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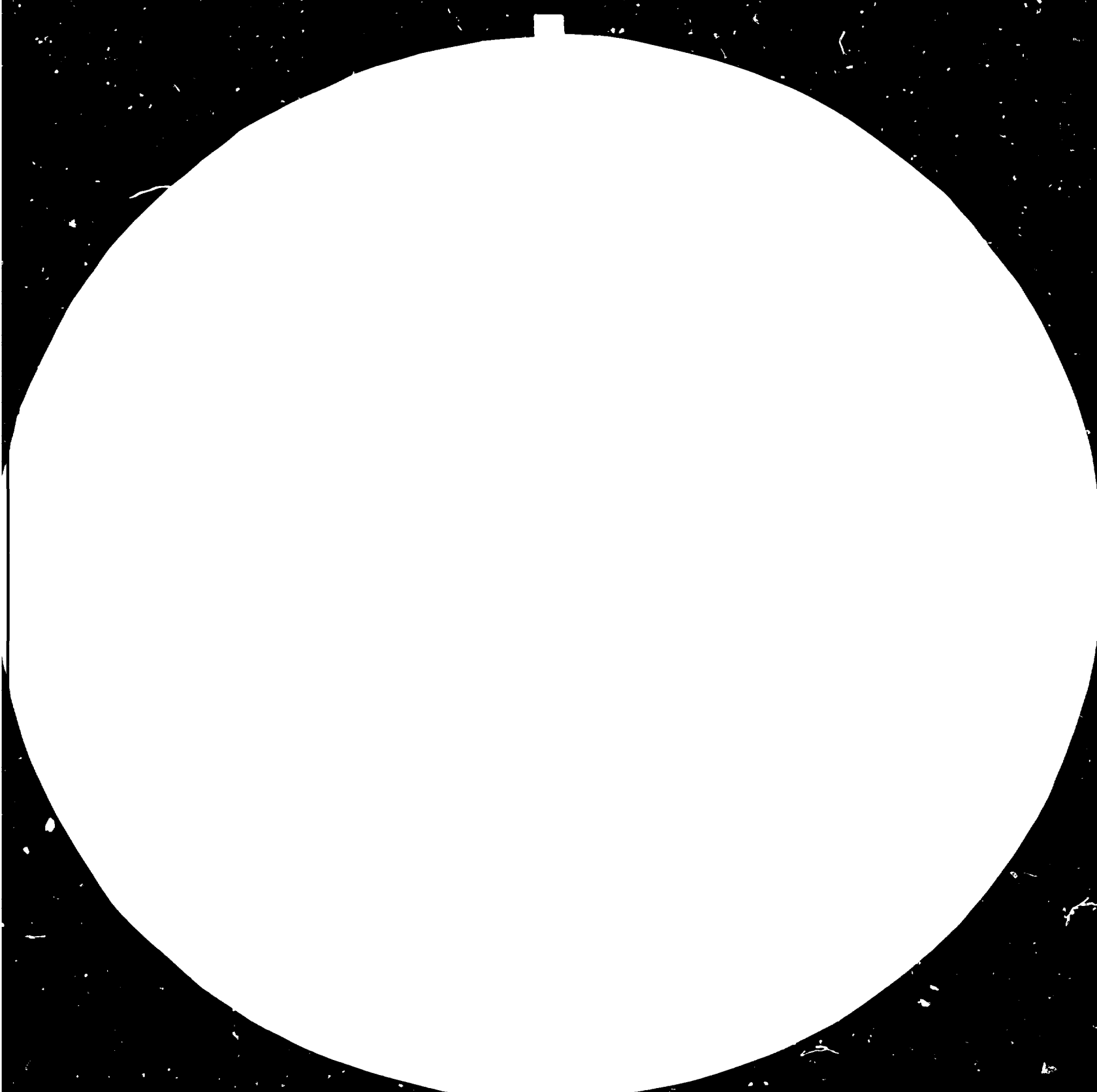

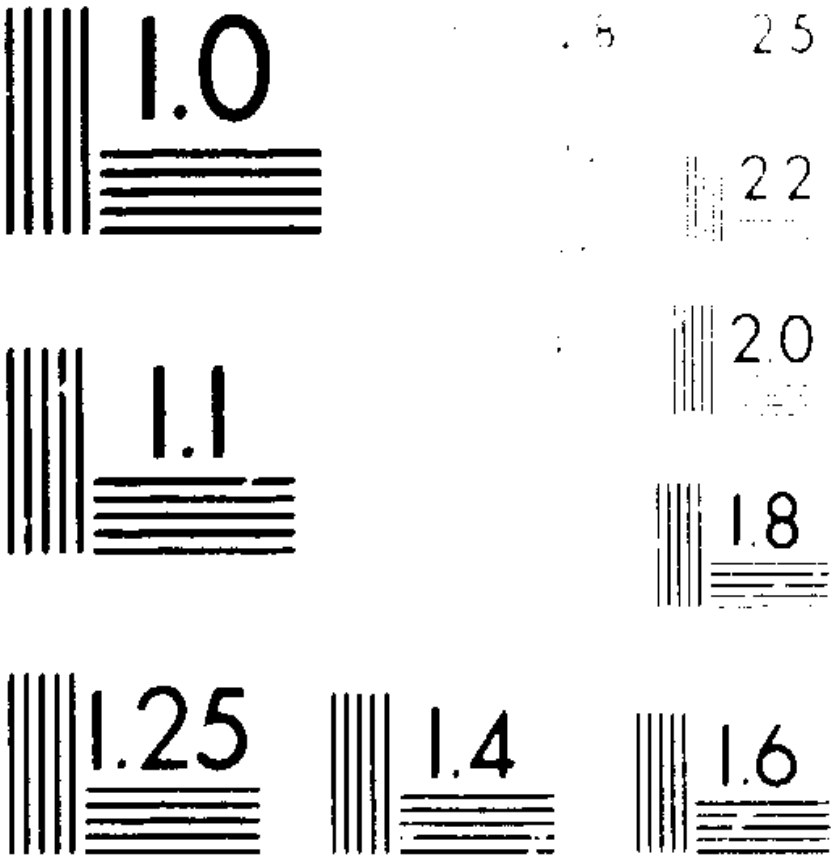
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February 1984

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ASSISTANCE TO THE NEPAL INSTITUTE OF STANDARDS

DP/NEP/77/001/11-52

Final Report*

by

Carl-Robert Ringstroem

Consultant in Planning and Organization of Testing Laboratories

* This report has been reproduced without formal editing.

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SUMMARY

This mission is the part of the project that is responsible for the planning and eventual establishment of a National Testing Laboratory. The need for a laboratory has been verified and its immediate and long-term requirements have been investigated.

An organization plan for a laboratory has been recommended and the difference specialized laboratories have been ordered by priority. The highest priority has been shown to be for the testing of agricultural products and other existing important industrial products.

A list of equipment for an operational laboratory suited for agricultural and other prevalent products has been compiled. It is kept within the limits of the existing funds of US$65,000 and it is selected so as to be up-to-date and of high quality.

It is estimated that this first part of the laboratory shall be functional within one year in temporary accomodation. The long-term development is figured to cost US$4 million (manpower not included) of which the instrument component is US$1.1 million. The total implementation is estimated at five years. Future needs are envisaged for specialized or more sophisticated equipment for about US$1 million.

I INTRODUCTION

1. Project Background

As mentioned in the Job Description (Annex 1), the Nepal Bureau of Standards (NBS) was originated by His Majesty's Government (HMG) by the Industrial Policy Act (2030) in 1974.

This UNDP/UNIDO project, Annex2, became operational when the CTA Peter Jones took office in April 1979. He left in May 1980 and he was not succeeded until 1 September 1981 when Mr. Santosh Sen arrived for a one year assignment. Then the project again waited over a year until this mission began. Shortly after Mr. Sen left, the then Director of the NBS, Mr. Indra Ratna Stapit resigned to attend to private business. Only half a year later the new Director was appointed, Mr. Dinash Raj Bhattarai. He came from the Bureau of Mines.

So far all the work has been devoted to the formulation of standards and to information about standards and standard certificates, which agrees with the immediate objectives of the project. The project document has as one of the output points a report on existing testing facilities and such which have to be established.

It is obvious that a National Certification and Marking System cannot operate without quality control and testing facilities. It is also easily understood that a testing laboratory is depending on calibration. This has been considered in the last project revision and the object of this mission has been to initiate a NBS National Testing Laboratory.

2. This Mission

This 3 month mission started with the arrival of the expert in Kathmandu on 11 November 1983. As Saturdays are the weekly holidays in Nepal, the first meeting with the Director of the NBS, Mr. Dinash Raj Bhattarai was on 13 November. He gave a short briefing and introduced the counterparts, Mr. Binod Bahadur Thapa, head of the Standards Formation Division and Mr. Uttam K. Kunwar, in charge of the project

for new buildings forthe NBS. He also introduced the counterpart Mr. Bishnu Rajbhandari. A large and comfortable office on the top floor in the temporary headquarters of the NBS in Dilli Bazar was allocated to the UNIDO project.

II FINDINGS

1. Present Organization of the Nepal Bureau of Standards

A chart of the present organization of the NBS is given in Annex 3. The number of assigned officers is 34 and 4 positions are vacant. Mr. Sen's project for staff strength in 1983-1984 was 38 officers.

2. Testing facilities in the possession of the NBS

Although the NBS has already approved some 300 standards and has received some 25 applications for quality certification marks from manufacturers, it does not as yet have any testing facilities of its own.

Three members of the staff have received quality control training abroad: 2 on UNIDO fellowships in Holland and one by SIDA in Sweden. No-one has been trained in testing.

3. External testing equipment

Testing facilities of a high standard for food are available in the Faculty of Agriculture of the Tribhuvan University and in the Royal Drugs Research Laboratory. They are not however readily available for external testing. Testing facilities for fibrous materials have not been found. For building materials there is an excellent tensile test machine and a universal Brinell-Vickers hardness tester in the Faculty of Engineering of the Tribhuvan University. A new metallographical laboratory and a chemical analytical laboratory for metals have just been inaugurated at the "Pilot and Demonstration Foundry Plant". All of these are available for external testing with no waiting.

4. Nepal Standards

An investigation has shown that 30% of the standards so far deal with food, followed in number by fibrous materials of an organic origin - wood, paper, textile, leather, bristle, third by number comes building and construction materials - concrete, metal and fourther technical products - soaps, dyes.

5. Industries in Nepal

A study of the Nepalese factories gave the same picture as for standards. Half the number of factories are connected with food production, followed by organic fibrous materials and building materials.

6. Funds

For the short-term development of a laboratory the following funds exist. UNIDO: DP/NEP/77/001/49-99 for 1984 equipment component US$ 52,994 and a Counterpart contribution in kind for 1983-1984 for equipment Rs 150,000 (about US$ 9,000) and for chemicals and other consumables Rs 50,000 (about US$3,000) which makes a total of US$65,000. The counterpart contribution is restricted to such items that can be purchased locally.

