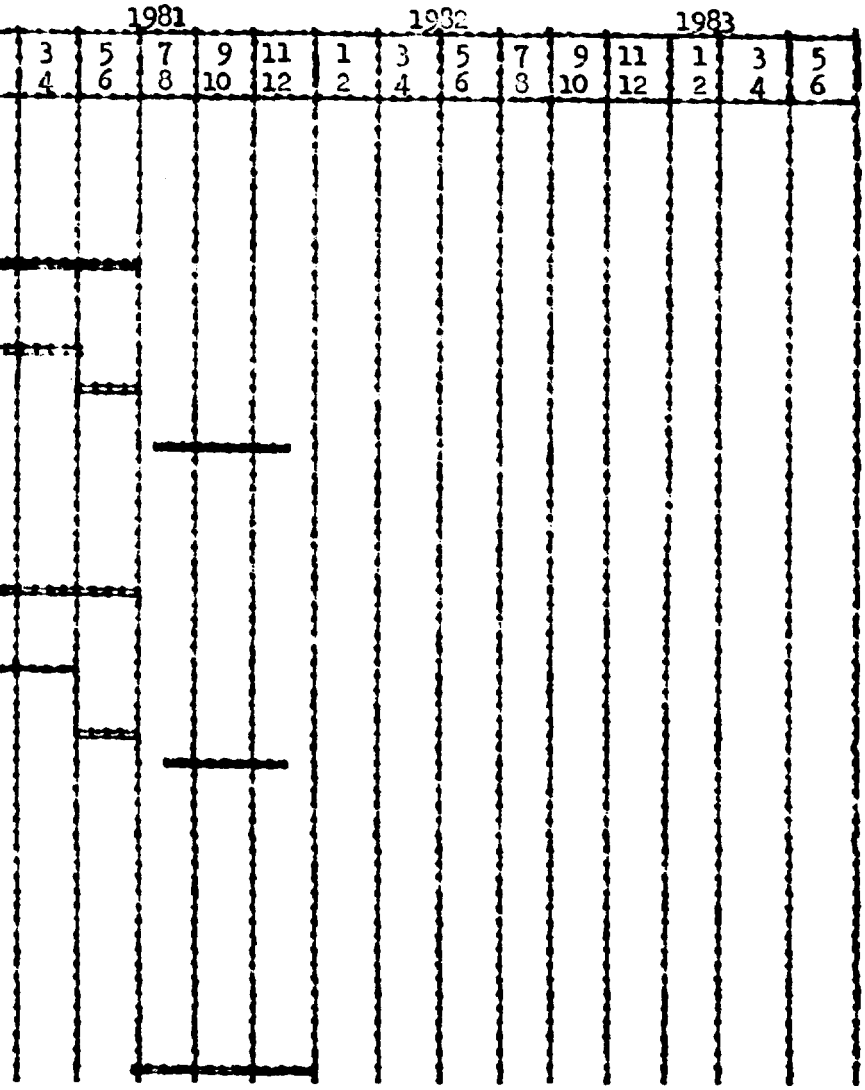
a) Expert activities
b) Studying the existing Food Production
c) Laying out of national Food standards
d) Carrying out a training course in Food standards
e) Implementation of Fellowship

2- To establish Textile standards covering the national products

a) Expert activities
b) Studying the existing Textile production
c) Laying out of national Textile standards
d) Carrying out a training course
e) Implementation of fellowship

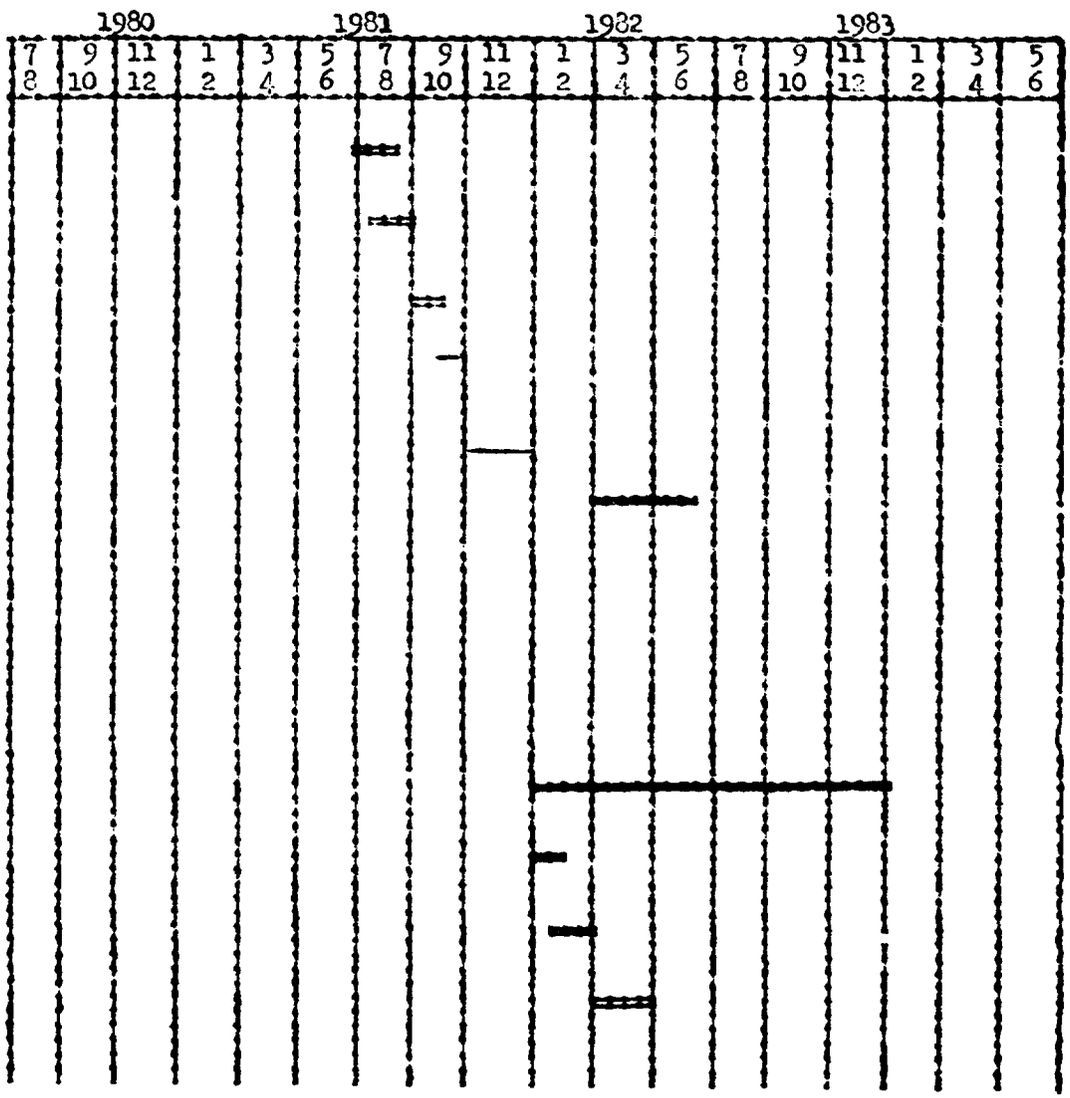
3- To promote in-plant standardization being the very roots of national stnadardization by assisting in the establishment, organization and operation of company standards departments in some of the leading industrial enterprises.

a) Expert activities


1981
1982
1983
3 4
5 6
7 8
9 10
11 12
1 2
3 4
5 6
7 8
9 10
11 12
1 2
3 4
5 6

Annex II (Contd.....2)

WORK PLAN




b) Study of standardization activities in some major enterprises

c) Selection of two plants for project activities

d) Preparation of a manual on the operation of standards departments

e) Conducting a training course

f) Assisting the selected plants in the setting up organization and operation of standards department

g) Implementation of followship

4- To Assist in the wide adoption of quality technology and in the setting up organization and operation of quality control departments in some of the leading industrial enterprises as a necessary pre-requisite for quality improvement activities;

