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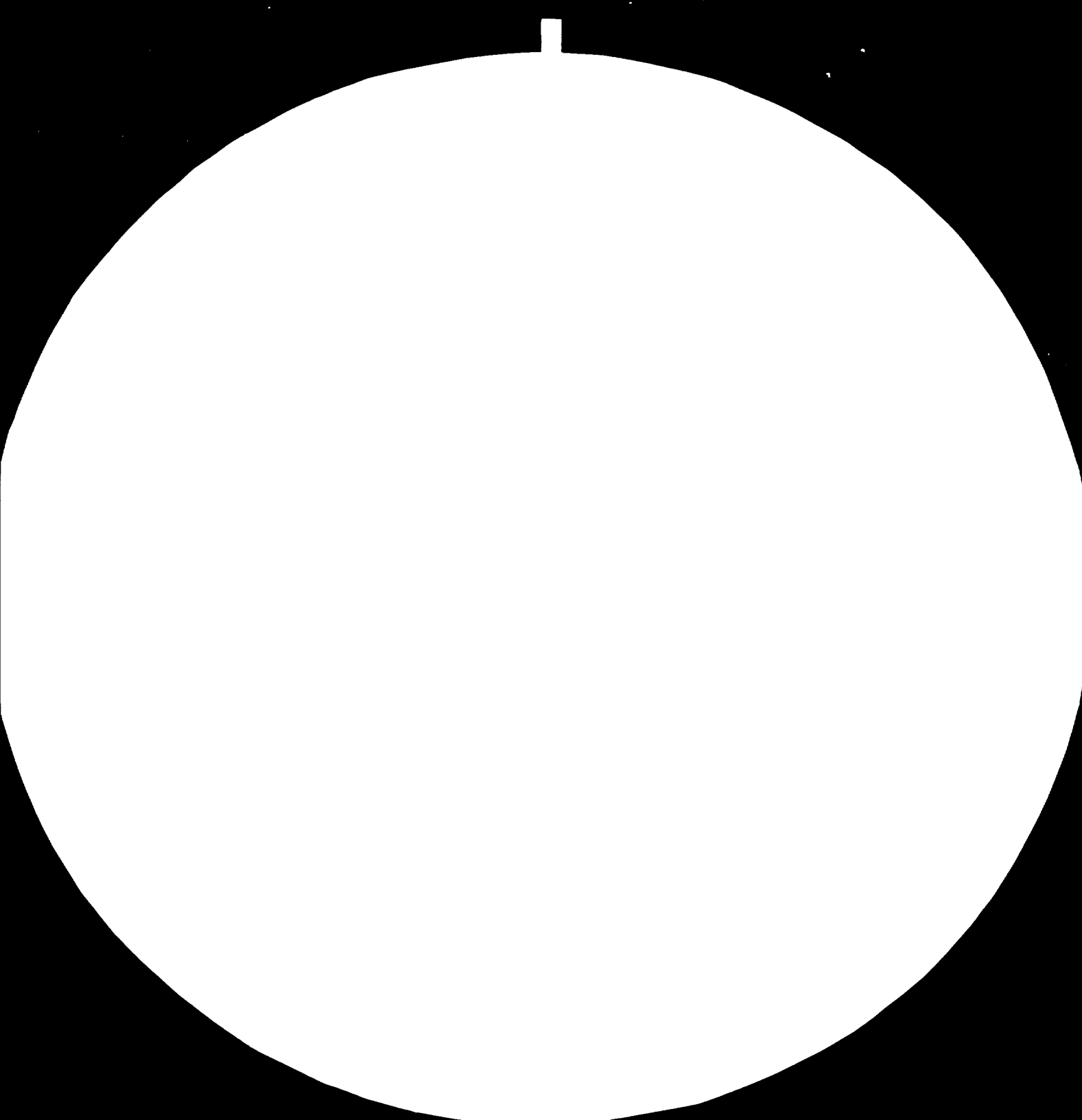
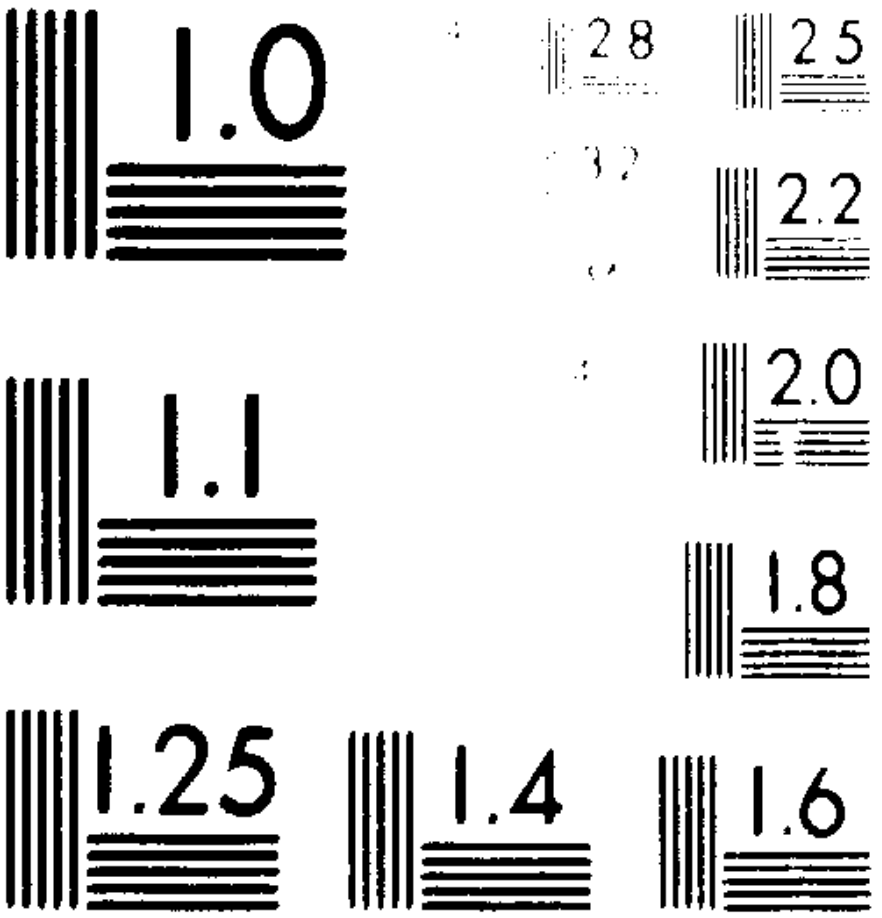
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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DP/ID/SER.A/
15 September 1980
English

