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DEVELOPMENT OF THE YEMENI INSTITUTE FOR STANDARDIZATION, QUALITY ASSURANCE AND METROLOGY

DP/YEM/87/003

YEMEN ARAB REPUBLIC

Technical report: Testing and Metrology Equipment*

Prepared for the Government of the Yemen Arab Republic
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Dr. Ahmad Geneidy, Consultant,
Testing and Metrology Equipment

Backstopping officer: V. Kozlov, Institutional Infrastructure Branch

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

V.89-51807 (EX)

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INTRODUCTION

The present assignment was carried out within the implementation of the large-scale project "Development of the Yemeni Institute for Standardization, Quality Assurance and Metrology" (DP/YEM/87/003/11-51).

As seen from the terms of reference indicated in the Job Description, which is reproduced as Annex 1 to this report, the main objective of the mission is to finalize the evaluation and selection of all of the equipment component which has been preliminarily estimated at US$750,000 representing almost half of the UNDP contribution to the project. This called for two types of activity:

1. The study and evaluation of the various quotations received by UNIDO from the many manufacturers/suppliers in order to select and order the most appropriate equipment for the achievement of project objectives.

2. The preparation of detailed technical specifications for the equipment whose offers were found to be irrelevant or which have not been requisitioned so far.

In addition, the Consultant, on the request of the backstopping officer, Mr. V. Kozlov, investigated in the field all aspects related to the equipment such as the premises, experts and training.

The two-month assignment started on 30th October 1988 and was carried out in UNIDO Headquarters in Vienna and in the field in Sana'a. The particulars of the Consultant's counterpart are shown in Annex 2.

The present report summarizes the Consultant's activities, findings and recommendations.

ACTIVITIES, FINDINGS AND RECOMMENDATIONS

1. Evaluation and Selection of Equipment

A. Introduction

In September 1988, UNIDO sent the names of all project equipment - as indicated in the 12 lists of Annex 3 attached to the project document - to the respective manufacturers/suppliers for bidding. By the end of October and beginning of November 1988, a large number of quotations were received. Thus the first task of the Consultant was to evaluate these quotations and select the most appropriate equipment. Since the equipment lists carried only the names of equipment with no detailed technical specifications, manufacturers and suppliers had to offer all available types of equipment without confining their quotations only to that equipment which complies to certain specified standards. This situation entailed the necessity of conducting a thorough study of each offered item in order to identify that equipment which conforms to the required standards/specifications in order to be able to carry out a fair comparison between various offers and to ensure the procurement of that equipment which would lead to the achievement of project objectives. This process had to be time-consuming.

In this respect, it is worth mentioning that the presence of the Consultant in UNIDO Headquarters for a portion of his mission proved to be extremely useful as it enabled him to contact some manufacturers/suppliers to clarify and settle certain technical points in their respective offers. This helped to speed up the process of equipment evaluation and selection.

B. Principles and rules governing the evaluation of equipment

In order to discharge his duties in a logical and systematic manner, it was necessary - at the very outset - to identify the role of the laboratories to which the equipment will be supplied and, accordingly, establish the principles and rules that should govern the process of equipment evaluation and selection in order to enable these laboratories to play their due role.

As perceived and viewed by the Consultant, the functions of quality control laboratories established within a national standards body would be:

1. To carry out investigational testing to provide the necessary data for the elaboration, amendment and revision of national standards.

2. To develop new, simpler, cheaper and less time-consuming analytical techniques and to check the precision of test methods.

3. To design, develop and make specialized testing equipment which is not available in the market but is needed to identify the characteristics of certain products.

4. To check the conformity of goods to compulsory standards.

5. To test products covered by voluntary standards for the regular assessment and evaluation of the quality level of national production. Such assessment will be greatly useful to the government, industry and to the national standards body itself. It will enable the government to follow up the quality of locally made products and take the necessary measures, the manufacturers to improve their products quality and the national standards body to check the applicability of national standards.

