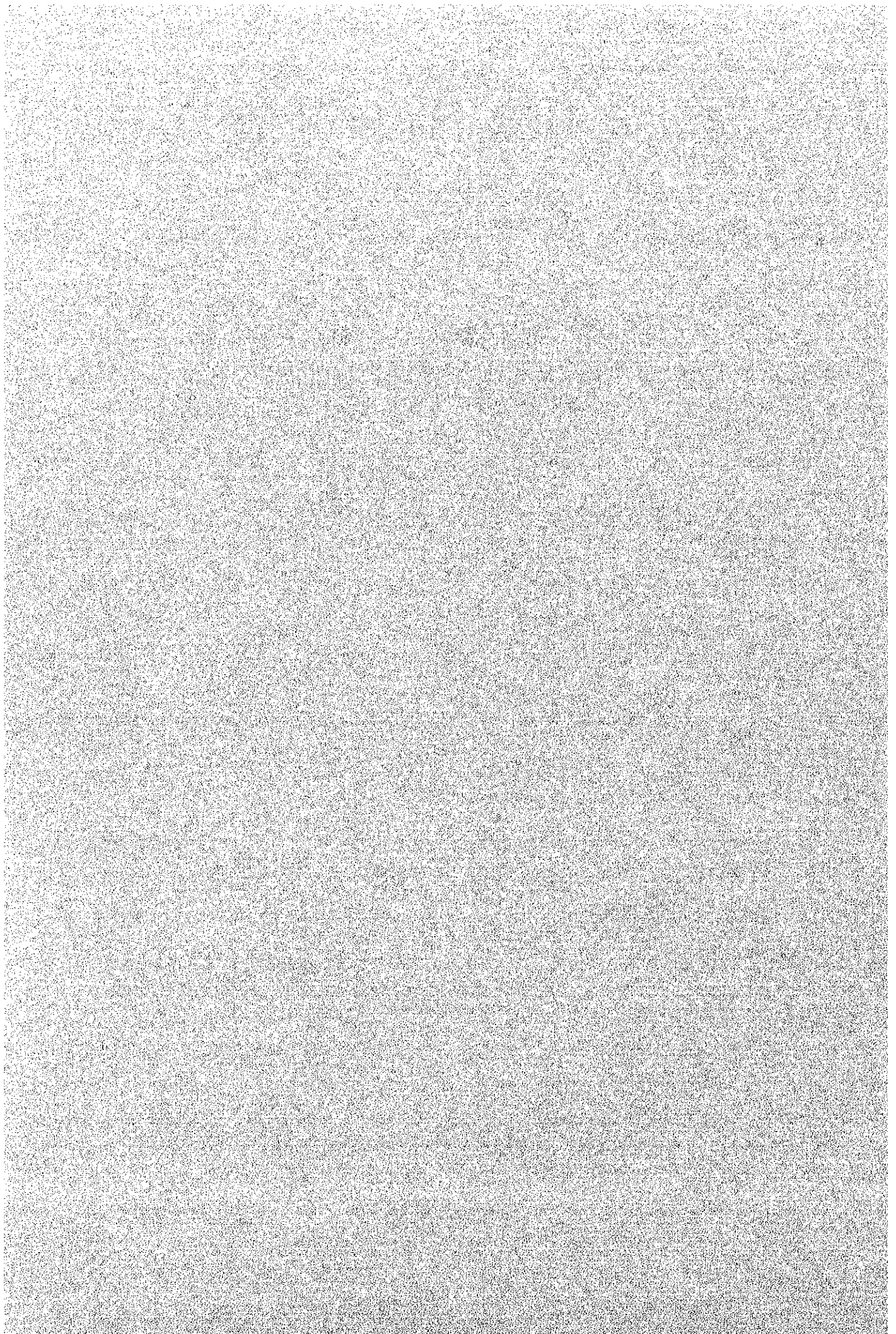


## 6. 資 料



INSTITUT STANDARD DAN PENYELIDIKAN PERINDUSTRIAN MALAYSIA

SUMMARY  
PROJECT PROPOSAL FOR  
UPGRADING OF MEASUREMENT CENTRE OF SIRIM

## PROJECT FOR UPGRADING OF MEASUREMENT CENTRE OF SIRIM

### 1. PROJECT DESCRIPTION

The propose project is to upgrade the capabilities and instrumentation of SIRIM's Measurement Centre in its field and level of precision. This is to support and meet the demand of the rapidly developing local industries in line with the SIRIM function as the National Custodian of Weights and Measures and as the National Metrology Laboratory.

Generally, the proposed project comprises of five main components as follows, however the final details depend on the finding of the study currently being undertaken by JICA :-

- i) Survey/Development Study and initial preparation to determine and ensuring the proposed instrumentation and fields to be developed are suitable to the actual needs. The study must be carried out by metrology experts. At this stage the building to house various laboratories will also be designed. The experts are needed to design the air-conditioning and environmental system for the critical laboratories and also in determining other important necessity.
- ii) A new building has to be constructed as the existing building (Block 8) is fully occupied and not suitable to house the proposed new laboratories. The new building with an estimated floor area of 4645 m<sup>2</sup> will incorporate the following special features in certain rooms or sections ;
  - \* 24-hour air-conditioning
  - \* Vibration free flooring or vibration free equipment tables
  - \* Specially designed air-conditioning system and wall to maintain temperature at  $20 \pm 0.2^{\circ}\text{C}$  and relative humidity of less than 65% or better.

- iii) The equipments of various levels of precision and various fields of measurement are needed in addition to the existing equipments in the existing fields and new equipments for the new fields. The new fields that are to be established are photometry, magnetic, acoustic and microwaves.
- iv) A total of 43 additional personnel consisting of Research Officers, Assistant Research Officers and supporting staff would be needed by the Centre to perform its function satisfactorily. The new as well as the existing staff should be trained in their respective fields to develop their relevant knowledge and competency in performing their duties and responsibilities.
- v) Experts are required to help in the implementation of the project including in the designing of the building conditions, in recommending and selection of appropriate standards and equipments for various laboratories. The experts are required to set up the facilities and to train Centre personnel on the appropriate technologies especially in the new fields mentioned above.

## 2. DURATION OF THE PROJECT

It is estimated that the project will be completed within 4 years starting in 1994.

## 3. PROPOSAL

It is proposed that parts of the physical standards, all the experts for the project and training for the personnel of the centre to be funded by foreign agency under technical cooperation programme.

STANDARDS AND INDUSTRIAL RESEARCH INSTITUTE OF MALAYSIA

PROPOSAL FOR UPGRADING OF THE  
MEASUREMENT CENTRE OF SIRIM

AUGUST 1993

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## 1. INTRODUCTION

SIRIM is presently providing measurement services through its metrology laboratory established in 1979. The rapid advances in science and in industry have left SIRIM lagging about 10 years behind the needs of the scientific and industrial community in terms of measurements support capabilities. As the facilities in SIRIM has been designated as the National Metrology Laboratory, there is therefore an urgent need to upgrade the current facilities to meet the present and future needs of metrology in the country.

This paper provides the proposal for the upgrading of SIRIM metrology laboratory to become the National Measurements Centre to enable it to effectively implement The National Measurement System for the country. It is envisaged that the proposed upgrading when fully implemented will enable the laboratory to cater for the needs of the next ten years or so. The final details of the project depend on the finding of the study currently being undertaken by JICA.



## 2. JUSTIFICATION

SIRIM was appointed as the custodian of weights and measures in 1979 with the basic metrology<sup>1</sup> laboratory which was established in the same year. SIRIM is responsible for procuring and maintaining all the relevant physical standards for precision measurement. In 1981 SIRIM undertook a four-year development project with the cooperation of the Japanese Government to upgrade the facilities and capabilities of the laboratory. The project equipped the laboratory with metrological equipment capable of providing accurate measurements and calibrations needed at that time. However after the completion of the project in 1984, no substantial further development was undertaken to keep in touch with the demands arising from technological and industrial development.

The rapid advances in both science and industry has left the SIRIM metrology laboratory lagging about 10 years behind the needs of the scientific and industrial community. Whilst SIRIM is presently able to fulfil her role as a custodian in the area of legal metrology, SIRIM is unable to meet the needs of the scientific community and industry. In the SIRIM-Industry dialog held in November 1992, majority of industry associations expressed the need to upgrade the present metrology capability of SIRIM. Now, the scope and accuracy of primary reference standards and the

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<sup>1</sup>metrology: the science of measurement.

capability of the laboratory need to be upgraded and further developed in line with the advances in the technology of measurements and the demands for precision measurement services from industry.

### 3. OBJECTIVES OF THE CENTRE

The Centre will provide traceability of measurements to local industries through a National Measurement System. The main objectives of the Centre are:

- a) To develop measurement technology through research and development in measurement standards and parameters. 計量技術の開発
- b) To establish, update and maintain the national physical standards of measurements. 国家標準の確立、更新、維持
- c) To establish and implement a national measurement system for measurement traceability. 計量に係るトレーサビリティに対する国家計量システムの構築並びに実施
- d) To disseminate and promote measurement parameters and technology to industry. 工業界への技術の普及と促進
- e) To provide high precision measurement and calibration of standards services. 高精度計量と校正の提供

The proposed programme will equip the Centre with the scope and accuracies of calibrations and measurements capabilities as listed in Table I.

Table I: Scope and Accuracies of the Centre

Parameters	Range	Best Accuracy
Length	0.001 $\mu$ m to 100m	$\pm$ 0.5ppm
Mass	0.01mg to 1000kg	$\pm$ 0.5ppm
Force	0 to 300 ton	$\pm$ 0.005%
Pressure	0 to 10500 kPa	$\pm$ 0.001%
Temperature	-250°C to 2000°C	$\pm$ 0.001°C
Electrical Voltage	0 to 50 kV	$\pm$ 0.05ppm
Electrical Resistance	0 to 10 <sup>18</sup> Ohm	$\pm$ 0.05ppm
Electrical current	0 to 1000 A	$\pm$ 1ppm
Electrical Inductance	0 to 9000 H	$\pm$ 0.002%
Electrical Capacitance	0 to 9000 F	$\pm$ 1ppm
Frequency/Time	0 to 25 GHz	$\pm$ 10 <sup>-13</sup>
RF & Microwave	25 GHz	$\pm$ 0.1%
Photometry	Full Lab.	-
Magnetic	Full Lab.	-
Acoustic	20 to 150 db	$\pm$ 0.01%
Reference Materials	Full Lab.	-

#### 4. PROJECT DESCRIPTION

The development project comprises of the construction of the building to house the laboratories, the acquisition of physical standards including related equipments, and manpower development.

##### 4.1 BUILDING

A new building will have to be constructed to house the physical standards and measurement facilities. The existing metrology building (Block 8) in SIRIM is fully occupied and has no provision to cater for the use of the more precise measuring equipments, standards and calibration work. The new laboratory building with a floor area of 4645 m<sup>2</sup> will incorporate the following special features in certain rooms or sections:

- \* 24-hour air conditioning
- \* Vibration free flooring or vibration free equipment tables.
- \* Specially designed air conditioning system and wall including windows maintain temperatures at  $20 \pm 0.2^\circ\text{C}$  and relative humidity of  $55 \pm 5\%$ .

The the new building will be sited at a location based on the finding of the study currently being done by JICA. The building will house various laboratories with special specifications as detailed out in Appendix I. Appendix II describes general requirements for the building.

#### 4.2 EQUIPMENT

Various levels of precision physical standards and respective relevant equipment to be acquired in the various fields of measurement and laboratories are listed in Appendix III.

#### 4.3 MANPOWER REQUIREMENT AND DEVELOPMENT

In addition to the existing staff, a total of <sup>30</sup> 20 research officers, <sup>15</sup> 14 assistant research officers and <sup>14</sup> 9 supporting staff would be needed by the Centre for it to perform its functions satisfactorily. The manpower will be recruited in stages as follows:

	Year 1* (1994)	Year 2 (1995)	Year 3 (1996)	Year 4 (1997)	Total
Research Officer	10	5	12	3	30
Assistant Research Officer	1	4	8	2	15
Supporting Staff	5	3	4	2	14
TOTAL	16	12	24	7	59

\*existing staff

The staff should be trained in their respective fields to develop and upgrade their relevant knowledge and competency in performing their duties and responsibilities.

## 5. EXPERTS

Due to the limited knowledge of SIRIM personnel in this rapidly developing technology, experts are required to help in the implementation of the project. Generally, there are three categories of experts required as follows;

(a) expert in building facilities design to achieve the special conditions of some of the laboratories, this expert is required in the designing stage of the laboratories i.e at the early part of year 1 (1994);

(b) experts in recommending and selection of physical standards and related equipments in various laboratories, and

(c) expert in specific technology/field of measurement to set up the facilities and train the centre personnel especially in the following fields: (i) Photometry, (ii) Magnetic, (iii) Acoustic, and (iv) Microwave.

## 6. FINANCIAL REQUIREMENT

Adequate financing is needed for the building including the land and physical standards including related equipments. An investment of 50 million ringgit is required made up of 12 million ringgit for construction of a special-purpose laboratory and 38 million ringgit for procurement of the various physical standards

and equipment. It is proposed that some of the physical standards, all the experts for the project and training for the personnel to be funded by foreign agency under technical cooperation programme.