THAI INDUSTRIAL STANDARDS INSTITUTE, PHASE II

DP/THA/72/027

THAILAND

Technical report: Assistance in Electrical and Illumination Test Laboratories*

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

Based on the work of Heinrich H. Bloebaum, expert
in electrical standards testing

United Nations Industrial Development Organization
Vienna

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## FOREWORD

The duration of the total mission was 6 weeks from 11. August 1980 to 20. September 1980, including briefing, travelling and debriefing.
Thus, three weeks in Thailand were spent for visits and fact findings, two more weeks for preparation of report and miscellaneous.

First of all, I wish to express my warm thanks to the Acting Secretary-General Sivavong Changkasiri for all helpful assistance I have been given from TISI. Especially the help of Miss Kanya Sinsakul in providing a perfectly arranged visiting tour through the laboratories and factories has been highly appreciated. Further thank is given to Mr. Piroj Sanyadechakul whose companionship, guidance and interpretions when necessary helped to running the whole mission at ease.

Bangkok, 1980-09-15

Heinrich Bloebaum

## Abstract

According to the visits to institutions and laboratories it was found out, that all tests can be done or are being done. However, an effort-wasting double, triple or even quadruple testing work is being done, where concentration of workload in one authority is needed.

As a first action it is recommended, to choose one of the most suitable laboratories for doing the tests for TISI and, if necessary, increase their facilities of equipment and manpower.

Step by step, TISI should recruit testing officers, TISI should establish a testing division or a test house with its own equipment for testing. Laboratory equipments for testing of cables and ballasts are listed in annex 4. The total value is about 60,000 US$.

Parallel to this, TISI should give special training to the testing officers, this should be performed in laboratories and factories in Thailand and abroad.

The need of advice and help by experts will arise, as soon as TISI is using its own testing facilities.
Provisions for some short-time assignments of the expert should be made and a certain follow-up should be maintained for a certain time. A total of 12 manmonths is suggested.

Further considerations should be taken into account, whether a private, non-profit test house could better fit the purpose.

