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Iraq

# ASSISTANCE IN STANDARDIZATION, METROLOGY, TESTING AND QUALITY CONTROL

TF/IRQ/77/003
IRAQ

Terminal report*

Prepared for the Government of Iraq
by the United Nations Industrial Development Organization

Based on the work of A. Geneidy,
Project Manager

* This document has been reproduced without formal editing.

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## Explanatory Notes

References to dollars ($) are to United States dollars, unless otherwise stated.

The monetary unit in Iraq is the dinar (ID). One thousand fils is one dinar. During the period covered by the report, the mean value of the dinar in relation to the United States dollar was US$1 = ID0.295.

The use of a hyphen between dates (e.g. 1978-1982) indicates the full period involved, including the beginning and end years.

The following abbreviations are used in this document:

| | |
|---|---|
| AC | Air Conditioning |
| COSQC | Control Organization for Standardization and Quality Control |
| CP | Counterpart |
| DRIC | Directorate of Research and Industrial Control |
| FIT | Funds-in-Trust |
| ID | Iraqi Dinar |
| IEC | International Electrotechnical Commission |
| IMC | Instrument Maintenance Centre |
| IOS | Iraqi Organization for Standards |
| NDT | Non-Destructive Testing |
| NSB | National Standards Body |
| PD | Project Document |
| PM | Project Manager |
| PR | Public Relations |
| QC | Quality Control |
| SIEI | Specialized Institute for Engineering Industries |

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## ANNEXES

## I. INTRODUCTION

1. Iraq has mainly been an agricultural country. However, since the early sixties, the Government has placed great emphasis on industrial development. As a result, industry has emerged as a rapidly growing sector acquiring an increasing share of the gross domestic product (GDP) and hence a greater importance to the national economy.

2. From the beginning, the importance of standardization as an efficient and effective tool for industrialization was not overlooked by the Iraqi Government which issued Law No. 15 - 1963 establishing the Iraqi Organization for Standards (IOS) as the national authority in the fields of standardization and metrology.

3. In carrying out its tasks as stipulated in the law, the IOS soon felt the persistent need to have its own competent laboratories. Thus on 1 December 1964, the IOS adopted a resolution to set up standards laboratories and requested the Board of Planning to allocate ID1,000,000 for that purpose in the five-year plan 1965-1969.

4. In implementation of the above decision, UNESCO, following a request from the Iraqi Government in February 1966, provided the services of Dr. R. Vieweg 1/ (December 1966 - January 1967) to conduct a feasibility study. In his report of April 1967, the consultant made the following two recommendations which envisaged the provision of some US$750,000 in international aid:

a) The IOS should start immediately forming a nucleus for the practical work of checking the country's weights and measures and specifications;
b) The IOS should be modelled so as to comprise three technical departmentsfor Specifications (including testing laboratories), Metrology (including calibration laboratories) and Instrument Repair.

5. These recommendations resulted in a Government request for a United Nations consultant to prepare the UNDP/SF request for international assistance. This task was accomplished by a UNESCO consultant and Dr. S.A. Thulin 2/ who were assigned for a 2 month mission in October 1967. The consultant also suggested first planning by subcontracting to an engineering firm either directly or through Funds-in-Trust (FIT) with a United Nations Agency.

6. Meanwhile, the Iraqi authorities decided to proceed with the planning of laboratory buildings pending the acceptance of the SF request. Consequently, in November 1967, the Iraqi Government requested UNESCO's assistance in providing a planning mission and the relevant FIT agreement was signed in July 1968. Due to the difficulties in recruiting suitable experts with sufficient broad knowledge to cover the wide range of activities needed, UNESCO provided the services of two consultants, Mr. K.F. Laurrel 3/ and Dr. S.A. Thulin 4/ in a one-month fact-finding mission (April-May 1969) to collect further detailed information to serve as the technical background for the planning and construction of the laboratories. Sinceit was later found to be difficult to make use of

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2/ Then Project Manager, National Institute of Standards, Cairo, Egypt
3/ Weights and Measures Service, Sweden
4/ Materials Testing Institute, Sweden

the services of consultant firms to complete the planning, the two consultants were given this task in September 1969. Assisted by the relevant specialists in their own country, the two consultants submitted their report in February 1970 on the necessary requirements and specifications for the buildings and equipment. The report was accompanied by eight detailed drawings to the effect that the material would be sufficient for the establishment of working architectural drawings and civil engineering plans by the General Directorate for Building and Construction in Iraq.

7. On a further request from the Iraqi Government for an expert to follow-up the building plans, UNESCO assigned the consultant Mr. K. Malinovsky 5/ for a six month mission starting in September 1971 to assist in the finalization of the designs and working plans. The consultant prepared a draft plan of operation (including a work plan) for a five-year project to be executed by UNESCO/UNIDO, a list of the main equipment as well as the job descriptions of experts.

8. In formulating its Industrial Development Plan 1976-1980, the Government of Iraq attached great importance to the promotion of standardization and quality. This was clearly reflected by the inclusion of the following three objectives in the objectives of the Plan:-

i) Development of a quality control system to raise the quality of locally produced items;
ii) Ensuring the availability of raw materials required for different industries and securing the proper linkages between different related projects and finally the utilization of materials according to the proper technical norms;
iii) Using the pricing policy of industrial products as a level for industrial development and for raising the quality of products and the introduction of an incentive system required for social development.

9. To this end. the Government allocated a sum of about US$8,000,000 for the establishment and completion of the testing and calibration laboratories.

10. Thus, in January 1976 the Iraqi Government requested UNIDO to delegate the manager of its project in Jordan Dr. A. Geneidy 6/ on a 3-week mission to provide technical guidance and recommendations on the layout of the laboratories, to make recommendations for the final selection of equipment and to advise on the formulation of a work programme for setting up the laboratories and putting them into operation. During his assignment (November-December 1976), the UNIDO consultant forwarded various comments and recommendations concerning the site, layout, buildings, services (water, gas, electricity, air supply, air conditioning, drainage), safety, laboratory furniture and fittings as well as testing equipment. In addition, he suggested that it would be indispensable for IOS to have UNIDO assistance in executing its ambitious project and that such assistance should be comprehensive in order to cover the whole field of standardization and its related disciplines and not to be confined only to testing and calibration.

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5/ Deputy Director, Scientific Research Insitute of Standardization, Moscow, USSR
6/ Formerly, Director General, Egyptian Organization for Standardization and Quality Control (EOS)

11. In materializing his proposal, which was accepted by the Iraqi Government, the consultant worked out the relevant Project Document (PD). A FIT Agreement was then concluded, and the PD was signed on 7 July 1977. On the nomination of the Government, UNIDO recruited Dr. A. Geneidy as Chief Technical Adviser and Dr. S.A. Thulin as Senior Adviser in Metrology. The implementation of the project started in April 1978.

12. During the early stages of the project's implementation, it was realized that the UNIDO inputs should be considerably increased. Accordingly, a new FIT agreement was signed by UNIDO on 26 January 1979 and the amended project document was signed on 31 January 1979. The main features of the new agreement were as follows:

| Item | US$ |
|---|---|
| Experts and consultants (170 m/m | 989,280 |
| Support personnel, travel and mission costs | 65,000 |
| | 1,054,280 |
| Fellowships and study tours (187.5 m/m) | 233,800 |
| Equipment | 60,000 |
| Miscellaneous | 15,000 |
| | 1,363,080 |
| Agency overhead (14%), excluding locally recruited personnel | 182,851 |
| | 1,545,931 |

The above figures show a net increase of US$560,903 (57%) in the Project's budget, mainly to cover:

i) the increase in experts and consultants' services by 22 m/m as well as an increase in support personnel;
ii) the introduction of a provision for travel, mission costs, study tours and some equipment;
iii) the increase in fellowships by 50 m/m.

13. Towards the end of 1980, the Central Organization for Standardization and Quality Control (COSQC) - which was set up in 1979 by the merger of the IOS and the Directorate of Research and Industrial Control - requested that, due to certain local conditions, the project should be extended for a fourth year ending in April 1982, without entailing any additional costs. Accordingly, a new agreement was signed and the UNIDO inputs became the following:

| Item | US$ |
|---|---|
| Experts and consultants (186 m/m) | 1,007,337 |
| Support personnel and travel | 69,000 |
| | 1,076,337 |
| Fellowships and Study Tours (159 m/m) | 236,702 |
| Equipment | 40,000 |
| Miscellaneous | 10,041 |
| | 1,363,080 |

II. OBJECTIVES

A. Development Objective:

The development objective of the project was a multi-sectoral one as it involved several sectors such as industry, mining, agriculture, commerce external trade, housing, public health, science etc.

The ultimate objective was to contribute substantially to the improvement of the national economy through the wide application of standardization principles and techniques which would lead to the full and efficient utilization of indigenous raw materials, reduction of production costs, increase of efficiency, raising the quality of locally produced goods, ensuring fairness in commercial transactions, safeguarding the health, interests and safety of consumers, control of imports and the promotion of exports.

B. Immediate Objectives:

1. To consolidate the activities of the IOS in the elaboration of national standards.
2. To promote in-plant standardization, being the roots of national standardization, by assisting in the establishment, organization and operation of standards departments in some of the leading industrial enterprises.
3. To maintain and use standards for the verification of weights and measures used in commercial transactions and industrial operations.
4. To maintain and use national standards to calibrate measuring instruments in order to ensure accurate measurements with traceability to international standards.
5. To assist in the setting up, organization 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 a certification marking scheme, the checking of product conformance to national standards and the control of imports and exports.
6. To assist in the setting up, organization and operation of mechanical and electrical workshops as well as an instrument maintenance and repair shop.
7. 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.
8. To assist in the planning, organization and operation of a national certification marking scheme as an efficient means for the adoption of national standards.
9. To assist in developing standardization and quality consciousness among the public and industrial circles.
10. To assist in expanding the existing library into an Information and Documentation Unit in the fields of standardization, metrology, testing and quality control.
11. To train local staff in carrying out their activities in the fields of standardization, metrology, testing and quality control and to assist IOS in setting up and operating a training unit in these fields.
12. To assist in the planning of a national system for standardization, metrology, testing and industrial quality control and in drafting the relevant legislation.

C. Planning and Design of Project:

In order to ensure the full and speedy realization of the development objective of strengthening the IOS/COSQC, the planning and design of the immediate objectives, outputs, activities, inputs and work plan of the project were based on the following principles:

1. A systems approach to the whole field of standardization and its related domains should be adopted. Consequently, the project covered the following disciplines:

| | | |
|---|---|---|
| a) | standardization | (immediate objective No. 1 and 2) |
| b) | metrology | (immediate objective No. 3 and 4) |
| c) | testing | (immediate objective No. 5 and 6) |
| d) | quality control | (immediate objective No. 7) |
| e) | certification | (immediate objective No. 8) |

The adoption of the system approach also implies the involvement of the project in furnishing the infrastructural support to the above disciplines, namely:

| | | |
|---|---|---|
| f) | propagation | (immediate objective No. 9) |
| g) | information and documentation | (immediate objective No. 10) |
| h) | education and training | (immediate objective No. 11) |

2. The principle of integration should be closely observed in each of the main disciplines. Thus, in the standardization field, the in-plant and national levels were covered. The same is true with QC. In the field of metrology, the project was involved in both legal and industrial metrology. In the latter domain, the project's involvement covered the whole spectrum of metrological activities of real need to the Iraq (mechanical, electrical, engineering, thermometry, photometry and time and frequency). Likewise, in the field of testing, the various aspects were covered, namely, chemical, bacteriological, physical, mechanical, electrical, metallographic and non-destructive testing.

3. Notwithstanding the importance of the various levels of implementing standards and QC (plant, industry and national), special emphasis should be accorded to the first basic level; namely the plant level. No effort for promoting the implementation of standards and QC at the national level could be fruitful without promoting these activities at the plant level. Therefore, in-plant standardization and QC were two of three areas (the third is metrology) which were provided with intermediate-term missions and not short-term consultancies. Thus objectives No. 2 and 7 were respectively concerned with assisting in the establishment of model standards and QC departments in some leading industrial enterprises. It should be emphasized that the realization of these objectives could not be achieved without the prior establishment of the corresponding departments/sections at the national level, i.e., within COSQC itself and that is what happened during the implementation of the project. It was envisaged that by the establishment of the upper and lower levels, it would be possible to leave the continuation of the activity and the establishment of the corresponding departments at the intermediate level (i.e. in the industry-wide state organizations) to the COSQC after the implementation of the project. These departments would then form the link between the national level (COSQC) and the plant level.

4. Based upon these three principles, the activities of the project would naturally pave the way to the establishment of the machinery and mechanism necessary for the setting up of national systems for standardization, metrology, testing and QC (immediate objective No. 12).

5. It was envisaged that the implementation of the project - as planned and designed in the above-mentioned manner - would place the COSQC in a position whereby it could effectively and efficiently play its role in the promotion of the national economy, i.e. the realization of the development objective.

## III. ACTIVITIES, OUTPUTS AND FINDINGS

### A. National Standardization

The first immediate objective of the project was to consolidate the activities of the IOS/COSQC in the elaboration of national standards. No special expert or consultant was assigned for the realization of this objective, therefore the PM took up this task in addition to his normal duties.

At the beginning of project implementation in 1978, it was found that a new law was being drafted to merge the IOS of the Board of Planning with the Directorate of Research and Industrial Control (DRIC) of the Ministry of Industry to form the Central Organization for Standardization and Quality Control (COSQC). The project participated effectively in the study and discussion of the draft law and several of its proposals were approved and incorporated in the law which was subsequently issued in June 1979.

One of the basic features of the law was the introduction of the principle of mandatory nature of Iraqi standards which called for making a radical change, not only in the handling of standardization activities but even in the phrasing and wording of national standards.

The number of standards finalized up to 1978/1979 amount to 2500 issued and draft standards. It was soon realized that:

1. The greater majority of these documents were only of theoretical significance as they were merely a translation of foreign standards with no idea about the possibility of their actual adoption in the local industry.
2. A considerable proportion of thesedocuments were irrelevant to the real needs of the country.

These two facts, together with the introduction of the mandatory nature of Iraqi standards, indicated that:

1. The technical staff lacked the proper understanding of the philosophy, objectives and methodology of national standardization.
2. A drastic change had to be introduced in the method of performing standardization activities.
3. The standards so far finalized could no longer be considered as Iraqi standards under the new law.

It was therefore concluded that the COSQC should start preparing new standards and that national standardization activities should be carried out on a sound and proper basis. To this end, the project's policy and activities were centrered around the following objectives:

1. To up-grade the capability and competence of the machinery responsible for the preparation of national standards;
2. To improve the mechanism of elaborating national standards;
3. To organize and rationalize the internal work of the standards department.

1. Improving the Standards Machinery

A comprehensive and intensive training course composed of 50 lectures were conducted for the benefit of the standards-writing staff of the COSQC. The course dealt in detail with all topics of the standardization discipline: theory, princples, aims, levels, aspects, subjects, economic benefits and methodology.

2. Improving the Standards Mechanism

A five-year plan was worked out to meet the actual needs of the country. A comprehensive survey - in the form of a detailed questionnaire on the present and future needs for standards - was conducted, covering 154 government departments, institutes, societies, industry (public, mixed and private sectors), trade and other concerned bodies. Replies which were received from 116 bodies (76.5%) were tabulated according to the industrial sector (food, chemical, textile, engineering) and within each sector the items were classified according to the aspect of standardization (terminology, product specifications, test methods, codes of practice).

In addition to the results of the survey, the following items were considered:

- main exports
- main imports
- industries included in the National Development Plan
- international standards of interest to developing countries.

From the 1534 items so considered, 496 items were selected for the first five-year plan (1980-1984). The planned items were selected on established priorities governed by the relevance of the item to the protection of health and safety and to the improvement of the national economy with special emphasis on export promotion. Also, higher priority was accorded to product specifications rather than to other aspects of standardization such as terminology and test methods.

The entire method of working out the standardization plan was documented in sufficient detail (360 pages) so as to serve as a guide for the preparation of future plans. The plan was explained and discussed in three plenary meetings by the senior staff of the COSQC where greater emphasis was placed on the method of quantitative establishment of priorities.

Implementation of the plan started on 1 July 1980 and was effected on new bases, namely:

- abolishing completely the procedure often followed previously of preparing national standards by the translation of the corresponding foreign standards. All standards have to be prepared through technical committees.

- adopting the principle of specialization in carrying out the technical activities of the COSQC by confining the responsibility of standards writing to the standards department rather than engaging all technical staff (including metrology ) in such activities.

- before indulging in the preparation of the working draft standard for any product, the concerned technical secretary should be sent for two weeks to a large plant manufacturing that product in order to study all aspects related with its specifications and production.

3. Organization of the Internal Work

In an effort to organize the technical and administrative work, the project advised, and assisted, the standards department in working out the rules of procedure as well as the style manual of Iraqi standards.

The procedure manual identified all steps to be taken for the standardization of a certain item starting from its inclusion in the plan up to the publication of the standard including the processing of the work in the technical committees. These rules help to identify the exact responsibility of the various levels and posts of the staff; simplify, facilitate and speed-up the work of the staff and technical committees, and facilitate follow-up actions. All these factors are conducive to increased productivity.

On the other hand, the style manual identifies the way of presenting Iraqi standards. It has several advantages: it unifies the general structure of the standard; organizes and facilitates the printing process resulting in a higher quality, quicker and low-cost printing; facilitates the identification of information when referring to a standard and also facilitates classification, cataloguing and indexing.

It is concluded that theproject's activities have marked an important phase in carrying out the standardization work of the COSQC. This is mainly due to:

1. Enabling the Standards Department to conduct its activities on the basis of theprovisions of the new law establishing the COSQC.
2. Elaborating Iraqi Standards within a well-prepared five-year plan (split into yearly plans) which was based on sound established priorities and met the present and near future needs of the country.
3. Upgrading the technical competence of the standards making machinery.
4. Adopting the proper methodology and mechanism for standards making that would ensure the realization of the objectives of national standardization.
5. Improving the quality of Iraqi standards and increasing the productivity of the standards department as a result of increasing the efficiency of the standards engineers and the rationalization and standardization of the technical and administrative work of the Department.

## B. In-Plant Standardization and Quality Control

### 1. Rationale of Project Activities

To be effective, standardization has to prevail at all levels of the various activities within a country. In industry, standardization at the plant/company level is normally the large base and the first important level of standardization. Being the root of national standardization, in-plant standardization is essential for proper industrial growth and development.

Iraq is passing through a phase of industrial development where a number of foreign collaborations have been established and differing foreign technologies, products, materials and components are flowing in fast. This situation has to be dealt with in an organized way to ensure the quick and proper absorption of know-how and ensure that the industry, and consequently the country, does not end with such a diverse and unnecessary variety so as to cause confusion, wastage and uneconomical manufacture. Company standardization, effectively carried out, could provide solutions to many of these problems.

While normally plants have to carry out the standardization activities themselves, in Iraq - as well as in most developing countries - the national standards body (NSB) would also have to assist in the promotion of the activity. To this end the present project included an intermediate-term expert to promote in-plant standardization. In this regard, the project was unique in attaching great importance to this activity.

On the other hand, one of the main aims of standardization is the upgrading of the quality of products and services. Standardization is the preliminary requirement for quality control and without which the latter could not be well achieved. Total quality control includes five types of controls, namely: design control, materials control, in-process control, finished products control and after-service control. The essential of each type of control are different and must be standardized and written in detail as company standards to serve as the basis for quality control. For instance, in-process control involves machinery, man and methods. Thus some of the company standards to be prepared, are a lubrication manual, a preventive maintenance manual, operation instruction sheets and a standard operation procedure. This interdependency, coupled with the fact that quality control is an area which can show the benefits of standardization in a decisive way, necessitates dealing with in-plant standardization and quality control simultaneously. The association of in-plant standardization and quality control activities would enable industrial enterprises to achieve productivity and quality, the two most critical factors challenging modern industry since they determine its competitiveness in local and international markets which has become a national goal of many developed and developing countries.