The schedule of expenditure for the project is as follows:

Year	Year 1	Year 2	Year 3	Year 4	Total
Land Preparation and Building Design (Million RM)	1.0				1.0
Construction of Special Lab. (Million RM)		11.5	0.5	-	12.00
Purchase of Standards & Equipment (Million RM)		2.0	20.0	15.0	37.0
Total (million RM)	1.0	13.5	20.5	15.0	50.0

7. IMPLEMENTATION SCHEDULE

The implementation schedule of the project is proposed as follows:

ACTIVITIES	Year 1 (1994)				Year 2 (1995)				Year 3 (1996)				Year 4 (1997)			
1. Land acquisition and Development Study																
2. Designing the building																
3. Preparation of tender document																
4. Tender																
5. Evaluation and award of tender																
6. Construction of building																
7. Procurement of equipment																
8. Recruitment of staff																
9. Manpower training																
10. Expert																



APPENDIX I

LABORATORIES AND SPECIFICATIONS

LABORATORY	FLOOR AREA ( m <sup>2</sup> )	ENVIRONMENT	SPECIAL REQUIREMENTS
1. TIME & FREQUENCY	190	23 ± 0.5°C 55 ± 5% RH	<ul style="list-style-type: none"> <li>- Screened room</li> <li>- Vibration free</li> <li>- Conduit for antenna cabling</li> <li>- Single-phase supply</li> <li>- Isolated ground point</li> </ul>
2. MASS (WEIGHT)	150	23 ± 0.2°C 55 ± 5% RH	<ul style="list-style-type: none"> <li>- Vibration free</li> <li>- Ground floor preferred</li> <li>- Single-phase supply</li> </ul>
3. INDUSTRIAL ENGINEERING	350	23 ± 0.2°C 55 ± 5% RH	<ul style="list-style-type: none"> <li>- Floor sunk into the ground for deadweight machine</li> <li>- Single-phase supply</li> <li>- 3-phase supply</li> </ul>
4. THERMAL	220	23 ± 0.5°C 55 ± 5% RH	<ul style="list-style-type: none"> <li>- Single-phase supply</li> <li>- 3-phase supply</li> <li>- Fume ventilation</li> <li>- Isolated ground point</li> </ul>
5. RF & MICROWAVE	190	23 ± 0.5°C 55 ± 5% RH	<ul style="list-style-type: none"> <li>- Screened room</li> <li>- Conduit for cabling and waveguide</li> <li>- Single-phase supply</li> <li>- Isolated ground point</li> </ul>

LABORATORY	FLOOR AREA ( m <sup>2</sup> )	ENVIRONMENT	SPECIAL REQUIREMENTS
6. PHOTOMETRY, RADIOMETRY & OPTICS	150	23 ± 0.5°C 55 ± 5% RH	- Single-phase supply - 3-phase supply - Isolated ground point
7. MAGNETICS	155	23 ± 0.5°C 55 ± 5% RH	- Screened room - Single-phase supply - 3-phase supply - Free of magnetic masses - Isolated ground point - A building on its own, constructed of non magnetic material
8. IMPEDANCE	155	23 ± 0.5°C 55 ± 5% RH	- Screened room - Single-phase supply - Isolated ground point
9. DC & AC LOW FREQUENCY	225	23 ± 0.5°C 55 ± 5% RH	- Screened rooms - Single-phase supply - 3-phase supply - Isolated ground point
10. ACOUSTICS & ULTRASONICS	150	23 ± 0.5°C 55 ± 5% RH	- Vibration free - Isolation mounting - Single-phase supply - Isolated ground point
11. HIGH VOLTAGE	220	23 ± 1°C 55 ± 5% RH	- Earth mat connected to earthing rods driven up to 10 meters into the ground - Safety cubicle for operator - Single-phase supply - 3-phase supply

LABORATORY	FLOOR AREA (m <sup>2</sup> )	ENVIRONMENT	SPECIAL REQUIREMENTS
12. REFERENCE MATERIALS	110	23 ± 0.5°C 55 ± 5% RH	- Single-phase supply
13. LENGTH	230	20 ± 0.2°C 55 ± 5% RH	- Single-phase supply
14. VOLUME & FLOW	850	23 ± 0.5°C 55 ± 5% RH	- Single-phase supply - 3-phase supply
15. EXPERIMENT LAB #1	90	23 ± 0.2°C 55 ± 5% RH	- Single-phase supply - 3-phase supply
16. EXPERIMENT LAB #2	90	23 ± 0.5°C 55 ± 5% RH	- Single-phase supply - 3-phase supply
17. INSTRUMENTATION LAB #3	90	23 ± 0.5°C 55 ± 5% RH	- Single-phase supply - 3-phase supply
18. WORKSHOP #4	90	23 ± 1.0°C 55 ± 5% RH	- Single-phase supply - 3-phase supply
19. OFFICER'S ROOMS AND OFFICE SPACE (Including Meeting Rooms)	470		
20. CORRIDOR, STAIRCASES, SERVICE LIFT AND TOILETS	470		
TOTAL FLOOR AREA	<u>4645</u> m <sup>2</sup>		

GENERAL REQUIREMENTS OF LABORATORIES1. Power Supply:

- a) Mains supply to the building shall be stabilised before distribution to all the laboratories. Regulation shall be 240 VAC  $\pm$  6% or better.
- b) Supply to each laboratory shall be on separate circuit or transformers so as to eliminate voltage variations and surges due to changes in load in different laboratories.
- c) Noise suppressors shall be installed at main distribution points.

2. Vibration and noise:

Vibration and noise shall be kept as minimum as possible, with the following guidelines:

- |             |   |
|-------------|---|
| Vibration - | Less than 50nm displacement below 200Hz at instrument base. |
| Noise -     | 35dB on Noise Criteria curve from 20 to 9,600 Hz            |

3. Dust control:

The particle count for dust shall be less than  $1.0 \times 10^4$  per cubic foot over 1.0 micron; less than  $5.0 \times 10^4$  per cubic foot over 0.5 micron.

4. Laboratory insulation:

Some laboratory walls shall be of double wall design.

5. Ballasts:

Ballasts for fluorescent lamps shall be installed outside the laboratories.

6. Air-Conditioners:

All laboratories shall be provided with independent air-conditioners.

7. Temperature Setting:

Each laboratory shall have its own temperature setting.

8. Humidity setting:

The humidity in each laboratory shall be controlled to  $55 \pm 5\%$  at all times.

9. Standby Dehumidifiers:

Portable dehumidifiers shall be installed in each laboratory and capable of removing moisture to maintain 55% RH and 23°C in case of main air-conditioning breakdown.

10. Illumination:

Illumination in the laboratories shall be 825 Lux measured at a height of one meter above the floor.

11. Air-Conditioning Airflow:

Airflow from air-conditioning units shall be laminar from ceiling to floor so that temperature uniformity can be achieved.

12. Power Points:

Dual single-phase power points shall be installed at every 1 meter at 90cm above floor along all walls in the laboratories.

13. Location of laboratories:

For reduction of exposure and prevention of gradients due to outside temperature changes, all primary laboratories be located internal to the building structure. There will be no walls of any primary laboratory adjacent to an exposed building exterior, nor any windows which face on the outside.

14. Entrance to laboratories:

Doors to laboratories shall be fitted with windows to permit people to see inside the laboratory without entering. Windows shall be 0.25 inch polished plate glass on which a very thin chromium alloy surface coating is deposited on one side. This protects against heat transmission from the outside, and from disturbance to workers inside.

15. Laboratory structure:

No structural steel beams are used in order to eliminate problems arising from stray fields from ring currents that develop in such structure.

16. Floor Tiles:

Antistatic tiles shall be used for laboratory flooring.

17. Standby Power Supply:

In the event of power supply failure, standby power supply shall be activated automatically to supply power to primary laboratories and to maintain designated temperature and humidity.

18. Entrance to main building:

Passage of equipment as well as people into the laboratory area shall be through an air-lock or intermediary room, which provides some protection against temperature disturbance and dirt.

LIST OF STANDARDS AND EQUIPMENT

## A. TIME AND FREQUENCY LABORATORY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Shielded Cabinet	1 unit
2. Primary Cesium Beam Tube	2 units
3. VHF Transmission Facility	1 set
4. VHF Receiver	1 unit
5. Backup GPS Receiver	1 unit
6. Rubidium Frequency Standard	1 unit
7. Synthesized Signal Generator	1 unit
8. Standard Quartz Oscillator	1 unit
9. Telephone Time Signal Transmission Facility	1 unit
10. Frequency Synthesizers	2 units
11. Spectrum Analyzer - Low Range	2 units
12. Spectrum Analyzer - High Range	2 units
13. Oscilloscope	2 units
14. Distribution Amplifier	1 unit
15. Time Interval Meter	2 units
16. Standard RPM Generator	1 unit
17. System Controllers	3 units
18. Precision DVM	1 unit
19. Time Interval Calibrator	1 unit
20. Distortion Measurement Set	1 set
21. Waveform Synthesizer	1 unit
22. GPIB System Analyzer	1 unit
23. High Accuracy Scope Calibration System	1 unit
24. RPM Generator	1 unit

## B. MASS (WEIGHT) LABORATORY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. 1 kg Primary Std. Mass (OIML Class E1)	2 pcs
2. Std. Weight Set (OIML Class E1), 1 mg - 20 kg	1 set
3. Std. Weight Set (OIML Class E2), 1 mg - 20 kg	1 set
4. Std. Weight Set (OIML Class E2), 1 mg - 500 g	2 sets
5. Std. Weight Set (OIML Class F1), 1 mg - 50 kg	1 set
6. Std. Weight Set (OIML Class F1), 1 mg - 1 kg	2 sets
7. Std. Weight Set (OIML Class F2), 1 mg - 50 kg	1 set
8. Std. Weight Set (OIML Class F2), 1 mg - 1 kg	3 sets
9. 1 kg Primary Std. Mass Comparator (readability 1 µg)	1 set
10. 50 kg Mass Comparator (readability 5 mg, Class E1)	1 set
11. 50 kg Mass Comparator (readability 10 mg, Class E2)	1 set
12. 20 kg Mass Comparator (readability 1.0 mg, Class E1)	1 set
13. 20 kg Mass Comparator (readability 1.0 mg, Class E2)	1 set

14.	10 kg Mass Comparator (readability 0.1 mg, Class E1)	1 set
15.	10 kg Mass Comparator (readability 0.1 mg, Class E2)	1 set
16.	2 kg Mass Comparator (readability 50 $\mu$ g, Class E1)	1 set
17.	1 kg Mass Comparator (readability 5 $\mu$ g)	1 set
18.	1 kg Mass Comparator (readability 10 $\mu$ g)	1 set
19.	1 kg Mass Comparator (readability 0.1 mg)	1 set
20.	500 g Mass Comparator (readability 10 $\mu$ g)	1 set
21.	200 g Mass Comparator (readability 0.1 mg)	1 set
22.	100 g Mass Comparator (readability 1 $\mu$ g)	2 sets
23.	50 g Mass Comparator (readability 1 $\mu$ g)	1 set
24.	20 g Mass Comparator (readability 1 $\mu$ g)	1 set
25.	5 g Mass Comparator (readability 0.5 $\mu$ g)	1 set
26.	5 g Mass Comparator (readability 1 $\mu$ g)	1 set
27.	3 g Mass Comparator (readability 0.1 $\mu$ g)	1 set
28.	Precision Platform Scale, capacity 600 kg (readability 1 g)	1 set
29.	Precision Platform Scale, capacity 300 kg (readability 0.1 g)	1 set
30.	Precision 20 kg balance, readability 50 mg	1 set
31.	Precision 10 kg balance, readability 10 mg	1 set
32.	Precision 5 kg balance, readability 1 mg	1 set
33.	Precision 1 kg balance, readability 0.1 mg	1 set
34.	Precision 1 kg S.G balance, readability 0.05 mg	1 set
35.	Precision 200 g balance, readability 0.01/0.1 mg	1 set
36.	Precision 25 g microbalance, readability 1 $\mu$ g	1 set
37.	Precision 4 g microbalance, readability 0.1 $\mu$ g	1 set
38.	Detector System for determining air density	1 set
39.	Anti-vibration balance tables	30 units
40.	Ultrasonic Weight Cleaning System (Various sizes)	1 set
41.	Aneroid Barometers (range atm. press)	2 units
42.	Fortin Barometers (range atm. press)	3 units
43.	Temperature (0.1C) and Humidity (2%) chart recorders	1 set

### C. INDUSTRIAL ENGINEERING LABORATORY

#### FORCE AND PRESSURE

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Precision Mercury Manometer, 1 atm., 0.01 mm	1 unit
2. Air/Gas Operated Digital Pressure Controller (0 - 10 kPa)	1 unit
3. Air/Gas Operated Pressure Balances (20, 50 & 100 kPa)	1 set
4. Oil-Operated Pressure Balances (200 kPa - 100 MPa)	1 set
5. Deadweight Force Standard Machine (250 kg)	1 unit
6. Deadweight Force Standard Machine (5000 kg)	1 unit
7. Universal Force Calibration Machine (5000 kg)	1 unit
8. Universal Force Calibration Machine (50000 kg)	1 unit
9. Hydraulic Force Standard Machine (2 MN)	1 unit
10. Hydraulic Force Standard Machine (5 MN)	1 unit
11. Precision Strain Gauge Load Cells (up to 500t)	1 set
12. Hardness Std. Machines for Vicker Scales HV30	1 unit
13. Hardness Std. Machines for Rockwell Scales HRB & HRC	1 unit



14. Hardness Std. Machines for R. Superficial Scales HR30N & HR30T	1 unit
15. Piston Cylinder Pressure Standard system	1 set
16. High accuracy low pressure calibrator	
a) Low gas pressure	1 unit
b) Medium gas pressure	1 unit
c) High gas pressure	1 unit
d) Absolute & barometric pressure	1 unit
e) Negative & gauge pressure	1 unit
17. Reference proving ring	
a) 20 kN	1 unit
b) 10 kN	1 unit
c) 5 kN	1 unit
d) 2 kN	1 unit
e) 1 kN	1 unit
18. Standard Barometer	1 unit
19. Variable pressure chamber & controller	1 set
20. Torque calibrators	1 set
21. Laser measurement & calibration system	1 set
22. Universal gear measuring machine	1 unit
23. Universal thread measuring machine	1 unit