6. To test the suitability of indigenous materials as alternatives to imported ones in local production, thereby assisting in the utilization of national resources and saving foreign currency.

7. To assist in the operation of the certification marking system by testing samples drawn from the applicant or licensee factories, or purchased from the open market or provided by complaining consumers. Test results so obtained are major decisive factors in the grant of new licences, suspension or cancellation of existing licences.

8. To help industry by providing or arranging facilities for the examination and testing of commodities, processes and practices and for investigation or research that may be necessary.

9. To promote testing activities in the country by:

   (a) upgrading the testing staff in industry through conducting training programmes to update their knowledge of the latest developments in testing techniques.
   (b) assisting the establishment of quality control laboratories in industrial units by providing them with advisory services and the specifications of the necessary equipment and their manufacturers/ suppliers.

10. To administer the national laboratory accreditation system.

11. To present official opinion in legal proceedings connected with product quality.

In addition to acting as the testing arm of the national standards body, quality control laboratories are of great use to other bodies in countries having no other laboratories, as in the Yemen Arab Republic. They would be required to provide general testing services to the government, industry and commerce. In such cases, these laboratories would be entrusted with other additional functions such as:

1. To act as the food control laboratory.
2. To carry out tests for custom purposes.
3. To test the delivery of government purchases.
4. To control imports.
5. To check exports.
6. To certify welders.
7. To act as a nucleus for industrial developmental research activities.

From the above, it is seen that:

1. The quality control laboratories are to be established as the competent national authority in all matters related to analysis, testing and measurement. They have to play a leading, guiding, supervising and promoting role in these fields.

2. They should render valuable services to the various sectors of the national economy.

3. Their work load has to be heavy, broad and highly diverse.

4. They may be called upon to carry out some research work.

In order to be able to fulfil the above obligations, laboratory equipment has to be of a certain high standard. Accordingly, it was deemed necessary that, in evaluating and selecting such equipment, the price factor should not be the sole criterion. Rather, great emphasis should be placed on equipment quality, i.e. on those features which lead to accuracy and precision - in terms of reproducibility and repeatability - safety, serviceability, reliability and trouble-free operation under heavy work loads and demanding conditions. In parallel, there are also other factors that ought to be considered such as productivity, ease and simplicity of operation, diversability, expandability and data management capability.

Below is a brief discussion with examples of some of the factors which have been closely observed in the evaluation and selection of laboratory equipment, especially so in the case of the five major items of equipment, namely the four fine analytical instruments (AAS, UV/VIS spectrophotometer, HPLC and GC) and the universal testing machine. The estimated costs of this equipment together with their essential accessories and spare parts, as indicated in the project document, amount to US$241,920, thus constituting 32.3%, i.e. almost one third of the equipment component of the project.

a. Accuracy and precision

As defined by the American Society for Testing and Materials (ASTM), accuracy is "the degree of agreement of individual or average measurements with an accepted reference value or level" whereas precision is "the degree of mutual agreement among individual measurements".

It goes without saying that for a testing laboratory in a standards institution, accuracy and precision command utmost importance. This becomes very evident from the fact that this laboratory is to be considered as the national top reference authority in its field of activity and that its results will be taken as the basis for serious decisions which may affect the health and interests of individuals, enterprises and the nation at large. Examples of the importance of accuracy and precision in measurement results are shown in the case of litigation and in health matters such as the measurement of radiation and pesticide residues in foodstuffs.

b. Safety

Safety facilities in equipment should allow the instrument functions to be immobilized to prevent misuse. This is of prime importance in such cases as the atomic absorption spectrophotometer (AAS). In selecting this fine and hazardous analytical instrument, care was exercised in ensuring the presence of comprehensive series of safety interlocks in its flame atomization system.

c. Serviceability

This important factor which contributes widely to equipment quality was assured by:

(i) Limiting the selection of equipment to the smallest possible number of reputed manufacturers/suppliers in the respective field and ensuring that they have service centres in YAR or in a nearby country.

