No.

THE KINGDOM OF THAILAND

THE PROJECT ON TECHNICAL STRENGTHENING OF NATIONAL INSTITUTE OF METROLOGY (THAILAND) PHASE 2

MID-TERM EVALUATION REPORT

OCTOBER 2006

JAPAN INTERNATIONAL COOPERATION AGENCY
THAILAND OFFICE

TIO
JR
06-010

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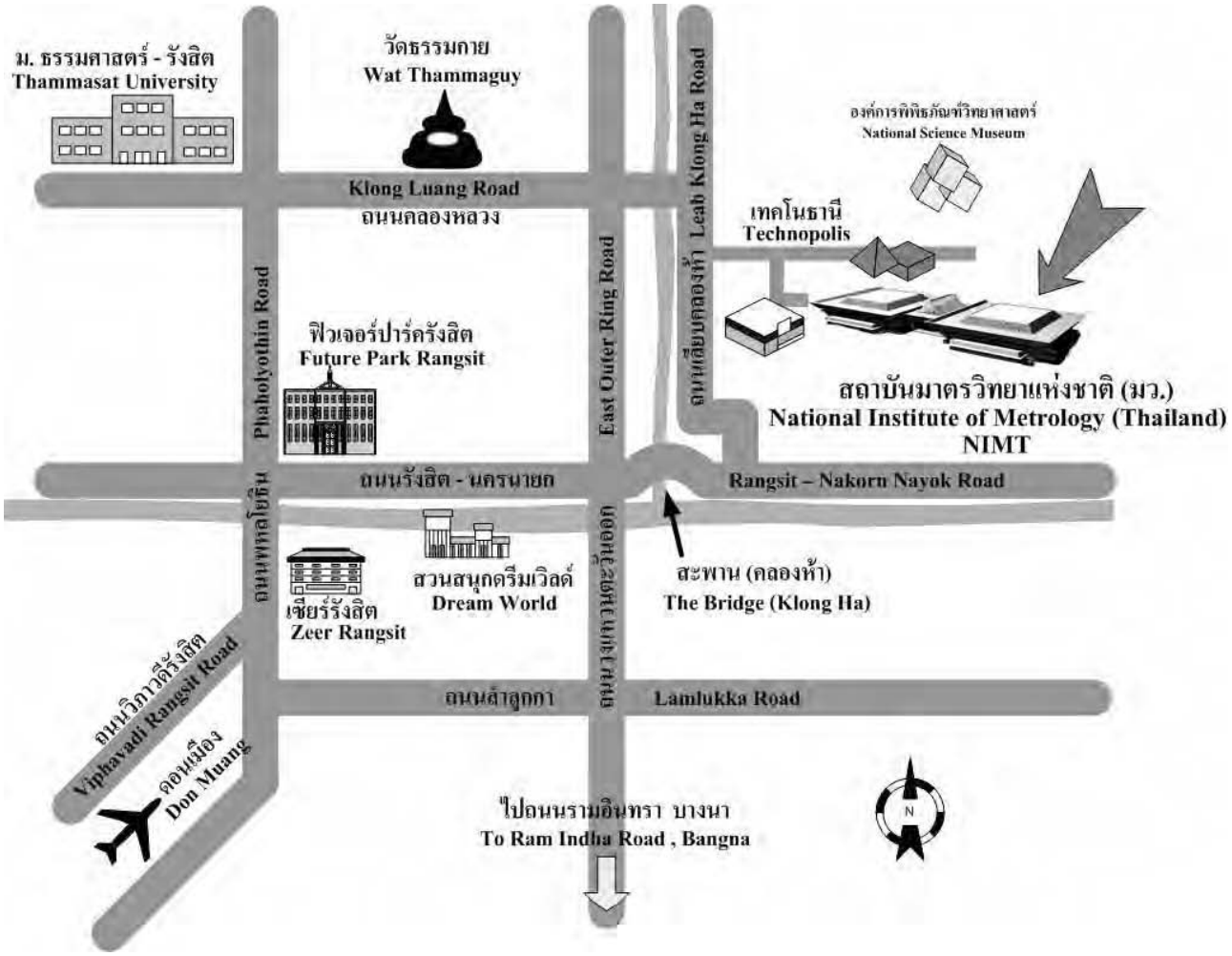
Map of the Project Site



Photos of the Project Facilities

New NIMT Building

Temperature Laboratory

Chemical Laboratory

Time and Frequency Laboratory

Length Laboratory

Electricity Laboratory

Summary

<table>
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<tr><td colspan="2">Country: Thailand</td><td>Project title: Project for Technical Strengthening for National Institute of Metrology (Thailand) Phase 2</td></tr>
<tr><td colspan="2">Issue / Sector:
Private Sector Development – Industrial Foundation and System</td><td>Cooperation scheme:
Project-type Technical Cooperation</td></tr>
<tr><td colspan="2">Division in charge: JICA Thailand Office</td><td>Total cost (as of this mid-term evaluation) :
200,604 thousand Japanese yen</td></tr>
<tr><td>Period of Cooperation</td><td>October 2004 - October 2007 (3 years)</td><td>Partner Country's Implementing Organization:
National Institute of Metrology (Thailand) (NIMT)</td></tr>
<tr><td colspan="2"></td><td>Supporting Organization in Japan:
Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry, National Metrology Institute of Japan (NMIJ), Japan Quality Assurance Organization (JQA), Japan Electric Meters Inspection Corporation (JEMIC), National Institute of Technology and Evaluation (NITE), Chemicals Evaluation and Research Institute, Japan (CERI)</td></tr>
<tr><td colspan="3">Related Cooperation: 24th and 25th ODA Loans by JBIC</td></tr>
</table>

1. Background of the Project

In the 8th National Economic and Social Development Plan (1997-2001), the Government of Thailand expressed the necessity of development of the National Metrology System for enhancing the reliability of export goods of Thailand. In August 1997, the Government enacted the National Metrology System Development Act to strengthen the international competitiveness of domestic industries. In accordance with this Act, the National Institute of Metrology, Thailand (NIMT), was established in June 1998 to commence the development of the National Measurement Standards in Thailand. The Cabinet approved the Master Plan on the National Metrology System Development in May 1999. Responding to these efforts of the Thai Government, the Government of Japan decided to provide ODA Loans from 2000 (24th and 25th ODA Loans by JBIC) for the construction of the new NIMT building and the procurement of the necessary equipment. The Government of Thailand requested the Government of Japan in 1999 to implement the Project for technical transfer, which is designed to strengthen the capability of NIMT to maintain and supply National Measurement Standards using equipment produced by the Japanese ODA Loans mentioned above.

2. Project Overview

Although the Project was planned for five years at the time of formulation, the Project was divided into 2 phases due to the delay in construction of a new building and procurement of machinery and equipment. The Phase 1 was scheduled for 2 years and started in October 2002. The Phase 2 started in October 2004, after the completion of the Phase 1. Throughout the Phases 1 and 2, the Project aims to provide technical transfer in 8 fields of measurement standard, in total of 40 quantities.

(1) Overall Goal

To strengthen the national measurement system in Thailand

(2) Project Purpose

NIMT establishes and manages National Measurement Standards with Internationally recognized level of accuracy

(3) Outputs

Output 1: The operation and administration of the Project are enhanced

Output 2: The equipment is operated and maintained properly

Output 3: The technical capability of C/P is upgraded

Output 4: Accuracy of national measurement standards is improved

Output 5: NIMT disseminates national measurement standards properly

(4) Inputs (as of this mid-term evaluation)

Japanese side:

・Long term expert: 5 persons ・C/P training in Japan: 13 persons ・Supporting local cost: 4,767,700TBH
・Short term expert: 17 persons ・Equipment provided by ODA Loan: 156 items delivered

Thai side:

・Building, facilities and space for the Project ・Counterparts: 34 persons ・Necessary budget for the Project: 2,775,000THB

II. Evaluation Team

Members of Evaluation Team	Team Leader:	Mr. Masazumi Ogawa, Deputy Resident Representative, JICA Thailand Office
	Evaluation Planning:	Mr. Hirofumi Kinugasa, Assistant Resident Representative, JICA Thailand Office
	Measurement Standard:	Mr. Yoji Matsui, Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
	Technical Evaluation:	Mr. Norio Ishizaki, Managing Director, International Accreditation Japan (IA Japan), National Institute of Technology and Evaluation (NITE)
	Evaluation Analysis:	Ms. Yuki Ohashi, Consultant, IC Net, Limited

Period of Evaluation: September 25, 2006 – October 6, 2006 | **Type of Evaluation:** Mid-term Evaluation

III. Results of Evaluation

1. Summary of Evaluation Results

There has been a delay in the procurement of machineries and equipments by Japanese ODA Loan, which has caused delay in the completion of technical transfer in 7 quantities as of the end of September, 2006. Other inputs from both Japanese and Thai sides have been provided as planned. In terms of the achievement in Output 2 to 5, although there has been a delay due to the delay in the procurement, the Project has been trying to recover form the delay and the expectation to complete the technical transfer in all 40 quantities is high.

(1) Relevance

The project was formulated based on the needs from the industrial community in Thailand, which needed to improve its competitiveness for export promotion and produce higher-quality goods to increase exports. Accordingly, more enterprises have been demanding high-quality technology of metrology and calibration services. This trend has remained the same since the formulation of the Project. The 9th National Economic and Social Development Plan (2002-2006) describes the significance of the metrology system in Thai industry, which needs to develop and spread the National Quality Management System. As the Thai Government has been recently preparing its 10th National Economic and Social Development Plan (2007-2011), it is confirmed that this direction in the importance of metrology in the Development Plan of the Country will not be changed in the new plan. Also, the consistency of the Project with the Japanese ODA policy to Thailand has not changed at the time of the mid-term evaluation.

(2) Effectiveness

The Project has finished the technical transfer in 29 out of 40 quantities in total. Although there has been a delay in the schedule caused by the procurement of machinery and equipment, it is confirmed that all the activities of technical transfer of the Project in the 40 quantities will be completed by the end of the Project period. That means that the Project can meet its minimum objective in the technical transfer to assist the C/Ps in establishing and maintaining the national measurement standards. However, the Project must make further efforts to finalize all the procurement process as soon as possible. Meanwhile, there are 8 quantities which have been assessed for accreditation, and other 6 quantities will receive the assessment to be accredited in the Japanese fiscal year 2006. The Project is required to do its best to prepare for assessment for accreditation in as many quantities as possible during the rest of the Project period.

(3) Efficiency

Output 2 to 5 of the Project can be achieved by implementing a series of technical transfer activities, which include C/P training in Japan, C/P's self study in NIMT, and follow-up training by short-term experts. Although there has been a delay in the activities due to the delay in the procurement of machineries and equipments by Japanese ODA loan, in general those quantities which have been finished all activities have been achieved the results stated in the Outputs according to the Experts and C/Ps. Quality, quantity, and timing of inputs both from the Thai and Japanese sides have been generally appropriate, except that the delay in the procurement has been a major constraint for the Project activities. In terms of equipment and consumable supplies provided by NIMT, some have observed that the stocks are not enough, and it takes a long time to obtain necessities after requests are made.

(4) Impact

Judging from the result of the questionnaire survey conducted during the evaluation study, prospects of achieving the Overall Goal are generally high. In terms of other impacts of the Project, the Final Report of the Phase 1 states that, as a result of the ASEAN seminars and workshops held by the Project, NIMT will gain more recognition as a core body of the national metrology system in Thailand, as well as in the ASEAN region. Since NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training was started in 2005, the recognition of NIMT in the ASEAN region will grow gradually in the future. Also the positive impacts on the international competitiveness for the export industry and the reduction of cost of calibration services have been considered positive impacts of the Project. In addition, the improvement in measurement technology in general can have ripple effects on environmental and health issues, among others.

(5) Sustainability

Given that NIMT was established in accordance with the National Metrology System Development Act, and it has become more important as a core body of national measurement standards, it is fair to say that NIMT has been a stable organization. However, it is necessary to strengthen NIMT by increasing the number of personnel. In the financial aspect, most of NIMT's budget is provided by the Government. NIMT does not have a policy to raise its own funds by providing more calibration services, since NIMT puts an emphasis on the improvement of its level of measurement standards as the primary standard organization of Thailand. The technology transferred to NIMT staff through the Project has been transferred to inside and outside NIMT by taking advantage of seminars held by the Project. In terms of maintenance of machinery and equipment, since the Project includes the preparation of calibration procedures as its activities, which require maintenance management manuals of the machinery and equipments, it is fair to say that an adequate maintenance management mechanism has been established in NIMT through the Project.

2. Factors that promoted realization of effects

(1) Factors concerning to the Planning

As to the important assumption "NIMT takes preventive measures against resignation of counterparts trained in the Project", no such resignation has been observed in the Phase 2. Regarding the measures against resignation of C/Ps, NIMT and C/P staff sign a contract so that the staff who was trained by the Project will remain in NIMT for a certain period. To consider this issue at the formulation of the Project has contributed to achievement of the Outputs of the Project.

(2) Factors concerning to the Implementation Process

The Project has been trying to overcome the delay in procurement by dispatching short-term experts flexibly, receiving assistance from supporting organizations in Japan, which has been a contributing factor for the Project in achieving the Project Purpose.

3. Factors that inhibiting realization of effects

(1) Factors concerning to the Planning

The important assumption "Installation and setting up of all machineries are properly completed" has had negative influence on the Project. Although this assumption was considered an external factor beyond the control of the Project, the issue actually rests largely on NIMT's effort.

(2) Factors concerning to the Implementation Process

At the time of the Mid-Term Evaluation, there is a delay in the procurement of machinery of Standard Scale and also in the construction of the Standard Gas laboratory. Although the construction of the testing and analysis laboratory has already finished, the construction of the gas filling and balance room has not started yet. This delay may prevent the completion of technical transfer in all the 40 quantities. In addition, a difficulty in communication and management, the issue of language ability both the Japanese and Thai sides, and the delay in international comparison has been observed as constraining factors in the implementation.

4. Conclusion

Although some project activities have been delayed in some quantities of the Project, the Project can achieve its Project Purpose by making every effort to overcome the delay in the rest of the Project period.

5. Recommendations

(1) Measures against resignation of C/Ps

NIMT and C/P staff sign a contract so that the staff who trained by the Project will remain in NIMT for a certain period. Most C/Ps have engaged themselves enthusiastically in their tasks in the Project, which can reflect in the progress of the Project. They are expected to continue this effort to attain the Project Purpose.

(2) Consistency in the management system

In order to implement accreditation in many quantities effectively, it is recommendable to set up a section which deals solely with the quality system and secures the consistency of DQM (Department Quality Manual) and technical manual.

(3) Strengthening of communication

Although most of the team members assessed that the communication among them is adequate, the communication and exchange of information should be improved so that everyone can work together to achieve the Project Purpose at the end of the Project.

(4) Strengthening of management

As it is required by ISO/IEC 17025: 2005, the strengthening in management of the organization is increasingly important.

(5) Immediate resolution of the procurement issue

For those 9 items to be procured, which have not finalized the contracts with suppliers and items for Standard Scale which have not been delivered yet, it is essential to make the best efforts to conclude the contracts and to have the necessary items delivered as soon as possible.

(6) Immediate start of the renovation of the rest of the standard gas laboratory

The construction of the gas filling and balance room has not started yet, and further delay may seriously hamper the technical transfer during the Project period. NIMT and the Project team must address this issue immediately.

(7) Application for the assessment of accreditation

The significance of accreditation as evidence of international credibility has been recognized widely among the industrial community. It is important for the Project to do its best to finish receiving the accreditation assessment in all quantities applicable during the Project period.

(8) Dissemination of the measurement standards

In order to secure the sustainability of NIMT in the future, it is necessary to strengthen a structure where NIMT provides the standards accredited in this Project to the calibration laboratories, and the laboratories provide the standards to general users.

(9) Strengthening of the promotion of national measurement standards

It is recommendable for NIMT to work harder on the promotion so that the achievement of the Project can be disseminated more widely in Thailand and other neighboring countries.

6. Lessons Learned

No lessons learned were extracted as of this mid-term evaluation.

List of Abbreviations

AIST	National Institute of Advance Industrial Science and Technology
C/P	Counterpart
CERI	Chemicals Evaluation and Research Institute, Japan
DQM	Department of Quality Manual
DSS	Department of Science Service
IAJapan	International Accreditation Japan
JBIC	Japan Bank for International Cooperation
JCC	Joint Coordinating Committee
JEMIC	Japan Electric Meters Inspection Corporation
JICA	Japan International Cooperation Agency
JQA	Japan Quality Assurance Organization
METI	Ministry of Economy, Trade and Industry
NIMT	National Institute of Metrology (Thailand)
NITE	National Institute of Technology and Evaluation
NMIJ	National Metrology Institute of Japan
ODA	Official Development Assistance
PO	Plan of Operation
PCM	Project cycle Management
PDM	Project Design Matrix
R/D	Record of Discussion
TICA	Thailand International Development Cooperation Agency
TISTR	Thai Institute of Science and Technological Research

1. Outline of the Evaluation Study

1-1. Background of the Evaluation Study

The Project on National Institute of Metrology Thailand (NIMT) (hereinafter referred to as the "Project") was designed for technology transfer with the equipment purchased by ODA loan of the Government of Japan.
In October 2002, the Japan International Cooperation Agency (JICA) started the JICA/NIMT Project (Phase 1) for technical strengthening of the NIMT, with the cooperation of the National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science and Technology (AIST), and other Japanese metrology institutes. The Phase 2 of the Project was commenced in October 2004, and the total duration of cooperation is five years. The Project aims to provide technical transfer in 40 measurement standards in five years, including Wavelength Standard and Hardness Standard, among others. The Project has already accomplished about 70% of the total technical transfer planned in the Project.

As the Project was reaching at the middle of the project period, a mid-term evaluation study was planned in order to examine the achievement of the Project.

1-2. Objectives of the Evaluation Study

The Mid-Term Evaluation Study had the following five objectives.

1) To review the progress of the Project and evaluate the achievement in accordance with the five evaluation criteria, namely relevance, effectiveness, efficiency, impact, and sustainability.
2) To draw the factors that promoted / impeded project effects.
3) To consider necessary actions to take and make recommendations for the Project.
4) To revise the Project Design Matrix (PDM) and the Plan of Operation (PO), if necessary.
5) To summarize the result of the study in a report.

1-3. Members of the Evaluation Team

<Japanese side>

	Member's Name	Position
1	Mr. Masazumi Ogawa (Team Leader)	Deputy Resident Representative, JICA Thailand Office
2	Mr. Hirofumi Kinugasa	Assistant Resident Representative, JICA Thailand Office
3	Ms. Yuki Ohashi	Consultant of JICA Thailand Office, IC Net Limited
4	Mr. Yoji Matsui	Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
5	Mr. Norio Ishizaki	Managing Director, International Accreditation Japan (IA Japan), National Institute of Technology and Evaluation (NITE)

<Thai side>

	Member's Name	Position
1	Dr. Pian Totarong	Director, National Institute of Metrology (Thailand) (NIMT)
2	Mr. Somsak Charkkian	Deputy Director, NIMT
3	Mr. Veera Tulasombut	Head of Mechanical Metrology Department, NIMT
4	Ms. Ajchara Charoensook	Head of Electrical Metrology Department, NIMT
5	Dr. Chainarong Cherdchu	Head of Chemical Metrology Department, NIMT
6	Mr. Virat Plangsangmas	Assistant Head of Acoustics and Vibration Metrology Department, NIMT
7	Mr. Tawat Changpan	Assistant Head of Mechanical Metrology Department, NIMT
8	Dr. Luxsamee Plangsangmas	Director, Industrial Metrology and Testing Service Center Thailand Institute of Science and Technology Research (TISTR)
9	Mr. Sompote Boonsanit	Scientist, Physics and Engineering Division Department of Science Service (DSS)

1-4. Schedule of the Evaluation Study

Date			Schedule	Remarks
9/25	Mon		Kick off meeting	Consultant
9/26	Tue		Interviews with Japanese Experts	Consultant
9/27	Wed		Interviews with Japanese Experts and C/Ps of NIMT	Consultant
9/28	Thu		Interviews with C/Ps of NIMT, TISTR, DSS and MIST,	Consultant
9/29	Fri		Interviews with JETRO, JBIC and JCC	Consultant
9/30	Sat		Compiling and analyzing collected information	Consultant
10/1	Sun		Compiling and analyzing collected information	Consultant
10/2	Mon	AM	Meeting with JICA Thailand Office	Japanese members
		PM	Kick-off Meeting in NIMT Discussion (1): Presentation of the achievement and plan of the Project	All members
			Discussion (2): Confirming the Actual Results	Japanese team
10/3	Tue	AM	Discussion (3): Confirming the Actual Results	Japanese team
		PM	Discussion (4): Confirming the Actual Results	All members
10/4	Wed	AM	Discussion (5): Confirming the Lessons Learned and Recommendations	Japanese team
		PM	Discussion (6): Confirming the Lessons Learned and Recommendations	All members
10/5	Thu	AM	Preparation form JCC/ Discussion (7) (if necessary)	Japanese team
		PM	7th JCC (Signing the Joint Evaluation Report)	All members
10/6	Fri	AM	Meeting on the preparation of Mid-term Evaluation Report	Japanese team
		PM	Meeting with JICA Thailand Office	Japanese team

2. Outline of the Project

2-1. Background of the Project

Thai industry has needed to produce goods of higher quality and improve their competitiveness for export promotion. In the 8th National Economic and Social Development Plan (1997-2001), the Government of Thailand expressed the necessity of development of the National Metrology System for enhancing the reliability of export goods of Thailand.

In August 1997, the Government enacted the National Metrology System Development Act to strengthen the international competitiveness of domestic industries. In accordance with this Act, the National Institute of Metrology, Thailand (NIMT), was established in June 1998 to commence the development of the National Measurement Standards in Thailand. The Cabinet approved the Master Plan on the National Metrology System Development in May 1999.

Responding to these efforts of the Thai Government, the Government of Japan decided to provide ODA Loans from 2000 (24th and 25th ODA Loans by JBIC) for the construction of the new NIMT building and the procurement of the necessary equipment.

The Government of Thailand requested the Government of Japan in 1999 to implement the Project for technical transfer, which is designed to strengthen the capability of NIMT to maintain and supply National Measurement Standards using equipment produced by the Japanese ODA Loans mentioned above.

2-2. Summary of the Project

The Project was planned for five years at the time of formulation. However, due to the delay in construction of a new building and procurement of machinery and equipment, the Project was divided into 2 phases. The Phase 1 was scheduled for 2 years and started in October 2002, after the Record of Discussion (R/D) was signed in September 2002. The Phase 2 started in October 2004, after the completion of the Phase 1. Throughout the Phases 1 and 2, the Project aims to provide technical transfer in 8 fields of measurement standard, in total of 40 quantities.

(1) Narrative Summary of the Project
In order to contribute to the strengthening of the National Measurement System in Thailand, the Project aims to make NIMT capable of establishing and maintaining the National Measurement Standards with the internationally recognized level of accuracy through technical transfer to the staff of NIMT.

(2) Project Period
From October 2004 to October 2007 (3 years)

(3) Total Amount of Cooperation
330 million Japanese Yen

(4) Counterpart Agency
National Institute of Metrology (Thailand) (also known as NIMT)

(5) Japanese Supporting Bodies

- Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry
- National Metrology Institute of Japan (NMIJ)
- Japan Quality Assurance Organization (JQA)
- Japan Electric Meters Inspection Corporation (JEMIC)
- National Institute of Technology and Evaluation (NITE)
- Chemicals Evaluation and Research Institute, Japan (CERI)

(6) Beneficiaries of the Project

a. Direct Beneficiaries

NIMT and staff of NIMT

b. Indirect Beneficiaries

Calibration laboratories including the Thailand Institute of Scientific and Technological Research (TISTR) and the Department of Science Service (DSS), and domestic industries in Thailand (especially export industries and enterprises trying to acquire ISO9000s, ISO14000s).

3. Evaluation Process

3-1. Methodology of the Evaluation

The Project Cycle Management (PCM) method was applied to the evaluation. The evaluation was conducted by comparing the design and outcomes of the project using the five evaluation criteria: relevance, effectiveness, efficiency, impact, and sustainability as briefly explained below. Evaluation Grids were produced to compare the outcomes of the Project with its design.

1) Relevance
An overall assessment of whether the Project Purpose and the Overall Goal are in line with the policies of the counterpart country and donors and with the counterpart's needs and priorities.

2) Effectiveness
A measure of whether the Project Purpose will be achieved. This is then a question of the degree to which the Project Outputs contributes to the achievement of the intended Project Purpose.

3) Efficiency
A measure of the extent to which the Project has generated Project Outputs in relation to the total resource inputs.

4) Impact
The positive and negative changes, produced directly and indirectly as the result of the Project.

5) Sustainability
An overall assessment of the extent to which the positive changes achieved by the Project can be expected to last after the completion of the Project.

3-2. Method of Study

1) Document review
Relevant documents such as Record of Discussions (RD), Project Document, minutes of meetings, reports of Japanese experts were reviewed to examine the achievement and implementation process of the Project.

2) Questionnaires
A questionnaire survey was conducted to the Japanese experts and counterpart personnel of NIMT who are involved in the Project. Questionnaires were distributed to and collected from these 2 groups. Answers were checked, compiled, and analyzed to see the trend of answers in the survey items (see Annex 3 for the questions in the questionnaires).

3) Interviews
Interviews were conducted with different groups such as Japanese experts, counterpart personnel, Ministry of Science and Technology, JICA, TISTR, DSS, JETRO, and JBIC. The interviews were intended not only to evaluate the achievement and non- or underachievement of the Project but also to identify contributing and constraining factors to such situations (see Annex 4 for the list of interviewees, and Annex 5 for main questions of the interviews).

4. Achievement of the Project

4-1. Inputs

1) Inputs from the Thai side

a. Building, facilities and space for the Project

The construction of the new building of NIMT by a Japanese ODA Loan was completed, and NIMT was relocated during the period of September to December 2005, except the Laboratory of Acoustics and Vibration (See Annex 26 for the field observation report on the new building). The office space for the Project team was provided in the new building. Although the facilities essential for the Project were provided in the new building, they needed reconstruction and renovation in some laboratories, such as Chemical Standard and Standard Scale. The reconstruction was almost finished, except that of Standard Gas whose construction has yet to begin and has caused a delay in technical transfer[1] of the quantity.

b. C/P and administrative personnel

NIMT has allocated one administrative C/P, who is the director of NIMT, and 33 technical C/Ps for each target quantity of the technical transfer in the Phase 2. Although one technical C/P in Time and Frequency has resigned, it is not a problem since the supervisor of the resigned person who also has been receiving the instructions from the Project has taken over the task (see Annex 9 for details).

c. Maintenance of machinery and equipment

The machinery and equipment have been provided as planned (see Annex 10 for details). According to the Japanese experts and C/Ps of NIMT, the maintenance of those machinery and equipment has been implemented appropriately.

d. Necessary budget for the implementation of the project

As administrative and operational expenses, NIMT allocated 519,600 THB in the Thai fiscal years 2005 and 2006, and TICA allocated 805,170 THB in the Thai fiscal year 2005 and 930,405 THB in the Thai fiscal year 2006 for the Project (see Annex 13 and 14 for details).

2) Inputs from the Japanese side

a. Dispatch of Experts

Four long-term experts, namely Chief Advisor, Coordinator, Physical Standards, Electromagnetic Standard, and Chemical Standard, have been dispatched as planned since the beginning of the Phase 2. Regarding the short-term experts, 17 experts (in 11 quantities, environment management, calibration procedure, and accreditation in Form Standard) were dispatched by the end of September 2006. The dispatch has been delayed in some quantities such as Fixed Point, GB/Scale, Flux/Intensity, Pressure and Spectral Irradiance, due to the delay in the procurement of related machineries (see Annex 15 and 16 for details).

b. C/Ps' training in Japan

[1] In this Project, the technical transfer consists of 3 types of activities: 1) C/P training in Japan, 2) self-learning by C/P after the training in Japan, and 3) follow-up training by the short-term experts. Although there are some exceptions, the technical transfer of each quantity is done through implementation of these 3 activities respectively.

A total of 13 C/Ps have been trained in Japan between the beginning of the Phase 2 and the end of September 2006. There has been a delay in schedule for GB/Scale (see Annex 15 and 17 for details).

c. Equipment and materials procured by Japanese ODA Loan
Annex 11 shows the List of Machinery and Equipment procured by Japanese ODA Loans by the end of September 2006. A total of 156 machineries and equipment of the Project were procured by Japanese ODA Loan by the end of September 2006 in the Phase 2. Apart from those already delivered, Annex 12 shows 75 items which have not been delivered yet. Among them are 9 items which are still under the process of finalizing the contracts with suppliers. One of the reasons of the delay lies in the difficulty in identifying the supplier by International Competitive Bidding (ICB) procurement. In the process of ICB procurement, there were machineries for which the estimation did not meet the actual offer or those for which no supplier was found. Later the modality of procurement was changed to the International Shopping, and then to the direct contract to facilitate the process. The procurement committee of NIMT once dissolved itself, and the procurement process was suspended while the new members of the committee were chosen. It was also time consuming for NIMT to follow the procurement guideline of JBIC to meet its requirements.

d. Supporting Local Cost
The supporting local cost from the beginning of the Phase 2 to September 2006 amounts to 4,767,700 THB.

4-2. Outputs

<OUTPUT 1>

The operation and administration of the Project are enhanced.
Indicator 1) Staff and budget are allocated to the Project.

The C/P staff members have been allocated as shown in Annex 9, and the questionnaire and interviews in the mid-term evaluation confirmed that the allocation of C/Ps was implemented as planned. The Japanese long-term experts were also allocated as planned, while the short-term experts were dispatched depending on the schedule of procurement of relevant machinery and equipment (see Annex 16). Regarding the cost of the Project office, it was confirmed that it was also as planned (see Annex 13 and 14).

<OUTPUT 2>

The equipment is operated and maintained properly.
Indicator 1) National measurement standard are installed and established. 2) Equipments are operated and maintained. 3) Manuals of operation and maintenance management are provided.

In order to keep the equipment operated and maintained properly, it is necessary to install and establish national measurement standards. In this Project, the installation and establishment of national standards is completed when the technical transfer is finished. Although it was planned to finish the technical transfer in 36 quantities by the end of September 2006 (refer Annex 15), the actual number of quantities which have completed is 29.

After the installation and establishment of the standards, the equipment is operated and maintained based on the standards. The staff members are trained on operation and maintenance through the technical transfer which concludes with the preparation of the calibration procedure. The preparation includes manuals of maintenance management. Although the calibration procedure is prepared at the end of the technical transfer, the number of quantities which already have their calibration procedures is 22 at this moment due to the delay in the procurement of machinery and equipment, and the delay in the preparation process of the procedure itself (see Annex 18).

<OUTPUT 3>

The technical capability of C/P is upgraded.
Indicators 1) Technical Cooperation Program is created. 2) Counterparts are appropriately assigned. 3) Technical capability of calibration is enhanced.

The technical cooperation program was created at the beginning of the Project (see Annex 8), and it was confirmed that the C/Ps have been allocated as described in Annex 9 as planned.

At the end of the technical transfer, the uncertainty budget sheet is created. By checking uncertainty on the sheet, the improvement of calibration technology can be assessed. Although the calibration procedure was planned to be prepared in 36 quantities by the end of September 2006, the actual number of quantities achieved is 29 due to the delay in the procurement of machinery and equipment.

In this mid-term evaluation, the point of "skill after the training" in the Evaluation Sheet of Technical Transfer was assessed by a technical member of the evaluation team. In this sheet, criteria of the assessment on each quantity include such items as installation, operation, calibration technology, calibration procedure, and accreditation. The assessment was done by setting points for each criterion and summing up the points to draw the total score (see Annex 19 for the allocation of points). The score after the training was improved in all quantities compared with the score before the training. Annex 20 shows the result in each quantity.

The implementation of seminars by the C/Ps can also indicate the improvement of their technical capability. In this Project, during the follow-up training by the short-term experts in Thailand, most of the C/Ps held a seminar on their quantity. In addition, the Project held the ASEAN seminar and workshop[2] as well as the Joint Training[3], which are intended not only for the other stakeholders in the Country, but also for related organizations in other countries of ASEAN (see Annex 21 and 22 for details).

<OUTPUT 4>

Accuracy of national measurement standards is improved.
Indicators 1) Measurement standards are established and maintained. 2) Environmental management technology of calibration laboratories is improved.

[2] It had 20 participants from 10 countries in the ASEAN region. The budget was provided by the Ministry of Economy Trade and Industry (METI), Japan.
[3] It had 23 participants from 12 countries in the region.

3) International comparison is implemented.

The Project aims to improve the accuracy of national measurement standards to an internationally competitive level. Such level is expected to be achieved at the end of the technical transfer of the Project. Thus it is fair to say that 29 quantities have achieved such level at this point in the mid-term evaluation, although 36 quantities were planned to reach such level by the end of September 2006.

In terms of environmental management of the laboratories, most of the experts and C/Ps stated in the questionnaire of the mid-term evaluation that the environment of their laboratories has been good, especially after moving to the new building.

International comparison is not always available even if the Project is ready and willing to invite one. While the Project has finished the technical transfer in 29 quantities, it has participated in 15 international comparisons for 10 different quantities.

<OUTPUT 5>

NIMT disseminates national measurement standards properly.
Indicators 1) Calibration technology for reference standards is improved. 2) Calibration procedures are created. 3) Items pointed by evaluation of Quality System and the way to solve the items

At the time of formulation of the Plan of the Project, the traceability chart is created for each quantity, which shows level of accuracy that the calibration technology of NIMT can provide, using the machinery described in the chart. The procurement plan of machinery and equipment was prepared based on these charts. Therefore, NIMT is expected to be able to provide an adequate level of national measurement standards by materializing what has been described in the charts. However, there are quantities which have not yet been as described in the charts because of the delay in the procurement of machinery and equipment.

NIMT issues a document called “calibration certificate” when it provides calibration services. This certificate can evaluate the level of accuracy since it contains a description of uncertainty budget.

The calibration procedure is prepared at the end of the training with the short-term experts. The procedure also shows the level of calibration technology. However, due to the delay in the procurement and the process of preparation of the procedure itself, the preparation has been delayed in 11 quantities (25 achieved out of 36 planned).

Most of the C/Ps and experts (17 out of 22 persons) have stated in the questionnaire of the mid-term evaluation that the actual achievement in terms of the improvement of calibration technology for reference standards is good, because it has been achieved in most of the quantities.

The Quality System is assessed by the accreditation process. As the result of assessment of the accreditation, items which were not adequate or did not meet the requirement are pointed out. By the end of September 2006, the Project has applied and has been assessed for accreditation in 8 quantities, and it has planned to apply for accreditation in additional 6 quantities in the year 2006.

4-3. Project Purpose

<PROJECT PURPOSE>

NIMT establishes and manages national measurement standards with Internationally recognized level of accuracy
Indicators 1) The technical ability of counterparts in 8 fields of measurement standards in NIMT is strengthened 2) Calibration measurement capability is enhanced 3) 1. The quantities of calibration services are increased. 2. The accuracy of calibration services is enhanced. 3. The range of calibration services is widened.

In the questionnaire for C/Ps and experts conducted by the mid-term evaluation, 14 out of 22 persons stated that actual achievement in terms of the technical ability in 8 fields of measurement standard in NIMT is good. Although there has been a delay in the schedule, improvement has been seen in the quantities which have completed the technical transfer.

In terms of the actual achievement of accuracy of calibration services, 18 out of 22 rated it as good or very good.

