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English

25 May 1985

14778

DPR Korea.

Metrological provision and evaluation of electrical measurements

DP/DRK/81/008/11-02/313K

DPR Korea

Technical report: Study and analysis of the existing situation with regard to electrical measurements of the Central Institute of Metrological Sciences.

Prepared for the Government of DPR Korea by the United Nations Industrial Development Organization, executing agency for the United Nations Development Programme

Based on the work of O.M.Pavlov, expert in metrological provision and evaluation of electrical measurements.

United Nations Industrial Development Organization

Vienna

1 EXPLANATORY NOTES

1. The average value of the Korean Won in terms of United States dollars during the period of the Project is as follows:

   1Won=0.39US $

2. Abbreviations used in the text:

   CIMS - Central Institute of Metrological Science.
   PIMS - Province Laboratory of Metrology and Standardization
   RD - Referece Device.
   SMS - State Metrological Service.
   MMS - Manufacturer of Metrological Service.
   AC - Accuracy Chart.
   SAC - State Accuracy Chart.
   LAC - Local Accuracy Chart.

2. ABSTRACT

The expert was attached to the CIMS in Pyongyang, DPR Korea DP/DRK/81/008/11-02/313 K. Duration of the activity is one month.

The duties were to:

1. Study and analyse the existing situation with regard to electrical measurements of the CIMS.
2. Develop and discuss measures for strengthening and developing existing facilities in the field of electrical measurements.
3. Advise on and assist in equipping the laboratory of electrical measurements, including selection of equipment, preparation of lay-outs and installation.
4. Select a list of equipment needed to supplement the existing equipment.
5. Use of existing material and equipment in the Institute for possible immediate assistance to the electrical measurements laboratory.
6. On-the-job training of the laboratory staff in the techniques of electrical measurements as the various items of equipment are installed.

The expert will also be expected to prepare a technical report setting out the findings of his mission and recommendations to the Government on future action which might be taken.

The Democratic People's Republic of Korea is at present in a phase of intensive development, especially in the industrial field.

The basic problems of Project are:

a) Development and improving the metrology and standardization

service of DPR Korea in the electrical measurement field; extension of field of operation of Metrology and standardization, which are very effective means to guarantee the measurements unity, to rise in quality control in the industry, to reduce the expenses on production treatment and manufacturing.

b)State supervision on development, embedment and maintenance of standards and specifications in appropriate fields of national economy.

c)State supervision on the measuring technique condition and measurement methods, which are used, and technological process control in branches of national economy.

d)State calibration of devices for Pyongyang district and reference devices for PLMS.

e)Carry out state tests of measuring instrument newly designed devices.

f)Carring out scientific research works for keeping and improving standards of physical quantities and reference devices.

g)Carring out repairing works with precision measuring technique for needs of CIMS and PLMS and carring out experienced models of devices developed by science departments of CIMS.

h)Carring out precision measurements for manufactures and Institutes for Scientific Research.Work regime of CIMS is one shift.

The basic conclusions are as follows:

1. UNIDO assistance is considered as an extremely important factor, especially in the field of metrological provision of electrical measurements.
2. The laboratory of electrical measurements have been organized.
3. The substantial increase number of the Reference Devices are also strongly desired for fulfilling the Project objectives to the full scale.
4. The parts of ordered equipment are received and put in to operation.
5. The laboratory personnel was trained in the techniques of electrical measurements as the various equipments are installed.
6. The laboratory personnel was trained in keeping and using of laboratory equipment.
7. The outputs achieved are basis for future developments in this field.

The basic recommendations are as follows:

1. The further development of the electrical measurements field for meeting the needs of national industry is recommended.
2. The purchase of the special equipment (see annex 3) for rigging up the laboratory should be approved by UNIDO for complete attainment of the Project Objectives.
3. For further development of this field of measurements, additional UNIDO assistance is necessary (expert assitance, special equipment purchase, training) amounting to US $ 160,000.

2.1 Table of Contents

2.2 Annexes

3. INTRODUCTION

3.1 Legal Context

This project document shall be the instrument referred to as such in Article I, Paragraph I of the Assistance Agreement between the Government of the Democratic People's Republic of Korea and the United Nations Development Programme, signed by the Parties on 8 November 1979.