It was this very fact which governed the planning of the project activities in these two areas. Thus, in the design of the project, the two relevant experts were scheduled to be recruited at the same time. Fortunately enough, they arrived in the field almost together; their arrival being less than three weeks apart.

Thus, from the beginning of project activities in in-plant standardization (objective No. 2) and QC (objective No. 7) were carried out simultaneously in the industrial units selected. This ensured that the two teams from the COSQC associated with these activities would complement each others efforts. Moreover, with simultaneous work, a co-ordination between the two activities would ensure that during the period the COSQC teams were working, there would not be much duplication as far as the role of standardization in QC and associated areas were concerned. In actual practise, the two teams worked in different areas for case studies and programmes, but when it came to the area of QC, a joint effort was quite useful.

It was also scheduled to carry out project activities in more than one enterprise so that in case any problems or difficulties were faced in one enterprise, emphasis could be shifted to the other. Also with this method, the best results from 2-3 enterprises together can give a reasonable number of suitable case study results.

In this regard, it should be emphasized that engineering industries lend themselves best to company standardization. An engineering manufacturing enterprise should therefore, be preferable for starting an in-plant standardization activity if it had to yield results in a limited time and be used as a model. Also the enterprise must be large enough with design, planning, manufacturing, QC, plan engineering, purchasing, storing and maintenance types of activities so that standardization results in various domains can be shown. Enterprises with such specifications are mostly found within the State Organization for Engineering Industries. However, in-plant standardization and QC in the enterprises of this Organization were the concern of another UNIDO project ("Specialized Institute for Engineering Industries (SIEI) - DP/IRQ/77/003").

Consequently, technical visits were paid to ten representative large enterprises in the public sector outside the engineering field and in the mixed sector as well. Two firms 7/ were selected for concerted project activities, a textile firm in the public sector and an engineering firm in the mixed sector manufacturing gas cooking appliances, refrigerators, deep freezers and heaters. The first firm was chosen on the following grounds:

- it had considerable equipment which possessed a certain engineering bias and as such would be suitable for carrying out case studies.

- it was a complex with different plants but having some common activities like purchase, stores, managements services, QC, chemical laboratories. It was envisaged that working in such a complex, which comprises plant and corporate levels, would be extremely useful in the live demonstration of the application of one of the principles on which the project was designed, namely operating standardization and QC activities

7/ Later on, when it was realized by the project management that in-plant standardization and QC activities should be extended for another year, a meeting was held with SIEI in which it was agreed that project activities could be extended to the firms belonging to the State Organization for Engineering Industries. Consequently a third firm, The State Enterprise for Electrical Industries, was selected and added to the above two firms.

at the plant level with central corresponding activities at the relevant State Organization level.

Ideally, the promotion of in-plant standardization and QC requires that the message about their need, importance and benefits be passed on to all industrial units (and even to service organizations) as quickly and effectively as possible. This is the case even in developed countries. While this becomes more crucial in developing countries, it will however prove to be a very long, gradual and slow process, especially in the case of in-plant standardization, a relatively new discipline which is not very well known in developing countries. Nevertheless, a start should be initiated.

Consequently, the project envisaged the promotion of in-plant standardization and QC by assisting in the establishment, organization and operation of standards and QC departments in some leading industrial enterprises in Iraq and by giving training in their concepts and techniques to the various levels of management and to different types of personnel.

To this end, a more or less phased programme was followed in both activities composed of the following steps:

- creation of in-plant standardization and QC sections within the COSQC;
- imparting intensive and extensive training in the concepts, tools, techniques of these two disciplines to all COSQC counterparts who would be responsible for carrying out the relevant activities in the future;
- formation of two teams, composed of the relevant expert and his counterparts;
- sending the two teams to the selected firms to assist in the initiation operation and promotion of standardization and QC by establishing some "model" activity;
- conducting a quick survey in the firms to study the various activities and operations with special reference to standardization and QC;
- selecting a few priority areas and items in which some standardization and QC work/case studies could be attempted to give results in a relatively short time especially where shortcomings attributable to the lack of standardization and QC activities could be shown;
- discussing with the management and arranging for obtaining suitably experienced and senior persons to be involved, or to participate, in the pilot studies to be carried out
- carrying out some pilot work in the selected areas through the COSQC team and company personnel provided for the purpose;
- putting the other services of COSQC (testing, calibration, standards information) at the disposal of the two teams wherever deemed necessary for the proper implementation of the pilot work. This, in addition to facilitating project activities in the selected plants, would have the further advantage of acquainting industrial enterprises with the services rendered by the COSQC and the importance and benefits of availing themselves of these valuable services to solve their productivity and quality problems;
- conducting, as the need arose, various types of educational and training activities (courses, seminars, lectures) for the various levels and types of the administrative (purchasing) and technical personnel;

- Obtaining case studies which could be instrumental in convincing the managements to initiate and promote organized and formalized standardization and QC activities. Through these case studies, the project could give concrete examples of the actual benefits that would accrue in the plants through the use of these two disciplines. While examples from plants in other countries would help, the surer way of convincing managements is through examples from Iraq, or, still better, from the concerned plants themselves;
- reporting results to the management and suggesting the setting up and or consolidation of standardization and QC departments/units/cells under a qualified senior official;
- recommending to the management that their enterprises should share the experience and beneficial results of standardization and QC work carried out in their plants with other companies, through technical meetings, seminars and conferences conducted by various bodies (e.g. State Organizations, Chambers of industries, technical societies) or organized at the national level;
- documenting and publishing the results of the case studies, after obtaining clearance from the concerned enterprises, to be used in promotional activities either by the COSQC, companies or other bodies.

Carrying out the programme would fulfil the following aims:

a) To create a model and demonstration unit in each firm would be instrumental in spreading the message of standardization and QC to other companies, or sister plants directly, or through the COSQC.

b) To demonstrate in a perspective manner the areas, tools, techniques and benefits of standardization and QC;

c) To impart practical training to counterpart staff from COSQC and industry;

d) To assist industrial enterprises in solving their productivity and quality problems and to provide them with the practical means by which they would be able to implement national standards and thereby obtain the standards mark;

e) To assist in propagating the message of in-plant standardization and QC by documenting and publishing the results of project activities to be used as promotional material in the future;

f) To strengthen the ties between the COSQC and industry so that joint, consistent and concerted efforts are made to improve products and services and hence the national economy at large.

The above shows the way in which the project approached and tackled the initiation and promotion of in-plant standardization and QC in the Iraqi industry. Below, a brief review of the findings and results obtain in each of these two areas is made.

2. In-plant Standardization

In the three selected firms - which could be collectively considered as a true representation of the public and mixed sectors which constitutes, by far, the greater majority of industrial activity in Iraq 8/ - project studies revealed that the status of company standardization is generally as follows:

- No company standardization department existed; no immediate plans were there for such an activity; not much awareness for the need of such an activity.
- In many cases, materials and standard parts for production or maintenance were not adequately specified.
- The variety stocked in stores was unnecessarily large and hardly any organized variety reduction programmes were performed. In some instances, up to over 50% of the items stock could have been eliminated, with an overall benefit to the company.
- The inventory of some items was very high, in some cases running into tens of years; in other cases about 60% of the stock had been lying or would not be utilizeds, resulting in blockage and wastage of money, time, effort and space.
- Documented standards did not exist to guide the companies in purchases, manufacture, inspection and testing procedures.
- The location and identification of items, in some stores, was very poor leading to wastage of effort, mix ups, confusion.
- Standards required to control the quality of incoming materials and items, processes, services or products were normally not available.
- Means to take full benefit of the know-how available and paid for were either not adequate or properly used.
- No adequate controls were available or exercised; nor systems available (for codification) to control the entry of new items into inventory.
- No adequate emphasis on the preservation, prevention of deterioration, control on identifying items with a limited shelf-life was placed, causing losses and quality assurance problems. This is important in Iraq due to the comparatively large inventories held.
- Adequate use of safety standards was not made.
- Organized cost reduction techniques (value analysis) were not generally used.

These shortcomings indicated very clearly the urgent and pressing need to initiate and promote in-plant standardization in the Iraqi industry.

8/ The industrial private sector in Iraq is mostly composed of small units.

Some of the results achieved through the implementation of the project's phased programme were:

a) An in-plant standardization section was set up in the COSQC and its' staff adequately trained.
b) The management of the three firms became aware of the importance and benefits of company standardization.
c) The concept of documented company standards in all three plants was introduced.
d) Forty-six documented company standards were prepared.
e) Thirty seven case studies were performed, 14 of which were documented; the remaining were to be documented by the counterparts who had the necessary details.
f) A system was given to all three firms on how to select, order, file, update, cross reference and disseminate information from standards. Assistance was also given in guiding them on the merits - and demerits of using different national standards, on the use of international standards whenever possible, and in some cases, giving them lists of Iraqi and international standards which they needed urgently.
g) Systems for the location of items and the identification of some important ones were given to the three firms.
h) Drawing control, requisition control and value analysis were done in one of the firms to indicate the benefits possible and cost reduction achievable. About 30 actual new drawings were thus examined.
i) A process specification concept was introduced to assist in the retention of the knowledge and experience of personnel and results of experimentation, to remove the indispensability and to result in improved QC and basis for economical processing.
j) Details were given for various controls that could be exercised for controlling inventory and variety, for cost reduction, for use of standard items (instead of specials or now preferred ones). Some examples are:

i) In one plant, 25% of the imported items were recognized as possible standard ones, 28 items were investigated in detail and 19 were found to be conforming to international standards;
ii) In one type of V-belts stocked in a company as spares, 70 belt varieties were reduced to 43;
iii) The variety for steel items was reduced by 59%;
iv) 14% of the items were identified as duplicate in bearings used as spares in one plant;
v) 41% variety reduction was recommended in winding wires in one plant;
vi) Non-standard sizes, in winding wires, were reduced from 76% to 10%;
vii) 207 different motors on the equipment were installed in one plant in 68 kw ratings were suggested to be standardized to 56 standard motors for future replacement and reduction in the number of spares.

k) A liaison officers scheme from major industrial units was suggested to ensure mutual interchange of information on standardization and standards.
l) 75 persons from the COSQC and industry were trained either in company standardization or in specific areas such as stores control or design technology.

It is concluded that inspite of the difficulties which faced the project as a result of the problem of securing suitable counterparts both in COSQC and industry, a definite beginning has been made in in-plant standardization activities which in future years should have far reaching benefits to industry and the country. An in-plant standardization section has been introduced in the COSQC after about 17 years' of its existence and in a few selected industries. Although a fully-fledged standards department, adequately staffed may not start being established immediately in industry due to the shortage of suitable personnel, especially under the prevailing circumstances, yet the need for this activity and the benefits it can bring have started to become appreciated by many and a few managements have become convinced of the need and benefits, while more can be convinced over the years. The message of in-plant standardization can be gradually spread to other units until the activity takes a firm root.

Seventy persons have been trained and though some are below the level needed for training in such a new discipline, the various aspects of the activity have become known and have been documented which should be of great help.

The case studies, investigations, company standards which have been prepared and the methodology and techniques advised and demonstrated will make the task of propagation easier in . future than it was during the two years of initiation. The results obtained through project activities should convince most managements who may so far be unaware of the need and benefits of in-plant standardization and need convincing.

3. Quality Control

Project activities in this area were much more extensive than the corresponding activities in in-plant standardization, simply because of the counterpart situation. While in-plant standardization activities were very much handicapped by the shortage in the number and qualifications of the counterparts, QC activities were fortunate in getting an adequate number of qualified and experienced ones. During the 2-year reporting period, 15 counterparts from the COSQC were attached to the relevant expert; three were senior specialists who were associated with the expert for the whole period and 10 were associated with him for not less than 10 months each. The three senior counterparts were knowledgeable in QC itself. The chief counterpart had experience for 15 years and had attended two training courses in standardization and QC in Japan and the USSR (3 months each). The second had experience of 13 years and had attended a 10 week course on QC in Sweden. The third had experience for 10 years and had attended a 4.5 month course in QC in Holland. Four counterparts had an M.Sc.degree and one had a Ph.D degree. A similar situation also existed in industry.

In was therefore possible to work in four more plants (in the public and mixed sectors) in addition to the three firms mentioned in company standardization.

Another characteristic in this regard was the fact that contrary to company standardization which was almost completely unknown to the COSQC and industry, QC was known and sometimes practices in one way or another. These two factors rendered the task somewhat easier than in the case of in-plant standardization.

Project studies in the seven firms revealed that the status of quality and quality control in the public and mixed sectors in Iraq was as follows:

- The two sectors had organized manufacturing facilities. Most of them had licensing agreements from abroad. The machinery, tools and in many cases, materials were imported. The products manufactured were largely for domestic markets. There was a liberal import of many of the consumer products which were also produced at home. These locally-made products thus had to face quality and price competition against the imported goods.
- Inspection was a dominant activity, especially of the finished product. Mostly, visual defects which were likely to lessen the buyer's interest were given priority in the checks. Gauges and instruments of common use were available, but their use was somewhat limited. Quality control and quality systems as integrated and plant-wide activities are yet to be developed. Defect prevention was not a developed activity. Quality records and quality reporting had not necessarily served quality improvement and quality assurance. Clear cut standards for acceptance of quality had not been documented.
- Most of the plants were handicapped for want of the requisite manpower for QC and the other manufacturing, especially the engineering and the technological functions. The problem was even more serious in the smaller plants.
- Defects were usually high, in one factory, almost two out of three products were repaired. The in-process rejection varied from 20-30% of production.

Some of the results achieved through project activities are:

1. A "Quality Control Systems Division" was set up within the COSQC. At least five counterparts have received intensive theoretical education as well as practical training in quality technology and management. The training they have undergone and the considerable confidence they have gained will qualify them to undertake quality control and improvement activities in Iraqi industries.
2. About 150 engineers, technicians attended courses and seminars in quality technology and management.
3. Several case studies have been performed and documented. They should prove very useful in future promotional activities.
4. Quality systems and plans were recommended for each product in the seven firms for consistent quality in production.
5. Several practical results have been achieved. Examples are:

i) In the gas cooker plant, defects were improved by 30%;
ii) In the five textile plants, the first grade of grey cloth was increased by about 30%;
iii) In the woollen mill, yarn uniformity was improved by about 40%;
iv) In one plant the co-efficient of variation in the preparatory material was reduced by 30%;
v) In fans, as well as dairy products, defect sources were pinpointed for improved performance efficiency.

6. More significant than these improvements is the positive attitude and appreciation on the part of the concerned managements that quality as a systems approach could serve them well for assuring high standards in the products and achieving, at the same time, significant economies in manufacture by way of preventing defects, substandard rejects, repairs and waste, and raising productivity and plant utilization.

In conclusion, it could be said that the intensive exercises undertaken in the seven factories can be regard as a significant step forward in securing the right directional trend for quality control in Iraq. The classical inspection basis has been re-oriented to meet the response of both the statutory and the economic considerations in the country.

With the close follow-up steps chalked out and the prompt action that the COSQC has already launched, there should soon arise a situation in which not only the products produced in the plants studied qualify for certification marking, but also QC would surely and steadily extend to many more factories in Iraq. The COSQC has received requests from some managements for assistance in the setting up of AC departments and training their personnel in modern techniques of QC. Especially the progress made by the public sector management of the firms in which QC implementation was launched, is commendable and their attitude and interest should serve as a positive guide for other managements in the country to emulate the path for total QC implementation in their plants.

## C. Metrology

This field covered both legal and industrial metrology (immediate objectives No. 3 and 4 respectively).

It was very unfortunate that project activities were greatly impeded due to the delay of procuring the equipment on the part of the COSQC. The detailed technical specifications of the necessary instruments and equipment for both types of metrology, with the sole exception of time and frequency, were worked out before September 1978. However, it took one year for the COSQC to contact the relevant manufacturers for quotations. This caused an adverse effect on the implementation of the project and the realization of its objectives. This situation was further aggravated by two other factors; namely the delay and difficulty in nominating suitable candidates for fellowships and the difficulty in recruiting international staff in these highly specialized domains; senior adviser in metrology, engineering metrology and thermometry.

The project envisaged the provision of the following international staff:

| Post No. | Title | M/M |
|---|---|---|
| 11-02 | Senior Adviser in Metrology | 20 |
| 11-03/A | Legal Metrology | 2.5 |
| 11-03/B | Engineering Metrology | 3.0 |
| 11-03/C | Time and Frequency Metrology | 6.0 |
| 11-03/D | Thermal Metrology | 3.0 |
| 11-03/E | Photometry | 4.0 |
| 11-03/F | Electrical Metrology | 5.0 |

The Senior Adviser in Metrology joined the project from the beginning, but left it after six months (September 1978) during which he worked out the detailed technical specifications for the whole fields of legal and industrial metrology and the lay outs of the various laboratories, except time and frequency. Since then, the post was not filled. Consequently, the Project Manager took up the task of guiding and co-ordinating international activities in this field.

In the field of legal metrology, several candidates for the post were forwarded by UNIDO. However, the COSQC decided towards the end of 1981, to dispense with this post and take up this activity alone.

Concerning time and frequency metrology, inspite of a 6 month delay in the selection on the part of the COSQC, the consultant was fielded as scheduled in October 1979 for the first part of his split mission. During this period, which lasted for one month, the consultant assessed the needs of Iraq in this field, prepared the detailed technical specifications of the necessary equipment (estimated at US$292,300) together with lists of potential suppliers, worked out the lay out of the laboratory, estimated personnel requirements and forwarded recommendations concerning the acquisition of selected publications, further development of the time and frequency unit as well as purely technical metters such as the scheme for time and frequency metrology, temperature stabilization and national and regional standard frequency transmission. Since OCtober 1979, some manufacturers have been contacted but no positive steps for procurement had been taken by the COSQC up to June 1982.

In 1981, a Consultant in Photometry was fielded in the first part of a split mission and carried out activities similar to those mentioned above.

By the beginning of 1982, the majority of instruments and equipment for the Electrical Metrology Section were received. It was, therefore, possible to field the relevant short-term consultant (February - June 1982). Project activities in this field included the installation, testing and evaluation of all instruments and equipment and the training of the counterparts in the most important theoretical and practical aspects of electrical metrology, the proper and safe operation of equipment, the basic preventive maintenance procedures as well as some routine corrective activities, the maintenance and custody of the national units of the basic electrical parameters, the maintenances of the reliability of the laboratory and the reporting of measuring data. For the latter purpose, certificates and calibration sheets were designed. In the field of electrical metrology, it is concluded that, with the available high quality instrumentation - when supplemented by the missing items as proposed - the Electrical Metrology Laboratory will be capable of offering very similar services for the Iraqi industry, like other national standards laboratories abroad.

The staff have achieved a basic working level in high precision electrical metrology and become capable of carrying out all the routine calibration services currently offered. It has also developed a basic discipline in the maintenance of instruments. However, their number should be increased and their theoretical knowledge and practical skills should be constantly improved.

In March 1980, a consultant was assigned to advise on modifying the existing metrological laboratories to enable the necessary stringent control of temperature and humidity to be obtained. This would provide a short-term solution. He also prepared outline plans for building new laboratories which would satisfy the long-term needs.