As to the indicator 3, there was no updating of the Price List since April 2004. In order to assess the technical achievement, it is necessary to update the Price List as soon as possible.

4-4. Overall Goal

<OVERALL GOAL >

To strengthen the national measurement system in Thailand
Indicator 1) NIMT actively participates in the Global MRA 2) The traceability system of Thailand is firmly established.

According to the report of "Survey and verification of NIMT's activities" (Annex 23), since the beginning of the Phase 2, NIMT has held the 6th APMP TC Chair and the DEC Meeting and hosted the APMP DEC Planning Workshop in May 2005. Also in February 2006, NIMT held the APMP/TCQM Workshop on Gas CRM. In terms of accreditation, NIMT obtained accreditation of IA Japan on Rockwell Hardness Standard in January 2005. Also in November 2005, the accreditation assessment on Form Standard (plug/ring gauge, flatness standard, roughness standard, roundness standard and angle standard) was conducted by IA Japan. Since the Phase 1 up to the mid-term evaluation of Phase 2, the Project has applied and has been assessed for accreditation in 8 quantities in total. In addition, the surveillance on wavelength and acoustics as well as on the hardness standard has been conducted.

The appendix B of Global MRA is a record of international comparison, and NIMT has been registered in the Rockwell Hardness Standard in the B. The appendix C is the record of accreditation (CMC). This

information is available on the website of Bureau International des Poids et Mesures (BIPM)[4]. The appearance on these appendixes indicates international recognition, and NIMT has been trying to get more quantities registered in them.

The traceability system was described in the Master Plan on National Metrology System Development in 1999 (described in Annex 24). To make each organization work under this system, it is necessary to strengthen each organization to play its role. NIMT needs to enforce its role as the national metrology institute which provides primary standards to the calibration laboratories, and it has indeed been playing such role.

[4] http://www.bipm.org/en/home/

5. Revision of the PDM

The evaluation team decided to make the following modifications to the PDM.

		BEFORE THE REVISION	AFTER THE REVISION	REASONS OF REVISION
1	Indicator 2-1 of Output 2	2-1. National measurement standard are installed and established.	2-1. National Measurement Standards are installed and established in the 40 quantities of the Project	The Project provides technical transfer in 40 target quantities, and the achievement can be monitored by the number of quantity.
2	Indicator 2-2 of Output 2	2-2. Equipments are operated and maintained.	2-2. Registration of maintenance record and calibration record of equipment	The indicator before the revision was almost the same as the output 2. The indicator after the revision is set considering the means of verification of the original PDM.
3	Indicator 2-3 of Output 2	2-3. Manuals of operation and maintenance management are provided.	2-3. Manuals of operation and maintenance management are provided and organized for reference.	The revised indicator was set considering the fact that the manuals not only must be provided, but also should be organized for regular reference.
4	Indicator 3-3 of Output 3	3-3. Technical capability of calibration is enhanced.	3-3. Improvement in the uncertainty 3-4. Point of the "skill after training" 3-5. Number of Seminars and Joint training	The indicator before the revision was similar to the output 3, and it was not clear as an indicator. Therefore, using the means of verification in the original PDM, the new three indicators were derived.
5	Indicator 4-1 of Output 4	4-1. Measurement standards are established and maintained.	4-1.Inprovement in uncertainty	The indicator before modification was not clear as to what exactly it indicates. Using the means of verification in the original PDM, the indicator was made clearer.
6	Indicator 4-2 of Output 4	4-2. Environmental management technology of calibration laboratories is improved.	4-2. Registration of environmental data for every laboratory	Same as above.
7	Indicator 4-3 of Output 4	4-3. International comparison is implemented.	4-3. Number of International Comparison implemented.	Same as above
8	Indicator 5-1 of Output 5	5-1. Calibration technology for reference standards is improved.	5-1. Improvement in calibration technology for reference standards	Phrasing has been changed so that it clearly refers to an indicator.
9	Indicator 5-2 of Output 5	5-2. Calibration procedures are created.	5-2. Number of calibration procedures created.	The modified indicator contains the number of calibration to monitor the achievement.
10	Important assumptions	Installation and setting up of all machineries are properly	Procurement, installation and setting up of all machineries	The word “procurement” was added.

	on Outputs	completed.	are properly completed.	
11	Input 2 (Japanese side)	C/P training in Japan – Maximum 10 persons during the Project	C/P training in Japan – Approximately 10 persons during the Project	The actual number by the end of September 2006 is 13.

6. Evaluation Based on Five Evaluation Criteria

The following are the results of the evaluation based on the five evaluation criteria.

6-1 Relevance

The Project is relevant particularly in terms of needs of the industrial community in Thailand, national development policy of Thailand, and cooperation policies of Japan.

1) Relevance to the needs for national measurement standards in Thailand

The project was formulated based on the needs from the industrial community in Thailand, which needed to improve its competitiveness for export promotion and produce higher-quality goods to increase exports. Accordingly, more enterprises have been demanding high-quality technology of metrology and calibration services. This trend has remained the same since the formulation of the Project.

2) Relevance to the National Development Policy of Thailand

The 9th National Economic and Social Development Plan (2002-2006) describes the significance of the metrology system in Thai industry, which needs to develop and spread the National Quality Management System. As the Thai Government has been recently preparing its 10th National Economic and Social Development Plan (2007-2011), it is confirmed that this direction in the importance of metrology in the Development Plan of the Country will not be changed in the new plan.

3) Relevance to the cooperation policy of Japan

The consistency of the Project with the Japanese ODA policy to Thailand has not changed at the time of the mid-term evaluation.

6-2. Effectiveness

1) Prospects of achieving the Project Purpose

The Project has finished the technical transfer in 29 out of 40 quantities in total. Although there has been a delay in the schedule caused by the procurement of machinery and equipment, it is confirmed that all the activities of technical transfer of the Project in the 40 quantities will be completed by the end of the Project period. That means that the Project can meet its minimum objective in the technical transfer to assist the C/Ps in establishing and maintaining the national measurement standards. However, the Project must make further efforts to finalize all the procurement process as soon as possible.

Meanwhile, there are 8 quantities which have been assessed for accreditation, and other 6 quantities will receive the assessment to be accredited in the Japanese fiscal year 2006. The Project is required to do its best to prepare for assessment for accreditation in as many quantities as possible during the rest of the Project period.

2) Contributing and constraining factors for the achievement of the Project Purpose

At the time of the Mid-Term Evaluation, there is a delay in the procurement of machinery of Standard Scale and also in the construction of the Standard Gas laboratory. Although the construction of the testing and analysis laboratory has already finished, the construction of the gas filling and balance room has not started yet. This delay may prevent the completion of technical transfer in all the 40 quantities. Meanwhile, the Project has been trying to overcome the delay by dispatching short-term experts flexibly, receiving assistance from supporting organizations in Japan, which has been a contributing factor for the Project in achieving the Project Purpose.

3) Changes in important assumptions

The following are the five important assumptions in achievement of the Project Purpose. All assumptions remain relevant to the Project.

- There is no change in the C/P employment plan; any change will negatively affect the Project.
- There is no change in budget allocation and policy; any change will negatively affect the Project.
- There is no change in organization; any change will have a direct negative impact on the Project.
- Installation and setting up of all machineries are properly completed.
- NIMT takes preventive measures against resignation of counterparts trained in the Project.

It has been confirmed that there is no change in the first three factors.

The assumption "Installation and setting up of all machineries are properly completed" has had negative influence on the Project. Although this assumption was considered an external factor beyond the control of the Project, the issue actually rests largely on NIMT's effort.

As to the assumption "NIMT takes preventive measures against resignation of counterparts trained in the Project", no such resignation has been observed in the Phase 2.

6-3. Efficiency

1) Achievement of the Project Outputs

Achievements of each Output are examined in the Section 4-2 of this report.

2) Contributing and constraining factors for the achievement of the Project Outputs

On the Output 1 "The operation and administration of the Project are enhanced", a difficulty in communication and management has been observed.

On the Output 2 "The equipment is operated and maintained properly", the delay in procurement of the equipment can hinder the achievement.

On the Output 3, "The technical capability of C/P is upgraded", the issue of language ability was pointed out from both the Japanese and Thai sides, although there is less difficulty when it comes to technical matters.

With regard to the Output 4 "Accuracy of national measurement standards is improved", the delay in international comparison was pointed out by the experts as factors which hinder the achievement of this Output.

For the Outputs 3 and 4, an expert mentioned as a possible contributing factor the establishment of a work environment to appreciate the improvement in accuracy.

Regarding the measures against resignation of C/Ps, NIMT and C/P staff sign a contract so that the staff who was trained by the Project will remain in NIMT for a certain period. The C/Ps have also engaged themselves enthusiastically in their tasks in the Project. These are contributing factors to achievement of the Outputs of the Project.

3) Quality, quantity, and timing of inputs

Quality, quantity, and timing of inputs both from the Thai and Japanese sides have been generally appropriate as examined in the Section 4-1. However, the delay in the procurement has been a major constraint for the Project activities.

In terms of equipment and consumable supplies provided by NIMT, some have observed that the stocks are not enough, and it takes a long time to obtain necessities after requests are made.

6-4. Impact

1) Prospects of achieving the Overall Goal

Judging from the result of the questionnaire survey conducted during the evaluation study, prospects of achieving the Overall Goal are generally high.

2) Other impacts

The Final Report of the Phase 1 states that, as a result of the ASEAN seminars and workshops held by the Project, NIMT will gain more recognition as a core body of the national metrology system in Thailand, as well as in the ASEAN region. Since NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training was started in 2005, the recognition of NIMT in the ASEAN region will grow gradually in the future.

The positive impact on the international competitiveness for the export industry and the reduction of cost of calibration services have been considered positive impacts of the Project.

In addition, the improvement in measurement technology in general can have ripple effects on environmental and health issues, among others.

3) Changes in important assumptions

Here is the important assumption to achievement of the Overall Goal. It is still relevant to the project and has been met.

- There is no change in the role of NIMT as the institute for maintaining national measurement standards.

6-5. Sustainability

1) Institutional aspect

Given that NIMT was established in accordance with the National Metrology System Development Act, and it has become more important as a core body of national measurement standards, it is fair to say that NIMT has been a stable organization.

Although the C/P staff members have been allocated sufficiently to the Project, NIMT still does not have a sufficient number of staff. According to its plan of recruitment, NIMT has expected to increase the number of staff to 167 in 2006, and 207 in 2008. However, the actual number of staff is 140 as of September 1, 2006. In order to provide calibration services adequately and play the role as the provider of national measurement standards in Thailand, it is necessary to strengthen NIMT by increasing the number of personnel.

In terms of the sense of ownership of NIMT toward the Project, each C/P staff is working very hard to obtain the technology through the Project.

2) Financial aspect

Since NIMT has been fully supported by the Thai Government, most of its budget is provided by the Government (see Annex 25). According to the director, NIMT does not have a policy to raise its own funds by providing more calibration services. If anything, NIMT puts an emphasis on the improvement of its level of measurement standards as the primary standard organization of Thailand.

As shown in the Table 1 below, NIMT plans to increase its operation budget from 2007 to 280 % of that of 2006. But the Government has not approved this budgetary plan at this point.

Table 1: NIMT's Budget 2004-2010

Activity/Project	Budget (Baht)						
	2004	2005	2006	2007	2008	2009	2010
- Activity: Development of national measurement unit	52,041,490	33,674,100	48,674,100	206,391,060	189,070,050	168,920,450	142,621,850
- Activity: Development of measurement and calibration personnel	6,775,964	-	-	-	-	-	-
- Activity: Development of metrology services	30,054,082	57,090,000	73,870,700	158,820,200	142,695,700	145,195,000	145,429,800
- Activity: General administration	-	10,373,000	-	-	-	-	-

- Activity: Raising metrology awareness in Thai society	8,819,076	-	10,659,500	23,161,000	29,005,200	32,005,600	34,657,600
- Activity: Development of calibration laboratory network	4,284,388	-	-	-	-	-	-
- Activity: Metrology integration with other related organizations	-	-	21,500,000	38,440,000	26,090,000	26,790,000	27,290,000
Total budget regarding outputs	101,975,000	101,137,100	154,704,300	426,812,260	386,860,950	372,911,050	349,999,250

* The data from 2004 to 2006 are the actual figures and those from 2007 to 2010 are the planned ones.

Source: NIMT

3) Technical aspect

The C/Ps have acquired very well the technology transferred so far in the Project. They have been taking advantage of seminars held by the Project to transfer the knowledge and technology gained through the training. The C/Ps have also good communication among themselves to exchange the knowledge.

In terms of technical transfer toward parties outside NIMT, there have been more seminars held by NIMT, which are open to the calibration laboratories and industrial community. Making the most of these seminars and training, NIMT is expected to help disseminate the technology.

In terms of maintenance of machinery and equipment, since the Project includes the preparation of calibration procedures as its activities, which require maintenance management manuals of the machinery and equipments, it is fair to say that an adequate maintenance management mechanism has been established in NIMT through the Project.

7. Conclusion

Although some project activities have been delayed in some quantities of the Project, the Project can achieve its Project Purpose by making every effort to overcome the delay in the rest of the Project period.

8. Recommendations

As the result of the study, the evaluation team makes the following recommendations.

(1) Measures against resignation of C/Ps
Regarding the measures against resignation of C/Ps, NIMT and C/P staff sign a contract so that the staff who trained by the Project will remain in NIMT for a certain period. Most C/Ps have engaged themselves enthusiastically in their tasks in the Project, which can reflect in the progress of the Project. They are expected to continue this effort to attain the Project Purpose.

(2) Consistency in the management system
Through the Project, NIMT has increasing the number of quantities getting assessed for accreditation. In order to implement accreditation in many quantities effectively, it is recommendable to set up a section which deals solely with the quality system and secures the consistency of DQM (Department Quality Manual) and technical manual. It is important to establish a cross-sectional communication system among different departments, and prepare a system to deal with the management system and required items which are common among the departments.

(3) Strengthening of communication
The Project has a monthly meeting to monitor the progress of each activity and share information among the team members. Although most of the team members assessed that the communication among them is adequate, there were some observations that the information discussed in the monthly meeting is not passed on to the other staff, and the communication between the technical and administrative departments is not sufficient. The communication and exchange of information should be improved so that everyone can work together to achieve the Project Purpose at the end of the Project.

(4) Strengthening of management
As it is required by ISO/IEC 17025: 2005, the strengthening in management of the organization is increasingly important. The new requirement of ISO/IEC 17025: 2005 in clause No. 4.1.6 states as follows: "Top management shall ensure that appropriate communication processes are established within the laboratory and that communication takes place regarding the effectiveness of the management system."

(5) Immediate resolution of the procurement issue
The delay in the procurement has been a serious constraint for the Project so far, and it still has not been solved yet. Especially for those 9 items which have not finalized the contracts with suppliers and items for Standard Scale which have not been delivered yet, it is essential to make the best efforts to conclude the contracts and to have the necessary items delivered as soon as possible.

(6) Immediate start of the renovation of the rest of the standard gas laboratory

Although the testing and analysis laboratory has already finished the construction, the construction of the the gas filling and balance room has not started yet, and further delay may seriously hamper the technical transfer during the Project period. NIMT and the Project team must address this issue immediately.

(7) Application for the assessment of accreditation

The significance of accreditation as evidence of international credibility has been recognized widely among the industrial community. It is important for the Project to do its best to finish receiving the accreditation assessment in all quantities applicable during the Project period.

(8) Dissemination of the measurement standards

In Thailand, there are already 74 calibration laboratories and 112 testing laboratories corresponding to ISO/IEC 17025. In order to secure the sustainability of NIMT in the future, it is necessary to strengthen a structure where NIMT provides the standards accredited in this Project to the calibration laboratories, and the laboratories provide the standards to general users.

(9) Strengthening of the promotion of national measurement standards

NIMT has been actively organizing seminars and training for internal and external stakeholders, which is admirable in terms of technical transfer among them. Although the Project is designed to enhance the technical capability only in NIMT and has been progressing in such direction, it is necessary to promote the recognition among the industrial community as end users of national measurement standards. It is recommendable for NIMT to work harder on the promotion so that the achievement of the Project can be disseminated more widely in Thailand and other neighboring countries. In this regard, it is necessary to update the information of NIMT such as the price list of calibration services and website.

List of Annex

MINUTES OF MEETINGS
BETWEEN THE JAPANESE MID-TERM EVALUATION TEAM
AND
THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THAILAND
ON
THE JAPANESE TECHNICAL COOPERATION FOR
THE PROJECT ON TECHNICAL STRENGTHENING OF
NATIONAL INSTITUTE OF METROLOGY (THAILAND) PHASE 2

The Japanese Mid-term Evaluation Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA"), headed by Mr. Masazumi Ogawa conducted an evaluation study from September 25th to October 5th, for the purpose of the Joint Mid-term Evaluation of the project on Technical Strengthening of National Institute of Metrology (Thailand) Phase2 (hereinafter referred to as "the Project").

During the study, the Team had a series of discussion with the Thai authorities concerned, jointly evaluated the achievements of the Project, and exchanged views of the Project.

As a result of the study and discussions, both Japanese and Thai sides came to an agreement regarding the evaluation results including recommendations in the document attached hereto.

Bangkok, October 5, 2006

Mr. Masazumi OGAWA
Leader
Japanese Mid-Term Evaluation Team
Japan International Cooperation Agency
Japan

Dr. Pian TOTARONG
Director
National Institute of Metrology (Thailand)
Ministry of Science and Technology
The Kingdom of Thailand

1. Background and Purpose of the Evaluation Study

The Project on National Institute of Metrology Thailand (NIMT) is designed for technology transfer with the equipment purchased by ODA loan of the Government of Japan.

In October 2002, Japan International Cooperation Agency (JICA) started the JICA/NIMT Project (Phase1) for technical Strengthening of the NIMT, with the cooperation of the National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science and Technology (AIST), and other Japanese metrology institutes. The Phase 2 of the Project was commenced in October 2004, and the total duration of cooperation is five years. The Project aims to provide technical transfer in 40 quantities of measurement standard during the 5 years, which includes Wavelength Standard, Hardness Standard and so on. The Project has already accomplished about 70% of the total technical transfer which has planned in the Project.

As the Project is reaching at the middle of the project period, a mid-term evaluation study was planed in order to examine the achievement of the Project.

The Mid-Term Evaluation Study had the following five objectives.

1) To review the progress of the Project and evaluate the achievement in accordance with the five evaluation criteria, namely relevance, effectiveness, efficiency, impact, and sustainability.
2) To draw the factors that promoted / impeded project effects.
3) To consider necessary actions to take and make recommendations for the Project.
4) To revise the Project Design Matrix (PDM) and the Plan of Operation (PO), if necessary.
5) To summarize the result of the study in a report.

2. Mid-Term Evaluation Team members

<Japanese side>

	Member's Name	Position
1	Mr. Masazumi Ogawa (Team Leader)	Deputy Resident Representative, JICA Thailand Office
2	Mr. Hirofumi Kinugasa	Assistant Resident Representative, JICA Thailand Office
3	Ms. Yuki Ohashi	Consultant of JICA Thailand Office, IC Net Ltd.
4	Mr. Yoji Matsui	Deputy Director, Measurement and Intellectual Infrastructure Division; Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
5	Mr. Norio Ishizaki	Managing Director, International Accreditation Japan (IA Japan), National Institute of Technology and Evaluation (NITE)

<Thai side>

	Member's Name	Position
1	Dr. Pian Totarong	Director, National Institute of Metrology (Thailand) (NIMT)
2	Mr. Somsak Charkkian	Deputy Director, NIMT
3	Mr. Veera Tulasombut	Head of Mechanical Metrology Department, NIMT
4	Ms. Ajchara Charoensook	Head of Electrical Metrology Department, NIMT
5	Dr. Chainarong Cherdchu	Head of Chemical Metrology Department, NIMT
6	Mr. Virat Plangsangmas	Assistant Head of Acoustics and Vibration Metrology Department, NIMT
7	Mr. Tawat Changpan	Assistant Head of Mechanical Metrology Department, NIMT
8	Dr. Luxsamee Plangsangmas	Director, Industrial Metrology and Testing Service Center Thailand Institute of Science and Technology Research (TISTR)
9	Mr. Sompote Boonsanit	Scientist, Physics and Engineering Division Department of Science Service (DSS)

3. Methodology of Evaluation Study

3-1. Method of Evaluation

The Project Cycle Management (PCM) method was applied to the evaluation. The evaluation was conducted by comparing the design and outcomes of the project using the five evaluation criteria: relevance, effectiveness, efficiency, impact, and sustainability as briefly explained below. Evaluation Grids were produced to compare the outcomes of the Project with its design.

1) Relevance
An overall assessment of whether the Project Purpose and the Overall Goal are in line with the policies of the counterpart country and donors and with the counterpart's needs and priorities.

2) Effectiveness
A measure of whether the Project Purpose will be achieved. This is then a question of the degree to which the Project Outputs contributes to the achievement of the intended Project Purpose.

3) Efficiency
A measure of the extent to which the Project has generated Project Outputs in relation to the total resource inputs.

4) Impact
The positive and negative changes, produced directly and indirectly as the result of the Project.

5) Sustainability
An overall assessment of the extent to which the positive changes achieved by the Project can be expected to last after the completion of the Project.

3-2. Method of Survey

1) Document review

Relevant project documents, such as Record of Discussions (RD), Project Document, Minutes of Meetings, Reports of Japanese experts were reviewed to examine the achievement and implementation process of the Project.

2) Questionnaires

Questionnaire survey is to be conducted to the Japanese Experts and Counterpart personnel of NIMT who are involved in the Project. Questionnaires are to be distributed to and collected from these 2 groups. Answers are checked, compiled, analyzed to see the trend of answers in the survey items.

3) Interviews

A series of interviews are to be conducted to different groups, such as Japanese experts, counterpart personnel, Ministry of Science and Technology, JICA, TISTR, DSS, JETRO, JBIC and so on. The interview is intended not only to evaluate the achievement and non (under) achievement of the Project but also to identify contributing and constraining factors to such situations.

4. Achievement of the Plan

4-1. Achievement of Inputs

1) Inputs from the Thai side

a. Building, facilities and space for the Project

The construction of new building of NIMT by Japanese ODA Loan was completed, and NIMT was relocated during the period of September to December, 2005, except the Laboratory of Acoustics and Vibration. The office space for the Project team was provided in the new building. Although the facilities essential for the Project have been provided in the new building, it needed the reconstruction and renovation in some laboratories, such as Chemical Standard and Standard Scale. The reconstruction was almost finished, except that of Standard Gas, which has not initiated the construction yet and has caused a delay in technical transfer[1] of the quantity.

b. C/P and administrative personnel

NIMT has allocated one administrative C/P, which is the director of NIMT, and 33 technical C/Ps for each target quantity of the technical transfer in the Phase 2. Although one technical C/P in Time and Frequency has resigned, it did not cause problem since the supervisor of the resigned person who also had been receiving the instructions from the Project had taken over the task.

[1] In this Project, the technical transfer consists of 3 types of activities, which are 1) C/P training in Japan, 2) self study of C/P after the training in Japan, and 3) follow-up training by the short-term experts. Although there are some exceptions, the technical transfer of each quantity completes by implementing these 3 activities respectively.

c. Maintenance of machinery and equipments

The machinery and equipments have been provided as planned. According to the Japanese experts and C/Ps of NIMT, the maintenance of those machinery and equipment has been implemented appropriately.

d. Necessary budget for the implementation of the project

As administrative and operational expenses, NIMT allocated 519,600 THB in the Thai fiscal year of 2005 and 2006 each year, and TICA allocated 805,170 THB in the Thai fiscal year of 2005 and 930,405 THB in 2006 for the Project.

2) Inputs from the Japanese side

a. Dispatch of Experts

Four Long-term experts, namely Chief Advisor, Coordinator, Physical Standards, Electromagnetic Standard, and Chemical Standard, have been dispatched as planned since the beginning of the Phase 2. Regarding the Short-term experts, 17 experts (in 11 quantities, environment management, calibration procedure, and accreditation in Form Standard) were dispatched up to the end of September 2006. The dispatch has been delayed in some quantities such as Fixed Point, GB/Scale, Flux/Intensity, Pressure and Spectral Irradiance, due to the delay in the procurement of related machineries.

b. C/P's training in Japan

A total of 13 C/Ps have been trained in Japan since the beginning of Phase 2 up to the end of September 2006. According to the Plan there is a delay in schedule for GB/Scale.

c. Equipments and materials procured by Japanese ODA Loan

A total of 156 machineries and equipments of the Project were procured by Japanese ODA Loan up to the end of September, 2006 in the Phase 2. A part from those already delivered, there are 75 items which have not been delivered yet, and among them there are 9 items which are still under the process of finalizing the contract with suppliers. One of the reasons of the delay lies in the difficulty in identifying the supplier by International Competitive Bidding (ICB) procurement. In the process of ICB procurement, there were machineries which the estimation did not meet the actual offer or those which could not find any supplier. Later the modality of procurement was changed to the International Shopping and then to the direct contract to facilitate the process. In the procurement committee of NIMT, there was an incident that the committee decided its dissolution, and the procurement process was suspended while deciding on the new members of the committee. In addition it was time consuming for NIMT to follow the procurement guideline of JBIC to meet its requirement.

d. Supporting Local Cost

The expenditure in the supporting local cost from the beginning of Phase 2 up to September 2006 sums up to 4,767,700 THB.

4-2. Achievement of Project Outputs

<OUTPUT 1>

The operation and administration of the Project are enhanced.
Indicator 1) Staff and budget are allocated to the Project.

It was confirmed by the questionnaire and interview of the mid-term evaluation that the allocation of C/Ps was implemented as planned. The Japanese Long-term experts also have been allocated as planned, while the Short-term experts have been dispatched depending on the schedule of procurement of related machinery and equipment. Regarding the cost of the Project office, it was confirmed that it was also as planned. .

<OUTPUT 2>

The equipment is operated and maintained properly.
Indicator 1) National measurement standard are installed and established. 2) Equipments are operated and maintained. 3) Manuals of operation and maintenance management are provided.

In order to keep the equipment operated and maintained, it is necessary to install and establish national measurement standard. In this Project, it can be said that the installation and establishment of national standard is completed when the technical transfer is finished. Although it was planned to finish the technical transfer in 36 quantities up to the end of September 2006, the actual number of quantities which have completed is 29.

After the installation and establishment of the standard, the equipment is operated and maintained based on the standard. The skills of operation and maintenance are trained through the technical transfer and its process is finalized by the preparation of calibration procedure, which includes manuals of maintenance management. Although the calibration procedure is prepared at the end of the technical transfer, the number of quantities which already have their calibration procedures is 22 at this moment due to the delay in the procurement of machinery and equipment, and the delay in the preparation process of the procedure itself.

<OUTPUT 3>

The technical capability of C/P is upgraded.
Indicators 1) Technical Cooperation Program is created. 2) Counterparts are appropriately assigned. 3) Technical capability of calibration is enhanced.

The technical cooperation program was created at the beginning of the Project, and it was confirmed that the C/Ps have been allocated based on the plan.

At the end of the technical transfer, the uncertainty budget sheet is created, and by checking the uncertainty on the sheet, the improvement of calibration technology can be assessed. Although the calibration procedure was planned to be prepared in 36 quantities up to the end of September 2006, the actual number of quantities achieved is 29 due to the delay in the procurement of machinery and equipment.

In this mid-term evaluation, the point of "skill after the training" in the Evaluation Sheet of Technical Transfer was assessed by a technical member of the evaluation team. In this sheet, there are criteria of the assessment such as installation, operation, calibration technology, calibration procedure, accreditation among other, on each quantity. The assessment was done by setting points for each criterion and summing up the points to draw the total score. As the result, the score after training was improved in all quantities comparing with the score before training.

The implementation of seminars by the C/Ps can also indicate the improvement of their technical capability. In this Project during the follow-up training by the Short-term experts in Thailand most of the C/Ps holds a seminar on their quantity. In addition, the Project holds the ASEAN seminar and workshop[2] as well as the Joint Training[3], which are intended not only for the other stakeholders in the Country, but also for the related organizations in other countries of ASEAN region.

<OUTPUT 4>

Accuracy of national measurement standards is improved.
Indicators 1) Measurement standards are established and maintained. 2) Environmental management technology of calibration laboratories is improved. 3) International comparison is implemented.

The Project aims to improve the accuracy of national measurement standard to the level which corresponds to the international comparisons. It can be considered that the level could be achieved at the end of the technical transfer of the Project. Therefore, it can be said that 29 quantities have been achieved the level at this moment of mid-term evaluation, although it was planned to achieve in 36 quantities at the end of September 2006.

In terms of environmental management of the laboratories, most of the experts and C/Ps evaluated in the questionnaire of the mid-term evaluation that the environment of their laboratories has been good, especially after moving to the new building.

The international comparison is not always available even if it is ready to participate. While the Project has finished the technical transfer in 29 quantities, it has participated in 15 international comparisons as to 10 different quantities.

[2] It had 20 participants from 10 countries in the ASEAN region. The budget was provided by Ministry of Economy Trade and Industry (METI), Japan.
[3] It had 23 participants from 12 countries in the region.

<OUTPUT 5>

NIMT disseminates national measurement standards properly.
Indicators 1) Calibration technology for reference standards is improved. 2) Calibration procedures are created. 3) Items pointed by evaluation of Quality System and the way to solve the items

At the time of formulation of the Plan of the Project, the traceability chart is created for each quantity, which shows level of accuracy the calibration technology of NIMT can provide, using the machinery described in the chart. The procurement plan of machinery and equipment was prepared based on these charts. Therefore, it can be said that NIMT would be able to provide adequate level of national measurement standard by materializing what has been described in the charts. However, there are quantities which have not been as it described in the chart yet because of the delay in the procurement of machinery and equipment.

NIMT issues a document so called "calibration certificate" when it provides calibration services. In this certificate, it is possible to evaluate the level of accuracy since it contains a description of uncertainty budget.

The calibration procedure is prepared at the end of training with short-term experts, which also shows the level of calibration technology. However, due to the delay in the procurement and the process of preparation of the procedure itself, the preparation has been delayed in 11 quantities (25 achieved out of 36 planned).

Most of the C/Ps and experts (17 out of 22 persons) has evaluated in the questionnaire of the mid-term evaluation that the actual achievement in terms of the improvement of calibration technology for reference standards is good, because it has been achieved in most of quantities.

The Quality System is assessed by the accreditation process. As the result of assessment of the accreditation, items which were not adequate or did not meet the requirement are pointed out. Up to the end of September 2006, the Project has applied and got assessed for the accreditation in 8 quantities, and it has planed to apply for in additional 6 quantities in the year 2006.

4-3. Achievement of Project Purpose

<PROJECT PURPOSE>

NIMT establishes and manages National Measurement Standards with Internationally recognized level of accuracy
Indicators 1) The technical ability of counterparts in 8 fields of measurement standards in NIMT is strengthened 2) Calibration measurement capability is enhanced 3) 1. The quantities of calibration services are increased. 2. The accuracy of calibration services is enhanced.

3. The range of calibration services is widened.

In the questionnaire for C/Ps and experts conducted by the mid-term evaluation, 14 out of 22 persons evaluated that actual achievement in terms of the technical ability in 8 fields of measurement standard in NIMT is good. Although there is a delay in the schedule, in the quantities which have completed the technical transfer they have been observing the progress and improvement.

In terms of the actual achievement of accuracy of calibration services, 18 out of 22 persons answered that they evaluate it good or very good.

As to the indicator 3, there was no updating of the Price List since April 2004. In order to assess the technical achievement it is necessary to update it as soon as possible.

4-4. Achievement of Overall Goal

<OVERALL GOAL >

To strengthen the national measurement system in Thailand
Indicator
1) NIMT actively participates in the Global MRA
2) The traceability system of Thailand is firmly established.

According to the report of "Survey and verify NIMT's activities", since the beginning of Phase 2 NIMT have held the 6th APMP TC Chair and DEC Meeting as well as the APMP DEC Planning Workshop in May 2005 as the host. Also in February 2006, it held the APMP/TCQM Workshop on Gas CRM. In terms of accreditation, NIMT obtained accreditation of IA Japan on Rockwell Hardness Standard in January 2005. Also in the November in 2005, the accreditation assessment on Form Standard (Plug/Ring gauge, Flatness standard, Roughness standard, Roundness standard and Angle standard) was conducted by IA Japan. Since the Phase 1 up to the moment of the mid-term evaluation of Phase 2, the Project has been applied and got assessed for the accreditation in 8 quantities in total. Also the surveillance on wavelength and acoustics, as well as on hardness standard has been conducted.

The appendix B of Global MRA is a record of international comparison, and NIMT has been registered in the Rockwell Hardness Standard, while in the appendix C the record of accreditation (CMC) is appeared.

The traceability system was described in the Master Plan on National Metrology System Development in 1999, and to make each organization functioning under this system, it is necessary to strengthen each organization to play each role. NIMT needs to enforce its role as the national metrology institute which provides primary standard to the calibration laboratories, and it has been under the process in the actual situation.

5. Revision of the PDM

During the discussion on the evaluation, the team reached to an agreement on making the following modifications to the PDM.

		BEFORE THE REVISION	AFTER THE REVISION	REASONS OF REVISION
1	Indicator 2-1 of Output 2	2-1. National measurement standard are installed and established.	2-1. National Measurement Standards are installed and established in the 40 quantities of the Project	The Project provides technical transfer in 40 target quantities, and the achievement can be monitored by the number of quantity.
2	Indicator 2-2 of Output 2	2-2. Equipments are operated and maintained.	2-2. Registration of maintenance record and calibration record of equipment	The indicator before the revision was almost same as the output 2. The indicator after the revision is set considering the means of verification of the original PDM.
3	Indicator 2-3 of Output 2	2-3. Manuals of operation and maintenance management are provided.	2-3. Manuals of operation and maintenance management are provided and organized for reference.	The revised indicator was set considering the fact that the manuals are not only required to be provided, but also should be organized for regular reference.
4	Indicator 3-3 of Output 3	3-3. Technical capability of calibration is enhanced.	3-3. Improvement in the uncertainty 3-4. Point of the "Skill after training" 3-5. Number of Seminars and Joint training	The indicator before the revision was similar to the output 3, and it was not clear as an indicator. Therefore, using the means of verification in the original PDM, the new three indicators were derived.
5	Indicator 4-1 of Output 4	4-1. Measurement standards are established and maintained.	4-1.Inprovement in uncertainty	In this indicator before modification was not clear what dose it indicate. Using the means of verification in the original PDM, the new indicator was derived to make it clearer.
6	Indicator 4-2 of Output 4	4-2. Environmental management technology of calibration laboratories is improved.	4-2. Registration of environmental data for every laboratory	Same as above.
7	Indicator 4-3 of Output 4	4-3. International comparison is implemented.	4-3. Number of International Comparison implemented.	Same as above
8	Indicator 5-1 of Output 5	5-1. Calibration technology for reference standards is improved.	5-1. Improvement in calibration technology for reference standards	The style of sentence was changed to suit as an indicator.
9	Indicator 5-2 of Output 5	5-2. Calibration procedures are created.	5-2. Number of Calibration procedures created.	In the modified indicator, it contains the number of the Calibration to monitor the achievement.

10	Important assumption d of Outputs	Installation and setting up of all machineries are properly completed.	Procurement, installation and setting up of all machineries are properly completed.	The word "procurement" was added to make it clearer.
11	Input 2 (Japanese side)	C/P training in Japan – Maximum 10 persons during the Project	C/P training in Japan – Approximately 10 persons during the Project	The actual number up to the end of September 2006 is 13.

6. Evaluation Based on Five Evaluation Criteria

Result of the evaluation based on five evaluation criteria are described below.

