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NATIONAL QUALITY CONTROL  
AND TESTING CENTRE

DP/ETH/79/003  
ETHIOPIA

Report of the Tripartite In-Depth Evaluation Mission\*

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## SUMMARY OF FINDINGS AND RECOMMENDATIONS

### FINDINGS

The National Quality Control and Testing Centre has been established within the Ethiopian Standards Institution (ESI) compound constructed by the Government at a total cost of Birr 6.8 million (US\$3.3 million).

The Centre comprises five laboratories providing testing facilities for mechanical and building materials as well as for agricultural, food, chemical, leather, textile and electrical products. In addition, a mechanical workshop has been set up to provide ancillary services. Products that can be tested in the Centre are mainly those covered by the 108 Ethiopian Standards approved and issued in 1971/1972.

The laboratories have been provided with a large number of sophisticated and modern testing equipment. However, most of these laboratories lack equipment, instruments and accessories and additional items necessary for the full determination of all quality characteristics of the relevant products. This is mainly due to shortcomings in the design of the project, several problems encountered in the procurement, supply, packaging and transportation of equipment in addition to cuts in the equipment budget.

It was necessary to initiate the operation of the laboratories with graduate staff. Thus, apart from its Head, the Centre is staff with 16 graduates (including four having M.Sc degrees) and one technician. This is seen to be adequate in quantity and quality, for the time being.

The training component could not be implemented completely as conceived in the project document due to a shortage of available funds. Of the 48 m/m constituting the fellowship input, only 28 m/m (58%) were implemented.

With adequate staffing and the arrival of about 95% of the ordered equipment, all laboratories and their ancillary services were operating at the time of the evaluation. For example, since the departure of the international staff in August 1984, the Electrical Products Testing Laboratory has tested 873 samples (4614 tests) from 11 factories, the Biochemical Laboratory has tested 108 samples (1330 tests) from 23 factories, the Mechanical and Building Materials Testing Laboratory has tested 585 samples (2761 tests) from 14 factories and the Workshop has manufactured many items.

It is, therefore, concluded that in spite of the several problems which have faced the implementation of the project - the Centre is functioning in a satisfactory manner and is achieving most of its objectives. The operation of the Centre marks a significant step in establishing a national testing capability. For the first time, Ethiopia has got a functioning, multi-disciplinary test house - though modest - capable of testing and certifying a relatively wide range of locally produced and imported products. The Centre is thus on the way to filling a serious gap in the technical infrastructure so essential to the social and economic development in general and to industrial development in particular.

The Centre - especially after further consolidation - will help the Government to evaluate the quality of indigenous raw materials for possible use as substitutes for imported ones, to control imports and exports and to enforce standards to upgrade the quality of locally produced commodities. As to the ESI, the Centre will help it in preparing, amending and revising national standards, following up their implementation in industry, operating the certification marking system and in sending testing and technical services to all sectors of the country. In the longer term, the Centre could be involved in industrial research and could also promote sub-regional co-operation.

It should, however, be emphasized that in order to make full use of the existing testing facilities and to enable the Centre to meet the present needs of the economy, it is necessary to complement these facilities with additional equipment to enable the complete testing of the products covered by the 108 approved Ethiopian Standards and also to augment its capability to test all products covered by the 1985 standards to be approved and in the pipeline. To this end, the extension of the technical assistance becomes absolutely necessary.

Besides evaluating the establishment of the National Quality Control and Testing Centre, the mission assessed the need for the setting up of the National Metrology Centre and found it to be essential for the effectiveness and proper adoption of standardization and quality control.

#### RECOMMENDATIONS

1. In order to enable the National Quality Control and Testing Centre to meet the present needs for testing the products covered by the 2093 standards (approved, to be approved and in the pipeline), it is necessary to complete the existing testing facilities and to set up additional facilities. To this end, the extension of the technical assistance is necessary to provide the following estimated inputs:

Equipment	US\$ 230,000	
Fellowships		28 m/m
Consultants		6 m/m

2. Since proper standardization and quality control cannot be practiced without precise measurements and in order to satisfy the needs of the ESI and other sectors for metrological services, it is necessary to establish the National Metrology Centre for which the Government has already constructed the relevant premises.

3. In order to give the ESI its due status which would strengthen its capability in carrying out its mandate, it is necessary to issue the proclamation upgrading the ESI to the status of a Commission.

4. Steps should be taken to consider the approval of all draft standards prepared by the ESI. The delay for several years in approving standards may render some of them irrelevant or obsolete besides preventing the periodic reviewing of standards to keep abreast of the advances in science and technology.

5. In order to reap the benefits of standardization and quality control to the promotion of the national development, national systems of standardization and quality assurance should be established and operated as soon as possible. These systems, as well as the national metrology system, should be compatible with the centrally planned economy of Ethiopia with due regard to locally prevailing conditions.

6. Consideration should be given to insisting that only foreign products which 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 Ethiopia. Apart from preventing overloading the Centre, this practice would help to raise the quality of imported products available on the local market.

7. As the national machinery responsible for setting up upgrading quality standards of goods and services, the ESI should be enabled to attract and maintain talents on its staff. The adoption of a suitable salary structure and a good incentive scheme is, therefore, very much recommended.

8. To enable the ESI to attain the development objective of the project and to play its due role in the development of the national economy, the ESI should - on its part - consider the following recommendations:

a) Since by the very nature of its functions, the ESI should be at the centre of the stage in the matter of its contacts with the various sectors in the country, its success in fulfilling its objectives depends to a very large extent on its relations with these sectors especially with industry. The ESI should not, therefore, spare any effort to enhance and strengthen very close and co-operative linkages with these sectors. In approaching and dealing with them, the ESI should not have the attitude of a policing agency, but rather as a source and donor of valuable technical assistance.

b) As the state competent body in all matters concerning standardization, quality control and metrology, the ESI should take the initiative to spearhead a continuous nationwide education and training activity with the mutual co-operation of Government departments and agencies, academic, industry, institutes, technical societies and other concerned bodies. To this end, a central committee/council composed of representatives of such bodies should be established within the ESI Committee structure to be in charge of this activity with its secretariat, a training section/division to be created in the ESI. The first step would be to build up a group of qualified quality control instructors/specialists.

c) By its pivotal role and through the group of qualified quality control instructors/specialists, the ESI should also spearhead the drive to promote quality control in industry until it takes a firm root. This can be achieved by establishing quality control departments at the various levels in the industrial sector thus constituting a 3-tier structure, the base of which is the plant or corporate level while the second level would be the relevant industrial group (food, textiles, metals etc.) The apex of this 3-tier organization would be a quality control department in the Ministry of Industry. The strong linkages and close co-operation between the ESI and this organization would be instrumental in improving the quality of Ethiopian products.

d) The ESI should develop its modest library to a well equipped and efficient information and documentation section/centre for the dissemination of technical information on standards, regulations, certification schemes, test methods, quality control and metrology to ESI staff as well as to outside bodies such as Government departments and agencies, municipalities, industrial enterprises, commercial establishments, import and export trade .....

9) In order to assist the National Quality Control and Testing Centre to set up and maintain a high standard of laboratory practice, so essential for its proper functioning, and to enable it to achieve its aim, it is strongly recommended that:

- a) Serious consideration should be given to the implementation of correct safety precautions and measures. Safety equipment and devices should be provided as soon as possible.
- b) Adequate facilities should be provided for receiving, processing, storing, filing and dispatching of products and other items.
- c) A well prepared procedural manual should be established and followed to streamline the operations of the Centre.
- d) A good records system which provides for the retention of all relevant information about each product tested should be maintained. An efficient cross-reference system should be adopted so that information on any manufacturer or product in which the Centre is concerned, can be immediately traced. Separate file(s) on failure statistics should be kept.
- e) Each testing laboratory should have a library of reference test books and journals relating to its range of work. Each laboratory should also have a laboratory manual containing short descriptions and drawings of each of the equipment present together with operational descriptions.
- f) A central inventory of all equipment/instruments should be made.
- g) An adequate budget should always be provided for instrument maintenance and repair.
- h) The Centre should develop contacts with interested sectors. To promote this endeavour the publication of an attractive booklet detailing the services available in the Centre is necessary.
- i) Likewise, the Centre should initiate and encourage contacts with counterpart test houses having similar functions/activities both at the national and international levels.