D. Testing

1. Activities and Outputs

In this field, the scope of the project covered all aspects of creating a viable group of laboratories for the purpose of providing an efficient service for the testing and assessment of most of the industrial products of Iraq taking into account that such services and facilities should be of a high quality

Thus, the international technical assistance, mainly in the form of providing consultants and fellowships, was rendered in several domains of this field, namely:

a) Instrumental Methods of Chemical Analysis
b) Physical Testing of Materials (paper, plastics, rubber, leather, textiles, paints and varnishes)
c) Mechanical Testing
d) Electrical Testing
e) Non-Destructive Testing (NDT)
f) Metallographic Testing

In general, the international staff were responsible for specifying the necessary equipment for the above laboratories as well as for training the counterparts in their use. Since there should be a time gap (about one year) between these two types of activities - to allow for ordering and procuring of the equipment by the Government - the consultants' missions were carried out as split missions consisting of two separate parts; the first part (usually lasting between four and six weeks, according to the type and scope of the work), for specifying the equipment and the second part for training the counterparts and running the laboratories. This was the case with the laboratories c),d) e). Equipment specifications for laboratories a) and b) were prepared by the COSQC and Project Manager, while those for laboratory f) were prepared by the Project Manager.

The main common activities during part I of all the consultants' missions - as specified in the relevant work programmes prepared by the Project Manager - were as follows:

1. Conducting a comprehensive study to assess the needs of the COSQC and industry for the services to be rendered by the specific laboratory and to estimate the required capacity and throughput rate of the laboratory with a forecast for the foreseen future.
2. Working out, in the light of the above study, the detailed technical specifications of the equipment and furniture according to international or if not existing, recognized national standards.
3. Estimation of the approximate costs to be incurred.
4. Preparation of a list of well-known manufacturers and/or suppliers.
5. Advising on the necessary environmental conditions and safety measures.
6. Selecting the most appropriate site within the COSQC complex, and working out the corresponding layout recommending any changes if deemed necessary.
7. Determination of the optimum staff - in terms of the number and qualifications of personnel - required for the proper operation of the laboratory.
8. Preparation of a list of selected bibliography.
9. Imparting preliminary education to the counterparts and advising on training institutes abroad.

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10. Preparation, before leaving Baghdad, of a report of the consultant's activities, findings and recommendations.

It should be emphasized that part I of any project mission constituted a basic stage on which the development of testing activities in the COSQC depended. It is the stage where the nature and characteristics of testing equipment are identified which, in turn, determine the usefulness and credibility of the COSQC laboratories.

In identifying the detailed technical specifications of testing equipment, several factors have to be taken into consideration to determine the exact types of equipment that are most needed.

For example, in the case of non-destructive testing (NDT), not only industrial products are involved but also the requirements of other bodies, such as the authorities concerned with railways, oil pipelines and atomic energy. Then the most suitable NDT techniques have to be identified as there are many of these techniques, such as:

i) Visual examination
ii) Liquid penetrant
iii) Magnetic particle
iv) Sonic and ultrasonic
v) X-ray radiography
vi) Gamma ray radiography
vii) Netron radiography
viii) Eddy current
ix) Microwave inspection
x) Acoustic emission
xi) Thermal inspection
xii) Leakage detection
xiii) Chemical spot testing
xiv) Spark testing
xv) Hardness testing

It was found that the first seven techniques were the ones that were most needed to satisfy local demands.

Similarly, assessing the requirements of electrical testing activities called for deep consideration as to the nature of electric products and appliances, presents a unique feature. The consideration centred on two questions:

a) scope of laboratory, i.e. products to be tested
b) type of testing, i.e. criteria on which testing should be based.

A great deal of though was given to attempting to answer these questions.

With regard to the first question, it was noted that the electrical appliance sector, everywhere, is a distinct grouping within the whole electrical industry; it serves exclusively the consumer, many of their standard tests are unique in character which follows that an appliance testing laboratory does not adapt easily to the introduction of other products for testing.. Also, for the wide range of power requirements for electrical products, no single test house could, in pratical terms, provide the necessary facilities. It was, therefore, decided to confine the project to household electrical appliances but with consideration given to certain electrical products which are within the power range of appliances and either have an unsatisfactory record or are sold on the home market in large quantities. Examples of such products are: meters, plugs and sockets, primary and secondary batteries and switches (wall and ceiling and other independent components).

As for the second question, it was pointed out that ideally, the testing and granting of the approval mark for an electrical appliance should indivate that the appliance, to which the mark is given, is of an acceptable quality in every criteria; performance, reliability, endurance and safety. Unfortunately, this cannot be achieved meaningfully because there is one vital difference between performance and the remaining characteristics and that is that performance is subjective in character; it can only be measured comparativvely, while saftey, reliability and endurance are objective; they are not compatative measurements or in other words, their acceptable levels are as relevant for the simplest as well as for the most sophisticated types of appliances.

The real difficulty about quantifying performance is that the level of performance acceptability varies from one product to another in the same category. For example, the simplest suction type of vacuum clearner cannot be expected to clean carpets as thoroughly as a more sophisticated type using specially designed brushes, an adjustable head and a more powerful motor, or in other words, the acceptable performance level of the former is naturally set at a lower level than that of the latter. Attempts by various countries have been made to produce a standard for one range of appliances with different acceptable performance levels (e.g. A,B,C,D, etc.) taking into account the permutations and combinations of other design criteria (e.g. size of motor, type of drive, method of handling etc.) but the results have been unsatisfactory. A different approach regarding performance measurement was then tried which became known as the "Standard Methods of Measuring Performance (SMMP)". The idea was that if the measuring techniques for performance tests could be accurately standardized, a system of informative labelling could be introduced for attachment to the appliances. The labels were intended to provide sufficient performance information for the prospective purchaser to compare it with that of another appliance within the same range, since thetests for each were identical. It proved however to be of very limited success, largely because purchasers - even in developed countries - are not generally prepared to go to the lengths of reading information on labels before deciding to buy.

Having decided that performance could not effectively be linked to the remaining quality characteristics, most of the industrialized countries prepared their national standards based on safety requirements, but at the same time incorporating the current requirements for durability and reliability in service. Thus at the outset safety was defined widely, embracing not only electrical, but also mechanical, thermal and any other form of safety involved in the purpose for which the particular appliance was designed. It covers both the reliability and durability of the appliance measured in many years of use (including a degree of rough usage). Because of the comprehensiveness of the tests, it was obvious that the appliances would demonstrate during those tests whether or not it performed as was intended.

The above shows that testing household electrical appliances for safety introduces an element of performance. However, there is no attempt to categorize or grade it for the basic reason that performance is a subjective character and can only be assessed comparatively. What is more, there are national differences of interpretation of the meaning of good, bad and indifferent performance.

The International Electrotechnical Commission (IEC) recognizes this principle in respect of household electrical appliances and has confined its standards to testing for safety. If the COSQC aligned its' system of testing (and approval) with that of the IEC then an important advantage would accrue. All the experience and codes of practice which have been built up over many years in the electrical appliances test houses in Europe and elsewhere would be directly relevant for information, advice and instruction.

From the above, it became evident that there should be every reason for COSQC to adopt the principle laid down by the IEC for testing household electrical appliances to safety as defined broadly.

Accordingly, the detailed technical specifications of the testing equipment and instruments were prepared based on that conclusion.

As for part II of the consultants' missions (usually lasting between two and four months, according to the type and scope of the mission), the main common activities were as follows:

1. Assisting and supervising the installation and arrangement of the equipment in the laboratories.
2. Putting the equipment into operation and exploiting their full capabilities.
3. Determination of the standard methods of testing to be followed.
4. Imparting intensive on-the-job training to the counterparts in the preparation of samples, manipulation of equipment, statistical treatment and interpretation of results and final evaluation of the product.
5. Assisting the counterparts in the establishment of an individual file for all equipment containing its catalogue, method of use and all available information.
6. Preparation of reference "Laboratory Manual" standardizing the methodology to be followed in conducting laboratory work to achieve reliability in test results. The methodology should include the planning and establishment of laboratory routines, testing and reporting procedures and forms, from the intial enquiry of the client and the different stages of the progress of the test specimen from its receipt to the final report, disposition of specimen and rention of records. The manual should also contain the methodology to be followed in individual laboratories discussin the quality and control of laboratory personnel, mode of selection of test methods and recording and reporting systems.

7. Supervising the counterparts on the day-to-day running of the section.
8. Assisting the local staff in providing technical advice and services to industry.
9. Specifying any complementary/additional equipment/accessories to be procured in the next stage of the section's development.
10. Conducting training courses for the technical staff of the COSQC and industry as well.
11. Preparing a final report on the consultant's activities, findings and recommendations.

It is to be noted that it was sometimes necessary to augment the above common activities by others to perfect the functions of specific sections. For example, since the standard atmospheric conditions for testing of materials, products, and equipment are of prime importance and need to be controlled to obtain comparable and reproducible results, the existing conditions of 20 laboratories in the COSQC, including the conditioning rooms, were surveyed every day during two consecutive months. The results obtained were very useful in demonstrating the variations in atmospheric conditions.

Similarly, in the Electrical Testing Section, a guide for the setting up of a certification and approvals system was prepared and a practical demonstration on a live case (motors for air coolers) was made. A detailed scheme of surveillance for the approval of electrical appliances was prepared with a guide for COSQC inspectors on general points to check during a surveillance factory visit. The Factory Visit Report and Certificate of Approval were prepared.

## 2. Findings

a) A complex of testing laboratories with ancillary services has been erected in a pleasant area within the boundaries of Baghdad to provide a service for testing and analytical assessment for a wide range of products, materials and appliances.

b) All testing and metrology laboratories are well equipped with modern equipment and high quality instruments which are necessary to obtain the standard of results required. No efforts or funds were spared to get the most up-to-date equipment and the general standard is undoubtedly very high. It is rare to find any test house in the developing world with such a high standard of equipment. The COSQC must be commended and congratulated on the excellent quality of equipment and furniture it has selected for its laboratories.

In this connection, it should be stated that the work of the counterparts and the contributing committees making the final selection of the instruments - on the basis of the technical specifications prepared by the experts - should be acknowledged and praisde. Considering the inexperience of the counterparts in the instrumentation of a national testing and standards laboratory, as well as the remarkable results achieved, it can be stated that they have completed a good job.

c) Testing facilities at the COSQC, though housed in one building, are scattered among several divisions/sections according to the type of industrial activity (food, chemical engineering, textile, etc.). All of these divisions/sections are under the management of the Director-General of the Department of Quality Control. The personnel in these divisions/sections are engaged sometimes in the inspection of relevant products and sometimes in their testing. They are all accommodated in the testing laboratories. This is an old practice inherited from the erstwhile Department of Research and Industril Control (DRIC) whic, in 1979, was merged with the former IOS to form the present COSQC.

d) It is thus seen that within the COSQC there is no separate body or agency exclusively concerned with testing. This type of organization and structure has certain inherent defects.

Although the functions of inspection and testing overlap, it is desirable to distinguish between them. Testing refers to the quantitative determination or measure of certain properties. Inspection, on the other hand, has to do with the observance of the processes and products of manufacture to ensure the presence of the desired qualities. Thus inspection aims at the control of quality through the application of established criteria and involves the idea of rejection of sub-standard products. In theseting, the aim is to determine the quality i.e. to discover facts regardless of the application of the results. Combining these two different activities has two main disadvantages:

i) It will expose the laboratory staff, while testing, to an environment which may make them biased and the implications of the results are likely to affect their correct assessment ability.

ii) Being engaged in two different activities with different theories and techniques, the staff will not be able to build up a deep experience in either, a factor so essential for the calibre of staff working in a national standards body. Science and technology are developing at a very large rate and to excel in any branch and keep pace with its recent developments needs a high and deep specialization in the concerned activity.

e) In order to assess the quality of the various materials (foods, chemical products, building materials, metals ) it is often necessary to determine their chemical composition. Consequently, each division within the COSQC in order to preserve, enhance and consolidate its autonomy and independence, maintains its own facilities for the chemical analysis of the materials and products considered to be within its own sphere of activity. This resulted in two main disadvantages:

i) Damage to costly equipment:

This is well demonstrated by the fact that conducting chemical analysis in physical testing premises involves the evolution of corrosive atmospheres (vapours, gases) which will damage the sensitive and costly equipment present in the same laboratory. Besides being costly, this will affect the accuracy of the results obtained from such equipment and instruments.

ii) Unnece sary costly duplication and a less efficient use of instruments and resources.

One example is the presence of three atomic absorption spectrophotometers, housed in widely separate laboratories within the province of their respective divisions. They are operated entirely independently of the others. In all cases, the same fuel oxidant and other services are necessary. They all have safety hazards and therefore they all need adequate exhaust facilities for the removal of the noxious fumes generated during their operation. Atomic absorption is a technique for the quantitative analysis of metals and some non-metals present in trace amounts in a wide range of substances. The actual analysis for a particular element is virtually identical regardless of the origin of the sample the only important difference being in the pre-treatment of the sample prior to its analysis. Relocation of all three instruments within one laboratory has certain obvious advantages. A common facility for the extraction of the noxious fumes produced during operation of the instruments could be used. Supplies of the necessary compressed gases could be sited in one place. A further advantage of gathering the three instruments in one laboratory accrues from the presence of the analysts/chemists working on these instruments in one space. This will greatly foster and enhance the very fruitful exchange of ideas and experiences which, in turn, will lead to the upgrading of their technical competence together with a full exploitation of the capabilities of the three analytical instruments.

A second example is the presence of two auto-analyzers in two different divisions. Another related case is the presence of a very expensive and highly versatile instrument in one division although it could be very usefully employed for other divisions. This is the case of the X-ray Analyzer, which is housed in the Building Materials Division.

It is therefore necessary to combine all analytical instruments in one separate and general division/section serving all other divisions/sections.

f) There is some lack of adequate safety precautions and procedures. The best principle is to regard all anlytical operations as being more or less hazardous and to conduct work in the laboratories accordingly. Concerning personal protection, the eyes and hands are, in general, the parts of the body likely to require protection in the laboratory. Eyes should be protected by safety spectacles fitted with side pieces and made of toughened glass. For hand protection, gloves made from plastic, nitrile rubber and fabric coated with poly vinyl chloride (PVC) give all round protection.

Some hazardous situations have been observed in the chemical laboratories and suitable measures should be taken. Examples are the use of ordinary refrigerators for storing flammable liquids, use of unlabelled compress gas cylinders and the presence of hazardous radiations and spillage of mercury from the polarograph.

g) As a result of the presence of independent testing divisions/sections there are no adequate facilities for the receiving, storing and despatching of products and other items and the testing activity lacks proper rationalization and documentation. The provision of such facilities and organization constitutes a key factor in the success of a test house since they greatly affect the accuracy and credibility of test results as well as the efficiency of COSQC laboratories.

This is well demonstrated by the fact that there is a considerable interplay between the various testing divisions/sections of the COSQC as the complete information of many materials/products are to be obtained by testing in more than one division/section. Even in its present set-up there are some divisions which are multi-disciplinary in nature. For example, in the Engineering Testing Division, it might be necessary to subject a material/product to chemical, mechanical, electrical, metallographic and non-destructive testing. With the increasing volume of work in the coming years, a control procedure for the efficient and orderly operation of a multi-disciplinary test house will be necessary. As a first step, all testing laboratories should be combined under one roof to form a single set-up as an independent testing agency within the COSQC. Then, as all testing activities are to be co-ordinated, a standard methodology has to be evolved to specify how test specimens are to be processed, the records of such processing and how these records interact with other systems (laboratory QC, accounting etc.) all of which will make up the total operational procedure of the test house.

Keeping the above facts in view, a system for theefficient control and firm supervision of laboratories has been outlined by the project on more than one occasion. The system takes into account the processing of the work from the intial inquiry of the client (within and outside the COSQC), to the final report, disposition of test specimens and retention of records. The system involves the establishment of a Plann and Progress Section. The first section would be responsible for the overall planning of work for the various laboratories and the control of products through them. These tasks entail identifying the products as they are received, estimating the cost of testing (if necessary), following up and checking the time spent on each of the processes during their progress to the final stage of despatch. In this way, a measure of the effectiveness of the organization is available and equally delays can be identified and thsu overcome. The section will be able to assess the loading of the whole test house constantly so that decisions can be taken regarding the rate of acceptance of samples in order to obtain full operation while, at the same time, avoiding testing delays. From the information obtained by the Planning and Progress Section, decisions can, in the future, be taken as to whether or not expansion of laboratory space is necessary.

The Recording and Filing Section will be concerned with the compilation of complete information including full identification data of the producted tested, the manufacturer concerned, the correspondence involved, the test method used for testing and all necessary observations and calculations as well as test reports. All test observations and measurements must be entered immediately into bound notebooks or preferably onto duplicate pages of workbooks or work cards or properly designed work sheets. The use of blank paper for recording observations is unacceptable. Errors in calculations and inaccurate transfer of data from workbook to test reports are major causes of incorrect reports. A firm requirement is that all calculations and data transfers should be checked by a second person who should sign the work sheet. In addition, copies of test reports, including interim test reports (prepared for products which have failed a test to the extent that the tests could not be completed) are filed with cross references to the manufacturer files. Records of the types and frequency of failures (more accurately described as points of non-compliance with the relevant standards) should be maintained. The compilation of these records should be divided into types of products. Separate file(s) on failure statistic should be kept.

h) The technical services and other "back-up" facilities available to the chemists/analysts were found to be woefully inadequate. For example, cylinders of compressed gases are necessary for the operation of several instruments and it is the sole responsibility of the indivual chemist/anlayst to arrange for a supply of the compressed gas. He/she has to acquire a cylinder and take it to the filling factory. This procedure is wasteful of trained personnel and often results in unnecessary delays of a week or more. Necessary gas cylinder keys and simple items such as PVC tape required to achieve gas-tight joints were unavailable. The laboratories do not possess test meters and a replacement dry battery for one instrument could not be obtained for more than two weeks.

i) Frequent interruptions to the mains power supply occurred on numerous days, sometimes up to six power cuts on the same day. Such unannounced interruptions must be kept to a minimum in the future to avoid serious damage to the costly instruments. Instruments employing an xenon lamp source, are used in the laboratory and OFF/ON power fluctuations will undoubtedly considerably shorten the life of these instruments. Other instruments such as the atomic absorption spectrophotometer and flame photometers which use an air/acetylyn flame each have a compressor to supply the air. When a power cut occurs, this could give rise to an explosion/fire hazard unless an analyst is in immediate attendance to switch off the fuel supply.

In addition, electricity cuts affect operations in the Electrical Testing Section where there is a requirement for a continuous power supply to provide for a variety of endurance tests. Batteries need a long charging and discharging time (up to 100 hours), control devices require continuous operation (on/off switches couplers) for periods up to 48 hours. Kettles and other liquid heaters require alternate heating and cooling in 24 hours. Some of the environmental tests using heating cabinets require over-night operation, etc. Moreover, if there are interruptions in the electricity supply for an hour or more, then many of the tests, especially those concerned with either heat or motor operation, could be rendered invalid. Also the subsequent interruption of the air conditioning system resulting in changes in temperature and humidity could affect some tests, where the ambient temperature and/or humidity are specified, although this would not be so serious (the tests are of the industrial grade) as would be the case in the metrology laboratory where a strict control of temperature and humidity is absolutely necessary for the maintenance of physical standards and for carrying out metrological activities.

A great need therefore for a standby electricity supply is obvious for the test laboratories.

j) The properties of materials and the behaviour of equipment under test are influenced by atmospheric conditions such as temperature, humidity, and pressure at the time of the test. That is why it is necessary to specify standard atmospheric conditions and conditioning procedures under which the test should be carried out or at which the specimen should be conditioned before the test.