(ii) Giving priority to that equipment which includes self-diagnostics since such facilities speed fault-finding, enable fast service and minimize equipment down-time and can substantially reduce service costs. Self-diagnostics result in assured reliability of analysis/testing.

d. Reliability

In addition to self-diagnostics, reliability includes dependable results which are also assured through state-of-the-art technology. Consequently, the technology level of the equipment was also given serious consideration. In this regard, the importance of including microprocessor-based instrument controls was not overlooked since they contribute widely to maximum reliability and optimization of instrument performance as well as providing flexibility.

e. Ease of operation

Ease of operation is quite an important characteristic, especially when one considers the fact that the equipment will be operated by staff who, though qualified, have not acquired extensive experience in their manipulation. Consequently, as a rule, automatic operation was always preferred to manual operation in the selection of all project equipment and not only in the five major items mentioned before.

f. Diversibility

Due to the very diverse nature of the materials and products to be analysed/tested in a multi-disciplinary laboratory, diversibility becomes a very desirable equipment characteristic. A very good example is represented by an abrasion tester which can be used to assess the abrasion resistance of a large array of materials such as paper and board; textiles and coated fabrics; paints, varnishes and lacquers including traffic and rubber paints; glazing materials; ceramic tiles; inked ribbons; marking epoxy-base inks; carrying cases; floor coverings; decorative laminates; marking of

electronic hems; anodized aluminium alloys; polyurethane; floor and deck enamels; transparent plastics; organic coatings; packing; photographic plates and foils, etc. Needless to say that such equipment is more expensive than a similar one with few applications. Thus the above abraser was selected in preference to another one although its price was 61% higher than the latter.

g. Expandability

Special interest was given to that equipment which exhibits expandability. In fact, this property was a pre-requisite for selecting the five major items of equipment mentioned before. To be expandable, the equipment design should be founded on the concept of independent modules linked together to compose a system best suited to a specific application. The modular design allows the tailoring of the analytical/testing system to meet any need. Thus starting with a simple system, one can expand it at any time to any desired degree of sophistication to match any future need or to be suitable for research work. For example, this block-building design of the selected universal testing machine permits its extension at any later time to low cycle dynamic load tests and to operate under simulation of temperature, humidity, pressure and other environmental influences. It can also be expanded to carry out cupping and shear testing. The modular design offers maximum system flexibility, upgradability and integrity.

h. Data management capability

In order to comply with good laboratory practice (GLP) requirements, the management of the flow of data has become just as important as the data itself. Consequently, possessing a comprehensive high level data management capability was considered as an important asset in evaluating the major and sophisticated equipment. Data management includes data generation, presentation, editing, interpretation, analysis, plotting, reporting, printing, storage, archiving and transport. Editing is important as it eliminates the effect of anomalous readings. Data documentation is of particular importance to laboratories whose test results could be decisive, e.g. in court decisions. Retaining a permanent record of the parameters controlled, test method used and results obtained for future reference becomes highly desirable if not absolutely necessary.

A simple example of one of the benefits of data management capability is illustrated by the UV/VIS spectrophotometer which gives concentration readouts thus eliminating the manual calculations necessary when working from absorbance readings. It is a most useful feature in repetitive quality control studies.

Automation and data processing contribute widely to error-free evaluation of test results and provide dramatic savings in labour. They help very much in eliminating subjective errors in the manipulation of the equipment and the interpretation of results. As a consequence, time and effort are saved and personnel are relieved of some mundane duties and, accordingly, the morale is greatly increased.