6-1 Relevance

The Project is relevant particularly in terms of needs of industrial community in Thailand, national development policy of Thailand, and cooperation policies of Japan.

1) Relevance to the needs for national measurement standard in Thailand

The project was formulated based on the needs from the industrial community in Thailand, which is required to improve the competitiveness for export promotion and produce higher quality of goods to increase export. In order to do so, more enterprises have been demanding the technology of metrology and calibration services which are high in quality. This trend has not been changed since the formulation of the Project.

2) Relevance to the National Development Policy of Thailand

In the 9th National Economic and Social Development Plan (2002-2006), it describes the significance of the metrology system in Thai industry, which requires developing and spreading the National Quality Management System. As the Thai Government at this moment has been preparing its 10th National Economic and Social Development Plan (2007-2011), it is confirmed that this direction in the importance of metrology in the Development Plan of the Country will not be changed in the new plan.

3) Relevance to the cooperation policy of Japan

The correspondence of the Project with the Japanese ODA policy to Thailand has not been change at this moment of mid-term evaluation.

6-2. Effectiveness

1) Prospects of achieving the Project Purpose

The Project has finished the technical transfer in 29 quantities out of 40 quantities in total. Although

there is a delay in the schedule caused by the procurement of machinery and equipment, it is confirmed that the all activities of technical transfer of the Project in the 40 quantities will be completed by the end of the Project period, which means that the Project can achieve its minimum accomplishment in the technical transfer to assist the C/Ps in establishing and maintaining the national measurement standards. However, in order to do so, it is required to make further efforts to finalize all the procurement process as soon as possible.

Meanwhile, there are 8 quantities which have been assessed for the accreditation, and other 6 quantities will receive the assessment to be accreditated in the Japanese fiscal year of 2006. The Project is required to do its best to prepare for assessment of the accreditation in as many quantities as possible during the rest of the Project period.

2) Contributing and constraining factors for the achievement of the Project Purpose

At the time of the Mid-Term Evaluation, there is a delay in the procurement of machinery of Standard Scale and also in the construction of the Standard Gas laboratory. Although testing and analyzing laboratory has already finished the construction, the construction of the gas filling and balance room has not been started yet. It may constrain the completion of technical transfer in all of the 40 quantities. While there has been a delay, the Project has been making efforts to overcome the delay by dispatching Short-term experts flexibly, borrowing the assistance of supporting organizations in Japan, which has been a contributing factor for the Project to achieve the Project Purpose.

3) Changes in important assumptions

There are following five important assumptions to achieve the Project Purpose. All assumptions remain relevant to the project.

- There is no change in C/P employment plan, which has bad influence on the Project.
- There is no change in budget allocation and policy, which has bad influence on the Project.
- There is no change in organization, which influence directly to the Project.
- Installation and setting up of all machineries are properly completed.
- NIMT takes preventive measures against resign of counterparts trained in the Project.

For the first three factors, it was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.

Regarding the assumption, "Installation and setting up of all machineries are properly completed", it has been receiving negative influence on the Project. Although this assumption was considered as an external factor, which is out side the control of the Project, the issue rests largely on NIMT's effort.

As to the assumption, "NIMT takes preventive measures against resign of counterparts trained in the Project", there is no such an issue observed in the Phase 2.

6-3. Efficiency

1) Achievement of the Project Outputs

Achievements of each Output are examined in the Section 4-2 of this report.

2) Contributing and constraining factors for the achievement of the Project Outputs

On the Output 1 "the operation and administration of the Project are enhanced", it has been observed a difficulty in communication and management.

On the Output 2, "The equipment is operated and maintained properly", the delay in procurement of the equipment can constrain the achievement.

On the Output 3, "The technical capability of C/P is upgraded", the issue of language ability was pointed out from both Japanese and Thai side, although there is less difficulty when it comes to the technical matters..

In case of the Output 4 "Accuracy of national measurement standard is improved", the delay in international comparison was pointed out by the experts as factors which interfere in the achievement in this Output.

For the output 3 and 4, the establishment of working environment to appreciate the improvement in accuracy was mentioned as a possible contributing factor by an expert.

Regarding the measures against resignation of C/Ps, NIMT and C/P staff sign a contract so that the staff who trained by the Project will remain in NIMT for certain period. Also the C/Ps have been engaged themselves enthusiastically on their tasks in the Project. These are contributing factors to achieve the Outputs of the Project.

3) Quality, quantity, and timing of inputs

Quality, quantity, and timing of inputs both from the Thai and Japanese sides have been generally appropriate as examined in the Section 4-1. However, the delay in the procurement has been a major constraint for the activities of the Project.

In terms of equipments and consumable supplies provided by NIMT, there are some observations that the stocks are not enough, and it takes long time to obtain the necessity after they made the requests.

6-4. Impact

1) Prospects of achieving the Overall Goal

Judging from the result of the questionnaire survey conducted during the evaluation study, prospects of

achieving the Overall Goal are high in general.

2) Other impacts

In the Final Report of the Phase 1, it was mentioned that as a result of the ASEAN seminars and workshops held by the Project, NIMT will gain its recognition more widely as a core body of the national metrology system in Thailand, as well as in the ASEAN region. Since NIMT has been holding the ASEAN seminar and workshops continuously, and also the Joint Training which was started in 2005, the recognition of NIMT in the ASEAN region will be grown gradually in the future.

The impact regarding the international competitiveness for export industry and the reduction of cost of calibration services have been continuously considered as positive impacts of the Project.

In addition, the improvement in measurement technology in general can expect ripple effects on environmental and health issues among others.

3) Changes in important assumptions

There is a following important assumption to achieve the Overall Goal. It is still relevant to the project and has been met.

- There is no change in the role of NIMT as the institute for maintaining national measurement standard.

6-5. Sustainability

1) Institutional aspect

Considering the fact that NIMT was established in accordance with the National Metrology System Development Act, and there is a growing importance in the role of NIMT as a core body of national measurement standard, it can be regarded that NIMT has been stable as an organization.

Although the C/P staff has been allocated sufficiently to the Project, NIMT still does not have sufficient number of staff. According to its plan of recruitment, NIMT has been expecting to increase staff up to 167 in 2006, and 207 in 2008. However, the actual number of staff is 140. In order to provide calibration services adequately and play a role as the provider of national measurement standard in Thailand, it is necessary to strengthen its organization by increasing the number of staff.

In terms of the sense of ownership of NIMT toward the Project, each C/P staff is considered to be making excellent efforts to obtain the technology through the Project.

2) Financial aspect

Since NIMT has been fully supported by the Thai Government, most of its budget is provided by the

Government, and it is confirmed to be the some by the interview with the Ministry of Science and Technology. According to the director of NIMT, it dose not have a policy to generate more self income by providing more calibration services. Rather than that, NIMT puts emphasis on the improvement of its level of measurement standard as a primary standard organization of Thailand.

3) Technical aspect

The technology transferred so far in the Project has been accepted excellently by the C/Ps. The staff has been taking advantage of seminars held by the project to transfer the knowledge and technology gained through the training. Also it was considered that C/Ps have good communication among them to exchange the knowledge.

In terms of technical transfer toward outside the NIMT, there has been increasing occasion of seminars held by NIMT, which are open to the calibration laboratories and industrial community. Making the most of these seminars and training, NIMT is expected to make an effort in the dissemination of the technology.

In terms of maintenance of machinery and equipment, since the Project includes the preparation of calibration procedures as its activities, which require maintenance management manuals of the machinery and equipments, it can be expected that an adequate maintenance management mechanism has been established in NIMT through the Project.

7. Conclusion

Although some project activities have been delayed in some quantities of the Project, the Project will be able to accomplish its Project Purpose by making every effort to overcome the delay during the rest of the Project period.

8. Recommendations

As the result of the study, the evaluation team makes the following recommendations.

(1) Measures against resignation of C/Ps
Regarding the measures against resignation of C/Ps, NIMT and C/P staff sign a contract so that the staff who trained by the Project will remain in NIMT for certain period. Most of C/Ps has been engaged themselves on their tasks enthusiastically in the Project, which can be appreciated for the progress of the Project. It is expected to continue this effort to attain the Project Purpose at the end of the Project.

(2) Consistency and conformance in management system
Through the Project, NIMT has increasing number of quantities getting assessed for the accreditation. In order to implement the accreditation in many quantities effectively, it is recommendable to set up a

section which deals with the quality system as its specialty and secures the consistency and conformance of DQM (Department Quality Manual) and technical manual. It is important to establish a cross-sectional communication system between the each department, and prepare a system to deal with management system and required items which are in common among the departments.

(3) Strengthening of communication

The Project has monthly meeting to monitor the progress of each activity and share the information among the team members. Although most of members assessed that the communication between them is adequate, there were some observations that the information discussed in the monthly meeting is not passed on to the other staff, and the communication between technical and administrative department is not sufficient. It is recommendable to improve the communication and exchange of information deliberately so that everyone can work together to achieve the Project Purpose at the end of the Project.

(4) Strengthening of management

As it is required by ISO/IEC 17025: 2005, there is an increasing importance on the strengthening in the management of the top of organization in general. In the new requirement of ISO/IEC 17025: 2005 in clause No. 4.1.6, it mentions as follows; "Top management shall ensure that appropriate communication processes are established within the laboratory and that communication takes place regarding the effectiveness of the management system.

(5) Immediate resolution of the procurement issue

The delay in the procurement has been a serious constraint for the Project up to now, and still has not been solved yet. Especially for those 9 items which have not finalized the contract with suppliers and that of Standard Scale which is not delivered yet, it is urgently required to make the best efforts to reach to the contract and to get delivered as soon as possible.

(6) Immediate start on the renovation of the rest of standard gas laboratory.

Although testing and analyzing laboratory has already finished the construction, the construction of the gas filling and balance room has not been started yet, and further delay may cause another delay in the technical transfer during the Project period. NIMT and the Project team are required to cope with this issue immediately.

(7) Application for the assessment of accreditation

The significance of accreditation as an evidence of the international credibility has been recognized widely among the industrial community. It is important for the Project to be determined to do its best to finish receiving the accreditation assessment in all quantities applicable during the Project period.

(8) Dissemination of the measurement standard

In Thailand there are already 74 calibration laboratories and 112 testing laboratories corresponding to ISO/IEC 17025. In order to secure the sustainability of NIMT in the future, it is necessary to strengthen a structure where NIMT provides the standards accreditated in this Project to the calibration laboratories, and the laboratories provide the standards to general users.

(9) Strengthening of the promotion of national measurement standard

NIMT has been organizing seminars and training actively intended for internal and external stakeholders, which is admirable in terms of technical transfer among them. Although the Project is designed to enhance the technical capability only in the NIMT and has been progressing in the direction, it is necessary to promote the recognition among the industrial community as end users of national measurement standard. It is recommendable for NIMT to put further emphasis on the promotion so that the achievement of the Project can be disseminated more widely in Thailand, and other neighboring countries. In this regard, it is necessary to update the information of NIMT such as the price list of calibration services and web-site.

Attachments:

1. Project Design Matrix (PDM) before the revision
2. Project Design Matrix (PDM) after the revision
3. Evaluation Grid

Attachment 1: PDM (before the revision)

Project Design Matrix (PDM)
Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase II

Version: 0

Target group:
- Calibration Services Agencies such as TISTR and DSS
- Domestic Industries in Thailand (especially export industries and enterprises trying to acquire ISO9000s, ISO14000s)
  (According to the data of TISI in Ministry of Industry, 1212 factories acquired ISO9000s, as of August 1999.)

Project Period: October 16, 2004 - October 15, 2007

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
Overall Goal To Strengthen the national measurement system in Thailand	1 NIMT actively participates in the Global MRA. 2 The traceability system of Thailand is firmly established.	1-1 Survey and verify NIMT's activities 1-2 List in Appendix B and C of Global MRA 2-1 Calibration laboratories list of NIMT 2-2 The charts of measurement network in Thailand	a There is no drastic change in political and economic situation in Thailand. b The policy in Thai Government on the role or assignment of NIMT and reference standard calibration services agencies remain unchanged.
Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accurancy	1 The technical ability of counterparts in 8 fields of measurement standards(*1) in NIMT is strengthened. 2 Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 3-2 The accuracy of calibration services is enhanced. 3-3 The range of calibration services is widened.	1 Survey and verify NIMT's activities 2 Uncertainty budget sheet 3-1 Price List of calibration service 3-2 Price List of calibration service 3-3 Price List of calibration service	a There is no change in the role of NIMT as the institute for maintaining national measurement standard.
Outputs 1 The operation and administration of the Project are enhanced. 2 The equipment is operated and maintained properly. 3 The technical capability of C/P is upgraded. 4 Accuracy of national measurement standards is improved. 5 NIMT disseminates national measurement standards properly.	1-1 Staff and budget are allocated to the Project. 2-1 National measurement standards are installed and established 2-2 Equipment are operated and maintained. 2-3 Manuals of operation and maintenance management are provided. 3-1 Technical Cooperation Program is created 3-2 Counterparts are appropriately assigned. 3-3 Technical capability of calibration is enhanced. 4-1 Measurement standards are established and maintained. 4-2 Environmental management technology of calibration laboratories is improved. 4-3 International-comparison is implemented 5-1 Calibration technology for reference standards is improved. 5-2 Calibration procedures are created. 5-3 Items pointed by evaluation of Quality System and the way to solve the Items	1-1 Staff allocated list, budget, organization chart 2-1-1 Equipment inventory. 2-1-2 Equipment manuals and their list 2-2 Maintenance records or calibration record of equipment 2-3 Operation manual and maintenance management manual 3-1 Technical Cooperation Program sheet 3-2 Allocation list of counterparts by field 3-3-1 Budget sheet on uncertainty 3-3-2 Evaluation sheet of technical transfer 3-3-3 Records of seminar and in-house technical presentation 4-1 Records of the accuracy of national measurement standards. 4-2 File of environmental management sheet for every laboratory 4-3 Record of implementing International-comparison 5-1-1 Traceability charts of NIMT 5-1-2 Calibration certificate 5-2-1 Calibration procedure and their list 5-3 List of the Items pointed by evaluation and the list of the way to solve them	a There is no change in C/P employment plan which has bad influence on the Project b There is no change in budget allocation and policy which has bad influence on the Project c There is no change in organization which influence directly to the Project. d Installation and setting up of all machineries are properly completed. e NIMT takes preventive measures against resign of counterparts trained in the Project.
Activities 1-1 To allocate necessary personnel as planned. 1-2 To make budget plan and execute properly. 1-3 To make action plan and implement as planned 2-1 To install and commit equipment properly. (mainly procured by ODA Loan) 2-2 To operate and maintain equipment. 2-3 To make manuals of operation and maintenance management. 3-1 To make Technical Cooperation Program. 3-2 To assess existing level of basic technical capability of counterpart personnel. 3-3 To evaluate technical capability of counterpart after technical transfer. 4-1 To establish and maintain measurement standards. 4-2 To improve environmental management technology of calibration laboratories. 4-3 To implement International-comparison 5-1 To improve the calibration technology for reference standards based on national standard. 5-2 To make calibration procedure. 5-3 To establish Quality System.	Inputs <Japanese side> 1 (1) Dispatch of Japanese Experts Long Term Experts a Chief Advisor b Project Coordinator c Physical Standards d Electromagnetic Standards e Chemical Standards (2) Short Term Experts Necessary number of Short Term Experts will be dispatched. (Approximately 35) 2 C/P training in Japan - Maximum 10 persons during the Project 3 - Equipment is provided by ODA Loan 4 Supporting Local Cost <Thai side> 1 Provision of building, facilities and space for the Project 2 Allocation of the C/P and administrative personnel (1) Administrative C/P (2) Technical C/P (3) Staff in charge of the Project 3 Maintenance of machinery and equipment 4 Necessary budget for the implementation of the Project	NIMT takes prevent measure against resign of counterparts trained in the Project. Preconditions a Equipment by ODA Loan for the Project is procured as planned.

*1 8 fields of measurement standards
a. Electricity and Magnetism (EM)
b. Thermometry (T)
c. Length (L)
d. Time and Frequency (TF)
e. Acoustics and Vibration (AUV)
f. Mass and Related Quantities (M)
g. Radiation Pyrometry (PR)
h. Chemical Standard (QM)

Attachment 2: PDM (after the revision)

Project Design Matrix (PDM)
Project on Technical Strengthening of National Institute of Metrology (Thailand) Phasd I

Date: 05-10-2006
Version: 1

Target group:
- Calibration Services Agencies such as TISTR and DSS
- Domestic Industries in Thailand (especially export industries and enterprises trying to acquire ISO9000s, ISO14000s)
  (According to the data of TISI in Ministry of Industry, 1,212 factories acquired ISO9000s, as of August 1999, and 4,736 factories acquired ISO9000s, as of September 2006)

Project Period: October 16, 2004 - October 15, 2007

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
Overall Goal To Strengthen the national measurement system in Thailand	1 NIMT actively participates in the Global MRA. 2 The traceability system of Thailand is firmly established.	1-1 Survey and verify NIMT's activities 1-2 List in Appendix B and C of Global MRA 2-1 Calibration laboratories list of NIMT 2-2 The charts of measurement network in Thailand	a There is no drastic change in political and economic situation in Thailand. b The policy in Thai Government on the role or assignment of NIMT and reference standard calibration services agencies remain unchanged.
Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accurancy	1 The technical ability of counterparts in 8 fields of measurement standards(*1) in NIMT is strengthened. 2 Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 3-2 The accuracy of calibration services is enhanced. 3-3 The range of calibration services is widened.	1 Survey and verify NIMT's activities 2 Uncertainty budget sheet 3-1 Price List of calibration service 3-2 Price List of calibration service 3-3 Price List of calibration service	a There is no change in the role of NIMT as the institute for maintaining national measurement standard.
Outputs 1 The operation and administration of the Project are enhanced. 2 The equipment is operated and maintained properly. 3 The technical capability of C/P is upgraded 4 Accuracy of national measurement standards is improved. 5 NIMT disseminates national measurement standards properly.	1-1 Staff and budget are allocated to the Project. 2-1 National Measurement Standards are installed and established in the 40 quantities of the Project 2-2 Registration of maintenance record and calibration record of equipment 2-3 Manuals of operation and maintenance management are provided and organized for reference. 3-1 Technical Cooperation Program is created 3-2 Counterparts are appropriately assigned. 3-3 Improvement in the uncertainty 3-4 Point of the "Skill after training" 3-5 Number of Seminars and Joint training 4-1 Inprovement in uncertainty 4-2 Registration of environmental data for every laboratory 4-3 Number of International Comparison implemented 5-1 Improvement in calibration technology for reference standards 5-2 Number of Calibration procedures created. 5-3 Items pointed by evaluation of Quality System and the way to solve the Items	1-1 Staff allocated list, budget, organization chart 2-1-1 Equipment inventory. 2-1-2 Equipment manuals and their list 2-2 Maintenance records or calibration record of equipment 2-3 Operation manual and maintenance management manual 3-1 Technical Cooperation Program sheet 3-2 Allocation list of counterparts by field 3-3 Budget sheet on uncertainty 3-4 Evaluation sheet of technical transfer 3-5 Records of seminar and in-house technical presentation 4-1 Records of the accuracy of national measurement standards. 4-2 File of environmental management sheet for every laboratory 4-3 Record of implementing International-comparison 5-1-1 Traceability charts of NIMT 5-1-2 Calibration certificate 5-2-1 Calibration procedure and their list 5-3 List of the Items pointed by evaluation and the list of the way to solve them	a There is no change in C/P employment plan which has bad influence on the Project b There is no change in budget allocation and policy which has bad influence on the Project c There is no change in organization which influence directly to the Project. d Procurement, installation and setting up of all machineries are properly completed. e NIMT takes preventive measures against resign of counterparts trained in the Project.
Activities 1-1 To allocate necessary personnel as planned. 1-2 To make budget plan and execute properly. 1-3 To make action plan and implement as planned 2-1 To install and commit equipment properly. (mainly procured by ODA Loan) 2-2 To operate and maintain equipment. 2-3 To make manuals of operation and maintenance management. 3-1 To make Technical Cooperation Program. 3-2 To assess existing level of basic technical capability of counterpart personnel. 3-3 To evaluate technical capability of counterpart after technical transfer. 4-1 To establish and maintain measurement standards. 4-2 To improve environmental management technology of calibration laboratories. 4-3 To implement International-comparison 5-1 To improve the calibration technology for reference standards based on national standard. 5-2 To make calibration procedure. 5-3 To establish Quality System.	Inputs <Japanese side> 1 (1) Dispatch of Japanese Experts Long Term Experts a Chief Advisor b Project Coordinator c Physical Standards d Electromagnetic Standards e Chemical Standards (2) Short Term Experts Necessary number of Short Term Experts will be dispatched. (Approximately 35) 2 C/P training in Japan - Approximately 10 persons during the Project 3 - Equipment is provided by ODA Loan 4 Supporting Local Cost	<Thai side> 1 Provision of building, facilities and space for the Project 2 Allocation of the C/P and administrative personnel (1) Administrative C/P (2) Technical C/P (3) Staff in charge of the Project 3 Maintenance of machinery and equipment 4 Necessary budget for the implementation of the Project	NIMT takes prevent measure against resign of counterparts trained in the Project. Preconditions a Equipment by ODA Loan for the Project is procured as planned.

*1 8 fields of measurement standards
a. Electricity and Magnetism (EM)
b. Thermometry (T)
c. Length (L)
d. Time and Frequency (TF)
e. Acoustics and Vibration (AUV)
f. Mass and Related Quantities (M)
g. Radiation Pyrometry (PR)
h. Chemical Standard (QM)

Attachment 3: Evaluation Grid

1. Achievement

Contents		Verifiable Indicators	Accomplishment
Inputs	Japanese side	1) Experts	‣ 4 Long-term experts (Chief Advisor, Coordinator, Physical Standards, Electromagnetic Standard, and Chemical Standard) have been dispatched as planned.. ‣ 17 Short-term experts (in 11 quantities, environment management, calibration procedure, and accreditation in Form Standard) were dispatched up to the end of September 2006. The dispatch has been delayed in some quantities such as Fixed Point, GB/Scale, Flux/Intensity, Pressure and Spectral Irradiance; due to the delay in the procurement of related machineries.
		2) C/P's training in Japan	‣ A total of 13 C/Ps have been trained in Japan since the beginning of Phase 2 up to the end of September 2006. According to the Plan there is a delay in schedule for GB/Scale.
		3) Equipments and materials procured by ODA Loan	‣ A total of 156 machineries and equipments of the Project were procured by Japanese ODA Loan up to the end of September, 2006 in the Phase 2. A part from those already delivered, there are 75 items which have not been delivered yet, and among them there are 9 items which are still under the process of finalizing the contract with suppliers. One of the reasons of the delay lies in the difficulty in identifying the supplier by International Competitive Bidding (ICB) procurement. In the process of ICB procurement, there were machineries which the estimation did not meet the actual offer or those which could not find any supplier. Later the modality of procurement was changed to the International Shopping and then to the direct contract to make the process faster. In the procurement committee of NIMT, there was an incident that the committee decided its dissolution, and the procurement process was suspended while deciding on the new members of the committee. In addition it was time consuming for NIMT to follow the procurement guideline of JBIC to meet its requirement.
		4) Supporting Local Cost	‣ The expenditure in the supporting local cost from the beginning of Phase 2 up to September 2006 sums up to 4,767,700 THB.
	Thai side	1) Building, facilities and space for the Project	‣ The construction of new building of NIMT by Japanese ODA Loan was completed, and NIMT was relocated during the period of September to December, 2005, except the Laboratory of Acoustics and Vibration. The office space for the Project team was provided in the new building. Although the facilities essential for the Project have been provided in the new building, it needed the reconstruction and renovation in some laboratories, such as Chemical Standard and Standard Scale. The reconstruction was almost finished, except that of Standard Gas, which has not initiated the construction yet and has caused a delay in technical transfer of the quantity.
		2) C/P and administrative personnel	‣ NIMT has allocated one administrative C/P, which is the director of NIMT, and 33 technical C/Ps for each target quantity of the technical transfer in the Phase 2. ‣ Although one technical C/P in Time and Frequency has resigned, it did not cause problem since the supervisor of the resigned person who also had been receiving the instructions from the Project had taken over the task.
		3) Maintenance of machinery and equipments	‣ The machinery and equipments have been provided as planned. According to the Japanese experts and C/Ps of NIMT, the maintenance of those machinery and equipment has been implemented appropriately.
		4) Necessary budget for the implementation of	‣ As administrative and operational expenses, NIMT allocated 519,600 THB in the Thai fiscal year of 2005 and 2006 each

		the project	year, and TICA allocated 805,170 THB in the Thai fiscal year of 2005 and 930,405 THB in 2006 for the Project.
Overall Goal	To strengthen the national measurement system in Thailand	1. NIMT actively participates in the Global MRA	‣ According to the report of "Survey and verify NIMT's activities", since the beginning of Phase 2 NIMT have held the 6th APMP TC Chair and DEC Meeting as well as the APMP DEC Planning Workshop in May 2005 as the host. Also in February 2006, it held the APMP/TCQM Workshop on Gas CRM. In terms of accreditation, NIMT obtained accreditation of IA Japan on Rockwell Hardness Standard in January 2005. Also in the November in 2005, the accreditation assessment on Form Standard (Plug/Ring gauge, Flatness standard, Roughness standard, Roundness standard and Angle standard) was conducted by IA Japan. Since the Phase 1 up to the moment of the mid-term evaluation of Phase 2, the Project has been applied and got assessed for the accreditation in 8 quantities in total. Also the surveillance on wavelength and acoustics, as well as on hardness standard has been conducted. ‣ The appendix B of Global MRA is a record of international comparison, and NIMT has been registered in the Rockwell Hardness Standard, while in the appendix C the record of accreditation (CMC) is appeared.
		2. The traceability system of Thailand is firmly established	‣ This traceability system was described in the Master Plan on National Metrology System Development in 1999, and to make each organization function under this system, it is necessary to strengthen each organization to play each role. NIMT needs to enforce the role as the national metrology institute which provides primary standard to the calibration laboratories, and it has been under the process in the actual situation.
Project Purpose	NIMT establishes and manages National Measurement Standards with Internationally recognized level of achievement	1. The technical ability of counterparts in 8 fields of measurement standards in NIMT is strengthened	‣ In the questionnaire for C/Ps and experts conducted by the mid-term evaluation, 14 out of 22 persons evaluated that actual achievement in terms of the technical ability in 8 fields of measurement standard in NIMT is good. Although there is a delay in the schedule, in the quantities which have completed the technical transfer they have been observing the progress and improvement.
		2. Calibration measurement capability is enhanced	‣ In terms of the actual achievement of accuracy of calibration services, 18 out of 22 persons answered that they evaluate it good or very good.
		3-1. The quantities of calibration services are increased	‣ There was no updating of the Price List since April 2004. In order to assess the technical achievement it is necessary to update it as soon as possible.
		3-2.The accuracy of calibration services is enhanced	
		3-3. The range of calibration services is widened	
Outputs	Output 1) The operation and administration of the Project are enhanced.	1-1. Staff and budget are allocated to the Project.	‣ It was confirmed by the questionnaire and interview of the mid-term evaluation that the allocation of C/Ps was as implemented as planned. ‣ The Japanese Long-term experts also have been allocated as planned, while the Short-term experts have been dispatched depending on the schedule of procurement of related machinery and equipment. ‣ Regarding the cost of the Project office, it was confirmed that it was also as planned.
	Output 2) The equipment is operated and maintained properly.	2-1. National measurement standard are installed and established.	‣ In order to keep the equipment operated and maintained, it is necessary to install and establish national measurement standard. In this Project, it can be said that the installation and establishment of national standard is completed when the technical transfer is finished. Although it was planned to finish the technical transfer in 36 quantities up to the end of September 2006, the actual number of quantities which have completed it is 29.

	2-2. Equipments are operated and maintained. 2-3. Manuals of operation and maintenance management are provided.	‣ After the installation and establishment of the standard, the operation and maintenance are implemented based on the standard. The operation and maintenance are trained through the technical transfer and its process is finalized by the preparation of calibration procedure, which includes manuals of maintenance management. Although the calibration procedure is prepared at the end of the technical transfer, the number of quantities which already have their calibration procedures is 22 at this moment due to the delay in the procurement of machinery and equipment, and the delay in the preparation process of procedure itself.
Output 3) The technical capacity of C/P is upgraded.	3-1. Technical Cooperation Program is created. 3-2. Counterparts are appropriately assigned.	‣ The technical cooperation program has been created at the beginning of the Project, and it was confirmed that the C/Ps have been allocated based on the plan.
	3-3. Technical capability of calibration is enhanced.	‣ At the end of the technical transfer, the uncertainty budget sheet is created, and by checking the uncertainty on the sheet, the improvement of calibration technology can be assessed. Although the calibration procedure was planned to be prepared in 36 quantities up to the end of September 2006, the actual number of quantities achieved the progress is 29 due to the delay in the procurement of machinery and equipment. ‣ The point of "skill after the training" in the Evaluation Sheet of Technical Transfer was assessed by a technical member of the evaluation team. In this sheet, there are criteria of the assessment such as installation, operation, calibration technology, calibration procedure, accreditation among other, on each quantity. The assessment was done by setting points for each criterion and summing up the points to draw the total score. As the result, the score after training was improved in all quantities comparing with the score before training. ‣ The implementation of seminars by the C/Ps can also indicate the improvement of their technical capability. In this Project during the follow-up training by the Short-term experts in Thailand most of the C/Ps holds a seminar on their quantity. ‣ The Project holds the ASEAN seminar and workshop as well as the Joint Training , which are intended not only for the other stakeholders in the Country, but also for the related organizations in other countries of ASEAN region.
Output 4) Accuracy of national measurement standards is improved.	4-1. Measurement standards are established and maintained.	‣ The Project aims to improve the accuracy of national measurement standard to the level which corresponds to the international comparisons. It can be considered that the level could be achieved at the end of the technical transfer of the Project. ‣ 29 quantities have been achieved the level at this moment of mid-term evaluation, although it was planned to achieve in 36 quantities at the end of September 2006.
	4-2. Environmental management technology of calibration laboratories is improved.	‣ In terms of environmental management of the laboratories, most of the experts and C/Ps evaluated in the questionnaire of the mid-term evaluation that the environment of their laboratories has been good, especially after moving to the new building.
	4-3. International comparison is implemented.	‣ The international comparison is not always available even if it is ready to participate. While the Project has finished the technical transfer in 29 quantities, it has participated in 15 international comparisons as to 10 different quantities.
Output 5) NIMT disseminates national measurement standards properly.	5-1. Calibration technology for reference standards is improved.	‣ At the time of formulation of the Plan of the Project, the traceability chart is created for each quantity, which shows level of accuracy the calibration technology of NIMT can provide, using the machinery described in the chart. The procurement plan of machinery and equipment was prepared based on these charts. Therefore, it can be said that NIMT would be able to provide adequate level of national measurement standard by materializing what has been described in the charts. However, there are quantities which have not been as it described in the chart yet because of the delay in the procurement of machinery and equipment.

			‣ NIMT issues a document so called "calibration certificate" when it provides calibration services. In this certificate, it is possible to evaluate the level of accuracy since it contains a description of uncertainty budget.
		5-2. Calibration procedures are created.	‣ The calibration procedure is prepared at the end of training with short-term experts, which shows the level of calibration technology. Due to the delay in the procurement and the process of preparation of the procedure itself, the preparation has been delayed in 11 quantities (25 achieved out of 36 planned). ‣ Most of the C/Ps and experts (17 out of 22 persons) has evaluated in the questionnaire of the mid-term evaluation that the actual achievement in terms of the improvement of calibration technology for reference standards is good, because it has been achieved in most of quantities.
		5-3. Items pointed by evaluation of Quality System and the way to solve the items	‣ The Quality System is assessed by the accreditation process. As the result of assessment of the accreditation, items which were not adequate or did not meet the requirement are pointed out. Up to the end of September 2006, the Project has been applied and got assessed for the accreditation in 8 quantities, and it has plan to apply for it in additional 6 quantities in the year 2006.

2. Implementation Process

Contents	Verifiable Indicators	Accomplishment
Plan of activities	Have the activities been implemented as planned?	‣ Technical transfer has finished in 29 quantities while it was planned to be finished 36 quantities at the end of September 2006. ‣ 17 Short-term experts (in 11 quantities, environment management, calibration procedure, and accreditation in Form Standard) were dispatched up to the end of September 2006. The dispatch has been delayed in some quantities such as Fixed Point, GB/Scale, Flux/Intensity, Pressure and Spectral Irradiance, due to the delay in the procurement of related machineries. ‣ As to the installation of equipment, there are 75 items which have not been delivered yet, and among them there are 9 items which are still under the process of finalizing the contract with suppliers. ‣ There is a delay in the preparation of calibration procedure. The number of quantities which already have their calibration procedures is 22 at this moment due to the delay in the procurement of machinery and equipment, and the delay in the preparation process of procedure itself.
Methods of technical transfer	Is there any problem in the method of technical transfer?	‣ 19 out of 22 persons answered in the questionnaire the method was good or very good.
Management system	Is there any monitoring system?	‣ Monitoring of the project is done in monthly meeting with both JICA and Thai members, preparing monitoring sheet mostly by the coordinator, but reflecting sufficiently the opinion of Thai staff.
	Is there any problem in the decision-making system ?	‣ 19 out of 22 persons answered in the questionnaire the decision-making process is good or fair.
	Is there any problem in the communication in the Project?	‣ Communication was mostly good according to the questionnaire, however, there were observations which question the cross-sectional communication between DQM and between administrative and technical department..
Consciousness of the NIMT and its C/Ps	Do NIMT and the C/Ps have high level of consciousness toward the Project?	‣ 18 out of 22 persons answered in the questionnaire the level of participation of NIMT staff was good or very good.
Adequacy of the C/Ps	Have the C/Ps allocated to the Project been adequate?	‣ All of the 5 experts answered in the questionnaire that the C/Ps allocated were very good or good.

Participation and recognition of the other stakeholders toward the Project	Do the other stakeholders recognize and participate in the Project?	• 15 out of 22 persons in the questionnaire that the recognition of the Project is good. • The Project dose not include activities which require participation of other related organizations.

3. 5 Evaluation Criteria

Criteria	Survey items		Results
	Main items	Questions	
Relevance	Relevance in the national policy	Is there any change related to the metrology development in the governmental policies of Thailand?	‣ In the 9th National Economic and Social Development Plan (2002-2006), it describes the significance of the metrology system in Thai industry, which requires developing and spreading the National Quality Management System. As the Thai Government at this moment has been preparing its 10th National Economic and Social Development Plan (2007-2011), it is confirmed that this direction in the importance of metrology in the Development Plan of the Country will not be changed in the new plan.
		Is there any change in the ODA strategies for Thailand?	‣ The correspondence of the Project with the Japanese ODA policy to Thailand has not been change at this moment of mid-term evaluation.
	Relevance in the C/P organization	Is there any change observed in terms of the role of NIMT in the metrology area of Thailand among other related organizations during the Project?	‣ The role of NIMT has been defined in the National Metrology System Development Act. ‣ Although NIMT has been increasing its recognition, there is no major change in the role of NIMT.
	Relevance in the technique	Does Japan have technical superiority in the techniques handled in the Project?	‣ Japan has 100 years of history in the metrology while NIMT has 10 years.
	Relevance in the needs of beneficiaries	Is there any change observed in terms of the needs of industry in Thailand regarding the metrology and measurement standard during the beginning of Phase 2 up to now?	‣ The project was formulated based on the needs from the industrial community in Thailand, which is required to improve the competitiveness for export promotion and produce higher quality of goods to increase export. In order to do so, more enterprises have been demanding the technology of metrology and calibration services which are high in quality. This trend has not been changed since the formulation of the Project.
	Expectancy in the level of achievement in the Project Purpose, considering actual status of inputs, outputs and activities.	How do you evaluate the level of achievement in terms of Project Purpose at this moment?	‣ The Project has finished the technical transfer in 29 quantities out of 40 quantities in total. Although there is a delay in the schedule caused by the procurement of machinery and equipment, it is confirmed that the all activities of technical transfer of the Project in the 40 quantities will be completed by the end of the Project period, which means that the Project can achieve its minimum accomplishment in the technical transfer to assist the C/Ps establish and maintain the national measurement standards. ‣ In order to do so, it is required to make further efforts to finalize all the procurement process as soon as possible. ‣ There are 8 quantities which have been assessed for the accreditation, and other 6 quantities will receive the assessment to be accreditated in the Japanese fiscal year of 2006. The Project is required to do its best to prepare for assessment of the accreditation in as many quantities as possible during the rest of the Project period.