In addition, the counterpart provides the buildings for the NBS the value of which for the construction in the fiscal year 1984 is estimated at 1.4 million Rs. Of this Rs 175,000 (about US$12,000) are invested in the temporary headquarters for the laboratory. His Majesty's Government has allocated 6,000 m^2 of land worth Rs 1.2 million (about US$800,000) to the NBS for their new headquarters.

III DIFFICULTIES

1. Supplies

Although some agents and some chemical glassware are available from stock in Kathmandu, most agents, consumables and spare parts have to be replenished or acquired through tedious procedures from abroad.

The refilling of gas cyclinders with pressurised air, nitrogen, oxygen or hudrogen of analytical purity is difficult. For that reason it is better, where possible, to rely on air compressor, hydrogen generator etc., for the individual supply of gas for such instruments as gas chromatographs.

Liquid nitrogen or liquid air are not readily available so for the time being it is better to leave to the future items in need of a regular supply of such coolants etc., scanning electron microscope with Kevex analytical attachment.

2. Incompatible standards

Incompatibility in standards between East and West can impede the replenishment of consumables. Eastern-made stencils do not work on duplicators from the West because the pattern of the punch holes on the stencil is different from that of the fingers on the belt in a Western-made machine.

3. Lack of experience

There is no laboratory in the country that is accomodated in a building suitable for precision measurements i.e. that can be climate-conditioned to the necessary tolerances of temperature, humidity, vibration and dust. It is unlikely that anybody experienced in such matters is to be found in the country.

IV CONCLUSIONS

1. What can be done with existing funds

The amount of the exisitng funds is only about 5% of what is necessary to briefly equip a comprehensive national testing laboratory. It can however modestly equip a small specialized laboratory.

2. Priorities

For the industrial development in Nepal the top priority testing facilities are:

a) testing of food and products from agriculture and forestry;
b) calibration laboraotyr
c) facilities for specialized performance tests on commodities (pressure tests on tubes and pressure vessels)
d) materials testing (tensile strength and hardness)

V RECOMMENDATIONS

1. Short-term planning

It is recommended that the NBS laboratory is started with a small specialized unit of the following specifications:

a) meet the most urgent testing needs
b) can be established in a short time
c) can be made operational with existing funds
d) will serve a great number of customers from all over the country and thus give publicity to the NBS.

These specifications can be fulfilled by a small chemical laboratory with modern equipment for classical analysis, microbiology and basic testing of fibrous materials.

A list of equipment for such a laboratory suited for the testing of agricultural and forestry products such as food, textiles, and fuels has been compiled and is presented in Annex 4. When compiling the list care was taken that all equipment is up-to-date and selected so as not to become superfluous when the laboratory develops and an instrumental laboratory is added.

2. Long-term planning

a. Organization of the Laboratory

For the long-term planning of the NBS national testing laboratory, a draft organization plan of the laboratory was made and is presented as Annex 5. The laboratory could be divided in three divisions:

Division of Mechanics
Division of Chemistry
Division of Physics

b. Equipment

A list of equipment for the different laboratories has been compiled and is given in Annex 6. The total cost of basic equipment is US$ 1.1 million. The precision air-conditioning needed for some of the laboratories is estimated at US$ 200,000. Different kinds of supporting equipment like furniture, fixtures and fittings, connectors, stand-by power, pressure boosters, etc., are estimated at US$200,000. This gives a total cost for equipment of US$1.5 million.

c. Buildings

The costs of the buildings will be covered by His Majesty's Government. The buildings are estimated to have 4,000 m^2 working space for laboratories, a total of about 6,000 m^2 and render a cost of circa Rs 25 million (about US$1.7 million). The proposal of the Director Mr. Dinash Raj Bhattarai to temporarily accomodate the first laboratory in the administration building is very useful. It leaves time to appropriately design a final laboratory building with the assistance of an experienced expert on laboratory buildings. Possibly also to give a second thought to the choice of site.

Laboratory buildings must have the following qualities:

Flexible and easily adjustable to future needs;
Extendable to be able to grow as activity expands;
Fit for climatic conditioning i.e. on a robust foundation with walls of low thermal conductance and low humidity permeability;
The whole building, especially windows, doors, ducts etc., must be air tight enough to maintain a moderate overpressure, 1-2mm head of water, to prevent intrusion of dust and air of unsuitable temperature and humidity;
This overpressure shall be maintained in all parts of the buildings, even in not air-conditioned ones. The incoming air shall be made free from dust by filters before entering the fan.
Windows shall face directions with minimum solar radiation, i.e. facing north and to some extent south;
Building materials must not expel dust of evaporate fumes and shall not shrink or sag by ageing or by climatic variations;
All laboratory working space must be safe from floods and protected by lightening arrestors;
There must be a water resevoir covering not less than 4 days' consumption;
There must be a stand-by power generator for at least 50% of the total power load;
The regular electric power supply must have the ground accomplished by a third wire. The maximum permissable resistance between any connection point and absolute ground (earth) is one ohm.
There must be provisions to take care of poisonous refuse by destruction, neutralization or safe deposition and to purify and re-circulate used solvents.

To achieve this, consultations with an expert on laboratory building will be essential.

The site for the laboratory must be away from environmental influences such as:

vibrations and noise from airports, facotry, railroad or roads with heavy traffic;

smoke fumes or dust from industry, airport, railroad, major road, garbage disposal or incineration, sewer treatment plant, animal breeding farm etc.;

electrostatic or magnetic interference from power line, radio station, electric railroad, electrochemical industry, electric furnaces, electric welding etc.;

The land should have a topography that safeguards the drainage of water even in the heaviest rainfall;

The geological stratum of the land shall offer access to solid rock to support the foundations.

6,000m^2 of land for the laboratories, worht Rs 12 million (US$8,000,000) has been allocated by His Majesty's Government. It is situated by the Ring Road near the bridge over the Vishnumati River. This is a good place with respect to the accessability by road and power supply, however it is a disadvantage to be in the dust and vibrations from the big road. The land is flat rice land, four metres below the level of the road and consists of an estimated 10 m thick sediment of clay, which is not the best foundation for a laboratory.

d. Costs

In all, the costs of this phase of the establishment of the NBS National Testing Laboratory can be calculated as follows:

	US$ (M)
Basic Instruments	1.1
Support Equipment	0.4
Land	0.8
Buildings	1.7
Total	4.0

The manpower and training components are not included.

e. Assistance

At present no funds for the materialization of the given recommendations are available. There are different possible sources for the assistance to create a National Testing Laboratory. It is recommmended that His Majesty's Government seeks the assistance for a project for the purpose from UNDP/UNIDO.

f. Duration

The duration of the project should be at least five years.

g. Experts

The following experts should be consulted:

Expert in laboratory buildings	18 m/m
Expert in calibration	18 m/m
Expert in food testing	18 m/m
Expert in physical testing	18 m/m
Expert in electrical and electronic testing	12 m/m
Expert in materials testing and metallography	18 m/m
Expert in instrumental analysis	12 m/m
Expert in environmental testing	12 m/m
Expert in corrosion testing	6 m/m
Expert in textile testing	6 m/m
Total	138 m/m

The expert shall be consulted when needed in the following phases of the development of the laboratory:

In the planning of the building for each laboratory, the building expert and the pertinent technical expert;
In the procurement of the equipment, the pertinent consultant;
In the installation of the equipment and the instruction of the staff how to use it, the pertinent consultant.

This means that each expert has to come two or three times. It is advisable that when in the field the expert has at his disposal the use of a car.

h. Training

For each type of equipment one member of the staff should have three months' training either by the manufacturer or in an offficial testing laboratory abroad. Before going abroad he must have been trained by the expert and become used to the equipment and to the typical testing in Nepal.

The following training programme is recommended:

Food testing	3 m/m
Liquid and gas chromatograph	3 m/m
Spectrophotometry	3 m/m
Calibration	3 m/m
Electrical testing	3 m/m
Textile, paper, wood, leather and paints	3 m/m
Environmental testing	3 m/m
Strength of materials	3 m/m
Metallography	3 m/m
Corrosion testing	3 m/m
Total	30 m/m

VI FUTURE NEEDS

1. Equipment assemblies for performance testing

In pace with the approval of new standards and the granting of new licences for quality marks, new needs for performance testing apparatus and instruments to check the physical properties of commodities will arise. A list of envisaged performance testing equipment is given in Annex 7.

2. Non-Destructive Testing

With the increasing use of welding techniques in buildings, bridges, hydro-electric power plants, irrigation dams, etc., a need for non-destructive testing can be expected. A summary of equipment for non-destructive testing is given in Annex 8.

3. Improvement of Equipment

For various reasons, instruments that are usually found in modern laboratories are not included, e.g. a scanning electron microscope. A very important part of such an instrument is the Kevex attachment for elemental analysis. The attachment is dependant on a regular supply of liquid air which is not readily available in Kathmandu. Some very expensive instruments, available in other Nepalese Institutions, have for economic reasons been left for the future. Such instruments are: tensile test machine larger than 60 ton; fatigue testing machine and nculear magnetic resonance analyser (NMR). An x-ray difraction analyzer might be more in line with the future needs of the Bureau of Mines.

Other expensive instruments like equipment for the International Electrotechnical Commission IEC test F - vibration, IEC test Eb - bump, IEC test G - acceleration, mass spectrometer, elemental analyzer, differential thermal analyzer (DTA) may become needed after some time.

4. Cost of foreseen equipment

The cose of foreseen future needs can be computed as follows:

	US$
Performance Testing	70,000
Non-destructive Testing	65,000
Improvement of equipment	280,000
Supporting equipment	85,000
Extension of buildings	500,000
Total	1,000,000

ANNEXES

1. Job Description
2. Project Document DP/NEP/77/001
3. Chart of present organization of NBS
4. List of equipment. Short-term
5. Organization plan for National Testing Laboratory
6. List of equipment. Long-term
7. List of future performance testing.
8. List of future non-destructive testing equipment.

EQUIPMENT FOR THE NEPAL NATIONAL TESTING LABORATORY TO BE ACQUIRED IN 1984

An investigation has been carried out as to which exten testing facilities for steel and metals are available in other institutions until the Nepal Bureau of Standards Laboratory has been equipped for such testing.

It was found that equipment for the determination of carbon, sulphur, phosphorus and silicon in steel together with a complete metallographic laboratory having a metallographic microscope with Polaroid camera attachment, grinding machine, polishing machine and etching outfit is available in the "Pilot and Demonstration Foundry Project" in Lalitpur (DP/NEP/79/001).