C. Results

After establishing the above principles and rules that should govern the choice of equipment, the evaluation of each item in the quotations received started and resulted in the following purchase orders:

Requisition No.	Laboratory	Purchase Order No.	Value US$
88/1	Chem. & Food (Items 1 & 3)	15-8-E1366	85,400
88/1	Chem. & Food (Item 2)	15-8-E1294	36,500
88/1	Chem. & Food (Item 4)	15-8-E1295	18,000
88/1	Chem. & Food (Items 5, 6, 7, 15, 18, 23)	15-8-E1505	38,900
88/2	Textile	15-8-E1288	27,100
88/2	Textile	15-8-E1289	12,800
88/5	Leather	15-8-E1289	21,350
88/5	Leather	15-8-E1290	28,320
88/6	Paints	15-8-E1251	26,020
88/7	Building materials	15-8-E1287	31,115
88/8	Mechanical (Item 1)	15-8-E1300	124,000
88/9	Legal Metrology - Length (Items 3, 4, 5, 6. 7, 8, 9)	15-8-E1560	1,300
88/12	Industrial metrology (Items 3(a), 7, 9, 10, 11)	15-8-E1560	1,900
		Sub-total	452,705

Since this sum was almost equal to the portion of equipment component to be procured in 1988 as indicated in the project budget, UNIDO requested the UNDP Resident Representative in YAR to authorize the transfer of US$100,000 from equipment budget of 1989 to that of 1988. This authorization, which was given during the present assignment, would enable UNIDO to proceed with the implementation of some of the following purchase orders:

88/1	Chem & Food (Items 10, 12, 14)	15-8-E1506	10,750
88/1	Chem. & Food (Items 9, 13, 16, 17, 24, 25, 29, 32)	15-8-E1617	23,230

88/4	Plastics (Items 1, 2, 3, 4, 5)	15-8-E1680	70,575
88/8	Mech. (Items 2, 3, 4)		
88/12	Ind. Metrology (Items 1, 2, 3, 4, 5, 6, 8)	15-8-E1607	12,210
		Sub-total	116,765

It can, therefore, be said that the total value of equipment ordered during 1988 amounts to US$569,470.

The rest of the equipment which has already been evaluated and selected will be ordered in the beginning of 1989. It is composed of the following:

88/1	Chem. & Food (Items 8, 21, 26, 28, 30, 31)	US$	4,200
88/1	Chem. & Food (Items 11, 19, 20, 26, 27)		5,300
88/1	Chem. & Food (Items 22, 27)		2,100
88/3	Paper & Board (Items 2, 3, 4, 5, 6, 8, 9)		47,000
88/3	Paper & Board (Items 1, 3, 7)		4,000
88/10	Legal Metrology - Mass (Items 1, 2, 3, 4, 5, 7, 8, 14, 15, 17)		37,000
		Sub-total	99,500

Since the actual value of the equipment to be ordered in 1989 depends on the currency exchange rates prevailing at the time of ordering, the values given above are only approximate. However, they are very close to the true value; almost certainly $\pm$ US$ 1000.

It is, therefore, concluded that the total value of equipment evaluated and selected during the mission - including their essential accessories and spare parts - amounts to about US$ 669,000. The corresponding estimated value of the same equipment, accessories and spare parts as mentioned in the project document is US$608,592 (81% of project equipment), i.e. lower than the actual value by 9%. This is mainly due to the following three factors:

a) Decrease in the exchange rate of the dollar, especially at the time of the greater majority of purchase orders, namely November 1988.

b) Increase in the number of certain equipment items to assist in equipping the new branch laboratory at Hodaidah. For example, seven precision top loading balances have been ordered instead of two (Item 6 in the Chemical and Food Testing Laboratory).

c) The selection of equipment items has not been based on their mere suitability for routine work but rather on their quality and reliability characteristics in terms of accuracy, precision, performance, safety, serviceability, diversibility, expandability and data management capability. In fact, the selected items rank among the best available equipment on the market. Needless to say that this entails that the respective prices should be much higher.

From the foregoing discussion, it is concluded that:

a) Major equipment items representing 81% of project equipment have been evaluated and selected. The remaining portion, 19%, consists of some minor equipment, transport and office equipment, chemicals, glassware and utensils and references (books, etc.).

b) The original equipment estimates, as mentioned in the project document, are quite close to the actual value. The estimates are lower by 9% in spite of the three factors mentioned above.

c) The equipment funds for 1988, about US$455,000, have not only been completely utilized, but have also been augmented by US$100,000 from the 1989 funds.