In the COSQC, although there are four conditioning rooms especially designed to have their independet air-conditioning systems to maintain the desired temperature and humidity, these rooms are not used for that purpose, they are mainly used as storage rooms for samples/equipment. Thus, at present no conditioning of the test samples is carried out as required by the relevant ISO standards in the fields of textiles, paper, leather, rubber and plastics. Samples are tested according to their "as taken" conditions.

k) The Paper Testing Section, which should have a conditioning room, as conditioning of paper materials before testing is madatory according to ISO standards, does not have any such facilities whereas the paint laboratory which normally does not require conditioning has been provided with such facilities.

l) There is an acute shortage of space in such a way that there are several items of testing equipment for which no arrangement for installation could be made, due to a lack of space. Unfortunately, no provision was made in the foundations to carry more floors. The moving of the Metrology Departments to a separate building to be constructed will provide a good solution. The need for some rearrangement of the laboratories is keenly felt.

m) In the Physical Testing Division, about 25% of the equipment is not in proper working order due to mechanical or electrical faults, usually not of a major nature. Probably a simple repair could rectify the defect and bring the equipment into commission. Some of the expensive equipment like the weatherometer requires continuous attention in maintenace. Also all atomic absorption spectrophotometers were not in working order and required attention from a service engineer.

n) During carrying out the activities in the Electrical Testing Section it was realized that there were virtually no arrangements for providing earthing facilities for the electrical installations in dwellings in Iraq. The electrical transmission distribution system does not provide for regional earth return wires to which each house in the particular region would normally be connected. This state of affairs exists despite the fact that single phase socket outlets of the 13 amps 3 socket fused type with the large socket for an earth connection is widely used in Iraq. It follows, therefore, that reliance on protection against electric shock cannot be ensured by connecting the accessible conductive parts of an electrical appliance to the earthing conductor in the fixed wiring of the electrical installation in the house. This means that the question whether Class I appliances (as defined by IEC 335-1) so called earthed appliances, should be used in domestic dwellings needs serious consideration.

It was also realized that some appliances, in which water is involved in their operation, are only manufactured as Class I (earthed) products. The instalment of such appliances in the home should be carried out by qualified technicians and a suitable earth connection made on the premises.

The above findings emphasizes the need to take action, where possible, at the government level.

o) Most of the laboratory staff are graduates of chemistry, physics or chemical engineering. Most of them have no background of the techniques with which they are involved. They, however, had the benefit of on-the-job training which is far from being satisfactory.

p) Many useful test machines have been kept idle for want of minor and consumable spare parts which were not ordered with the equipment. Also, the capabilities of several instruments have not been fully exploited.

q) Visitors from outside have almost free access to the laboratory premises to deposit their samples or to inquire about the test results. This is a practice detrimental to the interest of laboratory work.

## E. Instrument Maintenance and Repair

Modern conditions as they progress being an increasing need for valuable scientific instruments. To keep them working, to repair damages quickly without having to send them abroad is an economic, scientific and technical necessity.

The ultimate objective would be to create an instrument repair centre of the highest quality, capable of repairing top grade instruments. This would serve Iraq as a whole.

There is, however, an immediate and less ambitious need to provide simpler repair facilities and thus avoiding sending instruments to other organizations, especially abroad, for this service. Often a simple repair would rectify an instrument which otherwise would be out of commission perhaps for months, while being repaird abroad. There would also be a considerable financial saving if such repairs were carried out locally. It follows therefore that sending the instruments to the home country for repair, the administrative complications, the additional costs and the waste of time would increase tremendously.

The need is obvious in view of the heavy investment in instruments for the accurate measurment of all basic parameters, for providing calibration services to industry and other users of precision instruments and for carrying out industrial testing of materials.

The COSQC has an increasing number of mechanical, electrical and electronic instruments. While the instruments are relatively new, it seems to be natural that they are in good condition and are working properly. However, it should be considered well in advance that, as a law of nature, all instruments require some kind of expenditure of energy to prevent their deterioration or failure. To ensure the quality and good condition of the instruments, regular maintenance is required. In the case of many instruments the maintenance should involve periodical calibration and readjustments as well. It should also be understood that even with the best quality maintenance and competent operation of the instruments, they are all liable to occasional failure or damage. To eliminate such problems, professional repair services are required. This all means that the custody of national wealth incorporated in the instruments of the COSQC requires the responsible planning and establishment of maintenance and repair services.

In this respect, it should be emphasized that the early establishment of such services would give an opportunity to the COSQC staff to become acquainted with the expensive instruments during their installation, especially where there would be no local agent for the supplier. After installation or first commissioning, of the vast array of apparatus and instruments, these maintenance and repair facilities will be highly important for providing preventive and breakdown maintenance as well as adjustments for calibration whenever feasible.

It is in the above context that the project included a separate immediate objective (No. 6) "to assist in the setting up, organization and operation of an instrument maintenances and repair shop". To this end a seven month mission, split into two parts of two and five months as well as two fellowships each of a 10 month duration, were to be provided.

The assignment started in April 1980 (a year after that scheduled). The delay was mainly due to:

a) The delay in approving the first candidate which resulted in him no longer being available;
b) The delay in approving a second candidate.

Since the proposed instrument maintenance unit in the COSQC was envisaged to cater also for the main needs of other bodies in Iraq, the instrumentation status was studied in the following bodies in addition, of course to its status in the COSQC:

1. Foundation of Scientific Research, consisting of:
   - Petroleum Research Institute
   - Building Research Institute
   - Soil Testing Laboratory.
2. University of Baghdad:
   - Electrical and Electronic Laboratories
   - Laboratories of the College of Science
3. University of Technology.
4. Palm Research Institute

5. Central Stores and Workshops for Electro-Medical Instruments of the Ministry of Health.
6. Specialist Heart Hospital.
7. Specialist Eye Hospital.
8. Hospital for Physiotherapy.
9. Regional Training Centre for the Repair of Electro-Medical Instruments.

In light of the above study, an Instrument Maintenance Centre was designed on the recommendation that maintenance services should be offered at two levels;

1. Law level maintenance: for non-measuring apparatus e.g. controlled ovens, controlled water/oil baths, centrigues, vacuum pumps etc.
2. High level maintenance and correctional calibration:

   a) testing laboratories' instruments as ph meters, spectrophotometers, flame photometer, gas chromatographs, gas analyzers and auto analyzers where reference calibration is either built-in or can be provided with the co-operation of the appropriate metrology section.

   b) metrology laboratories' instruments which are highly accurate reaching the state of the art such as frequency counters, storage oscilloscopes, current comparators, high voltage and high resistance measuring apparatus, AC/DC transfer standards, precision potentiometers. etc.

   c) complete instrumentation systems. These may be subcontracted for maintenance to the original manufacturer as it has been found to be more economical or else to call the specialist from the company whenever needed. This would apply to computer systems, X-ray diffraction, non-destructive testing apparatus etc.

To carry out the above maintenance activities, three levels of staff were envisaged:

- engineers/scientists
- technolgists
- technicians

Detailed technical specifications for the following equipment were worked out:

| | Estimated Cost US$ |
|---|---|
| Equipment for the Electrical + Electronic Workshop<br>Equipment for the Mechanial Workshop | 65,000.00 |
| Hand tools, spares and miscellaneous supplies | 5,000.00 |
| furniture (special type with 3 levels) | 5,000.00 |
| TOTAL | 75,000.00 |

During the two years which followed the first part of the consultant's mission (i.e. up to the end of project activites in May/ June 1982), a small amount of the required equipment was procured from the local market and neither of the two fellowships (10 months each) were implemented.

F. Certification Marking

The importance of certification marking as a very efficient and effective means to reap the benefits of standardization cannot be overlooked. The main objective of the project in this regard (immediate objective No. 8) was to assist in the planning, organization and operation of a national certification marking scheme.

Project activities to realize this objective started from its very beginning in 1978. It was noticed that the existing mark of the IOS was too crowded and complicated to be used as a mark of conformity. Consequently, the Project Manager prepared the specifications of a suitable mark and a national contest was carried out in 1978. However, no design was found to be suitable. Another contest was carried out in 1979.

In June 1979, the new law establishing the COSQC by the merger of the IOS and DRIC was issued. Article 3 of paragraph 4 stated that one of the functions of the COSQC was to grant the quality licence and the quality mark. However, there was no separate administrative unit to carry out the relevant activities and the COSQC was passing through a transitional period.

In November 1979, the relevant consultant was fielded for six months. There were difficulties in nominating suitable counterparts. In such circumstances and in the absence of the essential prerequisites the main concern of the consultant was to prepare all the documents that would be needed for the establishment, organization and operation of the certification marking system as well as to instruct the available counterparts on the related activities.

Consequently the full details of the certification marking system were worked out taking into consideration the mandatory nature of Iraqi standards. These included:

1 The principles of formulating the necessary bye-laws
2 The regulations and procedures for the application for the mark, sampling, testing reporting and quality control
3 The rules and criteria for the authorization (accreditation) of testing laboratories
4 The guidelines for the selection of products for approval and evaluation
5 The guidelines for the formulation of standards suitable for certification purposes
6 The organization of the quality marking system and its relevant bodies and staff.

In addition, a short training course was conducted. Apart from implementing one of the two relevant fellowships, no major step was taken by the COSQC to organize and operate the certification marking system as planned and detailed by the project.

## G. Standards Propagation

### 1. Introduction

There is always a need, especially in developing countries, to propagate information about standardization and quality control to government departments, universities and institutes, industrial enterprises, trade circles as well as the public at large in order to block out the wide-spread unawareness of their importance in national development. Public relations activities is an integral part of the NSB's effort to encourage the adoption of standardization and QC techniques in all national activities. The highly-developed NSB's do not maintain substantial public relations (PR) departments as a luxury; they do so becuase they materially assist greater influence in industry and in the nation's affairs.

The assignment of an expert in the propagation of standardization and QC disciplines was seen therefore as an essential step in order to achieve the widespread collaboration which is fundamental to the influence of the COSQC.

The main objective of the three month assignment was to assess and promote standards propagation in the COSQC and to train the relevant staff in the variety of the necessary approach using all modern techniques for mass communication in this field - television, radio, film, national, popular and technical press, exhibitions and displays, publications and posters, visual aids etc. - and to programme the requirements to this end.

### 2. Activities and Outputs

The following activities were carried out:

1. Preparation of six articles and press releases.
2. Designing and copy treatment for a COSQC information booklet.
3. Designing a mock-up for a bi-monthly bulletin to replace the annual bulletin.
4. Working out the design and text for a portable COSQC exhibition display consisting of 14 panels.
5. Working out the specifications of the necessary equipment including a camera with flash accessories; drawing and page layout boards; original artwork photo reproducer, automatic slide projector with synchronized tape and an automatic offset duplicator.
6. Preparation of the outlines of a film script about the COSQC activities.
7. Preparation of a complete scenario for a 30-40 minute programme for the Iraqi TV Channel 9 which was welcomed by TV producers and directors. The original film was shot all over Baghdad and in the laboratories of the COSQC, 20 library films were seen and sequences selected. The original film was edited and cut and the programme was ready to transfer to video except for the recorded interviews with COSQC senior personnel which never occurred. However, editing of the original film was completed, the scenario was entirely re-written and all the minutiae normally reserved for the final transfer to video were written in.
8. Preparation of a model post.

9. Giving details for launching the certification marking system.
10. Organization of a Standards Day for universities, technical colleges.
11. Preparation of a programme learner consisting of ten 1-hour lessons on standardization and QC for intermediate, secondary and industrial training schools.
12. Identifying the steps to be taken for the setting up of a consumer group.
13. Working out a five-year departmental structure projection with the job descriptions of the necessary staff.
14. Imparting training to the counterparts in practically every field of PR except visual aids, notably in TV, press, technical press and printing techniques.

3. Findings

It was apparent that few people in government departments, universities and technical colleges, public and private sector economies and the general public understood the significance of standardization in the country's development.

It also became apparent that there was a further dimension of unawareness, entirely significant in terms of the progress of the COSQC itself. With the exception of a few senior personnel, the graduate staff, whilst fully aware of the relationship of the national standards with their own laboratory testing, did not have the broader appreciation of standardization in its own right.

PR facilities did not exist. Some work had been done in connection with World Standards Day, and a rather good but sporadic journal had been produced but there was no sustained programme and indeed no equipment or facilities with which to mount such a programme.

4. Conclusion

An active propagation of standardization and QC is clearly necessary to combat the lack of understanding and even industrial apathy towards the whole important field. The COSQC has obviously been poorly equipped to deal with this need, yet, it is obvious that some of the staff have a good appreciation of what could be achieved in this direction. There is a lively nucleus on which to build a programme the effects of which could be far-reaching.

The essential element of all this is, however, the need to give more serious thought especially to the selection of personnel. What one calls propagation, PR, publicity or communication is as much as profession as any other post within a NSB. A new professional staff is essential beside the technical staff who can be spared from other departments of the COSQC. The low salary scale for such activity and the constant changes of staff and supervisory personnel have quite clearly discouraged staff and lowered their morale.

It is felt that the attitude taken reflected, at worst, a lack of serious intent and, at best, the view that "publicity" was a sector into which personnel could be placed until they could be found something better to do.

## H. Standards Information and Documentation

### 1. Introduction

Information is one of the most vital of a nation's resources and like other resources for economic and social development, this resource too needs to be effectively developed, conserved, distributed and utilized. So the information problem has to be widely understood as the national resources exploitation and development problem that it is. This requires a systematic approach for the proper co-ordination and liaison between the various components of the system.

NSBs, have, therefore, been forced to organize the need for providing information about their standards. With the growth of trade and international communications, users all over the world expect an extensive service, including information on international standards, and standards from other overseas countries. An index to the magnitude of the problem is provided by the fact that today the fund of world standards and specifications available is estimated at about half a million. These include standards developed by about 90 NSBs, international organizations like ISO, IEC, OIML, UN agencies like FAO, WHO and ILO and various other learned societies and associations.

As the need for information continued to grow, NSBs set up special departments for the dissemination of information on standardization. Information about standards may be sought to answer several types of queries concerned with various operations, namely, purchase, design, manufacturing, test methods, export trade etc. These operations are peculiar to a manufacturing establishment. But a research and development organization, a municipal body, a commercial establishment, an export house or association or a purchasing department of a government would, in addition, like to keep track of the progress in standardization in the development of new and revised standards and also in regard to the progress and policies in standardization at the national as well as regional and international levels.

Considering the rapid pace of industrial development in Iraq, the need for a well-knit technical documentation and information system assumes great urgency. The objectives of such a system should be:

a) to provide rapidly and effectively, all organizations and individuals concerned with national, foreign and international standards with complete information about them.
b) to encourage and facilitate scientific information on standardization in order to avoid unnecessary duplication of efort needed for developing standards and establishing quality characteristics.

In view of the importance of information and documentation activities and the full awareness that information planning should be an integral part of the development of the COSQC, the establishment, organization and operation of technical library, clearing house and information and documentation services were included as an important component of the present project with the object to establish an adequate information infrastructure responsive to the needs of the resurgent national economy of Iraq. Technical assistance in standards information and documentation through a four month mission split into two parts of one and three months .

2. Activities, Outputs and Findings of Part 1

1. Investigation of the status of information and documentation activities in Iraq (in and outside COSQC).

2. Assessment of the present and future requirements of the COSQC and the users it seeks to serve.

3. Identifying the most adequate set up and services to cope with these requirements. Working out a plan for the establishment of an Iraqi National Standards Information Centre (INSIC). Defining the objectives and functions of the proposed information system. Submitting details of the organization, staff structure and equipment required (estimated capital cost in the order of ID95,000).

4. Working out a phased, but intensive, programme of development in five stages spanning over a period of 1.5 years at the end of which it was envisaged that INSIC would be more or less fully operational. Another year would be required to launch a data bank and computerise the operations after a feasibility cum systems study had been conducted.

5. Submitting a report on the activities of the expert, findings and recommendations.

Project activities during part I of the mission revealed that information and documentation activities at the COSQC are more or less confined to operating a small library which serves more of a custodian function as distinguished from a service-oriented function. Other activities are limited to the publication of an annual bulletin, a yearbook of Iraqi Standards and some sectional lists of Iraqi standards.

The operations of the library are more or less limited to the routine business of:

a) Procurement of publications in response to request and authorizations received.

b) Accessioning, classifying and catologuing of publications, catalogues maintained at the library are confined mainly to books.

c) Lending services handling books and standards only. These services leave much to be desired in their efficiency and system of operation.

There do not exist any documentation, information, abstracting, current awareness, selective dissemination or technical inquiry services. Another lacuna noted was the non-existence of the requisite infrastructure to put out information products for circulation to interested users.

The space and equipment are far from adequate both in respect of the layout or area available for the projected expansion of the activities of the COSQC. There is a great need for a much larger collection of books, periodicals, information store, services to be organized, housing of equipment for copying, microfilming and printing and for the training of information staff.

A considerably larger complement of staff at various levels and attainments - technical and otherwise - would be needed.

3. Activities, Outputs and Findings of Part II (2.5 years after Part I)

Part II of the mission was supposed to be concerned with the training of the counterparts as well as the tasks of the organization, structuring and creation of the facilities recommended in Part I and making them operational.

However, the situation encountered upon starting the return mission was found somewhat difficult, even dispiriting, as none of the recommendations of the first part had been implemented.

In such circumstances, the original plan had to be modified. Additionally, considering the rather formative stage of the library, viewed against the tasks and functions of the COSQC, attention was given to the following three areas:

a) the proper organization and management of the library by introducing improved techniques and practices. Thus action was taken in:

- classification of books acquired during the preceeding two years;
- unification of existing dual classification system (Dewey classification, DC, and Universal Decimal Classification UDC) as recommended in Part I;
- cataloguing of new acquisitions and revising and updating the existing catalogue;
- weeding out old and obsolescent material to make room for new inputs;
- microfilms for old journals for record and reference;
- improving the loans procedure;
- records for monitoring serials inputs to the library;
- acquisition and management of stocks.

b) initiation of two information and documentation services of immediate interest to COSQC and the industrial and commercial users of its services:

- current awareness;
- documentation lists.

c) the organization of a training lecture course "standards information and documentation: Why, Where and How" for users of standards information and documentation services such as the COSQC technical staff, technologists and manufacturers, importers, exporters etc. Lecture notes were prepared and made available to the participants.

It is concluded that a complete metamorphosis in the development of standards information and documentation services is required. To bring this about, continuing direction and guidance over a much wider time-span are considered indispensable.

Apparently, the COSQC has the potential provided the necessary priority is accorded and sufficient management support for this activity (as an essential component of the COSQC's technical capability) is forthcoming.

## I. Education and Training

### 1. Introduction

In order to help the implementation of standardization and its related disciplines, several tools are at ones disposal: certification, PR, technical information and documentation, the ultimate goals of all these activities is, of course, to encourage and to facilitate the use of standards and the application of these disciplines. Education and training activities are another instrument in the same orchestra.

To educate is to create concepts and to train is to practise them. Thus education and training in standardization and its related disciplines include the explanation of the theories behind them as well as mastering their applications. Education and training activities in standardization and its related fields, aims, therefore, at creating an understanding of their various aspects, techniques and benefits. Education and training can be carried out in schools and universities or imparted to those who work in the production of goods and services.

Although standardizationand QC have been introduced as subjects in the curricula of some schools and institutes in certain developed countries, they are generally speaking, functional disciplines more than typical educational disciplines. Since these disciplines should be practised and mastered by the concerned manpower the project attached great importance to education and training. A separate immediate objective (no. 11) was devoted to these activities.