## Table of Contents

## 1. Introduction

In the past, quite a lot of institutions having laboratories were established with aid from different countries, however with very little coordination between each others.

One of the most serious problems in Thailand seems to be the lack of communication and perhaps lack of cooperation between the different institutions and authorities on all levels.
This leads to a manifold of work and should be considered as a waste of efforts and manpower.

For instance at the National Energy Authority with some foreign aid electrical standards and testing facilities were established. As it is understood, this is supposed to be obsolete and useless now and the whole thing has to start from the very beginning perhaps with some other kind of aid.

Another serious problem is the salary of government officers. It is comparatively low with respect to salaries offered by companies. No highly experienced manufacturing engineer would join TISI and on the other hand it is feared, that officers may desert to the industries, as soon as they get the proper training from TISI.

However, as compulsory standards were extablished and products are to be licensed, tests must be carried out.

## 2. Job Duties

The following headings 2.1 to 2.5 refer to the corresponding, task numbers 1 to 5 as described in job description (Annex 3.). However, some limiting remarks are given as follows:

Due to the short time of investigations the expert could not prove, whether all statements of the persons interviewed give a real description of the situation. Perhaps some of the persons are much too optimistic and others much too pessimistic. So it should always be taken into consideration, that this report is based upon talks with the testing

people and upon the findings and feelings of the expert. However, no thorough investigation could be done personally to verify if all statements of the persons concerned are reliable.
For instance, when a testing officer, obviously having all the necessary equipment, was claiming to be able to test according to the standards, the expert was supposed to believe in that.

## 2.1 Visits to Laboratories

Due to the limited time of the expert's mission, only the three most urgent subjects were evaluated, namely testing of:

- Automotive safety glass according to TIS 195-1976,
- PVC-insulated cables and flexible cords according to TIS 11-1978,
- Ballasts for fluorescent lamps according to TIS 23-1978.

The expert visited the laboratories of various institutions as listed in Annex 1, some factories additionally.
It was found out, that all were willing to carry out tests for TISI's needs, however not always the complete equipment was available. Also there seems to be lack of training and experience among the testing engineers and always TISI's needs were of second or third priority to them. The laboratories are equipped with testing facilities according to TISI-Standards on various levels, with different manpower and experience. Some have done nothing in this respect and others perform tests sufficiently. For quick reference the testing facilities are listed in Annex 2. Testing according to standards specifications needs very highly specialized knowledge and experience of the engineers concerned and of course very highly specialized equipment to be used. Performing the same tests for TISI in different laboratories by different people is quite a waste of efforts and redundancy of special tools and instruments.

## 2.2 Analysis of Problems

The problems which might cause some delays in testing product samples seem to be rather of administrational than of technical kind. The persons involved in testing do their job for TISI as second or third priority only. Furthermore, their technical background and experience is somewhat related to the job to be done, but mostly they have got no training in that very much specialized field.

So the advice is given, that a suitable trained person should be responsible for testing of the TISI item or items only.
For the future TISI should employ testing officers and the testing should be done at the premises of TISI, or alternatively at a commercial test house.

For the time being this could be done for instance by the officer met at the National Energy Authority. His laboratory has got all the facilities for electrical safety testing and the officer underwent a special training abroad. *)
At most of the other places the expert was asked for details about the bending and flexing apparatus (Annex 4, item 3.11). This is existing and available at the NEA.

Similarly, the Provincial Electricity Authority and the TISTR could do the testing.
However, instead of everybody is dealing a little with TISI testing, one of them should deal with TISI testing only.
As a good example, the testing of automative safety glass is done by TISTR only, this institution has got all the facilities and the testing officers seem to have no problems.
If one laboratory only is dealing with testing of ballasts or cables, the problem might arise, that the capacity of conditioning ovens is not enough. In that case, one or two additional ovens must be provided. However, the shortage of ovens for conditioning seems not be so serious, as at the time of inspection at all the places none of the ovens were heavily used, better to say, they were cold.

## 2.3 Assessment of Distinctions

In case of distinctions between test results a thorough comparison should be done, however for the purpose of this report the time for investigations was too short. Nevertheless some assumptions could be given.

*) However, all documents, concerning Thai Standard for Electrical Safety seem to be rather confusing.

As the testing procedure is of quite a sophisticated kind, different people could handle the matter from very different points of view. Especially when the testing engineer is not properly trained and/or has a lack of experience, he might perform the tests or parts of the tests completely wrong.