A Brinell and Vickers hardness test machine, three compression test machines for soil and minerals and a universal tensile test machine are in the Faculty of Engineering of the Tribhuvan University. The tensile test machine has 100 ton capacity = 980 kN. On the highest range 0 to 200 ton each division of the scale is 100 kp. On the lowest range 0 to 200 kp the divisions are 2 kp. The machine has attachments for bend test, for compression test and cyclic load.

It has been reported that until the Nepal Bureau of Standards Laboratory has been fully equipped, similar co-operation with other institutions may solve acute testing demands in the fields of thermal and electric testing.

What concerns the calibration and the standards for the physical units, they are far beyond the reach of the present budget of this project.

In the first step to fit out a chemical laboratory for the Nepal Bureau of Standards, it is recommended that the following equipment is procured. It is selected to be of high standard and up-to-date and to be sufficiently comprehensive to make the laboratory operational for many tests particularly in the field of food chemistry. When making the list, it was taken into account that the following equipment is already in the possession of the Nepal Bureau of Standards:

Set of standard sieves 200 mm

It was also considered that the procurement of the following equipment is already in process:

Electronic multimeter	Caliper
Portable PH-meter	Refractometer
Electronic moisture meter	Kjelldahl apparatus
Micrometer set	

The cost of the equipment has been kept within the total sum of the UNIDO budget for DP/NEP/77/001/49-99 for 1984 of US$52,994 and a counterpart contribution in kind for 1983 to 1984 of Rs 150,000 (about US$9,000) for equipment and Rs 50,000 (about US$3,000) for chemicals and other consumables. The counterpart contribution is restricted to such items that can be purchased locally.

It is considered that the National Testing Laboratory for a long time will have to rely on the collaboration with outside laboratories having equipment that is not yet acquired in their own laboratory. To facilitate such collaboration and to reduce tardiness a small vehicle for the laboratory is recommended.

LIST OF EQUIPMENT - COUNTERPART CONTRIBUTION

ITEM	COST US$
Crushing tray. 300 mm of cast iron Pilot Foundry	75
Crushing hammer. 400g	10
Diamond mortar ø30 mm Hard steel	150
Iron mortar ø 150 mm	50
Mortar porcelain ø 50 mm	3
ø 115 mm	10
ø 250 mm	60
Pestle porcelain 115 mm	3
150 mm	5
250 mm	20
Mortar agat ø 40 mm	20
ø 100 mm	70
Pestle agat 50 mm	7
100 mm	25
Sieve brass ø 200 mm 0.1 mm 2 pc	100
0.25 mm 2pc	80
Cover to sieve brass ø 200mm	20
Bottom to sieve brass ø 200 mm	25
Vise 100mm	50
Saw for metal with 10 blades	15
File for metal 5 pc	10
Scissors for metal	10
Power drill. 2 gear and tyristor regulator ø 13 mm shuck	100
Stand for power drill	70
Set of hard metal drillsø2 to ø 12 mm	30
Machine vise 75 mm	30
Front nipper	5
Side nipper	5
Hand saw for wood 500 mm	10
Axe 400 g	10
Carving knife 100 mm	5
Chisel 15 mm	5
Pruning scissors	15
Common scissors 100 mm	5
Shopping board	3
Set of knives. Stainless steel 4 pc	10
Scalpel	3

ITEM	COST US$
Forceps. Stainless steel, blunt points 105 and 200 mm	7
fine points 105 mm	2
Meat mincer	20
Gas cylinder LPG 50 l with valve and butyl tubing	100
Bunsen burner for LPG 5 pc	55
Tripod 120, 210 mm 5pc	25
Triangle, Iron wire with porcelain tubes 10pc 40mm, 50 mm 60 70 mm, and 30 mm tube	10
Triangle, nickel wire with silica tube 3 pc. 40 mm, 50 mm and tube	10
Wire gauze, Nichrome 160 mm 2 pc	10
Wire gauze ceramic centre 10 pc	20
Nickle crucible with cover ø 30 mm, 40 mm, 50 mm 60 mm,70mm	35
Iron crucible ø 40 mm, 48 mm, 60 mm, 15pc	45
Crucible cover Iron ø 40 mm 48 mm, 60 mm	4
Crucible tong. Stainless steel 200 mm and 300 mm	7
Fume hood 1200 mm	2,000
Extraction apparatus. Soxhlet 70ml, 6pc	300
30 ml 2 pc	102
250 ml 2 pc	145
Extraction thimbles. Soxhlet cellulose Packages of 25	
ø 22 mm 8 pc	140
ø 26 mm 40 pc	720
ø 33 mm 8 pc	175
Hot plate. 400 mm or double heating plate	240
Gas analysis apparatus. Orsat	700
Reading glass ø 100 mm 2pc	30
Magnifier ø15 mm 10 pc (in folding metal mount)	10
Torch magnifier with measuring scale ø 30 mm 7 pc	16
Socket wrenches 3mm to 20 mm	25
Open wrenches 6mm to 20 mm	15
Hexagonal wrenches 6mm to 20 mm	25
Insex keys 11/2 mm to 12 mm	5
Screwdrivers 2mm to 12 mm	10
Instrument screwdrivers 1/2 mm to 2 mm	3
Cross screwdrivers, Philips 3 mm to 8 mm	10
Universal plier	10
Hipper	10

ITEM	COST US$
Polygrip	10
Adjustable wrench 20 mm	15
File	3
Small hammer	5
Spanner 40 mm	15
Measuring tape 3000 mm	10
Steel measure	5
Water level	10
Voltage indicator. Neon or LED	4
Electric circuit indicator. Batter buzzer	5
Miscellaneous	511
Total Counterpart Contribution	9,000

LIST OF EQUIPMENT - UNDP/UNIDO CONTRIBUTION

ITEM	COST US$
Weighing in balance. Electronic toploader Mettler PC220	1,375
Analytical balance. Electronic. Mettler AE163	2,750
Weighing scoops. Stainless steel 105 mm 3pc	30
Brush. Soft hair for weighing 3 pc	1
Spoon. Stainless steel 150 mm 2 pc	3
Powder spatula 150 mm Stainless steel 2pc	3
Double spatula. Stainless steel 150 mm 2pc	2
Water distillation apparatus 1 1/2 l/h Buchi Fondavapor 285	2,030
Wrist flask shaker for 8 samples. Beko-Grave	1,250
Extraction heating units. Gerhardt 6 units	910
Interchangeable top mould for heating units ø95 mm 2pc	26
Cooling water feed piece for Soxhlet	230
Rectangular water bath. Stainless steel 350mm 500 mm Kebo-Grave	200
Heating and drying oven 471 250° Kebo-Grave T5042	600
Muffle furnace 31 1100° Kebo-Grave M1100/1	1,370
Magnetic stirrer with heating. Witeg M7 300° with stirring bars	50
Manual piston burette Metrohm E274 5ml	50
10 ml	150
50ml	165
Spare burette tips 10 pc	
Precision conductivity meter Digital with recorder output	600
Standard electrode for conductivity meter 2 pc	220
Temperature compensation for conductivity meter	110
Recorder Servogar 120-20	600
Precision pH/mV meter Digital	735
pH electrode 2 pc	130
Redox electrode 2 pc	130
Digital stopwatch with big display	40
Flame photometer with filters, air compressor and gas cylinder	630
Tintometer Lovibond AF710	2,100
Small visual universal polarimter Schmiedt + Haensch with measuring tube 200 mm	2,000
Colorimter Digital Perkin-Elmer 35	1,890

ITEM	COST US$
Moisture Balance with infrared dryer and stainless pan (Mettler PC220 LP 15 B	2,650
Barometer Paulin. In leather case Graduated for Kathmandu altitude	620
Whirling Psychrometer with table for Kathmandu altitude Lamprecht 740/741 (Alternative: electronic dew point meter iwth peltier cooling)	240
Digital resistance thermometer pt. 100 o.1 K with probe AMR/2211-1	175
Meteograph Lambrecht 253 for Kthmdu altitude with recording paper for 5 years	1,050
Flash point tester, Pensky-Martens Herzog for LPG	805
Softening point apparatus Ring + ball method with hot plate	440
Sieve shaker Engelsmann JEL 200	1,400
Siever cover and sieve receiver	45
Melting point determination apparatus Buchi 9510	1,330
Heating device for melting point	185
Attachments for melting point	175
Incubator 481 Heraeus	560
Sterilizing oven Heraeus 4[illegible]	560
Stereomicroscope Zoom 10 to 100	1,000
Universal microscope for transmitted and reflected light	3,000
Polaroid attachment (camera) for microscope	300
Bomb calorimter with digital thermometer, bomb, quarts discs, tablet press and oxygen cylinder with valves and tubing	8,300
Tintometer Lovibond Mod E	2,100
Laboratory mill Wiley Intermediate	2,300
Ball mill with 4 jars 1 l and 5 l	1,200
Small vehicle Mitsubishi 6501 100 with roof rack	3,400
Miscellaneous	609
Total UNIDO Contribution	52,994

ANNEX 1

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

JOB DESCRIPTION

DP/NEP/77/001/11-52 /31.3.K

Post title Consultant in Planning and Organization of Testing Laboratories

Duration Three months

Date required As early as possible

Duty station Kathmandu, with possible travel within the country

Purpose of Project: To advise and assist His Majesty's Government of Nepal and the Nepal Institute of Standards (NIS) in matters of organization, operation and implementation of standardization, quality control and certification marking systems, and the planning and eventual establishment of test laboratories.

Duties: The expert will be a member of an international team attached to the Nepal Institute of Standards (NIS). Under the overall direction of the Chief Technical Adviser in Standardization (Team Leader/Project Co-ordinator) and in close co-operation with the staff of the NIS, the expert will be expected to:

1. review and assess the available testing facilities required for standardization and quality control activities in the light of the work programme of NIS;

2. review and assess the need for additional testing facilities that should be set up and prepare a plan for the same.

The expert will prepare a final report setting out the findings of the mission and his recommendations to the Government on further actionwhich may be taken.

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

Qualifications: University degree or equivalent in engineering, or applied physical sciences. Extensive experience in planning organization and operation of quality control and testing laboratories.

Language: English

Background Information: The Industrial Policy Order 1974 of His Majesty's Government of Nepal included provision for the establishment of a National Standards Body. However, it was not until 1977 that the National Council for Standards was formed. Later that year the Development Committee Act 2013 gave the organization semi-autonomous status under the Ministry of Industry and Commerce and the Nepal Institute of Standards (NIS) was duly formed.

The role of the NIS as an essential part of the infrastructure necessary for the orderly growth and development of industry, the economic exploitation and conservation of natural resources as a means of improving the quality of goods and life has been recognized by His Majesty's Government. However, due to lack of both financial and manpower resources, the practical implementation was delayed and international assistance from UNDP was requested.