## INTRODUCTION

1. The present project ETR/79/003/A/01/37 which in effect has as its main objective the establishment of the National Quality Control and Testing Centre, was approved by the UNDP on 22 March 1979.
2. The project became operational in 1979 with the fielding of the CTA on 15 October 1980. In the course of the implementation of the project, a complex of problems was encountered and the Resident Representative of the UNDP requested for a tripartite in-depth evaluation to be held immediately after the termination of the project at the end of 1984. The request was subsequently approved by UNIDO and the Government and funds for the evaluation costs were released from the IPF.
3. The terms of reference (Annex 1) of the joint evaluation mission are:
  - (a) to evaluate the project in order to determine how adequately its immediate objective has been attained and how effective it has been or is likely to be in helping the Government to achieve the relevant sectoral and/or national development objective;
  - (b) to identify the factors which may have facilitated or deterred the achievement of the project's immediate objectives; and
  - (c) to make recommendations for future action.
4. The mission was composed of the following participants:
  - a representative of UNDP: Mr. Mathias Lubega  
Senior Area Officer

- a representative of UNIDO : Dr. Ahmad Goneidy  
Consultant
- representatives of Government: Dr. Mikias Abayneh  
Assistant Dean, Faculty  
of Technology  
Addis Ababa University
  
- Mr. Mohammed Eshetu  
Expert, Trade Dept., ONCCP
  
- Mr. Zenebe Tekle  
Acting Head, Market Research  
and Planning  
Ministry of Domestic Trade

5. The mission maintained close liaison with the UNDP Resident Representative in Ethiopia, the concerned agencies of the Government, the Project Manager and other personnel assigned to the project, the representatives of industry, as well as UNIDO field staff in the country (Annexes 2 and 3).

6. The mission wishes to express its gratitude to the Government officials of the ONCCP and the Ministry of Industry and of the Corporations and factories visited, for their valuable time and information. The mission particularly wishes to thank Ato Akberom Tedla, the General Manager of the Ethiopian Standards Institution as well as his dedicated team of collaborators for the assistance extended throughout the duration of the mission and for all the information which they readily provided. Finally, the mission wishes to express its appreciation to the UNDP Resident Representative Dr. Kenneth King for his imperative and comprehensive briefing as well as for the valuable administrative and logistic support which his office kindly provided to the mission.

PART II: EVALUATION OF THE PROJECT

A. PROJECT PREPARATION

Project Immediate and Development Objectives

7. Immediate Objectives:

- a. To organize within the organizational structure of the Ethiopian Standards Institution (ESI), a National Quality Control and Testing Centre, to set up and fully equip testing laboratories in the following product areas:
  - mechanical and building materials
  - chemical products
  - electrical products
  - textile and leather products.
- b. To develop procedures for testing materials, products and commodities, with respect to their various properties and quality, in order to give effect to and enforce adopted Ethiopian Standards;
- c. To carry out research as regards physical and mechanical characteristics of products and materials, their chemical compositions, durability, safety and other requirements, of relevance to the elaboration of Ethiopian Standards;
- d. To establish the necessary linkages with domestic industry with a view to securing its active cooperation in implementing the standardization and certification scheme;

- e. To strengthen the Standards Mark Certification Scheme operated by the ESI through the establishment of certification systems for products for which Ethiopian Standards have been issued.
- f. To train national staff in all aspects of quality control and in the operation of a standardization scheme.

3. Development Objective:

To introduce standardization and quality control in the Ethiopian economy, both in the primary and secondary sectors, with a view to improving the quality of goods produced for the home and export markets, to enhancing industrial growth and to promoting a shift from the export of raw materials to that of semi finished products.

Socio-economic Setting of the Project

9. The economy of Ethiopia is basically agricultural being followed by commerce and industry. Industrial development is a relatively recent factor in the country's economy but is rapidly increasing in importance. While industry accounted for less than 10% of the gross domestic product (GDP), it is one of the fastest developing sectors. Moreover, Ethiopia's foreign trade also constitutes an important activity and has a major bearing on the rate of growth of the economy.

10. In implementing industrial development, the country soon realized the need to organize activities aiming at rationalizing and improving productivity and quality of products, the reduction of waste and achieving the other objectives that would be attained through the introduction of standardization and quality control disciplines which furnish basic elements

in the technical infrastructure so essential for the success of industrial development and the improvement of the national economy.

11. To this end, the Government established the Ethiopian Standards Institution (ESI) in September 1970 by Order No. 64 of 1970. Proclamation No. 300 of 1972 provided the ESI, among other things, with the power to:

- prepare compulsory as well as optional Ethiopian Standards relating to practices, processes, materials, products and commodities in the field of commerce and industry and enforce the same;
- authorize the use of the Standards Mark to be affixed to materials, products and commodities which conform to Ethiopian Standards;
- certify import and export materials, products and commodities which conform to Ethiopian Standards;
- examine and test materials, products, commodities, practices and processes, and conduct any investigation or research that may be necessary;
- ensure by inspection and checking whether materials, products, commodities, practices and processes conform to Ethiopian Standards, and
- fix, impose and collect fees for services rendered by the Institution.

12. The creation of the ESI was supported by UNDP/UNIDO technical assistance starting in 1970, with the main objective of establishing a National Standards Body for the preparation, publication and implementation of national standards and the centralization of standardization and quality control methods throughout the country.

13. During 1971/72, 108 Ethiopian Standards were approved specifying certain aspects in various economic sectors such as agriculture and food products, building and civil engineering, metallurgy and mechanical engineering, chemical engineering and paper and stationery.

14. In carrying out its function of enforcing its standards in the manufacture of the relevant products and checking their conformance to these standards, the ESI soon felt the persistent and urgent need to have reliable testing facilities and well equipped laboratories since testing laboratories and ancillary facilities are an indispensable element in the application of national standardization and quality control programmes. The Government of Ethiopia, therefore, approached the UNDP which financed a preparatory phase «ETH/75/010 - Consultancy on the Establishment of the National Quality Control and Testing Centre». The consultancy mission specifically recommended the establishment of the Centre and advised ESI on its construction and organization. As a result of this recommendation, the present project was prepared and approved.

15. During the implementation of the project and in full realization and appreciation of the importance of industrialization to the raising of the standard of living of the people, the Government of Ethiopia accorded the highest priority to the development of the industrial sector. As a result, the contribution of this sector to the GDP at the end of the Ten-Year Development Plan will rise dramatically from 10% to about 25%. To cope with this development, the Government requested the support of UNDP/UNIDO to establish a National Metrology Centre within the ESI and at the same time drafted a new proclamation whereby the ESI would be re-established as the sole public agency having its own juridical personality and its status would be raised as it would be accountable to the Office of the Chairman of the Council of Ministers.

Project Design

16. While the development objective was stated explicitly and with clarity and precision, this was not the case with some immediate objectives, outputs and activities. For example, Immediate Objective No. 1 and its corresponding Output No. 1 concerning the establishment and operation of «fully equipped» quality control and testing laboratories in the mentioned fields are not precisely stated since the inputs, as indicated in the project document, cannot lead by any means to the achievement of such an objective. The same is true in connection with the term «research» in Immediate Objective No. 3 and its corresponding Output No. 3.

17. Also in the case of Objective No. 4 aiming to «establish the necessary linkages with domestic industry with a view to ...» - which is extremely important to any national standards body - its corresponding activity No. 4 not only lacks the necessary details, clarity and precision but even was made a general statement not only confined to the industrial sector but also extending to «the various economic agents with a view to ...». No means to achieve Objective 4 or to carry out its corresponding activity was mentioned elsewhere in the PD even in the part dealing with «Peak Activities».  
(p 13 and 14).

18. In addition, no outputs were stated for Immediate Objectives No. 5 and 6.

19. It is evident that the project provided facilities for testing the products covered by the 108 Ethiopian Standards issued in 1971/1972 and did not cater for the needs even at the time of project design in 1978 not to speak of the needs of the foreseen future nor for those concerning the testing of certain imported products.

20. Since the project envisaged the expenditure of heavy investment on the procurement of testing equipment and instruments estimated at US\$793,000<sup>1/</sup> it would have been necessary to provide facilities for the maintenance and repair of these scientific and technical instruments - as well as other similar instruments available outside the ESI - especially in the light of the complete absence of such repair and maintenance facilities in the whole country. Instead, the project was designed to provide an ordinary mechanical workshop which - though still useful to ESI - cannot repair and service its scientific and technical instruments. However, in the JD of the «Consultant on Equipment Maintenance and Servicing» the consultant was required to have «experience in maintenance and servicing of a wide range of modern scientific equipment» and «he will have special responsibility to train local staff in the maintenance and servicing of the range of equipment available within ESI and in the operation of the workshop facilities».

21. In the field of fellowships, two candidates were scheduled to be trained on maintenance and servicing of equipment abroad for four months each during the period from January 1981 to October 1981 whereas the corresponding consultant was scheduled to be fielded in January 1981 for a period of six months. This meant that, at the very best, the consultant would not be associated with the two candidates for at least one month.

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<sup>1/</sup> In addition to US\$5,000 for expendable equipment.



### B. PROJECT IMPLEMENTATION

#### Work Plan

22. There does not appear to have been any negotiation of the work plan between the first Chief Technical Adviser (CTA) and the counterparts after the arrival of the CTA. Consequently, the work plan in the original project document was not updated in spite of the changes in the proposed starting dates and duration of the various activities of the project.

