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**DEVELOPMENT OF YEMENI INSTITUTE FOR STANDARDIZATION,
QUALITY ASSURANCE AND METROLOGY (YISQAM)**

DP/YEM/87/003

REPUBLIC OF YEMEN

Report of the evaluation mission*

Prepared in cooperation with
the Government of the Republic of Yemen,
the United Nations Development Programme, and
the United Nations Industrial Development Organization

* This document has not been edited.

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LIST OF ABBREVIATIONS USED

BS	British Standard
CTA	Chief Technical Adviser
GDSM	General Directorate of Standards and Measures
EN	European Standard
MEST	Ministry of Economy, Supply and Trade
MI	Ministry of Industry
PDRY	Peoples' Democratic Republic of Yemen
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UN-Volunteer	United Nations Volunteer
YAR	Yemen Arab Republic
YISQAM	Yemeni Institute for Standardization, Quality Assurance and Metrology
YR	Yemeni Rial (1 US\$ = 12 YR as of October 1993)

I. SUMMARY

A. EXECUTIVE SUMMARY

Project Number: DP/YEM/87/003

Project Title: Development of Yemeni Institute for Standardization, Quality Assurance and Metrology (YISQAM)

Executing Agency		Government Implementing Agency		Date of Evaluation
UNIDO		General Directorate of Standards and Measures (GDSM), Ministry of Economy, Supply and Trade (MEST) This Ministry was replaced by the Ministry of Industry (MI) on 22.09.1990.		October 1993
Project Start-up Date			Project Completion Date	
Original Plan	Actual		Original Plan	Actual
JULY 1988	FEBRUARY 1989		JUNE 1991	MAY 1993
Budget			Original Budget \$US	Latest Revision J \$US
Total budget (budget line 99)			1,543,000	2,069,901
Government cost sharing (line 101)			---	---
Other Contributions (line 103)			---	---
UNDP Contributions (line 999)			1,543,000	2,069,901
Government Contribution in cash (local currency)			---	---
Government Contribution in kind			YR 26,423,125	YR 26,423,125

B. SUMMARY OF IMMEDIATE OBJECTIVES

This project is to establish the Yemeni Institute for standardization, Quality Assurance and metrology (YISQAM) within the ministry of Economy, Supply and Trade (now Ministry of Industry) which will provide the various sectors of activities in the country (industry, agriculture) trade, housing, health, education, supply, customs, justice, armed forces, police authorities etc.) with following services:

1. Elaborating and issuing national standards for products and services.
2. Testing indigenous raw materials as well as locally produced and imported goods.
3. Providing training in modern testing and quality control techniques.
4. Certification of products to recognized standards.
5. Verification of weights and measures in commercial.
6. Hallmarking of articles made of precious metals.
7. Making access to technical information relating to standards.
8. Rendering advisory and consultancy services on matters related to standardization, testing, quality control, quality assurance and legal metrology.

C. SUMMARY OF OUTPUTS

1. Fully operational Standardization Department capable of elaborating 30 Standards per year covering various types of products.
2. Fully operational Quality Assurance Department capable of advising to the Government on the quality level of raw materials as well as locally produced goods and to the industry on strengthening of the quality assurance system and inspection and control of products.
3. Fully operational Testing Department capable of testing of 1200 samples per annum in the fields of food, chemical (including paints, varnishes, leather and leather products, plastics, rubber foam, paper and board), textiles, metals and building materials.
4. Fully operational metrology and hallmarking Department capable of carrying out 500 inspections per month in the field of legal metrology and 50 inspections per month in the field of hallmarking.
5. Establishment of a functional standards library capable of lending services and informing organizations and individuals on the existence of other national standards.

II. INTRODUCTION

The purpose of this mission was to determine the progress of Project DP/YEM/87/003; to

- assess the degree to which the objectives and outputs of the project have been achieved against those planned in terms of scope, cost-effectiveness, sustainability and impact;
- identify reasons for any variances;
- specify in quantitative terms the "Institutes" future technical assistance needs taking into account alternative sources of financing;
- verify the extent to which the positive results of the project are likely to be sustained;
- identify where negative effects have occurred (i.e. vis-a-vis the project document or managerial problems), and to explain these along with the positive ones;
- specify the economic and social effects the project has generated and determine their possible impact;
- assess the cost-effectiveness of the activities undertaken;
- identify and analyse the causal factors involved;
- assess the ultimate beneficiaries of the project;
- determine the state of the internal managerial and administrative infrastructure of the Institute, particularly with respect to the following:
 - organizational structure;
 - job descriptions of senior personnel up to the Director level;
 - financial management procedures;
 - procurement procedures;
 - personnel management procedures;
 - general administrative procedures.
- determine the managerial styles in terms of: delegation of responsibilities; decision making processes; monitoring of activities; processing of information; levels of personnel initiative and acceptance of responsibility; and,
- determine the working relationship with other Ministries and the private sector, ways of reporting on companies who are not implementing the established standards, and mechanisms of follow-up.

The evaluation mission consisted of 1 member:

- Mr. A. Vellingiri
Representative of UNDP and UNIDO

From 10 to 24 October 1993 the mission focused on a detailed assessment of the capabilities established by this institution-building project and their adequacy in relation to the needs of Republic of Yemen.

The majority of the time was spent at Yemeni Institute for Standardization, Quality Assurance and Metrology (YISQAM). Information was also gathered from discussion within other YISQAM Departments particularly Metrology, Hallmarking, Standards, Quality Assurance, Testing as well as Information and Training Centre.

Member of the evaluation mission sincerely appreciate the excellent support received from the Supervisor and his staff of YISQAM and the UNDP Resident Representative and his staff.

III. BACKGROUND

Following the Third Five Year Development Plan the Government included in the Fourth UNDP Country Programme 1987 - 1991 the project for establishment of the Yemeni Institute for Standardization, Quality Assurance and Metrology (YISQAM).

As a preliminary step to start the implementation of a suitable project, a preparatory assistance was approved (DP/YEM/87/003/11-01/J12102) to conduct a thorough detailed study of the manufacturing sector analyzing its strengths and weaknesses, its potential for further development and to assess the real needs of the country in the fields of standardization, quality control and metrology in order to work out a project document covering the relevant UNDP/UNIDO technical assistance necessary for the achievement of the Government development objectives.

The objective of the project is to provide the country with an institution whose objectives and tasks can fulfill the needs of a national system for Standardization, Quality Assurance, Metrology and Hallmarking, and provide the country with services related to these activities. The project includes assistance on the fields of food, textile, building materials, leather, paints, paper, plastics, laboratory organization and management, instrumental and chemical analysis, standardization, quality control, metrology and hallmarking.

The Government implementing agency is the General Directorate of Standards and Measures (GDSM), which was one of the departments of the Ministry of Economy, Supply and Trade (MEST) which itself was replaced by the Ministry of Industry (MI) following the merger of YAR and PDRY on May 1990.

The project was approved on 11.07.1988 by the Government and on 16.07.1988 by UNDP/UNIDO and it became operational on 15. February 1989. The Government input was YR 26.423.125 to be provided in kind. UNDP contribution was US\$ 1,543,000 increased to 1,661,134 later to US\$ 1,967,547 and as per the Revision J dated 09.05.1993 to US\$ 2,069.901.