The work of NIS is underway. Keeping in view the priority objectives of the country's development plans and the resources and technical capabilities presently available in the country, the first areas in which the present project will be active are:

1. Planning, programming and executing all activities relating to formulation and implementation of standards;

2. Establishment of a national certification marking scheme based on the standards produced by NIS.

3. To advise and assist in the assessment of testing facilities and planning of laboratories for the above work;

4. Organization and implementation of a public information and educational campaign to build up standardization and quality consciousness at all levels throughout the country.

The implementation of the programme will require the active participation of many Government and private organizations.

ANNEX 2

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of His Majesty's Government of

NEPAL

Project Title	: Assistance to the Nepal Institute of Standards-II	Duration	: 2 years
Project No.	: DP/NEP/77/001/A/01/37		
Primary Function	:		
Secondary Func.	:		
Sector	: Industry, Commerce, Power and Mining (Govt. Class)	(UNDP Class and Code):	Industry (35)
Sub-Sector	: Industry (Govt. Class)	(UNDP Class and Code):	Industrial Institution (3530)
Government Implementing Agency	: Ministry of Industry and Commerce	Executing Agency:	United Nations Industrial Development Org. (UNIDO)
Date of Submission	:	Starting Date	: June 1978
Government Inputs	: _____ (Local Currency) (In Kind)	UNDP Inputs	: US$259,500

R.B. Bhattarai
Signed on behalf of the Government of Nepal

April 20, 1978
Date

Authorized by H.Q. Koenig's cable 16265 (14.10.5.1978)
Signed on behalf of the Executing Agency

Date

Signed on behalf of UNDP

Date

PART I LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article 1, paragraph 1, of the Assistance Agreement between the Government of Nepal and the United Nations Development Programme, signed by the parties on _____.

The Government Implementing Agency shall, for the purposes of the Standard Basic Agreement, refer to the Government Co-operating Agency described in that Agreement.

PART II A. Development Objectives

The objectives of the project is to use standardization and quality control activities which are to be initiated and strengthened through implementation of this Project, for acceleration of industrial and economic development of Nepal. At the initial stage standardization and quality control activities are to be concentrated on the selected priority areas indicated by the UNDP Country Programme (1975-1980) based on the HMG Fifth Five Year Plan.

B. Immediate Objectives

1. To advise and assist Nepal Institute of Standards (NIS) in matters of organization and in carrying out activities in the field of standardization.

2. To prepare a programme of work of NIS based on priority objectives of the Fifth Five Year Plan and on the resources and the technical capabilities presently available in the country.

3. To set up and start operation of a national certification marking system based on standards produced by the NIS.

4. To organize and implement an educational and mass-media information programme aimed at building up standardization and quality control consciousness among industrialists, Government officials and the general public.

C. Background the Justification

The prospects for industrial development in Nepal appear to be favourable and the Government has fully recognized the need to promote industrial development and has put forward a New Industrial Policy, the objectives of which are as follows:

1. To bring about both quantitative and qualitative improvements in industrial production and productivity.

2. To create more industrial employment opportunities for absorbing the excess labour force engaged in agriculture.

3. To mobilize local capital, skill and resources to the maximum.

4. To be self-relaint in essential goods and daily consumption and construction materials within the shortest possible time.

5. To minimize regional economic imbalance

6. To improve the balance of payment position through increased exports and import substitution.

.../.

It is imperative that at least half of the indicated objectives depend considerably on the level of quality of locally manufactured products. Therefore standardization and nation wide system of quality certification may and should pay a decisive role in achieving these objectives.

In the proclamation of the New Industrial Policy, among the national institutions which were to be established to support implementation of the Government policy towards industrialization, the Nepal Institute of Standards was listed and its functions were outlined.

However due to the very limited number of adequately qualified and experienced personnel in the field as well as the lack of financial resources, implementation was delayed and international assistance requested from UNDP.

The Institute of Standards has already been formed and the office of the Institute also has been established recently. The actual preparation of national standards has, however not yet begun.

It is fully recognized that this work is to be thoroughly planned and organized. The programme of standardization and quality control activities will be based not only (priorities which derive from the development objectives of the country but also on thorough consideration of capabilities (including technical facilities and qualified personnel) that will have been available in the country in course of a decade, for its accomplishment.

The implementation of the programme of standardization will unavoidably require active participation of many Government organizations, primarily those directly responsible for the pursuance of the industrial policy of the Government.

The Ministry of Industry and Commerce is called to play a leading role in operating standardization and quality control activities not only because it assumes major responsibility for industrial development but also because it is entrusted by the Government with authorities such as the issue of licences for establishing industries, export/import licences etc, which will be used for the stimulation of application of national standards.

D. Outputs

The following outputs are expected to be produced during the project life which (ll facilitate the achievement of the project's immediate objectives indicated in Section B.

1. Technical report on organization and operation standardization system in Nepal will be prepared by the Chief Technical Adviser in three months after his arrival to the country.

2. Technical report on organization and operation of National Certification marking system including testing facilities available in the country and those to be established will be prepared by the Chief Technical Adviser in Six Months after commencement of his assignment.

3. Technical reports on programming and implementation of public information and promotional campaign for standardization and quality control will be prepared by the consultant on completion of his missions to the country.

.../.

D. Activities

It is expected that the following activities will be carried out during the project life.

1. A perspective national programme of standardization and quality control will be formulated in the light of the general perspective for economic and industrial development of the country with proper considerations given to the availability of financial, technical and human resources.

2. A practice of annual planning and budgeting of standardization and certification marking activities will be introduced and followed.

3. The preparation and promulgation of national standards will be started and carried on according to the priorities established by the National programme of standardization and annual plans of the institute.

4. A National Certification marking system will be set up and put into operation for the commodities specifically selected by the Standards Council.

5. A close co-operation will be established and maintained between all the Government, public and private organizations which can be involved in standardization and quality control activities organized and coordinated by the Institute of Standards.

6. Training programmes, seminars, lectures etc. will be organized by the Institute of Standards for professionals from industries, government and public organizations.

7. A nation-wide educational and public information campaign will be organized and carried on by the Institute of Standards in co-operation with the relevant Government agencies and organizations.

F. Inputs

The Government will provide office facilities and support personnel to the international staff assigned to the project, required to undertake their activities within the scope of this project. The Government will secure full-time employed counterpart personnel to be assigned to the project.

UNDP/UNIDO will provide the following international expertise:

Chief Technical Adviser on Standardization and Quality Control. He will be expected to advise and assist the institute in carrying out the activities of the project indicated in section E and he will assume over all responsibility for the implementation of the project towards UNIDO/UNDP.

Qualifications: University degree or equivalent in chemical or engineering technology. Extensive experience in a senior position in standardization and quality control activities at a national level. Knowledge of economic and managerial aspects of standardization and quality control is essential. Experience in developing countries is desirable. Duration 18 months. Date required June, 1973.

.../.

Expert on Information for Standardisation will undertake three split missions to the project of total duration 5 months (1 month in August/September 1978, two months in March/April 1978 and two months in September/November 1979) and will be expected to assist the Institute of Standards in organization and implementation of public information and education campaign on the subject related to standardization, quality control and certification marking. Exact timing of these missions would be decided later on discussions with the Chief Technical Adviser.

Qualifications: University degree or equivalent in mass-media information with experience in developing countries essential. Duration as indicated above. Date required as above.

Consultants: will be assigned to the project on an adhoc basis whenever a need arises for consultation on a particular problem of project activities primarily connected with carrying out certification marking and testing work.

Fellowship training programme will be arranged.

(UNIDO/UNDP will provide eight fellowships of study tour as well as training suitable for the Institute in different fields. The subject, place, timing and the duration etc. will, be decided latter on jointly by UNIDO/UNDP or the Chief Technical Adviser and the Director of the Institute.

Equipment: Reproduction and audio-visual equipment for total amount of 12,000 US Dollars will be provided to the project under UNDP funds. Also a vehicle will be provided to the project for a cost not exceeding 4,000 US Dollars.

G. Work Plan :

A preliminary work plan is given on the next page as a bar chart. A detailed work plan for the implementation of the project will be prepared by the Chief Technical Adviser assigned to the project in consultation with the Director of the Nepal Institute of Standards and with the chairman of Council for Standards. This will be done at the start of the project and brought forward periodically. The agreed upon work plan will be attached to the project document as an Annex -1 and will be considered as part of the document.

(H. Preparation of the Framework for effective participation of National and International Staff in the project

The activities necessary to produce the indicated outputs and achieve the project's immediate objectives will be carried out jointly by the national and international staff assigned to it. The respective role of the national and international staff will be determined by their leaders, by mutual discussion and agreement, at the beginning of the project, and setout in a Framework, for Effective Participation of National and International Staff in the project. The Framework, which will be attached to the Project Document as an Annex, will be reviewed from time to time. The respective roles of the national and International Staff shall be in accordance with the established concept and specific purposes of technical co-operation.

.../.

I. Institutional Framework

The decision to establish the Nepal Institute of Standards was taken by the Government of Nepal within the context of the New Industrial Policy which was promulgated in 1974. However due to certain reasons the materialization of the above decision was delayed till 1977 when the office of the Institute was established, the Director appointed and the Standards Council formed.

The Institute has semi-autonomous status. The council for standards, the governing body, is headed by one of the honourable members of the national planning commission. Its functions and legal position among other Government Institutions have been fully identified through the necessary Government orders, and have been published in Government Gazette. The Ministry of Industry and Commerce, however, is the link between HMG and the National Standards Body.

Under the present conditions existing in the country, the Institute of Standards will also play the role of central coordinating agency, which will plan finance, organize and direct Standardization and Quality Control activities, carried out by other concerned Government Organizations, besides formulation and processing of Standards for approval by the Council for Standards, publication of Standards, issuing of Quality Certificates etc. It is expected that at the initial stage of operation of the Institute, the following organizations will be directly involved in the standardization, certification marking activities, within the scope of their competence.

1. The Food Research Laboratory, Ministry of Food, Agriculture and Irrigation
2. Royal Drug Research Laboratory, Department of Medicinal Plants of the Ministry of Forest
3. Agricultural Projects Service Centre
4. Forest Resources Development Board
5. Industrial Services Centre
6. The Institute of Applied Science and Technology
7. Department of Electricity
8. Department of Housing, Building and Physical Planning
9. Research Laboratories of the Department of Mines and Geology
10. Department of Mint
11. Institute of Engineering
12. Institute of Agriculture
13. Institute of Medicine
14. NIDC, TTC and other Departments and Corporations under the Ministry of Industry and Commerce.

Special Agreements will be arranged between the above organization and the Institute of Standards in order to secure active and efficient participation of these organizations in standardization and certification marking activities. At a later stage of implementation of the project, similar agreements could be arranged with other Government and private organizations if their participation in standardization or certification work is required.

.../.

J. Pre-requisites

1. The Government will take all necessary action to secure timely preparation, approval and promulgation of the standards orders which is to serve as the legal, administrative and organizational basis for all standardization and certification marking activities in the country.