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

3.2 Objectives of the Project

A. Development Objectives

On one hand to improve the quality of industrial products and to promote modernization in production techniques in all branches of industry through standardized measurements and laboratory testing methods based on higher precision measuring methods and means, and on the other hand increasing the export potential and volume, through improvement and stabilization of quality of products and matching them with the world market standards.

Since metrology is the basis of an effective standardization system as well, which is just as essential for industry to function efficiently, the status of the country's industrial standardization system should also be assessed.

B. Immediate Objectives

1. To provide metrology services for industry and comprehensive testing possibilities for quality certification and research testing; to establish within the organizational structure of the Central Institute of Metrological Science.

2. To strengthen existing laboratories in the field of electrical, with the necessary precise instrument.

3. To train national staff of the CIMS in the respective methods of metrological measuring techniques through training abroad as well as locally through courses, lectures and seminars by experts.

4. To strengthen research and development activities in the field of precise measurements.

5. To prepare a series of normative documents in various fields of metrology and establishment of respective systems with particular attention to industry's needs and strengthen co-operation with industry in this regard.

6. To improve the integration of efforts between the CIMS, industry, universities and associated state bodies and institutes.

3.3 Special Considerations

The achievement of the objectives of this project, as a consequential direct result, will improve the productivity of the whole national industry, and in the long-term make the country fully self-sufficient in metrological assurance.

Secondly, the Central Institute of Metrological Science (CIMS), once having become fully equipped and operational, will represent a source of experience which would then be available to other developing countries under the programme of ECDC/TCDC sponsored by the UNDP within the framework of the respective country programmes.

3.4 Background and Justification

A well functioning metrological service system is of paramount importance to manufacturing industries everywhere since it is the basis for achieving desired product

quality standards as well as production efficiencies and the Democratic People's Republic of Korea with its well developed and diversified industies is no exception. The metrological system in the country, however, is lagging behind that of industry's requirements in providing vitally needed precise measuring and instrument certification services. The Government has recognized this shortcoming and it is its intention to bring the level of metrology in the country to the desired level as soon as possible.

The institution charged with the responsibility for providing metrological services as well as being the centre for metrology in general is the CIMS. Strengtening its capacities in specific areas of metrology, as requested and specified by the Government, is the overall objective of the project. In line with the above, the Government has recently decided to transform the Institute into a National Centre having the additional responsibilities for carrying out metrological research activities and producing precision measuring instruments needed within a countrywide overall Metrological Service System.

The metric system was adopted by the Government as the nation's legal system of measurement in all commercial and technical activities in 1946. Later in 1975 SI units were adopted.

Metrological support to the DPR of Korea's national economy is regulated by standards (rules of legislative metrology). There are presently only about 60 national standards ensuring the uniformity of measurements in the country.

Within the country, each province has a metrological centre which is under the guidance and supervision of the CIMS. At present the CIMS as well as the centres in the provinces are not in a position to provide proper verification and clibration services and testing in industry due to the lack of basic precise measuring equipment and properly trained staff.

After finalizing the second phase of the project, which would be connected with the creation of the national standards in basic fields of measurements, the CLMS could be responsible for the following activities:

- providing standards and reference standards measuring instruments in the country for certifying dimensions of physical measurement units with the necessary accuracy.
- development of reference calibration schemes in all the main fields of measurements.
- development of rules and regulations for legislative metrology, measurements and methods for transferring physical quantity units from certified standards to working measuring instruments.
- development of precise methods of measurement and the corresponding measuring instruments for scientific research work and generating standard reference data.
- instrument calibration and checking activities.
- certification of the quality of industrial products, testing of new measuring instruments and methods.
- training of the national metrological staff.
- methodical guidance to the metrological organizations that function in enterprises.
- international co-operation in the field of metrology and metrological technology.

The Government, taking into consideration that the National Metrological System does not meet the requirements of industry in metrological assurance, being fully aware that the introduction of an accurate system of measurements within the industry is one of the basic preconditions for progress in industrial efficiency, asked for UNDP assistance in this field in the 1982-1986 Country Programme.

In addition to the present project, the Government may request UNDP/UNIDO assistance for further strengthening and development of the above activities in a follow-up phase during the Second Country Programme period.

4. MAIN ACTIVITIES

The expert arrived in Pyongyang on 13 May 1985 (from Vieena on 6th of May 1985) and started his work in accordance with the Job Description (see Annex 1). Work Programme was prepared jointly with the Deputy Director of CIMS Mr. Kim Sang Rok and the Duputy National Project Manager Mr. Kim Gwang Ho (see Annex).