According to the ministerial decree No. 121 dated 20. February 1993 (Annex 1) the following laboratories have been separated from the institute and formed new Departments in the Ministry of Industry:

- Food laboratory
- Chemical analysis
- Textile and leather
- Building materials and engineering
- Hallmarking
- Quality Control

The remaining Departments and laboratories are:

- Standardization Department
- Metrology laboratories
- Information, research and training centre
- Administration
- Branch Office in Aden

The current implementation status of the project as of October 1993 was as follows:

- | | |
|--------------------------|-------|
| 1. International Experts | 100 % |
| 2. Fellowships | 100 % |
| 3. Equipment procurement | 100 % |

Proposals for enhancing the capability of YISQAM as well as findings of the mission and recommendations are given in this report. The technical part of the report is given as Annex 13

IV. PROJECT RESULTS

A. Outputs

This section evaluates each of the project outputs on the basis of the project document, Revision J. The assessment of equipment capability within YISQAM functional units is given as Annex 2.

Output 1: Standardization

This project component was to result in functioning after 12 months from the beginning of project implementation and will be fully operational before the completion of the project for elaborating at least 30 standards per year. There are 6 staff members in this department out of which 4 have been trained in elaborating standards. The achievement of the output 1 from 1989 until 1993 is given as Annex 3.

Until 1990/1991 the technical committee came together for the elaboration of the standards. Thereafter it did not come together to elaborate standards due to organizational reasons. Hence the staff members of the standard department of YISQAM are elaborating the standards mostly by adopting foreign standards since 1992 and send them to technical committee members for inviting comments on them.

Output 2: Quality Assurance

The Quality Assurance Department is rendering advisory services to the Government and Industry on the quality level of raw materials, locally produced goods, on the suitability of materials to the manufacturing processes and on the quality standards of the products.

There are 3 staff members in this department who were trained by consultants and UN-Volunteers under this project. The achievement of this output is given in the Annex 4.

Output 3: Testing

This testing department is rendering services to Government and industries in testing of raw materials, semi-finished and finished products. The services delivered are in the fields of food, chemical including paints and varnishes, leather and leather products, plastics, rubber and foam, paper and board, textiles, metals and building materials.

All the staff members have been trained in the manipulation of the instruments and interpretation of results. The current implementation status is such that 100 % of the equipment ordered under Project Revision J has been received, installed and commissioned except some instruments and machines, for which a new laboratory building, 3 phase power supply etc. are needed.

The output of testing laboratories is given as Annex 5 and the achievement of the output of YISQAM is given as Annex 6.

The output of testing laboratories is considerably very low because of following reasons:

1. The implementation of the project is from 1989 until 1991
2. The 1st set of the equipment arrived at the project site was in 1989
3. The last set of the equipment arrived at the project site was in 1993
4. The last UN-Volunteer left the project after training the counterpart was in May 1993
5. All the laboratories are operational but not fully operational. Some of the instruments are not operational due to lack of 3 phase power supply, laboratory space, chemicals, maintenance etc.

Output 4: Metrology and Hallmarking

In this department there are 9 staff members working. All the members have been trained in the manipulation of the equipment and interpretation of results by consultant and UN-Volunteer.

The current implementation status is such that 100 % of the equipment ordered under Project Revision J has been received, installed and commissioned except one furnace, which has been delivered after the departure of the UN-Volunteer.

The achievement of the output is given as Annex 7.

The output is very low because of following reasons:

1. The following legislation have not been approved by the legal system of the country
 - a) Enforcement regulation for the law No. 28/1991 concerning Weights and Measures
 - b) Law for the Hallmarking and its enforcement regulations
2. The last UN-Volunteer to Hallmarking left the project after training the counterparts was in May 1993.

Output 5: Technical Information

The library is located in the 1st floor of the laboratory building. The standards, books, periodicals procured under the Project Revision J were organized in racks and shelves. The library is provided with adequate staff to render the services required. The services given by the library include lending of books/magazines and information about standards.

The achievement of the output is given as Annex 8.

V. SUMMARY OF FINDINGS AND RECOMMENDATIONS

A. Findings on project identification and design

1. The project attempts to institute a comprehensive Quality control, Quality Assurance, Standardization and Metrology capability in various technical areas in a short period. This is an undertaking especially challenging in the areas of management, staffing and training.

2. The facilities and equipment of the Yemeni Institute for Standardization and Quality Assurance and metrology are average.
3. There is insufficient current data to identify or quantify potential users within Republic of Yemen.
4. In the project document under prior obligations it is not specifically written that the Government should provide the laboratories having a floor area of 1410 m² equipped with air conditioning system. Furthermore the requirements of each laboratory room are not specified in the form of "Room Data Sheets" for civil engineers. Due to these reasons the air conditioning system was over looked by the civil engineers during the construction of the laboratory buildings. This aspect was a pre-condition for accurate, repeatable testing and measuring results.
5. In the project document the requirements of the laboratory building rooms were not specified. Because of that many requirements like air conditioning system, regulated power supply, 3 phase supply in the whole 1st floor of the laboratory building, central gas supply, compressed air, safety aspect etc. were not provided.
6. The room allocated to the mechanical workshop is very near to the metrology laboratory, which creates vibration and affect the neighbourhood laboratory during the period of carrying out precision measurements.

B. Findings on general results of project

1. Through this project Yemen Republic was provided by testing facilities comprising wide range of laboratories.
2. All the laboratories are operational but not fully operational.
3. Staff was trained abroad and on the job by volunteers and experts and they gained enough experience in testing a wide range of products. But additional trainings for staff in other range of products are necessary.
4. The present YISQAM premises is appropriate for the actual needs of country except for mechanical and building material laboratory, mechanical workshop, electrical and electronic instruments maintenance workshop and facilities like air conditioning system, 3 phase power supply, regulated power supply etc.
5. In the project document the establishment of the Yemen Institute for Standardization, Quality Assurance and Metrology (YISQAM) within the Ministry of Industry (new name) was recommended. So far the evaluator could not see any legal document concerning this establishment.
6. According to the ministerial decree No. 121 dated 20. February 1993 (Annex 1) the following laboratories have been separated from the institute and formed new Departments in the Ministry of Industry:
 - Food laboratory
 - Chemical analysis

- Textile and leather
- Building materials and engineering
- Hallmarking
- Quality Control

The remaining Departments and laboratories are:

- Standardization Department
- Metrology Laboratories
- Information, research and training centre
- Administration
- Branch Office in Aden

7. A library is provided with books related to Quality Control, Legal Metrology and dictionaries and approved Yemeni Standards, Regional Standards, International Standards etc. which could render required service to the public.

C. Main problems faced by the project

1. Due to the lack of funds, YISQAM was not able to build the laboratory buildings to accommodate the universal testing machine, impact tester, hardness tester and workshop machineries. The newly procured universal testing machine is stored on an open space for about 3 years without any shelter. The packing of the machine is not meant for storing the machine for such a long period on an open space, exposed to rain, humidity and temperature variation between day and night, which may cause corrosion. If the machine is got rusted, then it may cost high amount of money to repair it.
2. Little effort has been made to "market" the laboratory facilities although most of the laboratories are operational.
3. Many testings could not be carried out because of lack of gas and chemicals. Chemicals procured under UNDP-Project are being stored in a store room for which the key is not available due to some internal organizational reasons since April 1993. Hence the evaluator had no opportunity to check how much chemicals are still available in the store room. Ministry of Industry purchased some chemicals in Sana'a for testing in 1993.
4. The following legislation have not yet been approved by the legal system of the country
 - a) Enforcement regulation for the law No. 28/1991 concerning weights and measures.
 - b) Law for the Hallmarking and its enforcement regulations
 - c) Organization and job description of the institute as an independent organization. Because of these reasons the institute was not able to carry out its duty fully.
5. One of the trained staff members of the institute has been transferred to one of the department of the Ministry of Industry. Furthermore some of the trained staff members have been transferred from their trained fields to some other field within the institute, for

which they have not received any training. All these actions are affecting the outputs of the institute.