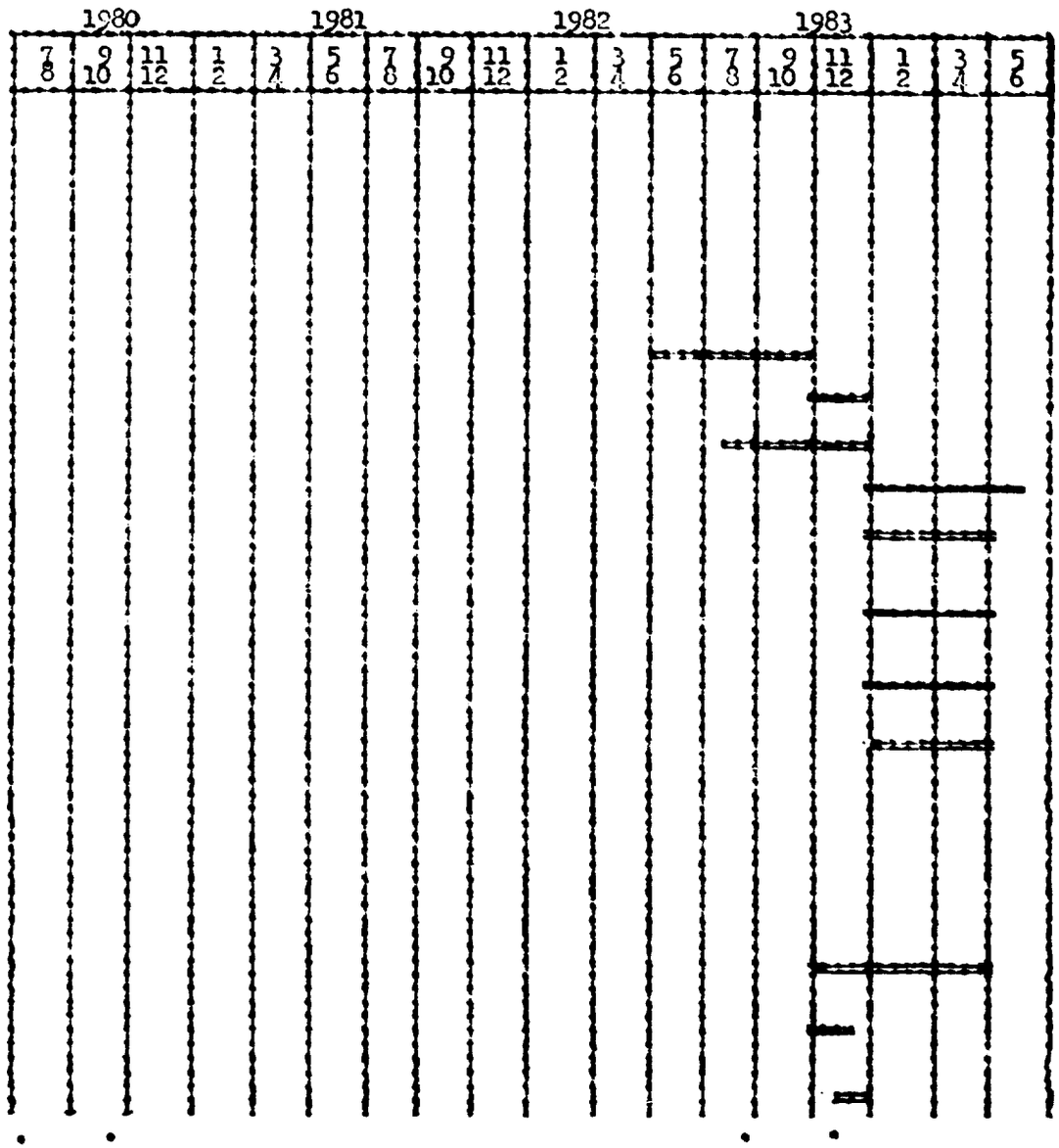
a) Expert activities

b) Study of Quality Control activities in some of the leading industries

c) Selecting some plants for intensive Quality technology implementation

d) Guiding these plants to set up and operate Quality Control departments

WORK PLAN




e) Issuance of a Quality Control Manual to assist industry in;
- basic implementation of Q.C.
- adoption of the most appropriate Qaulity Control techniques
- reaching a stage where enterprises can more easily obtain standards and quality marks to their own benefits.

f) Conducting a training course

g) Implementation of following (SQCI)

h) Implementation of followship(SQCII)

i) Implementation of followship in Quality Control of Food Industry

j) Implementation of followship in Quality Control in Textile Indus.

k) Impelementation of followship in Quality Control Chemical Industry

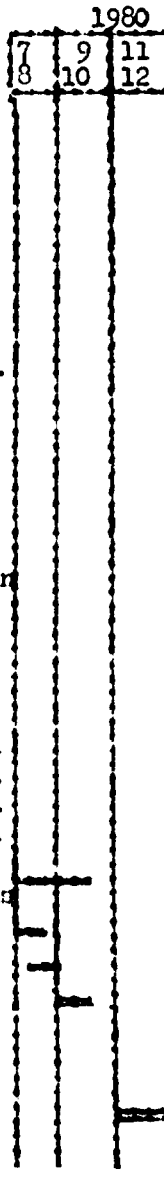
l) Impelmentation of followship in the Construction

5- To assist in the Planning, Organization and operation of a national certification marking scheme as an efficient means for the adoption of national Standards;

a) Expert activities

b) Selection of a suitable standards mark

c) Formulation of Quality certificate and licence




d) Issuance of legal provisions for the certification marking scheme
e) Preparation of a manual on the procedures and methods for the scheme
f) Operation of the scheme
g) Implementation of the followships of certification mark

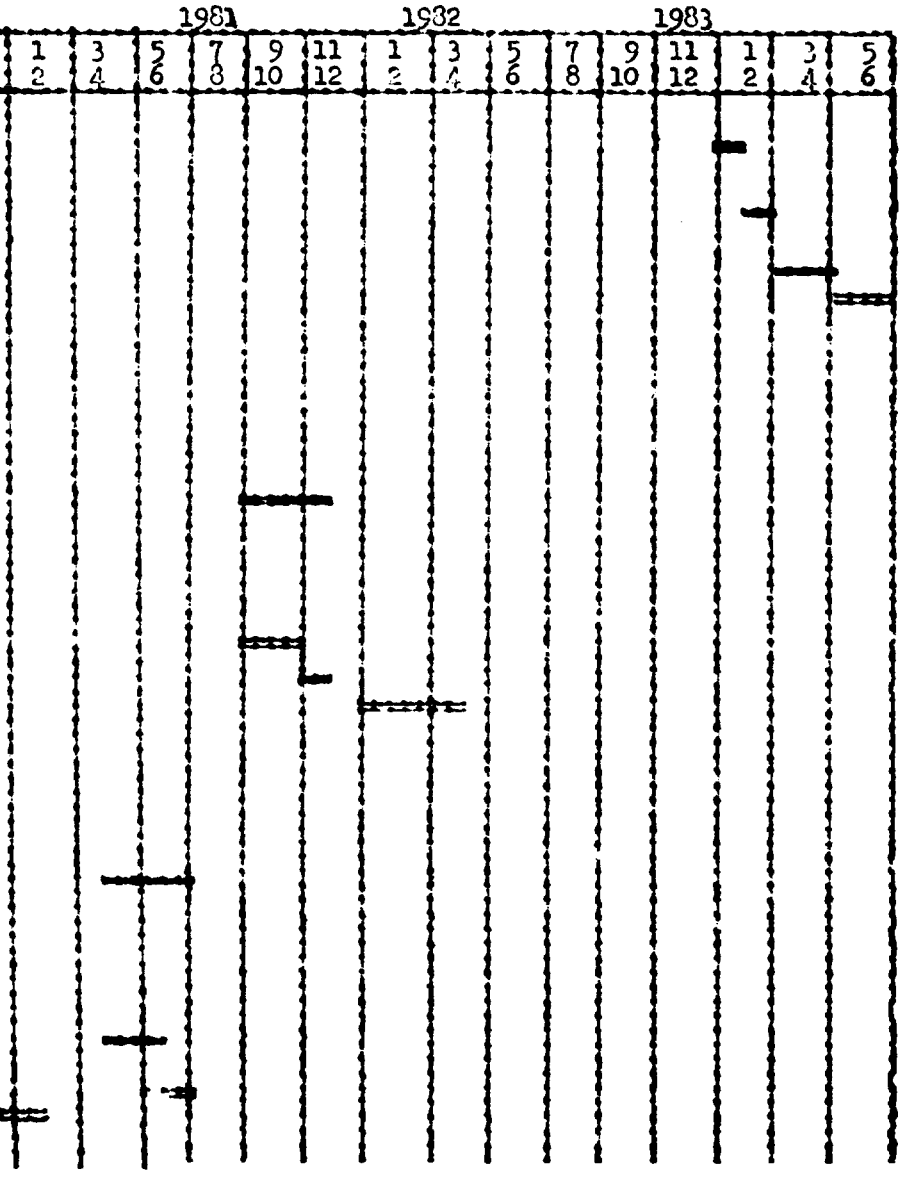
6- Standard propagation: To assist in developing standardization and Quality consciousness among the Public and industrial circles:

a) Expert activities
b) Planning a public relations campaign using all means of public communication including mass media organization of conferences and seminars and issuance of pamphlets, booklets etc.
c) Implementation of plan
d) Implementation of followship

7- Standards information and documentation: To assist in establishing an information and documentations unit in the field of standardization, testing and Quality C.:

a) Expert activities
b) Preparation of equipment specifications and request for quotations
c) Ordering of equipment
d) Delivery of equipment
e) Installation of equipment and work preparation
f) Start of operational activities
g) Implementation of the followship.

WORK PLAN



B - SUB - PROJECT

ESTABLISHMENT OF QUALITY CONTROL

LABORATORY

CONTENTS

I. Introduction:

The economy of the People's Democratic Republic of Yemen is primirly agricultural. The government's policy in the current development programme is to raise the international development level aiming at the diversification of the economy.