LENGTH AND DIMENSIONAL

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Iodine-Stabilized He-Ne Laser Measurement System	1 set
2. Automatic Gauge Block Interferometer System	1 set
3. Gauge Block Calibration Unit	1 set
4. Gauge Block Set (1 mm - 100 mm), steel, Gr. AA special	1 set
5. Gauge Block Set (1 mm - 100 mm), steel, Gr. AA	1 set
6. Gauge Block Set (1 mm - 100 mm) tungsten carbide, Gr. AA	1 set
7. Gauge Block Set (1 mm - 100 mm), ceramic, Gr. AA	1 set
8. Long Gauge Block Set (125 mm - 500 mm), steel, Gr. AA	1 set
9. Thin Gauge Block Set (steps 0.001, 0.01, 0.1 mm), Gr. AA special	1 set
10. Gauge Block Accessories Set (BS 4311)	1 set
11. Calibrated Steel Balls (1 mm - 25 mm, step 1 mm)	1 set
12. Calibrated Steel Balls (1 mm - 12.5 mm, step 1 mm)	1 set
13. Combination Angle Gauges (0 - 90, 3" step)	1 set
14. Combination Angle Gauges (0 - 90, 6" step)	1 set
15. Precision Polygons (Ref. Gr.) Sets, 5-12 faces	1 set
16. Precision Polygons (Calibrn. Gr.) Sets, 5-12 faces	1 set
17. Taper Parallels Combination Set (6.4 mm - 25.4 mm)	1 set
18. Engineers Parallels (Gr. A, BS 906), various sizes	1 set
19. Optical Flats (Sizes 38, 50, 75, 100 mm)	1 set
20. Optical Parallels, NPL specs., (4 pcs., 12.00 - 12.375 mm)	1 set
21. Optical Parallels, NPL specs., (5 pcs., 12.00 - 25.00 mm)	1 set
22. Universal Monochromatic Light Unit (Sodium)	1 unit
23. Toolmakers Flats, BS 869, dia. 63, 100, 160, 200 mm	1 set
24. Gauge Block Maintenance Kit	5 sets

25. Master Cylindrical Plug Gauges (various sizes)	1 set
26. Master Ring Gauges (various sizes)	1 set
27. Master Taper Plug Gauges (various sizes)	1 set
28. Precision Ext. Micrometer Sets (0-100, 200, 300 mm)	1 set
29. Precision Int. Micrometer Sets (5 - 200 mm)	1 set
30. Self-Centering Inside Micrometers (6 - 100 mm)	1 set
31. Depth Micrometer Set (0 - 100 mm)	1 set
32. Micrometer Heads with sliding spindle (5 $\mu$ m, 25 mm)	1 set
33. Screw Thread Micrometer with interchangeable anvils	1 set
34. Thread Pin Gauges (dia. 0.17 - 5.05 mm)	1 set
35. Pin Gauge Sets (dia. 0.1 mm - 10.00 mm)	1 set
36. Thread Limit Plug Gauges (nominal dia.1 - 200 mm)	1 set
37. Thread Limit Roller Gauge (nominal dia.1 - 200 mm)	1 set
38. Thread Limit Setting Gauge (nominal dia.1 - 200 mm)	1 set
39. Precision Comparator Stands (bore mounting 8 mm, 28 mm)	1 set
40. Digital Height Measuring Machine, 800 mm	1 unit
41. Center Bench	2 units
42. Surface Plate with center	1 unit
43. Taper Testing Machine (max. 30 degree)	1 unit
44. Universal Measuring Block	2 units
45. Universal Measuring Machine, digital readout, 725mm	1 unit
46. Testing Machine for Dial Indicators (range 3 mm, 0.1 $\mu$ m)	1 unit
47. Autocollimators	2 units
48. Toolmaker Microscope (150 mm x 75 mm, 1 $\mu$ m)	1 unit
49. Precision Profile Projector (mag. 5x - 100x, 1 $\mu$ m)	1 unit
50. Roundness Measuring Machine	1 unit
51. Surface Texture Measuring Machine	1 unit
52. Screw Thread Gauging and Measuring Machine	1 unit
53. Automatic Gear Inspection Machine	1 unit
54. 3-Coordinate Measuring Machine (850 x 700 x 600 mm)	1 unit
55. Granite Surface Tables (Fed. Specs. Gr. AAA)	5 units
56. Component Measuring Microscope (50x50 mm, mag.50x)	1 unit
57. Precision Gauge Measuring Center (SIP)	1 unit
58. Temperature(0.1C) and Humidity(2%) Chart Recorders	1 unit

#### D. THERMAL LABORATORY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Fixed Point Calibration System	1 set
2. Std. Platinum Resistance Thermometer (PRT)	5 units
3. Digital Thermometer	3 units
4. Ice Crusher	2 units
5. High Precision Temperature/Humidity Chamber	2 units
6. High Precision Digital Multimeter	1 unit
7. Fixed Point Cells	6 units
8. Lamp Comparator	1 unit
9. Tungsten Lamp	1 unit
10. Low Temperature PRT	3 units
11. Viscosity Meter	1 unit
12. Humidity Meter	1 unit
13. Argon Gas	1 set

14. Pen Recorder	2 units
15. Standard Resistors	5 units
16. High Temp. Black Body Calibration System	2 sets
17. Hygrothermograph	3 units
18. Voltage Calibrator	1 unit
19. Low Temperature Calibration Bath	1 unit
20. Oil Calibration Bath	1 unit
21. Helium Filled Thermometer	1 unit
22. PC System and Printer	1 set
23. Optical Pyrometer	1 unit
24. High Temperature Furnace	1 unit
25. Standard Radiation Pyrometer System	1 set
26. Precision Surface Calibrator	1 unit
27. Precision Temperature Calibrator	1 unit
28. Ice Bath (various sizes)	5 units
29. Precision Mercury-in-glass Thermometer (double tube)	5 units
30. Automatic Precision Thermometer Bridge System	1 set
31. Continuous Distill H <sub>2</sub> O & Ice Maker	1 set
32. Quality Fluorescent Table Lamp	3 units
33. Precision Telescope with stand	2 units
34. Continuous Camera Display	1 set
35. Conductivity Meter	1 unit

#### E. FLOW AND VOLUME LABORATORY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. 500 Litre Bell Prover	1 unit
2. Precision Platform Scale (600 kg)	1 unit
3. Storage Tank, 1000 liter, (stainless steel)	1 unit
4. Calibration Fluid (light oil)	1000 litres
5. Gravimetric Tank, 500 litre (stainless steel)	1 unit
6. Transfer wet-type Gasmeter	1 unit
7. System Consultations	3 set
8. Instrumentation and Computers	3 set
9. Hoist/Crane System (overhead)	3 set
10. 3.5 m <sup>3</sup> Bell Prover	1 unit
11. CVM Transfer Gasmeter, 400 m <sup>3</sup> /h x 3	1 set
12. High Pressure Reference Gasmeter	1 unit
13. Sonic Nozzles (Low Pressure)	1 set
14. Sonic Nozzles (High Pressure)	1 set
15. Load Cells System (max. 10 tonne)	1 set
16. Load Cells System (max. 5 tonne)	1 set
17. Gravimetric Tanks (max. 10 m <sup>3</sup> )	1 unit
18. Gravimetric Tanks (max. 10 m <sup>3</sup> )	1 unit
19. Head Storage Tank	1 unit
20. Pumps, Pipelines and Auxilliaries	1 set
21. Reference Transfer Meters	1 set

F. RF & MICROWAVE LABORATORY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Standard Power Sensors	3 units
2. Power Meter	3 units
3. Attenuation Standards	1 set
4. Impedance Standards	1 set
5. Microwave Source	1 unit
6. Measuring Receiver	1 unit
7. Microwave Counter	2 units
8. Noise Standard	1 set
9. Power Comparator	1 unit
10. Attenuation Comparator	1 unit
11. Impedance Comparator	1 unit
12. Automatic Network Analyzer	1 unit
13. Micropotentiometers	1 set
14. Calorimeters	2 units
15. EMC/EMI Test Facility	1 set
16. Waveguides and Components	1 set
17. Six-port Reflectometer	1 unit
18. Digital Multimeter	1 unit
19. RMS Voltmeter	1 unit
20. System Controller + Software	2 sets
21. Shielded Room	1 unit
22. Thermistor Mounts/Peak Power Sensor	1 set
23. Microwave Test Accessories	1 set
24. RF Signal Generator	1 unit

G. PHOTOMETRY, RADIOMETRY & OPTICAL LABORATORY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Luminous Intensity Standard Lamps	3 units
2. Luminous Flux Standard Lamps	4 units
3. Colour Temperature Standards	3 units
4. Standard High Pressure Mercury Vapor Lamps	3 units
5. Standard Photocell	3 units
6. Silicon Photodiode	3 units
7. Standard White Reflector Disks	2 units
8. Spectral Illuminance Standard Lamps	2 units
9. 1.5m Photometric Sphere	1 unit
10. DC Power Source	2 units
11. AC Power Source	2 units
12. Spectrophotometer	1 unit
13. System Controller	2 sets
14. Spectral Radiance Lamps	3 units
15. Spectral Irradiance Lamps	3 units
16. Radiometric Sources	3 units
17. Radiometric Detectors	3 units
18. Standard Optical Sensor	1 unit
19. Standard Optical Power Meter	1 unit
20. Optical Calorimeter	1 unit

21. Wavelength Calibration Std.	1 unit
22. Visible Light Source	1 unit
23. White Light Source	1 unit
24. Optical Signal Generator	1 unit
25. Stabilized Light Source	1 unit
26. Optical Spectrum Analyzer	1 unit
27. Optical Wavelength/Frequency Counter	1 unit
28. Optical Wavelength Meter	1 unit
29. E/O Converter	1 unit
30. O/E Converter	1 unit
31. Optical Fiber Transmission Measuring Set	1 unit
32. Programmable Optical Attenuators	1 unit
33. Fiber Optics Accessories	1 set
34. System Controller + Software	1 set
35. Laser Diode System	1 set
36. He-Ne Laser System	1 set

#### H. MAGNETICS

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Standard Magnets	1 set
2. Nuclear Magnetic Resonance System	1 set
3. Helmholtz System	1 set
4. DC Magnetic Hysteresis Loop Tracer	1 set
5. Vibrating Sample Magnetometer	1 set
6. Core Loss Measurement System	1 set
7. Superconducting Magnet System	1 set
8. Magnetic Material Characterization System	1 set
9. Magnet Power Supply	1 set
10. Fluxgate Magnetometer	1 set
11. Gaussmeter	1 set
12. System Controller	1 set

#### I. IMPEDANCE

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Primary Capacitance System	1 set
2. Primary Inductance Standards	1 set
3. Primary AC/DC Resistors	1 set
4. Impedance Analyzer	1 unit
5. Capacitance Bridge	1 unit
6. Inductance Bridge	1 unit
7. AC Resistance Bridge	1 unit
8. Phase Standard	1 unit
9. Phase Measuring Equipment	1 unit
10. 8-Dial Inductive Voltage Dividers	2 units
11. Frequency Synthesizer	1 unit
12. 7-dial Inductive Voltage Divider	1 unit

13. Isolation Transformer	2 units
14. Standard Capacitors	1 set
15. Standard Inductors	1 set

J. DC AND AC LOW FREQUENCY

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. DC Comparator	1 unit
2. CCC Bridge	1 unit
3. Kelvin Double Bridge	1 unit
4. Zener Voltage Standards	3 units
5. AC/DC Multijunction Thermal Converters	1 set
6. Josephson Junction Array Voltage System	1 set
7. Zero Loss Dewar	1 unit
8. 10 kOhm Standard Resistor	3 units
9. 1 MOhm Standard Resistor	1 unit
10. 10 MOhm Standard Resistor	1 unit
11. Hall Effect System	1 unit
12. Power and Energy Standard	1 unit
13. Inductance Bridge	1 unit
14. Electrometer	2 units
15. Digital Teraohmmeter	2 units
16. Low Current Source	1 unit
17. Primary Capacitance Standard	1 unit
18. Primary Inductance Standard	1 unit
19. Primary Resistance Standard	1 unit
20. System Controller	2 units
21. Primary Volt Box	1 unit
22. Low Thermal Scanners	2 units
23. DC Current Shunts	1 set
24. Thermal Current Converter	1 set
25. AC Current Shunt	1 set
26. 3 Phase Watthour Meter Test System	1 set
27. Resistance Bridge	1 unit
28. Automated AC/DC Calibration set	1 set
29. Power and Energy Calibration Set	1 set
30. PRT & Digital Thermometer	1 set
31. AC/DC Transfer Standard	1 unit
32. Attenuator Calibrator	1 unit
33. Oil Bath	1 unit
34. Standard Resistors	1 set

K. ACOUSTICS AND ULTRASONICS

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Anechoic Room	1 unit
2. Reciprocity Calibration Set	1 set
3. Standard Microphone Set	1 set
4. Turntable Plotter	1 unit
5. Standard Exciter + Equipment	1 set
6. Vibration Transducers	1 set
7. Noise/Vibration Analyzer	1 unit
8. Sine Level Generator	1 unit
9. Power Amplifier	1 unit
10. Vibration Table	1 unit
11. Charge Amplifier	1 unit
12. True RMS DMM	1 unit
13. Phase-Lock-In Amplifier	1 unit
14. Reference Phase Generator	1 unit
15. Ratio Transformer	1 unit
16. Isolation Transformer	1 unit
17. Oscilloscope	1 unit
18. Noise Generator	1 unit
19. System Controller	1 unit
20. Measuring Amplifier	1 unit
21. Real-Time Frequency Analyzer	1 unit
22. Sound Intensity Probe	1 unit
23. Sound Intensity Calibrator	1 unit
24. Sound Intensity Analyzer	1 unit
25. Level Recorder	1 unit
26. Sound Random Generator	1 unit
27. Vibration Exciter Set	1 unit
28. Calibration System for Microphones	1 set
29. Calibration System for Accelerometers	1 set
30. Precision Standard Accelerometers	1 set
31. Free Field Response Microphones	1 set
32. Sound Power Source	1 unit
33. Conditioning Amplifier	1 unit
34. Charge Amplifier	1 unit
35. Precision Conditioning Amplifier	1 unit
36. Accelerometer Power Supply	1 unit
37. Sensitivity Comparator	1 unit
38. Power Amplifier	1 unit
39. Filter and Dwell Unit	1 set