It seems to be evident, that the preparations and final measurements are mostly done by technicians or unqualified people, thus the testing officer is left dealing only with the paperworks on his desk.

The testing officer or testing engineer never should consider manual work like using tools and instruments as of second class. He should never refuse to do things personally when he gets dirty or greasy fingers, or when heavy work is involved.

Generally, the testing engineer should do the work, the technicians helping him and not the technicians do the work and the engineer is supervising them. Only when everything is well established and has become completely routine, then this rule could be abandoned to a certain extent.

Some other reasons for distinctions could be found in the use of some rather awkward instruments. The expert has seen reference instruments, obviously 60 or 70 years old still being used for high precision measurements.

Especially under these climatic conditions with high humidity and varying temperatures nobody should rely for a long time upon the accuracy of the used instruments. It is highly recommended, that all precision instruments are to be checked at least annually by a proven authority.

The Thailand Institute of Scientific and Technological Research (TISTR) seems to have all the appropriate facilities for acting as calibration centre.

Finally the testing officers should always be aware, that the manufacturers might try to trick them out, tc bluff them or simply are cheating. Especially in the case of only theoretically trained inspectors, having no industrial experience, cheating them would be very easy.

To prevent being cheated, bluffed or tricked out, it would be an advantage, that inspectors, in addition to their theoretical background should have years of industrial and practical experience.

## 2.4 Equipment Needed

The complete tests can be done at the institutions as indic ted in Annex 2. However according to the workload especially for the ballasts the capacity for conditioning might not be sufficient. In this case TISI should retain the appropriate number of additional ovens (Annex 4, item 2.16).

## 2.5 Future Needs

According to the knowledge of the expert a detailed enumeration of equipments for TISI's future requirements would be nothing but a big bluff. For to achieve correct listings, thorough investigations are to be carried out in respect to:-

- existing standards
- compulsory standards
- general policy of TISI
- budget
- staff
- manpower
- room available, etc.

Without time consuming evaluation of these facts just any list of equipment could be compiled ranging in value between US$ 50,000.- and 1,000,000.- and none of them would be of any use to TISI.

A list of requirements for cable and ballast testing is compiled in Annex 4. However, as testing always needs complicated preparations, a complete mechanical and electrical workshop must be provided.

At the time being, preliminary tests could be done according to 2.2 and Annex 2.

## 3. Visits to Factories

The expert additionally visited some factories for ballasts and cables.

### 3.1 The Good Examples

The ARMSTRONG COMPANY for ballasts and the THAI-YAZAKI COMPANY for cables are very well equipped, they are running according to a quite high level of standards and are managed properly. It is believable, that companies like these easily can fulfill the requirements of quality, safety and standards.

### 3.2 The Bad Examples

However, the TARMING COMPANY for cables and ballasts and the PRATIPAT ENTERPRISE for ballasts run completely to the contrary. It makes no sense encouraging them to establish some quality control and testing facilities.

The expert doubts very much, that these factories ever can maintain the desired quality of their products and the earlier they give up, the better. They may produce anything else like crockery or plates and dishes but never those complicated devices.

## 4. Recommendations

### 4.1 Test House as a Commercial Enterprise

It should be decided on very high levels, whether a private or a governmental test house is to be established.
Most of the industrial countries keep their test houses running as a commercial enterprise, financed by distributions of manufacturers, by fees and by sales of standards documents.
Thus, salaries could be at the same level like salaries in industry and would be attractive to the very high experienced engineers now only working in factories.

### 4.2 Rearrangement of Institutions

As testing facilities do exist in other institutions and some testing officers have got the appropriate training, however now seem to be dealing with other matters, it would be wise, to reorganize parts of institutes and to shift parts of laboratories and manpower into the responsibility of TISI to avoid doublication of work and useless efforts. This again is a matter of decisions to be reached on very high levels.

### 4.3 Testing officers

Testing facilities obviously must be established in a certain test house with first priority to testing for TISI standards. At the very beginning testing officers are to be elected and to be appointed to their special duties. They should have a certain industrial background and they should not be newly university graduates for which the common nickname "greenhorn" applies. They all should get a tough and very much specialized training and at least some of them should study procedures in the test houses of developed countries. Considerations should be taken, whether any additional benefits would help a few highly experienced engineers to join TISI.