#### UNDP/UNIDO Inputs

23. While the expert services could have been timely, it was not possible due to the delay in the construction of the laboratory buildings as well as their furnishing. In so far as quality is concerned the first Chief Technical Adviser (CTA) was not satisfactory and his services had to be terminated. The effectiveness of the subcontractor services was affected by delays in the construction and furnishing of the laboratories as well as the delays and other difficulties in the procurement of equipment. The fact that the contract was awarded before the completion of the buildings which had resulted in a delay in establishing a firm schedule cost the project an extra \$10,000.

24. The fellowships were by and large satisfactory except in the case where the fellows had to undergo training in CSSR through an interpreter and therefore could not profit as much as they could have done if they had been sent to an English speaking country. In general the cost of fellowships was higher than had been budgeted. Therefore due to the shortage of funds not all fellowships were implemented.

However, some courses, not scheduled, were carried out by the CPA in Addis Ababa and other cities.

25. As mentioned above many problems arose as a result of the Equipment Component. In the first instance the CPA requisitioned equipment whose cost exceeded the budget; then orders were made of equipment which was not required; some important items were simply not ordered; other items were short landed; there were also delays at the port of entry due to port congestion. Some items which were damaged during transportation were not replaced by the insurance company for one technical reason or another and the Ethiopian Government was at a loss because they did not have the terms and conditions of the insurance. The case in point was where the Insurance Agency said that damage was due to improper packing/bad handling during transportation; and it is not certain whether they were referring to the transportation on the high seas or inland in Ethiopia.

26. Some equipment arrived with brochures written in German or some other language other than English, which made it impossible for the Institution to utilize them until they had ordered for manuals in English. Due to all these problems the subcontractors' time expired before all the equipment was in place. At the time of the mission about 95% of the equipment had arrived.

27. Because of this state of affairs the last Tripartite Review had agreed that UNEDC would submit a report to the Government and to the UNDP, explaining in detail all pertinent aspects of the equipment procurement process and its financial ramifications. This report was to be ready in time for this evaluation mission. Unfortunately, the report was not available at the time of the mission.

Government Inputs

28. Concerning Government component contribution, it has already been mentioned that the delay in the completion of the construction and furnishing of the laboratories was a major factor which affected the timeliness of the activities of this project. However, at the time of the evaluation all the buildings were 95% ready and in most cases functional except where some equipment had not arrived. The building for the Metrology project, which the mission finds complementary to, and essential for the effectiveness of the National Quality Control and Testing Centre is also complete except the furnishing and some modifications which have to be made.

29. While the recruitment of the counterparts had not been adequate, there were enough counterparts, at the time of the mission, for the number of activities in which the Institution was engaged. The activities were limited mainly due to the fact that the Draft Proclamation to provide for the establishment of Ethiopian Institution for Standardization, with 435 standards has not been approved by the Government. This has affected adversely the project's achievement of its immediate objectives and further delay in approving the proclamation is bound to affect the contribution of the project to the development objective. It was understood from the Ministry of Industry and from ESI that the Proclamation was under active consideration by the Council of Ministers and that it was likely to be approved soon. Presently, only 100 standards which were established in 1970/71 have the legal backing, it is therefore extremely important that the 435 standards are approved as soon as possible.

30. It is the view of the mission, that with better planning and coordination between the CTA and the ESI as well as better performance by the Purchase Unit (P&C) of UNEDC Headquarters many difficulties and problems in the implementation of this project could have been avoided - indeed the effect on the project of the delay in the construction of laboratories, the delays in the arrival of equipment and damage to or undelivered items of equipment could have been minimized.

C. PROJECT RESULTS

Project Results and Achievements of its Immediate Objectives

31. The production of the following three outputs was foreseen in the project document:

- a) Fully equipped and operational quality control testing laboratories in the following product areas:
  - mechanical and building materials;
  - chemical products;
  - agricultural and food products;
  - electrical products;
  - textile and leather products.
- b) Standard test procedures to satisfy existing Ethiopian Standards; research related to the establishment of new Ethiopian Standards and certification systems.
- c) Linkages with national industry, designed to assist it in the manufacture of products of satisfactory quality and conforming to the Certification Marking Scheme.

32. The first output, with the possible exception of the term "fully equipped" has been produced to a great extent. It was mentioned, in commenting on the design of the project (page 7), that project inputs would not lead - in any way - to the production of "fully equipped" testing laboratories in the relevant areas. In order to ensure the complete production of this output as envisaged, additional inputs would be necessary.

33. The greater majority of testing facilities were operational at the time of the present evaluation. The remaining portion was not operating due to various reasons including the non-arrival of some equipment, damage to certain items and the lack of some necessary accessories and replacement parts.

34. The present staff operating the laboratories is seen to be adequate - in quality and quantity - for testing the products covered by the 108 Ethiopian Standards approved so far.

35. The output, which constitutes the main thrust of the project, is contributing positively to the achievement of the project's immediate objectives.

36. Concerning the second output, the existing testing facilities could - with some additional equipment - realize the production of the first part of this output. As for carrying out research work, this should be viewed as a future output although some limited research work could be carried out at present. The standard of equipment procured as well as that of the technical staff well qualify the National Quality Control and Testing Centre to produce the second part of the output in the near future after its technical personnel have acquired sufficient knowledge and experience in their work. In order to expedite this development, it is necessary that more technicians (laboratory assistants) should be recruited to carry out the main bulk of routing testing under the supervision of the graduate staff who could thus be partly released to devote more interest to research activities.

37. The third output was produced mostly through the contacts established with industry in regard to the implementation of Ethiopian Standards and the operation of the certification marking system as well as through conducting a series of training/consulting programmes in Addis Ababa and other industrial centres in Ethiopia. Due to the importance of this output to its effective functioning, the ESI should continue its efforts to establish and enhance very close linkages with industry. To this end, continuous promotional activities should be carried out and the ESI should approach industry as a source and donor of valuable technical assistance rather than as a policing agency.

38. With the production of most of the project's outputs, the immediate objectives of the project have been - and are being - achieved in a satisfactory manner.

Contribution of Project to the Achievement of Development Objectives

39. The achievement of the project's immediate objectives will certainly contribute to the attainment of the development objectives, namely "to introduce standardization and quality control in the Ethiopian economy, both in the primary and secondary sectors, with a view to improving the quality of goods produced for the home and export markets, to enhancing industrial growth and to promoting a shift from the export of raw materials to that of semi-finished and finished products". There has been created an important element in the technical infrastructure so essential for proper development. This is represented by the setting up and operation of adequate multi-disciplinary and modern facilities for the testing of a large variety of products. As a result, the ESI has been placed in a better position to discharge some of its important functions. The establishment of the National Quality Control and Testing Centre helps the ESI to elaborate and implement national standards and enables it to test and evaluate locally produced goods, to control the quality of imports and exports and to render technical services to industry and trade.

40. However, the full attainment of the development objectives requires - besides the continuous development of the Centre - very significant developments in other essential, complementary and adjunct fronts, including:

- a) The consolidation and raising of the status of the ESI and its full integration into the industrial, technical, scientific, commercial and other sectors of the country.
- b) The strengthening of the capabilities of the ESI with special reference to the establishment and operation of the National Metrology Centre (NMC).
- c) The strengthening of the staff of the ESI and their continuous upgrading to increase their efficiency and to qualify them to educate guide and advise the various sectors in the wide adoption of standardization and quality control, particularly the industrial sector.

- d) The establishment and operation of national systems of standardization, quality assurance and metrology compatible with the centrally planned economy of Ethiopia.
- e) The planning and operation of extensive and continuous education and training activities in collaboration with interested and concerned bodies in the country.
- f) The establishment and operation of efficient information and documentation services in the fields of standardization, quality control, quality assurance and metrology.

Follow-Up

41 The Government's response to the project's results is quite positive and is giving serious consideration to the implementation of its recommendations.

PART II: FINDINGS AND RECOMMENDATIONS

A. FINDINGS

Premises

42. A complex of buildings on a plot of land of 90,000 m<sup>2</sup> has been provided by the Government in a pleasant area in the outskirts of Addis Ababa at six kilometres from the city centre. An open space of about 45,000 m<sup>2</sup> was left for possible extension.

43. The complex contains a multi-storey building which houses the ESI headquarters, a conference room to accommodate an audience of 300 people and an employees cafeteria and services building. Testing facilities and ancillary services are scattered among several buildings. There are two large laboratory buildings housing testing equipment and instruments, a mechanical workshop with an annexed store and a separate large building for the forthcoming National Metrology Centre (NMC). The total cost incurred in the construction of this complex amounted to Birr 8.0 million equivalent to US\$3.3 million.

44. The testing and metrology buildings as well as the ancillary services are all constructed as one-storey buildings with a factory-roof type ceiling. It seems that it would have been much preferable if the laboratories were housed in one building with foundation capable of carrying several storeys. This would have saved land at present and also in case of future extension which could be made vertically up. Moreover, it would facilitate the movement of samples from one laboratory to another. For example, in the Electrical Testing Section, it might be necessary to subject a material/product to electrical, chemical, mechanical, metallographic and non-destructive testing (if existing). Another important issue in this connection is the



fact that such layout may discourage mutual discussions and exchange of views between the testing staff in more than one laboratory to help in the proper evaluation of the quality of any material/product as a result of testing it in various laboratories.