Effectiveness (expectancy)	Interfering factors in the achievement of Project Purpose	Is there any interfering factors in the achievement of Project Purpose?	‣ At the time of the Mid-Term Evaluation, there is a delay in the procurement of machinery of Standard Scale and also in the construction of the Standard Gas laboratory. Although testing and analyzing laboratory has already finished the construction, the construction of the gas filling and balance room has not been started yet, and further delay may cause another delay in the technical transfer during the Project period. ‣ While there has been a delay, the Project has been making efforts to overcome the delay by dispatching Short-term experts flexibly, borrowing the assistance of supporting organizations in Japan,
	Causality between Outputs and Project Purpose	Are the outputs sufficient to achieve the Project Purpose?	‣ Appropriate
	Are those important assumptions of the outputs still applicable in the achievement of Project Purpose? The possibility to clear the important assumptions.	Is there any change in staff employment plan of NIMT since the beginning of Phase 2 up to this moment?	‣ It was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.
		Is there any change in budget allocation and policy of NIMT since the beginning of Phase 2 up to this moment?	‣ It was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.
		Is there any change in organization of NIMT since the beginning of Phase 2 up to this moment?	‣ It was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.
		Have all the equipments been provided and installed?	‣ Regarding the assumption, "Installation and setting up of all machineries are properly completed", it has been receiving negative influence on the Project. Although this assumption was considered as an external factor, which is out side the control of the Project, the issue rests largely on NIMT's effort.
		Has NIMT been taking preventive measures against resign of staffs trained in the Project?	‣ As to the assumption, "NIMT takes preventive measures against resign of counterparts trained in the Project", there is no such an issue observed in the Phase 2.
	Interfering factors in the achievement of Outputs	Is there any interfering factors in the achievement of Outputs?	‣ On the Output 1 "the operation and administration of the Project are enhanced", it has been observed a difficulty in communication and management. ‣ On the Output 2, "The equipment is operated and maintained properly", the delay in procurement of the equipment can constrain the achievement. ‣ On the Output 3, "The technical capability of C/P is upgraded", the issue of language ability was pointed out from both Japanese and Thai side. ‣ On the Output 4 "Accuracy of national measurement standard is improved", the delay in international comparison was pointed out by the experts as factors which interfere in the achievement in this Output. ‣ For the output 3 and 4, the establishment of working environment to appreciate the improvement in accuracy was mentioned as a possible contributing factor by an expert.
	Causality between Activities and Outputs	Are the activities sufficient to achieve the Outputs?	‣ Appropriate

Efficiency	Causality between Outputs and Inputs	Are Inputs sufficient?	Is there sufficient budget? and is the budget allocated appropriately?	‣ In terms of equipments and consumable supplies provided by NIMT, there are some observations that the stocks are not enough, and it takes long time to obtain the necessity after they made the requests.
			Is the budget sufficient to implement the activities?	
		Are C/Ps allocated sufficiently?	Are C/Ps allocated as planned?	‣ The C/Ps were allocated as planned.
			Are the allocated C/Ps sufficient to implement the activities?	‣ It was confirmed with experts that the allocated staff was sufficient to implement the activities.
		Are the machines and equipments provided sufficiently?	Have the machines and equipments provided by ODA loan been maintained adequately?	‣ 17 out of 22 persons answered in the questionnaire that the maintenance of machinery and equipments are good or very good.
			Have the operation manuals and maintenance management manuals been prepared adequately in order to make it possible to give sufficient maintenance?	‣ 17 out of 22 persons answered in the questionnaire that the maintenance of machinery and equipments are good or very good.
			Have the machines and equipments been provided sufficiently to implement the activities?	‣ Although there is a delay in the procurement, with the machineries provided the national measurement standard has been installed and established. ‣ There was a machinery which is not utilized because of the difference between the items required and provided.
	Are those important assumptions of the activities still applicable in the achievement of Outputs? Is there any bad influence of the important assumptions?		Has NIMT been taking preventive measures against resign of staffs trained in the Project?	‣ NIMT C/Ps sign a contract with NIMT before project training. ‣ There is no problem of resignation of C/P up to now in Phase 2.
	Timeliness of the Input		Has the input of the Project been provided in a timely manner to implement the activities as planned?	‣ Although there is a delay in the procurement, the Project has been managing the schedule well by dispatching short-term experts flexibly depending on the schedule of procurement.
	Expectancy of the achievement of Overall Goal comparing to the accomplishment of Input/Output and the state of activities		Considering the actual state of implementation of the Project, how do you evaluate the possibility of achievement of the Overall Goal as an impact of the Project?	‣ Judging from the result of the questionnaire survey conducted during the evaluation study, prospects of achieving the Overall Goal are high in general.
	Interfering factors in the achievement of Overall Goal		Is there any conceivable factor which interferes in the achievement of Overall Goal?	‣ Change of governmental policy in Thailand ‣ Improvement in management ‣ Working environment which appreciates the improvement of accuracy.
	Causality between Overall Goal and Project Purpose		Is the Overall Goal an effect of the achievement of Project Purpose?	‣ Appropriate

Impact (Expectancy)	Are those important assumptions of the Project Purpose still applicable in the achievement of Overall Goal?		Is there any conceivable factor which can change the role of NIMT as the institute for maintaining national measurement standard in the future?	‣ It is still relevant to the project and has been met.
	Ripple effect apart from the Overall Goal	Progress or status of the impact which is prospected in the ex-ante evaluation	NIMT becomes a central organization in the field of measurement standard in ASEAN area.	‣ In the Final Report of the Phase 1, it was mentioned that as a result of the ASEAN seminars and workshops held by the Project, NIMT will gain its recognition more widely as a core body of the national metrology system in Thailand, as well as in the ASEAN region. Since NIMT has been holding the ASEAN seminar and workshops continuously, and also the Joint Training which was started in 2005, the recognition of NIMT in the ASEAN region will be grown gradually in the future.
			Competency of Thai industry is strengthened	‣ The impact regarding the international competitiveness for export industry and the reduction of cost of calibration services have been continuously considered as positive impacts of the Project.
			The cost of calibration is reduced	
		Other predictable impacts	What is the expectable positive impact of the Project?	‣ The improvement in measurement technology in general can expect ripple effects on environmental and health issues among others.
			What is the expectable negative impact of the Project?	‣ None
	Other negative impacts and their countermeasures		If there is any negative impact, what is its countermeasure?	‣ None
	Policy assistance		Is there continuous policy assistance after the Project?	‣ It is confirmed in the interview with MOST that the Government will continue same volume of support.
	Related regulations and legislations		Are the related regulations and legislations prepared? Or will they be prepared in the future?	‣ It is confirmed in the interview with MOST that the Government will continue same volume of support.
	Organizational capability of NIMT		Dose it have enough human resources? Are they allocated adequately? And dose it have adequate management system?	‣ Although the C/P staff has been allocated sufficiently to the Project, NIMT still does not have sufficient number of staff. According to its plan of recruitment, NIMT has been expecting to increase staff up to 167 in 2006, and 207 in 2008. However, the actual number of staff is 140. In order to provide calibration services adequately and play a role as the provider of national measurement standard in Thailand, it is necessary to strengthen its organization by increasing the number of staff.
			Is the organizational capability of NIMT sufficiently prepared to continue their achievements from the Project after the end of the Project?	‣ Considering the fact that NIMT was established in accordance with the National Metrology System Development Act, and there is a growing importance in the role of NIMT as a core body of national measurement standard, it can be regarded that NIMT has been stable as an organization.
	Ownership toward the Project		Dose NIMT have a sense of ownership toward the Project?	‣ In terms of the sense of ownership of NIMT toward the Project, each C/P staff is considered to be making excellent efforts to obtain the technology through the Project.

Sustainability (Expectancy)	Budget	Is there sufficient budget secured in order to NIMT continue the same volume and level of activities in the future?	‣ Since NIMT has been fully supported by the Thai Government, most of its budget is provided by the Government, and it is confirmed to be the some by the interview with the Ministry of Science and Technology. According to the director of NIMT, it dose not have a policy to generate more self income by providing more calibration services. Rather than that, NIMT puts emphasis on the improvement of its level of measurement standard as a primary standard organization of Thailand.
		Is there any possibility of increasing the cost of NIMT in the future?	‣ More activities, if the importance of standard material is recognized by community. ‣ It may have more income through calibration services.
	Technology transferred by the Project	The technology transferred so far to the staffs of NIMT has been accepted by them in terms of level of technology?	‣ The technology transferred so far in the Project has been accepted excellently by the C/Ps. The staff has been taking advantage of seminars held by the project to transfer the knowledge and technology gained through the training. ‣ It was considered that C/Ps have good communication among them to exchange the knowledge.
		The technology transferred so far to the staffs of NIMT has been customary and socio-culturally acceptable to them?	‣ Appropriate
	Maintenance of machinery and equipments	NIMT will be able to maintain machinery and equipment appropriately?	‣ 17 out of 22 persons answered in the questionnaire that the maintenance of machinery and equipments will be done properly. ‣ In terms of maintenance of machinery and equipment, since the Project includes the preparation of calibration procedures as its activities, which require maintenance management manuals of the machinery and equipments, it can expect that the Project contains an adequate maintenance management mechanism inside the Project.
	Mechanism of dissemination of the transferred technology	Dose the Project include a mechanism of technical transfer among the staffs of NIMT?	‣ In terms of technical transfer toward outside the NIMT, there has been increasing occasion of seminars held by NIMT, which are open to the calibration laboratories and industrial community. Making the most of these seminars and training, NIMT is expected to make an effort in the dissemination of the technology.
		Dose the Project include a mechanism of technical transfer to the other calibration laboratories?	‣ The Project holds C/P seminar, ASEAN seminars and workshops and Joint Seminar as an opportunity to disseminate its technology, although some of these are not included in the Project's activities.
	Interfering factors in the sustainability of the Project	Is there any other conceivable factor which hinders the sustainability of the Project?	‣ Improvement in management and budget after the Project.

Annex 1: PDM (before the revision)

Project Design Matrix (PDM) Version: 0

Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase II

Target group:

- Calibration Services Agencies such as TISTR and DSS
- Domestic Industries in Thailand（especially export industries and enterprises trying to acquire ISO9000s, ISO14000s）
  （According to the data of TISI in Ministry of Industry, 1212 factories acquired ISO9000s, as of August 1999）

Project Period: October 16, 2004 - October 15, 2007

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
Overall Goal To Strengthen the national measurement system in Thailand	1 NIMT actively participates in the Global MRA. 2 The traceability system of Thailand is firmly established.	1-1 Survey and verify NIMT's activities 1-2 List in Appendix B and C of Global MRA 2-1 Calibration laboratories list of NIMT 2-2 The charts of measurement network in Thailand	a There is no drastic change in political and economic situation in Thailand. b The policy in Thai Government on the role or assignment of NIMT and reference standard calibration services agencies remain unchanged.
Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accurancy	1 The technical ability of counterparts in 8 fields of measurement standards(*1) in NIMT is strengthened. 2 Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 3-2 The accuracy of calibration services is enhanced. 3-3 The range of calibration services is widened.	1 Survey and verify NIMT's activities 2 Uncertainty budget sheet 3-1 Price List of calibration service 3-2 Price List of calibration service 3-3 Price List of calibration service	a There is no change in the role of NIMT as the institute for maintaining national measurement standard.
Outputs 1 The operation and administration of the Project are enhanced. 2 The equipment is operated and maintained properly. 3 The technical capability of C/P is upgraded. 4 Accuracy of national measurement standards is improved. 5 NIMT disseminates national measurement standards properly.	1-1 Staff and budget are allocated to the Project. 2-1 National measurement standards are installed and established 2-2 Equipment are operated and maintained. 2-3 Manuals of operation and maintenance management are provided. 3-1 Technical Cooperation Program is created 3-2 Counterparts are appropriately assigned. 3-3 Technical capability of calibration is enhanced. 4-1 Measurement standards are established and maintained. 4-2 Environmental management technology of calibration laboratories is improved. 4-3 International-comparison is implemented 5-1 Calibration technology for reference standards is improved. 5-2 Calibration procedures are created. 5-3 Items pointed by evaluation of Quality System and the way to solve the Items	1-1 Staff allocated list, budget, organization chart 2-1-1 Equipment inventory. 2-1-2 Equipment manuals and their list 2-2 Maintenance records or calibration record of equipment 2-3 Operation manual and maintenance management manual 3-1 Technical Cooperation Program sheet 3-2 Allocation list of counterparts by field 3-3-1 Budget sheet on uncertainty 3-3-2 Evaluation sheet of technical transfer 3-3-3 Records of seminar and in-house technical presentation 4-1 Records of the accuracy of national measurement standards. 4-2 File of environmental management sheet for every laboratory 4-3 Record of implementing International-comparison 5-1-1 Traceability charts of NIMT 5-1-2 Calibration certificate 5-2-1 Calibration procedure and their list 5-3 List of the Items pointed by evaluation and the list of the way to solve them	a There is no change in C/P employment plan which has bad influence on the Project b There is no change in budget allocation and policy which has bad influence on the Project c There is no change in organization which influence directly to the Project. d Installation and setting up of all machineries are properly completed. e NIMT takes preventive measures against resign of counterparts trained in the Project.
Activities 1-1 To allocate necessary personnel as planned. 1-2 To make budget plan and execute properly. 1-3 To make action plan and implement as planned 2-1 To install and commit equipment properly. (mainly procured by ODA Loan) 2-2 To operate and maintain equipment. 2-3 To make manuals of operation and maintenance management. 3-1 To make Technical Cooperation Program. 3-2 To assess existing level of basic technical capability of counterpart personnel. 3-3 To evaluate technical capability of counterpart after technical transfer. 4-1 To establish and maintain measurement standards. 4-2 To improve environmental management technology of calibration laboratories. 4-3 To implement International-comparison 5-1 To improve the calibration technology for reference standards based on national standard. 5-2 To make calibration procedure. 5-3 To establish Quality System.	Inputs <Japanese side> 1 (1) Dispatch of Japanese Experts Long Term Experts a Chief Advisor b Project Coordinator c Physical Standards d Electromagnetic Standards e Chemical Standards (2) Short Term Experts Necessary number of Short Term Experts will be dispatched. (Approximately 35) 2 C/P training in Japan - Maximum 10 persons during the Project 3 - Equipment is provided by ODA Loan 4 Supporting Local Cost	<Thai side> 1 Provision of building, facilities and space for the Project 2 Allocation of the C/P and administrative personnel (1) Administrative C/P (2) Technical C/P (3) Staff in charge of the Project 3 Maintenance of machinery and equipment 4 Necessary budget for the implementation of the Project	NIMT takes prevent measure against resign of counterparts trained in the Project. Preconditions a Equipment by ODA Loan for the Project is procured as planned.

*1 8 fields of measurement standards
a. Electricity and Magnetism (EM)
b. Thermometry (T)
c. Length (L)
d. Time and Frequency (TF)
e. Acoustics and Vibration (AUV)
f. Mass and Related Quantities (M)
g. Radiation Pyrometry (PR)
h. Chemical Standard (QM)

Annex 2: PDM (after the revision)

Project Design Matrix (PDM) Date: 05-10-2006

Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase II Version: 1

Target group:

- Calibration Services Agencies such as TISTR and DSS
- Domestic Industries in Thailand（especially export industries and enterprises trying to acquire ISO9000s, ISO14000s）
  （According to the data of TISI in Ministry of Industry, 1,212 factories acquired ISO9000s, as of August 1999, and 4,736 factories acquired ISO9000s, as of September 2006）

Project Period: October 16, 2004 - October 15, 2007

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
Overall Goal To Strengthen the national measurement system in Thailand	1 NIMT actively participates in the Global MRA. 2 The traceability system of Thailand is firmly established.	1-1 Survey and verify NIMT's activities 1-2 List in Appendix B and C of Global MRA 2-1 Calibration laboratories list of NIMT 2-2 The charts of measurement network in Thailand	a There is no drastic change in political and economic situation in Thailand. b The policy in Thai Government on the role or assignment of NIMT and reference standard calibration services agencies remain unchanged.
Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accurancy	1 The technical ability of counterparts in 8 fields of measurement standards(*1) in NIMT is strengthened. 2 Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 3-2 The accuracy of calibration services is enhanced. 3-3 The range of calibration services is widened.	1 Survey and verify NIMT's activities 2 Uncertainty budget sheet 3-1 Price List of calibration service 3-2 Price List of calibration service 3-3 Price List of calibration service	a There is no change in the role of NIMT as the institute for maintaining national measurement standard.
Outputs 1 The operation and administration of the Project are enhanced. 2 The equipment is operated and maintained properly. 3 The technical capability of C/P is upgraded. 4 Accuracy of national measurement standards is improved. 5 NIMT disseminates national measurement standards properly.	1-1 Staff and budget are allocated to the Project. 2-1 National Measurement Standards are installed and established in the 40 quantities of the Project 2-2 Registration of maintenance record and calibration record of equipment 2-3 Manuals of operation and maintenance management are provided and organized for reference. 3-1 Technical Cooperation Program is created 3-2 Counterparts are appropriately assigned. 3-3 Improvement in the uncertainty 3-4 Point of the "Skill after training" 3-5 Number of Seminars and Joint training 4-1 Inprovement in uncertainty 4-2 Registration of environmental data for every laboratory 4-3 Number of International Comparison implemented 5-1 Improvement in calibration technology for reference standards 5-2 Number of Calibration procedures created. 5-3 Items pointed by evaluation of Quality System and the way to solve the Items	1-1 Staff allocated list, budget, organization chart 2-1-1 Equipment inventory. 2-1-2 Equipment manuals and their list 2-2 Maintenance records or calibration record of equipment 2-3 Operation manual and maintenance management manual 3-1 Technical Cooperation Program sheet 3-2 Allocation list of counterparts by field 3-3 Budget sheet on uncertainty 3-4 Evaluation sheet of technical transfer 3-5 Records of seminar and in-house technical presentation 4-1 Records of the accuracy of national measurement standards. 4-2 File of environmental management sheet for every laboratory 4-3 Record of implementing International-comparison 5-1-1 Traceability charts of NIMT 5-1-2 Calibration certificate 5-2-1 Calibration procedure and their list 5-3 List of the Items pointed by evaluation and the list of the way to solve them	a There is no change in C/P employment plan which has bad influence on the Project b There is no change in budget allocation and policy which has bad influence on the Project c There is no change in organization which influence directly to the Project. d Procurement, installation and setting up of all machineries are properly completed. e NIMT takes preventive measures against resign of counterparts trained in the Project.
Activities 1-1 To allocate necessary personnel as planned. 1-2 To make budget plan and execute properly. 1-3 To make action plan and implement as planned 2-1 To install and commit equipment properly. (mainly procured by ODA Loan) 2-2 To operate and maintain equipment. 2-3 To make manuals of operation and maintenance management. 3-1 To make Technical Cooperation Program. 3-2 To assess existing level of basic technical capability of counterpart personnel. 3-3 To evaluate technical capability of counterpart after technical transfer. 4-1 To establish and maintain measurement standards. 4-2 To improve environmental management technology of calibration laboratories. 4-3 To implement International-comparison 5-1 To improve the calibration technology for reference standards based on national standard. 5-2 To make calibration procedure. 5-3 To establish Quality System.	Inputs <Japanese side> 1 (1) Dispatch of Japanese Experts Long Term Experts a Chief Advisor b Project Coordinator c Physical Standards d Electromagnetic Standards e Chemical Standards (2) Short Term Experts Necessary number of Short Term Experts will be dispatched. (Approximately 35) 2 C/P training in Japan - Approximately 10 persons during the Project 3 - Equipment is provided by ODA Loan 4 Supporting Local Cost	<Thai side> 1 Provision of building, facilities and space for the Project 2 Allocation of the C/P and administrative personnel (1) Administrative C/P (2) Technical C/P (3) Staff in charge of the Project 3 Maintenance of machinery and equipment 4 Necessary budget for the implementation of the Project	NIMT takes prevent measure against resign of counterparts trained in the Project. Preconditions a Equipment by ODA Loan for the Project is procured as planned.

*1 8 fields of measurement standards
a. Electricity and Magnetism (EM)
b. Thermometry (T)
c. Length (L)
d. Time and Frequency (TF)
e. Acoustics and Vibration (AUV)
f. Mass and Related Quantities (M)
g. Radiation Pyrometry (PR)
h. Chemical Standard (QM)

Annex 3: Questionnaires

- Questions in the questionnaire to Japanese Experts

1. EVALUATION ON ACHIEVEMENT OF THE PROJECT

(1) OUTPUTS OF THE PROJECT

OUTPUT 1: THE OPERATION AND ADMINISTRATION OF THE PROJECT ARE ENHANCED

Q1	What dose the "operation and administration of the Project" indicate in this output? Only those of JICA's project, all of those in NIMT, or others?
Q2	Considering the plan of achievement at the midterm of the Project period, how do you evaluate the actual achievement in terms of enhancement of the operation and administration of the Project?
Q3	How do you evaluate the actual allocation of staffs, comparing with the Plan
Q4	How do you evaluate the actual allocation of budget, comparing with the Plan?
Q5	How do you evaluate the formation of the organization of the Project, comparing with the Plan?

OUTPUT 2: THE MACHINERY AND EQUIPMENT ARE OPERATED AND MAINTAINED PROPERLY

Q6	What dose he "machinery and equipment" in this output indicate? Only those utilized in the Project, all of those in NIMT, or others?
Q7	What kind of state dose the "proper operation and maintenance" means?
Q8	How do you evaluate the actual achievement of the Project in terms of the maintenance of machinery and equipment?
Q9	Is there any machinery or equipment which is not under operation or maintenance?
Q10	How do you evaluate the actual achievement of the Project in terms of the installation and establishment of National Measurement Standard?
Q11	How do you evaluate the actual achievement of the provision of the manuals in operation and maintenance management?

OUTPUT 3: TECHNICAL CAPABILITY OF C/P IS UPGRADED

Q12	What kind of technical capability dose project plan to upgrade? Only that of calibration or others?
Q13	How do you evaluate the actual achievement of the improvement of technical capability in the calibration?
Q14	How do you evaluate the actual implementation of the technical cooperation program?

OUTPUT 4: ACCURACY OF NATIONAL MEASUREMENT STANDARD IS IMPROVED

Q15	What dose the "accuracy of national measurement standard" means in this output?
Q16	How do you evaluate the actual achievement in terms of the improvement of accuracy in the national measurement standard?
Q17	How do you evaluate the actual achievement in terms of the improvement of environmental management technology in the calibration laboratories?
Q18	How do you evaluate the actual achievement in terms of implementation of international comparison?

OUTPUT 5: NIMT DISSEMINATES NATIONAL MEASUREMENT STANDARDS PROPERLY

Q19	What dose "proper dissemination of national measurement standards" mean?
Q20	How do you evaluate the actual implementation in terms of the dissemination of national measurement standard?
Q21	How do you evaluate the actual achievement in terms of the improvement of calibration technology for reference standards?
Q22	How do you evaluate the actual achievement in terms of the establishment of Quality System?

(2) PROJECT PURPOSE

NIMT ESTABLISHES AND MANAGES NATIONAL MEASUREMENT STANDARDS WITH INTERNATIONALLY RECOGNIZED LEVEL OF ACCURACY

Q23	How do you evaluate the actual achievement in terms of the technical ability in 8 fields of measurement standards in NIMT?
Q24	How do you evaluate the actual achievement in terms of the accuracy of calibration services?

(3) OVERALL GOAL

TO STRENGTHEN THE NATIONAL MEASUREMENT SYSTEM IN THAILAND

Q25	What kind of state or activities dose the participation of Global MRA mean?
Q26	How do you evaluate the actual state of participation in the Global MRA?
Q27	How do you evaluate the actual traceability system of Thailand?

2. EVALUATION ON THE IMPLEMENTATION PROCESS OF THE PROJECT

Q1	Comparing with the plan, is there any delay in the implementation of installation, operation and maintenance of the machinery and equipment, and preparation of their manuals?
Q2	Comparing with the plan, is there any delay in the implementation of technical transfer?
Q3	Comparing with the plan, is there any delay in the implementation of the evaluation of C/P's capability before and after the technical transfer?
Q4	Comparing with the plan, is there any delay in the implementation of establishing and maintaining measurement standard?
Q5	Comparing with the plan, is there any delay in the implementation of improving environmental management technology of calibration laboratories?
Q6	Comparing with the plan, is there any delay in the implementation of implementing international comparison?
Q7	Comparing with the plan, is there any delay in the implementation of improving the calibration technology for reference standards based on national standard?
Q8	Comparing with the plan, is there any delay in the implementation of making calibration procedure?
Q9	Comparing with the plan, is there any delay in the implementation of establishing Quality Control System?
Q10	How do you evaluate the method of technical transfer of the Project?
Q11	How do you evaluate the monitoring activities of the implementation and achievement of the Project?
Q12	How do you evaluate the process and style of decision making in the Project?
Q13	How do you evaluate the communication between Japanese Experts and C/Ps?
Q14	How do you evaluate the communication among Japanese Experts?
Q15	How do you evaluate the communication between the Project and Ministry of Science and Technology?
Q16	How do you evaluate the communication between the Project and JICA office?
Q17	How do you evaluate the communication among staffs of NIMT?
Q18	How do you evaluate the method of advising of Japanese experts to staffs of NIMT?
Q19	How do you evaluate the level of participation of the staffs of NIMT in the Project?
Q20	Do you think NIMT has a sense of ownership toward the Project?
Q21	Do you think the C/Ps allocated to the Project are adequate for the Project?
Q22	How do you evaluate the participation of other related organizations such as TISR and DSS?
Q23	How do you evaluate the recognition of the Project to the other related organizations?
Q24	If there is any, please describe issues and problems in the implementation of the Project.

3. EVALUATION BASED ON THE 5 CRITERIA OF THE EVALUATION

(1) RELEVANCE

Q1	Is there any change observed in terms of the role of NIMT in the metrology area of Thailand among other related organizations during the Phase 2 of the Project up to now?

Q2.	Is there any change observed in terms of the needs of industry in Thailand regarding the metrology and measurement standard during the beginning of Phase 2 up to now?

(2) EFFECTIVENESS

Q3	How do you evaluate the level of achievement in terms of Project Purpose at this moment?
Q4	Considering the plan for the rest of Project period, what do you think the level of final achievement will be at the end of Project?
Q5	Is there any issue or problem to achieve the Project Purpose at the end of the Project?
Q6	Apart from the 5 outputs of the Project and important assumptions, is there any other factor to be considered in order to achieve the Project Purpose of the Project?
Q7	How do you evaluate the NIMT's preventive measures against resign of staffs trained in the Project?

(3) EFFICIENCY

Q8	Considering the plan of the Project, how do you evaluate the level of achievement in terms of Outputs at this moment?
Q9	Please describe the factor which can interfere in the achievement of Output 1 "The operation and administration of the Project are enhanced", if there is any.
Q10	Please describe the factor which can interfere in the achievement of Output 2 "The equipment is operated and maintained properly", if there is any.
Q11	Please describe the factor which can interfere in the achievement of Output 3 "The technical capability of C/P is upgraded", if there is any.
Q12	Please describe the factor which can interfere in the achievement of Output 4 "Accuracy of national measurement standards is improved", if there is any.
Q13	Please describe the factor which can interfere in the achievement of Output 5 "NIMT disseminates national measurement standard properly", if there is any.
Q14	Do you think the activities which have been set to achieve the Output 1 "The operation and administration of the Project are enhanced" are sufficient to achieve it?
Q15	Do you think the activities which have been set to achieve the Output 2 "The equipment is operated and maintained properly" are sufficient to achieve it?
Q16	Do you think the activities which have been done to achieve the Output 3 "The technical capability of C/P is upgraded" are sufficient to achieve it?
Q17	Do you think the activities which have been set to achieve the Output 4 "Accuracy of national measurement standards is improved" are sufficient to achieve it?
Q18	Do you think the activities which has been set to achieve the Output 5 "NIMT disseminates national measurement standard properly" are sufficient to achieve it?
Q19	Was the budget allocated as it planned up to now?
Q20	Was the allocated budget sufficient to implement each activity?
Q21	Were the staffs of NIMT allocated to the Project as it planned up to now?
Q22	Were the allocated staffs sufficient to implement each activity?
Q23	Were the machinery and equipment procured as it planned up to now?
Q24	Were the procured machinery and equipment sufficient to implement each activity?
Q25	Has the input of the Project been provided in a timely manner to implement the activities as planned?
Q26	Comparing with similar projects, do you think the cost of this Project was adequate to achieve the 5 Outputs of this Project?
Q27	Comparing with similar projects, do you think this Project will achieve results corresponding to the amount of cost at the end of the Project?

(4) IMPACT

Q28	Considering the actual state of implementation of the Project, how do you evaluate the possibility of achievement of the Overall Goal as an impact of the Project?
Q29	Is there any conceivable factor which interferes in the achievement of Overall Goal? If there is any, please describe the factor.

Q30	Is there any conceivable factor which can change the role of NIMT as the institute for maintaining national measurement standard in the future? If there is any Please describe it.
Q31	What is the expectable positive impact of the Project (eg. Impact on national policy, institutional mechanism, legal system, environment, gender, human rights, poverty and other socio-cultural issues)? If there is any please describe it.
Q32	What is the expectable negative impact of the Project (eg. Impact on national policy, institutional mechanism, legal system, environment, gender, human rights, poverty and other socio-cultural issues)? If there is any please describe it.

(5) SUSTAINABILITY

Q33	Do you think that the related policy, regulation and legal system have been developed sufficiently in order to keep NIMT's activities sustainable after the completion of Project?
Q34	Do you think that the NIMT has been developing the organizational capacity (eg. Staff allocation, decision making process, and so on) to continue its activities and play its role after the completion of the Project?
Q35	Do you think that the NIMT has sufficient enthusiasm for the Project, in order to continue its activity and play its role after the completion of the Project?
Q36	Is there sufficient budget secured in order to NIMT continue the same volume and level of activities in the future?
Q37	How do you evaluate the measures of NIMT to secure its budget?
Q38	Is there any possibility of increasing the cost of NIMT in the future?
Q39	Do you think the technology transferred so far to the staffs of NIMT has been accepted by them in terms of level of technology?
Q40	Do you think the technology transferred so far to the staffs of NIMT has been customary and socio-culturally acceptable to them?
Q41	Do you think NIMT will be able to maintain machinery and equipment appropriately?
Q42	Does the Project include a mechanism to transfer technologies among the staffs of NIMT?
Q43	Does the Project include a mechanism to transfer technologies to the secondary organizations?
Q44	Is there any conceivable factor which interferes with the mechanism of technical transfer of NIMT to secondary and other organizations?
Q45	Is there any other conceivable factor which hinders the sustainability of the Project?

- Questions in the questionnaires to C/P personnel

1. EVALUATION ON ACHIEVEMENT OF THE PROJECT

(1) OUTPUTS OF THE PROJECT

OUTPUT 1: THE OPERATION AND ADMINISTRATION OF THE PROJECT ARE ENHANCED

Q1	Considering the plan of achievement at the midterm of the Project period, how do you evaluate the actual achievement in terms of enhancement of the operation and administration of the Project?
Q2	How do you evaluate the actual allocation of staffs, comparing with the Plan
Q3	How do you evaluate the actual allocation of budget, comparing with the Plan?
Q4	How do you evaluate the formation of the organization of the Project, comparing with the Plan?

OUTPUT 2: THE MACHINERY AND EQUIPMENT ARE OPERATED AND MAINTAINED PROPERLY

Q5	How do you evaluate the actual achievement of the Project in terms of the maintenance of machinery and equipment?
Q6	Is there any machinery or equipment which is not under operation or maintenance?
Q7	How do you evaluate the actual achievement of the Project in terms of the installation and establishment of National Measurement Standard?

Q8	How do you evaluate the actual achievement of the provision of the manuals in operation and maintenance management?
Q9	Dose each laboratory own and maintain the operation manual and maintenance management manual?

OUTPUT 3: TECHNICAL CAPABILITY OF C/P IS UPGRADED

Q10	How do you evaluate the actual achievement of the improvement of technical capability in the calibration?
Q11	How do you evaluate the actual implementation of the technical cooperation program?

OUTPUT 4: ACCURACY OF NATIONAL MEASUREMENT STANDARD IS IMPROVED

Q12	How do you evaluate the actual achievement in terms of the improvement of accuracy in the national measurement standard?
Q13	How do you evaluate the actual achievement in terms of the improvement of environmental management technology in the calibration laboratories?
Q14	How do you evaluate the actual achievement in terms of implementation of international comparison?

OUTPUT 5: NIMT DISSEMINATES NATIONAL MEASUREMENT STANDARDS PROPERLY

Q15	How do you evaluate the actual implementation in terms of the dissemination of national measurement standard?
Q16	How do you evaluate the actual achievement in terms of the improvement of calibration technology for reference standards?
Q17	How do you evaluate the actual achievement in terms of the establishment of Quality System?

(2) PROJECT PURPOSE

NIMT ESTABLISHES AND MANAGES NATIONAL MEASUREMENT STANDARDS WITH INTERNATIONALLY RECOGNIZED LEVEL OF ACCURACY

Q18	How do you evaluate the actual achievement in terms of the technical ability in 8 fields of measurement standards in NIMT?
Q19	How do you evaluate the actual achievement in terms of the accuracy of calibration services?

(3) OVERALL GOAL

TO STRENGTHEN THE NATIONAL MEASUREMENT SYSTEM IN THAILAND

Q20	How do you evaluate the actual state of participation in the Global MRA?
Q21	How do you evaluate the actual traceability system of Thailand?

2. EVALUATION ON THE IMPLEMENTATION PROCESS OF THE PROJECT

Q1	Comparing with the plan, is there any delay in the implementation of installation, operation and maintenance of the machinery and equipment, and preparation of their manuals?
Q2	Comparing with the plan, is there any delay in the implementation of technical transfer?
Q3	Comparing with the plan, is there any delay in the implementation of establishing and maintaining measurement standard?
Q4	Comparing with the plan, is there any delay in the implementation of improving environmental management technology of calibration laboratories?
Q5	Comparing with the plan, is there any delay in the implementation of implementing international comparison?
Q6	Comparing with the plan, is there any delay in the implementation of improving the calibration technology for reference standards based on national standard?
Q7	Comparing with the plan, is there any delay in the implementation of making calibration procedure?
Q8	Comparing with the plan, is there any delay in the implementation of establishing Quality Control System?