Thus the industrial sector has recently emerged as a rapidly growing sector which acquires steadily increasing importance in the national economy. It is expected to share by about 40% in the national income on 1983 (source Ministry of Planning in PDRY).

Sizeable quantities of various raw materials for production are being imported on the basis of suppliers' certificates of quality. It is essential that in order to protect the interests of the country random samples tests are carried out on these.

In addition, tests will have to be carried out on finished goods coming out of these factories to ensure proper standards and quality. This intended laboratory could carry out these functions of quality control also.

In other words testing and control laboratory is essential to ensure that only proper tested raw materials enter the production line and only standard tested finished goods are made available for sale.

At present the existing laboratory facilities in PDRY are extremely modest. Also there are no standards available nor do any accepted facilities exist to enforce testing and inspection of procedure. In this respect the important role played by central quality control laboratories cannot be overlooked.

The Government is becoming concious of the need to organize laboratory testing facilities and introduce standardization and quality control in order to improve the quality of industrial products which will lead to the full and efficient utilization of indigenous raw materials, reduction of production costs, increase of efficiency, raising of quality of locally produced goods ensuring fairness in commercial transactions, safeguarding the health interests and safety of consumers, control of

imports and promotion of exports.

The importance of establishing a central quality control laboratory as an efficient tool for industrialization was not overlooked by the government which asked for the assistance of UNIDO in order to study the existing laboratory facilities. The UNIDO expert made a survey for the whole concerned places, viz, Ministries, factories and educational Institutes. The general idea reveals the modest laboratory facilities in general. The UNIDO Expert proposes a 3 year plan for the elaboration of a central quality control laboratory.

II. Counterpart:

The counterpart agency of this sub-project is the Democratic Yemen Organization for Standardization and Quality (DYOSQ) which belongs to the Ministry of Industry.

III. Objectives of the sub-project:

The objectives of the sub-project of quality control laboratory is to promote the industrial development by standardization and quality control to achieve added value to PDR Yemen products and to facilitate trade.

IV. Selection of site for the new central laboratory for Quality Control:

The site for the new laboratory has to be selected with regard to different aspects;

1- No interference by vibrations from factory, mine or traffic etc.

2- No noise from the above mentioned or power line or amusement centre, sports ground etc.

3- No dust or fumes from mine, factory, road or garbage incineration etc or OZON from corona discharges on powerline.

4- No electric or magnetic fields from heavy industries (big machines, arc welding, electrometallurgy etc) or power lines etc.

5- Solid rock ground preferably granite for foundations.

6- Flood proof topagraphy and convenient slope for self draining sewers.

7- Away from fog, smog and dampness and the salt laden mists from the ocean.

Other points of view are;

8- Proximity to the customer i.e. it should be situated near the center of gravity of the industry of the country or near the largest industrial area.

9- Administrative convenience i.e. near the capital.

10- Communications which means with good connections by road, rail and air to all corners of the country and foreign countries.

Separation of any of the following units is not recommended Central Administration unit, Stnadardization Unit and Central laboratory unit. On the other hand it may be necessary to split the central laboratory to more than one site to find the solid granite ground for the metrological comparator laboratory, the silent location for the acoustic laboratory and the conveient communications for the samples to the performance testing laboratory etc. The DYOSQ should not only have the technical facilities but it should also have convenient means to serve all the nation.

V. Layout:

The buildings will be situated in such a way that interference from the activity in one department to another is avoided e.g. by vibrations from mechnical testing to sensitive instruments in metrology laboratory if found.

On the other hand department with equipment in common like Inorganic and Organic Chemistry using the same analytical balances must both be adjacent to the balance room.

The building shall be oriented so that direct sunlight can not enter the windows. All buildings shall have airconditioning with dust filters and sufficiently tight doors and windows. Some parts of the fibre laboratory must have the relative humidity kept within very close tolerances which is easier to achieve with wall material of low water vapour permeability.

VI. Laboratory furniture and fittings:

The laboratory furniture should be designed and constructed so that any contamination can be removed easily, and it must be so arranged that it does not impede egress in any emergency.

VII. Services:

The generation of unacceptable noise is a problem which requires careful consideration in designing and installing mechanical services.

VIII. Lighting:

Fluoresoent tubes are generally required for laboratory lighting.

IX. Working surfaces:

The properties of an ideal working surface include;

a) hard scratch resistance surface
b) low porosity
c) good heat resistance
d) good chemical resistance
e) good resistance to staining
f) availability as a virtually continous surface or in a large sheets.

X. Foundations:

Mechnical laboratories and workshop have to be on the ground floor so that foundations for the heavy machines can be built directly on the ground. It must be kept in mind that they must not be bolted directly on the rock but have to stand on solid heavy concrete foundations standing

on vibration dampers. Otherwise vibrations will be transmitted to the rock and spread to other departments where they can damage sensitive and expensive equipment.

XI. Storage and disposal ofchemicals;

The chemical laboratories shall have storages for gasflasks, volatile, inflaminable or poisonous meterials that are well ventilated and with doors only to the open air.

The chemical laboratories must also have permanent vessels to receive wast solvents acids and other aggressive or poisonous solutions otherwise they are likely to end up in the sewer which then would be damaged poisonous or flammable.

These vessels must be regularly maintained and emptied whereby the contents shall be made harmless by proper methods or purified for reuse. In laboratories handling acids, caustics, flammable materials like solvents, fibres etc, or furnaces or burners there shall be emergency showers.

XII. Pipes and Cables;

The laboratories shall have a sewer system that is flood proof. There shall be water supply with a tank at sufficient altitude to serve the highest water tap and big enough to cover one day's consumption and a tank in the ground that can hold 5 days' supply.

There shall be electric power supply with constant standby power for some lights, elevator and such equipment that are destroyed by power failure longer than 30 minutes or long term testing where the test becomes useless and has to be repeated in case of power cut off.

There shall be hot water or water heaters in the chemical laboratories.

There shall be gas pipes and compressed air pipes to all laboratories.

Cables for all telecommunications to all rooms such as extension telephones, intercomm, pageing system, fire alarm, buglar alarm remote control of doors, data communications etc.

XIII. The proposed time for executing the erection of the Quality Control Laboratory;

It is proposed to be finished in three years for the following reasons;

1- To be finished in the same time of the first sub-project i.e. running of the Democratic Yemen Organisation for Standardization and Quality to share in taking off with the Standardization and Quality aspects.

2- The serious shortage of the laboratories and in the meanwhile the active growing of the local industry presses the urgent need of such laboratory.

3- The enthusiasm of the Government towards quick utilization of standardization and quality control.

4- It should be put in mind during the building of the laboratory the forthcoming expansion for Methology Laboratory.

XIV. Divisions of the Laboratory;

I- Chemical analysis division
II- Civil engineering division
III- Organic material division
IV- Food and Beverages division
V- Other services;

1) Work shop
2) Library
3) Auditorium
4) Typing pool
5) Reproduction and photograph
6) Canteen
7) Medical aid

Test methods should be approved for the use by DYOSQ laboratories. They shall be selected in the following order of periority;

1) ISO standard
2) IEC standard
3) Foreign national standard
4) Well reputed company specification
5) Methods originally used by the local factories.

## XV. Duties of the divisions of the laboratory;

### I. Chemical analysis division;

The analytical department shall perform chemical analysis and other testing materials propertios that are of chemical nature.

1. Inorganic analysis
1.1. Classical
1.2. Instrumental
2. Organic analysis
2.1. Classical
2.2. Instrumental
3. Thermal analysis and thermo gravimetry
4. Chemical properties
4.1. Volatility and solibility, adsorption
4.2. Heat formation, particularly heat of combustion
4.3. Temperatures of Flash point and ignition temperature pyrolysis and carbonisation etc.
4.4. Ignitability, flammability etc.
5. Structural analysis
5.1. Optical microscopy
6. Calibration
6.1. Small masses and volumes
6.2. Concentration of standard solutions and analytical standards.

II. Civil engineering:

1. Materials to be tested in this department

1.1. Enamel, glass and ceramic

1.2. Cement and concrete

1.3. Stone, brick and other building material

2. Test to be performed

2.1. Fatigue tests

2.2. Creep test

2.3. Ductility test

2.4. Internal pressure test on vessels

2.5. Sieving

III. Organic material division:

1. Materials to be tested in this division

1.1. Plastic and rubber

1.2. Fibres

Synthetic, wool, cotton, yarn, textiles, clothes, rope, paper and board.