The project envisaged to impart and promote education and training by:

a) On-the-job training through direct contact and close association of the national counterparts within and outside COSQC with the international staff.

b) Provision of a training component of 187.5 m/m for the implementation of 44 fellowships and six study tours.

c) Assisting in the setting up and operating of a well equipped training unit/centre within the COSQC.

d) Conducting the following training courses:

- National Standardization
- In-plant Standardization
- Quality Control
- Metrology

e) Issuing the following training manuals:

- National Standardization
- In-plant Standardization
- Quality Control
- Metrology

No special mission was assigned to attain the education and training objective, a task which was taken up by the Project Manager and the international experts and consultants.

2. Activities and Outputs

a) On-the-job Training

The project was very keen to render this training as comprehensively and effectively as possible. It requested the COSQC to nominate as many counterparts as possible to each expert/consultant even if they were not working exclusively in the specific field but in a field more or less connected with it. In one case, and at one time, fifteen counterparts were associated with one expert. It could be assumed that almost all of the technical staff of the COSQC had the opportunity to be trained by one or more of the international staff.

b) Fellowships and Study Tours

Similarly, great emphasis was given to the implementation of the training compc nent provided by the project (187.5 m/m) which constituted an important part of project activities. To this end, many efforts were spent to overcome the difficulties encountered and to expedite the implementation of this component.

The first difficulty was connected with the language ability of the candidates since the overwhelming majority of the training was to be carried out in English. Thus a good knowledge of this language represented a decisive factor in implementing the training component The first step taken in this regard was to test prospective candidates in order to establish their level of proficiency in English. This was carried out by the British Council in Baghdad on the basis of Davies Assessment which was the standard procedure followed so far. Out of the 40 employees thus tested, only one passed. All of the others were in need of further tuition reaching up to six months.

Since this result represented a major obstacle in the implementation of the fellowships, the problem was discussed at length with the British Council by the Project Manager who pointed out that Davies Assessment is intended for university studies and not for short-term training (mainly as practical attachment) and that a more meaningful assessment should be made on the basis of special tests tailored to the needs of practical attachment both from the linguistic and technical sides. The Project Manager also proposed the use of UNIDO form FEL.2.E (9.68). An agreement was thus reached whereby a new system would be followed. Each fellowship candidate would be given:

i. a multiple-choice grammar test
ii. a productive writing test.

These tests would be followed by an interview in which the examiner would test:

i. speaking ability
ii. listening comprehension
iii. reading comprehension
iv. ability to describe a technical process related to the specific field of work (using material to be provided by the Project Manager)
v. number work in English.

In the light of the results furnished by the above tests, the British Council would fill in UNIDO form FEL.2.E; candidates acquiring A or B in the four paragraphs of the form could be considered for fellowships; their applications would be sent to UNIDO accompanied by the completed forms. Others would have to be given further tuition followed by another test.

The agreement was immediately put into operation. Thirty eight employees were thus tested in the British Council on 18, 19 and 28 October 1978. Based on test results, the prospective candidates were classified into three groups requiring 72, 120 and 200 hours of language tuitiion. The British Council started this tuition on 18 November 1978 with the full co-operation and support of the IOS which paid about US$4,500 as tuition fees.

It is worth mentioning that the British Council authorities in London approved the agreement. Similarly, the Training Branch of UNIDO agreed to the arrangement and expressed its appreciation of the "most efficient co-operation" of the project. The arrangement - which was subsequently adopted by all UNIDO projects working in Iraq - helped very much the implementation of the training component.

Meanwhile, in order to expedite the implementation of the fellowships, the Project Manager contact many relevant overseas institutes and managed to secure 34 placements in five countries: Australia, FRG, India, Netherlands and New Zealand.

In spite of these efforts and the later reduction in November 1980 of the training component from 187.5 m/m to 159 m/m it was not possible to implement the fellowships and study tours as envisaged. At the end of 50 months of project duration (April 1978-June 1982), it was only possible to implement 75 m/m of fellowships out of 153 m/m (49%) and 0.5 m/m of study tours out of 6 m/m (8.3%) giving an overall implementation of the training component of 47.5%. This was mainly due to the rather slow nomination by the Government of candidates for taining and that some candidates were unable to take up their fellowships because of conditions in the country.

c) Training Courses

As mentioned before, it was scheduled to conduct only four training courses in national standardization, in-plant standardization, metrology and QC. However, in implementing the project, it was soon realized that the education and training activity as spelled out in the Project Document was far from being sufficient to attain the desired objectives. No training course, in the real sense of this term, has ever been conducted by the COSQC. This was mainly due to the lack of appreciation of the importance of this activity but also to the severe shortage in qualified and experienced instructors. Even the technical staff of the COSQC itself was in persistent need of training. This situation called for according the training activity a higher priority and adopting a deeper and more comprehensive approach to this activity. Accordingly, a broad plan for education and training was worked out and implemented in the course of project implementation.

The first phase was to train the technical staff of the COSQC intensively to upgrade their capabilities in discharging their duties and secondly to form a nucleus of competent instructors who would be able to impart training to personnel in bodies outside the COSQC. Consequently, three comprehensive and in-depth courses in standardization, in-plant standardization and QC (not less than 25 lectures each) were conducted by the Project Manager and the two experts attached to the project. In addition many short courses were conducted by the consultants covering the other functions of the COSQC.

The next phase was concerned with the education and training of the manpower working in industry and other sectors. To this end, a considerable volume of education and training activities were carried out through conducting a large number of training programmes which were also open to COSQC staff. Every possible care was exercised in the design of these programmes to meet the specific needs and due regard was given to the nature and specialization of the various audiences. Accordingly, these training programmes varied in nature, duration and depth. Some programmes were general and others were specialized. Some were of short duration (three to six days), others were as long as several weeks. Some were full-time courses, while others were on a part-time basis. Some were appreciation courses for top management others were for engineers and specialists and a few were for technicians and operatives. Almost all courses included theoretical and practical aspects in varying degrees. Practical application was a very important phase in several courses varying from 3 to 12 weeks depending on the specific programme.

In addition to these programmes, the international staff participated in education and training courses conducted by bodies other than the COSQC. The number of educational and training courses conducted by the Project amounted to 30 programmes which were attended by more than 500 people. Almost all of the technical personnel of the COSQC (about 150) attended one or more courses organized by the project.

Annex III lists some selected titles of these training programmes.

d) Training Materials

To render the training activity useful and effective, great emphasis was placed on the well preparation of suitable training materials. Thus, some 3,000 pages of training material were published by the project in the form of lecture notes, manuals, case histories, case studies, hand-outs. Some of these were written or translated into Arabic

3. Conclusion

A good deal of education and training activity was carried out both within and outside the COSQC. In the COSQC, the technical staff have acquired basic and extensive knowledge and experience which, undoubtedly, has raised its technical capability. In addition, a group of specialists has been formed, who can serve as competent instructors. Outside the COSQC, a large number of people have been educated and/or trained in the various aspects of standardization and quality control.

However, the number of persons trained is very low compared to what is required if standardization and QC activities are to take deep roots, develop and yield real benefits. The field is enormous and the task is laborious. The development of specialists to acquire professional competence is a time consuming process and it should be a continuous activity. It is worth mentioning that developed - and some developing - countries have been educating and training in standardization and QC for years and are still giving more and more emphasis to this activity every year.

In this respect, one must not lose sight of the fact that behind the success of the quality revolution in Japan is the motto"QC starts with education and ends with education" 9/ . This motto has been well-proved in all other countries committed to quality and has led to a universally recognized fact which is presently formulated in the slogan "No Education: No Quality".

Standardization and quality consciousness on the part of everybody and their proper practising on the part of the concerned people will ensure the steady improvement of quality of local goods, growth of exports and raising standards of living. National prosperity will not be a far cry, seen from this perspective. The country should, therefore, gear all its efforts at achieving quality and productivity through standardization and QC. To this end, a national continuous campaign for education and training is vital.

The COSQC - which assumes the role of a national authority and provides the framework for a national commitment to quality through a series of activities: standards formulation, standards implementation, laboratory testing, product certification, accreditation and metrology - should take the lead in this regard.

9/ Kaoru Ishikawa "Quality Control Starts and Ends with Education", Quality Progress, August 1972, p 13.

J. National System for Standardization, Metrology, Testing and Quality Control

The concluding objective of the project was to assist in the organization and operation of the whole set-up of standardization and the related disciplines through the establishment of a national system for standardization, metrology, testing and quality control (immediate objective No. 12).

Early in 1979, UNIDO forwarded the candidature of four consultants to take up this mission. Although some of them were quite competent, none were accepted. It was then agreed between the COSQC and the project that this important task would be taken up by the Project Manager and the directors of the relevant departments of the COSQC after conducting study tours in some countries adopting such systems. Tight programmes were worked out by the project and great efforts were spent by the Training Branch of UNIDO to carry out these programmes. However, when the study tours were about to be implemented in 1981, the COSQC decided to postpone them and finally cancelled them altogether.

## IV. DIFFICULTIES

During implementation, the project faced many difficulties which had an adverse effect on the realization of its objectives. The difficulties encountered are classified under the following seven headings:

### A. COSQC Administration

1. Unfortunately, the COSQC underwent frequent changes during project implementation. Thus between 1979 and 1982, the IOS/COSQC was managed by seven administrators (secretary-generals or presidents). Since most of these administrators were recruited on a temporary basis, they - naturally - showed very little interest - if any at all - in being involved in project affairs.

### B. Counterparts

2. The COSQC departments and sections were operated by an inadequate number of professional staff (engineers, chemists, physicists etc.) supported by a disproportionate number of willing, but relatively inexperienced, technicians. The difficulty was compounded by frequent changes among the professional staff with the result that the experience and expertise acquired, through being a counterpart or granted a fellowship or through attending a training course conducted by the project, were lost to the COSQC. In addition to this loss, constant changes of staff and supervisory personnel have clearly lowered morale among qualified staff.

At one time more than 30 staff members of the IOS were transferred outside the COSQC. Apart from losing their experience, many of them attended English courses organized by the British Council which were funded by the IOS to improve their language ability so that they could be nominated for project fellowships.

At another time, 70% of the well-trained counterparts and other laboratory personnel were transferred to another department within the COSQC. The loss of such a large number of trained technical hands certainly affected the performance of the laboratories as far as the use of the large number of equipment installed was concerned.

3. In order to render the association of the counterpart to the international staff more fruitful and effective as well as to exploit the maximum benefit out of the mission, the project adopted a policy to ensure the realization of this objective. As soon as the date of arrival of the expert/consultant became known, the Project Manager contacted the COSQC in writing advising it of this arrival, specifying the qualifications and experience of the suitable counterparts and requesting his/her (their) immediate nomination so that he/she (they) could be briefed on their work and given the relevant technical material for study and/or asked to prepare certain data/information before the arrival of the expert/consultant. Unfortunately, not only was this impossible to be achieved in the majority of cases, but - quite often - the expert/consultant arrived in the field sometime (perhaps several months) before the nomination of the counterparts.

4. In several cases, one person was nominated as a counterpart for more than one consultant.

5. Quite often the counterpart in Part I of the mission was not nominated as a counterpart in Part II of the same mission.

6. In several cases, the counterpart was not of the required level or qualifications. For instance, the consultant in electrical testing was left with four femaletechnicians and one female chemical engineer loaned for the period of the mission. A session of 1.5 to 2 hours daily was devoted to reading; explaining and, where practicable demonstrating each clause of the standard dealing with the testing method. The consultant first read and then described in simpler language a paragraph, then the senior counterpart (and later the chemical engineer) whose English was adequate, translated for the benefit of the remaining technicians. This was followed clause by clause by demonstrations using appliances which were available.

7. Where some of the project's activities were carried out in industry, the counterpart situation was not better than that in the COSQC.

8. The various problems posed by the counterpart situation are well demonstrated by two typical examples.

a) In the case of the standards propagation mission (3 m/m), the public relations officer, who had just returned from abroad on one of the project's fellowships was nominated as a counterpart. Soon he was promoted to a senior administrative post. Some days were spent in trying to find another counterpart. This was then absent for 20 days and her replacement, who was expected to convey the training during this period, was herself transferred outside the COSQC. Certainly, the absence of a serious counterpart capability diminished the value of the assignement.

b) The expert in in-plant(company) standardization was fielded on 1 January 1980 for an initial duration of one year (later extended for another year). During the two years, five counterparts were provided in total, though not altogether as follows:

| Counterpart | Duration |
|---|---|
| Chemist | May-December 1980 |
| Chemist (part-time) | July-December 1980 |
| Chemical Engineer | January-May 1981 |
| Electrical Engineer | January-December 1981 |
| Physicist | January-December 1981 |

From this list it is seen that:

i) The expert, who was initially assigned for one year, worked for more than four months without any counterpart;

ii) The most suitable person to be a counterpart for this expert should be a qualified engineer with some industrial experience. None of the two counterparts during the first year complies to this requirement;

iii) The first counterpart had a very limited industrial experience and, being a chemist, had no engineering background at all. Consequently, a number of basic engineering subjects/data had to be explained since most of the work was naturally attempted in engineering industries or areas associated with engineering. The difficulty was compounded by the fact that this counterpart had applied for further studies abroad in chemistry, and therefore, foresaw certain problems in working in company standardization. Naturally, he did not show much interest and saw no benefit in such an activity.

iv) The second counterpart, who was also a chemist but with no industrial experience at all, was nominated after more than six months of the intial one-year assignment on a part-time basis. He had been engaged in making national standards and was then made in charge of the Chemical Specifications Section. Obviously due to his background and sudden load of work and extra responsiblity, he could initially hardly spend much time with the expert. In spite of all these factors, he was nominated for a fellowship in company standardization.

v) At the end of the year both counterparts left the Company Standardization Section, the first for higher studies abroad and the second for military service. Thus even the little experience they had was lost and the efforts of the expert were in vain.

vi) At the beginning of 1981, three new counterparts werenominated, two were engineers and the third a physicist. The chemical engineer was very suitable as he was a senior person with industrial experience and although the project conveyed this view to the COSQC on many occasions, he was transferred to another section in the COSQC.

vii) The last counterpart who was a physicist was willing to learn. However, one should admit that it is quite difficult for a physicist to absorb a tough subject such as company standardization having close connections with industry and engineering. Consequently, the expert had to start from the very beginning. In addition, the language ability posed a serious communications problem as it was usually necessary to resort to translation through another counterpart especially when it came to engineering terms.

viii) All such problems only meant that the expert's time and efforts were mostly lost and that very little benefit was drawn from his mission.

C. Fellowships

9. The nomination by the Government of candidates for fellowships was very slow in most cases. For example, in 1979 not a single nomination was forwarded whereas it was scheduled that, in that year, 104.5 m/m out of 187.5 m/m (i.e. 55.7% of the total training component) should have been implemented.

10. Finalization of departure formalities usually took months. For example, on 3 January 1980, the COSQC was advised by the project in writing that the candidate in engineering metrology should start training on 1 March 1980. However, the candidate could not finalize departure formalities before 17 June 1980. Such delays caused much trouble to the training institutes abroad and led in certain cases to the cancellation of the training altogether.

11. In many cases fellowship nominees suffered from a language inability. They had, therefore, to undergo several language tests until they could pass. Consequently, implementation of the fellowship had to be delayed for some time.

12. In several cases, nomination of candidates was changed sometimes at the very last moment due to their transfer to other posts either within the COSQC itself or outside it. This caused long delays in implementing the fellowships.

13. Due to conditions in the country, some candidates were unable to take up their fellowships.

It should be mentioned that in order to achieve the maximum benefit from the association of experts/consultants and on-the-job training of the counterparts, the timing of implementing the fellowships was so scheduled that the trainee should return before the arrival of the relevant expert/consultant. Unfortunately, due to the above difficulties, this could not be achieved, except in a few cases. Moreover, it was only possible during the 50 months of project duration to implement 47.5% of the total training component which is considered to be of vital importance to the project.

D. Training Courses

14. Participants in training courses were of very differing levels; some were very senior while others were very junior.

15. Some participants came from very special areas not directly connected with the subject of the training courses.

16. Many participants had very little knowledge of English and consequently could not benefit much from the training courses.

E. Experts

17. In many cases, the time taken by the Government to select and approve experts was quite long amounting to several months.

18. There has been some delay in providing a few expert and consultancy services due to eitherlengthy recruitment formalities or to unavailability of experts/consultants in certain very specific areas (e.g. thermometry).

19. In some cases, it was not possible to arrange important technical visits to enterprises and other bodies outside the COSQC during the assignments of the consultants.

20. A great number of the recommendations by the experts/consultants were not implemented by the COSQC. This led to the delay, or even to the incomplete achievement of the relative immediate objectives. For example, the recommendations for the organization and operation of the certification marking system, which was given in 1979, had not been put into operation at the end of the project in 1982. Likewise, the Consultant in Standards Information and Documentation also made recommendations in 1979, but the Information and Documentation Unit was not organized.

F. Equipment

21. Almost from the outset, the project suffered from very long delays in the procurement of necessary equipment by the Government. For example, the technical specifications for mass, engineering, electrical, thermal and legal metrology as well as for photometry were worked out by theproject before August 1978. However, only after one year did the COSQC convey these specifications to the relevant suppliers to submit their quotations. Similarly up to December 1980, not a single item of equipment for mechanical testingn, electrical testing and non-destructive testing had been ordered by the Government although their technical specifications were prepared by the Project before October 1979. By the end of the project in June 1982, the equipment for time and frequency metrology as well as for the Information and Documentation Unit was not ordered by the Government although their specifications were prepared by the project in 1979. The same is true for the equipment of the Instrument Maintenance Centre (IMC) whose specifications were worked out by the project before June 1980.

22. The lack of the full quota of test equipment at the outset of Part II of some consultants' missions has obviously hampered the planned completion of the missions or of certain laboratories. For example, after three years from the preparation of equipment specifications by the project, Part II of the missions on mechanical testing, NDT and electrical testing started with incomplete equipment. It was therefore impossible to realize the major objective of such missions, namely the establishment of fully operational laboratories. In the mechanical testing laboratory, the two most important equipment (the universal testing machines), which constitute the very core of the laboratory have not been received. The same is true with the NDT laboratory. In the electrical testing laboratory only 70% of the instruments and rigs as recommended have been received.

G. Miscellaneous

23. Owing to the shortage in available space and other pressing commitments within the COSQC complex, it was not possible to provide the full allocation of accommodation as recommended by the project.

24. Certain considerations have hampered the realization of one of the immediate objectives, namely the setting up, organization and operation of an instrument maintenance workshop. In the project document signed on 7 July 1977,the relevant activities were envisaged to be carried out by one consultant. However, in working out the amended project document, the activity was divided into two posts:

11-03/N Testing Equipment Maintenance and Repair
11-03/O Measuring Instruments Maintenance and Repair

Although this splitting was absolutely unjustifiable from the technical point of view, the COSQC viewed it as the only solution to settle the dispute that arose between the Testing Department and the Metrology Department as to which of them should be responsible for the activity. When the problem no longer existed, the Project Manager advised the COSQC to re-combine the two posts. Consequently, on clearing the relevant candidate for the first post (11-03/N) the COSQC gave its approval on the assumption that the consultant would carry out both missions. The consultant was posted in April-June 1980 and the Testing Department was charged with the implementation of his recommendations, the most important of which was the procurement of the specified equipment. However, after several months, the Metrology Department took over this task which, after several more months gave it up to the Testing Department. This resulted in that, after two years from implementing Part I of this mission, no material progress was made. It was, therefore, impossible to achieve immediate objective No. 6.