Q9	How do you evaluate the method of technical transfer of the Project?
Q10	How do you evaluate the monitoring activities of the implementation and achievement of the Project?
Q11	How do you evaluate the process and style of decision making in the Project?
Q12	How do you evaluate the communication between Japanese Experts and C/Ps?
Q13	How do you evaluate the communication between the Project and Ministry of Science and Technology?
Q14	How do you evaluate the communication among staffs of NIMT?
Q15	How do you evaluate the method of advising of Japanese experts to staffs of NIMT?
Q16	How do you evaluate the level of participation of the staffs of NIMT in the Project?
Q17	Do you think NIMT has a sense of ownership toward the Project?
Q18	How do you evaluate the participation of other related organizations such as TISR and DSS?
Q19	How do you evaluate the recognition of the Project to the other related organizations?
Q20	If there is any, please describe issues and problems in the implementation of the Project.

3. EVALUATION BASED ON THE 5 CRITERIA OF THE EVALUATION

(1) RELEVANCE

Q1	Is there any change observed in terms of the role of NIMT in the metrology area of Thailand among other related organizations during the Phase 2 of the Project up to now?
Q2.	Is there any change observed in terms of the needs of industry in Thailand regarding the metrology and measurement standard during the beginning of Phase 2 up to now?

(2) EFFECTIVENESS

Q3	How do you evaluate the level of achievement in terms of Project Purpose at this moment?
Q4	Considering the plan for the rest of Project period, what do you think the level of final achievement will be at the end of Project?
Q5	Is there any issue or problem to achieve the Project Purpose at the end of the Project?
Q6	Apart from the 5 outputs of the Project and important assumptions, is there any other factor to be considered in order to achieve the Project Purpose of the Project?
Q7	Is there any change in staff employment plan of NIMT since the beginning of Phase 2 up to this moment?
Q8	Is there any change in budget allocation and policy of NIMT since the beginning of Phase 2 up to this moment?
Q9	Is there any change in organization of NIMT since the beginning of Phase 2 up to this moment?
Q10	Has NIMT been taking preventive measures against resign of staffs trained in the Project?

(3) EFFICIENCY

Q11	Considering the plan of the Project, how do you evaluate the level of achievement in terms of Outputs at this moment?
Q12	Please describe the factor which can interfere in the achievement of Output 1 “The operation and administration of the Project are enhanced”, if there is any.
Q13	Please describe the factor which can interfere in the achievement of Output 2 “The equipment is operated and maintained properly”, if there is any.
Q14	Please describe the factor which can interfere in the achievement of Output 3 “The technical capability of C/P is upgraded”, if there is any.
Q15	Please describe the factor which can interfere in the achievement of Output 4 “Accuracy of national measurement standards is improved”, if there is any.
Q16	Please describe the factor which can interfere in the achievement of Output 5 “NIMT disseminates national measurement standard properly”, if there is any.
Q17	Do you think the activities which have been set to achieve the Output 1 “The operation and administration of the Project are enhanced” are sufficient to achieve it?
Q18	Do you think the activities which have been set to achieve the Output 2 “The equipment is operated

	and maintained properly" are sufficient to achieve it?
Q19	Do you think the activities which have been done to achieve the Output 3 "The technical capability of C/P is upgraded" are sufficient to achieve it?
Q20	Do you think the activities which have been set to achieve the Output 4 "Accuracy of national measurement standards is improved" are sufficient to achieve it?
Q21	Do you think the activities which has been set to achieve the Output 5 "NIMT disseminates national measurement standard properly" are sufficient to achieve it?
Q22	Was the budget allocated as it planned up to now?
Q23	Was the allocated budget sufficient to implement each activity?
Q24	Were the staffs of NIMT allocated to the Project as it planned up to now?
Q25	Were the allocated staffs sufficient to implement each activity?
Q26	Were the machinery and equipment procured as it planned up to now?
Q27	Were the procured machinery and equipment sufficient to implement each activity?
Q28	Has the input of the Project been provided in a timely manner to implement the activities as planned?

(4) IMPACT

Q29	Considering the actual state of implementation of the Project, how do you evaluate the possibility of achievement of the Overall Goal as an impact of the Project?
Q30	Is there any conceivable factor which interferes in the achievement of Overall Goal? If there is any, please describe the factor.
Q31	Is there any conceivable factor which can change the role of NIMT as the institute for maintaining national measurement standard in the future? If there is any Please describe it.
Q32	What is the expectable positive impact of the Project (eg. Impact on national policy, institutional mechanism, legal system, environment, gender, human rights, poverty and other socio-cultural issues)? If there is any please describe it.
Q33	What is the expectable negative impact of the Project (eg. Impact on national policy, institutional mechanism, legal system, environment, gender, human rights, poverty and other socio-cultural issues)? If there is any please describe it.

(5) SUSTAINABILITY

Q34	Do you think that the related policy, regulation and legal system have been developed sufficiently in order to keep NIMT's activities sustainable after the completion of Project?
Q35	Do you think that the NIMT has been developing the organizational capacity (eg. Staff allocation, decision making process, and so on) to continue its activities and play its role after the completion of the Project?
Q36	Do you think that the NIMT has sufficient enthusiasm for the Project, in order to continue its activity and play its role after the completion of the Project?
Q37	Is there sufficient budget secured in order to NIMT continue the same volume and level of activities in the future?
Q38	Is there any possibility of increasing the cost of NIMT in the future?
Q39	Do you think the technology transferred so far to the staffs of NIMT has been accepted by them in terms of level of technology?
Q40	Do you think the technology transferred so far to the staffs of NIMT has been customary and socio-culturally acceptable to them?
Q41	Do you think NIMT will be able to maintain machinery and equipment appropriately?
Q42	Is there any conceivable factor which interferes with the mechanism of technical transfer of NIMT to secondary and other organizations?
Q43	Is there any other conceivable factor which hinders the sustainability of the Project?

Annex 4: List of Interviewees for the Mid-term Evaluation

No.	Name	Position
1.	Dr. Yoshiaki Akimoto	Chief Advisor, JICA/NIMT Project, Phase II
2.	Dr. Joji Kinoshita	Japanese Expert in Electromagnetic Standard, JICA/NIMT Project, Phase II
3.	Dr. Akra Nomura	Japanese Expert in Chemical Standard, JICA/NIMT Project, Phase II
4.	Mr. Jiro Matsuda	Japanese Expert in Physical Standard, JICA/NIMT Project, Phase II
5.	Ms. Ikuko Niizeki	Coordinator, JICA/NIMT Project, Phase II
6.	Dr. Pian Totarong	Director, National Institute of Metrology (Thailand)
7.	Ms. Natanit Pangjeerakumchorn	Assistant Manager of Administration Department, Acting International Relations Section Head, National Institute of Metrology (Thailand)
8.	Ms. Thasorn Sinhaneti	Metrologist, Humidity Standard, National Institute of Metrology (Thailand)
9.	Mr. Samana Piengbangyang	Metrologist, Roughness and Roundness Standard, National Institute of Metrology (Thailand)
10.	Mr. Kittipong Chaemthet	Metrologist, Force Standard, National Institute of Metrology (Thailand)
11.	Mr. Pairoj Rattanangkul	Metrologist, Vibration Standard, National Institute of Metrology (Thailand)
12.	Mr. Keisuke Matsumoto	Secretary-General, Japanese Chamber of Commerce, Bangkok
13.	Mr. Kensuke Fukawa	Representative, Representative Office in Bangkok, JBIC
14.	Mr. Yasuhide Yamada	Vice-President, JETRO Bangkok
15.	Ms. Chie Hamaguchi	Director, Energy & Environment Technology, JETRO Bangkok
16.	Mr. Pathom Yamkate	Deputy Permanent Secretary, Ministry of Science and Technology
17.	Dr. Sompote Boonsanit	Senior Scientist, Department of Science Service (DSS), Ministry of Science and Technology
18.	Dr. Luxsamee Plangsangmas	Acting Director, Industrial Metrology and Testing Service Center, Thailand Institute of Science and Technological Research (TISTR)

Annex 5: Main Questions of the Interviews

• Japanese Experts
Complementary questions based on the answers of questionnaire

• Counterpart Personnel of NIMT
Complementary questions based on the answers of questionnaire

• Ministry of Science and Technology

Q1	Is there any change in national policy in terms of industry and metrology in Thailand?
Q2	Is there any change in the role of NIMT?
Q3	How dose the new National Development Plan treat the related area of industry and metrology?
Q4	How do you think the recognition of NIMT among the industrial communities?
Q5	Do you think is there any change in the needs of industry toward the establishment of internationally recognized measurement standard?
Q6	Is there any change in the Plan of recruitment of staffs of NIMT?
Q7	Is there any change in the budget of NIMT provided by the Government?
Q8	Is there any change in organization of NIMT?
Q9	Do you expect any change in the role of NIMT as a primary organization of measurement standard in Thailand in the future?
Q10	What do you expect the role of NIMT among ASEAN countries?
Q11	What do you expect about the impact of the Project on international competency of Thai industry?
Q12	What impact do you expect in terms of the reduction of the cast of calibration among Thai industrial community?
Q13	Do you think it will see any other positive and negative impact of the Project?
Q14	Will Thai Government keep supporting NIMT in terms of policy, legislations and regulations after the Project?
Q15	Will Thai Government keep its financial support toward NIMT? How is the tendency on increase or decrease of the budget?

• TISTER and DSS

Q1	Dose your organization participate in any activities of NIMT?
Q2	Dose your organization recognize about JICA's project in NIMT?
Q3	How do you evaluate the role of NIMT as a primary organization in national measurement standard?
Q4	What do you think about the needs of industrial community toward the NIMT's activity and primary measurement standard?
Q5	What do you expect from NIMT in terms of its role and activity?
Q6	Do you expect any change in the role of NIMT as a primary organization of measurement standard in Thailand in the future considering the relationship with other related organizations?

• JETRO and JCC

Q1	How does Japanese industrial community in Thailand recognize this Project?

Q2	Do the Japanese enterprises participate in any activities of the Project?
Q3	What do you think the expectation of Japanese industrial community in Thailand toward the Project?
Q4	Do you think is there high demand on calibration services from Japanese enterprises in Thailand?
Q5	What do you recommend to the Project in order to make calibration services in Thailand practical to the Japanese enterprises?

- JBIC

Q1	What was the reason of delay in the procurement of machinery and equipment of the Project?
Q2	What were the countermeasures against the problem?
Q3	What is the Plan of procurement for the rest of machinery and equipment in the rest of the Project Period?
Q4	What do you recommend to the Project to improve the situation in the rest of the Project period?
Q5	What are the lessons leant of the Project which is the combination of ODA loan and technical transfer like this Project?

3. 5 Evaluation Criteria

Criteria	Survey items		Results
	Main items	Questions	
Relevance	Relevance in the national policy	Is there any change related to the metrology development in the governmental policies of Thailand?	‣ In the 9th National Economic and Social Development Plan (2002-2006), it describes the significance of the metrology system in Thai industry, which requires developing and spreading the National Quality Management System. As the Thai Government at this moment has been preparing its 10th National Economic and Social Development Plan (2007-2011), it is confirmed that this direction in the importance of metrology in the Development Plan of the Country will not be changed in the new plan.
		Is there any change in the ODA strategies for Thailand?	‣ The correspondence of the Project with the Japanese ODA policy to Thailand has not been change at this moment of mid-term evaluation.
	Relevance in the C/P organization	Is there any change observed in terms of the role of NIMT in the metrology area of Thailand among other related organizations during the Project?	‣ The role of NIMT has been defined in the National Metrology System Development Act. ‣ Although NIMT has been increasing its recognition, there is no major change in the role of NIMT.
	Relevance in the technique	Does Japan have technical superiority in the techniques handled in the Project?	‣ Japan has 100 years of history in the metrology while NIMT has 10 years.
	Relevance in the needs of beneficiaries	Is there any change observed in terms of the needs of industry in Thailand regarding the metrology and measurement standard during the beginning of Phase 2 up to now?	‣ The project was formulated based on the needs from the industrial community in Thailand, which is required to improve the competitiveness for export promotion and produce higher quality of goods to increase export. In order to do so, more enterprises have been demanding the technology of metrology and calibration services which are high in quality. This trend has not been changed since the formulation of the Project.
	Expectancy in the level of achievement in the Project Purpose, considering actual status of inputs, outputs and activities.	How do you evaluate the level of achievement in terms of Project Purpose at this moment?	‣ The Project has finished the technical transfer in 29 quantities out of 40 quantities in total. Although there is a delay in the schedule caused by the procurement of machinery and equipment, it is confirmed that the all activities of technical transfer of the Project in the 40 quantities will be completed by the end of the Project period, which means that the Project can achieve its minimum accomplishment in the technical transfer to assist the C/Ps establish and maintain the national measurement standards. ‣ In order to do so, it is required to make further efforts to finalize all the procurement process as soon as possible. ‣ There are 8 quantities which have been assessed for the accreditation, and other 6 quantities will receive the assessment to be accreditated in the Japanese fiscal year of 2006. The Project is required to do its best to prepare for assessment of the accreditation in as many quantities as possible during the rest of the Project period.

Criteria	Survey items		Results
	Main items	Questions	
Effectiveness (expectancy)	Interfering factors in the achievement of Project Purpose	Is there any interfering factors in the achievement of Project Purpose?	‣ At the time of the Mid-Term Evaluation, there is a delay in the procurement of machinery of Standard Scale and also in the construction of the Standard Gas laboratory. Although testing and analyzing laboratory has already finished the construction, the construction of the gas filling and balance room has not been started yet, and further delay may cause another delay in the technical transfer during the Project period. ‣ While there has been a delay, the Project has been making efforts to overcome the delay by dispatching Short-term experts flexibly, borrowing the assistance of supporting organizations in Japan, which has been a contributing factor for the Project to achieve the Project Purpose.
	Causality between Outputs and Project Purpose	Are the outputs sufficient to achieve the Project Purpose?	‣ Appropriate
	Are those important assumptions of the outputs still applicable in the achievement of Project Purpose? The possibility to clear the important assumptions.	Is there any change in staff employment plan of NIMT since the beginning of Phase 2 up to this moment?	‣ It was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.
		Is there any change in budget allocation and policy of NIMT since the beginning of Phase 2 up to this moment?	‣ It was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.
		Is there any change in organization of NIMT since the beginning of Phase 2 up to this moment?	‣ It was confirmed with Ministry of Science and Technology and director of NIMT that there is no negative change, respectively.
		Have all the equipments been provided and installed?	‣ Regarding the assumption, “Installation and setting up of all machineries are properly completed”, it has been receiving negative influence on the Project. Although this assumption was considered as an external factor, which is out side the control of the Project, the issue rests largely on NIMT’s effort.
		Has NIMT been taking preventive measures against resign of staffs trained in the Project?	‣ As to the assumption, “NIMT takes preventive measures against resign of counterparts trained in the Project”, there is no such an issue observed in the Phase 2.
	Interfering factors in the achievement of Outputs	Is there any interfering factors in the achievement of Outputs?	‣ On the Output 1 “the operation and administration of the Project are enhanced”, it has been observed a difficulty in communication and management. ‣ On the Output 2, “The equipment is operated and maintained properly”, the delay in procurement of the equipment can constrain the achievement. ‣ On the Output 3, “The technical capability of C/P is upgraded”, the issue of language ability was pointed out from both Japanese and Thai side. ‣ On the Output 4 “Accuracy of national measurement standard is improved”, the delay in international comparison was pointed out by the experts as factors which interfere in the achievement in this Output. ‣ For the output 3 and 4, the establishment of working environment to appreciate the improvement in accuracy was mentioned as a possible contributing factor by an expert.
	Causality between Activities and Outputs	Are the activities sufficient to achieve the Outputs?	‣ Appropriate

Criteria	Survey items			Results
	Main items		Questions	
Efficiency	Causality between Outputs and Inputs	Are Inputs sufficient?	Is there sufficient budget? and is the budget allocated appropriately?	‣ In terms of equipments and consumable supplies provided by NIMT, there are some observations that the stocks are not enough, and it takes long time to obtain the necessity after they made the requests.
			Is the budget sufficient to implement the activities?	
		Are C/Ps allocated sufficiently?	Are C/Ps allocated as planned?	‣ The C/Ps were allocated as planned.
			Are the allocated C/Ps sufficient to implement the activities?	‣ It was confirmed with experts that the allocated staff was sufficient to implement the activities.
		Are the machines and equipments provided sufficiently?	Have the machines and equipments provided by ODA loan been maintained adequately?	‣ 17 out of 22 persons answered in the questionnaire that the maintenance of machinery and equipments are good or very good.
			Have the operation manuals and maintenance management manuals been prepared adequately in order to make it possible to give sufficient maintenance?	‣ 17 out of 22 persons answered in the questionnaire that the maintenance of machinery and equipments are good or very good.
			Have the machines and equipments been provided sufficiently to implement the activities?	‣ Although there is a delay in the procurement, with the machineries provided the national measurement standard has been installed and established. ‣ There was a machinery which is not utilized because of the difference between the items required and provided.
	Are those important assumptions of the activities still applicable in the achievement of Outputs? Is there any bad influence of the important assumptions?		Has NIMT been taking preventive measures against resign of staffs trained in the Project?	‣ NIMT C/Ps sign a contract with NIMT before project training. ‣ There is no problem of resignation of C/P up to now in Phase 2.
	Timeliness of the Input		Has the input of the Project been provided in a timely manner to implement the activities as planned?	‣ Although there is a delay in the procurement, the Project has been managing the schedule well by dispatching short-term experts flexibly depending on the schedule of procurement.
	Expectancy of the achievement of Overall Goal comparing to the accomplishment of Input/Output and the state of activities		Considering the actual state of implementation of the Project, how do you evaluate the possibility of achievement of the Overall Goal as an impact of the Project?	‣ Judging from the result of the questionnaire survey conducted during the evaluation study, prospects of achieving the Overall Goal are high in general.
	Interfering factors in the achievement of Overall Goal		Is there any conceivable factor which interferes in the achievement of Overall Goal?	‣ Change of governmental policy in Thailand ‣ Improvement in management ‣ Working environment which appreciates the improvement of accuracy.

Criteria	Survey items			Results
	Main items		Questions	
Impact (Expectancy)	Causality between Overall Goal and Project Purpose		Is the Overall Goal an effect of the achievement of Project Purpose?	‣ Appropriate
	Are those important assumptions of the Project Purpose still applicable in the achievement of Overall Goal?		Is there any conceivable factor which can change the role of NIMT as the institute for maintaining national measurement standard in the future?	‣ It is still relevant to the project and has been met.
	Ripple effect apart from the Overall Goal	Progress or status of the impact which is prospected in the ex-ante evaluation	NIMT becomes a central organization in the field of measurement standard in ASEAN area.	‣ In the Final Report of the Phase 1, it was mentioned that as a result of the ASEAN seminars and workshops held by the Project, NIMT will gain its recognition more widely as a core body of the national metrology system in Thailand, as well as in the ASEAN region. Since NIMT has been holding the ASEAN seminar and workshops continuously, and also the Joint Training which was started in 2005, the recognition of NIMT in the ASEAN region will be grown gradually in the future.
			Competency of Thai industry is strengthened	‣ The impact regarding the international competitiveness for export industry and the reduction of cost of calibration services have been continuously considered as positive impacts of the Project.
			The cost of calibration is reduced	
		Other predictable impacts	What is the expectable positive impact of the Project?	‣ The improvement in measurement technology in general can expect ripple effects on environmental and health issues among others.
			What is the expectable negative impact of the Project?	‣ None
	Other negative impacts and their countermeasures		If there is any negative impact, what is its countermeasure?	‣ None
	Policy assistance		Is there continuous policy assistance after the Project?	‣ It is confirmed in the interview with MOST that the Government will continue same volume of support.
	Related regulations and legislations		Are the related regulations and legislations prepared? Or will they be prepared in the future?	‣ It is confirmed in the interview with MOST that the Government will continue same volume of support.
	Organizational capability of NIMT		Dose it have enough human resources? Are they allocated adequately? And dose it have adequate management system?	‣ Although the C/P staff has been allocated sufficiently to the Project, NIMT still does not have sufficient number of staff. According to its plan of recruitment, NIMT has been expecting to increase staff up to 167 in 2006, and 207 in 2008. However, the actual number of staff is 140. In order to provide calibration services adequately and play a role as the provider of national measurement standard in Thailand, it is necessary to strengthen its organization by increasing the number of staff.
			Is the organizational capability of NIMT sufficiently prepared to continue their achievements from the Project after the end of the Project?	‣ Considering the fact that NIMT was established in accordance with the National Metrology System Development Act, and there is a growing importance in the role of NIMT as a core body of national measurement standard, it can be regarded that NIMT has been stable as an organization.

Criteria	Survey items		Results
	Main items	Questions	
Sustainability (Expectancy)	Ownership toward the Project	Dose NIMT have a sense of ownership toward the Project?	‣ In terms of the sense of ownership of NIMT toward the Project, each C/P staff is considered to be making excellent efforts to obtain the technology through the Project.
	Budget	Is there sufficient budget secured in order to NIMT continue the same volume and level of activities in the future?	‣ Since NIMT has been fully supported by the Thai Government, most of its budget is provided by the Government, and it is confirmed to be the some by the interview with the Ministry of Science and Technology. According to the director of NIMT, it dose not have a policy to generate more self income by providing more calibration services. Rather than that, NIMT puts emphasis on the improvement of its level of measurement standard as a primary standard organization of Thailand.
		Is there any possibility of increasing the cost of NIMT in the future?	‣ More activities, if the importance of standard material is recognized by community. ‣ It may have more income through calibration services.
	Technology transferred by the Project	The technology transferred so far to the staffs of NIMT has been accepted by them in terms of level of technology?	‣ The technology transferred so far in the Project has been accepted excellently by the C/Ps. The staff has been taking advantage of seminars held by the project to transfer the knowledge and technology gained through the training. ‣ It was considered that C/Ps have good communication among them to exchange the knowledge.
		The technology transferred so far to the staffs of NIMT has been customary and socio-culturally acceptable to them?	‣ Appropriate
	Maintenance of machinery and equipments	NIMT will be able to maintain machinery and equipment appropriately?	‣ 17 out of 22 persons answered in the questionnaire that the maintenance of machinery and equipments will be done properly. ‣ In terms of maintenance of machinery and equipment, since the Project includes the preparation of calibration procedures as its activities, which require maintenance management manuals of the machinery and equipments, it can expect that the Project contains an adequate maintenance management mechanism inside the Project.
	Mechanism of dissemination of the transferred technology	Dose the Project include a mechanism of technical transfer among the staffs of NIMT?	‣ In terms of technical transfer toward outside the NIMT, there has been increasing occasion of seminars held by NIMT, which are open to the calibration laboratories and industrial community. Making the most of these seminars and training, NIMT is expected to make an effort in the dissemination of the technology.
		Dose the Project include a mechanism of technical transfer to the other calibration laboratories?	‣ The Project holds C/P seminar, ASEAN seminars and workshops and Joint Seminar as an opportunity to disseminate its technology, although some of these are not included in the Project's activities.
	Interfering factors in the sustainability of the Project	Is there any other conceivable factor which hinders the sustainability of the Project?	‣ Improvement in management and budget after the Project.

Annex 6: Evaluation Grid

1. Achievement

Contents		Verifiable Indicators	Accomplishment
Inputs	Japanese side	1) Experts	‣ 4 Long-term experts (Chief Advisor, Coordinator, Physical Standards, Electromagnetic Standard, and Chemical Standard) have been dispatched as planned.. ‣ 17 Short-term experts (in 11 quantities, environment management, calibration procedure, and accreditation in Form Standard) were dispatched up to the end of September 2006. The dispatch has been delayed in some quantities such as Fixed Point, GB/Scale, Flux/Intensity, Pressure and Spectral Irradiance, due to the delay in the procurement of related machineries.
		2) C/P's training in Japan	‣ A total of 13 C/Ps have been trained in Japan since the beginning of Phase 2 up to the end of September 2006. According to the Plan there is a delay in schedule for GB/Scale.
		3) Equipments and materials procured by ODA Loan	‣ A total of 156 machineries and equipments of the Project were procured by Japanese ODA Loan up to the end of September, 2006 in the Phase 2. A part from those already delivered, there are 75 items which have not been delivered yet, and among them there are 9 items which are still under the process of finalizing the contract with suppliers. One of the reasons of the delay lies in the difficulty in identifying the supplier by International Competitive Bidding (ICB) procurement. In the process of ICB procurement, there were machineries which the estimation did not meet the actual offer or those which could not find any supplier. Later the modality of procurement was changed to the International Shopping and then to the direct contract to make the process faster. In the procurement committee of NIMT, there was an incident that the committee decided its dissolution, and the procurement process was suspended while deciding on the new members of the committee. In addition it was time consuming for NIMT to follow the procurement guideline of JBIC to meet its requirement.
		4) Supporting Local Cost	‣ The expenditure in the supporting local cost from the beginning of Phase 2 up to September 2006 sums up to 4,767,700 THB.
	Thai side	1) Building, facilities and space for the Project	‣ The construction of new building of NIMT by Japanese ODA Loan was completed, and NIMT was relocated during the period of September to December, 2005, except the Laboratory of Acoustics and Vibration. The office space for the Project team was provided in the new building. Although the facilities essential for the Project have been provided in the new building, it needed the reconstruction and renovation in some laboratories, such as Chemical Standard and Standard Scale. The reconstruction was almost finished, except that of Standard Gas, which has not initiated the construction yet and has caused a delay in technical transfer of the quantity.
		2) C/P and administrative personnel	‣ NIMT has allocated one administrative C/P, which is the director of NIMT, and 33 technical C/Ps for each target quantity of the technical transfer in the Phase 2. ‣ Although one technical C/P in Time and Frequency has resigned, it did not cause problem since the supervisor of the resigned person who also had been receiving the instructions from the Project had taken over the task.
		3) Maintenance of machinery and equipments	‣ The machinery and equipments have been provided as planned. According to the Japanese experts and C/Ps of NIMT, the maintenance of those machinery and equipment has been implemented appropriately.
		4) Necessary budget for the implementation of the project	‣ As administrative and operational expenses, NIMT allocated 519,600 THB in the Thai fiscal year of 2005 and 2006 each year, and TICA allocated 805,170 THB in the Thai fiscal year of 2005 and 930,405 THB in 2006 for the Project.

Contents		Verifiable Indicators	Accomplishment
Overall Goal	To strengthen the national measurement system in Thailand	1. NIMT actively participates in the Global MRA	‣ According to the report of “Survey and verify NIMT's activities”, since the beginning of Phase 2 NIMT have held the 6th APMP TC Chair and DEC Meeting as well as the APMP DEC Planning Workshop in May 2005 as the host. Also in February 2006, it held the APMP/TCQM Workshop on Gas CRM. In terms of accreditation, NIMT obtained accreditation of IA Japan on Rockwell Hardness Standard in January 2005. Also in the November in 2005, the accreditation assessment on Form Standard (Plug/Ring gauge, Flatness standard, Roughness standard, Roundness standard and Angle standard) was conducted by IA Japan. Since the Phase 1 up to the moment of the mid-term evaluation of Phase 2, the Project has been applied and got assessed for the accreditation in 8 quantities in total. Also the surveillance on wavelength and acoustics, as well as on hardness standard has been conducted. ‣ The appendix B of Global MRA is a record of international comparison, and NIMT has been registered in the Rockwell Hardness Standard, while in the appendix C the record of accreditation (CMC) is appeared.
		2. The traceability system of Thailand is firmly established	‣ This traceability system was described in the Master Plan on National Metrology System Development in 1999, and to make each organization function under this system, it is necessary to strengthen each organization to play each role. NIMT needs to enforce the role as the national metrology institute which provides primary standard to the calibration laboratories, and it has been under the process in the actual situation.
Project Purpose	NIMT establishes and manages National Measurement Standards with Internationally recognized level of achievement	1. The technical ability of counterparts in 8 fields of measurement standards in NIMT is strengthened	‣ In the questionnaire for C/Ps and experts conducted by the mid-term evaluation, 14 out of 22 persons evaluated that actual achievement in terms of the technical ability in 8 fields of measurement standard in NIMT is good. Although there is a delay in the schedule, in the quantities which have completed the technical transfer they have been observing the progress and improvement.
		2. Calibration measurement capability is enhanced	‣ In terms of the actual achievement of accuracy of calibration services, 18 out of 22 persons answered that they evaluate it good or very good.
		3-1. The quantities of calibration services are increased	‣ There was no updating of the Price List since April 2004. In order to assess the technical achievement it is necessary to update it as soon as possible.
		3-2.The accuracy of calibration services is enhanced	
		3-3. The range of calibration services is widened	
Outputs	Output 1) The operation and administration of the Project are enhanced.	1-1. Staff and budget are allocated to the Project.	‣ It was confirmed by the questionnaire and interview of the mid-term evaluation that the allocation of C/Ps was as implemented as planned. ‣ The Japanese Long-term experts also have been allocated as planned, while the Short-term experts have been dispatched depending on the schedule of procurement of related machinery and equipment. ‣ Regarding the cost of the Project office, it was confirmed that it was also as planned.
	Output 2) The equipment is operated and maintained properly.	2-1. National measurement standard are installed and established.	‣ In order to keep the equipment operated and maintained, it is necessary to install and establish national measurement standard. In this Project, it can be said that the installation and establishment of national standard is completed when the technical transfer is finished. Although it was planned to finish the technical transfer in 36 quantities up to the end of September 2006, the actual number of quantities which have completed it is 29.
		2-2. Equipments are operated and maintained.	‣ After the installation and establishment of the standard, the operation and maintenance are implemented based on the

Contents		Verifiable Indicators	Accomplishment
		2-3. Manuals of operation and maintenance management are provided.	standard. The operation and maintenance are trained through the technical transfer and its process is finalized by the preparation of calibration procedure, which includes manuals of maintenance management. Although the calibration procedure is prepared at the end of the technical transfer, the number of quantities which already have their calibration procedures is 22 at this moment due to the delay in the procurement of machinery and equipment, and the delay in the preparation process of procedure itself.
	Output 3) The technical capacity of C/P is upgraded.	3-1. Technical Cooperation Program is created.	‣ The technical cooperation program has been created at the beginning of the Project, and it was confirmed that the C/Ps have been allocated based on the plan.
		3-2. Counterparts are appropriately assigned.	
		3-3. Technical capability of calibration is enhanced.	‣ At the end of the technical transfer, the uncertainty budget sheet is created, and by checking the uncertainty on the sheet, the improvement of calibration technology can be assessed. Although the calibration procedure was planned to be prepared in 36 quantities up to the end of September 2006, the actual number of quantities achieved the progress is 29 due to the delay in the procurement of machinery and equipment. ‣ The point of “skill after the training” in the Evaluation Sheet of Technical Transfer was assessed by a technical member of the evaluation team. In this sheet, there are criteria of the assessment such as installation, operation, calibration technology, calibration procedure, accreditation among other, on each quantity. The assessment was done by setting points for each criterion and summing up the points to draw the total score. As the result, the score after training was improved in all quantities comparing with the score before training. ‣ The implementation of seminars by the C/Ps can also indicate the improvement of their technical capability. In this Project during the follow-up training by the Short-term experts in Thailand most of the C/Ps holds a seminar on their quantity. ‣ The Project holds the ASEAN seminar and workshop as well as the Joint Training , which are intended not only for the other stakeholders in the Country, but also for the related organizations in other countries of ASEAN region.
	Output 4) Accuracy of national measurement standards is improved.	4-1. Measurement standards are established and maintained.	‣ The Project aims to improve the accuracy of national measurement standard to the level which corresponds to the international comparisons. It can be considered that the level could be achieved at the end of the technical transfer of the Project. ‣ 29 quantities have been achieved the level at this moment of mid-term evaluation, although it was planned to achieve in 36 quantities at the end of September 2006.
		4-2. Environmental management technology of calibration laboratories is improved.	‣ In terms of environmental management of the laboratories, most of the experts and C/Ps evaluated in the questionnaire of the mid-term evaluation that the environment of their laboratories has been good, especially after moving to the new building.
		4-3. International comparison is implemented.	‣ The international comparison is not always available even if it is ready to participate. While the Project has finished the technical transfer in 29 quantities, it has participated in 15 international comparisons as to 10 different quantities.
	Output 5) NIMT disseminates national measurement standards properly.	5-1. Calibration technology for reference standards is improved.	‣ At the time of formulation of the Plan of the Project, the traceability chart is created for each quantity, which shows level of accuracy the calibration technology of NIMT can provide, using the machinery described in the chart. The procurement plan of machinery and equipment was prepared based on these charts. Therefore, it can be said that NIMT would be able to provide adequate level of national measurement standard by materializing what has been described in the charts. However, there are quantities which have not been as it described in the chart yet because of the delay in the procurement of machinery and equipment.

Contents		Verifiable Indicators	Accomplishment
			‣ NIMT issues a document so called “calibration certificate” when it provides calibration services. In this certificate, it is possible to evaluate the level of accuracy since it contains a description of uncertainty budget.
		5-2. Calibration procedures are created.	‣ The calibration procedure is prepared at the end of training with short-term experts, which shows the level of calibration technology. Due to the delay in the procurement and the process of preparation of the procedure itself, the preparation has been delayed in 11 quantities (25 achieved out of 36 planned). ‣ Most of the C/Ps and experts (17 out of 22 persons) has evaluated in the questionnaire of the mid-term evaluation that the actual achievement in terms of the improvement of calibration technology for reference standards is good, because it has been achieved in most of quantities.
		5-3. Items pointed by evaluation of Quality System and the way to solve the items	‣ The Quality System is assessed by the accreditation process. As the result of assessment of the accreditation, items which were not adequate or did not meet the requirement are pointed out. Up to the end of September 2006, the Project has been applied and got assessed for the accreditation in 8 quantities, and it has plan to apply for it in additional 6 quantities in the year 2006.