#### Testing Facilities and Ancillary Services

45. The Centre comprises the following:

- (a) Mechanical and Building Materials Testing Laboratory.
- (b) Chemical Products Testing Laboratory.
- (c) Agricultural and Food Products Testing Laboratory.
- (d) Electrical Products Testing Laboratory.
- (e) Textile and Leather Testing Laboratory.
- (f) Workshop.

46. The Mechanical and Building Materials Testing Laboratory is intended to test structural steels, cement and cement products, timber and timber products and mechanical fasteners.

47. At present, this laboratory suffers from damaged or missing parts of devices (pipe-testing machine, Le Chatelier flasks, Rigdin apparatus). As such, this laboratory should be provided with the parts, accessories and additional which are necessary to the already existing equipment as well as with other testing equipment to complete the testing of cement and cement products, gypsum, lime and tiles. The total cost is estimated at US\$ 30,000.

48. The Chemical Products Testing Laboratory can test plastics, petroleum, surface agents and other chemical products. It contains a fine set of modern analytical

instruments such as atomic absorption spectrophotometer, ultra-violet spectrophotometer, infra-red spectrophotometer, gas-liquid chromatograph (GLC) and high performance liquid chromatograph (HPLC).

49. For these instruments and others, the laboratory is in need of integrated circuits, materials for column chromatography and thin layer chromatography (TLC), reagents for the preparation of derivatives for the GLC and HPLC, and supports packing material for columns, etc. The total cost is estimated at US\$ 7,000.

50. It is to be noted that none of the three analysts working on the expensive and highly sophisticated analytical instruments has received any training abroad.

51. The Agricultural and Food Products Testing Laboratory can test a wide range of products such as coffee and coffee products, hides and skins, oil seeds and pulses, edible oils, meat and meat products, fruits and vegetables, beverages, sugar, flour mill products, dairy products, canned foods and fermentation products.

52. However, it is not possible to determine the microbiological characteristics of these products, which are extremely important - since the relevant facilities were not covered by the project although few equipment were procured.

53. The cost of the necessary bacteriological testing equipment as well as for chemicals and glassware for this laboratory and the chemical products laboratory are estimated at US\$ 18,000.

54. The Electrical Products Testing Laboratory may be the least equipped laboratory in the Centre. It consists of one room which is not enough to carry out the required tests. With the type of equipment procured which are mostly composed of measuring instruments with no testing rigs/equipment, it is not possible to fully test many electrical products. Even primary batteries cannot be fully tested according to IEC standard.

55. Equipment procured were mainly measuring instruments for voltage, current, power, resistance, capacitance and also some testing devices like the high voltage test instrument for testing the electric strength of solid and liquid insulating materials.

56. In order to test other electrical products, it is necessary to simulate life conditions for the given product and carry out tests for mechanical strength, resistance to fire, fault conditions, etc. It is, therefore, imperative to have apparatus which could subject different appliances to impact, bend, stress, etc. Some of these apparatus are simple and were made in the Centre's workshop such as battery testing racks and lamp testing racks. However, others are impossible to make locally and therefore have to be procured from abroad. With such equipment - which may cost about US\$ 10,000 - the laboratory will be able to test the following electrical products:

- primary batteries
- secondary batteries (lead-acid batteries)
- tungsten filament lamps
- Edison screw lampholders
- switches
- appliance couplers, plugs and sockets

- PVC and rubber insulated cables and
- household appliances (refrigerators, electric stoves, electric space heaters, electric water heaters, fans, pressing irons, etc.).

57. It is to be noted that these products - which will be tested according to IEC standards - are mostly covered by the 485 Ethiopian standards ready for approval. Also testing of several of these products are requested by the Import and Export Corporation.

58. The Textile and Leather Testing Laboratory can test some (but not all) characteristics of yarns, fibers (natural and man-made), threads, fabrics and leather. Unfortunately, this laboratory has suffered from large cuts in the relevant equipment in the early stages of the project. It is, therefore, necessary to complement the existing facilities by procuring equipment at an approximate total cost of US\$ 20,000.

59. The Mechanical Workshop is supposed to be a metalwork and woodwork shop. Some basic machines and technologies are not available such as column drill, rod metal cut off, tinsmith technologies, acetylene and arc welding sets, double wheel grinder, compressor, and universal tool room sharpener. There are no machines for woodworking technologies. In addition, there are no milling cutters, drillbits, bolts, nuts, screws, nails, raw materials, etc.

60. In order to complement the metalwork shop and to provide machines for woodworking technologies, it is necessary to invest about US\$ 30,000.

61. Before ending this part of the report on the various laboratories of the NQCTC and their activities, the mission feels it necessary to draw the attention to the issue of un-announced interruptions in the power supply. Such interruptions must be kept to a minimum in the future to avoid serious damage to costly equipment. Some instruments such as the atomic absorption spectrophotometer (and flame photometers) which use an air/acetylene flame 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.

62. In addition, electricity cuts affect operations in the Electrical Products Testing Laboratory where there is a requirement for 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 for 24 hours. Some of the environmental tests using heating cabinets require over-night operation, etc. Moreover, if there are interruptions of the electricity supply for an hour or more, then many of the tests, specifically 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 industrial grade) as will be the case in the National Metrology Centre where a strict control of temperature and humidity will be absolutely necessary for the maintenance of physical standards and for carrying out metrological activities.

63. A great need, therefore, for a stand-by electricity supply and voltage stabilizer is no doubt felt for the test laboratories. The relevant ratings can only be determined when establishing the MEC.

Staff

64. The Centre's staff is composed as follows (Annex 4):

Head	1
M.Sc.	4
B.Sc.	12
Diploma	1
	<hr/>
	18

65. It is thus seen that the staff of the Centre is quite qualified and - for the time being - is adequate in number. There are, however, two points which need emphasis:

- (a) There is a disproportional number of graduates and technicians, thus - apart from the Head - there are 16 graduates and one technician only. However, it is quite understandable to initiate the operation of this new Centre by graduates. But this situation should not be allowed to continue for long. Technicians should be adequately trained to take over most of the work of the graduates who should concentrate more on improving testing activities in industrial laboratories and indulge gradually in simple research work aiming at improving the quality standard of Ethiopian products.

(b) There is a need to impart training to some of the technical personnel who could not be trained during the project mainly due to a shortage in available funds. Of the 40 m/m training component of the project only 28 m/m (50%) were implemented. As a result, there are certain important areas (e.g. instrumental techniques of chemical analysis) where no training was imparted to the respective testing staff, while more personnel in other areas should be adequately trained. It is suggested to complete the training input of the project as follows:

Spectrophotometry (AAS-UVS)	3 m/m
Chromatography (GLC, HPLC)	3 "
Leather testing	2 "
Electrical testing	3 "
	<hr/>
	11 m/m

#### Organization and Administration of the Centre

##### Safety

66. Some fire hose reels were seen in laboratory buildings. Much more serious and urgent attention should be given to take correct safety precautions especially in the chemical and related laboratories.

67. The technical staff should be fully aware of the possible hazards likely to be encountered in the experimental work. There is a great number of books, references and literature concerning laboratory safety, the most important of which should be made available. It is essential

that all chemists/analysts should make a careful study of suitable texts on laboratory hazards. Ideally, before embarking on a testing programme, the analyst should consult the literature for possible hazards likely to be encountered in the experimental work and he/she must ensure that the working conditions in the laboratory are safe.

68. Following are some of the safety precautions and measures that should be given very serious consideration:

- (a) Hand-to-mouth operations (eating, drinking, smoking) should be forbidden.
- (b) The wearing of safety spectacles and laboratory coats should be mandatory for all personnel.
- (c) A small "FIRST AID" box and a fire extinguisher (1.5 kg CO<sub>2</sub>) should be placed in each laboratory.
- (d) Notices given clear instructions as to the procedure to be followed in case of fire should be posted in prominent places.
- (e) Refrigerators used for the storage of flammable liquids should be made explosion/fire resistant.
- (f) Compressed gas cylinders should be clearly labelled for identification of content according to the international standard ISO 148. 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 conditions.



- (g) Hazardous radiation such as ultra-violet (UV) radiation encountered with many instrumental techniques (atomic absorption photometry and UV spectrophotometry) must be protected against according to the recommendations of the International Commission on Radiological protection.
- (h) Stocks of flammable liquids in the laboratories should be kept to a minimum.

#### Equipment

69. Since many useful test equipment have been kept idle 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.

70. Pending the establishment of the Instrument Maintenance Division/Section, it is necessary to organize all matters and affairs concerning laboratory instruments. There should be a central inventory of all instruments whether already arrived or which will be coming. Equipment and instruments should be entered on a running register more or less like the acquisition of books in a library, i.e., with an accession number, date of arrival and particulars of the division/section to which it has been or will be 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.