4.1 Meetings

The meeting with the Duputy Director of CIMS Mr. Kim Sang Rok, the Deputy National Project Manager Mr. Kim Gwang Ho and representative of the ministry of Foreign Trade, Mr. Ko zu chol was organized on 14 May 1985.

Then I had several meetings with Mr. Kim Sang Rok and Mr. Kim Gwang Ho again.

On the 14th of May 1985 I also had meeting with the Resident Representative of the United Nations Development Programme (UNDP) Mr. S. Ristic and his staff.

Then on the 16th of May 1985 I had meeting with Director of CIMS Mr. Kim Hi Sang and his staff. Here the main objectives of the Project were discussed and the ways of how to reach them were considered. I got acquainted in all possible details with the implementation of the Project, with exisiting and possible problems and with achivements as well.

Further I considered a number of probleme in the frame of this Project (see Annex 2) together with Duputy Director Kim Sang Rok, Deputy National Project Manager Mr. Kim Gwang Ho, Chief of the electrical measurement department, Mr. Pak Hyong Pal, senior enginner Mr. Choe Yun Jong and others.

Several meetings and visits, such as visits to Instrumentation Plant in Taean and PLMS in Sinuzu were also organized.

4.2 Finances

The Government Contribution is granted.

5. Main outputs

The following Project activities are finished by the National Project Personnel:

a) State-of-the-art study in the field of metrology and standardization is recommended.
b) Laboratories staff is trained in precise measurement technique, in testing and carring out quality control.
c) Some drafts of needed technical documentation for keeping and using the reference devices are prepared.
d) Received devices are mounted and brought in to operation.

6. BODY OF THE REPORT

Chapter I

A. Analysis the present state at electrical measurements field of CIMS

Electrical measurement laboratory of CIMS consists of six sections, which occupy six rooms, the whole square is 180m². The number of laboratory personnel is 25.

Ambient temperature is supported at 20 ±2°C during the year.

a) Section of d.c resistance devices and calibration standard cells occupy one room of total square of 36m².

There the next equipment are:

1) 24 electrical resistors for range 10^{-4}-$10^{6}\Omega$ among them:

nominal Ω	type	number	accuracy %	manufacture
10^{-3}÷10^{3}	2792	5	0.005	Japan, Yokogawa
10^{-4}; 10^{-3}; 10^{4}; 10^{5}; 10^{6};	"	5	0.01	"
10×10	"	1	0.03	"
10×10^{2}	"	1	"	"
10×10^{3}	"	1	"	"
10×10^{4}	"	1	"	"
10×10^{5}	"	1	"	"
10^{-2}; 10^{-3}	P 310	2	0.02	ЗИП, SV
10^{1}; 1; 10	P 321	3	0.01	"
10^{2}; 10^{3}; 10^{4}; 10^{5};	P 331	4	0.01	"

2) The d.c standard bridge type 2768, one manufactured by Yokogawa, Japan. Relative accuracy is 0.02 - 0.05% for elecurical resistance 0.1Ω-11kΩ.

3) The d.c double bridge type 2752,one manufactured by Yokogawa, Japan. Relative accuracy is 0.03 -0.05% for electrical resistances 10^{-1}Ω - 11kΩ

4) The resistance comparator type T/2772-61, one, manufactured by Yokogawa, Japan. Relative accuracy is 0.005% for electrical resistances 10^{-4}Ω- 10^{6}Ω. Correlative of the bridge arms are 1:1 and 1:10

5) Thermostated oil bath type 9730CR, one, manufactured by Guildline, Canada. The constancy of temperature ± 0.003°C.

6) Standard cells type CSC- 1, 3 pieces, firm Simadz, Japan. Instability for year -- 20μv.

7) Thermostated oil bath type 9732VT, one, firm Guildline, Canada. The constancy of temperature ± 0.00° °C.

8) D.C six-dial potentiometer type P348, one, firm ЗИП, SU . Relative accuracy is 0.002 with the range 20mV -0.211111 V.

9) D.C potentiometer type P 355, one, firm ЗИП,SU. Relative accuracy is 0.005-0.5% with the range from 0 to 1500mV.

b) Section of calibration d.c and a.c voltage and current devices occupies one room,which square is 36m^2.
There the next equipment are:
1) D.C calibration setup type Y302;one, firm ЗИП,SU. Calibration accuracy 0.02%. This setup provides the calibration voltmeters with the range 3 -450 V; ampermeters with the range 0.1- 20A.