2. The Government will provide financial resources required for normal functioning of Nepal Institute of Standards and implementation of the approved programmes of its activities.

3. The Government will secure timely selection, preparation and release of the national staff who need training under fellowships provisions of the project document.

4. Nepal Institute of Standards will provide all the available information required for the implementation of this project, to the international staff assigned to the project.

The Project Document will be signed by the Resident Representative on behalf of UNDP and UNIDO assistance to the project will be provided subject to UNDP receiving satisfaction that the prerequisite listed above have been fulfilled or are likely to be fulfilled. When the anticipated fulfilment of one or more prerequisite fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

K. Future UNDP Assistance

It is anticipated that successful implementation of the present project will lead to a considerable development and expansion of standardization and quality control activities in the country which in its turn will create necessity to provide additional technical assistance to the Institute of Standards.

The requirements of future assistance will be determined by a joint UNDP/UNIDO mission in consultation with respective Government authorities as a later stage of the implementation of project.

PART III. Schedules of Monitoring, Evaluation and Reports

A. Tripartite Monitoring Reviews

The project will be subject to periodic review in accordance with the policies and procedures established by UNDP for monitoring project and programme implementation.

B. Evaluation

The project will be subject to evaluation in accordance with the policies and procedures established for this purpose by UNDP. The organization terms of reference and timing of the evaluation will be decided by consultation between HMG and UNDP and UNIDO (as Executing Agency).

C. Progress and Terminal Reports

The Chief Technical Adviser will produce his first progress report in a month after his assignment to the project. All the subsequent progress reports will be prepared after every six months of the project implementation.

The terminal report of the project will be prepared in accordance with the policies and procedures established by UNDP.

.../.

WORK PLAN BAR CHART

	1978 J F M A M J J A S O N D	1979 J F M A M J J A S O N D
Prerequisites		
1. Promulgation of the Standards Order (Gathen Mosh)	———	
2. Recruitment of technical staff of the Institute to be completed (as and when necessary)	———	
Activities (see "E" page 3)		
1. Preparation of perspective national programme of standardization	———	
2. Annual Plans and Budgets	1978 ———	continuous
3. Preparation of national standards	———	continuous
4. National certification marking system	Preparatory work	Operational
5. (a) Formation of the pool of the organization to be involved in standardization and Q.C.	Preparatory work ———	———
(b) Co-ordination of the activities		———
6. Training programmes of NIS	———	———
7. National educational and public information campaign	Preparation ———	Implementation ———
Inputs: (see "F" page 3)		
International Staff		
Assignment of CTA (11-01)	———	
Expert in Information for standardization (11-02)	(Aug/Sept.) 1st Mission	(Mar/April) 2nd Mission (Sept./Oct.) 3rd Mission

WORK PLAN BAR CHART (CONT'D)

Inputs (Cont'd)	1978 J F M A M J J A S O N D	1979 J F M A M J J A S O N D
Consultants (time and specialization to be determined later)		
Training		
1. Study Tours		
2. Fellowships Standardization and Food Products		
3. Standardization of Electrical Materials and Appliances		
4. Standardization of Construction Materials		
5. National Programmes of Q.C. and Certification Marking		
Equipment		
Reproduction and audio-visual equipment to be delivered by		
Outputs (see "D" page 2)		
1. Technical Report on organization and operation standardization in Nepal	———	
2. Technical Report on certification marking		———
3. Technical Report on Public information and education campaign	———	
UNIDO/UNDP Project Review Mission		———

PROJECT BUDGET COVERING UNDP CONTRIBUTIONS

(in US Dollars)

Country : Nepal

Project Title : Assistance to the Nepal Institute of Standards-II

Project No. : DP/NEP/77/001/A/01/37

		Total		1978		1979	
		m/m	$	m/m	$	m/m	$
10	PROJECT PERSONNEL						
11	Experts						
11-01	Chief Technical Adviser on Standardization and Quality Control	18	87,200	7	32,200	11	55,000
11-02	Expert on Information for Standardization	5	31,200	2	11,700	3	19,500
11-03	Consultants	10	63,000	4	24,000	6	39,000
11-99	Sub-Total	33	181,400	13	67,900	20	113,500
15	Internal Travel		950		350		600
16	Mission Costs		2,500		-		2,500
19	Component Total		184,850		68,250		116,600
30	TRAINING						
31	Fellowships	38	51,000	20 (1.240)	25,800	18	25,200 (1.240)
39	Component Total	38	51,000	20	25,800	18	25,200
40	EQUIPMENT						
41	Non-Expendable Equipment		16,000		12,000		4,000
42	Expendable Equipment		4,000		1,000		3,000
49	Component Total		20,000		13,000		7,000
50	MISCELLANEOUS		4,000		1,750		2,250
99	GRAND TOTAL		259,850		108,800		151,050

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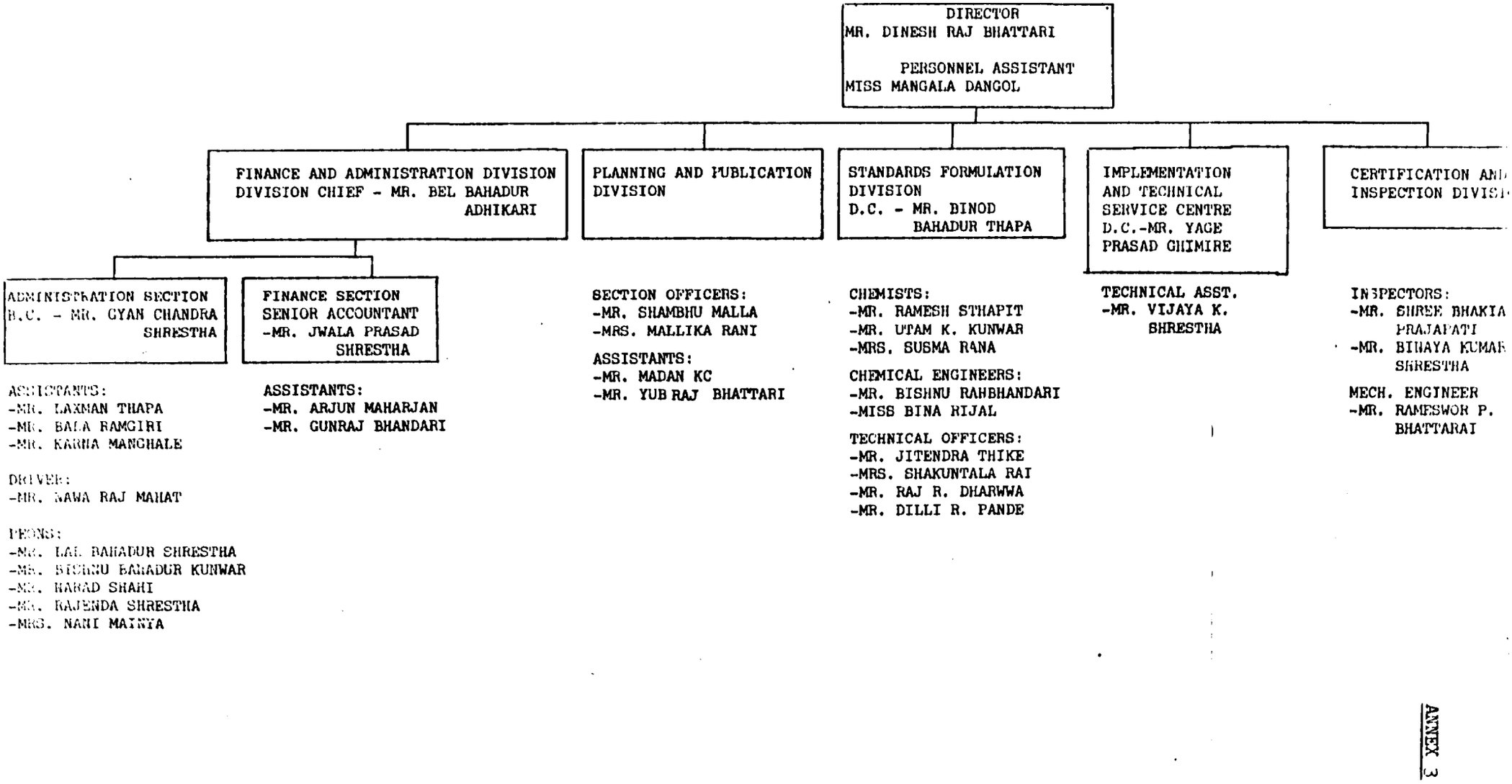

DIRECTOR
MR. DINESH RAJ BHATTARI
PERSONNEL ASSISTANT
MISS MANGALA DANGOL
FINANCE AND ADMINISTRATION DIVISION
DIVISION CHIEF - MR. BEL BAHADUR ADHIKARI
PLANNING AND PUBLICATION DIVISION
STANDARDS FORMULATION DIVISION
D.C. - MR. BINOD BAHADUR THAPA
IMPLEMENTATION AND TECHNICAL SERVICE CENTRE
D.C.-MR. YAGE PRASAD GHIMIRE
CERTIFICATION AND INSPECTION DIVISI
ADMINISTRATION SECTION
S.C. - MR. GYAN CHANDRA SHRESTHA
FINANCE SECTION
SENIOR ACCOUNTANT
-MR. JWALA PRASAD SHRESTHA
ASSISTANTS:
-MR. LAXMAN THAPA
-MR. BALA RAMGIRI
-MR. KARNA MANGHALE
DRIVER:
-MR. NAWA RAJ MAHAT
PEONS:
-MR. LAL BAHADUR SHRESTHA
-MR. BISHNU BAHADUR KUNWAR
-MR. HARAD SHAHI
-MR. RAJENDA SHRESTHA
-MRS. NANI MAINYA
ASSISTANTS:
-MR. ARJUN MAHARJAN
-MR. GUNRAJ BHANDARI
SECTION OFFICERS:
-MR. SHAMBHU MALLA
-MRS. MALLIKA RANI
ASSISTANTS:
-MR. MADAN KC
-MR. YUB RAJ BHATTARI
CHEMISTS:
-MR. RAMESH STHAPIT
-MR. UTAM K. KUNWAR
-MRS. SUSMA RANA
CHEMICAL ENGINEERS:
-MR. BISHNU RAHBHANDARI
-MISS BINA RIJAL
TECHNICAL OFFICERS:
-MR. JITENDRA THIKE
-MRS. SHAKUNTALA RAI
-MR. RAJ R. DHARWWA
-MR. DILLI R. PANDE
TECHNICAL ASST.
-MR. VIJAYA K. SHRESTHA
INSPECTORS:
-MR. SHREE BHAKTA PRAJAPATI
-MR. BIWAYA KUMAR SHRESTHA
MECH. ENGINEER
-MR. RAMESWOR P. BHATTARAI

ANNEX 3

ANNEX 4

EQUIPMENT FOR THE NE NATIONAL TESTING LABORATORY TO BE ACQUIRED IN 1984

An investigation has been carried out about to which extent testing facilities for steel and metals are available in other institutions until the Nepal Bureau of Standards laboratory has been equipped for such testing.