2. Preparation of equipment specifications

After evaluating and selecting project equipment from among the various quotations, the next step was to prepare the detailed technical specifications for the remaining items. This has been done and comprised three groups of equipment, namely:

(a) Offered equipment which was found irrelevant. This group include the following:

Req. No.	Laboratory	No. of items
88/4	Plastics Testing	4
88/9	Legal Metrology - Length	1
88/10	Legal Metrology - Mass	13
88/11	Legal Metrology - Capacity	7
		25

(b) Equipment which was identified individually in the project document but was not requisitioned due to lack of the relevant detailed specifications.

This group included:

- vehicle
- photocopier
- typewriter (electric)

The value of these items was estimated at US$9700. However, on the advice of the UNDP Office in Sana'a, specifications were prepared for a heavy duty land cruiser, station wagon, 6-seater, with 4 wheel drive; a heavy duty copier and two electric typewriters instead of one, with a total estimate of US$38,100.

(c) Equipment groups which were not itemized in the project document. The individual items of these groups were identified with their technical specifications as follows:

Laboratory/Equipment		No. of items
Hallmarking		53
Glassware and utensils	(General glassware	174
	(Volumetric "	170
	(Standard ground joints	273
	(Utensils	154
Chemicals (general and for specific equipment)		391
References (books, etc.)		467
Periodicals		10
	Total	1692

Before concluding parts 1 and 2 above concerning project equipment, it is worth emphasizing, once more, that it has been possible to provide 81% of project equipment (about US$670,000) by major items of very high quality and reliability standards at an actual cost only exceeding the estimated cost by not more than 10% in spite of the three strong reasons mentioned before. In order to materialize the establishment of the laboratories as originally speculated and planned, it is strongly recommended to augment the remaining funds (about US$80,000) by some US$100,000 for the procurement of the remaining items composed mainly of minor equipment, transport and office equipment, chemicals, laboratory glassware and utensils, as well as technical books and publications, all of which are indispensable for the proper operation of the Yemeni Institute for Standardization, Quality Assurance and Metrology. If this is not practically feasible, then the increase should not be less than 10% of the equipment component to compensate for the increase in actual cost mentioned above.

3. Other related topics

A. Laboratory Premises

Project equipment will be housed in premises which have already been built and furnished. These premises were originally designed mainly for chemical and food testing, building materials and mechanical testing, workshop, legal metrology together with a library and the relevant offices. On the other hand, analytical and testing activities within the present project include, besides the above, instrumental analysis, physical testing of materials (paper and board, paints and varnishes, plastics and rubber, leather and leather products and textiles), hallmarking together with their ancillary facilities. In this respect, it is worth mentioning that, according to recognised national and international standards, physical testing of materials should only be carried out in standard atmospheric conditions in terms of temperature and humidity. Such facilities are not available in the present premises. Also, the installation of the atomic absorption spectrophotometer (AAS) and hallmarking equipment require special measures. Special attention should also be given to safety and fire protection without overlooking the importance of providing the proper facilities for the safe storage of hazardous materials. Last but not least, the effluent from laboratory sinks contains varying quantities of acids, alkalis and solvents which should be neutralized before entering the mains. Consequently, the building should be provided with an efficient neutralizer.

In the opinion of the Consultant, it is very much advisable to conduct a comprehensive and critical study and investigation of the technical factors related to the present laboratory premises and to implement the resulting changes as soon as possible. Special attention should be given to the following:

a) Accommodation, within the whole complex, of the activities relating to instrumental analysis, physical testing of materials and hallmarking, taking into consideration safety and smooth work flow. This may entail a complete re-arrangement of the proposed location of the various activities.

b) Installation of facilities for providing standard atmospheric conditions.

c) Safety and fire protection.

d) Neutralizer.

e) Fume hoods: safety and performance factors.

f) Safe storage facilities for toxic and hazardous materials such as corrosive chemicals, flammable solvents, liquefied gases, etc.

g) Storage of general chemicals, glassware, laboratory tools and utensils, apparatus and spares, etc.

h) Special considerations in bacteriological laboratory.

i) Floor coverings in different laboratories.

j) Power, power outlets and voltage stabilization.

k) Laboratory water and drainage systems.