2) A.C calibration setup type T/2558; one, firm Yokogawa, Japan. Calibration accuracy 0.08% with the range 0.1-600 V, ampermeters with the range 0.1- 50A.

3) D.C calibrator type T/2552, one, firm Yokogawa, Japan. Calibration accuracy ± 0.005%, with the range 1mV-1000V.

4) The digital mulitimeter type 2501A, two pieces, firm YOKOGAWA Japan.

D.C. to 1000V accuracy 0.002%
A.C to 600V accuracy 0.05-0.5%

At frequencies from 40 Hz-100kHz.
Electrical resistances from 100Ωto 100MΩwith relative accuracy 0.003- 0.1%.

c) Section of electrical inductance occupies one room, which square is 18m².

There the next equipment are:

1) 4 electrical inductance measures for the range 100μH-100mH among them.

nominal	type	number	accuracy %	firm
100μH	RS-102	1	± 0.25	ANDO, Japan
1mH	RS-10y	1	± 0.1	"
10mH	RS-106	1	± 0.1	"
100mH	RS-108	1	± 0.1	"

2) The a.c digital bridge for measurement LCR type AG 4301, one, firm ANDO, Japan. Relative accuracy is ± 0.2%.

d) Section of calibration electrical power and energy devices occupies the room, which square is 36m².
There the next equipment are:

1) The standard meter of three-phase current type FLS-101, one, firm Sibaura, Japan. Accuracy is ± 0.2%.

2) The setup for a.c energy calibration of three-phase current type FB 3004, one, firm Key Hin, Japan. Accuracy is ± 0.2%.

3) The set up for a.c energy calibration of one-phase current type FB 3002, one, firm Key Hin, Japan. Accuracy is ± 0.2%.

4) The standard digital power converter type 2885, two, firm Yokogawa, Japan. The range of measured currents is to 10A and voltage is to 300V at frequency 45-450Hz, accuracy is ± 0.02%

e) Section of magnetic material testing occupies the room which square is $18m^2$.

There the next equipment are:

1) D.C magnetic hysteresis loop trace type 3257, one, firm Yokogawa, Japan. Relative accuracy is ± 0;5%. Measuring range : ± 1×10^3 - ± 1×10^8 Maxwell turns/cS.

2) 13 standard magnetes for the range $2 \cdot 10^2 - 2 \cdot 10^4$.

nominal Gauss	type	number	accuracy %	manufacture
10^3 ; $5 \cdot 10^3$; 10^4	MKS	3	± 0.01	Smitomo, Japan
$2 \cdot 10^2$; $5 \cdot 10^2$; 10^3; $2 \cdot 10^3$	MKS-550	5	± 0.2	"
10^4 $1.5 \cdot 10^4$; $2 \cdot 10^4$	"	2	± 0.5	"
$3 \cdot 10^3$; $4 \cdot 10^3$; $5 \cdot 10^3$;	MKS-750	3	± 0.2	"

F) Section of time and frequency occupies the room which square is $36m^2$.

There the next equipment are:

1) The frequency meter type AB-2104, one, firm Ando, Japan. Measuring Range: 10 Hz - 1000MHz. Constancy is $\pm 5 \times 10^{-8}$.

2) The a.c. standard calibrator type GH-111, one, firm Tokio-genna. Measuring Range: 1Hz-10MHz Constancy is $\pm 5 \times 10^{-8}$.

B. The list of primary calibration devices which can't be calibrated in DPR Korea.

There are the next primary calibration devices at CIMS, which must will be calibrated in the SU or other countries:

1) 10 electrical resistors for the range 10^{-4}-10^6 Ω;

2) Standard cells-4pieces;
3) 4 electrical inductance measures for the range 100μH-100mH;

6.2 Chapter II

A. Installation and put in operation the equipment, which were recieved in accourdance with Project.

16th May 1985 the next equipment was supplied at electrical measurement laboratory of CIMS:

a) The magnetic field meter type MG-5D, one, firm Amekc, USA.
b) The d.c. potentiometer type 5590 C No 244608A with next the accessory:
   1) Controller type 5750CS No 245433
   2) Power supply Unit No 245704
   3) Nanovoltmeter type 6050 NO 246537
C) Controlled Cell Batteries, four, No 112, 113, 114, 116 with BCS calibration of the BS23ES cells Nos. 02466, 02464, 02463, 02465.