L. HIGH VOLTAGE

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Standard CT	2 unit
2. Standard PT	2 units
3. PT/CT Test Set	1 set
4. AC/DC High Voltage Meter	1 set
5. CT Burden Box	1 set
6. PT Burden Box	1 unit
7. High Voltage Dividers	2 units
8. AC Galvanometer	1 unit
9. AC/DC Supply	1 unit
10. Current Unit	1 unit
11. Voltage Unit	1 unit
12. Step-up Transformer	1 unit
13. Step-down Transformer	1 unit
14. Voltage Regulator	2 units
15. AC Voltmeter	1 unit
16. Phase Shifter	1 unit
17. Voltage Adapter	1 unit
18. Current Adapter	1 unit
19. Safety Control Room	1 unit
20. High Current Transformer	1 unit
21. Main Power Supply and Isolator	1 unit

M. REFERENCE MATERIALS

<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1. Certified reference material for viscosity	1 set
2. Certified materials for density	1 set
3. Certified Brinell hardness Standards Blocks	1 set
4. Certified Vicker hardness Standards Blocks	1 set
5. Certified Rockwell hardness Standards Blocks	1 set
6. Std. reference materials for selected chemicals	1 set
7. Std. reference materials for Viscosity Fixed Point	1 set
8. Std. reference materials for Thermocouple	1 set
9. Std. reference materials for thermal conductivity	1 set
10. Std. reference materials for Thermal Expansion	1 set
11. Std. reference materials for Thermal Resistance	1 set
12. Std. reference materials for Freezing Point	1 set
11. Std. reference materials for Vapour Pressure	1 set
12. Superconductive Thermoelectric Fixed Point Device	1 set



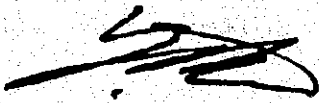
MINUTES OF DISCUSSIONS  
ON THE JAPANESE PROJECT-TYPE TECHNICAL COOPERATION  
FOR THE PROJECT ON THE MEASUREMENT CENTRE  
OF SIRIM (PHASE II )  
IN MALAYSIA

The Japanese Preliminary Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Yoshiro Minato, visited Malaysia for the purpose of clarifying the outline and background of the Malaysian proposal as well as confirming the feasibility of the Japanese Technical Cooperation for the Project on the Measurement Centre of SIRIM (Phase II) in Malaysia (hereinafter referred to as "the Project").

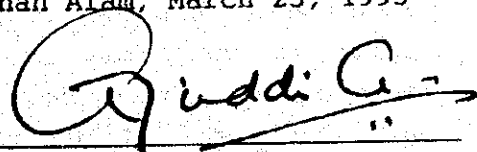
During its stay in Malaysia, the Team exchanged views and had a series of discussions on the Project with the authorities concerned of the Government of Malaysia (hereinafter referred to as "the Malaysian Side"), and also made a field survey to the proposed Project site and the relevant facilities.

As a result of the discussions, both sides reached an understanding concerning the matters referred to in the document attached herewith.

Shah Alam, March 23, 1995



Mr. Yoshiro Minato  
Leader,  
Preliminary Survey Team,  
Japan International  
Cooperation Agency,  
Japan



Dato' Dr. Ahmad Tajuddin Ali  
Director General,  
The Standards and Industrial  
Research Institute of Malaysia,  
Ministry of Science, Technology  
and Environment,  
Malaysia

THE ATTACHED DOCUMENT

1. Name of the Project

The Project on the Measurement Centre of SIRIM (Phase II)

2. Implementing Agency of the Project

Measurement Centre of the Standards and Industrial Research Institute of Malaysia (hereinafter referred to as "SIRIM") in the Ministry of Science, Technology and Environment (hereinafter referred to as "MOSTE").

The organization chart of the Project is shown in Appendix I.

3. Administration of the Project

Director General of SIRIM, as the Project Director, will bear overall responsibility for the administration and implementation of the Project.

Head of the Measurement Centre of SIRIM, as the Project Manager, will be responsible for the managerial and technical matters of the Project.

4. Site for the Project

Block 8 of SIRIM in Shah Alam, scheduled to be extended by the end of 1995, will be the Project site.

The Project site has to be provided with the necessary facilities such as temperature control, humidity control and other related facilities.

When the construction of the Measurement Centre in Bukit Jalil is completed in early 1998, the Project site will move to this building.

All the cost and the responsibility for the moving of the Centre will be borne by the Malaysian side.

The schedules of the extension of Block 8 and the construction of the new building are shown in Appendix II and Appendix III respectively.

## 5. Duration of the Project

The duration of the technical cooperation for the Project by the Government of Japan through JICA will be for 4 years from the date agreed by both sides in the Record of Discussions (R/D), to be concluded between JICA and the Malaysian side.

## 6. Objective of the Project

### 6.1 Overall Goal

National Measurement Standards System is established.

### 6.2 Project Purpose

Maintenance system of measurement standards of length, pressure, electricity and vibration, which are provided for the industries, is established in the Measurement Centre of SIRIM.

## 7. Brief Outline of the Project

### 7.1 Outputs

In the fields of length, pressure, electricity and vibration in the Measurement Centre of SIRIM,

- (1) Measurement system configuration is fulfilled and equipment is upgraded.
- (2) Maintenance system of measurement standard equipment is developed and the equipment is utilized effectively.
- (3) The competence and proficiency of research officers and other technical staff members are upgraded.

### 7.2 Activities

In the fields of length, pressure, electricity and vibration:

- (1) a. Configuration and specification of measurement standard equipment are designed (both sides).

- b. Measurement standard equipment is procured and installed (both sides).
  - c. Instruction manuals to operate measurement standard equipment are developed (both sides).
- (2)
- a. Maintenance manuals of measurement standard equipment are developed (both sides).
  - b. Calibration record forms of measurement standard equipment are developed (both sides), and utilized (mainly Malaysian side).
- (3)
- a. Implementation plan of technology transfer is compiled (both sides).
  - b. The Japanese experts provide technical guidance for the Malaysian counterparts by utilizing measurement standard equipment (mainly Japanese side).
  - c. The Malaysian counterparts are trained in Japan (mainly Japanese side).
  - d. Procedure manuals on management and control of measurement standards are developed (both sides).
  - e. The Malaysian counterparts provide technical guidance for the other technical staff members (mainly Malaysian side).

#### 8. Scope of Technical Cooperation

Measurement technology in the fields of :

- (1) Length.
- (2) Pressure.
- (3) Electricity.
- (4) Vibration.

As for the measurement technology in the field of vibration, the decision to include it in the scope of the Project, will be decided when the Expert Survey Team is dispatched. The decision will be based on the necessity of that field and the availability of the expert, the counterpart and the equipment.

In the case that the measurement technology in the field of vibration is excluded from the scope of the Project, related words and sentences of item 6.2, 7.1, 7.2 and 9.1 of this attached document will be modified.

## 9. Measures to be taken by the Japanese Side

### 9.1 Dispatch of Japanese Experts

(1) Maximum number of the long-term experts, who will be dispatched, is six and the fields are as follows.

- ① Chief advisor \*
- ② Project coordinator
- ③ Expert in the field of Length
- ④ Expert in the field of Pressure
- ⑤ Expert in the field of Electricity
- ⑥ Expert in the field of Vibration

\* One of the experts in the technical fields may act as the Chief Advisor.

(2) The short-term experts in the technical fields and equipment's installation/operation will be dispatched when the necessity arises.

### 9.2 Training of Malaysian Counterpart Personnel in Japan

Approximately two to three counterpart personnel will be accepted for training in Japan each year during the cooperation period.

### 9.3 Provision of Equipment

The Malaysian side requested the provision of equipment to the Team as shown in Appendix IV

The Team stated that they would examine the list of equipment requested by the Malaysian side within the limits of the budget, taking the Malaysian priority into consideration.

10. Measures to be taken by the Malaysian Side

10.1 Preparation of the necessary amount of local costs

Necessary amount of local costs for the implementation of the Project will be provided.

The tentative schedule of budget allocation is shown in Appendix V .

10.2 Provision of Equipment

Equipment necessary for the implementation of the Project other than those provided through JICA will be provided.

The Malaysian side has already secured RM 12.46 million for equipment which will be used in the four fields of Technical Cooperation and has requested RM 26.25 million additionally to the Government for the next five years.

10.3 Provision of Offices and Facilities

The Malaysian side agreed to the provision of necessary space and facilities for the implementation of the Project. The tentative layout plan is shown in Appendix VI .

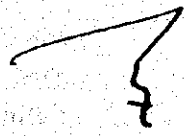
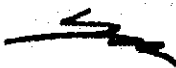
10.4 Assignment of the necessary number of Counterpart Personnel and Administrative Staff

Approximately three counterpart personnel for each Japanese expert will be assigned.

The tentative schedule of staff allocation is shown in Appendix VII .

11. Schedule of the Project

Both sides agreed with the Tentative Schedule of Implementation (TSI) as shown in Appendix VIII .



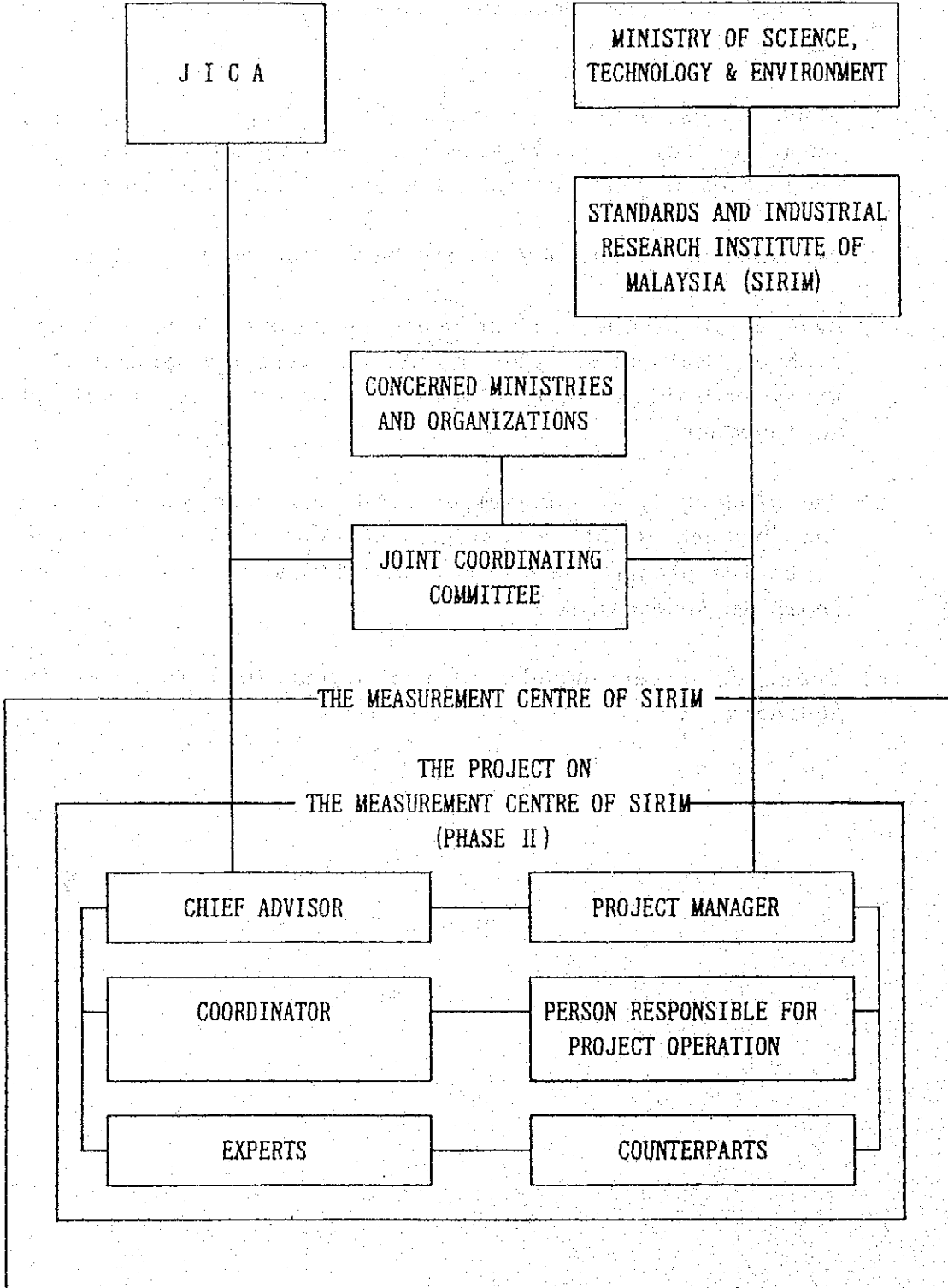
12. Others

- (1) The Malaysian side understood the nature and system of the Project-type Technical Cooperation of the government of Japan.
- (2) Both sides agreed to establish a Joint Coordinating Committee to ensure smooth implementation of the Project. The Committee shall meet at least once a year.
- (3) Transfer of technology should be conducted in English.
- (4) Evaluation of the Project would be conducted jointly by JICA and Malaysian side, during the last six months of the cooperation term in order to examine the level of achievement.
- (5) The project cycle management (PCM) workshop was held at the beginning of a series of discussions, and the tentative project design matrix (PDM) was formulated as shown in Appendix IX .
- (6) The list of attendants in the discussions is shown in Appendix X .