## 4.4 Preliminary Testing for TISI

[illegible] TISI and of the [illegible]

described under 2.2 should be strengthened with manpower and perhaps some additional equipments, however with first priority to the persons involved.

## 4.5 Experts

As soon as TISI has established its own testing facilities a certain supervision and guidance by the expert for a period of about 2 months is recommended. This might be repeated whenever the demand arises.

As a suggestion for the period of the next 4 years a number of 10 to 12 manmonths should be provided.

As a matter of fact, quite a number of experts were attached to TISI and the advice of experts certainly will be necessary for many years to come, however not in all sections and not continuously.

As the experts come from different countries and naturally have different ideas, this might cause some discontinuities. So it seems to be advisable in each special field to stick to one expert only, as soon as a mutual agreement is reached.

As it is the fact in most cases, all contacts are cut off when the expert leaves the country. However the expert, being in his home country can still perform valuable tasks and actions for the institution or the counterparts. He still could give advice and comments by letters. He could collect documents and literature and specifications. He could contact producers of special equipment. He could arrange suitable programs for training and special fellowships.

## 4.6 International Cooperation in S-E Asia

A close cooperation between the Standard Institutions of South-East-Asia is recommended for the following reasons :

- mostly they face the same problems,
- they are comparable in their phase of development,
- they are not too far away from each other,
- identical experts often serve subsequently to different countries in this area.

The advantages of such cooperation :

- coordination of efforts,
- exchange of experience and training,
- mutual use of special testing facilities.

## Annex 1 List of Visited Laboratories

List of testing laboratories willing to participate as joint-counterparts

(equipped with electrical and electronics test instruments)

1. Department of Science , Ministry of Science & Technology (DOS)
2. Thailand Institute of Scientific and Technological Research , Ministry of Science & Technology (TISTR)
3. Metropolitan Electrical Aulhority (MEA)
4. Electricity General Authority of Thailand (EGAT)
5. Provincial Electricity Aulhority (PEA)
6. National Energy Authority (NEA)
7. Telephone Organization of Thailand
8. Faculty of Engineering , King Mongkut Institute of Technology , Bangkok North
9. Faculty of Engineering , King Moungkut Institute of Technology , Thonburi
10. Faculty of Engineering , Chulalongkorn University.

## Annex 2 Table of Testing Facilities

| | Testing of | | |
|---|---|---|---|
| | Safety glasses | Cables | Ballasts |
| 1. Dept. of Science, Min. of Science & Technology (DOS) | o | + | + |
| 2. Thailand Inst. of Scientific & Tech. Research, Min. of Science & Technology (TISTR) | ++ | + | ++ |
| 3. Metropolitan Electrical Authority (MEA) | o | + | + |
| 4. Electricity General Authority of Thailand (EGAT) | o | - | - |
| 5. Provincial Electricity Authority (PEA) | • | ++ | ++ |
| 6. National Energy Authority (NEA) | o | ++ | + |
| 7. Telephone Organization of Thailand | • | - | - |
| 8. Fac. of Eng., King Mongkut Inst. of Technology, BKK North | o | • | o |
| 9. Fac. of Eng., King Mongkut Inst. of Technology, Thonburi | • | o | o |
| 10. Fac. of Eng., Chulalongkorn University | o | - | - |

**explanations:**

++ equipment fully available, tests can be done

///// recommended

\+ equipment partly available, most tests can be done

\- equipment partly available, but no manpower, or difficulties

• no facilities

UNITED NATIONS

Annex 3

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

4 July 1979

JOB DESCRIPTION
DP/THA/72/027/11-05/31.3.A

**Post title** Consultant on Electrical and Illumination Test Laboratories

**Duration** One and a half months

**Date required** As soon as possible

**Duty station** Bangkok

**Purpose of project** To produce and promulgate national standards and to test products and place factories under surveillance in accordance with a national certification scheme.

**Duties** In collaboration with the Director of the Institute and with the incumbent standards engineer expert, the expert will assess the testing capacity of the various illumination engineering laboratories used by the Institute and will accordingly:

1. Visit each of the authorized electrical and illumination test laboratories and spend some days in each in order to evaluate suitability of equipment for TISI's needs.
2. Analyse technical problems which might cause some delays in testing product samples.
3. Assess wherever possible the distinction between the test results of authorized and company laboratories.
4. Compile a list of equipment which could be retained by TISI and used to supplement the capacity of the authorized laboratories for TISI testing programmes.
5. Assess TISI's future needs for testing facilities in the light of its rate of expansion and make recommendations.