1.3. Natural products

Skin and leather

1.4. Paint

Varnish

Paint and lacquer

Wood preservations

Glue and adhesives

1.5. Bitumen and tar

1.6. Fuel

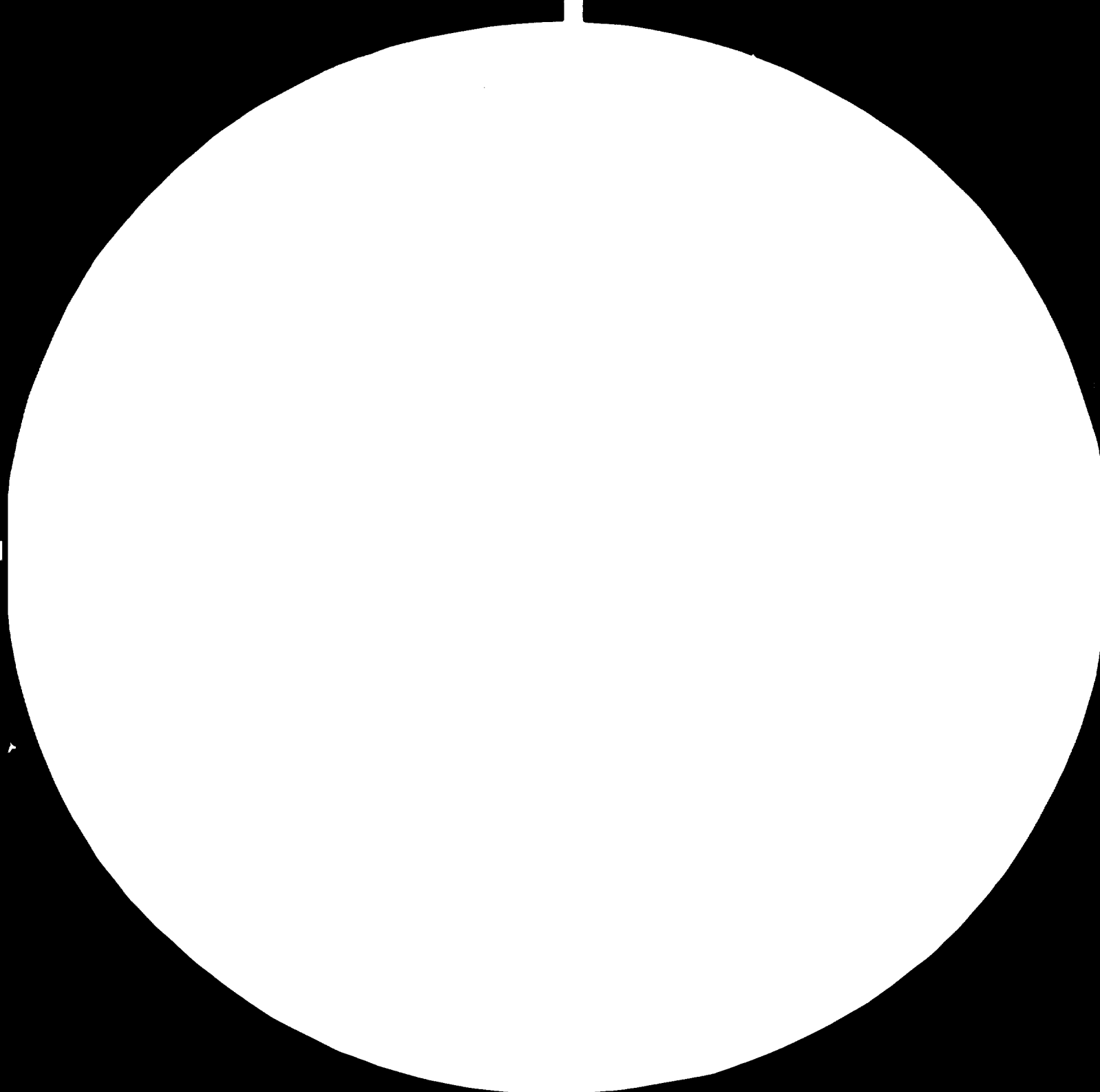
Coal

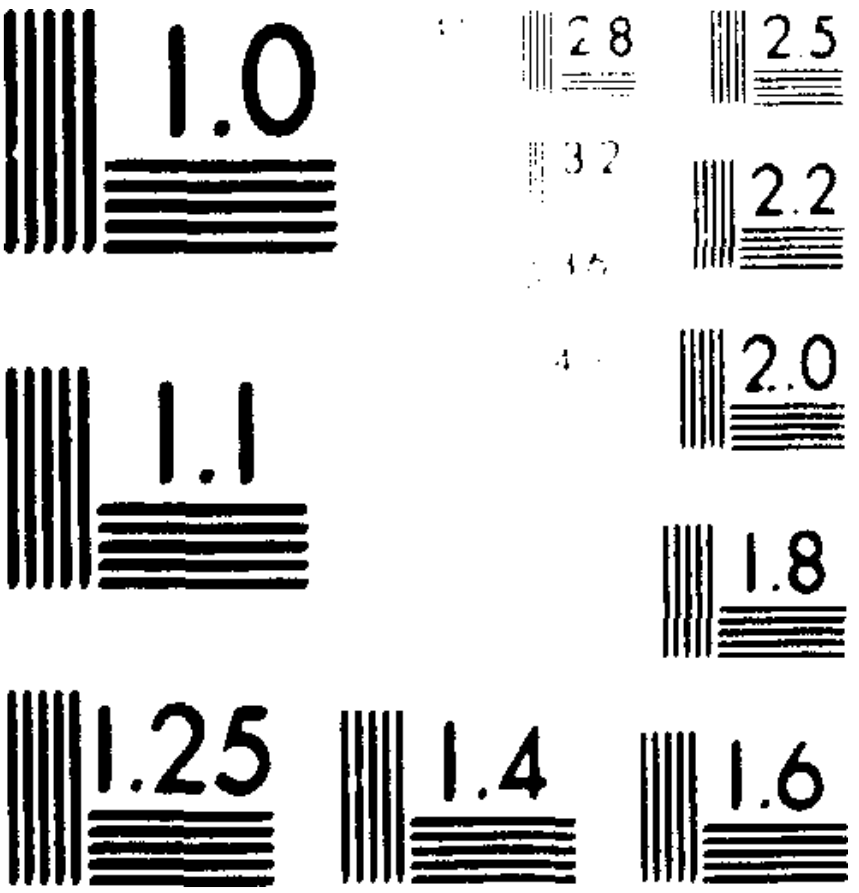
Oil

Petrol

Gas

1.7. Lubricants





2. Tests to be performed

2.1. Tensile tests

2.2. Hardness tests

2.3. Impact test

2.4. Bending test

2.5. Deffection test

2.6. Melt index

2.7. Elastic and plastic properties, damping

2.8. Ductility test (ball test)

2.9. Tear test

2.10. Adhesion test

2.11. Abrasion test

2.12. Viscosity

2.13. Film thickness

2.14. Hiding capacity and finess of grind

2.15. Setting, gelation and hardening time, dry time

2.16. Shrinking test

2.17. Twist in yarn

2.18. Crease resistance test

2.19. Length and weight of yarn

2.20. Yarn eveness test

2.21. Weight of paper

2.22. Moisture measurements

2.23. Washability

IV. Food and beverages division:

1. Chemical analysis

PH - determination

Hardness of water

Infra - red spectoroscopy

Gas chromatograph

Liquid chromatograph

Electrophoresis

Fat testing

Protein testing

2. Microbiology

3. Structural analysis

4. Water content solid content, ash content

5. Heat of combustion

V. Other services:

1. Workshop

1.1. Turning

1.2. Milling

1.3. Drilling

1.4. Shaping

1.5. Cutting

1.6. Sawing

1.7. Cut off

1.8. Grinding

1.9. Welding

1.10. Bending

1.11. Winding of transformers and motors

1.12. Electronic workshop

1.13. Instromental workshop

1.14. Glass blowing and grinding workshop

2. Libarary

3. Auditorium

4. Typing pool

5. Reproduction and photography

6. Canteen

7. Medical aid

## XVI. EQUIPMENT PROPOSED FOR DYOSO LABORATORY:

### I. Chemical analysis:

#### 1.1. Weighing

1.1.1. Top loading balances, Digital substitution type

| | | |
|---|---|---|
| 1.1.1.1. | 5000g Mettler | 2500$ |
| 1.1.1.2. | 170g Mettler | 1000$ |

1.1.2. Analytical balance Digital, substitution

| | | |
|---|---|---|
| 1.1.2.1. | 160g ± 0.01mg Mettler | 2000$ |
| 1.1.2.2. | 20 g ± 0.001mg Mettler | 5000$ |
| 1.1.2.3. | Set of masses stainless 1mg - 100g. (calibrated) | 750$ |
| 1.12.4. | Weighing glasses, weighing scoop, weighing boats, Brushes, spoons | 100$ |
| 1.12.5. | Set of volumetric flasks with certificate 10-25-50-100-250-500-1000ml 5 of each | 200$ |