Appendix I - (1). ORGANIZATION CHART OF THE PROJECT

(Japanese Side)

(Malaysian Side)





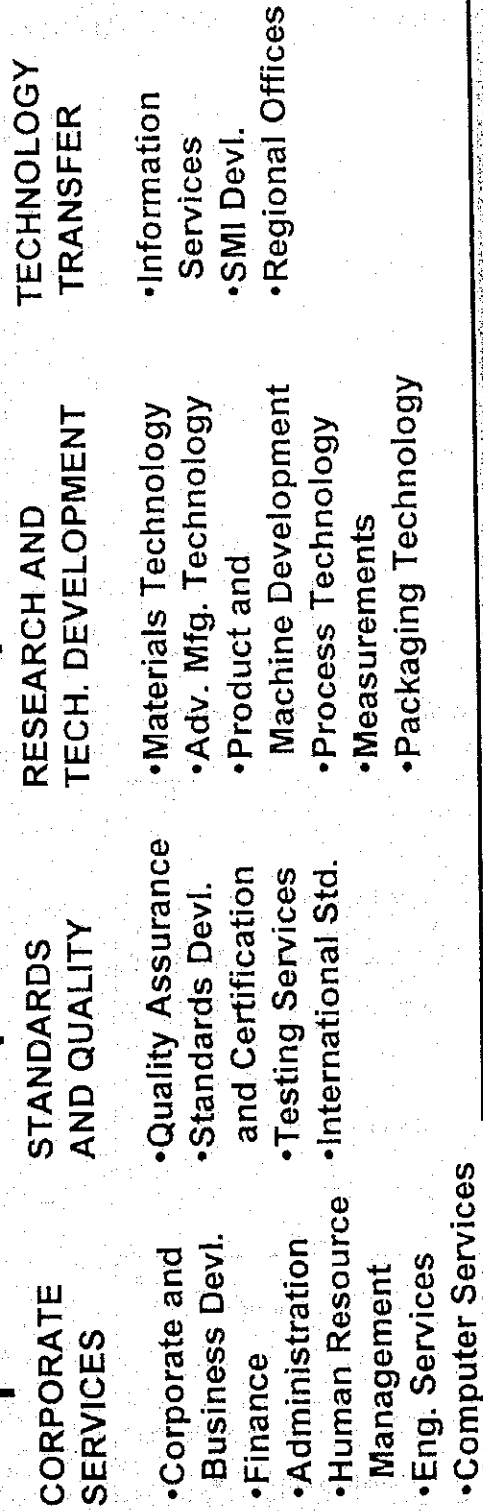
Appendix I - (2) **SIRIM ORGANIZATION CHART 1995**  
**MINISTER OF SCIENCE,  
 TECHNOLOGY AND THE ENVIRONMENT**

RESEARCH COUNCIL  
 STANDARDS COUNCIL  
 ACCREDITATION COUNCIL

SIRIM BOARD

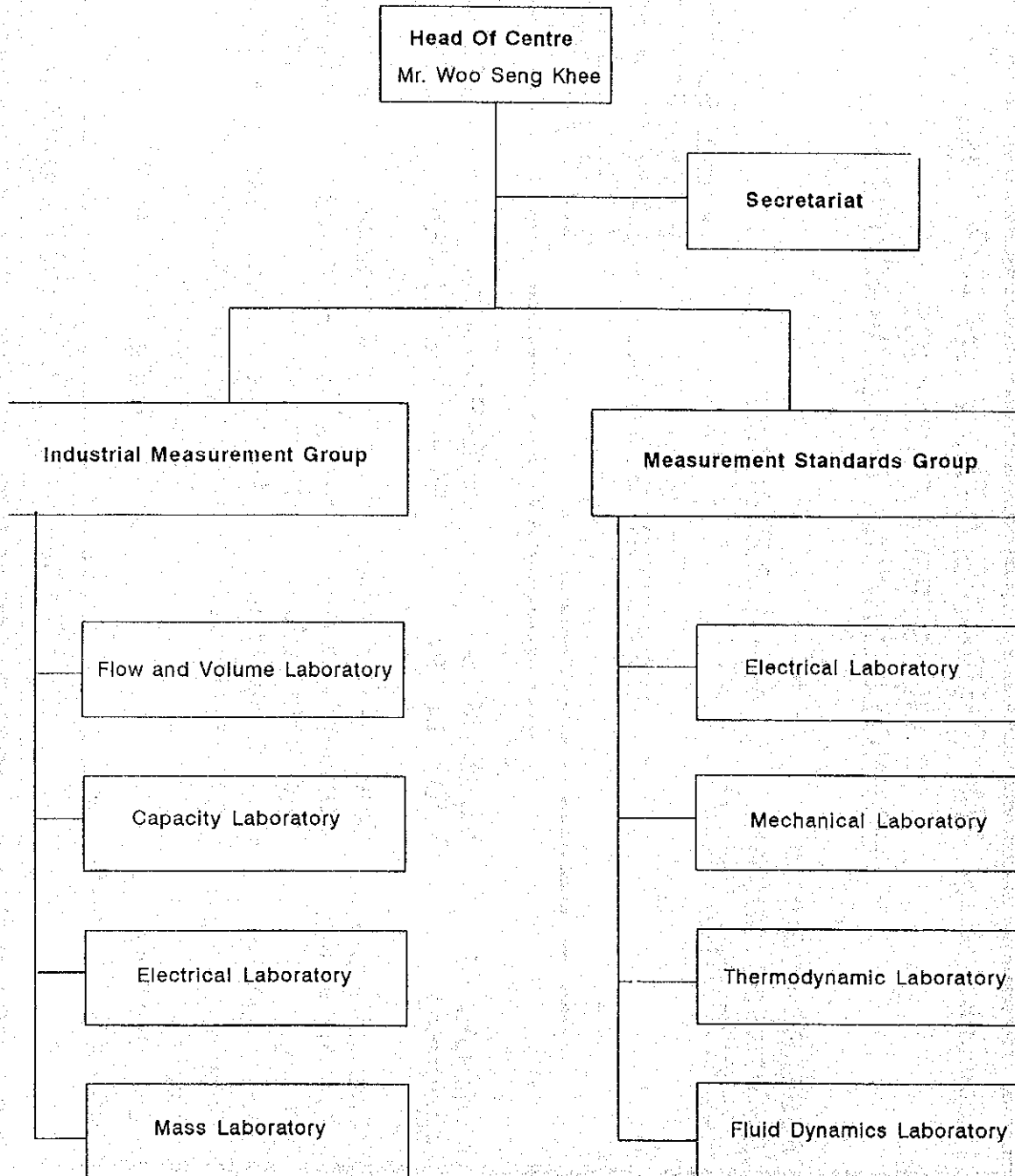
MAC Secretariat  
 MRM Secretariat  
 Internal Audit  
 Corporatization S'riat  
 DG's Office

DIRECTOR- GENERAL



**SIRIM ... a friend and partner of industry**

Appendix I-(3) ORGANISATION CHART  
OF  
MEASUREMENT CENTRE 1995



Measurement Centre

Appendix II - Construction Schedule For Extension to Block 8

No.	Activities	15/2/95	15/3/95	15/4/95	15/5/95	15/6/95	15/7/95	15/8/95	15/9/95	15/10/95	15/11/95
1.	Contract Commerce										
2.	Preliminary										
3.	Piling Work										
4.	Foundation Finish										
5.	Frame										
6.	Roofing & Plumbing										
7.	Wall and Partition										
8.	Doors										
9.	Wall Plastering										
10.	Floor Finish										
11.	Ceiling completed										
12.	Electrical works										
13.	Completion of Contract										

Appendix III - Construction Schedule For The New National Measurement Centre in Bukit Jalil

No.	Activities	1st qr 1995	2nd qr 1995	3rd qr 1995	4th qr 1995	1st qr 1996	2nd qr 1996	3rd qr 1996	4th qr 1996	1st qr 1997	2nd qr 1997	3rd qr 1997	4th qr 1997
1.	Land Acquisition												
2.	Land Surveying & development												
3.	Designing of building												
4.	Preparation of Tender document												
5.	Tender												
6.	Evaluation & Award of Tender												
7.	Construction of Building												
8.	Completion of Building												

Appendix IV List of Equipment Requested

ELECTRICAL METROLOGY

Parameter/ Laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range & Specification	Reference in Project Document	Similar proposal in RM7 with comments
1. DC Voltage	1. Null Detector (Fluke 845AB) 2. Amplifier (Fluke 5725A) 3. DMM (8.5 digits) 4. 100 l Liquid He Transport Dewar	1 unit 1 unit 1 unit 1 unit	1 $\mu$ V - 1000V ranges  1.4 inches neck diameter minimum	7 - 90 7 - 90 7 - 90 7 - 90	Nil, only for upgrading of dc voltage comparator (automatic system)
2. Resistance	1. DC Shunts 15A, 100A, 300A Guideline 9230 2. 1 milliohm standard (I&N 4223-B) 3. 10 milliohm standard (I&N 4222-B) 4. 100 milliohm standard (I&N 4221-B)	1 set 1 unit 1 unit 1 unit	0.04%  20 ppm 20 ppm 20 ppm	7 - 91 7 - 91 7 - 91 7 - 91	Nil, only High Resistance Measurement System
3. LC Standard	1. Capacitance Bridge 2. 1 MHz Capacitance Standards 3. 1 MHz Inductance Standards 4. Standard Capacitor 1000pF 20kV 5. Standard Capacitor 10nF 2kV 6. Current Comparator w/CT	1 unit 1 set 1 set 1 unit 1 unit 1 unit	1 ppm 0.05% 0.05%	7 - 92 7 - 92 7 - 92	Nil, only Primary Standard for Capacitance
4. AC Voltage	1. Inductive Voltage Divider 2. Amplifier (Fluke 5725A)	1 unit 1 unit	7 or 8 dial	7 - 93 7 - 93	

ELECTRICAL METROLOGY

Parameter/ Laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range & Specification	Reference in Project Document	Similar proposal in RM7 with comments
5. Power and Energy	1. Digital Power Meter (3 phase - 4 wire) with integrator (Yokogawa 2533E)	1 unit	0.05%		Dividers and transformers only
	2. Standard Watthour Meter (3 phase - 4 wire)	1 unit	0.01%	7-94	
	3. DMM	2 units	7 digits	7-94	
	4. Calibrator (Fluke 5700-03)	1 unit		7-94	
	5. Amplifier (Flukew 5725A)	1 unit		7-96	
6. High Voltage	1. Automatic Instrument Transformer Test Set (Keihin Densoki Model ATS-51)	1 unit		7-96	
	2. Standard Current Transformer (Keihin Densoki Model CT-11)	1 unit		7-96	
	3. Standard Current Transformer (Keihin Densoki Model CT-12)	1 unit		7-96	
	4. Standard Potential Transformer (Keihin Densoki Model PTP 664G)	1 unit		7-96	
	5. Burden Box for CT	1 unit	Power factor 1 and 0.8	7-96	
	6. Burden Box for PT	1 unit	Power factor 1 and 0.8	7-96	
	7. Auxiliary Potential Transformer (Keihin Densoki Model PTS-34)	1 unit		7-96	
	8. Auxiliary Current Transformer (Keihin Densoki Model CTS-211)	1 unit		7-96	
	9. Current Comparator Test Set up to 2000A (Keihin Densoki Model ET-1010)	1 set	Input: 240V, 50Hz	7-96	
	10. AC High Voltage Test Set (100kV) (Keihin Densoki Model ET-1010)	1 set	Input: 240V, 50Hz	7-96	
	11. DC High Voltage Supply (50kV) (Keihin Densoki Model EDP-50)	1 set	Input: 240V, 50Hz	7-96	
	12. Slide Transformer (Keihin Densoki Model S-220)	2 units	Input: 240V, 50Hz	7-96	

ELECTRICAL METROLOGY

Parameter/Laboratory	Proposed Equipment to be equired from JICA	Quantity	Reference in Project Document	Similar proposal in RM7
12. Microwave	50. Microcalorimeter( up to 18 GHz) Type N connector 51. Micropotentiometer (up to 18 GHz) Type N connector 52. Standard Noise Generator ( up to 18 GHz) Maury Microwave Corp. Type N connector 53. TEM Transmission Cell (Model TC 3020, 150L Amplifier Research, USA) 54. K2001 Digital Multimeter (Keithley) 55. Iwatsu SC-7204 Universal Counter	1 unit 1 set 1 set 1 unit 1 unit 1 unit	7 - 97 7 - 97 7 - 97 7 - 97	Microcalorimeter

VIBRATION METROLOGY

Parameter/ Laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range & Specification	Reference in Project Document	Similar proposal in RM7 with comments
1. Vibration	1. Reference Pick-Up 2. Standard Pick-Up 3. Vibration Meter 4. Vibration Machine 5. FFT Analyzer 6. Signal Generator 7. Amplifier	2 units 2 units 1 unit 1 unit 1 unit 1 unit 1 unit		7 - 154 7 - 154 7 - 154 7 - 154 7 - 154 7 - 154 7 - 154	Nil. RM7 proposal is an automatic system for the measurement of vibration pickup sensitivity.