D. Recommendations to Ministry of Industry / YISQAM

1. Expedite promulgation of laws for the control of weights and measures and control of hallmarking as well as issuing their executive regulations.
2. Take necessary steps to make the Yemeni Institute for Standardization, Quality Control and Metrology independent.
3. Do not divide the institute into two and in order to achieve most possible efficiency from the institute, it is strongly recommended to have only one national institute for Standardization, Metrology, Quality Control and Testing.
4. Provide necessary funds for the construction of a new laboratory building to accommodate the mechanical testing equipment including Universal Testing Machine and Workshop machineries, which are being stored unpacked on an open space without any shelter since 1990. The packing of the machine is not meant for storing it on an open space for such a long period. The rain, humidity and the temperature variation between day and night will affect the machine and cause corrosion. If the machine is got rusted then it could be repaired only by spending high amount of money.
5. Provide enough funds for the operation of the institute including purchasing chemicals, small parts, typing Yemeni Standards etc.
6. The laboratories were not provided with air conditioning system, which is a precondition for accurate repeatable testing and measuring results.
Considering the fact that in Sana'a the temperature varies considerably during the hours of the day and also dryness of weather necessitate air conditioning be provided to the laboratories in particular to laboratories for testing textiles, microbiological and physical testing, metrology etc. These laboratories should be provided with air conditioning system to maintain required atmospheric conditions of temperature of $23 \pm 1^{\circ}\text{C}$ and relative humidity of $50 \pm 5\%$.
7. Due to the tremendous fluctuation (200 - 280 V) of the power supply to the laboratories some of the testing instruments were damaged. To ensure the regulated power supply and avoid damaging of testing instruments, regulators in the power supply lines should be installed.
8. Maintenance and repairing section for electrical and electronic instruments should be created and implemented with necessary testing instruments. An engineer with electrical and electronic background should be trained abroad for about three months.
9. Transportation facilities for visiting the factories, organizations, importers, exporters etc. should be provided.

10. Expedite in approving the elaborated Yemeni Standards.
11. Prepare a Brochure about the testing capabilities of the institute and make public aware of the institute with it.
12. Establish close contacts with other existing testing laboratories of other Ministries and private organizations.
13. Arrange to prepare a Quality manual (Quality Handbook) for each and every testing laboratory which deals with the criteria and requirements for successful operation of the testing laboratories. This manual be based on the European Standard EN 45001 and BS 7501 on "General criteria for the operation of Testing Laboratories".
14. As the capability of the metrology department of YISQAM is very limited, it is strongly recommended to design the metrology laboratories and implement them in this project phase.
15. Install telephones in the laboratories, administration and other departments for internal communication.

E. Recommendations to UNDP / UNIDO

1. Prepare the Project Revision to enhance the capability of the institute in the following areas:
 - a) Acquire a limited number of essential testing instruments and spare parts, which had not been identified previously and provide additional fellowships to make the testing laboratories fully operational (see the proposal given as Annex 9)
 - b) Design the metrology laboratories and implement them, as the capability of the Metrology Department of YISQAM is very limited (see the draft proposal given as Annex 10).
 - c) Include the designing of the electrical and electronic instruments maintenance workshop together with the metrology laboratories, as some of the testing instruments procured under project revision J are not functional due to lack of such a workshop in the country (the proposal is included in the Annex 9).
2. Extend the project for three years to enable the above to be accomplished.

قرار نائب رئيس الوزراء وزير الصناعة رقم (١٤١) لعام ١٩٦٢ بشأن مسمى مختبر ضبط الجودة

نائب رئيس الوزراء وزير الصناعة :-

- ١- تطبيق الاطلاع على القرار الجمهوري باللائون رقم (١) لعام ١٩٦٠ بشأن تشكيل مجلس الوزراء
- ٢- وطن القرار الجمهوري باللائون رقم (٢٠٦) لعام ١٩٦٢م بشأن مجلس الوزراء
- ٣- وطن اللائون العدد المدي رقم (١٩) لعام ١٩٦١ م
- ٤- وطن القرار الجمهوري رقم (١١٨) لعام ١٩٦٢ بشأن اللائحة العظمى لوزارة الصناعة .

تفسير

- مادة (١) - مسمى مختبر ضبط الجودة بالادارة العامة للمختبرات وضبط الجودة .
- مادة (٢) - تطرح الادارة العامة للمختبرات وضبط الجودة الى الادارات التالية :-
 - ١- ادارة مختبر المواد الغذائية .
 - ٢- ادارة مختبر المواد الكيميائية والتطليل الاكس .
 - ٣- ادارة مختبر مواد البناء والمواد الهندسية .
 - ٤- ادارة مختبر المحولات .
 - ٥- ادارة مختبر المواد النسيجية والجلدية .
 - ٦- ادارة تأكيد الجودة .
 - ٧- ادارة الشؤون المالية والادارية .
- مادة (٣) - يحل بهذا القرار من تاريخ صدوره .
- مادة (٤) - يبلغ هذا القرار لمن يلزم به تنفيذه .

صدرت بالمشور القانونية

د/طن غالب محمد



صدر بدويان طام وزارة الصناعة
بتاريخ ٢٩/٤/١٤١٢ هـ
الموافق ١٩٦٢/٤/٢٠

**Assessment of Equipment capability within
YISQAM functional units**

Functional units	Compared to Project Revision J	Status	Remarks
Output 1 Standardization	as planned	operational	Literature and Standards are available
Output 2 Quality Assurance	as planned	operational	
Output 3 Testing laboratories - Food and Microbiology - Chemical Analyses - Textile and Leather - Building materials and Engineering	as planned as planned as planned as planned	operational operational operational not operational	Some instruments are not operational due to lack of maintenance and repair workshop Equipment could not be put in operation due to lack of laboratory space
Output 4 - Metrology - Hallmarking	less than planned as planned	operational operational	postponed due to financial constraints Accessories are missing
Output 5 Technical information	as planned	operational	

Achievement of the Output 1 (Standardization)

Magnitude	According to the Project Document	Output of YISQAM				
		1989 and before	1990	1991	1992	1993
Elaboration of Standards	30 per year	61	39	35	30	30
Approval of Standards	30 per year	61	---	---	---	---

Achievement of the Output 2 (Quality Assurance)

Magnitude	According to the Project Document	Output of YISQAM				
		1989	1990	1991	1992	1993
Establishment of Quality Assurance System	5 (total)	---	---	---	---	---
Inspection and control activities	200 products per year	---	18	16	16	45

Output of Testing laboratories of YISQAM
Testing Services rendered by the laboratories

Laboratories	1989		1990		1991		1992		1993	
	samples	reported	samples	reported	samples	reported	samples	reported	samples	reported
	received		received		received		received		received	
Food Technology	---	---	14	14	14	14	6	6	36	36
Chemical Analysis	---	---	10	10	5	5	10	10	15	15
Textile & Leather	---	---	---	---	1	---	---	---	---	---
Building material	---	---	4	4	1	1	---	---	---	---
Hall marking	---	---	---	---	---	---	---	---	---	---
Metrology	---	---	---	---	264	264	---	---	14	14
Total	---	---	28	28	285	284	16	16	65	65