71. For each equipment, there should be a separate file containing its catalogue, method of use and all other correspondence and available information.

72. It is advisable that all instruments should have a tag permanently fixed with wire to an accessible and visible support, indicating the name of the instrument, date of arrival (month and year only) and the relevant division/section. 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.

73. It is also advisable that all instruments above a certain value, say Birr 10,000, should have a distinct price tag permanently fixed on them. This will help to have a healthy respect for the expensive instruments, apparatus and will also identify those instruments/apparatus which need to be saved first in times of emergency such as flood or fire.

#### Processing and Documentation of Testing Activities

74. Simple forms and procedures are adopted in the testing activities of the Centre. But as a result of the presence of independent testing divisions/sections and the considerable interplay between them - particularly on expanding the Centre's capability - there should be adequate facilities for receiving, storing, despatching of products and other items and the testing activity should be properly rationalized and documented. 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 the Centre.

75. The interplay between the various laboratories is well demonstrated, as mentioned before, by the fact that the complete information of many materials/products are to be obtained by testing in more than one laboratory. 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.

76. Thus, 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 (e.g. laboratory quality control, accounting, etc.), all of which will make up the total operational procedure of the Centre. This system - for the efficient control and firm supervision of the MQCTC - should take into account the processing of the work from the initial inquiry of the client (within and outside the MQCTC), to the final report, disposition of test specimens and retention of records. The system would involve the establishment of a Planning and Progress Section (P & P) and a Recording and Filing Section. The first section will 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 thus 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 which, 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 expansion of laboratory space is necessary.

77. The Recording and Filing Section will be concerned with the compilation of complete information including full identification data of the product 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 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 on 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 statistics should be kept.

78. It has become evident that the above issues concerning the organization and administration of the Centre could not be taken care of by the international consultants - who have done a very good job - just because of the lack of time as they were completely occupied by uncracking the equipment cases, installation, repairing the damaged parts, operating the instruments and training the counterparts, all have been done in quite a short time.

79. Consequently, due to the importance of the proper organization and administration of the testing facilities in the Centre, the Head of the Centre should conduct a two-month study tour to study in-depth the organization and administration of two well developed test houses.

#### Operation

80. With adequate staffing and the arrival of about 95% of the ordered equipment, the Centre has been able to operate - within its capabilities - in a more or less satisfactory manner. Thus, since the departure of the international staff in August 1984, the Electrical Products Testing Section has tested 873 samples (4614 testing operations) from 11 factories, the Biochemical Laboratory has tested 198 samples (1336 testing operations) from 23 factories, the Building Materials and Mechanical Testing Laboratory has tested 525 samples (2761 testing operations) and the Workshop has manufactured many items (Annexes 5 - 8).

#### Justification of the Project

81. It is, therefore, seen that even though almost all laboratories cannot be fully functional - due to effecting certain cuts in the budget of their equipment as well as to other reasons - nevertheless, the Centre is functioning and achieving a considerable proportion of its envisaged objectives. As a matter of fact, the setting up and operation of the Centre mark a significant step in establishing a national testing capability. For the first time in her history, Ethiopia has now a functioning multi-disciplinary test house - though still modest - capable of

testing and certifying a relatively wide range of locally produced and imported products. The Centre has thus filled a serious gap from which Ethiopia has suffered so far. It is true that there are a very few number of laboratories scattered in the country but they all have a common feature in that they are all mainly destined to carry out tests in a certain specific field, e.g. health: such as the National Research Institute of Health and the Ethiopian Nutrition Institute (ENI); research: such as the Institute of Agricultural Research (IAR); or teaching: such as the Faculty of Technology, Addis Ababa University. In addition, since industrial and commercial testing is not their main function, product testing in these bodies usually takes quite a long time as it is not given adequate priority. In the face of this, the National Quality Control and Testing Centre is the only competent nationally - and may soon become internationally - recognized body for testing with facilities devoted totally to serving the various sectors (agricultural, industrial, commercial, scientific, etc.) of the national economy.

82. The Centre will help the country to control its imports and prevent dumping the local market with substandard goods and thereby protect local industry from unfair competition and safeguard the health, safety and life of the people. The Centre will also help the Government to control the quality of its exports and thereby promote its international trade with subsequent increase in its foreign exchange earnings. It will also help the Government to enforce quality standards to upgrade the quality of Ethiopian products. Finally, it will help the Government to evaluate the quality of its indigenous raw materials for use as substitutes for imported ones.

83. At the EEI level, the Centre enables it to:

- (a) carry out tests needed for the elaboration, amendment and revision of Ethiopian standards.
- (b) operate certification marking schemes.
- (c) improve testing techniques in industrial enterprises.
- (d) render valuable testing facilities to all sectors of the national economy.

84. In addition, in the longer term, the Centre could be involved in industrial research and could also promote sub-regional cooperation by giving services to the various countries of the sub-region.

85. Consequently, it becomes evident that - beyond any doubt - the Centre is greatly needed for safeguarding the life, health, safety and interest of the public at large as well as for the rapid industrialization of the country and the promotion of its national economy. The establishment of the Centre is, therefore, highly justified.

86. In order to make use of the testing facilities of the Centre, it is absolutely necessary to complement the existing facilities to enable the Centre to determine and evaluate the complete characteristics of the products involved at present i.e., which are covered by the 100 approved Ethiopian standards.

87. It is also very much justifiable to augment the capability of the Centre to test all products covered by the 465 standards under approval as well as the 1500 draft standards in the pipeline.

88. To this end, facilities should be provided for:

- (a) paper and board testing
- (b) paints and varnishes testing
- (c) metallographic testing

Also, in order to maintain, repair and service the large number of present and forthcoming instruments it is necessary to add facilities for:

- (d) instrument maintenance and repair.

89. Concerning paper and board, there is a need to test the rather large number of such products whether locally produced or imported. Local production comprises writing paper, typing paper, printing paper, bank paper (40 gram<sup>2</sup>), wrapping paper, toilet paper, tissue paper, paper napkins, folders, craft paper, liners, fluting medium, duplex board, manila board, double-double board, double-wall corrugated boxes, etc. These products constitute only about 30% of the national demand, the rest is secured through importation which should also be tested.

90. As for paints and varnishes, a group of commonly used commodities, the local production which amounts to 3.5 million litres per year from two factories, covers the national demand with no importation. There is, therefore, a great need to test these locally made products as not to allow any degradation in their quality.

91. Metallographic testing is very important to determine the properties of metals and metallic products.



92. The approximate estimated costs of the above three laboratories are as follows:

paper and board testing lab.	20,000
paints and varnishes testing lab.	20,000
metallographic testing lab.	25,000

93. Concerning the instrument maintenance and repair facilities it should be emphasized that instruments in the NQCTC will soon reach almost un-manageable proportions especially with the proposed extension of the project and the establishment of the NMC - not to speak of such apparatus and instruments in other bodies in Ethiopia. As such they constitute a national wealth. On the other hand, it is a law of nature that instruments lose some of their accuracy and gradually deteriorate by regular use. They always need periodic calibrations and re-adjustments as well. It should also be recognized 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 service is needed. This all means that the custody of national wealth incorporated in the scientific instruments of NQCTC and other bodies requires the responsible planning and establishment of adequate maintenance and repair services.

94. In this respect, it is worth mentioning that the early establishment of such services would give an opportunity to the NQCTC staff to get familiarized with the new expensive instruments during their installation especially where there would be no local agent for the supplier. After installation or first commissioning of the many apparatus and instruments to be received, these maintenance and repair facilities will be highly important for providing preventive and breakdown maintenance as well as adjustments and calibration whenever feasible.

95. It is, therefore, necessary to set up an Instrument Repair and Maintenance Division/Section in the Centre. This in-house facility should provide back up service for the vast array of instruments. When fully established, the division/section should have spare capacity to accept work from institutions and bodies not having this facility or have one of elementary nature. It will thus provide the BSI and other bodies with the much needed relief from total dependency on the availability of the supplier specialist and the consequent release of the foreign exchange locked up in out-of-order but recommissionable 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. This Division/Section should be initially able to handle electrical and electronic instruments but later on should be able to tackle non-electronic scientific instruments as it grows. In the course of time, it would also become a training establishment for the qualified staff of other laboratories in Ethiopia as well as in the sub-region.

96. For the proper establishment and operation of such a division/section, the services of an international expert and implementing one or more UN fellowships abroad are essential. The estimated cost of the equipment amounts to US\$ 30,000.

97. In ending this part of the report dealing with the Centre, the mission wants to emphasize the following two facts:

- (a) That such test houses always need continued development and expansion to cope with the ever growing needs of industrial development. This becomes very clear in the case of Ethiopia where its 10-Year Development Plan will raise the contribution of the industrial sector from 10% to about 25%.
- (b) That for the proper and efficient utilization of the capability of the Centre, several significant developments on the part of the Government and the ESI alike are essential. These will be referred to in the next part of this Chapter dealing with "Recommendations".