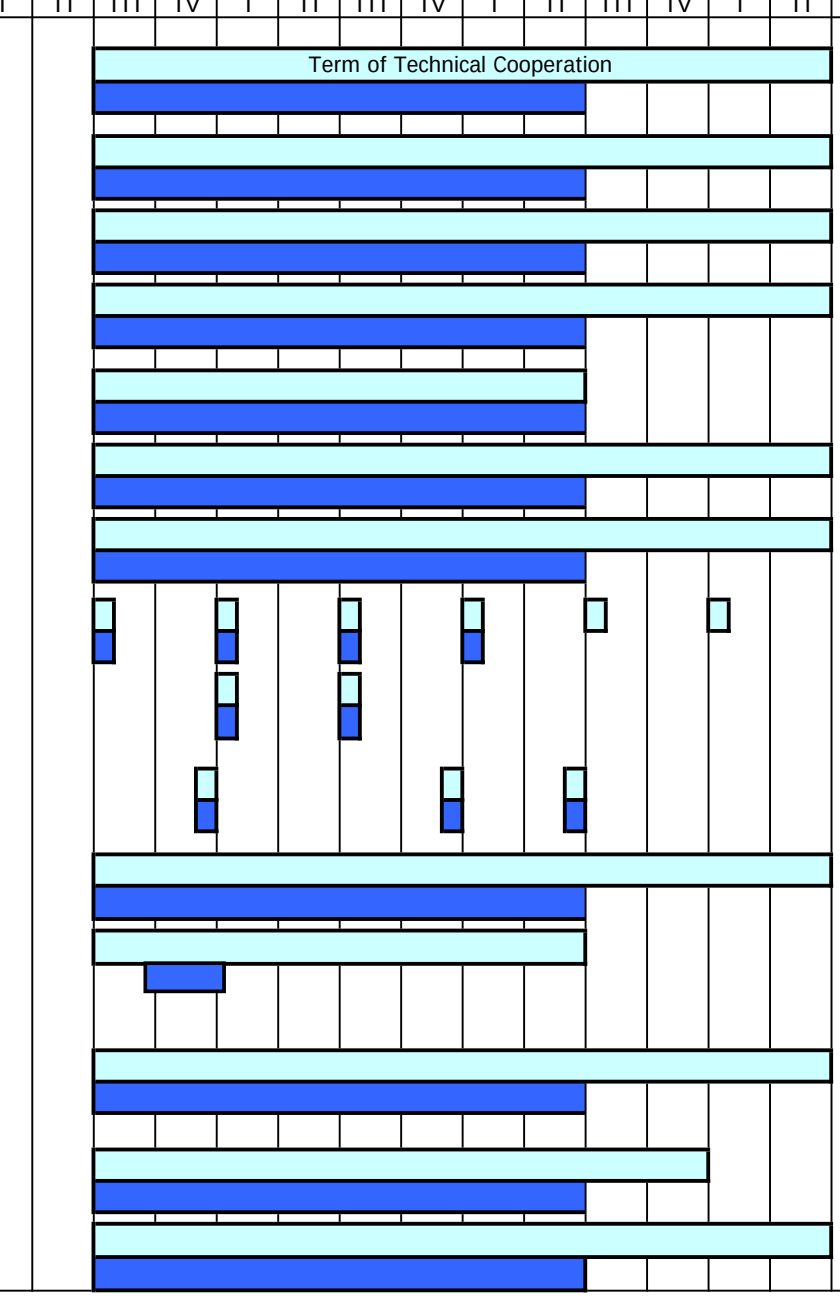
Contents	Verifiable Indicators	Accomplishment

2. Implementation Process

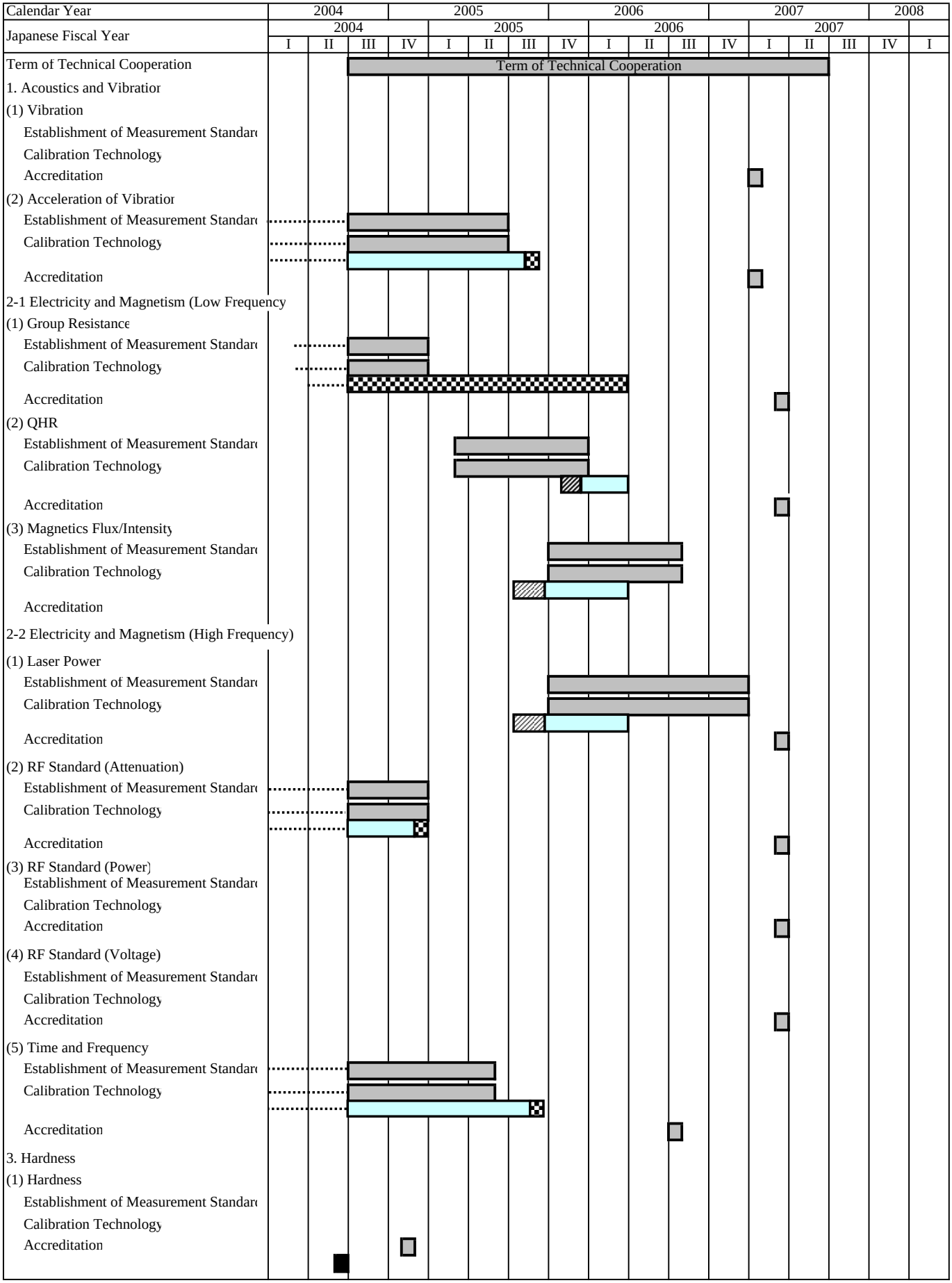
Contents	Verifiable Indicators	Accomplishment
Plan of activities	Have the activities been implemented as planned?	‣ Technical transfer has finished in 29 quantities while it was planned to be finished 36 quantities at the end of September 2006. ‣ 17 Short-term experts (in 11 quantities, environment management, calibration procedure, and accreditation in Form Standard) were dispatched up to the end of September 2006. The dispatch has been delayed in some quantities such as Fixed Point, GB/Scale, Flux/Intensity, Pressure and Spectral Irradiance, due to the delay in the procurement of related machineries. ‣ As to the installation of equipment, there are 75 items which have not been delivered yet, and among them there are 9 items which are still under the process of finalizing the contract with suppliers. ‣ There is a delay in the preparation of calibration procedure. The number of quantities which already have their calibration procedures is 22 at this moment due to the delay in the procurement of machinery and equipment, and the delay in the preparation process of procedure itself. ‣ There is a delay in the activity of Standard Gas due to the delay in the construction of its laboratories.
Methods of technical transfer	Is there any problem in the method of technical transfer?	‣ 19 out of 22 persons answered in the questionnaire the method was good or very good.
Management system	Is there any monitoring system?	‣ Monitoring of the project is done in monthly meeting with both JICA and Thai members, preparing monitoring sheet mostly by the coordinator, but reflecting sufficiently the opinion of Thai staff.
	Is there any problem in the decision-making system ?	‣ 19 out of 22 persons answered in the questionnaire the decision-making process is good or fair.
	Is there any problem in the communication in the Project?	‣ Communication was mostly good according to the questionnaire, however, there were observations which question the cross-sectional communication between DQM and between administrative and technical department..
Consciousness of the NIMT and its C/Ps	Do NIMT and the C/Ps have high level of consciousness toward the Project?	‣ 18 out of 22 persons answered in the questionnaire the level of participation of NIMT staff was good or very good.
Adequacy of the C/Ps	Have the C/Ps allocated to the Project been adequate?	‣ All of the 5 experts answered in the questionnaire that the C/Ps allocated were very good or good.
Participation and recognition of the other stakeholders toward the Project	Do the other stakeholders recognize and participate in the Project?	‣ 15 out of 22 persons in the questionnaire that the recognition of the Project is good. ‣ The Project dose not include activities which require participation of other related organizations.

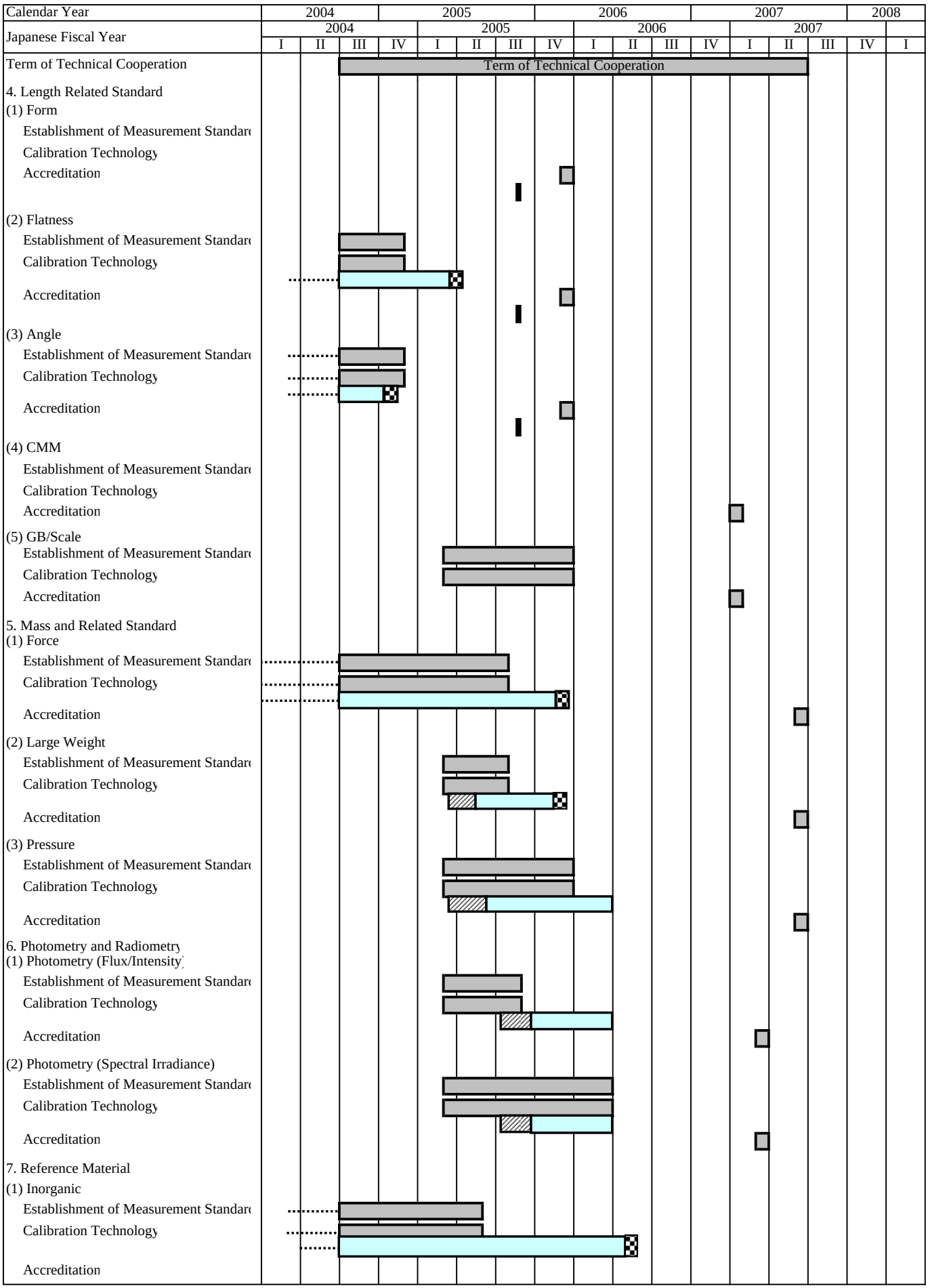
Annex 7: Plan of Operations

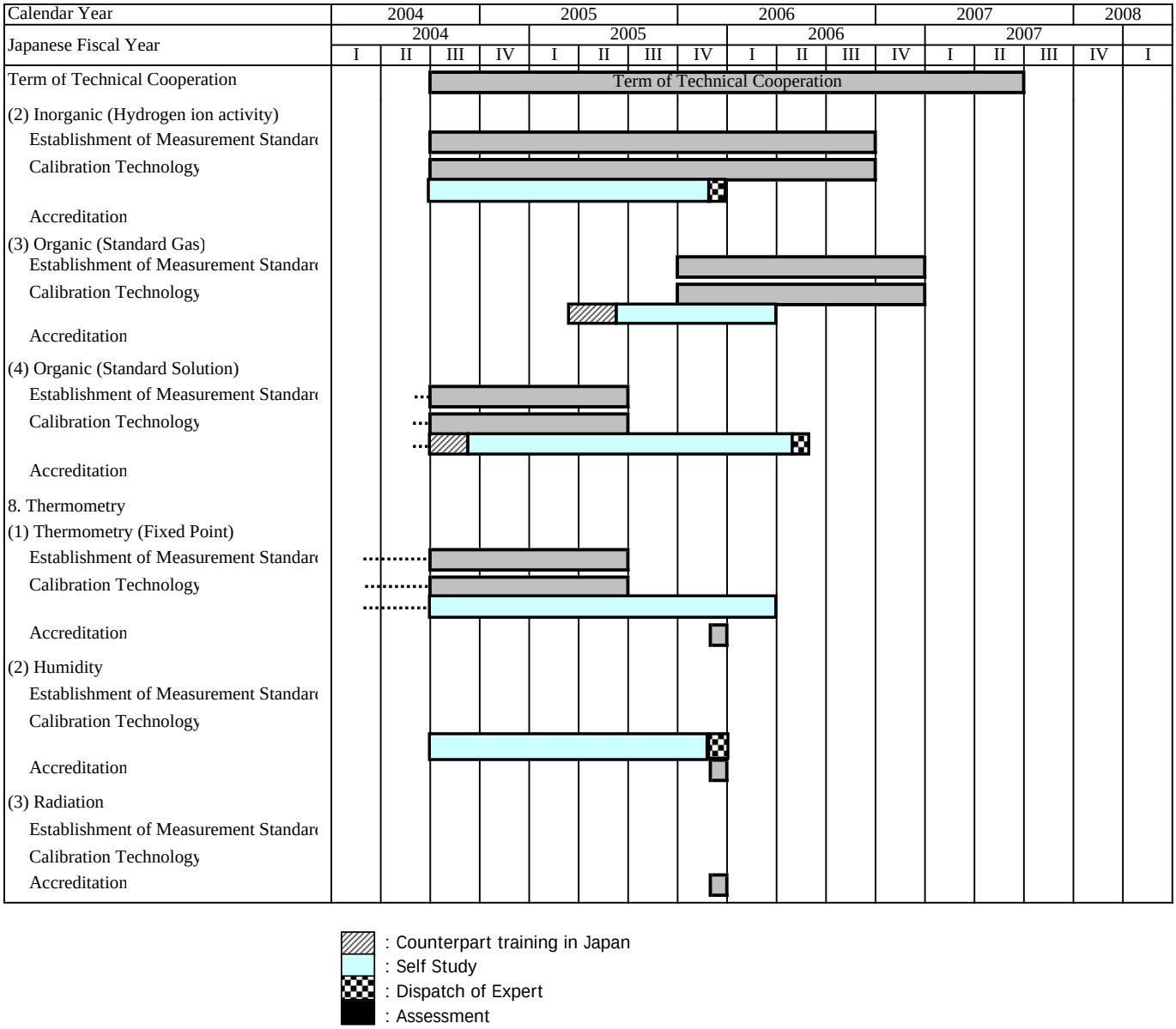
Calendar Year	2004				2005				2006				2007		
Japanese Fiscal Year	2004				2005				2006				2007		
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III
Term of Technical Cooperation															
1-1 To allocate necessary personnel as planned.															
1-2 To make budget plan and execute properly.															
1-3 To make action plan and implement as planned.															
2-1 To install and commit equipment. properly.															
2-2 To operate and maintain equipment.															
2-3 To make manuals of operation and maintenance management.															
3-1 To make Technical Cooperation Program.															
3-2 To assess existing level of basic technical capability of counterpart personnel.															
3-3 To evaluate technical capability of counterpart after technical transfer.															
4-1 To establish and maintain measurement standards.															
4-2 To improve environmental management technology of calibration laboratories.															
5-1 To improve the calibration technology for reference standards based on national standard.															
5-2 To make calibration procedure.															
5-3 To establish Quality System.															



Annex 8: Technical Cooperation Program (TCP)




Calendar Year
2004
2005
2006
2007
2008
Japanese Fiscal Year
2004
2005
2006
2007
I II III IV I II III IV I II III IV I II III IV I
Term of Technical Cooperation
Term of Technical Cooperation
4. Length Related Standard
(1) Form
Establishment of Measurement Standard
Calibration Technology
Accreditation
(2) Flatness
Establishment of Measurement Standard
Calibration Technology
Accreditation
(3) Angle
Establishment of Measurement Standard
Calibration Technology
Accreditation
(4) CMM
Establishment of Measurement Standard
Calibration Technology
Accreditation
(5) GB/Scale
Establishment of Measurement Standard
Calibration Technology
Accreditation
5. Mass and Related Standard
(1) Force
Establishment of Measurement Standard
Calibration Technology
Accreditation
(2) Large Weight
Establishment of Measurement Standard
Calibration Technology
Accreditation
(3) Pressure
Establishment of Measurement Standard
Calibration Technology
Accreditation
6. Photometry and Radiometry
(1) Photometry (Flux/Intensity)
Establishment of Measurement Standard
Calibration Technology
Accreditation
(2) Photometry (Spectral Irradiance)
Establishment of Measurement Standard
Calibration Technology
Accreditation
7. Reference Material
(1) Inorganic
Establishment of Measurement Standard
Calibration Technology
Accreditation


Calendar Year
2004
2005
2006
2007
2008
Japanese Fiscal Year
2004
2005
2006
2007
I II III IV I II III IV I II III IV I II III IV I
Term of Technical Cooperation
Term of Technical Cooperation
(2) Inorganic (Hydrogen ion activity)
Establishment of Measurement Standar
Calibration Technology
Accreditation
(3) Organic (Standard Gas)
Establishment of Measurement Standar
Calibration Technology
Accreditation
(4) Organic (Standard Solution)
Establishment of Measurement Standar
Calibration Technology
Accreditation
8. Thermometry
(1) Thermometry (Fixed Point)
Establishment of Measurement Standar
Calibration Technology
Accreditation
(2) Humidity
Establishment of Measurement Standar
Calibration Technology
Accreditation
(3) Radiation
Establishment of Measurement Standar
Calibration Technology
Accreditation
: Counterpart training in Japan
: Self Study
: Dispatch of Expert
: Assessment

Annex 9: Allocation of the C/P and Staff for Project

JFY / Name of C/P	2002 (4 5 6 7 8 9 10 11 12 1 2 3)	2003 (4 5 6 7 8 9 10 11 12 1 2 3)	2004 (4 5 6 7 8 9 10 11 12 1 2 3)	2005 (4 5 6 7 8 9 10 11 12 1 2 3)	2006 (4 5 6 7 8 9 10 11 12)	Training in Japan Duration (month)	Remarks
Term of Technical Cooperation	———	———	———	———	———		
Term of Technology Transfer	———	———	———	———	———		
1. Administrative C/P							
(1) Project Director Dr. Pian Totarong		———	———	———	———		
(2) Associate Project Director Flt.Lt. Bunjob Suktat	———	———					Resigned
(3) Assistant Project Director Mr. Somsak Charkkian	———	———	———				No assignment in Phase II
(4) Project Coordinator Mrs. Ajchara Charoensook	———	———	———				No assignment in Phase II
2. Technical C/P							
(1) Vibration Mr. Pairoj Rattanangkul	———	———	———	———	———	1.5	
(2) Humidity Ms. Thasorn Sinhaneti	———	———	———	———	———	1.5	
(3) Weight Evaluation Ms. Rungsiya Wongsudin	———	———	———	———	———	1.5	
(4) Radiation Thermometry Mr. Narudom Noulkhow	———	- - -	- - -	- - -	- - -	3	Study Abroad
Mr. Uthai Norranim		———	———	———	———		
(5) pH Standard Solution Mr. Bunthoon Laongsri	———	———	———	———	———	3	
(6) Hardness Mr. Tassanai Sanponput	———	———	———	———	———	2.5	

JFY / Name of C/P	2002 (4 5 6 7 8 9 10 11 12 1 2 3)	2003 (4 5 6 7 8 9 10 11 12 1 2 3)	2004 (4 5 6 7 8 9 10 11 12 1 2 3)	2005 (4 5 6 7 8 9 10 11 12 1 2 3)	2006 (4 5 6 7 8 9 10 11 12)	Training in Japan Duration (month)	Remarks
Term of Technical Cooperation	———	———	———	———	———		
Term of Technology Transfer	———	———	———	———	———		
(7) Time and Frequency							
Mr. Chalermchai Monsukhum	·····					2.5	Resigned
Mrs. Wannee Boonthittanont	———	———	———	———			Resigned
Mr. Somchai Nuamsettee	———	———	———	———	———		
(8) Form							
Mr. Samana Piengbangyang	———	———	———	———	———	4	
(9) Acoustics							
Ms. Surat Pattarachindanuwong	———	———	———	———	———	3	
(10) Wavelength							
Ms. Monludee Ranusawud	-·-·-	———	———	———	———	3	
(11) DC High Voltage							
Mr. Danai Pattarakijkul	———	-·-·-	———	———	———	3	
(12) AC Power							
Mr. Sittisak Pimsut	———	-·-·-	———	———	———	3	
(13) RF Standards							
Mr. Chairat Wichianmongkonkun	———	———	———	———	———	3	
(14) CMM							
Mr. Narin Chantawong	———	———	———	———	———	3	
(15) Force							
Mr. Kittipong Chaemthet	———	———	———	———	———	3	
(16) Resistance Standard							
Ms. Natenapit Chookunhom	———	———	———	———	———	3	
(17) Inorganic Standard							
Ms. Nongluck Tangpaisarnkul	———	———	———	———	———	3	

JFY / Name of C/P	2002 (4 5 6 7 8 9 10 11 12 1 2 3)	2003 (4 5 6 7 8 9 10 11 12 1 2 3)	2004 (4 5 6 7 8 9 10 11 12 1 2 3)	2005 (4 5 6 7 8 9 10 11 12 1 2 3)	2006 (4 5 6 7 8 9 10 11 12)	Training in Japan Duration (month)	Remarks
Term of Technical Cooperation							
Term of Technology Transfer							
(18) Fixed Point Ms. Charuayrat Yaokulbodee						3	
(19) Angle Standard Mr. Watcharin Samit						3	
(20) Standard Solution Dr. Preeyaporn Pookrod						3	
(21) Standard Gas Mr. Bunthoon Loangsri						3	
(22) Pressure Standard Mr. Likit Sainoo						3	
(23) Large Weight Standard Mr. Wirun Laopornpichayanuwat						2.5	
(24) Vickers Hardness Standard Ms. Rugkanawan Kongkavitool						2	
(25) Magnetic Standard Mr. Thapbodin Borerakarawin						3	
(26) Laser Power Mr. Narat Rujirat						3	
(27) Flux/Intensity Mr. Arkom Krachangmol						3	
(28) Spectral Irradiance Ms. Rojana Leecharoen						3	
(29) Environment Management Mr. Chusak Chuasai						0.5	
(30) QHR Standard Mr. Chaiwat Jessadajin						1.5	

JFY / Name of C/P	2002 (4 5 6 7 8 9 10 11 12 1 2 3)	2003 (4 5 6 7 8 9 10 11 12 1 2 3)	2004 (4 5 6 7 8 9 10 11 12 1 2 3)	2005 (4 5 6 7 8 9 10 11 12 1 2 3)	2006 (4 5 6 7 8 9 10 11 12)	Training in Japan Duration (month)	Remarks
Term of Technical Cooperation Term of Technology Transfer							
(31) Mass Standard Ms. Rungsiya Sukhon						0.5	
(32) Watt Hour Standard Mr. Voraphol Phapukdee						2	
(33) Chemical Analysis Dr. Charun Yafa						3	

Note: Allocated Training in Japan Study Abroad

Annex 10: List of Machinery and Equipment provided by Thai side

No.	Equipment Name	Manufacture/Model	Unit	Laboratory
1.	Standard Weight 1kg, 2kg, 5kg, 10kg, 20kg	OIML Class E1	1	Mass
2.	Cesium Clock Frequency Counter	HP 5071A HP 53132A	1 1	Time & Frequency
3.	Control Bath Voltmeter Calibrator Hydrogen generator	Hart Scientific 7041 Keithley 2182 Xitron Technologies 2000 Whatman 75-32	1 1 1 1	Chemical (pH & Metal) Standard Solution
4.	Temperature & Humidity Control	PGC 1355	1	Humidity
5.	Isolate table Volt Meter	Chuo Precision CRE Agilent 34420A	1 1	Radiation
6.	Frequency Counter	HP 53131A	1	Wavelength
7.	Weight Balance	Kern & Sohn GmbH PB4000-2	1	Hardness
8.	Long Gauge Blocks (steel) Granite Surface Plate	Schut Geometrische Meetech	1	Length
9.	High Voltage Resistor Divider	NML	1	Electrical
10.	Standard Indenter Class-4 type	Asahi Giken Co., Ltd.	1	Hardness
11.	Slide Table	Automation Service Co.	1	Temperature

No.	Equipment Name	Manufacture/Model	Unit	Laboratory
12.	Power Meter	432A	1	Time & Frequency
	Thermistor Mount		1	
	Cable		4	
	Torque Wrench (For SMA/PC3.5 mm)		1	
	Adapter N(f-f)		2	
	Adapter N(m-m)		2	
	Adapter N(m-f)		2	
	Adapter SMA(m)-N(f)		2	
	Adapter SMA(m-m)		4	
	Adapter SMA(f-f)		4	
	Adapter SMA(m-f)		2	
	DC Block N(m-f)		1	
	Power Splitter	11667A	1	
	Sweep Generator	83752	1	
	Isolator	I-A100,110-A1-(F3F3L1a)	2	
	Isolator	I-160,120-A1-(F3F3L1a)	2	
	Tuner	1643C	2	
	Low Pass Filter (100 MHz)		1	
	Low Pass Filter (1200 MHz)		1	
	Low Pass Filter (10 GHz)		1	
	Microwave Converter	11793A	1	
	Power meter	436A	1	
	Sensor module	11722A	1	
13.	Vickers Primary Machine	AKASHI / SHT 41	1	Hardness
	Micro – Vickers Testing Machine	MITUTOYO / HM-124	1	
	Micro – Vickers Testing Machine	Bariess / V-Test	1	
	Uncertified Hardness Block	ASAHI	1	
14.	Ball plate	KOBA	1	CMM
15.	Interface instrument	Toshiba & NI	1	Wavelength
16.	High Precision Bath	Hart Scientific / 7008IR	1	Radiation
17.	Digital thermometer	Hart Scientific / 1529 Chub-E4	1	Chemical
	Milli-Q water purification	Millipore	1	

No.	Equipment Name	Manufacture/Model	Unit	Laboratory
18.	Coaxial Thermistor Mount	Agilent / 8478B	1	Time & Frequency
19.	Adapter Charger		1	Flow
20.	Stabilized He-Ne laser	Laser / SL03	1	Length
21.	Current Shunt Holt, HCS-110 mA to 20 A	HCS-110 mA to 20 A	1	Electrical
22.	Current Shunt Holt 50 A, HCS-1-AF/50A	HCS-1-AF / 50A	1	Electrical
23.	Current Shunt Holt 100 A, HCS-1-AF/100A	HCS-1-AF / 100A	1	Electrical
24.	Standard Resistor 1 Ohm	L&N / 4210	1	Electrical
25.	Standard Resistor 1 Ohm	L&N / 4210	1	Electrical
26.	Standard Resistor 1 Ohm	L&N / 4210	1	Electrical
27.	Spectrum Analyzer	HP 8590A	1	Electrical
28.	Oscilloscope	Tektronix / 11801B	1	Electrical
29.	Samping Head	Tektronix / SD26	1	Electrical
30.	Base With Only Plumbing	DH Instruments / PG102	1	Pressure
31.	RPM 4 Base	DH Instruments / A700k	1	Flow
32.	MOLBLOC Flow element	DH Instruments / 2E3-S	1	Flow
33.	Sony Magne scale GB-A	Sony / GB-A	1	Force & Torque
34.	Sony detectors	Sony / MD-21/GIBR	1	Force & Torque
35.	National Instrument	PCI-232/8,8 Ports 232	1	Mass
36.	Dead Weight Force Machine	DWM 1 kN	1	Force & Torque
37.	Dead Weight Force Machine	DWM 10 kN	1	Force & Torque
38.	Single Channel Amplifier for Frequency	SBM / ML 60 B	1	Force & Torque
39.	Single Channel Amplifier for StrainGauge	SBM / ML 30 B	1	Force & Torque
40.	Single Channel Amplifier for StrainGauge	SBM / ML 30 B	1	Force & Torque
41.	Communication Processor to Interface	SBM / CP22	1	Force & Torque
42.	Digital Automatic Refractometer	Bellingham / RFM 870	1	Chemical

No.	Equipment Name	Manufacture/Model	Unit	Laboratory
43.	Susceptability Reference with CER	Earth	1	Mass
44.	General EASTERN	Hart / SSM	1	Temperature
45.	Reference Pressure Monitor	DH Instruments / RPM4BG15k	1	Pressure
46.	Reference Standard Weight	Mettler-Toledo / Class E0; 1 kg	1	Mass
47.	Reference Standard Weight	Mettler-Toledo / Class E0; 1 kg	1	Mass
48.	Reference Standard Weight	Mettler-Toledo / Class E0; 1 kg	1	Mass
49.	Handy Logger	Handy / MR2041E	1	Mass
50.	Torque Transducer		1	Force & Torque
51.	Amplifier Supply 220 V.		1	Force & Torque
52.	Reference Torque Wrench	Kriechen / EB0148,DRS20Nm	1	Force & Torque
53.	Reference Torque Wrench	Kriechen / EB0153,DRS1000	1	Force & Torque
54.	Pneumatic Oscillator Vibration		1	Force & Torque
55.	Hardness Tester	Mitutoyo / 0055712-00	1	Force & Torque
56.	Monitor Computer	Samsung / Sync Master213T	1	Force & Torque
57.	Petrotest 26-0017 Specific Gravity Bath	26-0017	1	Chemical
58.	ASI Cooling Circulation Bath		1	Chemical
59.	Glass Bell Cover with High Grade Aluminum	Glass Bell	1	Mass
60.	Glass Bell Cover with High Grade Aluminum	Glass Bell	1	Mass
61.	Hart Carousel Holding Fixture	Hart / 2018	1	Temperature
62.	Chamber Ambient Stability Container		1	Mass

No.	Equipment Name	Manufacture/Model	Unit	Laboratory
*63.	Electric Aspirator	VE-11	2	Chemical
*64.	Dryer SG-WDN	AI-1241-010	1	Chemical
*65.	Dryer SD-50N	AI-1242-010	1	Chemical
*66.	Thermo Hygrograph	TH-26-MN7	6	Chemical
*67.	Ultrasonic Bath	STURDY / UC-150	1	Chemical
*68.	Dehumidifier	RAM 201	5	Chemical
*69.	Hotair Oven	MMM / Ecocell 111	2	Chemical
*70.	Tool Kit	AI-1133-010	3	Chemical
*71.	Autodessicator	Bossman / SBK98	2	Chemical
72.	Universal Length Measuring Machine	Mahr	1	Diameter
73.	Three flat test accessories	Fujinon	1	Flatness
74.	Power Sensor	8481A	1	RF Microwave
75.	Attenuator Switch	11713A	1	RF Microwave
76.	Programmable Step Attenuator	8494N	2	RF Microwave
77.	VSWR Bridge	ZRA	1	RF Microwave
78	Power Standard	-	1	AC Power
79.	GPIB-USB Converters	-	3	Photometry
80.	Thermohygrometers with Loggers	-	2	Photometry
90.	GPIB Cables	-	11	Photometry
91.	Height Gauge	-	1	Photometry
92.	Level Scope for Lamp Alignment	-	1	Photometry
93.	Telescope Stand (Custom Ordered)	-	1	Photometry
94.	Vernier Caliper 600 mm	-	1	Photometry
95.	Gas Regulator	-	1	Photometry
96.	Timer	-	1	Photometry
97.	Power Surge Protection Outlet	-	1	Photometry
98.	Serial PCI Interface	-	2	Photometry
99.	Handheld Digital Multimeter	-	1	Photometry

Annex 11: List of Machinery and Equipment procured by ODA Loan

The National Metrology System Development Project (I)
Classified by Fields of Technology Transfer

	Scope	Item No.	Description
ACOUSTICS	Acoustics	AQ-1/001/1	STANDARD MICROPHONE
		AQ-1/001/2	PREAMPLIFIER
		AQ-1/002/1	STANDARD MICROPHONE
		AQ-1/002/2	PREAMPLIFIER
		AQ-1/003/1	STANDARD MICROPHONE
		AQ-1/003/2	PREAMPLIFIER
		AQ-1/004/1	STANDARD MICROPHONE
		AQ-1/004/2	PREAMPLIFIER
		AQ-1/005	CALIBRATION SYSTEM FOR MICROPHONE AND PISTONPHONE
		AQ-1/006	AMPLIFIER
		AQ-1/007	RECIPROCITY CALIBRATION SYSTEM
		AQ-1/008	DIGITAL THERMOMETER
		AQ-1/009	ATMOSPHERIC PRESSURE INDICATOR
		AQ-1/010	FFT ANALYZER
		AQ-1/011	RESISTANCE ATTENUATOR (PROGRAMMABLE ATTENUATOR)
		AQ-1/012	DIGITAL THERMOMETER
		AQ-1/013	THERMOMETER SENSORS
		AQ-1/014	ELECTRONIC DESSICATOR
		AQ-1/015	HUMIDITY (DATA LOGGER)
ELECTROMAGNETICS	Resistance	EM-1/018	KELVIN-VARLEY VOLTAGE DIVIDER
		EM-1/019	STANDARD RESISTOR 1 OHM
		EM-1/021	STANDARD RESISTOR 10 OHM
		EM-1/022	STANDARD RESISTOR 100 OHM
		EM-1/023	STANDARD RESISTOR 1 K OHM
		EM-1/026	DIGITAL THERMOMETER
	Capacitance (Out of scope)	EM-1/038	AC/DC TRANSFER STANDARD
		EM-1/039	AC/DC VOLTAGE STANDARD (MULTIFUNCTION CALIBRATOR)
		EM-1/045	CAPACITANCE BRIDGE
	AC Voltage	EM-2/016	DIGITAL MULTIMETER
		EM-2/017	AC/DC VOLTAGE STANDARD
		EM-2/048	DIGITAL AC/DC TRANSFER STANDARD
		EM-2/059	DIGITAL MULTIMETER
		EM-2/084/1	PHASE STANDARD
		EM-2/084/2	PHASE VERIFICATION BRIDGE
	AC Current (Out of scope)	EM-2/087	AC/DC TRANSFER STANDARD
		EM-2/090	AC CURRENT CALIBRATOR (UP TO 100A)
	Inductance	EM-2/118	SET OF STANDARD RESISTORS (1_A - 100A)
	Power	EM-2/218	DIGITAL POWER FACTOR
		EM-2/250	POWER REFERENCE STANDARD
		EM-2/251	AC VOLTAGE SOURCE
	DC High Voltage	EM-3/001	HIGH VOLTAGE DIVIDER 100 KV
		EM-3/002	HIGH VOLTAGE SOURCE 100 KV
		EM-3/003	HIGH VOLTAGE SOURCE 50 KV WITH POWER TRANSFORMER
		EM-3/004	DIGITAL VOLTMETER
	RF Voltage	EM-5/001	THERMAL VOLTAGE CONVERTER SETS
		EM-5/003/01	AC/DC TRANSFER STANDARD
		EM-5/003/05	THERMAL TRANSFER STANDARD & SOFTWARE
		EM-5/004	MICROPOTENTIOMETER SET
		EM-5/005	HIGH PRECISION DMM
	RF Attenuation	EM-5/006	VHF ATTENUATOR
	RF Power	EM-5/007	RF POWER METER CALIBRATION SYSTEM
		EM-5/014	DIGITAL MULTIMETER
		EM-5/016	VECTOR NETWORK ANALYZER
		EM-5/018	POWER SENSOR
		EM-5/019	POWER METER
		EM-5/020	DIRECTIONAL COUPLERS
		EM-5/024	OSCILLOSCOPE 1 GHZ
		EM-5/025	SPECTRUM ANALYZER
		EM-5/026	MICROWAVE ACCESSORIES SET
		EM-5/026/13	VERIFICATION KITS
		EM-5/026/14	VERIFICATION KIT