#### I.2. Inorganic Analysis:

1.2.1. Sample preparation

| | | |
|---|---|---|
| 1.2.1.1. | Steel top table and masonary hammers 500g-1000g | 200$ |
| 1.2.1.2. | Cast iron mortar ø200 mm H.220 mm | 50$ |
| 1.2.1.3. | Diamond mortar and pertle | 100$ |
| 1.2.1.4. | Porcelain mortar ø300 - 200 - 250 - 70mm | 100$ |
| 1.2.1.5. | Glass mortar ø 100mm | 10$ |
| 1.2.1.6. | Agat morters ø 70mm 2ø mm | 100$ |
| 1.2.1.7. | Mortar grinding machine 100ml. | 1500$ |
| 1.2.1.8. | Ball mill, Drums 0.75l-3l, Balls 10mm-40mm | 600$ |
| 1.2.1.9. | Set of sieves ø 100mm (36,72,100,120 mesh) | 20$ |
| 1.2.1.10. | Drillings and millings are made by the workshop | |

1.2.2. Bringing the samples into solution

| | | |
|---|---|---|
| 1.2.2.1. | Crucibles of iron and nickel 25-70-130ml. triangles, tripods, bunsenburners 10 of each and 2 blow torches crucible tongs | 500$ |
| 1.2.2.2. | Flask shaker | 300$ |
| 1.2.2.3. | Air pump for blow torches | 400$ |

1.2.3. Chemical operations

| | | |
|---|---|---|
| 1.2.3.1. | Labelled reagent bottles 500ml | |
| | Acetic acid dilute | |
| | Aceton | |
| | Ammonium hydroxide | |
| | Barium chloride | |
| | Carbon tetrachloride | |
| | Sulphuric acid | |
| | Diethyl ether | |
| | Dimethy Dimethylglyoxime | |
| | Ethanol | |
| | Ferric chloride | |
| | Hydrochloric acid | |
| | Nitric acid | |
| | Petroleum ether | |
| | Phospheric acid | |
| | Trichlorethylene | |
| | Xylene | |
| 1.2.3.2. | Filtration stands 10 pieces | 200$ |
| 1.2.3.3. | Analytical funnels 25mm - 100mm | |
| | Buchner funnels ø50m - ø150mm olass filters | |
| | filters crucibles separatory funnels 150ml-250ml | |
| | Spray bottles 10 pieces each | 500$ |
| 1.2.3.4. | Filter pumps and back pressure valves 10 pieces | 100$ |
| 1.2.3.5. | Laboratory centrifuge and tubes | 500$ |
| 1.2.3.6. | Dry cabinate $100^{0}$ $100^{1}$ | 200$ |
| 1.2.3.7. | Ashing furnace $1000^{0}$ 2.5 i | 1000$ |
| 1.2.3.8. | Hotplates 200x300mm 2 pieces | 200$ |
| 1.2.3.9. | Water bath 6 - place concentric rings stainless steel | 250$ |
| 1.2.3.10. | Crucibles of platinum with lid 5-15-25ml | 1000$ |
| | Dishes of platinum 20-50 ml | 600$ |
| | Crucibles and dishes of pocelain 5-100 ml | 100$ |
| 1.2.3.11. | Forceps stainless steel 10 pieces | 25$ |
| 1.2.3.12. | Desiccators of borosilicate ø 150-200m 10 pieces | 700$ |

| | | |
|---|---|---|
| 1.2.3.13. | Labelled dispensing bottles<br>Lithmus<br>Methy orange<br>Phenolphtalein<br>Universal indicator<br>Starch indicator | |
| 1.2.3.14. | Paper indicators PH, Mn, Fe, Cu, Cl etc. | 35$ |
| 1.2.3.15. | Burette stands with holders 10 pieces | 200$ |
| 1.2.3.16. | Burette stands with stirrer and/or heating Gallenkamp. | 200$ |
| 1.2.3.17. | Burette 1-5-10-25-50-100ml 5 pieces each with stop cock keys of glass resp. teflon. | 500$ |
| | Automatic Zero burettes 5-50ml 5 pieces | 300$ |
| | Microburettes, plunger type with dial 10ml I 0.002ml and 1ml = 0.002ml 5 pieces | 1000$ |
| 1.2.3.18. | One mark pipettes 0.5 - 1-5-10-25-50-100ml 10 pieces each | 150$ |
| 1.2.3.19. | PH-meter also useful for other ion selective probes. Orion 801 digital PH/mv meter | 1500$ |
| 1.2.3.20. | Conductivity meter, direct reading with conductivity probe Phillips Pw 8505 | 1000$ |
| 1.2.3.21. | Motordriven piston burette with constant preselected flow rate | 200$ |
| 1.2.3.22. | Millivolt recorder. Servogor M | 1500$ |
| 1.2.3.23. | Barometer anaroid type pauline | 600$ |
| 1.2.3.24. | Gas analyser Orsat | 1000$ |
| 1.2.3.25. | Gas burettes Gasometer 1-10 L | 100$ |
| 1.2.3.26. | Gas meter dry type 200 l/h | 1000$ |
| 1.2.3.27. | Gas flow meter Rotameter type 10-1-200 l/h | 700$ |
| 1.2.3.28. | Air pump membrane type 200 l/h | 700$ |
| 1.2.3.29. | Gas wash bottles 100-500ml 10 pieces | 200$ |
| 1.2.3.30. | Electrodeposition analyser with rotary efectrodes, stirrer, hot plate gallen kamp EME300 | 200$ |

| | | |
|---|---|---|
| | and power supply 7A 12V | 500$ |
| | Spiral wire anode of platinum 6g | 100$ |
| | Gauze cathode of platinum 20g | 300$ |
| | Beakers and beaker cover glass of polybutylen | 50$ |
| | Feeder wire platinum for mercury cathode | 10$ |
| 1.3. | Organic Analysis; | |
| 1.3.1. | Sample preparation and dissolving | |
| 1.3.1.1. | Cutters, saws, scissors, knives, shopping board | 200$ |
| 1.3.1.2. | Extractors, soxelet with thimbles, 5 stands and heaters | 1500$ |
| | 10 sets, 125ml, 10 sets 250ml, 5 sets 500ml | |
| 1.3.2. | Classical | |
| 1.3.2.3. | Fractional distillation apparatus K-20ml kit with heater | 1000$ |
| 1.3.2.4. | Combustion apparatus for elemental analysis C,H,N,O,S,P,Cl,F,J,B, Per kin Elmer 240 | 20000$ |
| 1.3.2.5. | Molar mass determination apparatus by elevation of boiling point Beckman | 100$ |
| | depression of melting point Beckman | 200$ |
| | Vapour density Victor Mayer | 100$ |
| 1.3.2.6. | Titrations for acidity, alcalinity saponification etc are made in the inorganic laboratory | |
| 1.3.2.7. | Melting point apparatus; Kofler hot bench | 1000$ |
| 1.3.2.8. | Refractometer, Abbe, Zeiss | 2000$ |
| 1.3.2.9. | Density balance for liquids and solids westphal | 100$ |
| 1.3.2.10. | Hydrometers 0.6-1.4g/$m^3$ set Accuracy 0.001 | 500$ |
| 1.3.2.11. | Density Comparator Fisher Davidson Gravitometer for liquid samples | 200$ |
| 1.3.2.12. | Bottle shaker | 300$ |
| 1.3.2.13. | Water bath, thermostated 20l | 150$ |
| 1.3.3. | Instrumental | |
| 1.3.3.1. | Infrared spectrophotometer perkin elmer 580 | 20000$ |
| 1.3.3.2. | Sepectrophotometer UV- Vis Perkin Elmer 550 | 20000$ |

| | | |
|---|---|---|
| 1.3.3.3. | Liquid chormatograph Perkin Elmer 601 | 10000$ |
| 1.3.3.4. | Gas Chromatograph Perkin Elmer 39200 with FID and HID detectors, pyrolysis attachment recorder and computing Integrator Hydrogen generator (electrolytical) | 20000$ |
| 1.3.3.5. | Fluoresence sepectrophotometer Perkin Elmer MPF-4 | 10000$ |
| 1.3.3.6. | Thermal analysis equipment | |
| 1.3.3.6.1. | Thermogravimetric TGS ] Perkin | |
| 1.3.3.6.2. | Thermomechnical TMS ] Elmer Dsc-2 | 20000$ |
| 1.3.3.6.3. | Different thermal analysis DTA ] System | |
| 1.3.3.6.4. | Mass spectrometer Micromass Q x 200 | 10000$ |

1.4. Air and water Pullution testing

| | | |
|---|---|---|
| 1.4.1. | Millipore filter outfit | 100$ |
| 1.4.2. | Draeger tester with tubes for Amonia, Carbon monoxide, hydrogen shulphide, petroluem hydrocarbons sulphure dioxide, trichloroaethylene | 1000$ |
| 1.4.3. | Turbidimeter EEL | 500$ |
| 1.4.4. | Dissolved oxygen meter | 1000$ |

1.5. Microsscopy:

| | | |
|---|---|---|
| 1.5.1. | Universal microscope 50x - 2000x with phase contrast and polarised light Binocular eye pieces, Viewing screen photo attachment and illumination carl Ziess | 15000$ |
| 1.5.2. | Stereomicroscope 10x 120xZoom with halogen lamp - fiber optical illumination | 3000$ |

1.6. Supply of distilled water:

| | | |
|---|---|---|
| 1.6.1. | Water still 1.8 l/h quarz 2 steps | 2500$ |
| 1.6.2. | Water still 1 step 5 l/h with 261 automatic electric collecting vessel and distribution polyethlene pipes to sinks and dish washers | 500$ |

1.7. Supply of burner gas;

LPG with distribution pipes

1.8. Supply of chemicals;

Store for non volatile chemicals

Store for acids

Store for gases (steel flasks)

$O_2$ $N_2$ $CO_2$ $H_2$ $SH_2$ Ar.