In addition to the premises in Sana'a, the Government is planning to build new premises for a branch laboratory in Hodaidah, which may be, at a later time, duplicated in Taiz. It goes without saying that it is essential to take into consideration the modern trends in laboratory design since the rapid change in scientific knowledge and methods has altered many of the former design concepts.

Testing laboratories pose certain problems particular to their specific nature. Consequently, their functional design becomes of basic importance since it affects efficiency in many ways, is reflected in the operational cost, places a limit on flexibility and is a very important element in the development of safe working practices. In this regard, the Consultant should like to refer to the Conference entitled "Lab design 82" held in London in June 1982 and sponsored by the Laboratory of the Government Chemist in association with the Chartered Institution of Building Services, the Confederation of British Industry (CBI), the Department of Education and Science, the Department of Health and Social Security, the Institution of Electrical Engineers (IEE), the Institution of Mechanical Engineers, the Property Services Agency, the Royal Institute of British Architects, the Royal Society of Chemistry, the Society of Chemical Industry and the United Kingdom Atomic Energy Authority.

Since it is expected that project equipment will arrive around the middle of the current year, and it is necessary that the premises should be ready to accommodate the equipment on arrival, it is recommended to have an expert's advice on the above topics as soon as possible.

B. Experts

The project envisages the provision of the services of two experts for nine months each, one in "Instrumental Methods of Chemical Analysis" and the other in "Laboratory Organization and Management".

Concerning the first post, experience has shown that competent experts in this field are almost only found within the academe, and it is well-known that, usually, university professors and other members of the academe cannot be away from their jobs for more than three or four months at the most. Even apart from this consideration, though important as it is, it has been practically found that, specifically in this field, on-the-job training would be more effective and can be accomplished in a shorter time if the expert assignment was in the form of a split mission. This is due to the fact that instrumental methods of chemical analysis are characterized by the large variety and diversity of the fields in which they can be applied.

Thus, in the first part of a split mission, the expert trains his counterparts on the application of instrumental methods in certain fields using certain techniques. After accomplishing this part, the counterparts apply what they have learned for some time to master the use of such methods and gain experience and self-confidence. In the second part of the split mission,

the expert would train the counterparts on the application of instrumental methods in other fields or on more advanced techniques. In this way, the counterparts can absorb the training in a shorter time and much more thoroughly than having the training accomplished at one time. Thus, it has been found that what the counterparts can acquire from a mission of nine months duration, for example, can be acquired thoroughly in six months.

It is, therefore, strongly recommended that the services of the Expert in Instrumental Methods of Chemical Analysis should be provided for six months split into two parts of three months each.

As for the second expert in "Laboratory Organization and Management", the problem of availability explained above also applies, though to a lesser extent. However, the duration of this post can also be lessened since the organization and management of each individual laboratory will be the responsibility of the respective United Nations Volunteer. The task of the expert would be only to coordinate the organization and management of the individual laboratories within one complex.

Accordingly, it is recommended that the service of the Expert in Laboratory Organization and Management should be provided for six months only either as one or a split mission according to the wish of the prospective candidate. This should be clearly indicated in the respective Job Description.

C. Training

On arriving in the field, the Consultant was very much surprised at the very sharp and remarkable increase in the number of the national counterparts. As of November 1988, there were 38 employees in the General Directorate for Standards including 29 graduates holding B.Sc. and M.Sc. degrees compared with only five employees including three graduates only a year before, which means a net increase in the technical staff of about 900% within one year. This is, in fact, a great achievement which is seldom, or rather impossible, to attain in a developing country. This achievement demonstrates very clearly the strong support of the Government to standardization and quality control activities as efficient and effective tools for the economic development of YAR, as well as the great efforts of the Director General of the Directorate to consolidate his technical manpower in order to enable the prospective YISQAM to play its due role in the national endeavour. Both the Government and the Director General should be highly commended for this achievement.