LENGTH	Wavelength	L-1/004/00	IODINE STABILIZED HE-NE LASER (633 NM)
		L-1/004/03	SI-AVALANCHE PHOTO-DIODE SYSTEM AND DETECTOR
		L-1/004/03/1	POWER SUPPLY
		L-1/004/09	OPTICAL MIXING ACCESSORIES
		L-1/004/13	OFFSET LOCK LASER
		L-1/004/13/1	TRAINING LASER SYSTEM
		L-1/004/14	OPTICAL MIXING ACCESSORIES
		L-1/004/16	OPTICAL POWER METER AND SENSOR
		L-1/004/17	ND FILTER
		L-1/004/22	ANALOG OSCILLOSCOPE
		L-1/004/23	UNIVERSAL MAGNETIC STAND
		L-1/004/24	THERMOSENSOR
	Plug/Ring	L-5/016	SMALL DIAMETER MEASURING INSTRUMENT
		L-5/017	STANDARD RING GAUGE SET, (5-200 MM)
		L-5/018	STANDARD PLUG GAUGE, (1-200 MM)
	Straightness	L-5/019	STRAIGHT EDGES, STEEL & GRANITE
	Angle	L-6/012	SMALL ANGLE GENERATOR
		L-6/013	INDEXING TABLE
		L-6/015	STANDARD SQUARE
		L-6/016/01	PRECISION LEVEL
	Flatness	L-7/004	FLATNESS INTERFEROMETER (FLAT TYPE, SPHERICAL TYPE)
	Roundness	L-7/006	ROUNDNESS TESTER
	Roughness	L-7/009	ROUGHNESS TESTER
		L-7/011	ROUGHNESS GAUGE
MASS	Mass	M-1/011	ATMOSPHERIC PRESSURE INDICATOR
		M-1/012	DIGITAL THERMOMETER WITH RTD SENSORS
		M-1/013	BALANCE, CAPACITY 5 G, RESOLUTION 0.1 _G
		M-1/014	STANDARD WEIGHT 1 KG, OIML CLASS E1
		M-1/016	GAUSSMETER
	Large Weight	M-3/010	ATMOSPHERIC PRESSURE INDICATOR
		M-3/013	DIGITAL THERMOMETER WITH RTD SENSORS
		M-3/015	BALANCE, CAPACITY 2 KG
	Pressure	M-5/005	DIGITAL MANOMETER (ABSOLUTE PRESSURE INDICATOR)
		M-6/011	DIGITAL MANOMETER (ABSOLUTE PRESSURE INDICATOR)
		M-6/018	DIFFERENTIAL PRESSURE MANOMETER
	Force	M-8/009	ATMOSPHERIC PRESSURE INDICATOR
		M-8/010	DIGITAL THERMOMETER WITH RTD SENSORS
HA	Hardness	O-2/002	ROCKWELL HARDNESS CALIBRATION MACHINE
		O-2/003	SHORE HARDNESS TESTING MACHINE
QM	Reference Materials	QM-3/001	ANALYTICAL BALANCE ; CAPACITY 205 G ; SENSITIVITY 10 _G
		QM-3/002	BALANCE, CAPACITY 5100G, SENSITIVITY 1 MG
		QM-3/003	EQUIPMENT FOR PRODUCING PURE WATER
		QM-4/001	AUTOMATIC POTENTIOMETRIC TITRATOR
		QM-4/002	DENSITY / SPECIFIC GRAVITY METER
		QM-4/003	HIGH-PRECISION PH METER
		QM-4/009	HYDROMETERS
TEMPERATURE	Fixed Point	T-1/065	DIGITAL MULTIMETER
		T-1/066	GPIB INTERFACE CARD AND CABLE
		T-1/068	STANDARD PLATINUM RESISTANCE THERMOMETER
		T-1/069	STANDARD PLATINUM RESISTANCE THERMOMETER
		T-1/070	DATA LOGGER
		T-1/078	SECONDARY STANDARD PRT
		T-1/079	PLATINUM RESISTANCE THERMOMETER
		T-1/080	ZERO STANDARD TEMPERATURE DEVICE
	Radiation	T-2/009	BLACK BODY FURNACE ; LOW TEMPERATURE RANGE
		T-2/011	BLACK BODY FURNACE ; MEDIUM TEMPERATURE RANGE
		T-2/013	PLATINUM RESISTANCE THERMOMETER , PT100 CLASS A
		T-2/015	FIXED POINT BLACK BODY FURNACE ; SILVER POINT
		T-2/016	FIXED POINT BLACK BODY FURNACE ; ALUMINIUM POINT
		T-2/017	FIXED POINT BLACK BODY FURNACE ; ZINC POINT
	Humidity	T-3/006	PRIMARY STANDARD OR HUMIDITY GENERATOR
		T-3/007	CHILLED MIRROR DEW POINT ANALYZER AND SENSORS
TI	Time and Frequency	TF-1/001	FREQUENCY COUNTER
		TF-1/004	SYNTHESIZED SIGNAL GENERATOR

The National Metrology System Development Project (II)
Classified by Fields of Technology Transfer

	Scope	Item No.	Description
V I B	Acceleration(Vibration)	AQ-2/001	ABSOLUTE ACCELEROMETER CALIBRATION SYSTEM
		AQ-2/002	STANDARD ACCELEROMETER
		AQ-2/004	SHOCK CALIBRATION SYSTEM
E L E C T R O M A G N E T I C S	Resistance	EM-1/029	STANDARD RESISTOR 10K OHM
		EM-1/030	STANDARD RESISTOR 10 OHM
		EM-1/031	STANDARD RESISTOR 100 OHM
		EM-1/032	STANDARD RESISTOR 1 KOHM
		EM-1/035	AUTOMATED RESISTANCE SYSTEM
		EM-1/036	SET OF STANDARD RESISTOR 1GOHM-100TOHM
		EM-1/K034	OIL BATH
		EM-1/110	STANDARD RESISTOR 100 OHM
		E-1/K09	RESISTOR CALIBRATOR
		E-1/K10	SET OF STANDARD RESISTOR 0.001 OHM - 1 OHM
		E-1/K12	DIGITAL MULTI-METER
		E-1/K34	SET OF RESISTANCE TRANSFER
		E-1/K38	TEMPERATURE CONTROLLER AIR BATH
	QHR	EM-1/101	QHR MEASUREMENT SYSTEM
		EM-1/103	HELIUM LEAK DETECTOR
		EM-1/104	CHAR RECORDER
		EM-1/105	CATHODE RAY OSCILLOSCOPE
		EM-1/106	DIGITAL THERMOMETER
		EM-1/107	HIGH-RESISTANCE METER
		EM-1/113	NULL DETECTOR
	DC High Voltage	EM-3/005	DC HIGH VOLTAGE POWER SUPPLY
	Laser Power	EM-7/008	WAVELENGTH METER
		EM-7/010	OPTICAL POWER METER
		EM-7/012	ADAPTER
		EM-7/024	DC NANOVOLTMETER
		EM-7/033	OPTICAL DEVICES - 1
		EM-7/040	RESISTANCE STANDARD
	Magnetics	EM-8/008	FLUXMETER CALIBRATOR
		EM-8/009	STANDARD RESISTANCE (1 OHM)
		EM-8/011	STANDARD RESISTANCE (100 M OHM)
		EM-8/012	STANDARD RESISTANCE (10 M OHM)
		EM-8/013	STANDARD RESISTANCE (1 M OHM)
		EM-8/014	DIGITAL MULTIMETER (DC VOLT METER)
		EM-8/015	FREQUENCY COUNTER
	RF Standard	EM-5/016/1	TYPE N CALIBRATION
		EM-5/034/01-06	ATTENUATION CALIBRATION SYSTEM
		EM-5/037	SIGNAL GENERATOR
		EM-5/040/01	CABLE
		EM-5/040/02	CABLE
		EM-5/041/01	CONNECTOR
		EM-5/041/02	CONNECTOR
		EM-5/041/03	CONNECTOR
		EM-5/041/04	CONNECTOR
		EM-5/041/05	CONNECTOR
		EM-5/043	PHASE SHIFTER
		EM-5/044	STANDARD MATCHING RANGE TUNER
		EM-5/045/01	ISOLATOR
		EM-5/045/02	ISOLATOR
		EM-5/045/03	ISOLATOR
		EM-5/045/04	ISOLATOR
		EM-5/100/01	NANOVOLTMETER
		EM-5/100/02	LOW THERMAL INPUT CABLE
		EM-5/100/03	LOW THERMAL SHORTING PLUG
		EM-5/101	RF AMPLIFIER
L E N G T H	Wavelength	L-1/006	MODULATION DOMAIN ANALYZER
		L-1/007	RF DIGITAL OSCILLOSCOPE
	Gauge Block	L-2/013	GAUGE BLOCK COMPARATER
		L-2/014	GAUGE BLOCK SET (RANGE 0.5-100MM,...)
		L-2/015	GAUGE BLOCK SET (RANGE 0.1-0.9MM,...)
		L-2/016	GAUGE BLOCK SET
		L-2/017	GAUGE BLOCK SET (RANGE 0.005-0.05)
	Standard Scale	L-4/005	STANDARD SCALE
		L-4/006	STANDARD SCALE

	Scope	Item No.	Description
LENGTH	Angle	L-6/011	OPTICAL POLYGON MIRROR
		L-6/014	ANGLE GAUGE BLOCK
	Roughness	L-7/007/1	STEP GAUGE
		L-7/007/2	STEP GAUGE
		L-7/007/3	STEP GAUGE
		L-7/016/02	NON-CONTACT TYPE ROUGHNESS MEASUREMENT SYSTEM
	CMM	L-8/004	BAROMETER
PHOTOMETRY	Photometry	PR-1/003	DC STABILIZED POWER SUPPLY
		PR-1/004	DIGITAL MULTIMETER
		PR-1/006	STANDARD SHUNT
		PR-1/007	DIGITAL DC POWER SUPPLY
		PR-1/010	SPECTRO-PHOTOMETER
		PR-2/002	PHOTOMETER BENCH
		PR-2/003	DC STABILIZED POWER SUPPLY
		PR-2/007	STANDARD SHUNT
		PR-2/008	DIGITAL DC POWER SUPPLY
	Radiometry	PR-3/001	SPECTRAL IRRADIANCE STANDARD LAMP
		PR-3/004	DC STABILIZED POWER SUPPLY
		PR-3/006	STANDARD SHUNT
		PR-3/007	DIGITAL DC POWER SUPPLY
TEMPERATURE	Fixed Point	T-1/082	IN FREEZING POINT OPEN CELL
		T-1/084	WATER TRIPLE POINT CELL AND APPARATUS
		T-1/088	Pt RESISTANCE THERMOMETER
		T-1/089	AC/DC STANDARD RESISTANCE 10 OHM
		T-1/090	Zn FREEZING POINT CELL
		T-1/091	Al FREEZING POINT CELL
		T-1/092	Ag FREEZING POINT CELL
		T-1/100	ELECTRIC FURNANCE FOR In FREEZING POINT
		T-1/101	Sn FREEZING POINT CELL
		T-1/102	ELECTRIC FURNACE FOR Sn FIXED POINT
		T-1/103	ELECTRIC FURNACE FOR Zn FIXED POINT
		T-1/ADD-1	Ga MELTING POINT CELL
		T-1/ADD-2	ANNEALING FURNACE
		T-2/031	TIN FREEZING POINT BLACKBODY
		T-2/032	INDIUM FREEZING POINT BLACKBODY
		T-2/034	DIGITAL VOLTMETER
MASS	Large Mass	M-4/001	MASS COMPARATOR (BALANCE)
		M-4/002	MASS COMPARATOR (BALANCE) CC50001S-L
		M-4/003	LEVELMATIC PAN
		M-4/004	STANDARD WEIGHT (MASS: 50 KG)
		M-4/006	STANDARD WEIGHT (MASS: 200 KG)
	Pressure	M-5/107	LOW NOISE DIGITAL MULTIMETER
		M-5/110	HYDRAULIC PRESSURE BALANCE
TI	Time and Frequency	TF-1/003	DISTRIBUTION AMPLIFIER
		TF-1/009	SHIELD ROOM
QM	Standard Gas	QM-1/002	BAROMETER
		QM-1/003	GAS CHROMATOGRAPH WITH TCD
		QM-1/004	GAS CHROMATOGRAPH WITH FID
		QM-1/005	DEW POINT METER
		QM-1/006	ND-IR (CO, CO2)
		QM-1/007	ND-IR (CO, CO2) (CO LOW CONCENTRATION)
		QM-1/008	SO2 ANALYZER (PPM LEVEL)
		QM-1/010	REGULATOR
		QM-1/016	FLOW METER
		QM-1/017	CYLINDER RACK
		QM-1/026	LARGE SCALE HIGH PRECISION BALANCE (15KG)
		QM-1/027	LARGE SCALE BALANCE (22KG)
		QM-1/029	STANDARD EQUIPMENT SYSTEM FOR NOX, SO2, CO, C_3H_8, CH4, O2, N2, SYNTHETIC AIR (GAS FILLING SYSTEM)
		QM-1/035	MASS PIECE SET
		QM-1/036	FT-IR
		QM-1/039	HELIUM GAS LEAK DETECTOR
		QM-1/042	NOX ANALYZER (PPM LEVEL)
		QM-1/049	POCKET SIZED GAS DETECTION INSTRUMENT
		QM-1/053	HIGH-PERFORMANCE VIBRATION-FREE TABLE
	Standard Solution	QM-2/001	GC/ECD/FID
		QM-2/002	HYDROGEN GENERATOR
		QM-2/003	AIR COMPRESSOR
		QM-2/004	GC/MS
		QM-2/005	LIQUID CHROMATOGRAPH
		QM-2/006	DENSITOMETER
		QM-2/007	KARL FISHER TITRATION
		QM-2/008	GLOVE BOX
		QM-2/009	BALANCE
		QM-2/010	THERMAL ANALYZER
QM		QM-2/011	BALANCE
		QM-2/012	BALANCE TABLE
		QM-2/013	REAL-TIME PCR
		QM-2/014	LC/MS/MS
	Inorganic	QM-3/001	ATOMIC ABSORPTION SPECTROMETER
		QM-3/002	ION CHROMATOGRAPHIC ANALYZER
		QM-3/003	SUB-BOILING WATER DISTILLATION SYSTEM
		QM-3/006	INDUCTIVELY COUPLE PLASMA-MASS SPECTROMETER
		QM-3/007	MICROWAVE DIGESTION SYSTEM

	Scope	Item No.	Description
		QM-3/008	UV-VIS SPECTROPHOTOMETER
		QM-3/009	PHOTOMETRIC AMPLIFIER WITH PHOTOMETRIC SENSOR
	pH Standard	QM-4/004	THERMOMETER
		QM-4/014	GAS FLOW CONTROLLER
		QM-4/016	HARNED CELL (12 UNIT/ITEM)
		QM-4/017	DATA CONTROLLER
		QM-4/018	BAROMETER

Annex 12: Schedule of Delivery of Equipment procured by ODA Loan

National Metrology System Development Project (II)
Date: September 29, 2006

No.	Item No.	Description	Contract No.	Delivery Date
1	L-4/004	Interferometer for Line Scale	NIMT/2548/06-2	N/A
2	QM-1/001	Thermo Hygrometer	NIMT/2549/04	30/12/06
3	QM-1/009	NOx Analyzer (ppb Level)	NIMT/2549/04	30/12/06
4	QM-1/037	Oxygen Analyzer	NIMT/2549/04	30/12/06
5	QM-4/009	Dryer	NIMT/2549/04	30/12/06
6	QM-4/022	Muffle Furnace	NIMT/2549/04	30/12/06
7	QM-1/032	High Pressure Gas Cylinder (for NOX & SOX Gas)	NIMT/2549/08	8/10/06
8	QM-1/033	High Pressure Gas Cylinder (for Inert Gas)	NIMT/2549/08	8/10/06
9	QM-1/046	Cylinder Hand Truck	NIMT/2549/08	8/10/06
10	QM-1/050	Liquid N2 Container	NIMT/2549/08	8/10/06
11	QM-1/054	Draft Shield	NIMT/2549/08	8/10/06
12	TF-1/008	Time and Frequency System	NIMT/2549/09	24/9/06**
13	EM-1/102	Squid Magnetometer	NIMT/2549/11	30/12/06
14	EM-1/114	Liquid Helium Dewar	NIMT/2549/11	30/12/06
15	EM-7/023	Voltage Current Source	NIMT/2549/11	30/12/06
16	EM-7/025	He-Ne Laser Source (632.8 nm)	NIMT/2549/11	30/12/06
17	EM-7/029	Automatic ND Filter	NIMT/2549/11	30/12/06
18	EM-7/031	Laser Power Controller	NIMT/2549/11	30/12/06
19	EM-7/032	Optical Bench	NIMT/2549/11	30/12/06
20	EM-7/041	Digital Voltmeter	NIMT/2549/11	30/12/06
21	EM-8/002	NMR Magnetometer	NIMT/2549/11	30/12/06
22	L-8/003	Step Gauge	NIMT/2549/11	30/12/06
23	PR-1/002	Integrating Sphere	NIMT/2549/11	30/12/06
24	PR-3/002	Spectroradiometer	NIMT/2549/11	30/12/06
25	PR-3/003	DC Stabilized Power Supply	NIMT/2549/11	30/12/06
26	T-2/023	Spectral Responsivity Measuring Instrument	NIMT/2549/11	30/12/06
27	T-1/081	HG Freezing Point Cell	NIMT/2549/14	27/10/06
28	M-5/101	Hydraulic Controlled Clearance Piston Gauge	NIMT/2549/16	6/12/06
29	EM-7/043	Comparison and Calibration Equipment	NIMT/2549/18	10/2/07
30	QM-1/040	Helium Gas Leak Detector	NIMT/2549/19	22/10/06
31	EM-1/100*	Superconducting Magnet and Cryostat for QHR	NIMT/2549/22	30/06/07
32	EM-1/108*	Liquid Nitrogen Vessel	NIMT/2549/22	30/06/07
33	EM-1/109*	Low Thermal EMF Shielded Cable 100 m	NIMT/2549/22	30/06/07
34	EM-1/111*	High Vacuum Pumping Set	NIMT/2549/22	30/06/07
35	EM-5/102	Analog and CW signal generator	NIMT/2549/23	21/12/06
36	EM-7/004	Tunable Laser (1550 nm Band)	NIMT/2549/23	21/12/06
37	EM-7/005	Tunable Laser (1300 nm Band)	NIMT/2549/23	21/12/06
38	EM-7/009	Optical Attenuator	NIMT/2549/23	21/12/06
39	EM-7/011	Optical Sensor	NIMT/2549/23	21/12/06
40	EM-7/042	Nanovoltmeter	NIMT/2549/23	21/12/06
41	EM-7/048	Optical Attenuator	NIMT/2549/23	21/12/06
42	PR-2/004	Digital Multimeter	NIMT/2549/23	21/12/06
43	PR-3/005	Digital Multimeter	NIMT/2549/23	21/12/06
44	EM-7/006	Optical Power Meter	NIMT/2549/24	5/12/06
45	EM-7/013	Optical Spectrum Analyzer	NIMT/2549/24	5/12/06
46	PR-1/009	Digital Watte Meter	NIMT/2549/24	5/12/06

No.	Item No.	Description	Contract No.	Delivery Date
47	PR-1/001	Total Luminous Flux Standard Lamp	NIMT/2549/25	7/11/06
48	PR-2/001	Luminous Intensity Standard Lamp	NIMT/2549/25	7/11/06
49	T-2/010	Standard Radiation Thermometer 900 nm	NIMT/2549/26	3/12/06
50	T-2/021	Standard Radiation Thermometer 650 nm	NIMT/2549/26	3/12/06
51	T-2/022	Standard Radiation Thermometer 1.6 micro meter	NIMT/2549/26	3/12/06
52	T-2/033	Blackbody Furnace for Ear Thermometer	NIMT/2549/26	3/12/06
53	EM-5/103	Low Pass Filter	NIMT/2549/27	26/12/06
54	L-1/009	Wavelength Meter	NIMT/2549/29	4/1/07
55	L-6/017	Electronic Level System (Inclinometer)	NIMT/2549/29	4/1/07
56	M-5/108***	5000 bar hydraulic high accuracy measurement system	NIMT/2549/30	4/07
57	L-8/006***	Standard Thermometer, Scanner and Sensor	NIMT/2549/31	6/07
58	T-1/104***	Electric Furnace for Al Fixed Point	NIMT/2549/31	6/07
59	T-1/105***	Electric Furnace for Ag Fixed Point	NIMT/2549/31	6/07
60	M-5/103***	Set of High Accuracy Pressure Monitor	NIMT/2549/32	12/06
61	M-5/100***	Hydraulic Pressure Balance	NIMT/2549/32	12/06
62	M-5/102***	Force Balance Piston Gauge	NIMT/2549/32	12/06
63	TF-1/005***	Analog and CW Signal Generator	NIMT/2549/33	12/06
64	EM-8/006*	Digital Fluxmeter	NIMT/2549/34	5/07
65	M-4/009*	Hand Forklift	NIMT/2549/34	5/07
66	PR-1/008*	AC Stabilized Power Supply	NIMT/2549/34	5/07
67	T-2/024*	Non-linear Measurement System	NIMT/2549/34	5/07
68	M-4/005*	Standard Weight (Mass: 100 kg)	NIMT/2549/34	8/07
69	M-4/007*	Standard Weight (Mass: 500 kg)	NIMT/2549/34	8/07
70	M-4/008*	Standard Weight (Mass: 1000 kg)	NIMT/2549/34	8/07
71	EM-8/001*	Helmholtz Coil System & Power Supply	NIMT/2549/35	1/07
72	EM-8/003*	Zero Gauss Chamber	NIMT/2549/35	1/07
73	EM-8/005*	Electromagnet, Power Supply & Refrigerated Circulator	NIMT/2549/35	1/07
74	EM-8/016*	Fluxgate Magnetometer	NIMT/2549/35	1/07
75	EM-7/027***	Ar Laser Source (488.0/514.5 nm)	NIMT/2549/36	12/06

Remark: * Contract signing in the near future

** Not deliver yet

*** Wait for effective date from JBIC

Annex 13: Annual Budget Allocation of NIMT

Description of Budget Allocated for JICA Experts per FY 2005

No.	Description	Qty	Unit	Budget Price/Unit	Total Budget	Budget segment of FY 2005
1	Office equipment expenses (single payment)					
	- Employee Card	12	set	100.00	1,200.00	Administrative Work, Material and Expenditure Segment
	- Name Card	12	box	300.00	3,600.00	Administrative Work, Material and Expenditure Segment
	Total (1)				**4,800.00**	
2	Monthly expenses			Budget / Month	Budget FY 2005	(From October 2004 to September 2005)
	- Daily newspaper / Japanese Magazine	12	set	15,000.00	180,000.00	Administrative Work, Material and Expenditure Segment
	- Copy machine rental fee	12	set	10,000.00	120,000.00	Administrative Work, Material and Expenditure Segment
	- House keeper	12	pax	9,000.00	108,000.00	Administrative Work, Material and Expenditure Segment
	- Stationery	12	set	3,000.00	36,000.00	Administrative Work, Material and Expenditure Segment
	- Ink Catridge	12	set	2,500.00	30,000.00	Administrative Work, Material and Expenditure Segment
	- Postage charge	12	month	1,500.00	18,000.00	Administrative Work, Material and Expenditure Segment
	- Transparency / paper	12	set	1,000.00	12,000.00	Administrative Work, Material and Expenditure Segment
	- Battery	12	set	900.00	10,800.00	Administrative Work, Material and Expenditure Segment
	Total (2)				**514,800.00**	
	Grand total (1) + (2)				**519,600.00**	

Description of Budget Allocated for JICA Experts per FY 2006

No.	Description	Qty	Unit	Budget Price/Unit	Total Budget	Budget segment of FY 2006
1	Office equipment expenses (single payment)					
	- Employee Card	12	set	100.00	1,200.00	Administrative Work, Material and Expenditure Segment
	- Name Card	12	box	300.00	3,600.00	Administrative Work, Material and Expenditure Segment
	Total (1)				**4,800.00**	
2	Monthly expenses			Budget / Month	Budget FY 2006	(From October 2005 to September 2006)
	- Daily newspaper / Japanese Magazine	12	set	15,000.00	180,000.00	Administrative Work, Material and Expenditure Segment
	- Copy machine rental fee	12	set	10,000.00	120,000.00	Administrative Work, Material and Expenditure Segment
	- House keeper	12	pax	9,000.00	108,000.00	Administrative Work, Material and Expenditure Segment
	- Stationery	12	set	3,000.00	36,000.00	Administrative Work, Material and Expenditure Segment
	- Ink Catridge	12	set	2,500.00	30,000.00	Administrative Work, Material and Expenditure Segment
	- Postage charge	12	month	1,500.00	18,000.00	Administrative Work, Material and Expenditure Segment
	- Transparency / paper	12	set	1,000.00	12,000.00	Administrative Work, Material and Expenditure Segment
	- Battery	12	set	900.00	10,800.00	Administrative Work, Material and Expenditure Segment
	Total (2)				**514,800.00**	
	Grand total (1) + (2)				**519,600.00**	

Annex 14: Annual Budget Allocation for the Project from TICA

Description of Subsidy Budget Allocated for JICA Experts, Other Expenses Segment FY2005

Name of Expert & Position:
1. Dr. Y. AKIMOTO, Chief Advisor
2. Mr. J. MATSUDA, Standards on Physics
3. Dr. J. KINOSHITA, Standards on Electromagnetic
4. Dr. A. NOMURA, Standards on Chemical
5. Ms. I. NIIZEKI, Project Coordinator

Country: Japan

To be under: Ministry of Science and Technology,
National Institute of Metrology (Thailand)

Working duration: October 16, 2002 - October 15, 2007

Budget allocation duration: October 1, 2004 - September 30, 2005 (12 months)

Description	Approval Rate of Ministry of Finance	Request for Allocation from Implementing Agency	Allocation Approval
Remuneration			
- Housing Allowance - BKK & Regional			
- First 15 days	Per paid but not exceed 1,600 THB/day		
- 15 days after	Per paid but not exceed 10,000 THB/month		
- Housing Allowance - Regional			
- First 30 days	Per paid but not exceed 1,000 THB/day		
- 30 days after	Per paid but not exceed 8,000 THB/month		
- Medical Fee	Per paid but not exceed 5,000 THB/year		
Temporary Payroll			
- Payroll for 1st class Secretary	8,610 THB/month	516,600.00	516,600.00
Social Security Subsidy			
October - September 5%	431 THB/month	25,860.00	25,860.00
- Payroll for 2nd class Secretary	6,590 THB/month		
Social Security Subsidy			
October - September 5%	330 THB/month		
- Payroll for Typist	4,700 THB/month		
Social Security Subsidy			
October - September 5%	235 THB/month		
- Payroll for Driver	4,700 THB/month	282,000.00	282,000.00
Social Security Subsidy			
October - September 5%	235 THB/month	14,100.00	14,100.00
Expsenses			
Travelling Expenditure			
- Upcountry housing expense (Expert)	Per paid but not exceed 1,600 THB/day		
- Travelling per dium (Expert)	500 THB/day		
- Transportation expense (Expert)	Per paid		
- Upcountry housing expense (Secretary)	Per paid but not exceed 1,200 THB/day		
- Travelling per dium (Secretary)	180 THB/day		
- Transportation expense (Secretary)	Per paid		
- Upcountry housing expense (Driver)	Per paid but not exceed 800 THB/day		
- Travelling per dium (Driver)	120 THB/day		
- Transportation expense (Driver)	Per paid		

- Vehicle maintenance	Per paid but not exceed 5,000 THB/year		
- Postage Charge	Per paid but not exceed 1,000 THB/year		
- Treating expense	Rate per Regulations of Disbursement of Treating Expense for Foreign B.E. 2536		
Materials Expenses			
- Gasoline	Per paid but not exceed 36,000 THB/year	180,000.00	180,000.00
- Car Materials	Per paid but not exceed 5,000 THB/year	25,000.00	25,000.00
- Office materials	Per paid but not exceed 6,000 THB/year	30,000.00	30,000.00
Total		**1,073,560.00**	**1,073,560.00**
Grand total allocated from TICA			**805,170.00**

Remark:

1. TICA approves budget allocation 75% of amount of request.
2. Amount approved can be averaged with the expenses, but not exceed the rate approved by the Ministry of Finance in each category, without request for approval to TICA.
3. When the approved amount in each category is not enough, please request for allocation approval as well as disburse the rest amount.

Description of Subsidy Budget Allocated for JICA Experts, Other Expenses Segment FY 2006

Name of Expert & Position:
1. Dr. Y. AKIMOTO, Chief Advisor
2. Mr. J. MATSUDA, Standards on Physics
3. Dr. J. KINOSHITA, Standards on Electromagnetic
4. Dr. A. NOMURA, Standards on Chemical
5. Ms. I. NIIZEKI, Project Coordinator

Country: Japan

To be under: Ministry of Science and Technology,
National Institute of Metrology (Thailand)

Working duration: October 16, 2002 - October 15, 2007

Budget allocation duration: October 1, 2005 - September 30, 2006 (12 months)

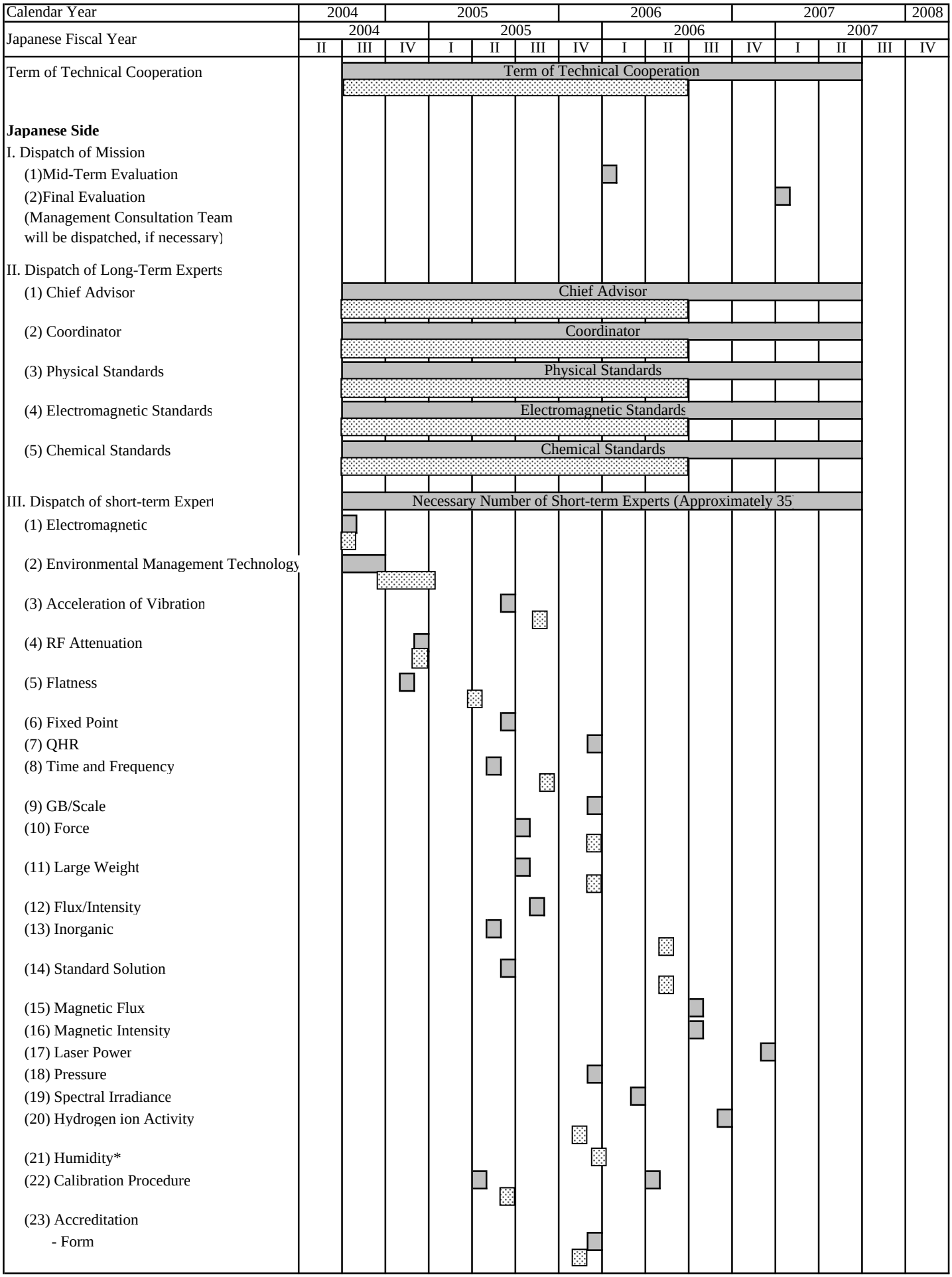
Description	Approval Rate of Ministry of Finance	Request for Allocation from Implementing Agency	Allocation Approval
Remuneration			
- Housing Allowance - BKK & Regional			
- First 15 days	Per paid but not exceed 1,600 THB/day		
- 15 days after	Per paid but not exceed 10,000 THB/month		
- Housing Allowance - Regional			
- First 30 days	Per paid but not exceed 1,000 THB/day		
- 30 days after	Per paid but not exceed 8,000 THB/month		
- Medical Fee	Per paid but not exceed 5,000 THB/year		
Temporary Payroll			
- Payroll for 1st class Secretary	10,350 THB/month	621,000.00	621,000.00
Social Security Subsidy			
October - September 5%	518 THB/month	31,080.00	31,080.00
- Payroll for 2nd class Secretary	7,730 THB/month		
Social Security Subsidy			
October - September 5%	387 THB/month		
- Payroll for Typist	5,610 THB/month		
Social Security Subsidy			
October - September 5%	281 THB/month		
- Payroll for Driver	5,610 THB/month	336,600.00	336,600.00
Social Security Subsidy			
October - September 5%	281 THB/month	16,860.00	16,860.00
Expsenses			
Travelling Expenditure			
- Upcountry housing expense (Expert)	Per paid but not exceed 1,600 THB/day		
- Travelling per dium (Expert)	500 THB/day		
- Transportation expense (Expert)	Per paid		
- Upcountry housing expense (Secretary)	Per paid but not exceed 1,200 THB/day		
- Travelling per dium (Secretary)	180 THB/day		
- Transportation expense (Secretary)	Per paid		

- Upcountry housing expense (Driver)	Per paid but not exceed 800 THB/day		
- Travelling per dium (Driver)	120 THB/day		
- Transportation expense (Driver)	Per paid		
- Vehicle maintenance	Per paid but not exceed 5,000 THB/year		
- Postage Charge	Per paid but not exceed 1,000 THB/year		
- Treating expense	Rate per Regulations of Disbursement of Treating Expense for Foreign B.E. 2536		
Materials Expenses			
- Gasoline	Per paid but not exceed 36,000 THB/year	180,000.00	180,000.00
- Car Materials	Per paid but not exceed 5,000 THB/year	25,000.00	25,000.00
- Office materials	Per paid but not exceed 6,000 THB/year	30,000.00	30,000.00
Total		**1,240,540.00**	**1,240,540.00**
Grand total allocated from TICA			**930,405.00**

Remark:

1. TICA approves budget allocation 75% of amount of request.
2. Amount approved can be averaged with the expenses, but not exceed the rate approved by the Ministry of Finance in each category, without request for approval to TICA.
3. When the approved amount in each category is not enough, please request for allocation approval as well as disburse the rest amount.