Store for flammable agents

Store for poisons locked

Inventory and replenishment system 2000DM

1.9. Supply of glassware;

1.9.1. Store for glassware and commodities

Bottles, flasks, beakers, test tubes, measures, pipettes, burettes, watch glasses, funnels

Gasgenerator (Kipp) $H_2S$ - $CO_2$ - $H_2$

Electrolysis hydrogen generator 3000DM

1.9.2. Store and workshop for fitting, rubber stoppers, cork stoppers 10-30mm

Flexible tubing of rubber, PVC silicone and neoprene for LPG - burners (8x3mm)

8x2mm, 5x1.5mm, 3x3mm.

Glass adapters and plastic adapters for Flexible tubings; straight tapered, T - shaped 5 - 12 mm.

Glass tubes

Flat flame burner

Blast burner with air compressor

Glass knife with sharping stone

Cork boring machine

Cork press

Sanding paper

File

Knife

| | | |
|---|---|---|
| | Screw driwers | |
| | Tongs | |
| | Adjustable spanner | 2000$ |
| 1.10. | Miscellaneous | |
| 1.10.1. | Laboratory stands with boxes | |
| 1.10.2. | Boss heads, clamps and rings | |
| 1.10.3. | Test tube racks | |
| 1.10.4. | Burners | |
| 1.10.5. | Tripodes, Triangles, Asbestors wire guazes | |
| 1.10.6. | Hoseclips | 2000$ |
| 1.11. | Other commodities: | |
| 1.11.1. | Crucible tongs stainless 10 pieces | |
| 1.11.2. | Test tube holders stainless 10 pieces | |
| 1.11.3. | Forceps stainless 10 pieces | |
| 1.11.4. | Spoons with spatula stainless 10 pieces | |
| 1.11.5. | Gaslighters piezo electric pistol type 5 pieces | 1000$ |
| 1.12. | Dishwashing: | |
| 1.12.1. | Automatic dishwasher Gellay LV 700 | 2000$ |
| 1.12.2. | Burette and pipette washer and dryer fisher 15-350-15 | 200$ |
| 1.12.3. | Drying cabinet 300 l | 1500$ |
| 1.12.4. | Brushes (cleaning - Bottle, Test tube, pipe) | |
| 1.12.5. | Detergent | |
| 1.13. | Emergency equipment: | |
| 1.13.1. | Buckets and sponges | |
| 1.13.2. | Saw dust | |
| 1.13.3. | Gas mask | |
| 1.13.4. | Rubber booths, rubber apron, and rubber gloves | |
| 1.13.5. | Fire extinguishers | |
| 1.13.6. | Emergency shower | 500$ |
| 1.13.7. | Eye bath | |

TOTAL COST 279.730$ FOR CHEMICAL ANALYSIS.

II. Civil engineering:

| | |
|---|---|
| II.1. Set of sieves ø 300mm with vibrator | 200$ |
| II.2. Sedimentation vessels | 700$ |
| II.3. Dryoven 125l 25°C - 200°C | 100$ |
| II.4. Top loading balance 13kg. I lg metter | 2000$ |
| II.5. Apparatus for test. ; setting and hardening times. Gillmore needles | 100$ |
| II.6. Apparatus for testing the drying shrinkage of hardened concrete | 1000$ |
| II.7. Apparatus to measure the impermeability of water in concrete | 15000$ |
| II.8. Concrete molds for cylinders ø100-ø200mm cubes 100mm - 200mm and beams 100x150x700mm | 1000$ |
| II.9. Curing tank with thermostat controlled electric heating | 2000$ |
| II.10. Concrete mixer 50 l | 1500$ |
| II.11. Slump test to measure the plasticity of mortar and clay | 100$ |
| TOTAL COST FOR CIVIL ENGINEERING TEST | 23700$ |

III. Organic Materials:

III.1. Plastic and Rubber

| | | |
|---|---|---|
| III.1.1. | Tensile test machine 25 KN (500kg Instron 1026) | 10000$ |
| III.1.2. | Wedge grips for strips and wires | 500$ |
| | 2 Rubber grips | 500$ |
| | 3 Drum grips for ropes | 500$ |
| | 4 Temperature cabinet 0°C - 150°C | 1000$ |
| | 5 Attachment for bending test | 1000$ |
| III.1.3. | Hardness test machine for rubber, Shore A Gardner HR 1052 I HR 1019 stand Charpy and Izod | 2000$ |

| | | |
|---|---|---|
| | Tinius olsen, made to operate with the dynatup instrumentation VI.1.3. | |
| III.1.4. | Apparatus for determination of temperature of deflection under load | 1000$ |
| III.1.5. | Torsion pendlum with temperature chamber - 30° - + 150°C | 3000$ |
| III.1.6. | Rebound resilience tester, luepke pendulum | 1000$ |
| III.1.7. | Moulding press for making test pieces | 2000$ |
| III.2. | Fibres: | |
| III.2.1. | Tensile testing machine 2-5 KN (250kg) Lorenze & waltre F01 | 8000$ |
| III.2.1.1. | Grips for metals | |
| 2. | Plastics | |
| 3. | Rubber | |
| 4. | Cords and yarn | |
| 5. | Textiles | |
| 6. | Fibres | |
| 7. | Ropes | |
| 8. | Paper | |
| 9. | Wood | |
| 10. | Belts | |
| 11. | Carpets (floor coverings) | 1000$ |
| III.2.2. | Yarn evenness tester | 2000$ |
| III.2.3. | Twist counter | 1000$ |
| III.2.4. | Warp Reel, Manual | |
| III.2.5. | Yarn numbering scale (Quadiant) | 2000$ |
| III.2.6. | Apparatus for determination of fiber diameter by Air flow method | 8000$ |
| III.2.7. | 1 m steel rule to measure fabrices (2 pieces) | 50$ |
| III.2.8. | 25 m tape to measure fabrics and ropes | 100$ |
| III.2.9. | Top loading balance 1300g I 0.1g Nettler | 1500$ |

| | | |
|---|---|---|
| III.2.10. | Linitest wash fastness tester with cylinders for washability, dry cleanability, dyeability, pilling and efficiency of detergent | 2500$ |
| III.2.11. | Impeller tumber for abrasion test Atlas aatcc accelerator | 1000$ |
| III.2.12. | Elmendorf pendelum for tear resistance test Lorenzen and Wettre 125 | 7000$ |
| III.2.13. | Scorch tester (fastness to hot pressing) Atlas SO - 513 | 1000$ |
| III.2.14. | Abrasion tester Taber (Roller type) | 10000$ |
| III.2.15. | Burst test Membrane type lorenzen and wettre PMA | 7000$ |
| III.2.16. | Air permeability tester lorenzen and wettre 73 | 3000$ |
| III.2.17. | Water permeability tester lorenzen and wettre 45 | 2000$ |
| III.2.18. | Laboratory wringer Atlas 14-1034-00 | 500$ |
| III.2.19. | Steaming press | 500$ |
| III.2.20. | Spinning machine laboratory size | 10000$ |
| III.2.21. | Cording machine | 6000$ |
| III.2.22. | Weaving machine | 6000$ |
| III.2.23. | Sewing machine singer | 1000$ |
| III.2.24. | Stiffness tester Taber | 1000$ |
| III.2.25. | Folding tester for paper | 1000$ |
| III.2.26. | Universal microscope 100x-100xmagn. | 1000$ |
| III.2.27. | Microtome sliding hand operated | 1000$ |
| III.2.28. | Supply of micro slides and micro cover glasses | 100$ |
| III.2.28. | Set of fiber identifying dyes | 100$ |
| III.2.29. | Precision test strip cutter lorenzen and wettre F108 | 1000$ |
| III.2.30. | Cutting machine for 100$m^2$ samples lorenzen and wettre 111 | 2000$ |
| III.2.31. | Scissors and knives | 300$ |
| III.2.32. | Thermo - hygrograph to record the ambient in the laboratory | 1000$ |