Achievement of the Output 3 (Testing)

Magnitude	According to the Project Document	Output of YISQAM				
		1989	1990	1991	1992	1993
Testing of samples	1200 per year		28	20	16	65
Training courses	6 (total)	---	6 (total)			
Assisting in preparation of National Standards per year	10	---	10	10	10	10

Achievement of the Output 4 (Metrology and Hallmarking)

Magnitude	According to the Project Document	Output of YISQAM				
		1989	1990	1991	1992	1993
Legal Metrology	6000 inspections per year	---	---	265	---	14
Repairing	120 per year	---	---	---	---	---
Hallmarking	600 per year	---	---	---	---	---
Training courses	2 (total)		2 (total)			

Achievement of the Output 5 (Technical Information)

Magnitude	According to the Project Document	Output of YISQAM				
		1989	1990	1991	1992	1993
Services for the staff of YISQAM and for other Govt. bodies, organizations, industries etc.	Services should be rendered as required	Services are being rendered as per requirement				

**PROPOSAL FOR ENHANCING THE CAPABILITY
OF YISQAM**

1. Personnel

- 1.1 Assignment of an International consultant 2 MM 40 000 US\$
to carry out following activities such as
- Designing of the metrology laboratories on equipment side, fellowships, consultants etc., and working out of layouts for the installation of the equipment.
 - Preparing of Job description for international consultants.
 - Designing of an electrical and electronic instruments maintenance workshop.
 - Coordination with the training institutions to wind-up the fellowship programme.
 - Coordination with the suppliers of instruments and evaluation of the quotations

2. Fellowships

- | | | |
|---|----------|--------|
| 2.1 Quality Assurance | 2 x 1 MM | = 2 MM |
| 2.2 Leather & Textiles
(Chemical Testing) | 1 x 2 MM | = 2 MM |
| 2.3 Food Technology | 2 x 1 MM | = 2 MM |
| 2.4 Chemical Analysis
(Rubber, Paper, Plastic) | 2 x 2 MM | = 4 MM |
| 2.5 Hallmarking | 2 x 1 MM | = 2 MM |
| 2.6 Standardization | 2 x 1 MM | = 2 MM |

2.7 Building material

- Testing of cement	1 x 2 MM	= 2 MM
- Universal testing machine, Hardness testing, Impact testing	1 x 2 MM	= 2 MM

2.8 Electrical and Electronic
instruments maintenance

1 x 3 MM = 3 MM

2.9 Study tour

1 x 1 MM = 1 MM

 22 MM 150 000,- US\$
3. Equipment

urgently needed to make the laboratories fully operational
with existing instruments

I. Priority

3.1 Textile & Leather	10 000,-	
3.2 Hallmarking	15 000,-	
3.3 Building material	50 000,-	
3.4 Chemical analysis	30 000,-	
3.5 Standardization (Computers, Typing machine)		10 000,-
3.6 Library	10 000,-	
3.7 Food Technology, Repair charges, Chemicals		50 000,-
3.8 Electronic Workshop	30 000,-	
	<hr/>	
	200 000,-	200 000,- US\$

II. Priority

X-ray unit for material testing 100 000,-
(only to be procured if the new building for Building
material laboratory is ready and if additional funds
are available)

 390 000,- US\$

**PROPOSAL FOR ESTABLISHING METROLOGY LABORATORIES
IN YISQAM**

		US\$
<u>1. Personnel</u>		
1.1	Chief Technical Adviser	24 MM 250.000,-
1.2 Short term consultants		
1.2.1	Mass, Volume	2 MM
1.2.2	Temperature	2 MM
1.2.3	Electrical measurements	2 MM
1.2.4	Pressure, Force	2 MM
1.2.5	Viscosity, Density	2 MM
1.2.6	Dimensional Metrology	2 MM
	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/>	
	12 MM	150.000,-
<u>2. Fellowships</u>		
2.1	Mass, Volume	3 MM
2.2	Temperature	3 MM
2.3	Electrical measurements	3 MM
2.4	Pressure, Force	3 MM
2.5	Viscosity, Density	3 MM
2.6	Dimensional Metrology	3 MM
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	18 MM	100.000,-
<u>3. Non-Expendable items</u>		
3.1	Mass, Volume	50.000,-
3.2	Temperature	80.000,-
3.3	Electrical	100.000,-
3.4	Pressure, Force	80.000,-
3.5	Viscosity, Density	40.000,-
3.6	Dimensional Metrology	100.000,-
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	450.000,-	450.000,-
		<hr style="width: 100px; margin-left: auto; margin-right: 0;"/>
		950.000,-

1. Laboratory rooms for Metrology Department are available as soon as the new building for the Building material laboratory, mechanical workshop and Hallmarking is erected.
2. At present there are 5 staff members in the Metrology Department. Additional staff may be necessary during the implementation of the metrology laboratories.

ORGANIZATIONS AND PERSONS MET**UNDP Office, Sana'a**

1. Mr. Awni S. Al-Ani, Resident Representative
2. Ms. Jenifer Haslett, Deputy Resident Representative
3. Mr. Vineet Bhatia, Assistant Resident Representative
4. Mr. Abdo Seif, Programme Assistant

Ministry of Industry, Republic of Yemen, Sana'a

1. Mr. Mohy A. Al Dhabbi, Deputy Minister
2. Mr. Abbas Ahmed Al-Mahdi, Supervisor, YISQAM

In-depth Evaluation of Project DP/YEM/87/003/16-11
Establishment of the National Institute for
Standardization, Quality Control and Metrology

TERMS OF REFERENCE

Background:

Following the Third Five Year Development Plan the Government included in the Fourth UNDP Country Programme 1987-1991 the project for establishment of the Yemeni Institute for Standardization, Quality Assurance and Metrology (YISQAM).

The objective of the project is to provide the country with an institution whose objectives and tasks can fulfill the needs of a national system for Standardization, Quality Assurance, Metrology and Hallmarking, and provide the country with services related to these activities. The project includes assistance on the fields of food, textile, building materials, leather, paints, paper, plastics, laboratory organization and management, instrumental and chemical analysis, standardization, quality control, metrology and hallmarking.

The Government implementing agency is the General Directorate of Standards and Measures (GDSM), which was one of the departments of the Ministry of Economy, Supply and Trade (MEST) which itself was replaced by the Ministry of Industry (MI) following the merger of YAR and PDRY on 22 May 1990.

At present YISQAM has a staff of 65. The Institute is directed by the Director General who reports to a Deputy Minister. According to the draft law for establishment of YISQAM, the Director General will report to the chief of the board/council.

The project became operational on 15 February 1989. The Government input was YR 26,423,125 to be provided in kind. UNDP contribution was US\$. 1,543,000 increased to 1,661,134 and later to US\$. 1,967,547 to cover actual equipment requirements.

The General Directorate of Standards and Measures consists of the following administrative units:

Department of Standardization:

- Food and Agricultural Standards Section
- Other Standards Section
- Information and Documentation Section

Department of Quality Control:

- Quality Control of Food and Agricultural Products (including water and microbiology)
- Quality Control of other Industries

Department of Physical Standards and Metrology:

- Legal Metrology
- Workshop

Department of Hallmarking:

- Analysis and Testing
- Hallmarking

In addition, there are three district offices in Sana'a, Taiz and Hodaida, the three most populated cities in Yemen, for the verification of weights and measures (Legal Metrology).