## V ACHIEVEMENT OF IMMEDIATE OBJECTIVES

In spite of the many difficulties that faced the project "a great deal of work has been done and the largest of the project's immediate objectives have already been achieved." 10/ The objectives can be classified in the following three categories:

1. Objectives Achieved:

- Immediate Objective No. 1 : National Standardization
- Immediate Objective No. 2 : In-plant Standardization
- Immediate Objective No. 3 : Legal Metrology
- Immediate Objective No. 5 : Testing
- Immediate Objective No. 7 : Quality Control
- Immediate Objective No. 11 : Training

2. Objectives the complete achievement of which depends on the implementation of the project's recommendations:

- Immediate Objective No. 8 : Certification Marking
- Immediate Objective No. 9 : Standards Propagation

3. Objectives partly achieved:

- Immediate Objective No. 4 : Industrial Metrology
- Immediate Objective No. 6 : Instrument Maintenance and Repair
- Immediate Objective No. 10 : Information and Documentation

## VI RECOMMENDATIONS

Since the COSQC has been established with the view to act as the country's setter, promoter, watchdog and arbiter of high quality standards of goods and services, it should reflect the highest possible standards in its organization, operation and activities and the highest possible reputation in efficiency, effectiveness and integrity.

In order to assist the COSQC in its efforts to attain the above goals, the following recommendations are made:

### A. General

1. In order to organize the various activities and functions of the COSCQ to place it in a better position to realize its objectives, it is recommended that is committee and secretarial structures should be as follows:

a) Committee Structure:

Under the Board of Administration, the following councils should be established:

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10/ UN Audit Memorandum No. 217/81 dated 23 November 1981.

i) Standards Council, with the hierarchy:
   - industry-wise standards committees (e.g. chemical industries standards committee, textile industries standards committee, food industries standards committee etc...)
   - technical committees (TC)
   - sub-committees (SC)
   - working groups (WG)
   - panels (P)

ii) Metrology Council

iii) Testing Council

iv) Quality Assurance Council

v) Education and Training Council

b) Secretariat Structure:

Under the President of the COSQC, the following directorates or divisions should be established:

i) Directorate of Standards
ii) Directorate of Metrology
iii) Directorate of Testing Laboratories
iv) Directorate of Quality Assurance (including inspectorate, quality control systems and certification marking)
v) Directorate of Technical Services (including information and documentation, propagation, and education and training)
vi) Directorate of Administration and Finance
vii) Office of the President.

2. In order to expedite the realization of the objectives of establishing the COSQC as the national authority in all matters related to standardization and its associated disciplines, the COSQC should formulate and draft the necessary legislation for setting up, organizing and operating the national system(s) of standardization, quality control and metrology.

3. By the nature of its functions, the COSQC should be at the centre of the stage in the matter of its contacts with the various circles and bodies in the country. It should be recognized that the success of the COSQC in fulfilling its role as a catalyst for the promotion of standardization and quality, and hence for the development of the national economy, depends to a very large extent, on its relations with the various sectors especially with industry. Although the COSQC has, by law, the legal authority to enforce certain measures against manufacturers, nevertheless, a sincere and co-operative approach is more effective in achieving its objectives. A close interaction between the COSQC and industry will greatly benefit both, with the resultant benefit to the country at large, as it will help and direct the activities of the COSQC towards the fields and areas needed by local industry and its relevant problems as well as help industry to appreciate the importance and

benefits of standardization and quality control and to find solutions to its problems. The whole totality of standardization and quality control should always be considered as a joint effort by the COSQC and industry. Thus, in dealing with industry, the attitude of the COSQC should be to avoid the sense of some conflict between it and industry and the creation of an atmosphere of control or censorship because of the nature of its responsibilities which are, no less, to set high industrial standards and to ban products that do not meet their requirements. Needless to say that such relation does not mean, in any sense, that firm decisions should not be taken, which may cause difficulties to a manufacturer, but rather all criticisms should be constructive with advice willingly given. It should be made nationally known that the function of the COSQC is to aid industry in achieving higher standards in quality and thus creating new markets, including export markets. It is, therefore, strongly recommended to foster closer interaction, good relationships and full co-operaiton with industry in the pursuit of high quality.

4. In order to help industry effectively, the COSQC should operate a consultative service in all domains of its activities: standardization, metrology, testing, quality control and quality assurance. Needless to say that such a service calls for highly competent technical staff backed with extensive experience. It should be a permanent and very important task of the COSQC to build up such staff and to ensure their availability in all fields and at all times.

5. The COSQC should build up an industrial information bank preferably in collaboration with the ministries of planning, industry and trade and the chambers of industry and commerce. To assist in the creation of such a bank, a comprehensive questionnaire, worked out in Arabic by the project, should be given a very wide circulation to all sectors: public mixed and private. The data thus obtained should be properly analyzed, tabulated and classified for easy identification and retrieval.

6. As the national machinery responsible for setting and upgrading quality standards of products and services, the COSQC staff should be of the highest possible caliber in every respect, technically and otherwise. The greatest care, should, therefore, be exercised in the selection, recruitment and posting of personnel. The salary structure should be established in such a way as to attract talents and to ensure, as far as possible, their continued aihesion to the COSQC. A good incentive system should also be adopted.

7. Since the COSQC suffers from a severe shortage in its technical - and even administrative staff - especially in certain engineering fields, no effort should be spared in strengthening its staff, especially with civil, mechanical and electrical engineers.

8. In order to streamline and rationalize the departmental operations and activities, every division/section should have a well prepared procedural manual.

B. National Standardization

9. In order to cope with the ever increasing need for national standards in the face of the limited available resources at its disposal, the hOSQC should carry out its standardization activities within intermediate and yearly plans based on established priorities. Standards plans should be realizable, should fit the social and economic context of Iraq and should leave room for the periodic verification of national standards. The issue of standards planning on established priorities becomes crucial in Iraq since the provision in the law that Iraqi standards are compulsory gives added weight to the need for expanding the range of national standards for the creation of compliance testing and certification schemes.

10. Since in a mandatory standardization system, failure of meeting the requirements of standards would automatically put the manufacturers out of business, very careful consideration should be given to these requirements. In addition, very close care should be exercised in phrasing these requirements and seeing that the standards do not have the risk of inhibiting innovation or stifling technological progress.

11. Since the adoption of mandatory standards may entail additional costs on the part of the manufacturers in the various sectors (public, mixed and private), the provision of the additional of the additional inputs and resources should be taken into serious consideration. This important issue should not be overlooked in establishing the national system of standardization in Iraq.

12. Standards should be reviewed at regular intervals and appropriate action taken. A standard that does not evolve in keeping with changing circumstances or technological advance may become irrelevant or inhibit progress. To this end, every Iraqi standard should be examined by the responsible technical committee not more than five years after publication revision or confirmation to establish whether it is still applicable and, if it is not, to identify and set in hand appropriate action. However, particular circumstances may lead to a review at any time.

13. When the need arises to alter certain requirements in a standard, the COSQC should issue a technical amendment in the same manner followed in issuing a standard. However, unless there is some overriding reason, not more than five technical amendments should be issued for one edition of a standard. The Standards Department of the COSQC should consider a revision not later than when the third amendment is being prepared.

14. The COSQC should monitor closely the progress made in elaborating Iraqi standards. The technical committee should be asked to establish target dates at the start of each standards project. The aim should be to get the draft finally approved for printing within 12 months of assigning the project to the COSQC standards engineer acting as the secretary of the technical committee.

15. The COSQC should ensure a constant feedback of the results of compliance tests carried out by the laboratories to the Standards Department.

16. Considering the findings of the project concerning the earth connection made on the premises in Iraq and to ensure protection against electric shock, the COSQC should elaborate an Iraqi standard on the safety requirements of electrical appliances adopting the principles of Class II as defined by the international standards IEC 335. The Government should also issue regulations that all such appliances sold in the country, which are operating directly off the supply, should be insulated in accordance with the princples of Class II. This method of electric shock prevention is widely used in many countries and is gaining general acceptance.

C. In-Plant Standardization and Quality Control

17. For national standardization to be effective and bring all its benefits to the country, standardization will have to be spread at the industrial base in an organized manner in the form of in-plant (company) standardization and company standards. It is, therefore, necessary that the COSQC should take the lead in spreading the message of in-plant standardization by continuing the work initiated by the project in encouraging and assisting industrial enterprises to establish, organize and operate company standards departments.

18. In order to be able to spread the message of in-plant standardization in an efficient and effective way, the COSQC should have a competent in-plant standardization section completely devoted to this work. Although as a result of project activities, an in-plant standardization section has been set up after 17 years of the existence of IOS/COSQC, it is far from being adequate. The section, which was set up in 1980, could not be provided with an engineer with some standardization or industrial experience. The section should be strengthened by the appointment of a senior engineer to be in charge of the activity and another mechanical engineer that was proposed for it. The second of the two fellowships of the project for in-plant standardization should be implemented urgently. Other engineers from the section should be given some training within the country whenever possible.

19. The case studies completed during the project period should be documented in Arabic with a summary sheet provided in English. The case studies documented in English should be translated into Arabic. The case study papers should be suitably filed for future reference and training. The case studies not completed should be worked on and documented as they will form the "backbone" of the propagation and promotional efforts.

20. Translation of the lecture notes on in-plant standardization should be done gradually by the staff of the in-plant standardization section to obtain a document more readily understood and also to enable the staff to go through the notes. Even if the translation is going to take time, the staff should go through the note a bit deeper.

21. A consolidation of the papers left by the project should be done to build up information on in-plant standardization. Filing, indexing and cross-referencing should be suitably done. More information should gradually be built up from articles mentioned in the bibliography prepared by the project, that are not available as well as new articles and papers which should be "searched" for and included.

22. The recommendations made in the reports submitted to the selected industrial enterprises, in which project activities were carried out, should be followed up with the management from time to time and further assistance given.

23. The COSQC should start issuing "Special Publications" a practice which is beneficially carried out by many developed and developing countries as these special publications provide very useful material for promotional purposes. In the field of in-plant standardization such publications could include:

- Information system for upkeep of "external standards in a company"
- Location of stored items in a company
- Company standards manual.

24. Considering that standardization involves both preparation and use of standards, that the publication of a standards is almost of no value if it is not implemented and that the COSQC prepares the standards which are to be implemented by industry, then the very close relation between these two parties (COSQC and industry) or rather these two partners, becomes an absolute necessity if standardization is to play its extremely important role in the proper industrial and econmic growth of the country. One of the means by which to achieve this very close involvement and co-operation is through the use of "Liaison Officers" from major industrial units to keep in touch with the COSQC regularly and in an organized manner to achieve the company and national objectives. It is, therefore, strongly recommended that the "Liaison Scheme" as proposed by the project should be implemented as soon as possible.

25. The COSQC should take the initiative to form an association/institute/ society for standards engineers to inter-communicate with each other, interchange their experiences, disseminate their practices and promote the application of the standardization discipline in all sectors of the national economy.

26. Exactly as in the case of in-plant standardization, the COSQC - by its pivotal role - should spearhead the drive for promoting quality control (QC) in industry by spreading this activity steadily to other industrial units until it takes a firm root. Thus, as outlined in in-plant standardization, this objective could be achieved through strengthening the QC department of the COSQC; completing, documenting and translating the study cases worked out by the project; following up the recommendations made in the reports submitted to the selected industrial units in which project activities were carried out, issuing some "Special Publications" on certain important aspects of the quality function; promoting the activity in industry by training and otherwise; encouraging and assisting industrial enterprises in establishing, organizing and operating QC departments; implementing a "Liaison Scheme" and initiating the formation of an Iraqi Society for Quality Control.

27. In its in-plant standardization and quality control activity, the SOCQC should aim at realizing the concept forwarded by the project concerning the setting up of a 3-tier structure the base level of which consists of the standards and QC departments in industrial units mainly in those enterprises belonging to the public and mixed sectors since they form the greater majority of Iraqi industries. In each of the Government industry-wise organizations in the public sector (e.g. State Organization for Food Industries, State Organization of Chemical Industries, State Organization of Engineering Industries.....), as well as in the governmental Industrial Development Organization which is responsible for the mixed sector, a central department is set up to co-ordinate, guide and supervise the activities of the corresponding departments at the base level, i.e. industrial units. The central departments will then work in co-ordination and collaboration with the corresponding department in the COSQC.

D. Metrology

28. To satisfy the long-term needs of the COSQC in the field of metrologym a new purpose-built two storey building with an overall size of 42m x 16.5m is necessary. This building, which should preferably be located between the chemical and engineering wings of the present laboratory premises, will be adequate to house all the envisaged metrological activities and associated staff.

Since adequate insulation is vitally important in order to obtain the close control which is necessary over the temperature and humidity in the laboratories, a cavity wall construction with foam in-filling should be used for all external walls and a substantial layer of insulating material should be added to the inside of the upper floor ceiling. There should be no external windows in the laboratories and the windows to the offices should be double glazed with solar glass. It is desirable to provide windows from the laboratories into the central corridor and these should also be double glazed. An air lock must be provided at each of the two entrances to the building and air locks are also required to each laboratory with self-closing devices fitted to each door.

The air conditioning system for this building should be independent of the central institute system and should be designed to operate continuously. The air conditioning plant should be housed in a separate building adjacent to the metrology laboratories and provision should be made for a diesel powered stand-by generator to provide an emergency electrical supply to the AC plant and laboratories in the event of a failure in the mains supply. The air conditioning units should incorporate filters to provide filtration of the air and the distribution of the conditioned air into each room should ensure that vertical and horizontal temperature gradients are minimized.

29. To provide a short-term solution to the airconditioning requirement, the COSQC should undertake the immediate modification of their existing metrology laboratory to ensure that the stringent technical conditions (i.e. the neceesary degree of control of temperature and humidity) needed for the proper operation of metrological activities can be achieved. To this end, it is necessary that all metrology laboratories which require precise control of the air conditioning should be placed on the ground floor of the existing building. The advantages of doing this include:

a) Insulation of the rooms will be simplified as there will be no direct solar radiation on the roof;
b) It may be possible to use the existing air ducts on the ground floor with appropriate modifications;
c) Modifications can be carried out on the ground floor without disrupting work in the electrical metrology laboratory, which is at present situated on the first floor.

The required modifications, which should preferably be made on a turnkey basis by a suitable contractor, should cover insulation, an air distribution system and air conditioning units as outlined by the project. It is also necessary to provide a diesel powered standy-by generator with a capacity of 125 KVA to supply the normal power needs of theground floor and the airconditioning units in case of a mains failure.

30. Contacts should be initiated and encouraged with other organizations with similar functions, whether national (Leningrad Institute in USSR); National Bureau of Standards in USA; National Engineering Laboratory (NEL) and National Physical Laboratory (NPL) in the UK; National Research Laboratory for Metrology (NRLM) in Japan and Physikalisch-Technische Bundesanstalt (PTB) in FRG)- or international (Bureau International de Poids et Mesures (BIPM)). It is only through bilateral contacts, participation in international activities and the exchange of information between organizations which have similar functions and tasks that the COSQC can keep abreast of their responsibilities.

31. The COSQC, should, as soon as possible, establish and Time and Frequency Laboratory as outlined and specified by the project. The room for the time and frequency standards should be temperature stabilized to preferably 24 ± 1°C at all times, continuously day and night, and also during non-working days. The air conditioning equipment must have a standby generator which automatically takes over in case of ordinary mains interruptions. The power line to the air conditioner should also provide 0.7 KVA to the frequency standards.

32. In addition to those already identified, the COSQC should evaluate all possible users and inform them about the coming time and frequency laboratory.

33. Investigations should be made regarding a country-wide or even regional standard frequency transmission.

34. Since the time and frequency laboratory cannot be maintained without constant attention during vacations or because of illness, at least two responsible engineers, thoroughly familiar with all the details and problems of the continuous operation of this laboratory, should be available.

35. Funds should be made available for the time and frequency technical staff to attend international conferences and to conduct study visits to other counterpart laboratories abroad since these are potential sources of information.

36. In addition to the procurement of the equipment and standards specified by the project, the purchase of a second stand by Time Transfer Receiver is recommended.

37. The Electrical Metrology Laboratory should be completed by the acquisition of the missing instruments and accessories enumerated by the project in order to enable the laboratory to render all necessary services needed at present.

38. The Electrical Metrology Laboratory should not remain detached from industry as it is at present. The laboratory should develop contacts with industrial laboratories and acquaint them with the services offered and encourage them to take advantage of them. To promote this endeavour the publication of a booklet detailing the services of the laboratory is necessary. The Arabic version of the draft booklet worked out by the project should be published in an attractive printed form containing some photographs about the activities of the laboratory. It should be given a wide distribution to the various industries and other related bodies. It is also recommended to organize consultations, or some kine of symposia, with demonstrations in the laboratory.

39. Since the number of staff members in the Electrical Metrology Laboratory is insufficient for normal calibration services and the shortage of personnel will be much aggravated by the increased demands of regular services for industry, the recruitment of at least one more professional and two other technicians is essential. The theoretical knowledge and practical skill of the staff should be constantly improved.

40. The expansion of the Electrical Metrology Laboratory should be carried out in the following three stages:

a) Acquisition of the missing instruments;
b) Acquisition of several other instruments specified by theproject to strengthen reliability and increase accuracy;
c) Provision of facilities for the high precision calibration of capacitors and inductors after careful analysis of the real demands of industry. The same is true with the acquisition of precision instruments for magnetic measurements.

## E. Testing

### I. General

41. Since the COSQC laboratory is, and should be considered as, the highest national authority, it should reflect the highest possible standards in terms of management, staff, equipment, work, motivation, maintenance and precision. The aim of setting up the laboratory will not be achieved unless a high standard of laboratory practice is set and maintained which will depend largely on the thoroughness of direction and supervision of the work of the staff.

42. Testing facilities in the COSQC should be combined under one administration after which the services of a highly qualified expert for the administration of the resulting testing house should be secured.

43. Laboratory staff should not be engaged in inspection and a separate cadre of inspectors should be created who should not be involved in testing. Inspectors should be segregated from laboratory personnel by providing them with alternative accommodation.

44. In order to increase the accuracy and reliability of the test results, to improve the efficiency of reporting and credibility in the COSQC laboratory which is a multi-disciplinary testing organization having considerable interplay amongst its individual laboratories and to enable the verification of recorded data in case of suspect results or an evaluation of the efficiency of personnel and equipment, adequate facilities should be provided for receiving, processing, storing, filing and dispatching of products and other items. A standard rigid method should be followed for the organization and rationalization of documents of the activities and functions of the laboratory.

45. To improve its efficiency, each testing section should have a library of reference text books and journals relating to its range of work. Compendia of references of national and international standards should be compiled. With such a facility, it is difficult for the laboratory staff to keep themselves abreast of the new developments in testing.

46. The laboratory should maintain a records system which provides for the retention of all relevant information about each product tested. The compilation of these records could be classified according to the manufacturer as well as to types of products. Separate file(s) on failure statistics should be kept. The COSQC is in a unique position to collect and collate technical information concerning all the features of products which are subjected to testing. Accordingly, failure reports will become increasingly statistically valuable as time progresses since they will help in taking appropriate action with manufacturers to increase the overall quality of Iraqi products. An efficient cross-reference system should be adopted so that information on every product, in which COSQC is concerned, can be immediately traced. The compiled information will prove to be extremely useful to the Iraqi Government as well as to the Standards and Quality Control Departments of the COSQC.

47. As in the case of the metrology laboratory, the COSQC should initiate and encourage contacts with counterpart test houses having similar functions whether at the national (e.g. the British Electrotechnical Approvals Board, BEAB; the VDE and the Bundesanstalt für Material prüfung, BAM etc.) or the international level (e.g. the International Commission for Conformity Certification of Electrical Equipment, CEE).