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

..../..

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

Project Personnel Recruitment Section, Industrial Operations Division
UNIDO, P.O. Box 707, A-1010 Vienna, Austria

## Annex 4 List of Equipments

### 1. Workshops

1.1 Mechanical Workshop

An ordinary mechanical workshop is essential with all tools for metal works, it should be available as a whole set or a number of sets. Estimated price, approximately 4.000 US$.

1.2 Electrical workshop

The same kind of workshop with additional tools and instruments for measurements of electrical quantities, like multiple meters, ohmeters current transformers, chart recorders. Price approximately 5.000 US$.

1.3 Electrical and Mechanical components store

Different electrical components shall be available like resistors, condensors, thermocouples, wires, plugs, switches, photocells, diodes etc.

The same applies for mechanical materials. Price approximately 3.000 US$.

### 2. Special Equipments for Ballast Testing

(Requirements according to TIS 23-1978)

2.1 Megohm-Tester up to 10 Mohms, accuracy 1 %

2.2 High-Voltage-Tester AC up to 5 kV

2.3 mA-Meter AC range 0.1, 0.5, 1 mA

2.4 Precision Light-spot Voltmeter, moving iron type, class 0.1 range 150 - 300 - 600 V 3 pieces

2.5 Precision light-spot ammeter, moving iron type, class 0.1 range from 50 mA to 5 A. Eventually 2 or 3 instruments with different ranges for to cover the total range.

2.6 Precision light spot wattmeter with electrodynamic movement, class 0.1, range 50 W to 1000 W.

2.7 Power factor meter class 1.5 for measurement of power factor between 0.5 - 1 - 0.5, rated current 5 A, rated voltage 220 V

2.8 Oscilloscope, dual beam, wide-band amplifier, high sensitivity

2.9 Set of thermometers

2.10 Variable transformer, output voltage 0 ... 260 V, 2.5 A

2.11 Constant voltage supply, output 220 V $\pm$ 0.2 % 500 VA

2.12 Standard test finger

2.13 Humidity test cabinet, for humidity in the range between 93 % and 95 % of relative humidity with a temperature range between 20 and 30°C $\pm$ 2°C. Capacity approximately 50 Liters.

2.14 Insulation Tester DC for 500 V DC.

2.15 Oilbath for temperatures up to 200°C $\pm$ 2°C
capacity approximately 20 Liters

2.16 Oven with maximum temperature 250°C $\pm$ 2°C
according to IEC 82-1973, fig. 3

2.17 Ball pressure apparatus according to IEC 82-1973, fig. 7

2.18 Photoelectric cell plus measuring instrument

2.19 Current transformer, lowest primary range 0.5 A, class 0.2

2.20 Reference lamps according to the ballasts to be tested

2.21 Reference ballasts according to the ballasts to be tested.

3. Special equipments for cable testing

3.1 Profile projector for optical enlarging and measurement of small items with accuracy of about $\pm$ 0.01 mm and total measurement area of about 100 mm x 100 mm

3.2 Precision Wheatstone-Kelvin bridge, range from $10^{-6}$ to $10^{8}$ Ohms, accuracy 0.02 %, including all resistors and galvanometer

3.3 Special dices for preparation of test strips for tensile test.

3.4 Tensile tester, for long elongations and small forces, with recording facilities, elongation speed between 25 and 35 cm/min

3.5 conditioning room or chamber with constant temperature of 20°C $\pm$ 1°C minimum capacity 20 liters

3.6 Heating cabinet, ventilated by natural circulation, temperature between 50°C and 80°C $\pm$ 2°C, capacity approximately 50 liters

3.7 Apparatus of pressure test at high temperature according to TIS 11-1975 Fig. 1

3.8 Water bath of 60°C ± 5°C, capacity approximately 100 liters

3.9 DC supply of 200 V, 1A

3.10 Analytical balance, digital, range 0 - 200 g, accuracy ± 0.1 mg

3.11 Heating cabinet of 150°C ± 2°C, capacity approximately 50 liters

3.12 Bending and flexing apparatus according to clause 8.2, fig. 3

3.13 High voltage Tester DC, 10 kV

Estimated price for all items 2.1 - 2.21 and 3.1 - 3.13 approximately 50,000 US$.

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