This equipment was used for intensification the sections:
a) D.C. resistance devices and calibration standard cells section.
b) Magnetic material testing section.

The equipment, which was recieved in accourdance with Project, was installed in the appropriate calibration sections, tested in the operation, checked up and calibrated.

The equipment which was recieved in non-operate condition, must be replaced or repaired.
(see Annexes 4.5)

6.3 Chapter III

A. The training of personnel at electrical measurements field in presicion measurement technique.

The laboratory specialists were suggested to use the next accuracy parameters:

-confidence interval where the metering accuracy is distributed with known probability;
-interval, where the bias error is distributed with known probability;
-numerical characteristics of bias error
-numerical characteristies of accidental error
-distribution function (density of probability) of bias error
-distribution function (density of probability) of accidental error.

The next ways of expression the metering accuracy were recommended too:

-confidence interval, where the combined error is distributed with known probability;
-confidence interval, where the bias error is distributed with known probability;
-standard approximation of distribution function of accidental error;
-standard deviation of accidental error;
-standard approximation of distribution function of bias and accidental errors, and their standard deviation
-distribution functions of bias and accidental error.

In addition to that the selection of the way is definited by the measurements assignment and the character of using their results, and it is regulated by the appropriate standard technical documents.

B. The requirements to the rooms of precison measurements laboratory.

The lab's room must Be so large to dispose control-measurement devices and to provide a field for disposition of auxiliary apparatus (ancillary equipment), shelvings for

devices and air condition installations.

The room's external wall must be situated at the northward of the building, and the windows must be double.

The diffuse artificial illumination about 300lx by fluorescence lamps provides for each working table. The tenfold illumination must be provided for the most precision measurements. It may be achieved by additional illumination.

As concerns the windows, it is need to bear in mind not only illumination but the temperature too.

It needn't forgot that the thermal convection with the external medium at one square meter of the double window equals at an average the two-fold quantity of the heat, which passes through the onter wall with 38cm thickness. This inder grows up to 4,5 times if the window has a single frame.

As the coolness curve defines as exponent function, the difference between outer's and room's temperatures is more important.

For precise measurements the temperature constancy is especially important.

The temperature 20±5°C is acceptable, as to cycle during which the temperature variation must be took into account, it must be equal to 24h.

If the air condition installation is used, the temperature and humidity may be contained into the established ranges.

Process of passing of higt precision measurements, besides of all another, requires that compulsorily stratified air areas with different temperatures are absent, that heated air not lifts dust and that current of air not affects personnel health.

It goes without saying the entrance into the lab's rooms through the tambour and suitable isolation of the walls, ceiling and floor. Tightly parqueted is the best payment for the floor.

The laboratory must be rigged with safe earth loop, which is free from earth current.

Preferably all heat radiated devices (transformers, rheostats, shunts etc.) despose above precise measurement devices such a way to exclude an influence of radiated heat upon the measurements.

The measuring laboratories in more degree than others needs with spechial trained personnel to guarantee the optimum use of control-measuring devices and the carring out the measurements with high accuracy.

For working in such a laboratory the persons with a gentle temper, application, punctuality, manifold development, capability to quick-witt the mind, critical manner in problem decision, perseverance and persistence are needed.

It is known from practical experiment, that monotonous, frequently repeated measurements better realized by women, at the same time men prefer to realize different tasks, which offers new problems.

The learning of error theory is so essential as an ability to turn with figures. The employee of measuring laboratory must be able to work out a document about passed test. This document have to comprise the next data; place and time of the test, temperature, designation of the device, which was used for testing, name of the surveyor etc.

6.4 Chapter IV

A. Draft of technical instruction about keeping and use of national standards.

The standards are kept, studied and used in compliance with approved rules for keeping and use standards and the demands of national accuracy chart.

The results of comparison, calibration and examination of the standard carries in the suitable standard working register and the standard passport.

Standard working register must be kept with suitable standard.

. Standard working register must be kept with suitable standard.

The verification certificate of DPR Korea standards, which are received from BIPM or National Metrological Institutes of other countries, muste be kept with suitable standard too.

When standards of other countries are compared with DPR Korea standards, it must be done officially with verification certificate, where the results of comperison are pointed out:

The head of institute, which keeps the standard and the scientific standard keeper responsible for sticking to rules of keeping and use the standard.