ELECTRICAL METROLOGY

Parameter/ Laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range & Specification	Reference in Project Document	Similar proposal in RM7 with comments
7. Time and Frequency	<ol style="list-style-type: none"> <li>1. Rubidium Frequency Standard (NEC)</li> <li>2. Telephone Speaking Clock with 1 pulse per second input</li> </ol>	<p>1 unit</p> <p>1 unit</p>	<p><math>10^{-11}</math></p>	<p>7 - 96</p> <p>7 - 96</p>	
8. Acoustic	<ol style="list-style-type: none"> <li>1. Digital Barometer</li> <li>2. Programmable Attenuator (Tamagawa TPA-302A)</li> </ol>	<p>1 unit</p>		<p>7 - 98</p>	
9. Photometry	<ol style="list-style-type: none"> <li>1. 6m Photometer Bench</li> <li>2. Distribution Thermometer</li> <li>3. Integrating Sphere 2.5m</li> <li>4. Reference Ballast</li> <li>5. Digital Pt. Resistance Thermometer</li> <li>6. Life Test System of Standard Lamp</li> <li>7. Optical Spectrum Analyzer (Anritsu)</li> <li>8. Optical Time Domain Reflectometer (Anritsu)</li> <li>9. Optical Wavelength/Frequency Counter (Anritsu)</li> </ol>	<p>1 unit</p> <p>1 unit</p> <p>1 unit</p> <p>1 unit</p> <p>1 unit</p> <p>1 set</p> <p>1 unit</p> <p>1 unit</p> <p>1 unit</p>		<p>7 - 100</p> <p>7 - 100</p> <p>7 - 100</p> <p>7 - 100</p> <p>7 - 100</p> <p>7 - 100</p>	<p>Nil, Photometry and optical standards but mostly for special measurements such as laser characteristics and fiber optics.</p>

ELECTRICAL METROLOGY

Parameter/ Laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range & Specification	Reference in Project Document	Similar proposal in RM7 with comments
10. Magnetics	<ol style="list-style-type: none"> <li>1. Helmholtz Coil System</li> <li>2. Electromagnet System</li> <li>3. Standard Magnets</li> </ol>	<p>1 unit 1 unit 1 set</p>		<p>7 - 101 7 - 101 7 - 101</p>	Electromagnet and Helmholtz Coil System
11 Accessories	<ol style="list-style-type: none"> <li>1. Metrology Property Management Software (Fluke MET/Track)</li> <li>2. Calibration Software (Fluke MET/CAL)</li> <li>3. Liquid Paraffin for oil bath (Showa Chemicals, Japan)</li> </ol>	<p>1 unit 1 unit 30 cans</p>	<p>For IBM PC For IBM PC 1 can = 18 liters</p>		

ELECTRICAL METROLOGY

Parameter/Laboratory	Proposed Equipment to be required from JICA	Quantity	Reference in Project Document	Similar proposal in RM7
12. Microwave	<ol style="list-style-type: none"> <li>1. HP8510C Vector Network Analyzer ( 45 MHz to 50 GHz)</li> <li>2. HP8511B Frequency Converter (50 GHz)</li> <li>3. HP 83651A Synthesized Sweeper( 10 MHz to 50 GHz)</li> <li>4. HP-1B Extender</li> <li>5. HP8360 Data Acquisition software</li> <li>6. HP11667C Power Splitter(DC to 50 GHz)</li> <li>7. EMCO 1090 Positioning Controller</li> <li>8. EMCO 1070 Antenna Tower</li> <li>9. HP11968 Antenna Positioning Mast</li> <li>10. HP Vectra 486DX2, 50 MHz</li> <li>11. HP Color Printer</li> <li>12. Microwave Anechoic Chamber (1 GHz to 50 GHz)</li> <li>13. Ground plane for open field test site (22m x 24m)</li> <li>14. HP11968C Antenna Tripod</li> <li>15. HP8565E Spectrum Analyzer ( 9 kHz to 50 GHz)</li> <li>Option 005 Add Alternate Sweep Output</li> <li>Option 006 Frequency Coverage Down to 30 Hz</li> <li>Option 007 Digitized Fast Time Domain Sweeps</li> <li>Option 008 Add Signal Identification</li> <li>16. HP 83051A Amplifier (45 MHz to 50 GHz)</li> <li>17. R&amp;S Synthesized Sweeper SMIK348.0010.03(10Hz - 140 MHz)</li> <li>18. HP83659A Synthesized Sweeper (10 MHz to 50 GHz)</li> <li>Option 001 Add Step Attenuator</li> <li>Option 002 Add Internal Modulation Generator</li> <li>Option 006 Fast Pulse Modulation</li> <li>Option 008 1 Hz Frequency Resolution</li> <li>19. HP8447F Option H64 Dual Preamplifier(9 kHz to 1.3 GHz)</li> </ol> <p>Type N(f) connector</p>	<p>1 unit                      1 unit                      1 unit                      2 units                      1 unit                      2 units                      1 unit                      2 units                      1 unit                      1 unit                      1 unit                      1 unit                      2 units                      1 unit</p> <p>2 units                      1 unit                      1 unit</p> <p>1 unit</p>		

ELECTRICAL METROLOGY

Parameter/Laboratory	Proposed Equipment to be required from JICA	Quantity	Reference in Project Document	Similar proposal in RM7
12. Microwave	<p>20. Adapter Type N(f) - 3.5mm(f) Part No. 1250-1745                  21. Adapter 3.5mm(f) - 3.5mm(f) Part No. 5061-5311                  22. Adapter 2.4mm(f) - 2.92mm(f) Part No. 1250-2187                  23. Adapter 2.4mm(f) - 2.4mm(f) Part No. 1250-2188                  24. HP11966L 10m(32.8 ft) antenna cables Type N(m)(m)                  25. HP11966M 10m(32.8 ft) antenna cables BNC(m)(m)                  26. Adapter Type N(m) BNC(f) HP1250-0780                  27. Adapter APC-7 to Type N(f) HP11524A                  28. Adapter 2.4mm(m) - Type K(m) HP11904A                  29. Adapter 2.4mm(f) - Type K(f) HP11904B                  30. Adapter 2.4mm(m) - Type K(f) HP11904C                  31. Adapter 2.4mm(f) - Type K (m) HP11904D                  32. Adapter 2.4mm(m) - Type N(m) HP11903A                  33. Adapter 2.4mm(f) - Type N(f) HP11903B                  34. Adapter 2.4mm(m) - Typr N(f) HP11903C                  35. Adapter 2.4mm(f) - Type N(m) HP11903D                  36. SAS-200/560 Emission Loop Antenna(20 Hz 2 Mhz) 5.25"                  37. EMCO 6507 Active Loop Antenna ( 10 kHz to 30 Mhz) 12" Type N(f) connector                  38. SAS-200/550-1B Active Rod Antenna (10 kHz to 60 Mhz) 43"                  39. HP11966A K24 Biconical Antenna (20 Mhz to 300 Mhz) Type N(f) connector                  40. HP11966D Log Periodic Antenna (200 MHz to 1 GHz) Type N(f) connector                  41. HP11966E Double Ridged Waveguide Horn Antenna (1 GHz to 18 GHz) Type N(f) connector                  42. HP11966I Double Ridged Horn Antenna (18 GHz to 40 GHz) Type K(f) connector                  43. HP11966H Tuneable Dipole Antenna (28 MHz to 1 GHz) Type N(f) connector                  44. HP11966P Broadband Antenna (30 MHz to 1 GHz) Type N(f) connector                  45. LW8853 Frequency Converter (18 GHz to 40 GHz)                  46. LW1107-7 Waveguide Transfer Std (18 GHz to 26.5 GHz)                  47. LW1107-8 Waveguide Transfer Std (26.5 GHz to 40 GHz)                  48. Microwave Source (18 GHz to 26.5 GHz)                  49. Microwave Source (26.5 GHz to 40 GHz)</p>	<p>6 units                  6 units                  6 units                  3 units                  3 units                  6 units                  6 units                  6 units                  6 units                  6 units                  6 units                  6 units                  6 units                  6 units                  3 units                  3 units                  3 units                  3 units                  3 units                  3 units                  3 units                  3 units                  3 units                  1 unit                  1 unit                  1 unit                  1 unit                  1 unit</p>		

LENGTH METROLOGY

Parameter/ laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range and Specification	Reference in Project Document (Table 7-3)	Similar proposal in RM 7 with comments
Length	Gauge Block Calibration Unit(Comparator)	1	Highest precision	1(3)	No
"	Long gauge block set(steel Gr:AA)	1	Grade AA	1(8)	"
"	Thin gauge block set(steel, Gr:AA special)	1	Grade AA	1(9)	"
"	Gauge block accessories set	1	-	1(10)	"
"	Gauge block maintenance kit	1	-	1(11)	"
Dia.	Precision Ext. Micrometer set	1	Highest accuracy	1(12)	No
Dia.	Precision Int. Micrometer set	1	Highest accuracy	1(13)	No
Length	Length Bench (20m) w/laser Measurement system	1	"	2(1)	No
Angle	Autocollimators	1	"	3(1)	No
Angle	Combination angle gauges (0 to 90, 3" step)	1	±2sec	3(2)	Yes
Angle	Combination angle gauges (0 to 90, 6" step)	1	±2sec	3(3)	"
Angle	Precision polygon sets (5 - 12 faces)	1	±5sec	3(4)	"
Angle	Precision Polygon(Calibration grade)	1	±10sec	3(5)	No

## LENGTH METROLOGY

Parameter/ laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range and Specification	Reference in Project Document	Similar proposal in RM 7 with comments
Dim.	Taper Parallels combination set	1 set	Ref.Gr	3(6)	Yes
Parallelism	Engineers parallels	1 set	Ref.Gr.	3(7)	"
Dia.	Calibrated steel bar(1mm - 25mm)	1set	±0.0005mm	4(1)	"
Dia.	Calibrated steel bar(1.5mm - 12.5mm)	1 set	±0.0005mm	4(2)	"
Flat.	Optical flat( 38, 50, 75, 100mm)	1set	0.1µm	4(3)	"
Flat	Optical Parallels(12-12.375mm)	1set	Highest accuracy	4(4)	"
Parallelism	Optical parallels (12-25mm)	1set	"	4(5)	"
Angle	Universal Monochromatic light unit	1	-	4(6)	"
Flat.	Toolmakers Flat	1set	0.1µm	4(7)	No
Gauge	Master cylindrical Plug Gauges	1set	Ref.Gr	4(8)	Yes
Dia.	Master Ring Gauges	1set	Ref.Gr	4(9)	Yes
Gauge	Master Taper Plug Gauges	1set	Ref.Gr	4(10)	Yes
Dia.	Self-Centering Inside Micrometers	1set	Highest Accuracy	4(11)	No
Depth	Depth Micrometers set	1 set	"	4(12)	No
Gauge	Micrometer Heads w/sliding Spindle	1 set	"	4(13)	Yes
Gauge	Screw Thread Micrometer w/interchangeable Anvils	1 set	"	4(14)	No

## LENGTH METROLOGY

Parameter/ laboratory	Proposed Equipment to be acquired from JICA	Quantity	Accuracy Required/ Range and Specification	Reference in Project Document (Table 7- 3)	Similar proposal in RM 7 with comments
Gauge	Thread Pin Gauges	1 set	Ref. Gr.	4(15)	Yes
Gauge	Thread Limit Plug Gauges	1 set	Ref. Gr.	4(17)	"
Gauge	Thread Limit Roller Gauges	1set	Ref. Gr.	4(18)	"
Gauge	Thread Limit Setting Gauges	1 set	Ref. Gr.	4(19)	"
accessory	Precision Comparator Stand	1set	-	4(20)	"
Height	Digital Height Measuring Machine (800mm)	1	Highest Accuracy	4(21)	"
Dim.	Centre Bench	1	-	4(22)	"
Dim.	Surface Plate w/centre	1	-	4(23)	"
Taper mea.	Taper Testing Machine	1	Highest Accuracy.	4(24)	No
Dim	Universal Measuring Machine	1	Highest Accuracy	4(26)	No
Dim.	Roundness Measuring Machine	1	"	4(30)	Yes
Roughness	Surface Texture Measuring Machine	1	"	4(31)	Yes
Gauge	Screw Thread Gauging and Measuring Machine	1	"	4(32)	Yes
Flat.	Granite Surface Plate(Gr.0) Size 1000mmx1000mm	4	Gr.0	4(35)	Yes
Accessory	Temperature and Humidity Chart Recorder	4	-	4(36)	No

PRESSURE METROLOGY

No.	Proposed Equipment to be acquired from JICA	Quantity	Range/Accuracy/ Specification	Reference in Project Document	Similar proposal in RM7 and comments.
1.	Interference Primary Standard Manometer.	1 unit.	800 mm Hg, Acc. $\pm 3 \times 10^{-6}$ .	Table 7-7 Item 3 (1).	Yes.
2.	Standard Haas Barometer.	1 unit.	800 mm Hg, Acc. $\pm 3 \times 10^{-5}$ .	Item 2 (2).	Yes, 2 units.
3.	Barometer Test Chamber.	1 unit.	1 atm.	Item 3 (3).	Yes.
4.	McLeod Vacuum Gauges.	1 set.	0.1 - 7 Pa.	Item 4 (1).	Yes.
5.	Ionization Vacuum Gauges.	1 set.	$10^{-1} - 10^{-4}$ Pa.	Item 4 (3).	Yes.
6.	Low Pressure Air-Operated Digital Piston Gauge System.	1 set.	0 - 10 kPa, Acc. 40 ppm.	-	-
7.	Absolute & Gauge Pressure Air-Operated Piston Gauge System.	1 set.	0 - 80 kPa, Acc. 40 ppm.	-	-
8.	Vacuum pumps (single- and double-stage types).	1 unit each.	0.01 Pa abs.	-	-



PRESSURE METROLOGY

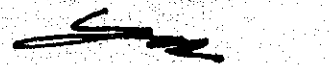
No.	Proposed Equipment to be acquired from JICA	Quantity	Range/Accuracy/ Specification	Reference in Project Document	Similar proposal in RM7 and comments.
9.	Precision Pressure Controller.	1 unit.	0 - 10 kPa.	-	-
10.	Digital Laboratory Barometer.	10 units.	1 atm., Acc. $\pm$ 0.15 mbar.	-	-

**Appendix V - Budget Allocation For Measurement Centre\*\***

Year	1995	1996	1997	1998	1999	2000
Operating Budget*	1.90	2.16	2.67	3.6	4.31	4.98
Development Budget (Building & Equipment)	12.0	12.7	18.81	21.88	10.24	1.55
R&D Budget*	0.867	0.5	1.2	2.0	1.1	0.2
Total	14.77	15.36	22.68	27.48	15.65	6.73