Purpose of the in-depth evaluation:

The purpose of the evaluation of the project are:

- assess the degree to which the objectives and outputs of the project have been achieved against those planned in terms of scope, cost-effectiveness, sustainability and impact;
- identify reasons for any variances;
- specify in quantitative terms the "Institutes" future technical assistance needs taking into account alternative sources of financing;
- verify the extent to which the positive results of the project are likely to be sustained;
- identify where negative effects have occurred (i.e. vis-a-vis the project document or managerial problems), and to explain these along with the positive ones;
- specify the economic and social effects the project has generated and determine their possible impact;
- assess the cost-effectiveness of the activities undertaken;
- identify and analyse the causal factors involved;
- assess the ultimate beneficiaries of the project.

The following to be assessed by national consultant:

1. The state of the internal managerial and administrative infrastructure of the Institute, particularly with respect to the following:
 - organizational structure;
 - job descriptions of senior personnel up to the Director level;
 - financial management procedures;
 - procurement procedures;
 - personnel management procedures;
 - general administrative procedures.

2. Managerial styles in terms of: delegation of responsibility; decision making processes; monitoring of activities; processing of information; levels of personnel initiative and acceptance of responsibility; and,

3. Working relationship with other Ministries and the private sector, ways of reporting on companies who are not implementing the established standards, and mechanisms of follow-up.

Composition of the Mission:

The mission will be composed of the following participants:

- a representative of both, UNDP and UNIDO

- a representative of the Government

Consultations in the field:

The mission will maintain close liaison with the UNDP Resident Representative in Yemen, the concerned agencies of the Government, and other national personnel assigned to the project, as well as UNIDO field staff in the country.

Although the mission should feel free to discuss with the authorities concerned anything relevant to its assignment, it is not authorized to make any commitments on behalf of the UNDP or UNIDO.

Time Table and Report of the Mission:

The mission should take place in Sana'a starting on _____ for a duration of 17 days. The representative of UNDP and UNIDO will receive

briefing at UNIDO Headquarters in Vienna. Upon arrival in Sana'a, the mission will be briefed by the UNDP Resident Representative, who will provide the necessary substantive and administrative support. Upon completion of its work, it will be debriefed by the UNDP Resident Representative and by the Institutional Infrastructure Branch at UNIDO Headquarters, Vienna.

The mission will prepare a draft report. The report should be completed as far as possible in the field so that there is an opportunity for additional consultations as may be necessary. It should be submitted in its final form simultaneously to the UNDP and UNIDO within 2 weeks after termination of the mission in Yemen. The UNDP and UNIDO, by agreement, will submit the report to the Government.

Documentation:

The mission will need to review all technical progress and final reports prepared under the project.

TECHNICAL PART

Annex 13

I. Project Implementation**A. UNDP/UNIDO inputs**

UNDP/UNIDO inputs are presented in Table No. 1 (Revision J dated 09.05.1993) and the figures given in this table are commented as follows:

The original UNDP/UNIDO inputs according to the project document is 1.543.000,- US\$ which has been increased to 2.069.901,- US\$. The money allocated for the equipment 750.000,- US\$ as per the project document was underestimated, did not result from the real cost of equipment. The fall of dollar value and general increase of prices for instruments more than 30 % meant that to purchase almost all the instruments specified in the project document, an amount of more than 250.000,- US\$ was needed. However, additional 200.000,- US\$ is urgently needed (Annex 9) to implement the laboratories fully operational with existing instruments.

B. Government inputs

The Government of Republic of Yemen has provided prior to the implementation of the project, all the premises necessary for carrying out the technical and administrative activities of the institute YISQAM. These premises included fully furnished and equipped office rooms, library as well as laboratory building with 2 floors having an area of 1410 m² equipped with laboratory furniture, services and utilities except air conditioning system and 3 phase supply etc.

Project Number/Amendment DP/YEM/87/003 J		Status O	Country REPUBLIC OF YEMEN WEST ASIA ARAB ST./LDC		Pad Date Printed 93-07-06	Programme Element J 12102	P.C.A. Name MS. BOCK	
Project Title ESTABLISHMENT OF THE NATIONAL INSTITUTE FOR STANDARDIZATION QUALITY CONTROL AND METROLOGY					Backstopping Officer Name: MR. KOZLOV			
Authority 1993 MANREV. 'J' SIGNED ON 9.5.93					Multi-Fund Projects:			
IDP:					TSS-AOS:		Donor:	
R.B:			Type:		COB Date:		Remarks	
SIGNED ORIGINAL IN DA/FS/FMTC PROJECT FILE					Medium Term Plan:			
IGO Code:								

Budget Line	Functional Title		Total	prior to 1992	1992	1993	1994	1995	Subseq.
11-01	EXP. IN STANDARDIZATION	\$. WM.	284,088 29.0	284,088 29.0					
11-02	LAB ORGANIZATION & MANGM	\$. WM.	54,864 8.0	54,864 8.0					
11-03	CONSULTANTS	\$. WM.	54,063 8.0	54,063 8.0					
11-50	SHORT-TERM CONSULTANTS	\$. WM.	172,181 18.7	171,563 18.7	618				
11-XX	SUB-TOTAL	\$. WM.	565,196 88.7	564,578 88.7	618				
13-00	ADMINISTRATIVE SUPPORT P	\$.	46,583	41,813	4,770				
14-01	FOOD TESTING	\$.	90,825	53,680	23,262	13,883			
14-02	PHYSICAL TESTING	\$.	45,855	45,813		42			
14-03	TEXTILE TESTING	\$.	51,016	50,964	2	50			
14-04	MECHAN. TESTING	\$.	78,471	53,844	14,346	10,281			
14-05	HALMARKING	\$.	33,559	1,892	22,790	8,877			
15-00	PROJECT TRAVEL	\$.	8,124	2,557	600	4,887			
16-00	OTHER PERSONNEL COSTS	\$.	20,597	5,597		15,000			

Project Number/Amendment: DP/YEM/87/003 J

Pad Date printed: 93-07-06

Page Number: 2

Budget Line	Functional Title		Total	Prior to 1992	1992	1993	1994	1995	Subseq.
18-00	SURRENDER PY OBLIGS	\$.	17,413-	14,247-	3,166-				
1X-XX	SUB-TOTAL	\$. WM.	922,813 55.7	806,491 55.7	63,302	53,020			
31-00	INDIVIDUAL FELLOWSHIPS	\$.	123,875	122,961	614				
32-00	STUDY-TOURS/UNDP GROUP T	\$.	11,667	15,973	4,306-				
33-00	IN-SERVICE TRAINING	\$.	6,675	5,875		800			
38-00	SURRENDER PY OBLIGS	\$.	16,049-	9,695-	5,133-	1,221-			
3X-XX	SUB-TOTAL	\$.	125,868	135,114	8,825-	421-			
41-00	EXPENDABLE EQUIPMENT	\$.	104,449	103,480	239	730			
42-00	NON-EXPENDABLE EQUIPMENT	\$.	957,660	945,813	11,847				
48-00	SURRENDER PY OBLIGS	\$.	62,338-	47,929-	14,409-				
4X-XX	SUB-TOTAL	\$.	999,771	1,001,364	2,323-	730			
51-00	SUNDRIES	\$.	21,803	15,816	2,621	3,366			
58-00	SURRENDER PY OBLIGS	\$.	354-	354-					
5X-XX	SUB-TOTAL	\$.	21,449	15,462	2,621	3,366			
99-99	PROJECT TOTAL	\$. WM.	2,069,901 55.7	1,958,431 55.7	54,775	56,695			

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Moreover it assigned the requisite adequate number of national professional as counterparts to the CTA, international consultants and UN-Volunteers employed under the project.