National Metrology Centre (NMC)

98. As stated in Annex 1, the terms of reference of the present mission include the assessment of the "relevance of, and need for, a Metrology Centre for the proper functioning of the ESI".

99. In this regard, it would have sufficed to say that any human activity, whatsoever, cannot be performed without some sort of measurement with varying degrees of precision according to the nature of the activity. But for the proper and effective performance of industrial quality control - one of the main functions of the ESI - high precision is, naturally, essential.

100. However, the mission - within the limited time available - gave keen interest to this issue. As a result of

the technical visits to some industrial enterprises and discussions with various people, the mission came up with the conclusion that there exist no metrological services in Ethiopia at a time when the Government is indulged in the implementation of ambitious development plans and while such services are badly needed by:

1) Many Government ministries, departments, authorities and agencies including:

- (a) Ministry of Transport and Communications.
- (b) Ministry of Information (Broadcasting).
- (c) Ethiopian Railways.
- (d) Ethiopian Telecommunications Authority.
- (e) Ethiopian Civil Aviation Authority.
- (f) Ethiopian Airlines.
- (g) Ethiopian Meteorology Agency.
- (h) Ethiopian Electric Light and Power Authority (EELPA).

2) The ESI:

- (a) to calibrate the vast array of instruments in its National Quality Control and Testing Centre.
- (b) to calibrate its weights and measures standards utilized for the verification of weights and measures used in commercial transactions. These ESI working standards have never been calibrated since their procurement more than 20 years ago.

- (c) to calibrate the measuring instruments used in its workshop.
  - (d) to calibrate the measuring instruments to be repaired in its forthcoming Instrument Maintenance and Repair Division/Section.
- 3) All industrial enterprises in whatever field they are active.
  - 4) All workshops whether working as an individual enterprise (such as the Agricultural Implements and Equipment Technical Services Corporation) or as part of an enterprise.
  - 5) All laboratories in scientific and research institutes, industry, hospitals, etc.

101. It is, therefore, concluded that the very early establishment of the EMC is highly justifiable.

#### Government Attitude

102. During its meetings with the senior executives in the various ministries and CNCCP, the mission felt very clearly the great interest and the high priority the Government accords to the consolidation of ESI following the instructions and directives of the Leader of the State. This great interest has been reflected in the large funds invested in the construction of ESI premises (Headquarters, National Quality Control and Testing Centre, and National Metrology Centre) the processing of the new proclamation upgrading

ESI to the status of a Commission accountable to the Office of the Chairman of the Council of Ministers and the preparedness of the CNCCP Manpower Planning Department to provide ESI with its requirements of staff. Government authorities have expressed very clearly their determination to spare no effort in strengthening the ESI in order to place it in a position where it can play its due role in the substantial development of the national economy in Ethiopia.

### B. RECOMMENDATIONS

#### Recommendations Concerning Technical Assistance

1. In order to enable the National Quality Control and Testing Centre to meet the present needs of testing the products covered by the 2093 Ethiopian standards (approved and to be approved soon), not to speak of the potential possibility of using it to serve the sub-region, it is necessary (a) to complete its existing facilities (b) to set up facilities for paper and board; paints and varnishes and metallographic testing as well as for instrument maintenance and repair and (c) to implement the fellowships which could not be implemented during the project under review due to shortage of funds as well as the fellowships to be provided for training on the use of the new facilities.

The total inputs will be as follows:

I. Equipment	<u>US\$</u>
For completion of:	
Building and Mechanical Lab.	30,000
Chemical and Biochemical Lab.	25,000
Electrical Lab.	13,000
Textile and Leather Lab.	20,000
Workshop (metal and woodwork)	30,000
References for laboratories	12,000
	<hr/>
	135,000
For establishing new laboratories:	
Paper and Board Lab.	20,000
Paints and Varnishes Lab.	20,000
Metallography Lab.	25,000
Instrument Repair	30,000
	<hr/>
	95,000
Total Equipment Component	230,000
II. Fellowships	
For training on existing facilities:	<u>m/m</u>
Spectrophotometry	3
Chromatography	3
Leather Testing	2
Electrical Testing	3
Laboratory Administration (Study Hour)	<u>2</u>
	13
For training on new facilities:	
Paper Testing	3
Paints Testing	3
Metallographic Testing	3
Instrument Repair	<u>6</u>
	15
Total Training Component	28
III. Consultants	
Instrument Repair	6

2. Since proper QC cannot be exercised and quality cannot be improved without accurate and precise measurements, and as a result of the mission's findings, it is necessary that the project for establishing the National Metrology Centre within ESI should be implemented as soon as possible. This becomes particularly so since the Government has already completed the necessary premises to accommodate the physical standards of measurement and the metrological instruments.

However, in implementing this project, serious consideration should be given to the following:

- (a) The project should not be started before assigning the necessary counterparts.
- (b) Every effort should be made to overcome the difficulties and eliminate the shortcomings of the project establishing the National Quality Control and Testing Centre.
- (c) Since ordering, procuring, and receiving scientific equipment - especially metrological standards and instruments - take quite a long time which may reach 18 months or even more, it is therefore necessary, for the proper implementation of the project that the second part of USA split mission as well as the assignment of the consultants should not start before the furnishing of the laboratories and the arrival of equipment.
- (d) Between the two parts of the USA split mission, counterparts should be sent on fellowships for training abroad.



- (e) A stand-by generator and a voltage stabilizer should be provided taking due consideration to the requirements of the HQCTC.

3. In implementing the above projects, it is recommended that:

- a) Equipment specifications should refer, as far as possible, to international standards and, if not, to recognized national standards. Otherwise, specifications should be stated very clearly, precisely and in reasonable detail. Precise specification of the power supply should also be stated.
- b) Equipment should be ordered with all spare parts necessary for regular operation for not less than 2-3 years.
- c) Equipment should be accompanied by 3 copies of the operational manual written in English. As distinct from the operational manual, two copies of the service manual in English should also be supplied if available. This manual not only helps in the quick maintenance of the apparatus in case of a breakdown to use or accident but also helps to identify spare parts which are liable to early breakdown by their very nature and to do their advance purchasing. One copy of the service manual should invariably stay with the instrument so that the user can do the elementary operative maintenance, to the extent possible or indicated in the operator's part of the manual, for visible troubles.

- d) To reduce the large inventories of spares and special tools and test apparatus, future instrument purchases should be restricted to very few 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.
  
- e) Instruments should not be opened by users but only by the service agent or by the staff of the instrument and repair shop when being established. 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 un-economic to repair.

#### Recommendations to the Government

4. In order to give the ESI its due status which would strengthen the capability of ESI in carrying out its mandate, it is necessary that the new proclamation upgrading ESI to the status of a Commission accountable to the Office of the Chairman of the Council of Ministers should be issued as soon as possible.

5. In enforcing standards and carrying out certification activities, the legal disputes that have been observed between ESI and some public manufacturers due to their inability to comply with the requirements of the relevant Ethiopian Standard(s), have arisen mainly due to the fact

that the present standardization and certification activities which are based on the provisions of a proclamation issued in 1970/71 do not any longer suit the present economic system of Ethiopia. It is, therefore, imperative to establish a national standardization system and a national QC/quality assurance system to fit the centrally planned economy of Ethiopia.

Due to the extreme importance of these two systems - which will be further complemented by a national metrology system within the National Metrology Centre project - international expertise in their preparation becomes essential.

6. Steps should be taken to approve all draft standards prepared and finalized by ESI. The delay of several years in approving standards may render some of them irrelevant or obsolete even before having the opportunity to enforce them. Also, such big delay would not allow the adoption of the widely recognized and applied principle of reviewing standards periodically (usually every 3 to 5 years) in order to keep abreast of the advances in science and technology.

7. Consideration should be given to insisting that only foreign products which 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 Ethiopia. In this way, ESI will only be concerned with testing products manufactured or assembled in Ethiopia. This practice has a double advantage. It plainly helps to raise the quality level of products available on the local market and also has the effect of helping to prevent

overloading the Centre which will soon suffer from a shortage in its technical staff. The Centre will thus be able to cope with the rapid throughput of work.

8. As the national machinery responsible for setting and upgrading quality standards of goods and services, the ESI 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 its personnel. The salary structure should be established in such a way as to attract talents and to ensure, as far as possible, their continued attachment to ESI<sup>1/</sup>. A good incentive scheme should also be adopted.

#### Recommendations to ESI

9. By the very nature of its functions, the ESI should be at the centre of the stage in the matter of its contacts with the various sectors in the country. It should be recognized that the success of ESI in fulfilling its role as a catalyst for the promotion of standardisation and quality control 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 ESI has, by proclamation, legal authority to enforce certain measures against manufacturers, nevertheless, a sincere and cooperative approach is more effective in

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<sup>1/</sup> In addition to the shortage in staff which ESI is suffering, a high personnel turnover has been noticed in recent years.

achieving its objectives. A close interaction between ESI 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 ESI 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 QC activities should always be considered as joint effort by ESI and industry. Thus, in dealing with industry, the attitude of ESI 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 close relation with industry 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 nationally known that the function of ESI is to aid industry in achieving higher standards in quality and thus creating new markets, including export markets. It is, therefore, strongly recommended that ESI should not spare any effort to foster closer interaction, good relationships and full cooperation with the various sectors of the national economy, especially with industry in the pursuit of high quality.