48. Consideration should be given to instisting that only foreign products that have been tested by, or carry a valid mark or certificate from recognized national or international standards bodies or from recognized test houses in the countries of origin, should be permitted to be marketed in Iraq. In this way, the COSQC will only be concerned with testing products manufacturer or assembled in Iraq. This practice, which has been introduced in a number of countries, has a double advantage. It plainly helps to raise the level of the quality of products available on the local market and also has the effect of helping to prevent overloading the testing laboratory which already suffers from a chronic shortage in its technical staff. The COSQC laboratory will thus be able to cope with the rapid throughput of work.

49. To avoid explosion, fire hazards, protect costly equipment and satisfy the full operation of certain laboratories, an auxiliary power supply must be made available.

50. Visits of outsiders to laboratories should be restricted and can only be permitted under very special circumstances.

## 2. Safety

51. Urgent attention should be given to the implementation of correct safety precautions, especially in the chemical and related laboratories. To this end:

a) The technical staff should be fully aware of the possible hazards likely to be encountered in the experimental work. It is essential that all chemists/analysts should make a careful study of suitable texts on laboratory safety and hazards. Before embarking on a testing programme, the analyst should consult the literature for possible hazards likely to be encountered in the experimental work and then ensure that the working conditions in the laboratory are safe.
b) "Hand to Mouth Operations" (smoking, eating, drinking) should be forbidden.
c) The wearing of safety spectacles and laboratory coats should be mandatory for all personnel.
d) A small "FIRST AID"box and a fire extinguisher (1.5kg $CO_2$) should be placed in each laboratory.
e) Notices giving clear instructions as to the procedure to be followed in case of fire should be posted in prominent places.
f) Appropriate measures should be taken to correct any hazardous situations which may exist.
g) Refrigerators used for the storage of flammable liquids should be made explosion/fire resistant.
h) Compressed gas cylinders should be clearly labelled for identification of content in accordance with ISO 448. They should not be dropped or mishandled in any way, should be secured in an upright position, and especially their valves, should be maintained in good condition.
i) Hazardous radiation such as ultra-violet (UV) radiation encountered with many instrumental techniques (atomic absorption, photometry, UV spectrophotometry and fluorimetry) must be protected against according to the recommendations of the International Commission on Radiological Protection.

j) Ozone produced by the intensive light radiated from xenon arc source must be removed by some effective fume removal device placed near the source.
k) Spillage of mercury from the polarography must be cleaned up without delay.
l) Stocks of flammable liquids should be kept to a minimum.

3. Staff

52. The technical staff should acquire a pride in always carrying out tests with extreme care and accuracy. It is only then that the very important requirement of repeatability and thus accuracy of tests can be achieved. The technical staff should show initiative and have an acquiring mind.

53. The laboratory chief/supervisor should be very carefully selected for a particular laboratory and should have the requisite qualifications, experience and aptitude. He should be a person of adequate technical knowledge and working experience in the discipline of the particular laboratory and familiar with the methodology of a test laboratory to enable him to foresee, recognize and cope with any technical problem likely to arise in the course of work in the laboratory. He should be able to guide, train and maintain very close staff supervision and control with a high degree of participation in the actual testing work and in the assessment of samples from test results. An incompetent and unqualified supervisor may completely ruin a test laboratory.

54. Since it is unreasonable to expect high precision in test results without the analyst having had lengthy experience in the area of work involved, laboratory chiefs and selected technical staff should have further training in recognized test houses abroad for a minimum period of three months. Further studies (M.Sc or Ph.D) are recommended especially in relatively new fields to Iraq such as materials science and metallurgical engineering.

55. Laboratory chiefs and senior staff should not remain in the testing area unless they are actually operating the instruments and testing machines. They should be provided with facilities commensurate with their training and potential which call for an environment in which they can think about the work in hand, consider the characteristics of the material being tested and compile a useful test report for the industry concerned.

56. Since the reliability of the test data is directly connected with the working reliability of the technical staff, the role of laboratory personnel in testing should never be minimized. Individual variations in reporting results becomes an important issue in any laboratory and senior staff should, therefore, make frequent checks on the performance of their subordinates.

57. Many tests have a subjective approach and there is often more than one interpretation to a statement in a specification. Since the COSQC laboratory should become nationally known as one of firm unbiased decision, there should always be room within it for discussion on testing techniques, specifications interpretation and other technical matters with theaim to improve the quality and efficiency of work. The COSQC should, therefore, encourage consultations among the testing staff. Testing techniques can always be improved since the person who works constantly on the test bench can often devise improvements especially if they are encouraged to do so by their chief.

4. Reorganization of Testing Facilities

58. Since there are many useful items of testing equipment for which no arrangement for installation could be made due to an acute shortage of space, the metrology laboratory should be moved to a separate and more suitable building to be constructed. As a temporary amelioration which may ease the situation to a certain extent, some sort of rearrangement of laboratories is necessary to make the best use of whatever little space is available for the proper installation of the valuable testing equipment and their effective utilization.

59. For the efficient and well-planned utilization of laboratory technical resources and space - including essential ancillary services and skilled personnel - as well as for the protection of the sensitive test equipment, the practice of chemical analysis in other testing sections must be discontinued. Analytical laboratories should be reorganized by centralizing all chemical analyses within one unified section "Analytical Services Section" which should be divided according to a particular set of analytical methods such as:

- Inorganic and organic analysis
- Atomic absorption spectrophotometry
- Molecular spectrophotometry (including infra-red (IR), ultra-violet visible (UV-VIS) absorptiometry and spectro-fluorimetry)
- X-ray methods.

60. The paper testing laboratory which requires conditioning should be shifted to the paints testing laboratories which may be transfered elsewhere.

61. The metallographic microscope, which is a research item, should be located preferably in a separate room out of the possibility of contamination with polishing products and etching acids and away from vibrations produced by the cutting machine.

62. In order to properly maintain and use the several sensitive and expensive balances scattered in the Physical Testing Section and, above all, to avoid unnecessary duplication, all the balances of this Section should be centrally located in a room free from dust and draught.

5. Standard Testing Conditions

63. Based on a survey conducted by the project, and as per ISO standards of testing of textiles, plastics, rubber, leather and paper, it is recommended to choose the standard atmospheric conditions of 27°C with 65% relative humidity with the proper tolerances for testing.

64. The services of the specially constructed conditioning rooms must be commissioned and fully utilized for contioning of test specimens before testing where such conditioning has been specified in the relevant standard(s). It is also considered essential to install recorders to provide a permanent record of temperatures and humidities prevailing throughout the conditioning and testing periods in both conditioning rooms and testing laboratories.

## 6. Equipment

65. It is necessary that an inventory should be made of all the items and accessories of every separate instrument/machine immediately upon receipt of the supplier's invoice. For each equipment, there should be a separate file containing its catalogue, method of use and all correspondence and available information. An Equipment Cardex System should be made keeping in view:

- easy recognition, identification and location of equipment;
- knowledge of stock;
- obtaining the relevant main information.

Information for each equipment should be entered upon a card indicating the name of equipment, model or type, catalogue number, serial number, purchase order number and date and location. The system will have the further advantage that repair, maintenance and obtaining spare parts will be much quicker.

For each testing section of the laboratory, two sets of cards should be filed; one in alphabetical order and the other in numerical order. A master copy of these sets should be maintained by the Administration Department which should also compile cards by supplier and location.

The system suggested by the project should be useful in this regard.

66. Each individual laboratory should have a laboratory manual containing a short description and drawing of every item of equipment present, together with operational descriptions.

67. The care and maintenance of equipment and surrounding areas (furniture, walls, floors etc...) must be of a standard well above the local norm.

68. Since many useful items of test equipment have been kept idel for want of minor and consumable spare parts which were not ordered with the equipment, a list of spare parts for such equipment should be prepared immediately and the spare parts procured from the relevant equipment suppliers.

69. Since the parameter of reliability of test data is very much dependent on the calibration oftest equipment to give the same results in different laboratories by different personnel, a programme of calibration with the Metrology Department should be put into operation for all measuring instruments. An indication when the instrument was last calibrated should be affixed to the instrument enclosure.

70. To increase the versatility and to improve the capacity of chemical testing methods, it is necessary that the following equipment be purchased:

- High performance liquid chromatograph (HPLC)
- Thin Layer chromatograph (TLC)
- Ion-selective electrodes
- Automatic potentiometric titrator
- Accessories for the infra-red spectrophotometer.

71. For further developing the Metallographic Testing Laboratory, the purchase of the following equipment is necessary:

- Stereomicroscope with magnifications from 5x to 100x and oblique incident illumination and with camera for macroscopy
- Two table microscopes with magnification up to 1200x and camera
- Two laboratory furnaces up to 1200°C.

72. As an aid to the Metallographic Testing Laboratory and for industrial process consultancy, a heat treatment laboratory should be set up. In such a case, the COSQC should seek the services of an international expert to specify the necessary equipment, conduct a heat treatment course for COSQC staff and industry as well as to render consultancy services which is highly needed by local enterprises and institutes.

73. The working of the Non-Destructive Testing Laboratory (NDT Lab.) should be consolidated. Ultrasonic Testing equipment for the examination of non-metals especially the testing of concrete should be procured. Also the equipment for leak detection especially suited to the testing of pipelines (water and petroleum). The addition of the thermography technique (i.e. the process of making thermal radiations visible and capable of interpretation) is useful especially for the Electricy Power Board of Iraq. This technique is most useful in the testing and checking of joints and electric switch yard and oberhead transmission lines.

74. As the amount of work progresses, another modern X-ray machine with 400 KVA should be procured.

75. The NDT library containing the standard books and journals recommended by the project should be established and continuously developed to keep abreast with the latest developments in the field of NDT.

76. Since the present two staff members have been trained to handle the equipment so far received and one of them has been trained on ultrasonics in the UK, one or two more staff members should be appointed to handle the rest of the equipment, i.e. radiography by X-ray and gamma ray methods and the magnetic particle inspection. They should be sent for training in NDT establishments abroad.

77. The list of equipment giving their applications should be printed and circulated widely to all concerned industries and bodies so that they may know and be able to refer their NDT problems to the COSQC laboratory for solution and advice.

7. Research and Development (R+D)

78. Since the majority of testing equipment is either suitable for R+D purposes or furnished with specialized spare parts and elements which allow to change the operational conditions in order to adapt them to the special work required in the different investigations to be carried out, the COSQC should carry out extensive investigations in the development of test methods. In drawing up national standards, the COSQC laboratory should be considered as the highest testing authority in developing test methods before they are finally embodied in national standards. The COSQC laboratory should also initiate and be engaged in useful short-term R+D work in materials and processes directly related to problems requirements of the local industry and the amelioration of the quality of industrial products.

8. Non-Destructive Testing Laboratory

79. The NDT laboratory must sell out the idea of utilizing its facilities in an organized manner and close liaison and contact should always be maintained with industry and other relevant bodies. After interaction, the work of the NDT laboratory should be projected into the following areas:

- Industrial testing and advising the results for the benefit of industry and other bodies;
- R+D in the application of NDT methods;
- Education, training and certification of NDT personnel.

80. The NDT laboratory should establish close contacts with counterpart laboratories and NDT societies in other countries such as the NDT section of the Atomic Research Centre of Harwell, England, and NDT societies in FRG, India, UK and the USA.

81 After establishing contacts with industry and other bodies, the NDT laboratory of the COSQC should endeavour to form a society of NDT personnel where they can meet and discuss NDT technology in a cordial atmosphere.

9. Electrical Testing Laboratory

82. Performance assessment in whatever form it takes should not be linked to the International Electrotechnical Commission (IEC) scheme for approving electrical appliances for their safety otherwise the extremely useful relationship with other testing houses working to IEC 335 would be jeopardized. By all means performance standard(s) can be introduced as some countries have, but it should be a national rather than an international scheme.

83. Since the commendable decision has been taken that the approvals scheme for the safety of household electrical appliances will be mandatory, caution is needed however in the method of introducing a legal scheme of this kind. Time is needed for manufacturers to redesign their appliances to meet the standard and furthermore, to allow for the implementation of amendments to the specifications, the time scale being dependent on the type of each amendment promulgated by the IEC.

84. In order to ensure against electric shock, the COSQC should pursue a vigorous campaign to confirme compliance where possible to Class II as defined by the IEC (electrical appliances NOT requiring earthing or grounding).

F. Instrument Maintenance and Repair

85. Since the number of appratus and instruments has reach almost unmanageable proportions, the COSQC should, as soon as possible, set up an Instrument Maintenance Centre (IMC). This in-house centre should provide back up services for the vast array of instruments and also what may be a unique service i.e. to provide an adjustment facility for measuring instruments which will come from other institutions and bodies and which may either be found out-of-order on arrival or out-of-acceptable limits for calibration and where a calibration certificate indicating gross errors will become meaningless to a non-scientific user who cannot make the corrections given in such a calibration certificate.

86. The IMC, when fully established, should have a capacity to accept work from institutions and bodies not having this facility or have one of an elementary nature. The Centre will provide the COSQC and other bodies with the much needed relief from total dependency on the availability of the supplier specialists and the consequent release of the foreign exchange locked up in out-of order but re-commissionable instruments or to help them get rid of dead or obsolete instruments after proper specialist inspection. In cases where the mother companies agree to send specialists, the costs incurred are usually excessive.

87. The IMC should initially be able to handle electrical and electronic instruments, but later on should be able to tackle non-electronic scientific instruments as well as it grows. In the course of time the Centre would also become a training establishment for the qualified staff of other laboratories in Iraq.

88. Since it is envisaged that the work in the IMC be done at two levels of maintenance (low level and high level) and a three-tier arrangement of staff, three engineers (including the IMC manager), two technologists and three technicians should be recruited in the initial stages. The staff should be trained to analyse a fault and do trouble-shooting on a variety of instruments rather than to train technicians for one type of apparatus/ instruments.

89. For the proper training of the staff, the services of a UNIDO expert are essential. A training programme should be organized where the following main topics should be studied:

- the operation of basic analog circuits
- the operation of basic digital circuits
- analysis of the operation of the most important instruments on the basis of their block diagrams
- analysis of some separate units, in many instruments one printed circuit board, of selected instruments
- application of the service equipment
- strategy of systematic trouble-shooting
- technology of repair.

During the whole training programme, the practical aspects should be pointed out and as much practical work as possible should be carried out.

90. As a matter of future policy, whenever an instrument or item of equipment is purchased, a service manual is obtained along with it as distinct from the operator's manual which is generally supplied. This manual not only helps in the quick maintenance of the apparatus in case of a breakdown to use or accident but also helps the IMC to identify spare parts which are liable to early breakdown by their very nature and to do their advance purchasing. The service manual should invariably stay with the instrument so that the user can do the elementary preventive maintenance, to the extent possible or indicated in the operator's part of the manual, for visible troubles.

91. There should be a central inventory of all instruments, whether already arrived or which will be coming. This function can be performed by the IMC by obtaining data from the user departments and classifying it properly. For future instruments, there should be a direct feedback from the purchase department to the Centre. Until then they should be entered on a running register more or less like the acquisition of books in a library, i.e. with an acquisition number, date of arrival and particulars of the department to whom it is issued, so that the relevant information can be extracted later on. With this inventory, it will be possible to keep track of the movement of the instrument as well as its condition and to do advance planning for their maintenance.

92. All instruments should have a tag permanently fixed with wire to an accessible and visible support, indicating the name of the apparatus, date of arrival (month and year only) and the indenting department. This will help in the inventory and in the periodic inspection at yearly intervals, without reference to the stock registers, a procedure which tends to become impossible as the number of instruments increases.

93. All instruments above a certain monetary value , say ID1000, should have a price tage permanently fixed to them. This will help to have a healthy respect for the expensive apparatus and will also identify apparatus which needs to be saved first in times of emergency, such as flood or fire.

94. To reduce the large inventories of spares and special tools and test apparatus, future instrument purchases should be restricted to not more than three reputed countries. It is easier to maintain similar apparatus and also a better contact with manufacturers is established through their publications and field staff and for sending local staff for training because of continued association.

95. Service history cards should be maintained for all instruments handled by the IMC. This will save time on repeat calls and recurring defects on similar instruments can be analysed. This information can be used as feedback to the manufacturer or for advice to the user to change his operating procedure or to avoid troublesome instruments in future purchases. This can lead to instrument evaluation in the long run and also serve as data for training staff.

96. Since instruments have a limited life, become obsolete due to advances in technology, get damaged due to indifferent storage and the use and consequent wear take their toll, it is therefore necessary to have the instruments inspected for their "health" say in January of each year, by specialists from the IMC, for repairability or write-off or for transfer from one department to another. In this way, those instruments which are unfit for further use are physically removed from the laboratories and stock registers to make room for new arrivals.

97. Instruments should not be opened by the users. The use of wrong tools or inadequate tools or the lack of knowledge of the internal mechanisms can damage the instruments so much that they may become uneconomic to repair.

98. Since th einstrument maintenance and repair cannot be carried out without the availability of suitable funds, it is absolutely necessary that an adequate budget should always be provided for that purpose.

G. Certification Marking

99. In order to reap the benefits of standardization, it is absolutely necessary that the COSQC should establish, organize and operate the certification marking system as fully detailed by the project.

H. Standards Propagation

100. The COSQC should accept the fact that a professional PR activity skillfully directed and sustained can mean a difference which can be counted in years in the progress of a NSB. It should, therefore, give utmost serious thought, with some urgency, to the establishment and staffing of an effective PR department. Special importance should be attached to the careful selection of personnel. As many new professional staff as possible should be recruited. It is not sufficient to staff the department with graduate engineers, chemists etc., who can be spared from other departments of the COSQC. A backbone consisting of a journalist, designer and editor experienced in their fields is essential.

101. A suitable salary scale should be established for PR staff that would attract qualified and experienced people and, at the same time, would allow keen and intelligent personnel already employed by the COSQC to be transferred without a loss of income. No personnel can expect to be enthusiastic if they lose money by changing to PR. The morale among the staff should be high. In this respect, positive and optimistic propaganda directed externally is also suprisingly effective internally.

102. A monthly (or other suitable period) PR panel should be set up to review progress in propagation and propose new ideas.

103. The PR staff should meet, as soon as possible, editors of newspapaers and journals, Iraqi News Agency staff. The impact of standardization and QC on industrial and economic development could be explained during these meetings. This increases the media's awareness and prepares them for reception of COSQC press information in the future.

104. The system for extracting information from technical officers dealing with standards committees should be adopted - as prepared in PR files.

105. The IOS Bulleting should be replaced with a concise, lively monthly News Bulleting, attractive in appearance, informative and even controversial at times. The mock-up and guidelines left with the counterpart would considerably help.

106. The PR staff should familiarize themselves through the COSQC and science libraries with all professional journals and their needs in order to publish features aimed specifically to their requirements.

107. Consideration should be given to implementing "Standard Days" in universities as soon as possible.

108. Each new staff member should spend one day at least in each department and laboratory of the COSQC and attend a standards technical committee. This should take place two months after entry in order to allow him/her some time to absorb the functions of standardization and quality control from colleagues.

109. Consideration should be given to another UNIDO expert assignment of 4-6 months at a later date. In this period, the expert and counterparts should script and co-produce a film, try to eliminate weaknesses in the conduct of the PR programmes at that time and generally tighten the organization and train in more sophisticated techniques. The expert should not arrive however until the counterpart staff are working in the department.