C. Equipment

All the incoming instruments were checked for physical damage and completeness and their delivery reported to UNDP/UNIDO and national project-coordinator. The CTA, consultants and UN-Volunteers installed the instruments and trained the counterparts in their use.

D. Consultants

The project became operational on 15. February 1989 with the arrival of CTA at the duty station. The international staff recruited to the project consisted of one CTA, 6 consultants and 5 UN-Volunteers, the details are given in figure 2.

Table 2

**International Staff
recruited under the Project DP/YEM/87/003**

Post	Field	Title	Planned in Work- months (WM)	Carried out in Work months (WM)
11-01	Standardization and Quality Control	CTA	24	29
11-02	Laboratory Organization and Management	Consultant	9	6
11-03	Instrumental Methods of Chemical Analysis	Consultant	9	5
11-51	Testing and Metrology Equipment	Consultant	2	} 15,7
11-52	Quality Control in the Food Industry	Consultant	6	
11-53	Quality Control in the Textile Industry	Consultant	3	
11-54	Quality Control in the Leather Industry	Consultant	2	
11-XX	Sub-Total		55	55,7
14-01	Food Analysis (Chemical and Microbiological)	UN- Volunteer	24	36
14-02	Physical Testing (Paints, Paper, Plastics Leather)	UN- Volunteer	24	24
14-03	Textile Testing	UN- Volunteer	24	24
14-04	Mechanical and Building Materials Testing	UN- Volunteer	24	24
14-05	Legal Metrology	UN- Volunteer	24	—
14-06	Hallmarking	UN- Volunteer	24	18
14-XX	Sub-Total		144	126

The co-operation between international staff and national counterparts was good and productive in terms of instruments installation, on-the-job training and laboratory guidelines and testing instructions.

It is to mention here that there is no UN-Volunteer recruited so far for legal metrology, because of non-operational metrology laboratories (except Mass Measurement Laboratory) due to lack of measuring instruments as well as following legislations approved by the legal system of the country.

1. Enforcement regulation for the law No. 28/1991 concerning weights and measures
2. Law for the Hallmarking and its enforcement regulations

This recruitment can be carried out after the implementation of the metrology laboratories as proposed in Annex 10.

E. Training Programme

The project document specified 16 international fellowships and one study tour having in total 34,5 MM. All these fellowships have been carried out adequately as given in the table 3.

During their stay they could learn to handle measuring instruments and to do testing work in their respective fields, but it was not possible for them to go into detail. However, the results of training abroad and through UN-Volunteers is that they are now in a position to give testing services to the public. But additional training as proposed in the Annex 9 is necessary to get more experience in respective field.

Apart from this training programme under the project, various countries and organizations have offered YISQAM staff members additional trainings, the details of which are given in the table 4.

Table 3

Fellowships

Pos.	Field	Number of Candidates	Duration Planned in MM (Total)	Duration Actual in MM (Total)
1	Standardization (Food, Textile, Elec.)	3	6	6
2	Quality Control in the Food Industry	1	2	2
3	Statistical Quality Control	1	3	3
4	Laboratory Organization and Management	1	2	2
5	Instrumental Methods of Chemical Analysis	1	2	2
6	Food Testing (Chemical and Microbiological)	1	2	2
7	Textile Testing	1	2	2
8	Physical Testing (Paper, Board, Plastics, Foam, Leather)	1	2	2
9	Paints Testing	1	2	2
10	Building Material Testing	1	2	2
11	Mechanical Testing	1	2	2
12	Legal Metrology	1	2	2
13	Hallmarking	1	2	2
14	Information and Documentation	1	2	2
15	Study tour	1	1,5	0,5
		17	34,5	33,5

Additional Training programme provided by various organizations and countries for YISQAM staff

Pos.	Field	Organization	Country	Year	Duration
1	Cement Testing	UNDP (not under project)	Turkey	1992	3 weeks
2	Study tour	UNDP (not under project)	India	1993	1 week
3	Food	UNDP (under UC/YEM/79)	Hungary	1990	1 month
4	Food	UNDP (not under project)	Turkey	1993	1 1/2 months
5	Hallmarking	Arab Standards and Metrology Organization (ASMO)	Jordan	1988	3 weeks
6	Hallmarking	ASMO	Jordan	1988	3 weeks
7	Hallmarking	ASMO	Jordan	1988	3 weeks
8	Standardization	ASMO	Jordan	1988	3 weeks
9	Food	Iraq	Iraq	1987	1 month
10	Food	Iraq	Iraq	1987	1 month
11	Food	Iraq	Iraq	1987	1 month
12	14 candidates in various testing fields	Oman	Oman	1992	24 months
13	Pre-Packaging	Japan International Cooperation Agency (JICA)	Japan	1993	3 months

II. Bilateral Project with Japan

Japan International Cooperation Agency (JICA) is assisting YISQAM by providing volunteers for Quality Control Laboratories as well as fellowships for YISQAM staff. The following table gives an overview of the assistance.

Type of assistance	Field	Place	Year	Duration
Volunteer	Chemical Analysis	Sana'a	1991 - 1993	2 years
Volunteer	Microbiology	Sana'a	1993 - 1994	2 years
Volunteer	Food Technology	Sana'a	1994 - 1995	2 years
Volunteer	Chemical Analysis	Sana'a	1994 - 1995	2 years
Volunteer	Chemical Instrumental Analysis	Sana'a	1994 - 1995	2 years
Fellowship	Pre-Packaging	Japan	1993	3 months
Fellowship	Microbiology	Japan	1994	5 months

III. Industrial Sectors in Yemen

The following table shows an overview of

YEMENI INDUSTRIAL FACILITIES WITH POTENTIAL NEED FOR TESTING AND CALIBRATION SERVICES

Pos.	Industrial Sector	Number of Industrial Units in Production					
		1988	1989	1990	1991	1992	Total
1	Food and Beverage	17	13	12	22	23	87
2	Textile, Wearing Apperals and leather industries	8	12	5	14	10	49
3	Wood products including Furniture	6	4	4	5	4	23
4	Paper products, Printing and publishing	2	10	1	7	5	25
5	Chemicals, Petroleum, Coal, Rubber and Plastic Products	12	19	7	16	6	60
6	Glass, construction materials	3	12	5	12	6	38
7	Non-metallic mineral products except Petroleum and coal	39	45	12	30	23	149
8	other manufacturing industries	---	3	2	13	3	21
	Total	87	118	48	119	80	452

IV. YISQAM Premises:

a. Findings:

YISQAM building is situated at Mogama Sinai area in Sana'a. It houses various laboratories, administration offices and store rooms.

The laboratory building comprises two floors. The basement houses following laboratories:

- Testing of building materials
- Testing of leather and leather products, paper etc.
- Hallmarking
- Metrology
- Future expansion rooms for metrology
- Store room

The ground floor houses following laboratories and other facilities:

- Microbiology
- Food
- Textile
- Chemical analysis/Instrumental analysis
- Library
- Conference room
- Samples office

The administration block houses departments and offices:

- Standards writing department
- Quality Assurance department
- Finance and personnel department
- Director General office
- Conference room

The YISQAM physical plant is appropriate for the actual needs of the YISQAM except for mechanical testing laboratory, mechanical workshop and electrical and electronic instruments maintenance workshop, for which a new laboratory building has to be constructed.

The laboratories are not provided with the air conditioning system, which is a precondition for accurate, repeatable testing and measuring results.