It was found that equipment for determination of carbon, sulphur, phosphorus and silicon in steel together with a complete metallographic laboratory having a metallographic microscope with Polaroid camera attachment, grainding machine, poloshing machine and etching outfit is available in the "Pilot and Demenstration Foundry Project" in Lalitpur. DP/NEP/79/001.

A Brinell and Vickers hardness test mechine, three compression test machines for soil and minerals and a universal tensile test machine are in the Faculty of Engineering of the Tribhuvan University, The tensile test machine has 100 ton capacity, =980 kN. On the highest range 0 to 200 ton each division of the scale is 100 kp. On the lowest range 0 to 200 kp the divisions are 2 kp. The machine has attachments for bend test, for compression test and for cyclic load.

It has been reported that until the Nepal Bureau of Standards Laboratory has been fully equipped, similar cooperation with other institutions may solve acute testing demands in the fields of thermal and electric testing.

What concerns the calibration and the standards for the physical units they are far beyond the reach of the present budget of this project.

In the first step to fit out a chemical laboratory for the Nepal Bureau of Standards it is recommended that the following equipment is procured. It is selected to be of high standards and up to data and to be sufficiently comprehensive to make the laboratory operational for many tests particularly in the field of food chemistry.

When making the list it was taken into account that the following equipment is already in the possession of the Nepal Bureau of Standards:

Set of standard sieves 200 mm.

It was also considered that the procurement of the following equipment is already in process:

Electronic multimeter
Portable PH-meter
Electronic moisture meter
Micrometer set
Caliper
Refractometer
Kjelldahl apparatus.

The cost of the equipment has been kept within the total sum of the UNIDO budget DP/NEP77/00149-99 for 1984 of $ 52994 and a Counterpart contribution in kind for 1983 to 1984 of 150 000 Rps about $ 9000 for equipment and 50 000 Rps about 3000 for chemicals and other consumables.

The Counterpart contribution is restricted to such items that can be purchased locally.

It is considered that the National Testing Laboratory for a long time will have to rely on the collaboration with outside laboratories having equipment that is not yet acuiired in their own laboratory. To facilitate such collaboration and to reduce tardiness a small vehicle for the laboratory is recommended.

List of Equipment

Counterpart Contribution

Item	$
Crushing tray. 300 mm of cast iron Pilot Foundry	75
Crushing hammer . 400 g	10
Diamond mortar. Ø 30 mm Hard steel	150
Iron mortar Ø 150 mm	50

Item	$
Mortar porcelain Ø 50 mm	3
Ø 115 mm	10
Ø 250	60
Pestle porcelain 115 mm	3
150 mm	5
250 mm	20
Mortar agat Ø 40 mm	20
Ø 100 mm	70
Pestle agat 50 mm	7
100 mm	25
Siev. Brass Ø 200 mm 0.1 mm.2 pc	100
0.25 mm 2.Pc	80
Cover to siev. Brass Ø 200 mm	20
Bottom to siev.Brass Ø 200 mm	25
Vise. 100 mm	50
Saw for metal woth 10 blades	15
File for metal . 5 pc.	10
Scissore for metal	10
Power drill. 2 gear and tyristor regulator.Ø 13 mm shuck	100
Stand for power drill	70
Set of hard metal drills/Ø2 to Ø 12 mm	30
Machine vise 75 mm	30
Front nipper	5
Side nipper	5
Hand saw for wood 500 mm	10
Ax 400 g	10
Carving knife. 100 mm	5
Chisel 15 mm	5
Pruning scissors	15
Common scissors. 100 mm	5
Shopping board	3
Set of knives. Stainless Steel 4 pc.	10
Scalpel	3

Item	8
Forceps. Stainless steel. Blunt points. 105 mm & 200 mm	7
Fine points. 105 mm	2
Meat mincer	20
Gas cylinder LPG 50 l with value and butyl tubing	100
Bunsen burner forLPG 5 pc	55
Tripod 120 ,, 210 mm .5pc.	25
Traingle, Iron wire with porcelain tubes 10 pc. 40 mm,50 mm	
60 mm, 70 mm and 80 mm tube	10
Triangle, Nickel wire with silica silica tube. 3 pc.40mm,50mm	
and mm tube	10
Wire gauze, Nichrome 160 mm.160 mm 2pc	10
Wire gauze ceramic center, 10 pc.	20
Nickle crucible with cover,Ø30mm,Ø 40mm,Ø50mm, Ø 60mm,Ø70mm	85
Iron crucible.Ø40mm,Ø48mm,Ø60mm, 15pc	45
Crucible cover. Iron Ø40 mm,Ø48 mm,Ø60 mm	4
Crucible tong. Stainless steel 200 mm and 300 mm	7
Fume hood. 1200 mm	2000
Extraction Appratus.Soxhlet 70 ml. 6 pc	300
30 ml.2 pc	102
250 ml.2pc	145
Fume Hood. 1200 mm	2000
Extraction thimbles. Soxhlet. Cellulose, Packages @ 23.	
Ø 22 mm 8 pc.	140
Ø 26 mm. 40 pc	720
Ø 33 mm . 8 pc	175
Hot plate. 400 mm.or double heating plate.	240
Gas cylinder LPG 50 i with value and butyl tubing	100
Bunsen burner for BPG 5pc.	55
Tripod. 120 mm 210 mm. 5pc	25
Traiangle. Iron with porcelain tubes. 40 mm. 50 mm 60 mm	
70 mm & 80 mm	5
Crucible tong. Stainless steel. 200 mm 2 pc	7
Gas analysis apparatus. Orsat.	700
Reading glass Ø 100 mm 2 x	30
Magnifier Ø15 mm 10x. In foldingmetal mount.	10

Item	$
Torch magnifier with measuring scale Ø 30 mm 7x	16
Socket wrenches 3 mm to 20 mm	25
Open wrenches 6 mm to 20 mm	15
Hexagonal wrenches 6 mm to 20 mm	25
Insex keys 1½mm to 12 mm	5
Screw drivers. 2 mmto 12 mm	10
Instrument screw drivers ½ mm to 2 mm	3
Cross screwdrivers.Philips 3 mm to 8 mm	10
Universal plier	10
Nipper	10
Polygrip	10
Adjustable wrench . 20 mm	15
File	3
Small Hammer	5
Spanner . 40 mm	15
Measuring Tape 2000 mm	10
Steel measure Water level	10
Voltage indicator. Neon or LED	4
Electric circuit indicator. Battery. buzzer	5
Miscellenous	511
Total Counterpart Contribution	---- 9000

UNDP/UNIDO Contribution

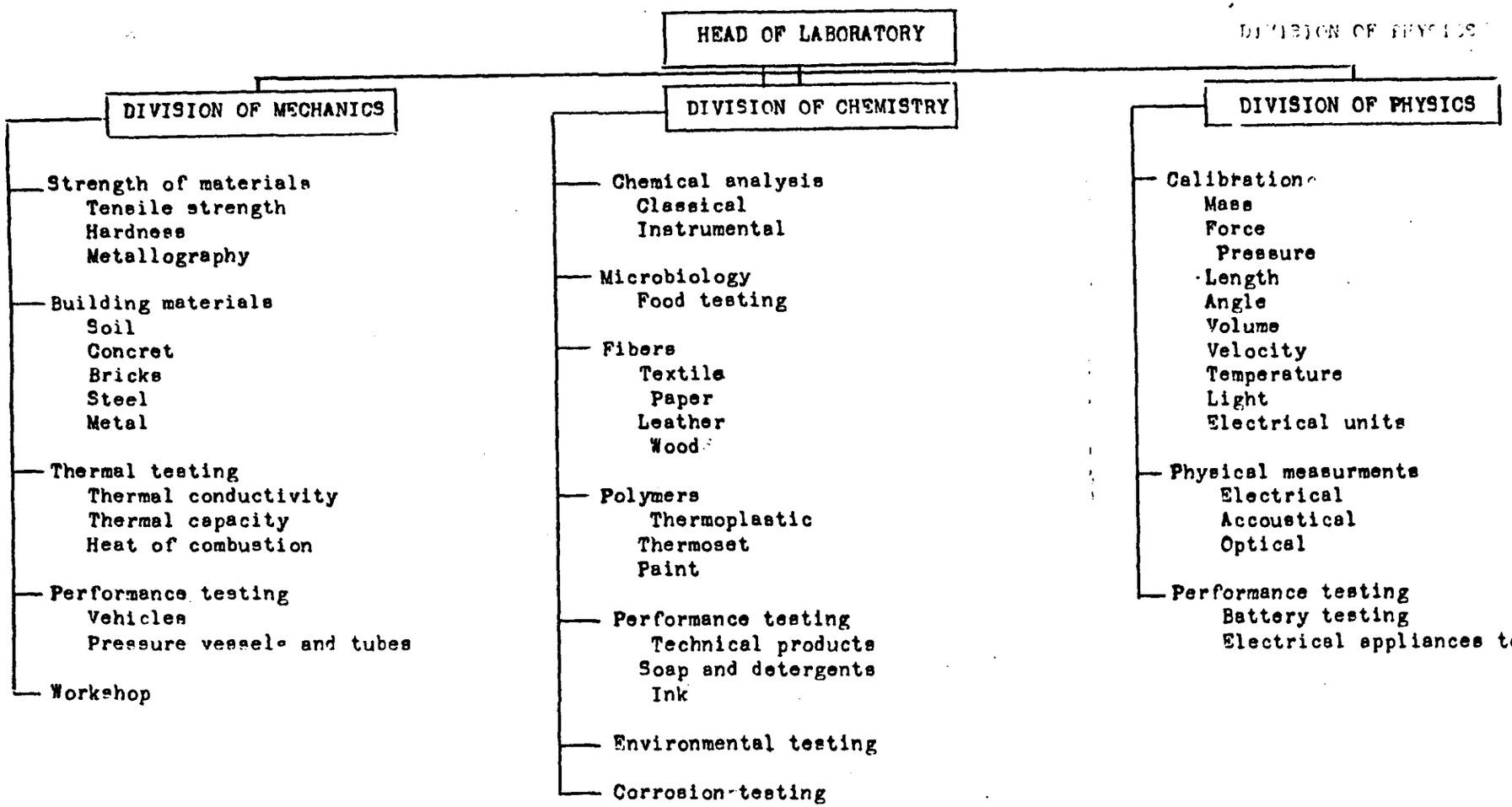
Item	$
Weighing in Balance. Electronic toploader. METTLER PC220	1375
Analytical Balance.Electronic .METTLER AE 163	2750
Weighing scoops. Stainlesssteel. 105 mm 3 pc.	30
Brush. Soft hair for weighing 3 pc.	1
Spoon. Stainless steel. 150 mm 2 pc	3
Powder spatula 150 mm. Stainless steel. 2 pc	3
Bouble spatula. Stainless steel. 150 mm 2 pc.	2
Water destillation apparatus. 1½ l/h. BUCHI FONDAVAPOR 285	2030
Wrist Flask shaker for 8 samples. KEBO-GRAVE	1250
Extraction heating units. GERHABDT 6 units	910
Interchangeable top mould for heating units.Ø95mm 2pc.	26
Cooling water feed pice for Soxhlet	230
Rectangular water bath . Stainless steel. 350mm 500 mm. KEBO-GRAVE	200
Heating and drying oven.47 1.250°. KEBO-GRAVE T 5042	600
Muffle furnace 3 l.1100°.KEBO-GRAVE M 1100/1	1370
Magnetic stirrer with heating .WITEG M ? 300°With stirring bars.	50
Manual piston burette. METRCHM E 274. 5 ml	150
10 ml	160
50 ml	165
Spare burette tips. 10 pc.	70
Precision conductivity meter. Digital with recorder output	600
Standard electrode for conductivity meter. 2 pc	220
Temperature compensation for conductivity meter	110
Recorder. SERVOGOR 120-20	600
Precision pH/mV meter. Digital	735
PH ekectride. 2 pc	130
Redox electrode 2 pc	130
Digital stopwatch with big display	40
Flame Photometer. With filters, air compressor & gas cylinder	630
Tintometer. LOVIBOND AF 710	2100
Small visual universal polarimeter. SCHIMIEDT+HÄNSCH with measuring tube 200 mm	2000
Colorimeter Digital PERKIN-ELMER 35	1890