## I. Standards Information and Documentation

For the standardization and quality control functions of the COSQC - a sine qua non for the transfer of modern technology - to be effective, a systematic approach to information problems is necessary to derive the maximum benefits. This can save collosal time, effort and wasteful repetitive work. To this end, the following recommendations are made:

110. A department to handle and operate the information system in an integrated manner under the guidance and control of a suitable Managing Committee should be established. The department so created may be termed "Iraqi National Standards Information Centre", (INSIC). This Centre should be visualized as a complete and integrated information system with interacting components like the central library, information store and a wide range of services originating at different points but available at any service point in the system. Interaction with the counterpart agencies outside the COSQC and with ISONET (the information network of the ISO) should be provided for. The Centre should act as an apex body of the entire system. It is imperative that INSIC starts functioning as early as possible, its development must proceed speedily according to a phased programme climaxing in the blossoming of a viable and dynamic set up making available services and products to accelerate the growth of the resurgent national economy.

111. To manage the information system and operate theINSIC, a considerable increase in staff is necessary, professionally trained personnel will be needed at two levels:

- high level personnel with a formal academic education
- medium level staff suitably trained in vocational courses.

112. The Chief of INSIC myst be an experienced officer with proper technical background and adequate administrative capability and experience in information and documentation activities. The Heads of the various units of INSIC, such as Technical Library, Information Services, Publications, Technical Inquiry Service, Translation, Reprography etc., must be professionally qualified with a basic univeristv degree and experience. The supporting staff for purchasing, cataloguing, circulation desk, documentation, compilation and production of publications should be at least diploma holders in the respective fields. Technically qualified people with training in information work will be needed for the Technical Inquiry Service, Abstracting, Editorial work etc. In addition, clerical, typing, processing and general assistants will be required in suitable strengths.

113. The high level staff should be encouraged to conduct post-graduate studies in library and information sciences and to participate in seminars, conferences etc. For the medium-level staff, short-term courses and extensive in-service courses in Iraq and/or abroad will be required.

114. To attract talented and dedicated workers to the field, trained and qualified personnel's pay should be compatible with and equivalent to those in technical departments, laboratory, and those engaged in certification work.

115. The Central Technical Library, being the heart of the information system, should acquire various types of documents like books, standards and specifications, and trade literature with a planned, accepted and approved policy (and not on an ad hoc basis as appears to be the case at present). When this happens, it would be possible to start services like documentation, reference, selective dissemination of information.

116. To make publications serve the needs and interests of the COSQC and users of its services effectively, a number of index fiels should be built up and maintained. To start with, the following files should be organized:

- current literature index
- similar index files for engineering drawings used in standards and specifications, project and feasibility study reports.

117. In order to make the technical users aware of what is available in the literature and can ask for the documents which are likely to be of interest, the following services should be established:

- monthly list of current acquisitions
- current awareness ervice
- selective dissemination of information
- subject bibliographies and reading lists
- COSQC Yearbook to be published annually w-th an index based on the ISO Thesaurus
- sectional and industry-wise lists of standards
- monthly periodical
- translation and transliteration services
- reprographic service
- microfilming service.

118. Since the creation of INSIC and the fulfilment of its various objectives and tasks would require a much larger space to house the additional collection of books and documents, information store and equipment and staff, it is necessary to provide for more space. Consideration may be given to the possibility of acquiring a major part of the building in which the library is housed at present by making suitable adjustments.

119. Also, the furniture required, like book racks, periodical display shelves and racks, index cabinets, should be a little more than double than presently available.

120. To provide the services and products envisaged by the establishment of the INSIC, it is necessary to procure extra equipment such as copying machines for documents, drawings and for stencilling, duplicating, printing collating,binding so as to provide quickly services within the COSQC at least for simple jobs requiring urgent attention.

121. Since the evolution of an effective information system in a learning process involves the manager an duser of information, it is necessary to organize training courses for users of the services of INSIC both for COSQC staff and the various sections of prospective users.

122. Considering the present status and the tasks to be accomplished, the services of a long-term international expert, for a minimum of one year, should be requested to provide intensive tutorship for manpower development and the organization and operation of INSIC.

123. Pending the establishment of INSIC, which may take up to two years, the following actions are called for to rennovate the existing library and diversify its functions to meet the immediate needs of information and documentation services:

a) While the addition of two hands has helped in revamping the library and initiating new activities, further support is needed for the work of compilation of current awareness bulletins, documentation lists, abstracting, indexing, translation etc. Two more middle level staff should, therefore, be provided immediately.

b) To provide for trained personnel at the junior and middle levels library staff should be deputed for short-term courses.

c) The work of compilation and publication of bulletins initiated during the project mission should be continued on a regular basis as these are the minimum essential services which will form the nucleus for the integrated system recommended above.

d) Technical departments of the COSQC may be asked to share documentation work (especially abstracting) on a part-time basis in the absence of the requisite staff in the library. The work would benefit them directly.

e) More space should be provided for seating library staff, for a reading room (microfilm) and for bulletin work. For the time being, the availability of some adjacent rooms to meet the immediate needs should be considered.

f) Old periodicals not in frequent use should be stored in microforms (microfilm and microfich) made with the help of sister institutions which have this facility. The process of weeding out "dead wood" like the one which was carried out during the project mission should be continued from time to time.

g) Since there is an urgent need to end the present state of segregation of the COSQC from libraries and documentation centres of other national and regional institutes in Baghdad 11/ contacts should be developed in the interest of national work to share the resources in books, periodical,s know-how available elsewhere and to promote collaboration through inter-library loans, publication of bibliographies, union lists, joint seminars, training programmes, and special lectures from time to time would be mutual beneficial.

h) A working manual should be prepared to codify procedures and practices for the library and to offer guidance to staff and others concerned. This will help streamline the various operations while serving as a training aid. The present time, when development and reorganization are being undertaken, is the opportune time to take up this work.

i) Liaison with international bodies like UNIDO,UNESCO, International Trade Centre (ITC), Federation International de Documentation (FID), World Intellectual Property Organization (WIPO), should be cultivated so as to make available to the COSQC the benefit of their valuable information services and wealth of literature.

j) As a member of ISONET, t e COSQC should actively participate in its work through the exchange of material provided for in the ISONET guide.

k) Since it is essential to end the present discrimination against those working for the library so that talent could be inducted into this area and the inferiority cokplex done away with, the emoluments of the technical personnel working in the library must be raised to equal those adminissible to the technical staff working in the other departments of the COSQC.

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11/ Such as Iraqi Scientific Documentation Centre, National Library, Central Library of Baghdad University, Documentation Centre of the Specialized Institute for Engineering Industries etc.

## J. Education and Training

124. Since it has become a well established and recognized fact that standardization and quality control are two universal and beneficial disciplines that could - or rather should - be applied to all areas of human endeavour whether related to the production of goods or services, it is essential that - in order for the country to reap the resultant social and economic benefits - standardization and quality control should be well known to all and properly practised and mastered by the concerned people. To achieve this, it is absolutely necessary that a broad range of educational and training activities should be carried out.

125. Due to the universal nature of standardization and quality control, education and training in those disciplines represent a huge task beyond the capability of any one body. There is, therefore, a persistent need to have a well-organized and planned approach to carry out this immense task, to co-ordinate the present scattered efforts carried out by the very few professional and technical institutes and to ensure that the training activities are well integrated and sceduled to avoid the overlapping, duplication and lack of sufficient participation in the different efforts. In this regard, the COSQC - being the state competent authority in all matters related to standardization, quality control and metrology - should have a basic responsibility. It is, therefore, strongly recommended that the COSQC should take the initiative to spearhead a nationwide education and training activity with the mutual co-operation of government agencies academies, industry, technical institutes and societies and other concerned bodies.

126. Considering that the education and training activity should be a continuous process, as experience has shown even in developed countries which have been carrying out this activity for years and are still giving more and more emphasis to it every year, it is strongly recommended to set up a permanent central commission to be in charge of the activity. To this end, the COSQC should establish and "Education and Training Council" on the lines proposed by the project's memorandum dated 4.12.1979. The COSQC President should chair this council.

127. The Education and Training Council should be composed among others of senior representatives from the following bodies:

- Ministry of Industry
- Unviersity of Baghdad and/or the Technological University
- National Centre for Consultancy and Management Development (NCCMD)
- Specialized Institute for Engineering Industries (ISEI)
- Arab Institute for Training in Statistics
- COSQC.

128. The terms of reference of the Education and Training Council should be:

a) to establish the strategy and policy of education and training in the four major fields - standardization, quality control, testing and metrology - at the national level.
b) to draw up long - and intermediate - term plans split into yearly plans for education and training.
c) to identify and assist in securing the resource inputs necessary for the implementation of the plans (instructors, training materials, references, audio-visual aids).
d) to supervise,follow-up, evaluate and review the implementation of the plan.
e) to promote the introduction of standardization and quality control into education curricula.
f) to take such action and measures as deemed necessary.

129. As the secretariat for the Council, the COSQC should establish an Education and Training Centre/Division preferably within the proposed Directorate of Technical Services. As the executive organi of the Council, this Centre/Division will be the focal point of the whole activity which will be instituted and offered on a continuing basis. It should, therefore, be competent enough to meet the challenge. To this end, it should be provided with all necessary resources: an efficient staff, an adequate budget and suitable facilities. It should be able to produce education and training material for the various levels and groups of audiences - preferably in Arabic. Such material should include many examples from local industry. It is also recommended to periodically publish technical information. The Centre/ Division should have the necessary equipment (including audio-visual aids and gadgets) and a reference library, providing text books and journals, which should be open to the public.

130. Before drawing up the national plan, it is highly recommended that some members of the Education and Training Council should visit some developed and developing countries which carry out such activity to familiarize themselves with the nature, status, scope and requirements of conducting this activity at thenational level.

131. The education and training plans should be carefully created to cater for the needs of the various sectors (public, mixed and private), the various industries (food, chemical, textiles, engineering) the various levels of personnel (top management, middle management, technicians, foremen and operatives) the various departments of the enterprise (administration, design, purchase, stores, production, inspection and quality control, sales, after-sales services) and the various groups (importers, exporters, consumers). The plans should also make use of the various types of education and training courses, seminars, conferences.

132. Since the responsibility of setting standards and quality of goods and services is solely in the hands of top management, the education of this level should be accorded a very high - if not the highest priority. The objective is to instil a sense of consciousness in top management for enlisting their full support for the effective implementation of standardization and quality control disciplines.

133. To build up high level specialist instructors and consultants, the COSQC should send missions to conduct post-graduate studies.

134. To speed up the education and training process, especially in quality control, the activity should include the development of specialist trainers. The obvious strategy would be to create a multiplier effect since once the specialist strength improves to a sufficient scale, the multiplier effect can be rapidly produced by conducting more educational and training programmes. Since they are to be competent instructors, the specialist trainers should be very well equipped with theoretical and practical expertise and skill.

135. Also, to increase the number of trainers, specialists should be sent for training programmes conducted by relevant national and international bodies such as the Asian Productivity Organization (APO), Japan International Co-operation Agency (JICA), Japan Productivity Centre (JPC), International Centre for Quality and Management Sciences (ICQMS) in Rotterdam and the Swedish International Development Authority (SIDA).

136. Training should not necessarily be of the university type. It should be highly application oriented. Especially for practitioners in industrial plants, training has to impart professional competence. The nature of training and the kind of material used have to be therefore highly applied and based on live situations.

137. With due regard to the ultimate objective of securing effective implementation of standardization and quality control discipline in industrial enterprises, the need is paramount to conduct in-plant training for various personnel. The training activity should not, therefore, overlook this type of training which has several advantages. In-plant courses can be topical and provide state-of-the-art information, information not yet available in books, because they bring together instructors and practitioners. They can provide the mechanism to distribute new developments in the relevant field and their generic application. Such courses also suit well companies isolated geographically. Some of the intangible benefits of in-plant courses are:

- all employees hear the same thing at the same time
- the ability to use in-house data for problem solving
- the chance to discuss problems of a proprietary nature that cannot be revealed at public course offerings.

138. Certain training courses in standardization and quality control should preferably include industrial engineering techniques such as time and motion study, production scheduling, value analysis/engineering, preventive maintenance.

139. After training is finished, the COSQC should conduct consultancy work in each factory as a follow-up to the training furnished by it.

140. The COSQC should consider the adoption of the system of certification of practitioners in standardization and quality control. For example, certification of quality engineers is designed to educate QC engineers in the essential and applications of statistical QC (SQC) and practical wyas for the purpose of making them the leaders of QC promotion in their respective enterprises. At the end of the course, those who would pass are qualified as certified quality engineer(CQE). The same principle is also carried out with standards engineers and QC technicians. The certification system has benefited both developed and developing countries.

141. At a later stage, education and training should be extended and directed to service industries.

Annex I

## INTERNATIONAL STAFF

| NAME | FUNCTION | 1ST MISSION DATES | 2ND MISSION DATES |
|---|---|---|---|
| A. Geneidy | Project Manager | 11.04.1978 - 10.05.1982 | |
| A. Thulin | Senior Adviser in Metrology | | |
| F. Roper | C. Mechanical Testing | 18.03.1979 - 28.04.1979 | 05.02.1982 - 19.04.1982 |
| A. Bhaduri | C. Materials Testing | 26.07.1979 - 25.01.1980 | |
| K. Srivastava | C. Non-destructive Testing | 19.09.1979 - 18.10.1979 | 28.02.1982 - 12.05.1982 |
| R. Hopper | C. Standards Propagation | 19.09.1979 - 18.12.1979 | |
| C. Zweigbergk | C. Electrical Testing | 24.09.1979 - 04.11.1979 | 01.12.1981 - 15.04.1982 |
| J. Fenerty | C. Instrumental Methods Chemical Analysis | 25.09.1979 - 24.01.1980 | |
| C. Abou | C. Time + Frequency Metrology | 01.10.1979 - 31.10.1979 | |
| R. Taneja | C. Information + Documentation | 31.10.1979 - 30.11.1979 | 06.02.1982 - 05.05.1982 |
| V. Libersky | C. Certification Marking | 19.11.1979 - 18.05.1980 | |
| S. Raju | E. Quality Technology + Management | 09.12.1979 - 07.12.1982 | |
| B. Bhagowalia | E. In-Plant Standardization | 01.01.1980 - 31.12.1981 | |
| S. Suri | C. Instrument Maintenance + Repair | 24.04.1980 - 23.06.1980 | |
| N. Lindenvald | C. Metallographic Testing | 04.01.1981 - 03.04.1981 | |
| R. Lozano | C. Photometry | 17.08.1981 - 16.09.1981 | |
| A. Toth | C. Electrical Metrology | 25.02.1982 - 24.07.1982 | |
| A. Scarr | C. Adviser on Planning + Organization of Metrological laboratories | 19.03.1982 - 30.04.1982 | |

C. = Consultant
E. = Expert

Annex II

## PROJECT FELLOWSHIPS

| No. | SUBJECT | DURATION | FELLOW'S NAME | DATES | COUNTRY |
|---|---|---|---|---|---|
| 1 | Standards Propagation | 3 m/m | Khalaf, M.A. 1/ | 23.04.1979 - 19.07.1979 | U.K. |
| 2 | Instrumental Methods Chemical Analysis | 4.5 m/m | Al-Sabti, K.R. | 01.10.1979 - 16.02.1980 | U.K. |
| 3 | Engineering Metrology I | 4 m/m | Al-Adhamy, N.K.H. | 19. 6.1980 - 18.10.1980 | U.K. |
| 4 | Weights and Measures | 4 m/m | Al-Ani, J.Y.L. | 12.12.1980 - 18.04.1981 | India |
| 5 | Engineering Metrology II | 3 m/m | Al-Ahmed, Elham H.M. | 08.01.1971 - 04.04.1981 | U.K. |
| 6 | Electrical Testing | 3 m/m | Al-Kattan, H.M. | 01.04.1981 - 12.07.1981 | F.R.G. |
| 7 | Time and Frequency Metrology | 4 m/m | Al-Samarrai, K. | 30.04.1981 - 03.09.1981 | Sweden |
| 8 | Photometry | 2 m/m | Rashid, S.A.S. | 30.04.1981 - 04.07.1981 | Sweden |
| 9 | Mechanical Testing | 4 m/m | Al-Kase, M.J. | 28.08.1981 - 02.12.1981 | New Zealand |
| 10 | Certification Marking | 1.5 m/m | Al-Assaf, S.A.W. | 02.09.1981 - 07.10.1981 | Hungary |
| 11 | Thermometry | 2 m/m | Ahmed, R.J. | 01.10.1981 - 30.10.1981 | U.K. |
| | | | | 01.11.1981 - 01.12.1981 | Sweden |
| 12 | Textile Testing | 5.5 m/m | Al-Nadawi, T. | 01.10.1981 - 12.04.1981 | U.K. |
| 13 | Metallographic Testing | 8 m/m | Bhea, Enaam | 19.11.1981 - 24.07.1982 | U.K. |
| 14 | Paints Testing | 3.5 m/m | Saleh, S.T. | 31.12.1981 - 03.04.1982 | U.K. |
| 15 | Quality Control in Textile Ind. | 4 m/m | Easo, D.H. | 02.01.1982 - 01.05.1982 | Netherlands |
| 16 | Quality Control in Food Industries | 4 m/m | Kello, N.P. | 02.01.1982 - 01.05.1982 | Netherlands |
| 17 | Quality Control in Construction Materials Industries | 3.5 m/m | Ali, J.F. | 20.01.1982 - 01.05.1982 | Netherlands |
| 18 | In-plant Standardization | 2.5 m/m | Jarallah, A.S.K. | 11.03.1982 - 07.04.1982 | India |
| | | | | 08.04.1982 - 21.05.1982 | Sweden |
| 19 | Weights and Measures | 4 m/m | Al-Shaby | 01.04.1982 - 31.07.1982 | India |
| 20 | Paper Testing | 3 m/m | Al-Sheikh, H.A.A. | 12.04.1982 - 23.05.1982 | Sweden |
| | | | | 24.05.1982 - 03.07.1982 | F.R.G. |
| 21 | Leather Testing | 2 m/m | Twaij, N.A.R. | 10.05.1982 - 03.07.1982 | F.R.G. |
| | Technical Services STUDY TOUR | 0.5 m/m | Hussain, Mahmoud M. | 10.05.1981 - 15.05.1981 | CSSR |
| | | | 1/ Left COSQC | 15.05.1981 - 25.05.1981 | Hungary |

Annex III

LIST OF SELECTED TITLES OF TRAINING COURSES ORGANIZED BY THE PROJECT

A. Standardization

1. Standardization: Its principles, aims, aspects, levels, benefits and methodology.
(50-lecture course for COSQC staff engaged in national standardization).

2. Standardization and its basic applications.

B. In-Plant Standardization

1. In-Plant Standardization.
(25-lecture course for COSQC counterparts in in-plant standardization).

2. Training-Survey-Review Programme for In-Plant Standardization for Iraqi Industries.

3. In-Plant Standardization in Design and Technology.

4. In-Plant Standardization in Stores.

C. Quality Control

1. Quality technology and management.
(50 Lecture course for COSQC staff engaged in quality control).

2. Quality Control in Textile Industries.

3. Quality Control for Factory Inspectors.

4. Data Evaluation and Process Control Techniques.

D. Testing

1. Testing Seminar

2. Testing of Materials

3. Instrumental methods of chemical analysis

4. Metallographic testing

5. Electrical Testing

6. Non-destructive Testing for superintendants and engineers

7. Non-destructive Testing for Inspectors

8. Non-destructive Testing for Operators

Annex III

E. Certification Marking

1. Certification Marking

F. Information and Documentation

1. Standards Information and Documentation: Why, Where and How.