Specific incidents with the standard must be fixed in the standard working register. In addition to that the cause and character of incident mast be ponted out (indicated) and preliminary conclusion about needed action for supporting standard's safety must be done.

The rules for keeping and use of standards must contain the next chapters:

1) Composition, appointment and place for keeping the standards.
2) The conditions of keeping and use of standards
3) The use of standards:
    a) calibration interval for working standards;
    b) procedure of propagation of national standards and working up the results of measurements;
    c) the form of inscription of observation results during the operation with standards.
4) The precautions which must be sticked to working with standards.
5) The rules of standards carriage.
6) The documents, which must be kept with standard.

B. The draft of technical instruction for keeping and use Reference Devices (RD)

The RD are used at State Metrological Service (SMS) and Manufacturer Metrological Service (MMS), which have received the right of devices calibration in established order.

RD must be used and kept on the conditions, which provides the correct-ness of their use and operation reliability.

The form of use and keeping RD is established at standard for procedure and operation documentation of the manufacturer.

RD must be used for calibration only.

The accounting of the presence and condition of RD is realized by SMSand MMS in established order.

The accounting of the presence and condition of the precision RD and subordinate RD spends separately.

RD during operation and keeping must be under the periodic verification.

Next devices must be under the compulsory state verification:

1)which are used by SMS;
2)which are used by MMS as precision RD.
3)which are used as RD for graduation and calibration devices.
4)which belongs to manufacturer but used by SMS as RD.
5)which are manufactured as RD in compliance with their direct appointment or with order conditions, obtained by manufacturer;
6)which are repaired by repair-device plants for outside managements;
7)which are intended used as RD to spend measurint-instrument state testings;
8)which are intended for using as working measuring instrument, when the measurements connects with the accounting of material valuables, safe-guarding of health, guarantee of safety and innocence of labour;

9) which are used for examination measurements by state arbitration;
10) which are used for measurements connected with registration official national and international sport records.

All the devices without dependence on their appointment must be put to the check tests.

The rest devices not indicated at sub-items 1-10 must be put to the Manufacturer Metrological Tests.

6.5 Chapter V

A. Recommendation for further development of measurement assurance in the field of electrical measurement.

Based on carried out analysis of present state at CIMS, PLMS and MMS, the conclusion that CIMS did not provides all the kinds of needed verifications can be done.

Therefore for connection with the growth of manufacturing of measuring instruments at DPR of Korea and increasing of quantity of reference devices at PLMS and MMS and also for increasing the out put of verification job, it is necessary to strengthen the all sections.
(see Annex 3)

7. Conclusions

1. UNIDO assistance is considered as an extremely important factor, especially in the field of metrological provision of electrical measurement instruments.
2. The electrical measurement laboratory have been organized.
3. The part of ordered installation are received and brought in operation.
4. The substantial increase number of the Reference Devices are also strongly desired for fulfilling the Project objectives to the full scale. (see Annex 3)
5. The laboratory personnel was teached in the techniques of electrical measurements at the varions items of equipment are installed.
6. The technical instractions about keeping and use laboratory installation are worked out.
7. The outputs achieved are basis for future developments in this field.

8. Recommendations.

1. The further development of electrical measurements field for more complete satisfaction of national industry is recommended.
2. The purchasing of special installation (see Annex 3) for strengthening the present state of electrical measurements field must be agreed by UNIDO for realization the Project in the complete value.
3. The substantial help of UNIDO is needed for further development of electrical measurements field. It may be based on consultations, experts helping, purchase of special equipment, personnel teaching.
4. The expansion of electrical measurements laboratory of CIMS is recomended to make such calibration sections as a.c. resistance devices and electrical capacitance measurement.

ANNEX 3

List of devices needed to strengthen the electrical measurement laboratory of CIMS