With the development of services and increased demand, the laboratory space will become insufficient, however, upon completion of the new planned mechanical testing laboratory

building, possibly within one year, some of the testing laboratories, such as building materials, leather and leather products could be moved to the new building. The additional laboratory space needed for the metrology laboratories then will be available in the ground floor.

The fluctuation of the power supply to the laboratories is very high, which damages the electrical and electronic testing and measuring instruments.

The 380 Volt, 3 Phase AC power supply is not being provided for the entire ground floor of the laboratory building thus causing problems with regard to equipment utilizing. Some of the equipment supplied under UNDP (Incubators, fume hoods etc.) have not been taken in operation so far, because of the non-availability of the 380 V, 3 phase supply.

b. Recommendations:

1. The laboratories should be provided with the air conditioning system in order to maintain required atmospheric conditions of temperature of 23 ± 1 °C and the relative humidity of 50 ± 5 % for some testing and metrology laboratories, where as for a few metrology laboratories the air conditioning system of $20 \pm 0,5$ °C, 50 ± 5 % is needed. These specifications have to be finalized in consultation with the CTA before designing the air conditioning system.
2. In order to ensure the regulated power supply and avoid damaging of instruments, regulator units should be installed in the power supply lines.
3. Extension of the 3 Phase, 380 V, AC power supply for all the laboratories of the ground floor should be done immediately.
4. Highly purified water supply for the microbiology and chemical analysis laboratories is urgently needed.
5. Central gas supply system should be installed.
6. Waste water from chemical and microbiology laboratories should be purified before it is let to the drainage.
7. It is strongly recommended to construct a new laboratory building to accommodate the mechanical testing equipment including Universal testing machine, workshop machineries, electrical and electronic instruments maintenance workshop as well as building material and leather and leather products testing laboratories. Before designing the building, a detailed specification of the requirements of the laboratory rooms in a form of "Room

Data Sheets" should be prepared in consultation with the CTA and given to the civil engineers.

V. Food and Microbiology Laboratory

a. Findings:

In this Laboratory there are 7 staff members. All the staff members have been trained in the manipulation of the equipment and interpretation of results.

The current implementation status is such that 100 % of the equipment ordered under Project Revision J has been received, installed and commissioned. Services rendered by this laboratory from 1989 until 1993 are given in Annex 5.

All the instruments are operational except following instruments.

- Rotary evaporator (defective)
- Kjeldahl Digestion Apparatus (Kjeldahl distillation unit has not been procured. Hence the whole supplied apparatus cannot be taken in operation)
- Radiation meter (defective)
- 2 Fume hoods (No 3 phase 380 V Power supply is available in this laboratory)
- Chromatograph (No chemicals)
- Bi-distillation apparatus (defective)
- Drying oven (No 3 phase 380 V Power supply is available in this laboratory)
- Muffle furnace (defective)
- Digital Colorimeter spectrometer (defective)
- Bacteriological thermostat (defective)
- Incubator (Thermometer and indicator are needed calibration)
- Drying cabinet (At low temperature the cabinet is not functional/lack of gas)
- Autoclave (Impossible to set temperature and pressure)
- Anaerobic box (no N₂ and CO₂ gas)
- PH meter (needs calibration)
- Refrigerator (defective)

b. List of equipment supplied to this department under the Project UC/YEM/79/201

Pos.	Equipment	Model
1	Water Distiller	MiM LD-103/2 (7648/80)
2	Water Distiller	MiM LD-103/2 (7565/80)
3	Vertical Sterilizer	ST-133 (6071/80)
4	Overpressure Sterilizer	ST-174 (8328/80)
5	Muffle furnace	MiM LR-202 (4265/80)
6	Drying oven	LP-321/321 / WSV 200 (79/1020) No 3 phase
7	Household Mixer	539 (74/E-06250/80)
8	Digital colorimeter spectrometer	410 (277731)
9	Precision PH meter	op 205
10	Circular Polarimeter	782637
11	Hand Refractometer	5489
12	Binocular Microscope	Laboval / (709794)
13	Bacteriological Thermostat	

c. Recommendations:

1. Necessary action should be taken to repair above said instruments
2. Following instruments are very urgently needed
 - Kjeldahl distillation unit
 - Soxhlet, fat extraction tubes
 - Acid hydrolysis and solvent extract in one system
 - Amylograph
 - Farinograph
 - Colorimeter Falling number
 - Alcoholimeters

- Autoclave
- Dealstark apparatus with container flask and heating

VI. Chemical Analysis Laboratory

A. Instrumental Chemical Analysis

a. Findings:

In this laboratory there are 3 staff members having university degree. All the members have been trained in the manipulation of the equipment and interpretation of results.

The current implementation status is such, that 100 % of the equipment ordered under project revision J has been received, installed and commissioned except the High Performance Liquid Chromatograph.

It is not possible to put it in operation because some important accessories and spare parts are missing and have not been ordered. This might have caused due to insufficient specifications of the equipment written at the time of ordering.

Furthermore, the burner delivered one is not suitable and due to lack of reference materials, chemicals etc. this laboratory is not in a position to carry out various tests.

The overall assessment is such that this laboratory is not fully operational.

b. Recommendations:

1. High Performance Liquid Chromatograph should be installed and commissioned after procuring missing accessories and Reagents (List is available in the Laboratory)
2. Accessories, spares and Reference substances for Gas Chromatograph should be procured (List is available in the Laboratory)
3. For Ultra Violet Spectrophotometer, Reference materials and spares are needed
4. Spares for Atomic absorption spectrophotometer are needed.
5. Infrared Spectrophotometer and Ultrasonic cleaner are additionally needed.

B. Chemical Analysis of Plastics, Rubber and Paper

a. Findings

In this unit of the laboratory for chemical analysis there are two staff members, who were trained in the manipulation of the equipment and interpretation of results by UN-Volunteer. All the instruments are in working conditions except the Universal testing machine.

This laboratory is facing following problems:

- Bursting resistance machine for paper testing is out of order.
- 3 Phase power supply 380 V/50 Hz is not available in this laboratory to put some instruments in operation.
- The Universal testing machine is not yet installed and commissioned.

b. Recommendations

1. The bursting resistance machine for paper testing should be repaired.
2. 3 Phase power supply 380 V/50 Hz should be made available in all the laboratories of ground floor.
3. Universal testing machine should be installed and commissioned.
4. Spare parts for absorber for paper testing are needed.

The testing services rendered by this laboratory from 1989 until 1993 are given below.

Laboratory	1989		1990		1991		1992		1993	
	Sam- ples re- cei- ved	Repor- ted	Sam- ples re- cei- ved	Repor- ted	Sam- Repor- ples re- cei- ved	ted	Sam- Repor- ples re- cei- ved	ted	Sam- Repor- ples re- cei- ved	ted
Chemical analysis (Instrumental analysis)	---	---	---	---	1	1	10	10	9	9
Chemical analysis of rubber, plastics and paper	---	---	10	10	4	4	---	---	6	6
Total	---	---	10	10	5	5	10	10	15	15

VII. Laboratory for testing textile, leather and leather products, paper, cardboard

a. Findings:

This laboratory has 3 staffmembers of having university degree.

2 members have been trained in the manipulation of equipment and interpretation of results and they are capable of utilizing the equipment and testing of above said products.

The current implementation status is such that 100 % of the equipment ordered, under Project Revision J, has been received, installed and commissioned. Almost all delivered equipment is operational except 2 instruments, which have been damaged due to high fluctuation of the power supply used in the laboratory.