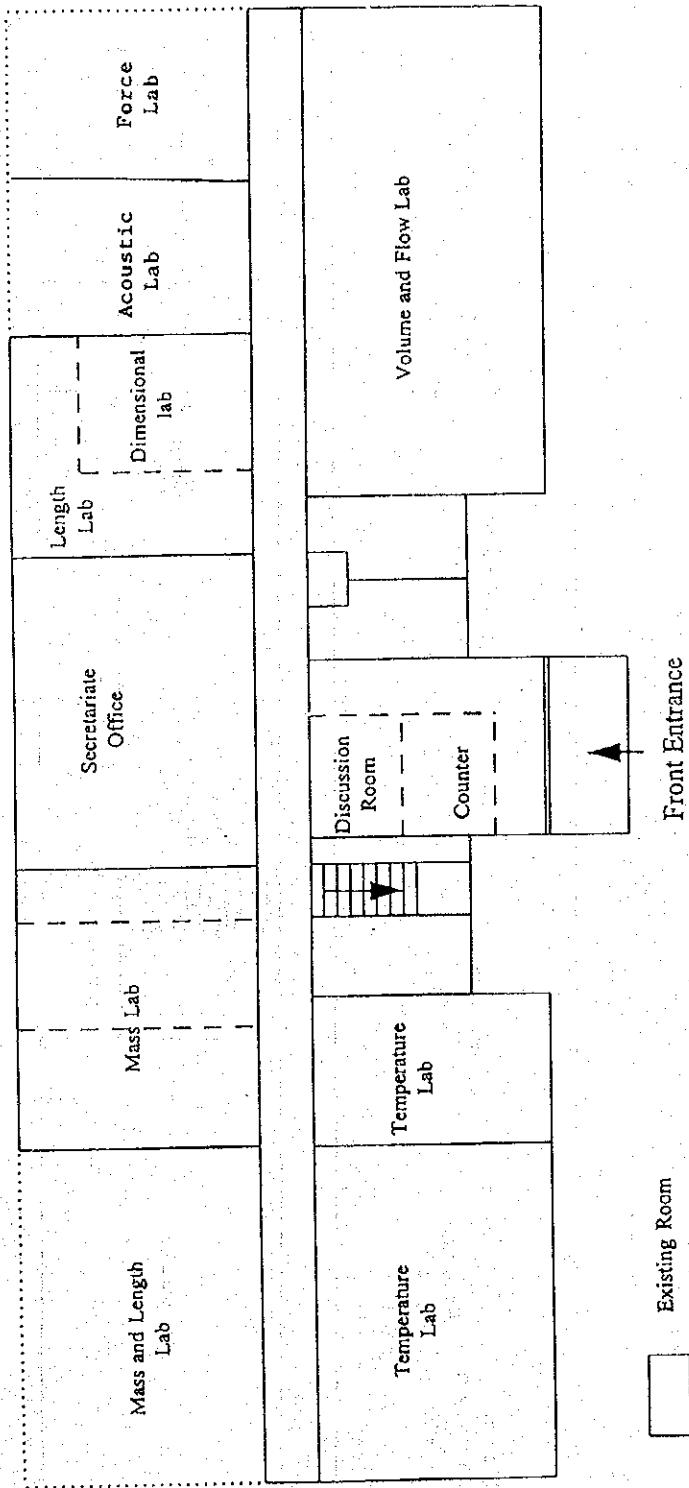
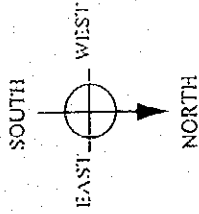
\*Budget estimate are in million ringgit.

\*\*Industrial Measurement Group of Measurement Centre does not have a development and R&D budget.  
Its Operating Budget is about 40% of total budget.



Appendix VI - Layout Plan of Block 8, Measurement Centre

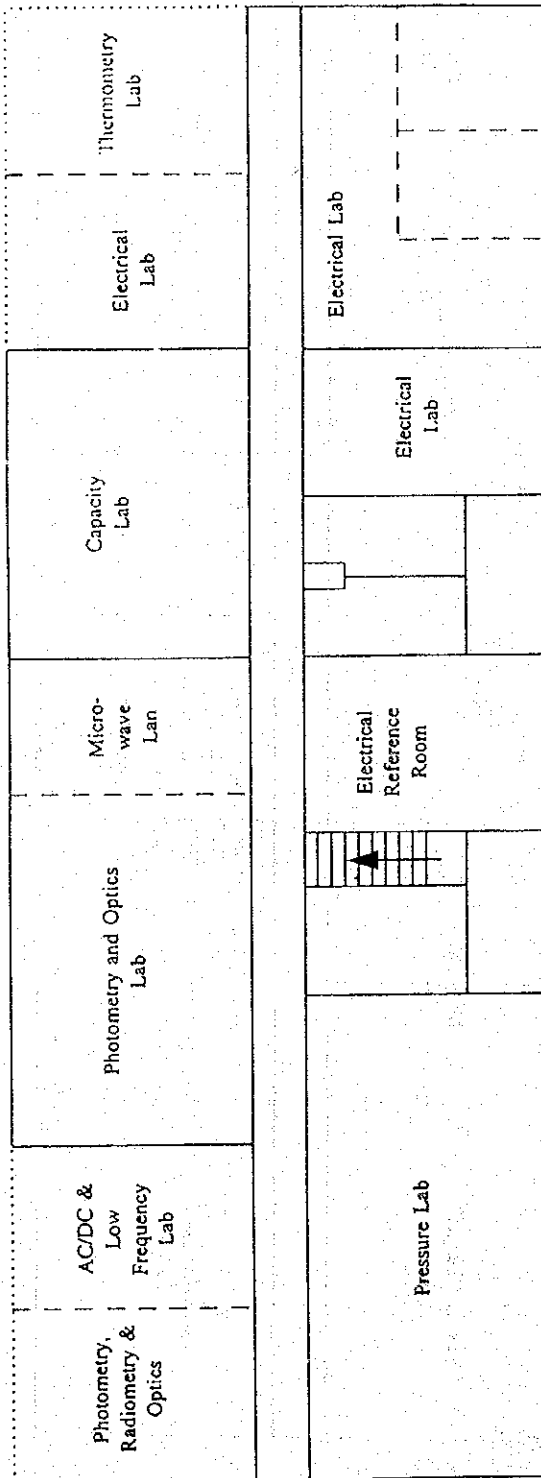
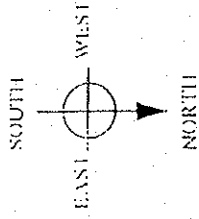
# Measurement Centre Ground Floor







- Existing Room
- Under Construction
- Partition in Room
- Stairs

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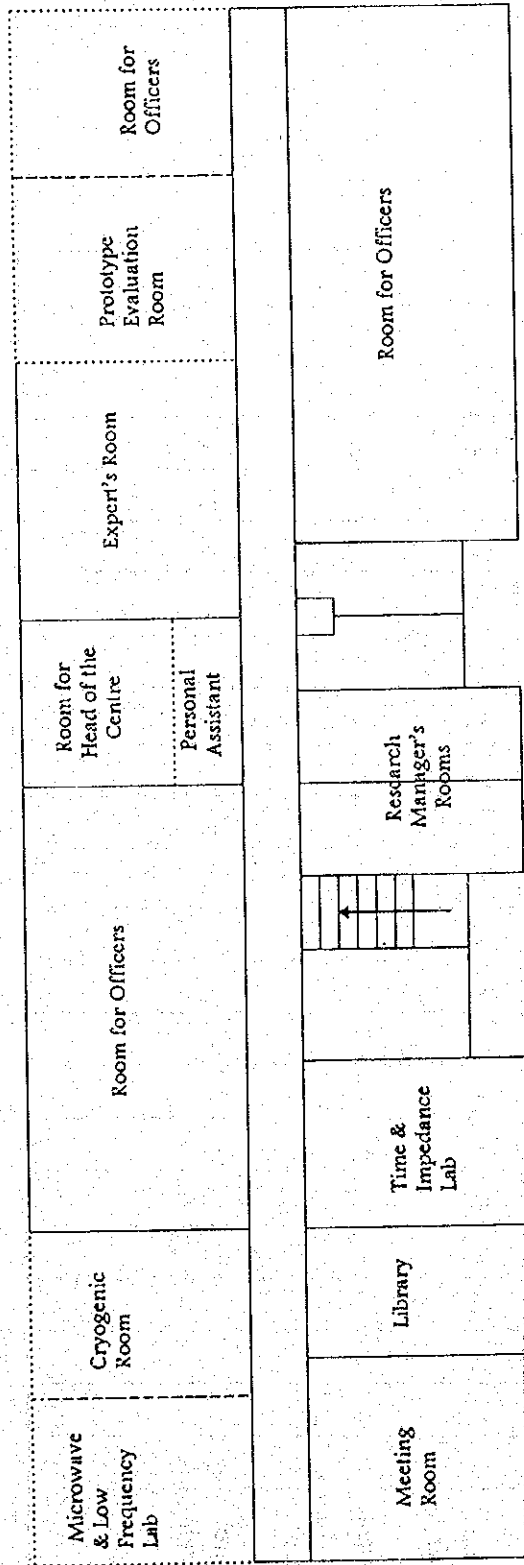
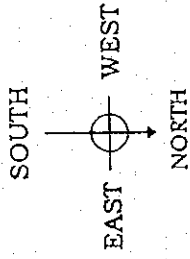
# Measurement Centre First Floor



-  Existing Room
-  Under construction
-  Partition in Room
-  Stairs

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# MEASUREMENT CENTRE SECOND FLOOR



- Existing Room
- Under construction
- Partition in room
- Stairs

*[Handwritten signature]*

Appendix VII - Manpower Allocation For Measurement Centre\*

	1995					1996					1997					1998					1999					2000									
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E					
Research Officer	4	7	4	1	5	5	8	4	1	5	6	10	6	2	5	8	11	8	3	5	10	13	10	4	5	11	14	11	5	5					
Assistant Research Officer	1	0	1	0	4	1	1	1	1	4	2	2	1	1	4	2	3	2	1	4	4	4	3	1	4	5	5	4	2	4					
Research Assistant	2	1	1	1	6	2	3	1	1	6	3	3	2	1	6	3	3	3	2	6	4	4	3	2	6	4	5	3	3	6					

- A - Mechanical Lab }
- B - Electrical Lab }
- C - Thermodynamics Lab } Measurement Standards Group
- D - Fluid Dynamics Lab }
- E - Industrial Measurement Group

\*Measurement Centre = Measurement Standards Group + Industrial Measurement Group

Appendix VII. TENTATIVE SCHEDULE OF IMPLEMENTATION

CALENDAR YEAR	1994		1995		1996		1997		1998		1999		2000			
	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	
JAPANESE FISCAL YEAR																00
Term of Technical cooperation																
Japanese Side																
I. Dispatch of Survey Team																
1) Preliminary Survey Team																
2) Experts Survey Team																
3) Implementation Survey Team																
4) Consultation Team																
5) Technical Guidance Team																
6) Consultation Team																
7) Evaluation Team																
2. Dispatch of Experts																
1) Long-term Experts																
① Chief advisor																
② Coordinator																
③ Length																
④ Pressure																
⑤ Electricity																
⑥ Vibration																
2) Short-term Experts																
3. Training of C/P in Japan																
4. Provision of Machinery & Equipment																
Malaysian Side																
1. Space and Facilities																
2. Building and Land																
3. Equipment and Machinery																
4. Budgetary Allocation																
5. Allocation of C/P & other staffs																

( Short-term experts on specific fields may be dispatched, if necessary )  
 ( Appropriate number of counterpart personnel may be acceptable annually )

- Note:
1. The Japanese fiscal year starts in April and ends in March.
  2. This schedule is subject to change in accordance with the progress of the Project.
  3. Long-term experts may be changed during the cooperation period.
  4. The term for the experts in the fields of Pressure and Vibration may change in accordance with the progress of the Project.

Appendix IX. TENTATIVE PROJECT DESIGN MATRIX

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p><b>Overall Goal:</b> National Measurement Standards System is established.</p> <p><b>Project Purpose</b> Maintenance system of measurement standards of length, pressure, electricity and vibration, which are provided for the industries, is established in the Measurement Centre of SIRIM.</p>	<p>1.a Results of international comparison of national measurement standards</p> <p>1.a Contents and number of calibration service programme in measurement.</p> <p>1.c Evaluation on maintenance system of measurement standards</p>	<p>1.a Record of international comparison of national measurement standards</p> <p>1.a Record of calibration service activities</p> <p>1.b Record of international proficiency testing</p> <p>1.c Tracer study of the industries</p>	<p>Development of national measurement standards system is promoted through continuous policy support.</p> <p>Medium and long term plans on measurement standards are developed in Malaysia.</p> <p>Dissemination activities for the industries are conducted by the Measurement Centre.</p>
<p><b>Outputs</b> In the fields of length, pressure, electricity and vibration in the Measurement Centre of SIRIM:</p> <ol style="list-style-type: none"> <li>Measurement system configuration is fulfilled and equipment is upgraded.</li> <li>Maintenance system of measurement standard equipment is developed and the equipment is utilized effectively.</li> <li>The competence and proficiency of research officers and other technical staff members are upgraded.</li> </ol>	<p>1.a Installation of measurement standard equipment</p> <p>1.b Utilization of measurement standard equipment</p> <p>1.c Number of instruction manuals of measurement standard equipment</p> <p>2.a Number of maintenance manuals of measurement standard equipment</p> <p>2.b Maintenance situation of measurement standard equipment</p> <p>2.c Stock and management condition of consumption goods and spare parts</p> <p>2.d Calibration history of measurement standard equipment</p> <p>3.a Number of manuals on management and control of measurement standards</p> <p>3.b Technological improvement of staff</p>	<p>1.a Record of project activities</p> <p>1.b Operation record of measurement standard equipment</p> <p>1.c Record of project activities</p> <p>2.a Record of project activities</p> <p>2.b Maintenance record of measurement standard equipment</p> <p>2.c Stock list of consumption goods and spare parts</p> <p>2.d Record form of calibration of measurement standard equipment</p> <p>3.a Record of project activities</p> <p>3.b Achievement check list of technology transfer by the Japanese experts and the Malaysian counterparts</p>	<p>Medium and long term plans of SIRIM Measurement Centre are developed.</p> <p>Other measurement standards are properly maintained by the Malaysian side.</p> <p>Budget for Measurement Centre is allocated sufficiently to maintain and replace the measurement standard equipment.</p>
<p><b>Activities</b> In the fields of length, pressure, electricity and vibration:</p> <ol style="list-style-type: none"> <li>Configuration and specification of measurement standard equipment are designed, (both sides)</li> <li>Measurement standard equipment is procured and installed. (both sides)</li> <li>Instruction manuals to operate measurement standard equipment are developed. (both sides)</li> <li>Maintenance manuals of measurement standard equipment are developed. (both sides)</li> <li>Calibration record forms of measurement standard equipment are developed (both sides) and utilized. (mainly Malaysian side)</li> <li>Implementation plan of technology transfer is compiled. (both sides)</li> <li>The Japanese experts provide technical guidance for the Malaysian counterparts by utilizing measurement standard equipment. (mainly Japanese side)</li> <li>The Malaysian counterparts are trained in Japan. (mainly Japanese side)</li> <li>Procedure manuals on management and control of measurement standards are developed. (both sides)</li> <li>The Malaysian counterparts provide technical guidance for the other technical staff members. (mainly Malaysian side)</li> </ol>	<p>Inputs [Japanese Side]</p> <ul style="list-style-type: none"> <li>Long-term experts</li> <li>Chief advisor, Project coordinator, length, pressure, electricity, vibration (maximum six (6) experts)</li> <li>Short-term experts</li> <li>A few installation/operation experts and some other experts in technical fields required annually</li> <li>Training in Japan</li> <li>Two (2) to three (3) counterparts annually in the fields of length, pressure, electricity and vibration</li> <li>Equipment supply</li> <li>Measurement standard equipment of length, pressure, electricity and vibration</li> </ul> <p>[Malaysian Side]</p> <ul style="list-style-type: none"> <li>Building and Space</li> <li>Equipment</li> <li>Counterparts</li> <li>Three (3) for each Japanese long-term experts) and other staff members required</li> <li>Operational budget</li> </ul>	<p>Pressure, Electricity, Vibration (maximum six (6))</p> <p>Measurement standard equipment of length, pressure, electricity and vibration</p> <p>Transfer by the Japanese experts and the Malaysian counterparts</p>	<p>Air conditioning and other environmental conditions for measurement are controlled properly.</p> <p>The counterparts stay and work as key research staff in the Measurement Centre.</p> <p>Pre-conditions</p> <ul style="list-style-type: none"> <li>Proper counterparts and other technical staff members are employed from educational institutes concerned with measurement technology.</li> <li>Electricity and other utilities are supplied stably.</li> <li>Consumption goods are procured properly.</li> <li>The Malaysian Government provides financial support for the Measurement Centre and required inputs are timely procured.</li> <li>Extension of the building will be completed by the scheduled date.</li> </ul>