10. Since in a mandatory standards and certification 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/wording these requirements and seeing that the standards do not have the risk of inhibiting innovation or stifling technological progress.

11. For the standardization and QC functions of ESI - a sine qua non for the transfer of modern technology - to be effective, an efficient information and documentation system is necessary to derive the maximum benefits. This can save colossal time, effort and wasteful repetitive work. Due to this fact, the establishment, organization and operation of technical library, clearing house and information and documentation services should be an integral part of the development of ESI. It is, therefore, strongly recommended that the ESI should greatly develop its existing modest library to a standards information and documentation centre with high capability for the dissemination of technical information on standardization, certification schemes, test methods, quality control and measuring systems to ESI staff as well as to outside bodies. Information about standards may be sought to answer several types of queries concerned with various operations, namely; purchase, design, manufacturing, testing, import and 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 the 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 and its associated disciplines at the national as well as regional and international levels.

For the proper establishment, organization and operation of such important service, the proposed information and documentation centre should be properly equipped. It is also necessary to train the Centre's staff abroad.

12. In order to reap the social and economic benefits of standardization and quality control, these disciplines should be well known to all and properly practiced 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 to cater for the needs of the various sectors (public and private), the various industries (food, chemical, textile, engineering, etc.), 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 QC, sales, after-sales services, etc.) and the various groups (importers, exporters, dealers, consumers, etc.).

The ESI - being the state competent authority in all matters concerning standardization, QC and metrology - should take the initiative to spearhead a nation-wide education and training activity with the mutual cooperation of Government ministries, departments and agencies, academe, industry, technical institutes, societies and other concerned bodies.

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 committee/council within ESI to be in charge of this activity with its secretariat a training section/unit to be created there. The central committee should be composed, among others, of representatives from Ministry of Industry, Faculty of Technology, National Productivity Centre, Polytechnic, ESI and others.

The terms of reference of this Committee would be:

- (a) To establish the strategy and policy of education and training in the four major fields - standardization, QC, 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, etc.).
- (d) To supervise, follow-up, evaluate and review the implementation of the plans.
- (e) To promote the introduction of standardization and QC in educational curricula.
- (f) To take such action and measures as deemed necessary to improve effectiveness of activity.

To speed up the education and training process, several engineers from ESI should be qualified as QC instructors through postgraduate studies and/or participation in training programmes conducted by relevant national and international bodies such as the Asian Productivity Organization (APO), Japan International Cooperation Agency (JICA), Japan Productivity Centre (JPC), International Centre for Quality and Management Sciences (ICQMS) in Rotterdam and the Swedish International Development Authority (SIDA). 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 training programmes. Since they are to be competent instructors, the specialist trainers should be very well equipped with theoretical and practical expertise and skill.

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 QC disciplines. To this end one- or two-day seminars could be conducted preferably with the assistance of international consultants.

13. The ESI - by its pivotal role - should spearhead the drive for promoting QC in industry by spreading this activity steadily to industrial units until it takes a firm root. This can be achieved by encouraging, guiding and assisting in establishing and operating QC departments at the various levels in the industrial sector thus constituting a 3-tier structure, the base of which is the plant or corporate level while the second level will be the relevant industrial group (e.g. food, beverages, tobacco, textiles, leather and shoes, metals, printing and paper, chemicals, woodwork). The apex of this 3-tier organization will be the QC department in the Ministry of Industry. The strong linkage and close cooperation between ESI and this 3-tier structure will be instrumental in improving the quality of Ethiopian products.

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

15. Considering that standardization involves both the preparation and use of standards, and that these standards which are prepared by BSI are to be implemented by industry, then the very close linkage between these two parties (BSI and industry), or rather these two partners, becomes an absolute necessity if standardization is to play its due role in the proper growth of industry. To this end, it is recommended that BSI should, as soon as possible, implement a «liaison scheme» whereby «liaison officers» from major industrial units would keep in touch with BSI regularly and in an organized manner to achieve the company and national objectives.

16. Since there is always a need, even in developed countries and especially in developing countries, to propagate information about standardization and QC 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, the BSI should accent the fact that a professional public relations (PR) activity skillfully directed and sustained can mean a difference which can be counted in years in the progress of any national standards body. The BSI should, therefore, give serious consideration - with some urgency - to the strengthening of its PR section. Special importance should be attached to

the careful selection of personnel. A «back bone» consisting of a journalist, designer and editor experienced in their fields is essential. The head of this section should be trained abroad in a well-developed counterpart institution.

#### Recommendations to the Centre

17. Since the NISTEC is - and should be - considered as the highest national authority, it should reflect the highest possible standards in terms of management, organization, staff, equipment, work, motivation, maintenance and precision. The aim of setting up the Centre 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.

18. In order to increase the accuracy and reliability of test results, improve the efficiency of reporting and credibility of the Centre, which is a multi-disciplinary testing organization having considerable inter-play 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, progressing, storing, filing and despatching 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 Centre. And to streamline its operations, the Centre should establish a well prepared procedural manual.

19. The Centre should also 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 the type of product. Separate file(s) on failure statistics should be kept. The Centre is in a unique position to collect and collate technical information concerning all 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 locally made products. An efficient cross-reference system should be adopted so that information on any product, in which the Centre is concerned, can be immediately traced. The compiled information will prove to be extremely useful to the Government as well as to the Standards and Quality Control Departments of ESI.

20. Serious consideration should be given to the implementation of correct safety precautions and measures especially in the chemical and related laboratories. Safety devices and equipment should be provided as soon as possible.

21. To improve its efficiency, each testing laboratory 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. Without such facility, it is difficult for the laboratory staff to keep themselves abreast of the new developments in testing.

22. Each individual laboratory should have a laboratory manual containing a short description and drawing of every one of the equipment present together with operational descriptions.

23. Since many useful test equipment have been kept idle 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 supplier through the remaining project fund and - if not possible - through local financing.

24. In order to keep track of the movement of laboratory equipment/instruments as well as their conditions and to do advance planning for their maintenance, a central inventory of all such equipment/instruments should be made. An inventory should be made of all items and accessories of every separate instrument/machine. For each equipment, there should be a separate file and 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.

25. Since instrument 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.

26. The Centre should not remain detached from other interested sectors as it may seem at present. The Centre should develop contacts with these sectors and acquaint them with the services offered and encourage them to take advantage of these services. To promote this endeavour, the publication of a booklet detailing the services of the

Centre is necessary. The booklet should be published in an attractive printed form containing some photographs illustrating the various testing activities of the Centre. It should be given wide distribution to the various interested sectors/circles. It is also recommended to organize consultations or some kind of symposia with demonstration in the Centre.

27. Outside Ethiopia, the Centre should initiate and encourage contacts with counterpart test houses having similar functions/activities whether at the national level (e.g. British Electrotechnical Approvals Board (BEAB), the Quality Control Centre, Cairo; the laboratories of the Indian Standards Institution and the National Test House (NTH) in India; VDE and the Bundesanstalt fur Materialprufung (BAM) in GFR, etc.) or at the international level (e.g. the International Commission for Conformity Certification of Electrical Equipment (CEE), etc.).

JOINT UNDP/UNIDO EVALUATION MISSION ON DP/ETH/79/003National Quality Control and Testing CentreTerms of ReferenceBackground

The economy of Ethiopia is primarily agricultural. The manufacturing sector is in its initial stages of development and so far has not made a significant impact on Ethiopia's development. In 1982, it contributed less than 7% to the G.D.P.

The existing industries are not performing satisfactorily due to obsolescent and poorly maintained machinery, a lack of skilled manpower at the managerial and technical levels, very limited capital investment in the manufacturing sector, wasteful production methods, etc. Some industrial sub-sectors face raw material shortages while others lack a sizeable export market for their products.

At this stage of industrial development in Ethiopia, there is a clear need to rationalize and improve productivity in the industrial sector, reduce wastage and introduce standardization and quality control practices in the national economy as a whole and industry in particular. The Ethiopian Standards Institution (ESI) was established in September 1970 in order to play a central and co-ordinating role in the preparation, authorization and implementation of a comprehensive package of Ethiopian Standards.

The creation of ESI was supported by UNIDO technical assistance from the outset and the main objective was to establish a National Standards Body for the preparation, publication and implementation of national Standards and

the centralization of standardization and quality control methods throughout the country.

The present UNIDO executed project was preceded by a preparatory assistance phase, financed through UNDP, (ETH/75/010 - Consultancy on the Establishment of the National Quality Control and Testing Centre). The preparatory assistance mission specifically recommended the establishment of the Centre and advised ESI on its construction and organization.