| | | |
|---|---|---|
| III.3. | **Paints:** | |
| III.3.1. | Spray box with spray gun | 5000$ |
| III.3.2. | Drying oven 10001 150°C | 2000$ |
| III.3.3. | Sand blast box | 7000$ |
| III.3.4. | Degreasing tank 20 l. | 1000$ |
| III.3.5. | Viscometers Flow time by ISO Flow cup and Ford Flow cup with water bath. Electronic digital pocket stop watch | 1000$ |
| III.3.6. | Rotatory viscometer 1 stormer viscometer gardner VG - 7250 2 ICI Cone and plate viscometer gardner VR - 4004 | 400$<br>2000$ |
| III.3.7. | Fineness of grind guage gardner GG-6390B | 100$ |
| III.3.8. | Cryptometer for hiding power gardner 66-9630 | 200$ |
| III.3.9. | Wet film thickness guage gardner GG.6280N | 100$ |
| III.3.10. | Magnetic thickness guage Gardner GG.6260 | 600$ |
| III.3.11. | Paint inspection guage to measure film thickness in a precision cut groove gardner GG.6290 | 200$ |
| III.3.12. | Falling sand abration tester gardner AG-1046 | 200$ |
| III.3.13. | Tintometer gardner XL - 10A | 3000$ |
| III.3.14. | Light fastness and weathering test Atlas weatherometer | 15000$ |
| III.3.15. | Scratch hardness tester pen type Ettichsen 291 | |
| III.3.16. | Electros tatic porosity detection (Holiday Detector) Gardner DR-22170 eloometer | 2000$ |
| III.3.17. | Cylindrical Mandrel bending test apparatus Erichsen 266 | 500$ |
| III.3.18. | Vicat neddle penetration apparatus Fisher 13-399 | 500$ |
| III.3.19. | Softening point of asphalt, Ball and ring apparatus with thermometer Fisher 1-551 | 100$ |
| III.3.20. | Scrubbability tester Gardner WG-2000 | 500$ |
| III.3.21. | Jacobson chalk tester Gardner GG-3801 | 100$ |
| III.4. | **Fuels** | |
| III.4.1. | Flash point tester Pensky-Martens Gallen kamp PEJ - 570 | 500$ |

| | | |
|---|---|---|
| III.4.2. | Viscosimeter Engler Gardner PG - 4155 | 150$ |
| III.4.3. | Dropping tester with thermometer | 100$ |
| III.4.4. | Apparatus for determination of vapour pressure pressure bomb, pressure gages 700 Kpa thermostatic waterbath | 3000$ |
| III.4.5. | Bomb calorimeter with console, firing accessory, pressure gage crusibles, briquette press and thermometer Gallen kamp CBA 300 | 3000$ |
| III.4.6. | Gas calorimeter with gasmeter, thermometers etc. Gallen kamp CBB - 800 | 2500$ |
| III.4.7. | Distillation apparatus is kept in chem. lab. | |
| | TOTAL COST FOR ORGANIC MATERIAL TESTING | 162,600$ |

| | | |
|---|---|---|
| IV. | Food and beverages: | |
| IV.1. | Chemical analysis | |
| IV.1.1. | PH meter orion 801 digital PH/mv meter | 1500$ |
| IV.1.2. | Infra red spectrophotometer avaulable in the organic laboratory | |
| IV.1.3. | Fluorescence spectrophotometer available in the organic laboratory | |
| IV.1.4. | Liquid chromatograph available in the organic laboratory | |
| IV.1.5. | Electrophoresis; power supply 5 - 100 mA; 50-500V electrophoreis chamber Gelman 51211 10 packs of membranes | 1000$ |
| IV.1.6. | Centrifuge | 1000$ |
| IV.1.7. | Butyrometer tubes | 500$ |
| IV.1.8. | Water bath $30^{o}$ - $100^{o}$ - 121 | 400$ |
| IV.1.9. | Kjeldahl equipment for protein determination | 7000$ |
| IV.1.10. | Spectrophotometer B2L spectronic 20 | 7000$ |
| VI.1.11. | Dry oven 50 l for moisture tests | 700$ |

| | | |
|---|---|---|
| IV.1.12. | 2 Refrigerators 100l | 1000$ |
| IV.1.13. | 2 Freesers 100l | 1000$ |
| IV.1.14. | Universal microscope 100x- 2000xMagn, is kept in the chemical laboratory | |
| IV.1.15. | Stereomicroscope 10-100xmagnification is kept is the chemical laboratory | |
| IV.1.16. | Distillation apparatus kit 500ml | 1000$ |
| IV.1.17. | Burettes pipettes labelled bottles for reagents and indicators | 500$ |
| IV.1.18. | Magnetic stirrer | 10000$ |
| IV.1.19. | Hydrometer of glass for | |
| | 1 Alcohol | |
| | 2 Milk fat | |
| | 3 Cheese fat | |
| | 4 Candesed milk | 100$ |
| IV.1.20. | Analytical balance 20g $\pm$ 1mg is kept in the chemical laboratory | |
| IV.1.21. | Top loading balance 160g $\pm$ 10mg is kept in the chemical laboratory | |
| IV.1.22. | Polarimeter with sodium lamp and measuring tubes Zeiss | 2000$ |
| IV.1.23. | Refractometer Abbe Zeiss | 20000$ |
| IV.1.24. | Soxlet extractors | 1500$ |
| IV.1.25. | Electric meat grinder | 300$ |
| IV.1.26. | Thermostated waterbath | 500$ |
| IV.1.27. | Knives and shopping boards | 50$ |
| IV.1.28. | Petri dishes, filtration funnels, beakers etc. kept in stores by the chemical laboratory | 2000$ |

IV.2. <u>Microbiological:</u>

| | | |
|---|---|---|
| IV.2.1. | Binocular dissecting microscope (for examination of foreign bodies and insects) with long arm stand and built in illumination | 800$ |

| | | |
|---|---|---|
| IV.2.2. | Incubator 501 | 700$ |
| IV.2.3. | Steriliser 501 Hot air | 500$ |
| IV.2.4. | Bacteria colony counter | 500$ |
| IV.2.5. | Microtome is kept by the fiber group | |
| IV.2.6. | Shaking incubator | 1000$ |
| IV.2.7. | Anaerobic jars with accessors | 350$ |
| IV.3. | Mechanical; | |
| IV.3.1. | Gelatin strength | 500$ |
| IV.3.2. | Penetrometer 50-100g Fisher 13-399-10 | 1000$ |
| IV.3.3. | Crush test apparatus 100N (10kg). | 2000$ |
| IV.3.4. | Surface tension tester Tensiomat Fisher model 21 | 1000$ |
| | TOTAL COST FOOD AND BEVERAGES | 73,800$ |
| V. | CHEMICALS NECESSARY FOR THE LABORATORIES | 100,000$ |
| VI. | Other services; | |
| VI.1. | Workshop | |

The work shop shall;

1) assist in sample preparation and making test pieces.
2) assist in the installation of new equipment.
3) do maintenance on equipment.
4) make spare parts that are not readily available.
5) make alternations and modifications of equipment.
6) make jigs and fixtures for the mounting of test pieces.
7) build specialised testing equipment.

| | | |
|---|---|---|
| VI.1.1. | Tool machines | |
| VI.1.1.1. | Lathe 300x1200mm with accessories | 10000$ |

| | | |
|---|---|---|
| VI.1.1.2. | Lathe 50x200mm with accessories | 2000$ |
| VI.1.1.3. | Milling machine 250x500mm | 10000$ |
| VI.1.1.4. | Shaping machine 250x500mm | 5000$ |
| VI.1.1.5. | Cutting machine 150mm | 1000$ |
| VI.1.1.6. | Drilling machine ø 25mm | 1000$ |
| VI.1.1.7. | Drill press ø 10mm | 500$ |
| VI.1.2. | Specialised machine | |
| VI.1.2.1. | 1 Band saw | 2000$ |
| VI.1.2.2. | 1 Cutter ] May be combined in one machine | 1000$ |
| VI.1.2.3. | 3 Diso saw ] | 1000$ |
| VI.1.2.4. | Welding kit for gas welding and hand soldering | 1000$ |
| VI.1.2.5. | Welding kit for electric welding | 1000$ |
| VI.1.2.6. | Electric grinder 250x40mm | 500$ |
| VI.1.2.7. | Belt grinding machine | 500$ |
| VI.1.2.8. | Polishing machine | 200$ |
| VI.1.3. | Hand tools | |
| VI.1.3.2. | Vises 60mm - 135mm | |
| VI.1.3.3. | Clamps | |
| VI.1.3.4. | Chisels and knives, scissors, shears, pouches | |
| VI.1.3.5. | Grinding wheel (electric) | |
| VI.1.3.6. | Screwdrivers, wrenches and spanners | |
| VI.1.3.7. | Pincers, nippers, and pliers | |
| VI.1.3.8. | Workshop files | |
| VI.1.3.9. | Hammers | |
| VI.1.3.10. | Soldering irons, tin, and soldering flux | |
| VI.1.3.11. | Shears for sheet metal (Bench type) | 1000$ |
| VI.1.4. | Instruments | |
| VI.1.4.1. | Steel tape rules | |
| VI.1.4.2. | Steel rules | |
| VI.1.4.3. | Vernier calipers | |
| VI.1.4.4. | Precision caliper micrometer | |
| VI.1.4.5. | Feele guages | |
| VI.1.4.6. | Electrical multimeter | 1000$ |
| | TOTAL COST WORKSHOP | 38,700$ |

VI.2. Libarary equipment: 20,000$

VI.2.1. To keep;

1. Books
2. Standards
3. Periodicals
4. Decrees
5. Patents

VI.2.2. To supply;

1. Books for reference
2. Books for loan
3. Books deposited in DYOSQ offices
4. Circulation scheme for periodicals
5. Accession catalogue
6. Handle loan of books from other institutions

VI.3. Auditorium: 150,000$

1. Seat 250 people in comfortable chairs with place to put documents and notes
2. Toilets and washrooms
3. Lobby big enough to serve refreshments during breaks
4. Audio-visual aids, connections for microphones and earphones by the seats

VI.4. Typing pool, photography and reproduction: 50,000$

1. Type reports, letter and other documents
2. Take pictures of event, samples, equipment etc. Supply copies for insertion in reports or to be used for information leaflets etc. Produce photos for staff, identification cards.
3. Print by stencils for offset reports and information material.