On the other hand, the remarkable increase in the technical personnel calls for the necessity of giving a second thought to the training programme of the project which has been somewhat squeezed for lack of sufficient personnel. It is strongly recommended to augment the training component by effecting the following changes:

a) The fellowship in Food Testing (Chemical and Bacteriological) of 2 m/m duration (p.33 of PD) should be replaced by two fellowships of 3.5 m/m as follows:

1 - Chemical Testing of Food	2 m/m
2 - Bateriological Testing of Food	1.5 m/m

b) Similarly, the fellowship in "Physical Testing" (paper and board, plastics and rubber, leather) should be replaced by three fellowships of 6 m/m as follows:

Testing of Paper, Board and Packaging	2 m/m
Testing of Plastics, Foam and Rubber	2 m/m
Testing of Leather and Leather Products	2 m/m

The net increase will thus become 5.5 m/m, i.e. about US$ 16,500.

On the other hand, since the 26 new graduates who joined the Directorate during the past year have no experience nor knowledge in such new disciplines as standardization and quality control, it is recommended to conduct a two week training course in standardization, quality assurance, testing and metrology for the technical staff of the Directorate as well as to interested staff in government departments and industry.

In this regard, it is worth mentioning that the Consultant, on a kind invitation from the UNDP Office in Sana'a, attended the Workshop on "Improve your Project" which was organized by the General Federation of the Chambers of Commerce and Industry in cooperation with ILO and UNDP during 4th-5th December 1988.

The Consultant also participated in a meeting convened at the Chamber of Commerce in Taiz on 7th December 1988 and attended by entrepreneurs from Taiz, Hodaidah and Ibb. At that meeting, chaired by the UNDP Resident Representative, the Consultant briefed the audience on the objectives of developing the Yemeni Institute for Standardization, Quality Assurance and Metrology (YISQAM) and the services to industry and commerce which the Institute would render on the completion of the project.

The above two events gave strong support to the Consultant's conviction concerning the usefulness, or rather the necessity, of addressing top management in industry due to its impact on the promotion of standardization and quality control activities. He, therefore, suggested to his counterpart the organization of three seminars of one or two days each for the chief executive officers (CEOs) of industrial and commercial enterprises in Sana'a, Taiz and Hodaidah. The suggestion was welcomed and the three seminars were included in the programme of the Directorate for 1989.

It is, therefore, strongly recommended that an expert be assigned in the second half of 1989 for one month to conduct and organize a 2-week training course on standardization, quality assurance, testing and metrology in collaboration with the project staff as well as to organize three one or two day seminars for the top management in industry and commerce in Sana'a, Taiz and Hodaidah.

ACKNOWLEDGEMENTS

The Consultant wishes to extend his heartfelt thanks and deep appreciation to his counterpart and National Project Coordinator, Mr. Abdel Karim Ahmad Al-Saidi, for his great enthusiasm and painstaking efforts to facilitate the implementation of his mission and of the project at large.

The Consultant wishes also to record his deep sense of gratitude to the UNDP Resident Representative in Sana'a, Mr. Mohammad Azzam, who has constantly shown keen interest and strong support, not only for the present assignment but also since the early stage of project formulation during the preparatory assistance mission in June-September 1987. Without this interest and support, the project would not have been approved and put into implementation in such a short period. Through Mr. Azzam, thanks must go to his dedicated team of officers who have rendered every possible assistance. In this respect, the Consultant is especially indebted to Mr. Abdou Seif who has spared no effort to help him out and give freely of his time in the face of the pressure of his heavy duties.

ANNEX 1

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project in the Republic of Iraq

JOB DESCRIPTION

DP/IRQ/87/008/11-51/J12102

Post title Consultant in metrology and quality control

Duration Two weeks

Date required As soon as possible

Duty station Baghdad

Purpose of project To increase the Central Organization for Standardization and Quality Control's capability in precise and standards measurements, verification and organization of quality control systems at plant levels.