Appendix X. LIST OF ATTENDANTS IN THE DISCUSSIONS

1. The Japanese Side

Mr. Yoshiro Minato	Director, Technical Cooperation Division, Mining and Industrial Development Cooperation Department, Japan International Cooperation Agency
Mr. Masatoshi Yorozui	Weights and Measures Office, Machinery and Information Industries Bureau, Ministry of International Trade and Industry
Mr. Ken Nishibata	Nishibata Technical Translation Service
Mr. Kiyoto Mitsui	Senior Advisor, Japan Quality Assurance Organization
Mr. Takashi Inoue	Chief of Staff, Development Planning Department, System Science Consultants Inc.
Mr. Tatsuya Murase	Technical Cooperation Division, Mining and Industrial Development Cooperation Department, Japan International Cooperation Agency
Mr. Hidenao Sawayama	First Secretary, Embassy of Japan
Ms. Kayoko Mizuta	Resident Representative, JICA Malaysia Office
Mr. Yoshikazu Yamada	Deputy Resident Representative, JICA Malaysia Office
Mr. Akihisa Tanaka	Assistant Resident Representative, JICA Malaysia Office

2. The Malaysian Side

Dato' Dr. Ahmad Tajuddin Ali

Director General,  
Standards and Industrial Research Institute of Malaysia

Hj. Abdul Aziz b. Abdul Manan

Deputy Director General,  
Standards and Industrial Research Institute of Malaysia

Dr. Chong Chok Ngee

Director,  
Research and Technology Development Division,  
Standards and Industrial Research Institute of Malaysia

Mr. Woo Seng Khee

Head,  
Measurement Centre,  
Standards and Industrial Research Institute of Malaysia

Mr. Ong Chin Giap

Research Manager,  
Measurement Standards Group,  
Measurement Centre,  
Standards and Industrial Research Institute of Malaysia

Dr. Montaj Mustakim

Research Manager,  
Industrial Measurement Group,  
Measurement Centre,  
Standards and Industrial Research Institute of Malaysia

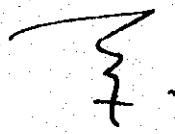

Ms. Mariani Mohd.

Head,  
Planning and Coordination Unit,  
Standards and Industrial Research Institute of Malaysia

Mr. Chen Soo Fatt

Senior Research Officer,  
Measurement Standards Group,  
Measurement Centre,  
Standards and Industrial Research Institute of Malaysia

- Mr. Abdul Rashid bin Zainal Abidin  
Senior Research Officer,  
Measurement Standards Group,  
Measurement Centre,  
Standards and Industrial Research Institute of Malaysia
- Ms. Siti Khamnah Hashim  
Research Officer,  
Planning and Coordination Unit,  
Standards and Industrial Research Institute of Malaysia
- Ms. Siti Maryam Othman  
Research Officer,  
Measurement Standards Group,  
Measurement Centre,  
Standards and Industrial Research Institute of Malaysia
- Mr. Ahmad Makinudin Dahlan  
Research Officer,  
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The Star - Saturday, March 25, 1995

## Sirim signs deal with JICA

STANDARDS and Industrial Research Institute of Malaysia (Sirim) sealed an agreement on Thursday with Japan International Cooperation Agency (Jica) to undertake the second phase of its measurement centre.

The pact is to establish a maintenance system for measurement standards at the primary level and to disseminate it to local industry.

Signing on behalf of Sirim was its director-general Datuk Dr Ahmad Tajuddin Ali while Jica was represented by the leader of the project's preliminary survey team, Yoshiro Minato.

At the press conference after the ceremony, Tajuddin said the project constituted part of Sirim's effort to upgrade Malaysian technical infrastructure to support the country's rapid industrial growth.

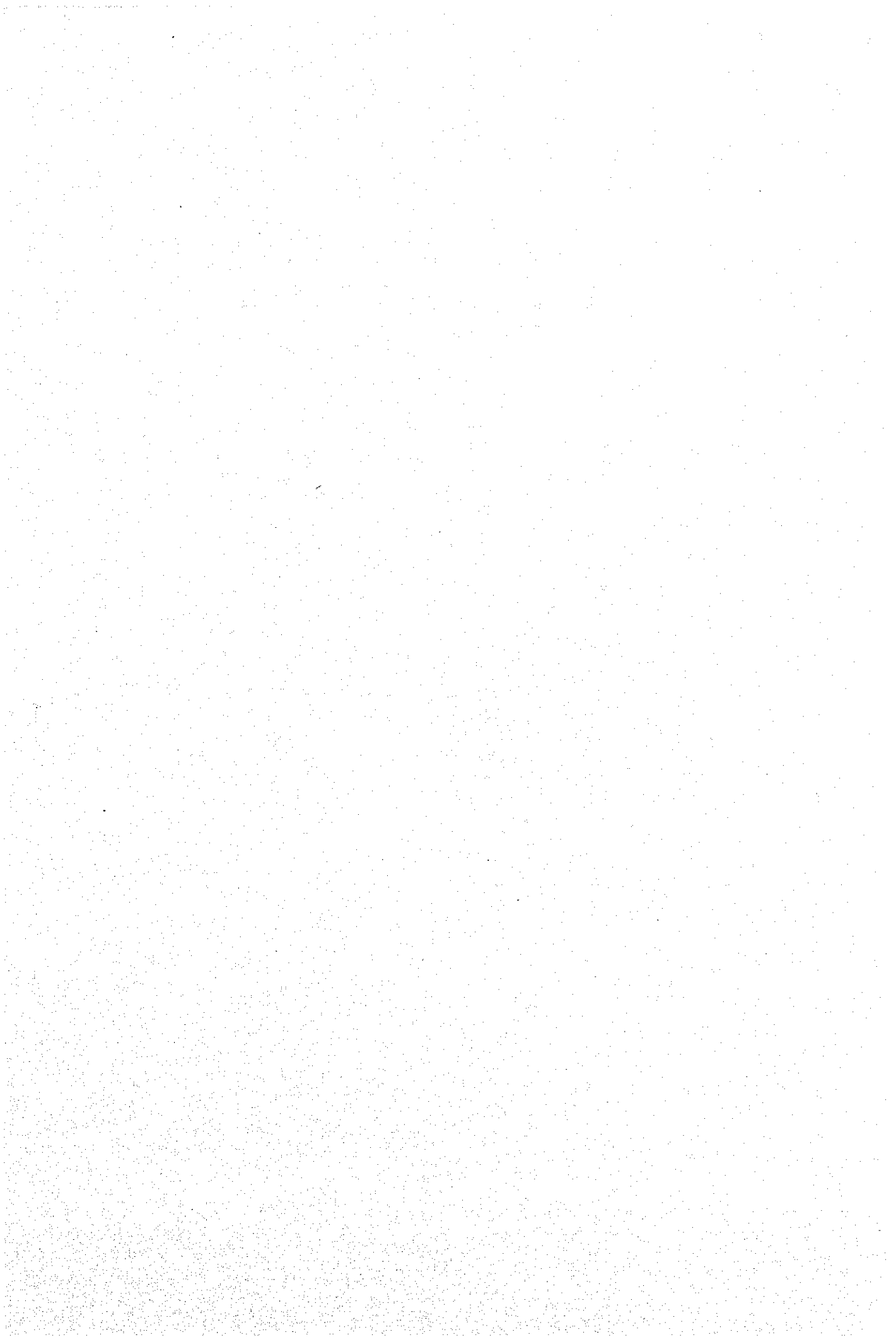
"As we move into higher technology, we need to upgrade the nation's physical infrastructure, especially its capacity to measure accurately.

"Therefore, there is a need to enhance measurement standards to cover other new areas like acoustics, electromagnetism and radiation," he said.

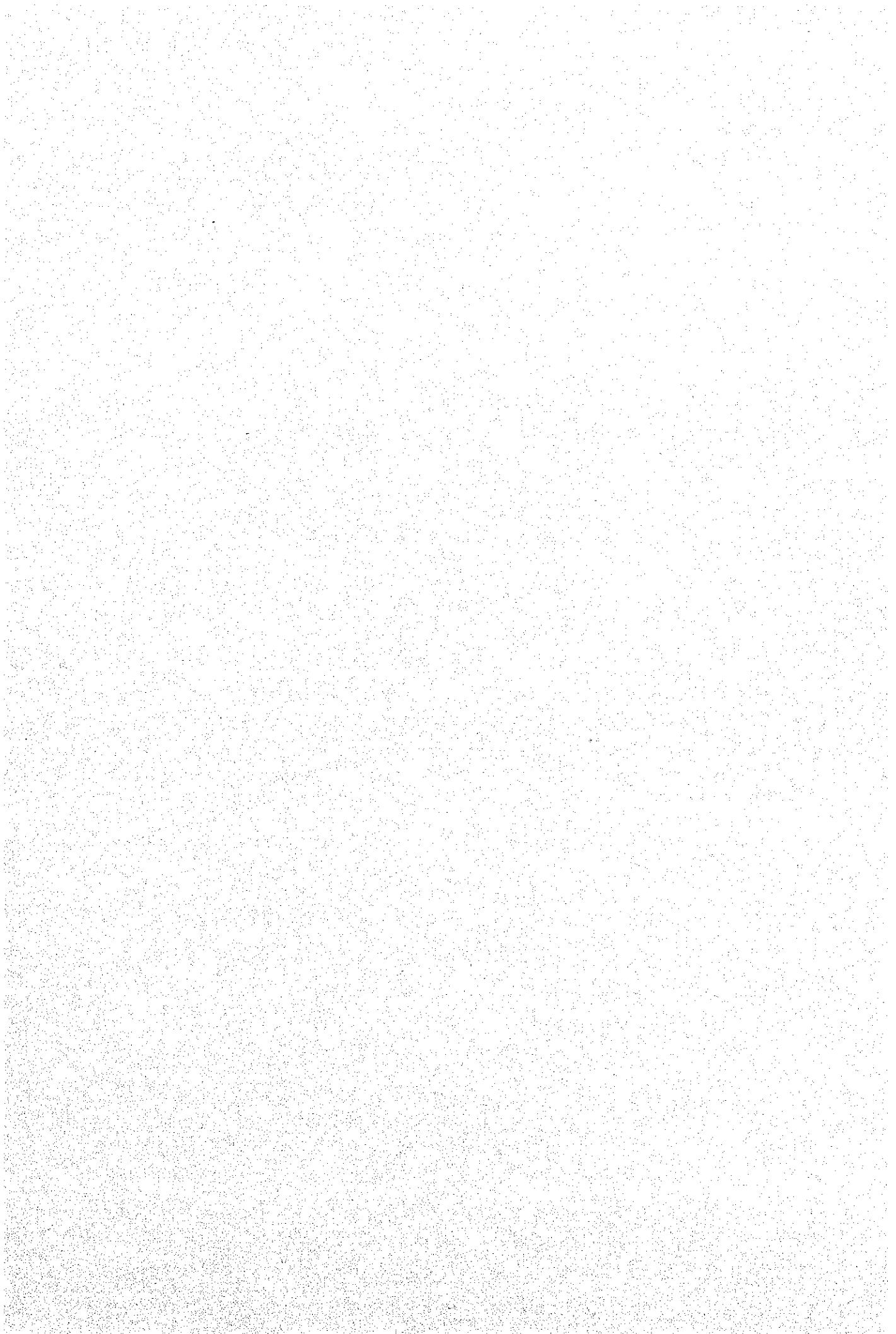
He added that under the first phase of the cooperation programme with Jica in 1981, both parties had successfully established a measurement standard for industry.

The second phase spanning four years is expected to begin from early 1996, with the dispatch of precision measuring equipment worth between US\$3 million and US\$5 million (RM1.68 million and RM12.8 million) from Japan.

Tajuddin said the upgrading of measurement standards would also benefit Japanese companies in Malaysia, since they could expect components of better standard from their local vendors.







JICA