No	Nomenclature	type	Number	Firm	Notes
1	2	3	4	5	6
1	Electrical resistors				
	10^{-4} Ω	P323	2	КЗИП ,SU	
	10^{-3}; 10^{-2} Ω	P310	4	"	
	10^{-1}; 1; 10 Ω	P321	6	"	
	10^{2}; 10^{3}; 10^{4}; 10^{5} Ω	P331	8	"	
	10^{6} Ω	P4013	2	КПИИЭП ,SU	
	10^{7} Ω	P4023	2	"	
	10^{8} Ω	P4033	2	"	
	10^{9} Ω	P4030	2	"	
	10^{10} Ω	P4085	2	"	
2.	Digital resistance comparator	P346	1	КЗИП ,SU	
3	Bridge setup with digital indicator	y401	1	КПИИЭП ,SU	
4.	A.C.electrical resistance 1-10^{6} Ω	P361	1 sets	КЗИП ,SU	
5.	Digital voltmeter	Ш31	1	КЗИП ,SU	
6.	A.C. semiautomatic Bridge	BM 484	1	Tesla,CSSR	
7.	Capacitance measures 10^{-3}-1 pF	KME-11	1	ЭТАЛОН ,SU	
	1-10^{6} pF	P597	2 sets	IC.T ,SU	
8.	Capacitance box 1-10pF	P5025	1	ТЭП ,SU	
9.	A.C. digital bridge	P7059	1	"	
10.	Bridge setup	y592	1	"	
11.	Inductance measures	P592	10	"	
12.	Mutual inductance measures	P5009	2 sets	"	
13.	Standard cells	X482	6	МикроприSор,SU	
14.	"	X488	6	"	
15.	"	X489	6	"	
16.	A.C.and D.C calibration setup	y300	1	ЗИП ,SU	

No	Nomenclature	type	number	Firm	Notes
1	2	3	4	5	6
17.	Devices for d.c; voltmeter calibration	BI-12	1	Рип,SU	
18.	D.c;calibrator	П-320	1	ЗИП ,SU	
19.	D;c.calibration setup	У358	1	"	
20.	Device for a.cvolt- meter calibration with amplifiers	BI-9	1	SIC named after Lenin,SU	
21.	D.c stabilizator	П136М	2	НЗИП ,SU	
22.	"	П138М	2	"	
23.	Microwebermeter	Ф191	1	ВИБРАТОР ,SU	
24.	Resistance box	Р33	2	ЗИП ,SU	
25.	Digital ohmmeter	Ш34	1	ЗИП ,SU	
26.	Teslameter	Ф4300	1	ЭП,SU	
27.	Teraohmmeter	Е6-14	1	РЭТ,SU	
28.	"	Е6-13	1	"	

ANNEX 1

UNIDO

PROJECT IN DPR KOREA

JOB DESCRIPTION
DP/DRK/81/008/11-02/313.K Rev. 1

Post title	Expert in Metrology (electrical measurements)
Duration	Three months; with possibility of extensio
Date required	March-April 1985
Duty station	Pyongyang; with travel within the country
Purpose of project	To assist the Government in strengthening and developing metrology, quality control and standardization activities of the National Institute of Metrology through the modernization and re-equipping of the existing laboratories as well as establishing new ones.
Duties	Under the direction of the Project Manager, the expert will be expected to:

1. Study and analyze the existing situation with regard to electrical measurements of the National Institute of Metrology.

2. Develop and discuss measuresfor strengthening and developing existing facilities in the field of electrical measurements.

3. Advise on and assist in equipping the laboratory of electrical measurements, including selection of equipment, preparation of lay-outs and installation.

4. Select a list of equipment needed to supplement the existing equipment.

5. Use of existing material and equipment in the Institue for possible immediate assistance to the electrical measurements laboratory.

6. On-the-job training of the laboratory staff in the techniques of electrical measurements as the various items of equipment are installed.

7. Draft technical instructions on the keeping and use of standards and laboratory equipment at the various levels.

The expert will also be expected to prepare a final report setting out the findings of his mission and recommendations to the Government on future action which might be taken.

Qualifications — University degree or equivalent in applied physical science or engineering with extensive experience in electrical measurements at the national level, organization, equipping and operating metrological laboratories, knowledge and experience in standard measurements.

Language — English, Russian an asset

Background Information — The Democratic People's Republic of Korea is at present in a phase of intensive development, especially in the industrial field. The country's economic policy is designed to maximize exports, with increasing emphasis on industrial products. To compete in international markets and serve its own internal market efficiently, the DPR Korea industry needs a national service with a modern infrastructure which, through up-to-dated metrology, will provide industrial quality control and standardization.

DPR Korea has its own well-developed and diversified industries. The metrological system in the country,

however, is lagging behind that of industry's requirements in providing vitally needed precise measurement and instrument certification services.

The institution charged with the responsibility for providing metrological services as well as being the centre for metrology in general is the National Institute of Metrology (NIM). Strengthening its capacities in specific areas of metrology is the overall objective of the project. In line with the above, the Government has recently decided to transform the Institute into a National Centre having the additional responsibilities for carrying out metrological research activities and producing precision measuring instruments needed within a country-wide overall metrological service system.