VI.5. Canteen: 30,000

1. Serve refreshments and food to staff and guests
2. Cater refreshments for meetings

VI.6. Medical aid:

TABLE 1 SHOWS THE TOTAL COST OF THE EQUIPMENT

| | ITEM | TOTAL COST US$ |
|---|---|---|
| 1. | Chemical analysis laboratory | 279,730 |
| 2. | Civil engineering laboratory | 23,700 |
| 3. | Organic material testing | 162,600 |
| 4. | Food and Beverges | 73,800 |
| 5. | Work shop | 38,700 |
| 6. | Chemicals necessary for the labs. | 100,000 |
| 7. | Libarary equipment | 20,000 |
| 8. | Auditorium | 150,000 |
| 9. | Typing pool etc. | 50,000 |
| 10. | CAnteen | 30,000 |
| | COMPONENT TOTAL | 928,530 |

XVII. BUILDING FOR THE LABORATORY;

1. The space required for the proposed laboratory equipment is estimated to about 2000 $m^2$ (less corridors, stairs, toilettes etc) Offices for senior staff is estimated to 540 $m^2$, corridors and toilettes estimated to 25% of the working space which means 650 $m^2$ together. The workshop with office store and corridors is estimated to 185 $m^2$.

Altogether the total area is nearly 3400 $m^2$ with the building cost 100 YD for $m^2$ given by the investment department in the Ministry of Industry will cost 1000,000$. That is 333 333$ (333000$ = )every year in a 3 year plan for the building.

2. The instrumental costs for the laboratory is estimated to 928530$ 930000$ =.

In a three year plan this makes an annual budget of 310000$ = for equipment.

3. The furniture for offices and laboratories including sinks and fume hoods is proposed to be imported, because no locall capabilities exist. The planning and drafting of the furniture shall be made together with drafting of the building to make sure they will fit. The furniture for each building must be ready the same moment the building is finished. The cost of imported made laboratory furniture is not easy to estimate. A flate "guestimate" is 200$ worth of furniture average for each $m^2$ "working space". That would equal 680000$ cost of furniture totally or 226666$ ie 226000$ = annually during 3 years.

4. Designing of the laboratory; There are no locall capabilities for designing laboratories. For this reason it is recommended that foreign experience can not be overlooked. A flat "guestimate" for this is about 20,000$ in the first year of the 3 year plan of the laboratory.

TABLE 2 The break down of the costs of equipment and building is shown in the following table;

| ITEM | TOTAL COST $ | FIRST YEAR $ | SECOND YEAR $ | THIRD YEAR $ |
|---|---|---|---|---|
| Equipment | 930000 | | 465000 | 465000 |
| Buildings | 1000000 | 1000000 | | |
| Furniture | 680000 | | 340000 | 340000 |
| Design | 20000 | 20000 | | |
| Miscellaneous | 20000 | | 10000 | 10000 |
| GRAND TOTAL | 2650000 | 1020000 | 815000 | 815000 |

XVIII TECHNICAL ASSISTANCE BY UNIDO:

The total period of this sub-project is 3 years, starts on July 1980 and ends on June 1983.

It is advisable that the counterpart for these follow-ups be one and the same person through the whole period and also that this person is the co-counterpart to all the experts and consultants. The first followup for the building plans and the architect drawings may be expected to be early in 1981.

To be able to keep with the usual approved limited number of man months of experts it is necessary that the missions are split in more than one period to enable the expert to attend both to the phase of selecting tendering and contracting the equipment and planning of foundations, power, water supply and other accessory facilities and later to the installation, and inplant training etc.

The following experts and consultants are proposed;

| | |
|---|---|
| Follow-up consultant short term assignments | 5mm |
| Expert in Food laboratories | |
| Purchase phase | 4mm |
| Training phase | 4mm |
| Expert in chemical analysis | |
| Purchase phase | 4mm |
| Training phase | 4mm |
| Expert in Organic material testing | |
| Purchase pahse | 4mm |
| Training phase | 4mm |
| Expert in Civil engineering testing | |
| Purchase phase | 2mm |
| Training phase | 2mm |
| Expert in Standardization and Quality Control documentation. * | |

* Benefits can be taken from the Expert whol will be present during the sub-project of running the DY Organization for standardization and Quality, during July 1980 and April 1981.

| | |
|---|---|
| Expert in testing equipment Maintenance and repaire. | 3mm |
| Total | 36mm |

XIX. FOLLOWSHIP PROGRAMME:

It is proposed that fellowships are given to courses of different categories as follows;-

1. Manufacture's courses on specific instruments when decision is taken on which equipment to buy. July 1980 - June 1983

| | |
|---|---|
| - Infrared spectophotomety | ½mm |
| - Liquid chromatography | ½mm |
| - Gas chromatography | ½mm |
| - Mass spectrometer | ½mm |
| - Universal microscope | ½mm |

2. University courses

| | |
|---|---|
| - Plastic testing | 1½mm |
| - Paints and varnishes | 1½mm |

3. Courses requested from UNIDO

July 1980 - June 1983;

| | |
|---|---|
| - Food quality control (2 participants) | 6mm |
| (including analysis and microbiological) | + 6mm |
| - Paints testing | 3mm |
| - Leather and shoe testing + plastic | 4mm |
| - Textile testing | 6mm |
| - Building material testing | 3mm |
| The total requested from UNIDO; | 28mm |

Executing Agency Inputs will be;

1) Projeot Manager
2) Experts;
   a) Expert in Food laboratories;

      Will assist in the installation and operation of Food and beverages testing equipment and in training counterparts on their use.

      Qualifioations; University degree or equivalent in engineering or scienoe with extensive experience in Food and beverages testing.

   b) Expert in Chemioal analysis;
      Will assist in the installation and operation of chemical analysis testing equipment and in training counterparts on their use.

      Qualifications; University degree or equivalent in engineering or scienoe with extensive experienoe in chemical analysis.

   c) Expert in Civil engineering testing;
      Will assist in the installation and operation of civil engineering testing equipment and in training counterparts on their use.

      Qualifiactions; University degree or equivalent in engineering or scienoe with extensive experience in civil engineering tests.

   d) Expert in Organic material testing;
      Will assist in the installation and operation of organic material testing equipment and in training counterparts on their use.

      Qualifications; University degree or equivalent in engineering or scienoe with extensive experienoe in organic material testing.

e) Expert in testing equipment maintenance and repairs;

Will assist in planning, equipping and operating a maintenance and repair unit for analytical and testing instruments and training the counterparts on such activities.

Qualifications; University degree in engineering or technology with extensive experience in maintenance and repair activities.

XX. EXPERTS AND TRAINING PROJECT BUDGET:

a) Experts;

| | | |
|---|---|---|
| - Consultant salary (estimated) | m/m | 6000$ |
| - Expert salary (estimated) | m/m | 5000$ |
| - Consultant | 5m/m | 30000$ |
| - Experts | 31m/m | 155000$ |
| Total | | 185000$ |

b) Training;

| | | |
|---|---|---|
| - Average | m/m | 1500$ |
| Total | 28m/m | 42000$ |
| Grand Total | | 227000$ |

N.B. It is supposed that experts presence and training will work out after the building is finished which is assumed to take one year.

TABLE 3. The break down of the costs of the quality control laboratory including experts; and training costs

| ITEM | TOTAL COSTS $ | FIRST YEAR $ | SECOND YEAR $ | THIRD YEAR $ |
|---|---|---|---|---|
| Equipment | 930000 | | 465000 | 465000 |
| Buildings | 1000000 | 1000000 | | |
| Furniture | 680000 | | 340000 | 340000 |
| Design | 20000 | 20000 | | |
| Experts & Training | 227000 | | 113500 | 113500 |
| Miscellaneous | 20000 | | 10000 | 10000 |
| Grand Total | 2877000 | 1020000 | 928500 | 928500 |

XXI. Conclusion:

UNIDO technical assistance is given in the following phases of the development of the DYOSQ laboratory.

a) Planning of the buildings
b) Final selection of the equipment
c) Installation, adjustment of the equipment
d) On the job training of the staff in the use maintenance of the new equipment.