The equipment delivered for testing leather is concerned mostly for physical testing and not for chemical and microbiological testing. The output of this laboratory for the past 5 years is given in Annex 5, which shows that no efforts have been taken for "marketing" the laboratory facilities to the public.

The laboratory is operational.

b. Recommendations:

1. Additional instruments needed for textile laboratory are as follows:
 - Thickness measuring instrument for textile yarns
 - Thermo-Hygrograph 0 ... 40 °C, 0 ... 100 % RH
 - Psychrometer, motor driven type, battery operated or for 220 V, 50 Hz supply
2. Instruments to carry out chemical and biological tests on leather are needed.
3. Industrial contacts should be intensified for "marketing" the laboratory facilities.

VIII. Building Materials and Mechanical Testing Laboratory

a. Findings:

In this Department there are 3 staff members with university degree.

All the members have been trained in the manipulation of the equipment and interpretation of results by an UN-Volunteer.

The current implementation status is such that 100 % of the equipment ordered under Project Revision J has been received, installed and commissioned except the Universal testing machine and an Impact tester. Because the present laboratory room could not accommodate these machines, the impact tester is being stored in the laboratory room for leather and leather products, where as the Universal Testing machine is being stored unpacked on an open space since the delivery of the machine 1990 without any shelter. The packing of the machine is not meant to store it for such a long period on an open space. The rain, and humidity and the temperature variation between day and night might have caused rust and already damaged the machine. If the machine is got rusted, then it has to be repaired with high costs.

The output of the laboratory is given in Annex 5. This laboratory is not fully operational.

b. Recommendations:

1. Construction of a new building to accommodate the Universal testing machine, Impact tester and Hardness tester is urgently needed.
2. Move the whole laboratory for building material testing and mechanical testing to the new building.
3. After the construction of the new building, following testing facilities are additionally needed to enhance the capabilities of this laboratory.
 - X-ray unit for material testing
 - Flaw tester
 - Chemical analysis apparatus for cement
 - Sample cutting machine for metal sample preparation

IX. Metrology Laboratories

a. Findings:

Metrology laboratories are located in the basement of the laboratory building. The YISQAM received under UNDP-Project measuring instruments for

Length measurement

(Vernier calipers, different micrometers, flexible and rigid tapes, dial gauges)

Mass measurement

(Weights OIML classes F₁, F₂ and M₁, electronic balances ranging from 200 g/0,1 mg upto 30 kg/0,1 g)

and

a set of mercury glass thermometers 0 °C - 150 °, two calibration baths and a set of densimeters etc.

There are 5 staff members (3 for legal metrology and 2 for industrial metrology) working in this field.

1. Mass Measurement

All the members have been trained on mass measurement field by the consultant and they are now in a position to give calibration services to the public.

The current implementation status is such that 100 % of the equipment ordered for mass measurement laboratory under the Project Revision J has been received, installed and commissioned. As the calibration certificates for weights of OIML class F₁ are missing, these have to be recalibrated to have them traceable to International Mass Standard.

This field of metrology is not fully operational.

2. Industrial Metrology

No staff member has been trained in this field. All the very simple instruments received, are not installed, but only stored in a room, for which there was no key available at the time of the evaluation due to some internal organizational problems.

This field of metrology is not operational.

3. Volume Measurement

The current implementation status is that no equipment has been ordered under Project Revision J and no staff member has been trained on this field.

Hence this field of metrology is not operational.

4. Temperature measurement

Only liquid-in-glass thermometers and calibration baths have been ordered, but not installed and commissioned.

The two baths are not suitable for calibration of glass thermometers. Furthermore no staff member has been trained on the calibration of thermometers.

This field of metrology is not operational.

The output of the Metrology laboratory (only on Mass measurement) is given in Annex 5.

The Metrology laboratories except Mass measurement field are not operational.

b. Recommendations:

As the capability of the metrology laboratories is very limited, it is recommended strongly to design the metrology laboratories and implement them (see the draft proposal given as Annex 10).

X. Hallmarking

a. Findings:

This laboratory has 4 staff members of having university degree.

All the members have been trained in the manipulation of the equipment and interpretation of results by an UN-Volunteer. One member has been trained additionally in Iraq for 2 months.

The current implementation status is such that 100 % of the equipment ordered under Project Revision J has been received, installed and commissioned except one furnace, which delivered after the departure of the UN-Volunteer. Except the furnace all the equipment is operational. All the tests are being carried out according to ISO 9202.

This laboratory is operational.

b. Recommendations:

- Necessary action should be taken for the installation and commission of furnace.
- It is absolutely necessary to procure following instruments and expendable items to make the laboratory fully operational
 - 1 Hand rolling mill with adjustable gap between rollers,
Rollers 120 mm width
 - 3 Touchstones 150 x 50 x 5 mm
 - 6 Touchstones 80 x 50 x 5 mm
 - 3 Magnifiers 5 x

- 3 Magnifiers 8 x
- 10 g Pure Gold 99,99 %
- 50 g Jeweller's gold
- 1 Pack PH-papers
- 2 kg Powder for cleaning touchstones
- 2 Automatic Zero burettes, 50 ml x 0,1
- 2 Plastic dishes 400 x 300 x 70 mm for cleaning touchstones
- 2 Jewell-case for keeping used touch needles and touchstones and spare touch needles 250 x 200 x 150 mm
- 1 Distillation apparatus 4 l/hour, 220 V, 50 Hz
- 2 Scientific pocket calculator

XI. Quality Assurance Department

a. Findings:

There are 3 staff members in this department who were trained by consultants under this project. Only one member has attended a Seminar in Germany for 2 weeks

The output of this department is given below.

1989		1990		1991		1992		1993	
recei- ved	Tested and reported	recei- ved	Tested and reported	recei- ved	Tested and reported	recei- ved	Tested and reported	recei- ved	Tested and reported
0	0	18	18	16	16	16	16	45	45

b. Recommendations:

1. More efforts have to be taken to "market" the laboratory facilities as most of the laboratories are operational.
2. Transportation facilities for visiting the factories, shops, importers, exporters etc. to get the samples to be tested should be provided adequately by YISQAM.

XII. Standard Department

a. Findings:

There are 6 staff members in this department, out of which 4 have been trained in elaborating standards

The output of the Standard Department is given below.

Year	1989 and before	1990	1991	1992	1993
Elaborated	61	39	35	30	30
Approved	61	--	--	--	--

In the year 1990/1991 there was a technical committee for the elaboration of the standards. Thereafter the technical committee did not come together due to organizational reasons to elaborate standards. Hence the members of the Standard Division of YISQAM are elaborating the standards mostly by adapting standards of other arabian countries since 1992 and send them to Technical Committee members for comments.

b. Recommendations

1. Efforts should be taken to have meetings with all technical committee members for elaborating standards.
2. It is recommended to provide computers, typing machine etc. to the Standard Department.
3. Facilities should be provided for the translation of the approved standards from arabic into english in order to provide them to importers and exporters.
4. Provide necessary funds for the members of the department to visit national and international standard organizations and to take part in technical committee meetings.

XIII. Library

a. Findings:

The library is located in the 1st floor of laboratory building.

The information materials procured under the project were organized in racks and shelves.

The library is provided with adequate staff to carry out the duties required. The services given by the library include lending of books/magazines and information about standards.

b. Recommendations:

1. Test books in Food, Metrology and other related testing fields are needed.
2. Computer for cataloguing the books and standards.
3. Visiting of international institutions and standard institutions (Training programme) is necessary.