The metric system was adopted by the Government as the nation's legal system of measurement in all commercial and technical activities in 1946. Later in 1975 SI units were adopted. There are presently only about 60 national standards ensuring the uniformity of measurements in the country.

Within the country, each province has a metrological centre which is under the guidance and supervision of the NIM. At present the NIM as well as the centres in the provinces are not in a position to provide proper verification and calibration services and testing in industry due to the lack of basic precise measuring equipment and properly trained staff.

ANNEX 2

WORK-PROGRAMME

for UNIDO expert O.M. Pavlov DR/DRK/81/008/11-02/313.K

1. Meeting with the National Project Manager, his staff, discussions and visit to UNDP office..... 1st day.

2. Meeting with the Director of the Central Institute of Metrological Science (CIMS), discussion of work-programme..... 2nd day.

3; Acquaintance with the personnel and equipment of electrical measurements laboratory..... 3rd day.

4. The analysis of present state of electrical measurement laboratory CIMS in accordance with measurement kind. 4th day to 6th day.

   a) power and energy..... 0.5 day.

   b) the d.c.resistance and electro-motive force.1 day.

   c) the d.c. and a.c. voltages and currents.....1 day.

   d) the electrical capacitance and inductances..0.5 day.

5. Visit to large plant, with the sections of electrical measurements to study and analyse the present state at electrical measurement field..... 7th day.

6; An assistance in equipment of electrical measurement laboratory of CIMS and among them mount and put into operation the installation received by Project.....8th to 9th day.

7. Teaching the personnel of electrical measurement laboratory.10th day.

8. Preparation the recommends for further development of electrical measurement assurance..... 11th day.

9. Preparation of the technical report.....12 to 14th day.

10. Departure from Pyongyang..... 15th day.

ANNEX 4

To UNDP Office
Information on the results of dismantlement of pakages and configuration examination

We inform you that the results of the dismantlement of electrical instruments received on the 16th of May 1985 are as follows:

1. When the accessory of potentiometer 5590C type, Nanovoltmeter No 246537 is moved in right and left there is sound inside it. It means that accessories were not properly assembled. So at present we can not operate the potentiometer collectively.

2. A standard cell which must be included in the potentiometer-5590C type is missing.

3. A thermometer of standard cell No 113 was damaged and indicating lamp for power on of No 112 does not glow. Thermometers of Nos 114 *nd 112 do not indicate temperature.

4. On the three pakages including standard cell box there are no signs for handling and perpendicular marks that must surely be marked during transportation of measurement instruments.

5. The dismantlement of pakages was carried out in the presence of Mr. Oleg Mihailovich Pavlov, the technical consultant sent from UNIDO.

The democratic People's Republic of Korea
The Central Institute of Metrological Science.

ANNEX 5

UNITED NATIONS DEVELOPMENT PROGRAMME
PYONGYANG, DPR KOREA

TELEX/CABLE Priority :
Charge

To : UNIDO
VIENNA

Date : 23 May 1985
Ref. : DRK/81/C08 E

MESSAGE (Use brief informal language)

MISC_____ STELLING. DRK/81/008. RE CONSIGNMENT UNDER P.O. 15-4-D 1306. AAA),ITEM BCS NO.02461 OF TYPE 5590C POTENTIOMETER MISSING. BBB) THERMOMETER OD STANDARD CELL NO 113 DAMAGED AND POWER INDICATING LAMP OF NO.112 NOT WORKING. THERMOMETERS OF NO.114 AND 112 NOT INDICATE TEMPERATURE. CCC) ACCESSORY OF POTENTIOMETER 5590C TYPE NANOVOLTMETER NO. 246537 OUT OF ORDER PRESUMABLY NOT PROPERLY ASSEMBLED. PLS URGENTLY SEND MISSING AND REPLACEMENT ITEMS AND ENSURING MARKING PAKAGES FOR PROPER HANDLING DURING AIRSHIPMENT THESE SENSATIVE EQUIPMENTS. LETTER FOLLOWS REPORTING CONDITION EQUIPMENT AFTER UNPACKING.

Slobodan Ristic
Authorized by : Resident Representative

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cc : Mr. O;M. Pavlov

Drafted/Cleared by :ONI/AH/Oni

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