Duties The Consultant will be attached to the Central Organization for Standardization and Quality Control (COSQC) and in close co-operation with the UNDP Office he will specifically be expected to:

1. Review and assess the present needs for further development and strengthening quality control and metrology activities which derive from the overall economic and industrial development of the country.

2. Prepare a draft project document covering UNIDO technical assistance in strengthening the Central Organization for Standardization and Quality Control (COSQC).

..../..

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Branch, Department of Industrial Operations
UNIDO, Vienna International Centre, P.O. Box 300, A-1400, Vienna, Austria

V.87-21818

Qualifications University degree or equivalent in applied physical science, with extensive experience in administration, organization and operation of a national system of metrology and quality control.

Language English

Background information Since 1976 when the Industrial Development Plan 1976 - 1980 was formulated the Government of Iraq has been attaching a great importance to the promotion of standardization and quality control. It was reflected in the objectives of the Plan as:

- Development of a quality control system to raise the qulaity of locally produced items.

The Central Organization for Standardization and Quality Control (COSQC), was set up in 1979 by the merger of the Iraqi Organization for Standards (IOS) and the Directorate of Research and Industrial Control.

The national economy is expected through COSQC national developed network on standardization, quality control and metrology, through improved in-plant standardization gets better and effective use of local raw materials, increased productivity of manpower and equipment, raised quality of goods and services, better protection of consumers, development of import substitution industries, promotion of export and build up of public confidence in local production.

In carrying out its functions COSQC needs to have its own competent laboratories for testing raw materials and manufactured products as well. Such tests are necessary for the elaboration and amendment of national standards, the supervision of mandatory standards and the operation of certification marking schemes.

ANNEX 2

PARTICULARS OF THE COUNTERPART

Mr. Abdel Karim Ahmad Al-Saidi, 34 years old, holds a B.Sc. degree in Chemistry and Geology from the University of Kuwait in 1980 and an M.Sc. degree in the Management of Technology from Vanderbilt University, USA, in 1985. He is a member of the Institute of Electrical and Electronic Engineers (IEEE), USA and the Engineering Management Society, USA.

After completing his military service, Mr. Al-Saidi was appointed on 18.02.1981 as Director, Food Testing, Quality Control, Standardization and Metrology of the Ministry of Economy and Industry. In 1982, he was transferred to the Division of Planning and Promoting Medium and Small-Scale Industries of the same ministry. On 22.09.1985 he joined the Yemen Corporation for Cement Industry and Marketing as Director of its Research and Technical Department, a post he held until 01.04.1987 when he was appointed as Director General of the General Directorate of Standards of the Ministry of Economy, Supply and Trade.

Mr. Saidi participated in the following training courses:

1. Standardization and Quality Control, Baghdad: April 1981
2. Quality Control in Industry, Amman: August 1981
3. Planning for Improving Performance in Public and Mixed Sectors, Sana'a: January 1982
4. Metrology, Amman: April 1982
5. Administrative Communications for Development, New York: August 1984
6. Administration of Government Projects, Washington: December 1984
7. Energy Saving in Cement Energy, Turkey.

Mr. Saidi also attended several regional and international meetings and conferences as follows:

1. Head, Yemeni Delegation to the Meeting of Directors of Arab Standards Institutions, held in Amman from 22nd to 24th September 1981.
2. Head, Yemeni Delegation to the 14th Session of the General Committee of ASMO: September 1981
3. Technology of Critical Metals and Elements, Tennesee, USA: March 1984
4. International Conference on Technology and Technology Transfer, Pittsburgh, USA: 8th to 10th October 1984.
5. Head, Yemeni Delegation to the 20th Session of the General Committee of ASMO, Amman: September 1987
6. Head, Yemeni Delegation to the 21st Session of the General Committee of ASMO, Amman: September 1988

In addition, Mr. Saidi authored and/or conducted about 20 papers/studies on various aspects of science and technology.