The present project, which in effect has as main objective the establishment of the National Quality Control and Testing Centre, was approved by the UNDP in March 1979.

The project became operational in 1979 with the fielding of the CTA. In the course of the implementation of the project, a complex of problems was encountered and the Resident Representative of the UNDP requested for a tripartite in-depth evaluation to be held immediately after the termination of the project at the end of 1984. The request was subsequently approved by the Government and funds for the evaluation costs were released from the IPF.

#### Scope and Purpose of the Review

The primary purposes of the review of the project are:

- to evaluate it in order to determine how adequately its immediate objective has been attained and how effective it has been or is likely to be in helping the Government to achieve the relevant sectoral and/or national development objectives;
- to identify the factors which may have facilitated or deterred the achievement of the project's immediate objective; and
- to make recommendations for future action.



The mission should feel free to review all steps taken in the formulation and implementation of the project and make recommendations as to its future.

In carrying out these purposes the mission will in particular:

- (a) assess to what extent the centre has been established in connection with the initial plans;
- (b) assess the realization of the initially planned staffing requirements for the centre;
- (c) analyse any internal and external factors that might have led to a less than satisfactory implementation of the project;
- (d) assess to what extent ESI has been able, since the centre was established, to carry out its mandate;
- (e) assess the ability of the project to maintain an adequately staffed centre in terms of quality and quantity of staff required to effectively provide the services envisioned;
- (f) assess to what extent project budget revisions have hampered the project in achieving the results originally planned; and
- (g) make recommendations regarding possible future assistance of UNDP/UNIDO to ESI.
- (h) assess the relevance of, and need for, a Metrology Centre for the proper functioning of the ESI.

Composition of the mission

The mission will be composed of the following participants:

- a representative of UNDP: Mr. Mathias Lubega, Senior Area Officer
- a representative of UNIDO: Mr. Ahmad Geneidy (Consultant)
- representatives of Government: 1) Dr. Mikias Abayneh, 2) Mr. Yohannes Eshetu and 3) Mr. Zenebe Tekle.

Consultations in the field

The mission will maintain close liaison with the UNDP Resident Representative in Ethiopia, the concerned agencies of the Government, the Project Manager and other national personnel assigned to the project, the representatives of industry, 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.

Timetable and report of the mission

The representative of UNDP and UNIDO will receive briefing at their respective headquarters. Upon arrival in Addis Ababa, the mission will be briefed by the UNDP Resident Representative, who will provide the necessary substantive and administrative support. The mission will complete its field work within two weeks, starting 13 March 1985. 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 its report along the lines indicated in the attached outline. 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. The UNDP and UNIDO, by agreement, will submit the report to the Government of Ethiopia.

LIST OF PERSONS CONTACTED

GOVERNMENT

1. Mr. Getachew Minas  
Head of Manpower Planning  
ONCCP
2. Mr. Tegeye Teklu  
Head of Trade Department
3. Mr. Bekele Gelatu  
Team Leader, Foreign Economic Relations Department
4. Mr. Bishu Sewde  
Head, Operations Department  
Ministry of Industry
5. Mr. Akberon Tedla  
General Manager  
Ethiopian Standards Institution (ESI)
6. Mr. Yohannes Afework  
Head, Technical Service Department  
ESI
7. Mr. Eba Babu  
Head, Administration and Finance Department  
ESI

UNDP

Dr. K. F. S. King  
Resident Representative

UNIDO

Mr. K. Venkatachallum  
Senior Industrial Development Field Adviser

LIST OF INDUSTRIAL ENTERPRISES VISITED

1. Ethiopian Oilseeds and Pulses Export Corporation
2. National Metal Foundry
3. Cemental Bede Unit
4. Akaki Metal Sheet Factory
5. Agricultural Implements and Equipment Technical Services Corporation

STAFF OF THE NATIONAL QUALITY CONTROL AND TESTING CENTRE

No.	Name & Department	Qualification	Graduation Year (B.C.)	Remarks
<u>Technical Service Department</u>				
1	Yohannes Afework (Head)	Civil Engineering (B.Sc.)	1955	Six-month training in Q.C. in Netherlands, and three-months Seminar in Sweden in Q.C.
<u>Electrical Lab.</u>				
2	Mesai Girma	Electrical Engineering (B.Sc.)	1973	Three-month training in Czechoslovakia
3	Zufan Tekle	"	1974	---
4	Birhanu Forede	"	1976	---
<u>Building &amp; Mechanical Lab.</u>				
5	Birhanu W/Michael	Civil Engineering (B.Sc.)	1975	---
6	Simegn Girma	Civil Engineering (B.Sc.)	1973	Four-month training in Building materials in England
7	Alemayehu Belete	Mechanical Engineering (B.Sc.)	1972	Three-month training in building materials in Czechoslovakia
8	Fiturzeab Asgedon	Mechanical Engineering (B.Sc.)	1972	Three-month training in Sweden

No.	Name and Department	Qualification	Graduation Year (E.C.)	Remarks
<u>Textiles Lab.</u>				
9	Izra Tereffe	Textiles Technology (Diploma)	1960	Five-month training in UK
		Textiles Engineering (M.Sc.)	1967	---
10	Kifle Telila	Textiles Technology (Diploma)	1962	---
		Textiles Engineerings (M.Sc.)	1972	---
11	Castro Djimma	Textiles Technology (Diploma)	1974	---
<u>Bio-Chemical Lab.</u>				
12	Tsedash Zewde	Pharmacy (B.Sc.)	1965	---
		Pharmacology (M.Sc.)	1975	---
13	Aklile Birhane	Chemistry (B.Sc.)	1972	---
14	Ishetu Gifar	" "	1973	---
15	Robel Motro	Biology (B.Sc.)	1972	Three-month training Czechoslovakia
16	Taniru Geno	Plant Science (B.Sc.)	1974	Three-month training in basic food micro-biology, quality control in England
<u>Maintenance and Servicing Workshop</u>				
17	Teklehaimanot Ande	Mechanical Engineering (B.Sc.)	1974	Four-month training in England
18	Abraham Tesfay	Electrical Engineering (B.Sc.)	1976	

TESTS CONDUCTED IN ELECTRICAL  
PRODUCTS TESTING LABORATORY  
AUGUST 1984 - MARCH 1985

<b>P r o d u c t</b>	<b>No. of Factories</b>	<b>No. of Samples</b>	<b>No. of Sample Tests</b>	<b>No. of Testings</b>
Tungsten Filament Lamp	4	203	3	624
Dry Cell Battery	7	665	6	3990
Total	11	873	9	4614



SAMPLES TESTED IN BIOCHEMICAL LAB.  
AUGUST 1924 - MARCH 1935

S. No.	Product	No. of Factories	No. of Samples	No. of Sample Tests	No. of Testings
1	Edible oil	15	40	15	500
2	Oil cakes	3	11	4	44
3	Spirits	1	27	11	297
4	Liquors	1	9	12	109
5	Wine (Vermouth and Aperitive)	1	13	14	252
6	Car polish	1	2	14	28
7	Safety matches	1	1	9	9
	Total	23	103	79	1330

MATERIALS TESTED IN BUILDING MATERIALS  
AND MECHANICAL TESTING LABORATORY  
AUGUST 1934 - MARCH 1935

No.	Product	No. of Factories	No. of Samples	No of Testing	Remarks
1	Hollow Concrete Blocks	7	210	1260	
2	Solid Clay Bricks	2	170	570	
3	Asbestos Cement Sheets	1	9	45	
4	Steel of Unknown Quality	1	2	2	
5	Steel Wire Nail	-	90	450	Product No.5,6,7 is produced in the same factory.
6	Hot rolled Steel Wire Rod	1	20	120	
7	Cold Drawn Steel Wire		21	42	
8	PVC Plastic Tiles	1	40	160	
9	Galvanized Corrugated Steel Sheets	1	6	42	Product No. 9 and 10 is produced in the same factory.
10	Galvanized Plain Steel Sheets		6	30	
11	Galvanized Plain Steel Sheets	-	9	30	Imported.
12	White Portland Cement	-	2 tins	10	Imported.

TESTING FACILITIES AND ACCESSORIES MANUFACTURED IN THE WORKSHOP

AUGUST 1984 UPTO MARCH 1985

1. Lampholder boards with supporting frames which enable to test 200 bulbs at a time.
2. Insulating boards with battery holders which enable to test 72 batteries at a time.
3. Cubic Photometric integrator.
4. Test corner.
5. Six cube moulds for preparing concrete cube specimens of  $100 \text{ mm}^3$ .
6. Six cube moulds for preparing mortar cube specimens of  $50 \text{ mm}^3$ .
7. Two  $420 \times 320 \times 24 \text{ mm}$  marked steel plates which enable the compression machine in the Materials and Mechanical Lab. to test square and rectangular blocks.
8. Sample storing and marking racks and benches.
9. Various supporting frames, fasteners and connecting tubes.
10. Water supply line and drainage for test benches.