Item	$
Moisture balance.METTLER PC 220 with Infrared dryer LP 15 B and Stainless pan	2650
Barometer, PAULIN. In leather case. Graduated for Kathmandu altitude.	620
Whirling Psychrometer . LAMERECHT L 740/741 with table for KTM altitude	240
Alternative: Electronic dew point meter with peltier cooling.	
Digital resistance thermometer.pt 100.0.1 K.with probe. AMR/- 2211-1	175
Meteorograph. LAMBRECHT 253. For Kathmandu altitude.With recording paper for 5 years.	1050
Flash point tester, Pensky-Martens. HERZOG. For LPG	805
Softening point apparatus. Ring and ball method. With hot plate	440
Sieve shaker. ENGELSMANN JEL 200 .	1400
Sieve cover and sieve receive	45
Melting point determination apparatus. BUCHI 9510	1330
Heating devise for melting point.	185
Attachments for Melting point	175
Incubator . 48 l. HERAEUS	560
Sterilizing oven. HERABUS 48 a	560
Stereomicroscope. Zoom. 10x to 100 x	1000
Universal microscope for transmitted and reflected light.	3000
Polariod camare attachment for microscope	300
Below are items of slightly lower priority:	
Bomb calorimeter with digital thermometer, bomb,quarts discs, tablet press and orygen cylinder with values and tubing	8300
Tintometer, LOVIBOND MOD E	2100
Laboratory mill. WILEY Intermediate	2300
Ball Mill with 4 jars 1L and 5L are balls	1200
Small vehicle MITSUBISHI 650 L 100 with roof rack	3400
Miscellanious	609
Total UNIDO contribution	52994

If the actual hotal purchase price deseend below this, the following aquipment should be considered for procurement;

~~Moisture balance METTLER PC 220 with Infrared Dryer LP 15 B and stainless steel pan~~	~~2650~~
Pyenometer,aircompression, BECKMAN MODEL 930	1300
Rotary Evaporator Buchi/R/A with waterbath W-240/N	1055

Proposed Organization Plan for National Testing Laboratory



ANEX 5

ANNEX 6

LIST OF EQUIPMENT. LONG TERM.

To make a functional National Testing Laboratory for the Nepal Bureau of Standards the following equipment is recommended:

ITEM		US $
INSTRUMENTAL ANALYSIS		
Liquid Chromatograph (LC), LKB, composed of:		
Components of primary priority:		
Pump with valves, 2150-102 to 2150-106		1870
Controller, 2152-002		3306
Sample injector, 2154-001 with mounting bracket		790
Column oven, 2155-002		3500
Gel permeation Column, 2135-230		675
Ion exchange Column		700
Reversed Phase Column, 2134-210		265
Rapid Spectral Detector, 2140 002		9640
Recording Integrator, 2220 002		3120
Connecting cable and pack of paper		125
Syringe, 2154-305		57
Syringe, 2154-310		57
	Total	24 105
Attachments of secondary priority:		
Electrochemical Detector 2143-002		2500
Refractive index Detector		2500
Computer interface, 2140-100		740
Floppy Disc, 2140-200		740
Computer, APPLE		2000
Solvent Conditioner, 2156-001, with Heium gas cylinder		1000
	Total	9480
Liquid Chromatograph,	Total	33585
Gas Chromatograph, PERKIN-ELMER, Sigma 115		16280
Attachments of primary priority:		
Pair of Detectors: Flame Ionization (FID) and Nitrogen/ Phosphorus (NPD)		6000
Air Cylinder with Regulator		650
Hydrogen Generator, 0023-0563		3200

Nitrogen Cylinder with regulator		650
Syringe, 1 microliter, with spare needle		100
Syringe, 10 microliter, with spare needle		100
	Total	26 980

Attachments of secondary priority:

Flame Photometric Detector (FPD)		3000
Hot wire Detector		3000
Helium Gas Cylinder with Regulator		650
	Total	6650
Gas Chromatograph	Total	33 630

Infrared Spectrophotometer (IR), PERKIN-ELMER, Model 1500 FT/IR		50 000
Necessary attachments and peripheral equipment:		
General purpose kit of liquid cells, 5100 7739		2500
Hydraulic Press, 15 ton, 5100-4599		1700
Multiple Internal Reflection (MIR) accessory, 0186-0382		1150
	Total	56350

Atomic Absorbtion Spectrophotometer (AAS), PERKIN-ELMER Model 5000 0047-08438		40 000
Necessary attachments and peripheral equipment:		
Zeeman Furnace Module		10 000
Solid sampling spoon kit		500
Pack of spare graphite tubes		580
Air Compressor, 0303-0314		1400
Acetylene Gas Cylinder, 1A, (8500 liter gas), with regulator 0303-0106		390
Nitrogen gas Cylinder with regulator, 0303-0264		650
Exhaust gas evacuation system		1300
Hollow Cathode Lamps: Ag,Au, Ca, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pt, W		4500
Electrodless Discharge lamps, As, Bi, Cd, Pb, Hg, P, K, Sn, Ti, Zn		4700
Double Power Supply		3100
	Total	67 120
INSTRUMENTAL ANALYSIS	Total	189 685

LABORATORY FOR FIBERS AND ALIKE MATERIALS

The laboratory has to be airconditioned to a temperature 18° C to 22° C and a relative humidity RH 63 % to 67 %.

Thermo- Hygrograph, LAMBRECHT	600
Microscopic Fibre Projector 100x, LORENZEN and WETTRE F82	2500
Universal Microscope with Ocular Scale	3500
Drying oven, 48 l	500
Quadrant Scale, 0 - 17.5 g and 0 - 50 g	320
Fibre identification dyeing kit	50
Measuring reel for yarn count	900
Twist counter,	1000
Counting glass	175
Flammability Tester	3500
Thermal Conductivity tester	2000
Weathering tester	15000
Flat Iron	20
Steam Press	1000
Universal Tensil Test Machine, ALWETRON TCT 20, 20 kN	20 000
Basic Measuring and Control System for Tensil Test Machine	20 000
Loadcells, 10 N, 100 N, 1 kN, 10 kN and 20 kN	6 500
Extensometer of pulse type, ALWETRON 065-178-4284	4000
Screw Clamps,open type, 15 mm, 065-463-0418 to 19, 50 N	640
Screw Clamps, open type 50 mm, 065-476-2419, 2 kN	640
Self locking Clamps for rope, 065-367-1665, 20 kN	910
Compression Plates 450x500 mm, 065-268-1329	2700
Bending Head Ø 15 mm, 065-464-1615	120
Rollers Ø 15 mm, 065-464-1607	100
Supports for rollers	170
Bursting Strength tester for textile	3000
Bursting Strength Tester for Paper,LORENZEN and WETTRE Code 04	3000
Elmendorf Tearing Tester with one Pendelum, LORENZEN and WETTRE	1100
Electronic Stiffness Tester, LORENZEN and WETTRE, Code 16 D	3500
Surface Wettability Tester, LORENZEN and WETTRE, Code 28	2800
Water Vapor Permeability Tester, LORENZEN and WETTRE Cod 45	2000
Static Friction Tester, LORENZEN and WETTRE Code 102	1000
Dynamic Friction Tester, LORENZEN and WETTRE, Code 103	1500
Precision Strip Cutter, LORENZEN and WETTRE, Code 142	360

Taber Abrasion Tester	3200
Smoothness and Porosity Tester, Digital, LORENZEN and WETTRE Code 131	3800
Launderometer	5000
Attachment for Dyeing test	1000
Total	118 105

PAINT LABORATORY

Fineness of Grind Gage, Stainless, GARDNER GR-2512	320
Pfund Cryptometer, Combined, GARDNER	500
Coating Thickness Gage, Digital, GARDNER Positector, metric	1150
Glossmeter, GARDNER Glossgard	1000
Colorimeter, GARDNER XL 805	2000
Ford Viscosity Cups No 2 and No 4, GARDNER, with stand VR 7215 and accessory kit VG 7208	340
Brookfield Viscometer, Digital, GARDNER VR-4845	2500
Total	7810

CALIBRATION

Masscomparator(Equal arm balance), 1 kg - 0.5 mg	4000
Masscomparator, 25 kg - 15 mg	6000
Electronic Precision Balance, 160 g - 10 microgram , METTLER AE163	3000
Electronic High Capacity Balance, 30 kg - 100 mg, SARTORIUS 3808MP6	3750
Weighing Platform 2000x4000 mm, 6000kg - 2000g, SAUTER EGS 6000	6700
Calibrated Masses, ORGANISATION INTERNATIONALE DE METROLOGIE LEGALE (OIML), 20 kg F 1 and 10 kg F1	600
Set of Weights 5 kg to 1 g, E 2	1000
Set of Weights 10 kg to 1 mg, F 1	1000
Laser Measurment System, HEWLETT PACKARD 5528 A	35 000
Mikrokator Comparator, CEJ 510-9, 6 micrometer : 0.1 micrometer	715
Comparator Stand, CEJ 513 B - 2	930
Triangular Straight Edge, CEJ 60 - 2	100
Parallell Jaws, CEJ 55 E	100
Holder, CEJ 61 - 2	50
Comparator Table for Measuring Tapes, 25 m with Standard Steel Tape, 25 m : 0.4 mm	15 000
Sets of Gage Blocks, CEJ M1 + M2 grade 00	10 000
Diabase Surface Table 600 mm x 600 mm, CEJ 8070 - 7	700
Precision Angle, CEJ DPV-1	100

Angle Gage Blocks, STARRETT WEBBER AG 11 LM	2000
Dead Weight Tester, 0.1 to 0.7 MPa, Gas. (1-7 Atm) BUDENBERG	1500
Dead Weight Tester, 0.1 to 55 MPa, Oil, (1-550 Atm), BUDENBERG	2500
High Pressure Pump, 60 MPa, 100 l/h	1000
Air Pump, 1 MPa, 100 l/h	500
Vacuum Pump 100 Pa, LEYBOLT	500
Water Manometer, 1000 mm Aq	250
Mercury Manometer, 600 mm Hg	200
Mercury Barometer 500 mm - 810 mm Hg, LAMBRECHT 610	1000
Mc Leod Compression Vacuum Gauge, Kammerer, 800 - 0.01 mPa ($80-10^{-4}$ Torr), BRAND	300
Precision Pressure Control Volumetrics	1600
Standard Manometers, 0.25 %, 0-1 MPa, 0-6 MPa, 0-60 MPa	450
Set of Calibrated Volumetric Flasks of glass with glass stopper, 0.1 %, 5-10-20-50-100-200-500-1000-2000 ml, 3 sets, DURAN	425
5000 ml, DURAN	25
Set of Calibrated Volumetric flasks of Stainless Steel, 0.05 % 5 l, 10 l, 20 l, 50 l, 100 l, FURHOFFS ROSTFRIA	5000
Volumetric Pipette, 0.5-1.0-2.0-5.0-10-20 ml, 3 sets, SILBERBRAND ETERNA	40
Graduated Pipette, 0.5-1-2-5-10-20-25 ml, 3 sets, BLAUBRAND	70
Measuring Cylinder, 5-10-25-50-100-250-500-1000-2000 ml, 3 sets DURAN Class A	100
Thermostated Oilbath 0° to 300° C	4000
Ice Bath	50
Refrigerator to make ice	500
Quartz Thermometer, -80° to 250°C ± 0°.04, HEWLETT PACKARD 2804A	4000
Universal Digital Thermometer, -250° to 2330C ±0°.1, with 8 different Thermocouples and with Pt 100 Probe, with output for recorder SYMETRA M 4201	3500
Recorder, SERVOGOR 200 - 01/32	2000
Optical Pyrometer, Digital, 0° to 2000°C, RAYNGER II Model R2LT and Model R2HT	4000
Calibrated Ribbon Lamp with Power Supply	2000
Thermometric Fixpoint, Tin Freezing Point, 231°,85, (231.85K)	1000
Optical Bench	3000
Standard Incandescent Lamps, 2 pc, with Power Supply	3000
Digital Photometer	500
Integrating Sphere, Ulbricht, 2 m	5000
Total	138 755

Direct Current Calibration Unit, FLUKE 7105 A	22000
Digital Multimeters with 4 shunts, 0.1 A to 100 A NORMA 05 135, 3 pc	7500
Precision Digital Wattmeter, NORMA 05 155	8700
Digital Power Factor Meter, YOKOGAWA 2524	2000
Oscilloscope, HEWLETT PACKARD 1727 A	10 000
Signal Synthesizer, Fluke 6010 A	4000
Power Supply/Amplifier, HP 6825 A	2400
Universal Counter Timer, FLUKE 1953 A	2000
Insulation Tester 1999 Megohm, NORMA D 3950	500
Gaussmeter, YOKOGAWA 3251	200
Electronic Fluxmeter, YOKOGAWA 3254	200
	Total 59500

STRENGTH OF MATERIALS

Universal Tensil Test Machine 600 kN (60 ton) TINIUS OLSEN	60 000
Sharpy Test Pendelum, TINIUS OLSEN	6000
Universal Hardness Tester, Brinell-Vickers-Rockwell, WOLPERT Dia Testor 2	9000
Standard Hardness Blocks	500
Test Specimen Cutter, TENSILKUT	6000
Test Specimen Lathe, TENSILATHE 505	20 000
Proving Rings for tension and compression, 50-500-5000 N PIAB KMR/6	5200
Proving Rings for tension and compression, 20 kN, 200 kN, 2 MN, PIAB MBM/3	18300
Testing Rack, 25 kN, PIAB MST 36 22 66	3000
Dynamometer, 5-10-50-200-500-2500 N, PIAB 122	5000
Dynamometer, 10-50-100-500 kN, PIAB 300016 to 300061	7600
Metallographic Microscope for brightfield and darkfield with Polaroid Camera Attachment, ZEISS IM 35	12300
Stereomicroscope, Rapid Magnification Change, Incident and Transmitted Light, ZEISS SR	2000
Fiber Illuminator with 3-armed goosneck guide, SCHOTT KL 1500	500
Wet Cutting Disc	500
Wet Pre-grinding Machine	500
Wet Plane Grinding Machine	800
Polishing Machine	800
Casting resin, Abrasives, Diamond Paste, Grinding Discs, Polishing Cloth	500
Etching Kit	500

Ageing Oven, 300°C, 50 l	500
Refrigerator, -300°C, 50 l, for brittleness-tests on chilled specimen	500
Total	160 000

ACCOUSTICAL MEASURMENTS

Sound Level Meter with Filter and Tripod, BRÜEL and KJAER 2230	4500
Portable Level Recorder, BRÜEL and KJAER 2306	3000
Sound Effect Generator, BRÜEL and KJAER 4205	2300
Accoustic Calibrator, BRÜEL and KJAER 4220	600
Total	1o400

WORKSHOP

Lathe 1200 mm x 300 mm	10 000
Lathe, 450 mm x 100 mm, EMCO Compact 8	2000
Milling Machine, 500 mm x 300 mm	12000
Drill Press, 30 mm x 500 mm	1000
Plane Scissor for Steel Sheet, 1.5 mm x 1000 mm	1000
Bending Machine for Steel Sheet, 1.5 mm x 1000 mm	500
Gas Welding and Cutting Kit with Gas Cylinders	500
MIG Welding Kit	1000
Hardening Furnace, 350x500x200 mm	2000
Mechanical Saw for Iron, 200 mm	1500
Electric Grinder, 200 mm	200
Bench-Vises, Wrenches and Hand-Tools for metal work	1000
Rules, Calipers, Squares, Angles, Bevel, Multimeters etc.	1000
Band Saw for Wood 200x500 mm	1200
Planer Machine, 250 mm	1000
Shaper Machine	1000
Belt Sander and Disc Sander	700
Paint Sprayer, 1 kW, with Spray Gun	600
Carpenters' Clamps and Hand-Tools	500
Total	37700

PERFORMANCE TESTING

Pressure test for tubes, pipes, gascylinders, pressure vessels		50 000
Tests for heaters, stoves, refrigerators		20 000
Tests for incandescent lamps, flourescent lamps, kerosen lanterns		15 000
Safety tests for electrical appliances		5000
High voltage tests for electrical appliances		10 000
Performance and durability of consumers'goods		10 000
Efficiency of corrosion protection coatings		2000
Efficiency of wood preservatives and water repellants		2000
	Total	114000

VELOCITY

Measuring Tape, Steel, 50 m		50
Photocell Units, (Lamp, Sensor, Amplifier), 10 ms, 2 pc		200
Reflector, 2 pc		6
Time Counter, 1 microsecond		500
	Total	756

ENVIRONMENTAL TESTING

Cabinet for Cold Test, (IEC Test A), 500 l		20 000
Cabinet for Dry Heat, (IEC Test B), 500 l		10 000
Cabinet for Damp Heat Steady State, (IEC Test Ca), 500 l		20 000
Cabinet for Accelerated Damp Heat, (IEC Test D), 500 l		30 000
Cabinets for Change of Temperature, (IEC Test N), 300 l		30 000
Vibrating Table, 400 kg, LORENZEN and WETTRE, Code 46		10 000
Drop Table, 75 kg, LORENZEN and WETTRE, Code 48 A		5000
	Total	125000

CORROSION

Humidity and Salt Mist Test Cabinet, GARDNER HR 3614, with Air Compressor, Air Pressure Regulator, Liquid Level Control and Reservoir Tank		20 000
Potentiostat, TACUSSEL Mod Bipad		20 000
Galvanostat, TACUSSEL Mod Corrovit		20 000
Recorder, SERVOGOR 200		1000
Portable Universal Recorder, Battery operated, YOKOGAWA Mod 3057, DC Sensitivity 1 mV, Speed 5 mm/h, 2 pc		1000
Earth Resistance Tester, 0.01 to 200 000 ohm, NORMA Mod D 3950		500
Analog Electronic Multimeter, Sensitivity 1 mV at 10 Mohm		200

Soil Electrodes, 1 pair Red-Ox and 1 pair non-polarizing	200
Reel with 200 m single conductor test cable, 2 pc	500
Total	

Grand Total 1 014 711

FUTURE PERFORMANCE TESTING EQUIPMENT

To meet future needs for tests on the performance of commodities the equipment for the following tests may be necessary for the Laboratory later on.

Item	$
Capacity test for starter batteries and dry cells	10 000
Testing household machines	10 000
Gas Calorimeter for LPG	10 000
Thermal Conductivity of building materials	10 000
Heat Flux meter	10 000
Accoustic properties of building materials,	25 000
Safety tests of vehicles	25 000
Safety tests on tools, ladders, hoists, machines and other equipment	25 000
Total	125000

FUTURE NONDESTRUCTIVE TESTING EQUIPMENT

When the roadnet in Nepal with big bridges expands and the hydroelectric power is exploited with heavy structures the need for the following nondestructive testing equipment can be envisaged,

Item	$
X-ray Radiography	20 000
Ultrasonic Testing	5000
Magnetic Crack Detector, MAGNAFLUX	10 000
Strain Gage Recorder	15000
Mobile Laboratory, Lorry with power generator	15000
Total	65000

FUTURE IMPROVMENTS OF EQUIPMENT BY EXPENSIVE ITEMS

The following equipment is left for the future because of its high cost. The list in Annex 6 is however made such that the acquisition of it will not duplicate any facilities. E.g. awaiting the Elemental Analyzer the Annex 6 has no Carbon in Steel Analyzer like a LENCO. Its price is about one third of an Elemental Analyzer but its use is restricted to determination of carbon in steel and not applicable for analysis of agrobased products.

Elemental Analyzer, PERKIN ELMER	30 000
Differential Thermal Analyzer, PERKIN ELMER	35 000
Scanning Electron Microscope with Kevex attachment, JEOL	120 000
Vibration Test, (IEC test F)	100 000
Bump Test, (IEC test E)	20 000
Total	305 000