Annex 15: Tentative Schedule of Implementation



Calendar Year	2004		2005				2006				2007				2008
Japanese Fiscal Year	2004		2005				2006				2007				
	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Term of Technical Cooperation	Term of Technical Cooperation														
- Thermometry															
- Time and Frequency															
- Vibration															
- Dimension															
- Resistance															
- RF Standard															
- Photometry															
- Force															
- Pressure															
IV. Training of C/P Personnel in Japan	Max. 10 persons during the Project														
(1) QHR															
(2) GB/Scale															
(3) Large Weight															
(4) Flux/Intensity															
(5) Spectral Irradiance															
(6) Pressure															
(7) Magnetic															
(8) Laser Power															
(9) Standard Gas															
(10) Chemical Analysis															
(11) Environment Management Technology*															
(12) Mass*															
(13) Watt Hour*															
Thai side															
I. Building and Facilities															
II. Machinery and Equipment															
III. Allocation of C/P Personnel and Necessary Staff															
IV. Allocation of Budget															

: Plan
: Actual
Note : *Additional quantities by NIMT's request

Annex 16: List of Dispatched Japanese Experts

		Japanese Fiscal Year	2002												2003												2004												2005												2006											
		Month	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	Term of Cooperation																																																											
	Term of Technology Transfer																																																											
EXPERTS	Mission Team																																																										
	Long-Term Experts																																																											
	Chief Advisor																																																											
	Coordinator																																																											
	Physical Standards																																																											
	Electromagnetic Standards																																																											
	Electromagnetic Standards																																																											
	Chemical Standards																																																											
	Short-Term Experts																																																											
	Improving the confidence of National Measurement Standards																																																										
	Radiation Thermometry																																																											
	Plug and Ring																																																											
	Roundness																																																											
	Wavelength																																																											
	Acoustics																																																											
	Hardness																																																											
	Environment Management																																																											
	AC Power																																																											

Dr. Yoshiaki Akimoto (Oct. 16, 2002-Oct. 15, 2007)

Ms. Ikuko Niizeki (Oct. 16, 2002-Oct. 15, 2006)

Mr. Jiro Matsuda (Oct. 16, 2002-Oct. 15, 2006)

Mr. Kiyohide Yonesu (Oct. 16, 2002-Oct. 31, 2004)

Dr. Joji Kinoshita(Oct. 16, 2004 - Oct. 15, 2007)

Dr. Akira Nomura (Oct. 16, 2004 - Oct. 15, 2007)

Mr. Norio Ishizaki (Dec.15, 2002–Dec.20, 2002)

Dr. Katsuo Seta (Dec.15, 2002–Dec.20, 2002)

Dr. Fumihiro Sakuma (Jan.20, 2003-Feb.12, 2003)

Mr. Kazuo Tomiyama (Jan.20, 2003-Feb.15, 2003)

Mr. Yuji Wakabayashi (Feb.4, 2003-Mar 4, 2003)

Mr. Jun Ishikawa (Mar.10, 2003-Apr.5, 2003)

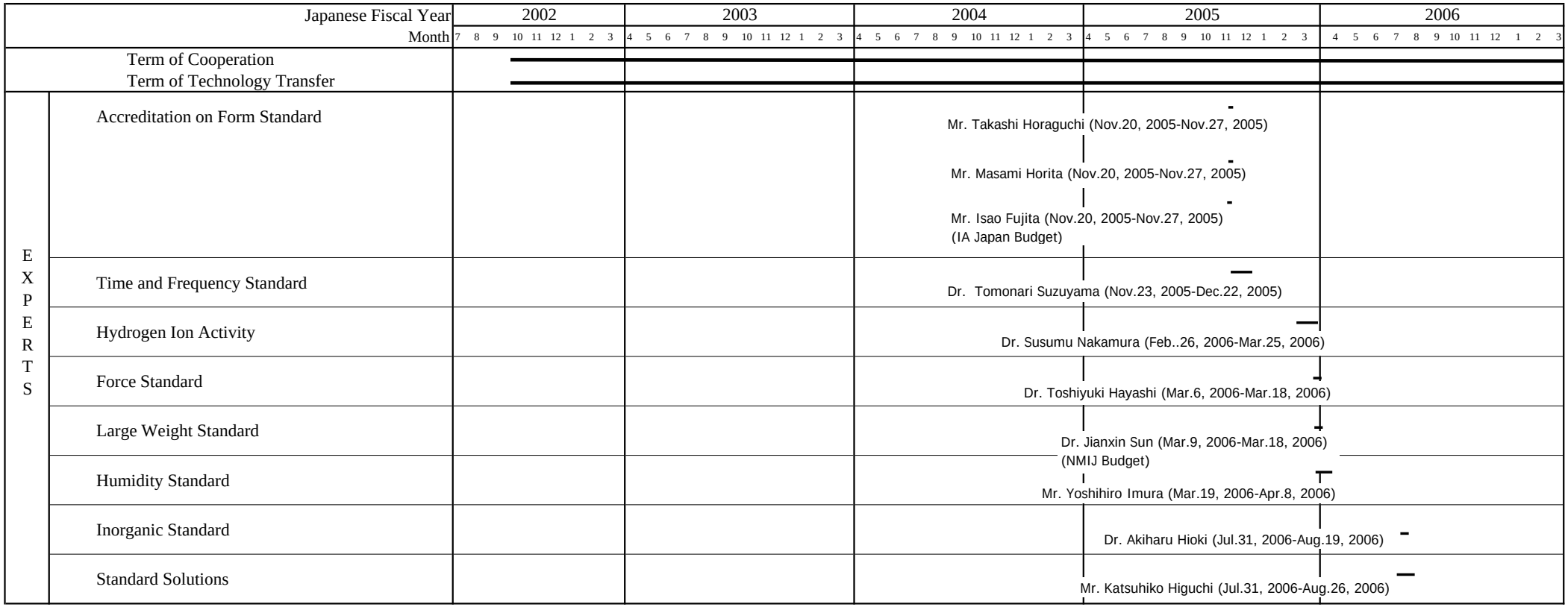
Mr. Hiroaki Nomura (Mar.17, 2003-Apr.12, 2003)

Mr. Hajime Ishida (Apr.10, 2003-May 8, 2003)

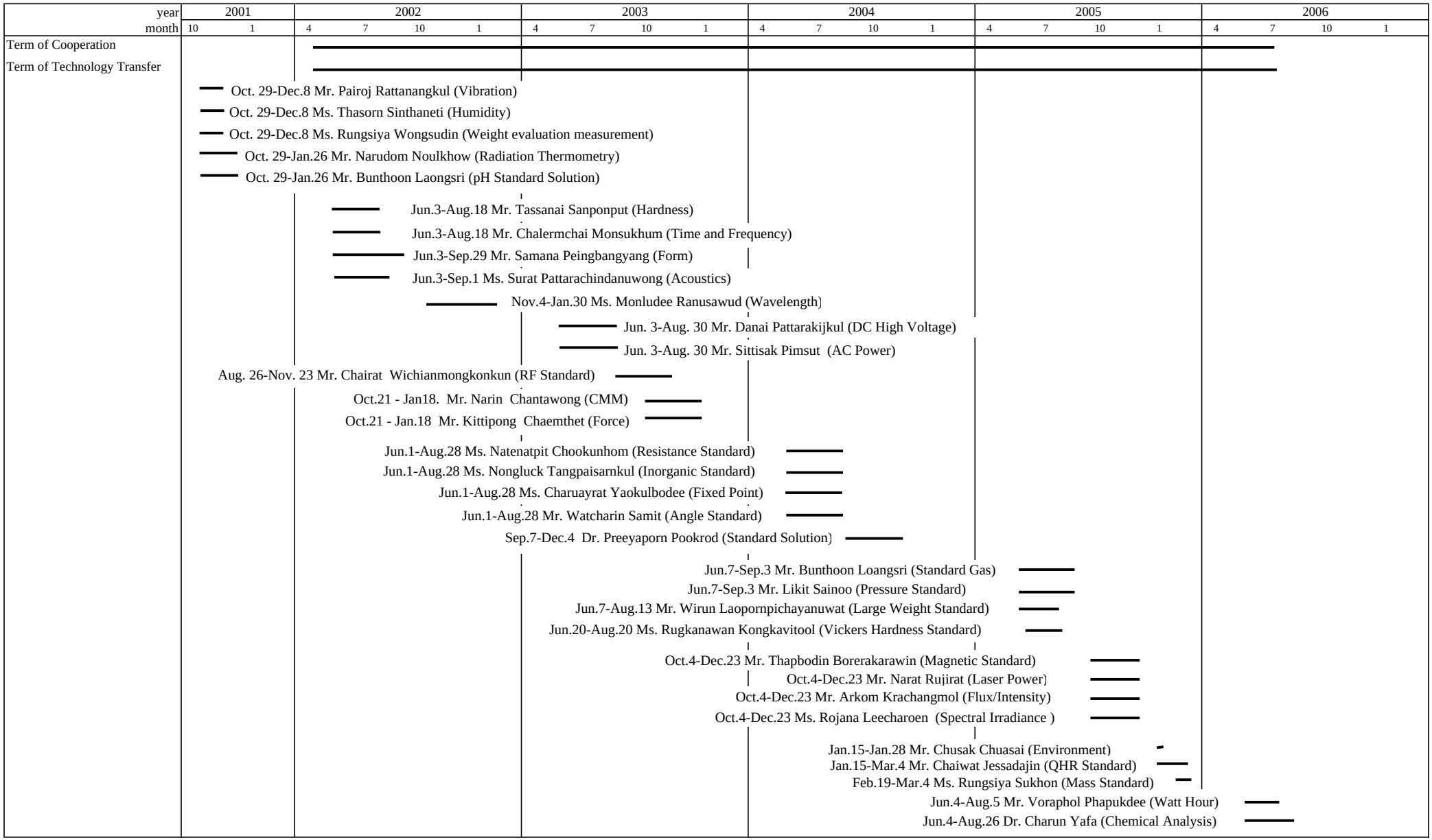
Mr. Joichi Yokota (Aug.29, 2003-Dec.27, 2003)

Mr.Masao Yamawaki (Nov. 25, 2003-Dec.19, 2003)

		Japanese Fiscal Year	2002	2003	2004	2005	2006
		Month	7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3
		Term of Cooperation					
		Term of Technology Transfer					
EXPERTS	Improving the confidence of National Measurement Standards			Ms. Hiromi Murata (Jan.18, 2004-Jan.24, 2004) Dr. Atsushi Onae (Jan.18, 2004-Jan.28, 2004) Mr. Takeshi Fujimori (Jan.18, 2004-Jan.30, 2004)			
	DC High Voltage			Mr.Tomeji Iguchi (Feb. 2, 2004-Feb. 27, 2004)			
	Calibration Procedure			Mr. Ichiro Fujima (Feb. 15, 2004-Feb. 21, 2004)			
	CMM			Dr. Sonko Osawa (Feb. 22, 2004-Mar. 20, 2004)			
	RF Power/Voltage			Ms. Keiko Sato (Mar.7, 2004-Apr.24, 2004)			
	Humidity			Dr. Chiharu Takahashi (Apr.4, 2004-Apr.12, 2004)			
	Roughness			Dr. Kazuya Naoi (Aug.3, 2004-Aug.24, 2004)			
	Calibration Procedure			Mr. Keisaburo Kano (Sep.1, 2004-Sep.30, 2004)			
	Improving the confidence of National Measurement Standards			Mr. Eizo Yamasaki (Sep.27, 2004-Oct.1, 2004) Dr. Koichiro Hattori (Sep.27, 2004-Oct.1, 2004)			
	Environment Management			Mr. Joichi Yokota (Dec.16, 2004-Apr.15, 2005)			
	Angle Standard			Dr. Tsukasa Watanabe (Jan. 19, 2005-Feb. 18, 2005)			
	RF Attenuation			Mr. Shigeru Igarashi (Feb. 28, 2005-Mar. 30, 2005)			
	Surveillance on Wavelength Standard and Acoustics Standard				Mr. Hiromi Ishige (Jun.9, 2005-Jun.17, 2005)		
	Flatness Standard				Dr. Toshiyuki Takatsuji (Jun.26, 2005-Jul.21, 2005)		
	Calibration Procedure				Dr. Tsukasa Watanabe (Sep.12, 2005-Oct.1, 2005)		
	Acceleration of Vibration Standard				Mr. Akihiro Ota (Nov.6,2005-Dec.3, 2005)		


Japanese Fiscal Year
2002
2003
2004
2005
2006
Month
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3
Term of Cooperation
Term of Technology Transfer
EXPERTS
Accreditation on Form Standard
Mr. Takashi Horaguchi (Nov.20, 2005-Nov.27, 2005)
Mr. Masami Horita (Nov.20, 2005-Nov.27, 2005)
Mr. Isao Fujita (Nov.20, 2005-Nov.27, 2005)
(IA Japan Budget)
Time and Frequency Standard
Dr. Tomonari Suzuyama (Nov.23, 2005-Dec.22, 2005)
Hydrogen Ion Activity
Dr. Susumu Nakamura (Feb..26, 2006-Mar.25, 2006)
Force Standard
Dr. Toshiyuki Hayashi (Mar.6, 2006-Mar.18, 2006)
Large Weight Standard
Dr. Jianxin Sun (Mar.9, 2006-Mar.18, 2006)
(NMIJ Budget)
Humidity Standard
Mr. Yoshihiro Imura (Mar.19, 2006-Apr.8, 2006)
Inorganic Standard
Dr. Akiharu Hioki (Jul.31, 2006-Aug.19, 2006)
Standard Solutions
Mr. Katsuhiko Higuchi (Jul.31, 2006-Aug.26, 2006)

Annex 17: List of the C/P Trained in Japan



Annex 18: List of Calibration Procedure

	Quantity	Name of C/P	Status	Remarks
1	Plug/Ring	Mr. Samana	Provided	Assessed in Nov. 2005
2	Radiation Thermometry	Mr. Narudom	Provided	
3	Roundness	Mr. Samana	Provided	Assessed in Nov. 2005
4	Wavelength	Ms. Monludee	Provided	Assessed in Jan. 2004
5	Acoustics	Ms. Surat	Provided	Assessed in Jan. 2004
6	Hardness	Mr. Tassanai	Provided	Assessed in Sep. 2004
7	AC Power	Mr. Sittisak	Provided	
8	DC High Voltage	Mr. Danai	Provided	
9	CMM	Mr. Narin	In Process	
10	RF Power/Voltage	Mr. Chairat	Provided	
11	Humidity	Ms. Thasorn	In Process	
12	Roughness	Mr. Samana	Provided	Assessed in Nov. 2005
13	Angle	Mr. Watcharin	Provided	Assessed in Nov. 2005
14	RF Attenuation	Mr. Chairat	In Process	
15	Flatness	Mr. Muhummad	Provided	Assessed in Nov. 2005
16	Vibration	Mr. Pairoj	Provided	
17	Time and Frequency	Mr. Somchai	Provided	
18	Hydrogen Ion Activity	Ms. Nongluck	Provided	
19	Force	Mr. Kittipong	In Process	
20	Large Weight	Mr. Wirun	In Process	
21	Inorganic	Ms. Nongluck	In Process	
22	Standard Solutions	Dr. Preeyaporn	In Process	

Annex 19: Allocation of Points for "Skill After Training" in Evaluation Sheet of Technical Transfer

In the Mid-term Evaluation of the Project (Phase 2), the point for "skill after training" was rated based on the following rules.

1. Standard Establishment
   + 0.5 point if completed up to the estimation of Budget Sheet
   +0.5 point if comparison has been undertaken with a disinterested party

2. Calibration Technology
   +0.5 point if completed up to the estimation of Uncertainty
   +0.5 point if the Calibration Procedure has been provided

3. Accreditation
   +0.5 points if the assessment for accreditation has been undertaken

These points were added to the points of "skill before training" assessed by the long-term experts of the Project.

Remarks:
- For the quantities whose point before training was more than 2.0, 0.5 point was subtracted for adjustment.
- Some quantities which had problems after the training was subtracted 0.5 point.

Annex 20: Evaluation Sheet on Technical Transfer

Quantity		Plug/Ring	Radiation	Roundness	Wavelength	Acoustics	Hardness	AC Power	DC High Volt
Name of Counterpart (C/P)		Mr. Samana	Mr. Narudom	Mr. Samana	Ms. Monludee	Ms. Surat	Mr. Tassanai	Mr. Sittisak	Mr. Danai
Skill	Before training				1	2	0.5	2	1.5
	After training				3.5	3	3	2.5*	3
Name of Short term expert		Mr. Tomiyama	Dr. Sakuma	Mr. Wakabayashi	Mr. Ishikawa	Mr. Nomura	Mr. Ishida	Mr. Yamawaki	Mr. Iguchi
Period for Transfer		2003-Jan	2003-Jan	2003-Feb	2003-Mar	2003-Mar	2003-Apr	2003-Nov	2004-Feb
Standard Establishment									
Installation		Done	Done	Done	Done	Done	Done	Done	Done
Operation		Done	Done	Done	Done	Done	Done	Done	Done
Evaluation	Stability	Measured	Measured	Measured	Measured	Measured	Measured	Measured	Measured
	Repeatability	Measured	Measured	Measured	Measured	Measured	Measured	Measured	Measured
	Comparison	JQA	NMIJ	NML	NMIJ.SIRIM	NMIJ	NMIJ.VMI	JEMIC	JEMIC
Budget Sheet		Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated
Calibration Technology									
Installation		Done	Done	Done	Done	Done	Done	Done	Done
Operation		Done	Done	Done	Done	Done	Done	Done	Done
Evaluation	Stability	Measured	Measured	Measured	Measured	Measured	Measured	Measured	Measured
	Repeatability	Measured	Measured	Measured	Measured	Measured	Measured	Measured	Measured
	Calibration Service	Started	Started	Started	Started	Started	Started	Started	Started
Uncertainty		Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated
Calibration Procedure (CP)		Provided	Provided	Provided	Provided	Provided	Provided	In process	Provided
Accreditation		Assessed in Nov. 2005*	In process	Assessed in Nov. 2005*	Assessed in Jan. 2004	Assessed in Jan. 2004	Assessed in Sept. 2004*	In process	In process
Seminar	Number of Participant	46	29	21	72	38	123	107	184
Remarks			C/P: Overseas	CP: Revised	APMP LK-11*	APMP KC*	APMP CCM.H-S1*		

*: Additional information

Quantity		CMM	RF Power	RF Voltage	Roughness	Angle	RF Att	Flatness	Resistance
Name of Counterpart (C/P)		Mr. Narin	Mr. Chairat	Mr. Chairat	Mr. Samana	Mr. Watcharin	Mr. Chairat	Mr. Muhammad	Ms. Natenapit
Skill	Before training	0.5	1	1	1	1.5	0.5	2	1.5
	After training	2.0	2.5	2.5	3.0	3.5	1.5	4.0	3.0
Name of Short term expert		Dr. Oosawa	Ms. Sato	Ms. Sato	Dr. Naoi	Dr. Watanabe	Mr. Igarashi	Dr. Takatsuji	Dr. Kinoshita
Period for Transfer		2004-Feb	2004-Mar	2004-Mar	2004-Aug	2005-Jan	2005-Feb	2005-Jun	2004-Nov
Standard Establishment									
Installation		Done	Done	Done	Done	Done	Done	Done	Done
Operation		Done	Done	Done	Done	Done	Done	Done	Done
Evaluation	Stability	Measured	Measured	Measured		Measured	Measured	Measured	Measured
	Repeatability	Measured	Measured	Measured	Measured	Measured	Measured	Measured	Measured
	Comparison	NMIJ	JQA	JQA	NMIJ	NMIJ	JQA	NMIJ	BIPM
Budget Sheet		Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated
Calibration Technology									
Installation		Done	Done	Done	Done	Done	Done	Done	Done
Operation		Done	Done	Done	Done	Done	Done	Done	Done
Evaluation	Stability	Measured	Measured	Measured		Measured	Measured	Measured	Measured
	Repeatability	Measured	Measured	Measured	Measured	Measured	Measured	Measured	Measured
	Calibration Service	Started	Started	Started	Started	Started	Started	Started	Started
Uncertainty		Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated
Calibration Procedure (CP)		In process	Provided	Provided	Provided	Provided	In process	Provided	Provided
Accreditation		In process	In process	In process	Assessed in Nov. 2005	Assessed in Nov. 2005	In process	Assessed in Nov. 2005	In process
Seminar	Number of Participant	184	76	76	61	73	78	45	76
Remarks		APMP LK-5 and LK-6				APMP LK-3			

Quantity		Vib/Accel	Time/Freq	pH	Force	Large Mass	Humidity	Stand Solution	Inorganic
Name of Counterpart (C/P)		Mr. Pairoj	Mr. Somchai	Ms. Nongluck	Mr. Kittipong	Mr. Wirun	Ms. Thasorn	Dr. Preeyaporn	Ms. Nongluck
Skill	Before training	1	3	2	1	2	2	2	1.5
	After training	2.5	4.0	3.5	2.0	3.0	3.0	2.5	2.0
Name of Short term expert		Mr. Ohta	Dr. Suzuyama	Dr. Nakamura	Dr. Hayashi	Dr. Sun	Mr. Imura	Mr. Higuchi	Dr. Hioki
Period for Transfer		2005-Nov	2005-Nov	2006-Feb	2006-Mar	2006-Mar	2006-Mar	2006-Jul	2006-Jul
Standard Establishment									
Installation		Done	Done	Done	Done	Done	Done		
Operation		Done	Done	Done	Done	Done	Done		
Evaluation	Stability	Measured	Measured	Measured	Measured	Measured	Measured		
	Repeatability	Measured	Measured	Measured	Measured	Measured	Measured		
	Comparison		NMIJ	NML	On planning	On planning			
Budget Sheet		Estimated	Estimated	Estimated	Estimated	Estimated	Estimated		
Calibration Technology									
Installation		Done	Done	Done	Done	Done	Done	Done	Done
Operation		Done	Done	Done	Done	Done	Done	Done	Done
Evaluation	Stability	Measured	Measured	Measured	Measured	Measured	Measured	Not yet	Not yet
	Repeatability	Measured	Measured	Measured	Measured	Measured	Measured	Not yet	Not yet
	Calibration Service	Started	Started	Started	Started	Started	Started	Not yet	Started
Uncertainty		Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated
Calibration Procedure (CP)		Provided	Provided	Provided	In process	In process	In process	In process	In process
Accreditation		In process	In process	In process	In process	In process	In process	No Plan	No Plan
Seminar	Number of Participant	48	40	96	None	None	44	57	57
Remarks				APMP QM-P06, P09	BC-NMIJ	BC-NMIJ			

Annex 21: Record of Seminars

No.	Date	Measurement Quantity	Short-Term Expert	Counterpart	Title	No. of Participant
1	Feb. 11, 2003	Radiation Thermometer Standard	Dr. Fumihiro SAKUMA	Mr. Narudom Noulkow	Seminar on Measurement Standards and Calibration Service 1. Radiation Thermometer and Calibration in Japan : Dr. Sakuma 2. Establishment of Radiation Thermometer Standards in Thailand : Mr. Narudom	29 persons
2	Feb. 13, 2003	Plug and Ring Standard	Mr.Kazuo TOMIYAMA	Mr. Samana Piengbangyang	Seminar on Measurement Standards and Calibration Service 1. Japanese Traceability system of Diameter Standard: Mr. Tomiyama 2.Calibration of Ring Gauge using Optical Inner Diameter Measuring : Mr. Samana	46 persons
3	Feb. 28, 2003	Roundness Standard	Mr. Yuji WAKABAYASHI	Mr. Samana Piengbangyang	Seminar on Measurement Standards and Calibration Service 1. Current Situation of Roundness Measurement : Mr. Wakabayashi 2. Calibration of Roundness Tester using Indexing Table : Mr. Samana	21 persons
4	Apr. 2, 2003	Wavelength Standard	Mr. Jun ISHIKAWA	Ms.Monludee Ranusawat	Seminar on Measurement Standards and Calibration Service 1. Current Situation of Wavelength Standard in National Metrology Institute : Mr. Ishikawa 2. Establishment of Length Standard and Traceability system in Thailand : Mr. Anusorn 3. Establishment of Wavelength Standard and Uncertainly measurement of Iodine Stabilization He-Ne Laser : Ms. Monludee	72 persons
5	Apr. 9, 2003	Acoustics Standard	Mr. Hiroaki NOMURA	Miss Surat Pattarachindanuwong	Seminar on Measurement Standards and Calibration Service 1. Technical Transfer to NIMT on Acoustics : Mr. Nomura 2. Verification of SLM and Sound Clibration : Miss Surat	38 persons
6	May 6, 2003	Hardness Standard	Mr. Hajime ISHIDA	Mr. Tassanai Sanponpute	Seminar on Measurement Standards and Calibration Service 1. Rockwell Hardness Measurement and Calibration : Mr.Ishida 2. Rockwell Traceability System of Thailand: Mr. Tassanai	19 persons
7	May 7, 2003	Hardness Standard	Mr. Hajime ISHIDA	Mr. Tassanai Sanponpute	Seminar on Measurement Standards and Calibration Service 1. Rockwell Hardness Measurement and Calibration : Mr.Ishida 2. Rockwell Traceability System of Thailand: Mr. Tassanai	104 persons
8	Dec. 12, 2003	AC Power and Calibration	Mr. Masao YAMAWAKI	Mr. Sittisak Pimsut	Seminar on Measurement Standards and Calibration Service 1. Current Situation of AC Power Standard in JEMIC : Mr. Yamawaki 2. AC Power Calibration Method in JEMIC: Mr. Sittisak	107 persons

No.	Date	Measurement Quantity	Short-Term Expert	Counterpart	Title	No. of Participant
9*	Jan.27, 2004	Acoustics Standard	Mr. Takeshi FUJIMORI	Ms. Surat Pattarachindanuwong	Seminar on Measurement Standards and Calibration Service 1. Current Situation of Acoustics Standard in Japan : Mr. Fujimori 2. Acoustics Standard and Calibration Service in Thailand : Mr. Virat 3. Calibration Technique of Sound Level Meter and Acoustical Calibrator at NIMT : Ms. Surat	50 persons
10*	Jan.27, 2004	Wavelength Standard	Mr. Jun ISHIKAWA	Ms. Monludee Ranusawud	Seminar on Measurement Standards and Calibration Service 1. Length Standard today : Mr. Ishikawa 2. The Open Laser Project : Mr. Ishikawa 3. Calibration Technique of Wavelength Standard in NIMT : Ms. Monludee 4. Calibration Service of Gauge Block in Thailand : Mr. Anusorn	191 persons
11*	Feb. 24, 2004	Geometrical Standard	Dr. Sonko OSAWA	Mr. Narin Chanthawong	Seminar on Measurement Standards and Calibration Service 1. Dimensional Metrology in NMIJ : Dr. Osawa 2. Gauge Calibration Technique Using a CMM : Dr. Osawa 3. Calibration Techniques of Gear Wheel Using CMM in NIMT: Mr. Narin 4. Calibration Service of CMM in Thailand : Mr. Anusorn	184 persons
12*	Feb. 24, 2004	DC High Voltage Standard	Mr. Tomeji IGUCHI	Mr. Danai Pattarakijkul	Seminar on Measurement Standards and Calibration Service 1. Current Situation of DC High Voltage Standard in Japan : Mr. Iguchi 2. Traceability of DC Voltage up to 1kV in Thailand : Ms. Ajchara 3. Calibration Technique of DC High Voltage Standard in NIMT : Mr. Danai	83 persons
13	Apr. 22, 2004	RF/Microwave Measurement Standards	Ms. Keiko SATO	Mr. Chairat Wichianmongkonkul	Seminar on Measurement Standards and Calibration Service 1. RF Power and RF Voltage Traceability system in JQA : Ms. Sato 2. RF&Microwave Measurement Fundamentals : Ms. Sato 3. Calibration Technique of RF Power and Calibration Services at NIMT : Mr. Chairat	76 persons
14	Aug. 20,2004	Roughness Standard	Dr. Kazuya NAOI	Mr. Samana PhengBangyang	Seminar on Measurement Standards and Calibration Service 1. Trend of Calibration Technique for Surface Texture Measurement Standards : Dr. Naoi 2. Establishment of Roughness Standard and Calibration Service in NIMT : Mr. Samana 3. Roughness Calibration in NIMT : Mr. Muhummad	61 persons
15	Sep. 23-24, 2004	Calibration Procedure	Mr. Keisaburo KANO		Seminar on Introduction to Accreditation 1. What is Accreditaion 2. Outline of ISO/IEC 17025	78 persons

No.	Date	Measurement Quantity	Short-Term Expert	Counterpart	Title	No. of Participant
16*	Jan. 26, 2005	ASEAN Seminar			Plenary lecture 1. JQA Activities for Promoting Industries : Mr. Yamasaki 2. Harmonization of Hardness Standards in the World : Mr. Takagi 3. How to Strengthen Metrology in Chemistry System in ASEAN :Dr.Chainarong 4. World Trends of Resistance Standard : Dr. Kinoshita 5. Metrology Demands for ASEAN and APMP DEC : Dr. Pian 6. Current Situation of JICA/NIMT Project : Dr. Akimoto 7. Importance of the Measurement and Intellectual Infrastructure in Modern Society : Ms. Nakamura	287 persons
17*	Jan. 26, 2005	Hardness Standard	Mr. Satoshi TAKAGI	Mr. Tassanai Sanponpute Ms. Rugkanawan Wongpithayadisai Mr. Montree Pakkratoke Dr. Khanchai Kosonthongkee	Seminar and Workshop on Measurement Standards and Calibration Service 1. Verification of Indenters for Hardness Standards : Mr. Takagi 2. Calibration Service of Hardness Standard in Vietnam : Mr. Sanh Vo 3. Establishment of Hardness standard in Thailand : Mr. Veera	74 persons
18*	Jan. 26, 2005	Chemical Standard	Dr. Akira NOMURA	Dr. Preeyaporn Pookrod Mr. Bunthoon Loangsri Ms. Nongluck Tangpaisarnkul	Seminar and Workshop on Measurement Standards and Calibration Service 1. Metrology in Chemistry and Certified Reference Materials : Dr. Nomura 2. Calibration Service of Chemical Standard in Malaysia : Mr. Khirul Anuar Mohd 3. DISM Activities in Laos : Mr. Singsonexay Viengkham 4. Recent Activities of Metrology in Chemistry in NIMT: Dr. Preeyaporn	101 persons
19*	Jan. 26, 2005	Resistance Standard	Dr. Joji KINOSHITA	Ms. Natenapit Chookunhom	Seminar and Workshop on Measurement Standards and Calibration Service 1. Dissemination of DC Resistance Standards inThailand : Mrs. Ajchara 2. SPRING Singapore Resistance Standards Calibration Service : Mr. Ang Chee Kiang 3. Calibration Service of Resistance Standard in Vietnam :Mr. Dien Khac Tran 4. How to Maintain Group of 1 Ohm Standard : Ms. Natenapit	76 persons
20	Feb. 16, 2005	Angle Standard	Dr. Tsukasa WATANABE	Mr. Wacharin Samit	Seminar on Measurement Standards and Calibration Service 1. Angle Standard Present condition of National Institute of Metrology (NMI) : Dr. Watanabe 2. Angle Traceability System in Japan : Dr. Watanabe 3. Autocollimator Calibration System at NMIJ : Dr. Watanabe 4. Rotary Encoder Calibration System at NMIJ : Dr. Watanabe 5. The Calibration Method of Polygon Mirror : Mr. Wacharin 6. The Calibration Method of Angle Gauge Block : Mr. Wacharin 7. Angle Measurement with a Sine Bar : Mr. Wacharin 8. Angle Traceability System in Thailand : Mr. Anusorn	73 persons

No.	Date	Measurement Quantity	Short-Term Expert	Counterpart	Title	No. of Participant
21	Mar. 28, 2005	RF Attenuation	Mr. Shigeru IGARASHI	Mr. Chairat Wichianmongkonkun	Seminar on Measurement Standards and Calibration Service 1. The Handling Method in High Frequency Equipments : Mr. Igarashi 2. Calibration Service of RF Attenuation in JQA : Mr. Igarashi 3. Calibration Techniques and Uncertainty of RF Attenuation Measurement : Mr. Chairat	78 persons
22	Jul. 18, 2005	Flatness Standard	Dr. Toshiyuki TAKATSUJI	Mr. Muhummad Madden	Seminar on Measurement Standards and Calibration Service 1. World Trend of Flatness Standard: Dr. Takatsuji 2. Establishment of flatness standard by measure of relative methods: Dr. Takatsuji 3. Application of Interferometer techniques to metrology: Mr. Anusorn 4. Establishment for Thailand flatness standard: Mr. Muhummad	45 persons
23*	Nov. 30, 2005	ASEAN Seminar			Plenary lecture 1. Development and maintenance of Measurement Stadnards-Today and Future in Japan: Ms. Nakamura 2. Recent Activity of CCL: Dr. Matsumoto 3. "e-trace" New Dissemination System for Measurement Standards: Dr. Yoshida 4. World Trends of Vibration and Acceleration Standard: Mr. Ota 5. World Trends of Time and Frequency Standard: Dr. Suzuyama 6. Compact, Low-cost, and Programmable Josephson Voltage Standards System : Dr. Shoji 7. How to make ASEAN Measurement Recognizable: Dr. Pian	183 persons
24*	Nov. 30, 2005	e-trace	Dr. Haruo YOSHIDA Dr. Hitoshi SASAKI	Mr. Chalit Kumtawee	Seminar and Workshop on Measurement Standards and Calibration Service 1. Josephson Voltage Standard for "e-trace": Dr. Yoshida 2. Compact Primary AC-DC Transfer Standard for e-trace Calibration: Dr. Sasaki 3. International Comparison of AC/DC transfer Standard: Mr. Chalit	84 persons
25*	Nov. 30, 2005	Time and Frequency Standard	Dr. Tomonari SUZUYAMA	Mr. Somchai Nuamsettee	Seminar and Workshop on Measurement Standards and Calibration Service 1. Frequency Remote Calibration using GPS Common View Method at NMIJ :Dr. Suzuyama 2. Time and Frequency Activities at NML, SIRIM Berhad, Malaysia: Mr. Ahmad Sahar 3. Time Transfer in Thailand: Mr. Somchai	40 persons
26*	Nov. 30, 2005	Vibration and Acceleration Standard	Mr. Akihiro OTA	Mr. Pairoj Rattanangkul	Seminar and Workshop on Measurement Standards and Calibration Service 1. Recent Progress of Vibration and Acceleration Standard in Japan: Mr. Ota 2. Vibration Standards and Calibration Services, SPRING Singapore :Mr. Chan Chee Keong 3. Vibration Standards and Calibration Services of Vibration in Thailand: Mr. Virat	48 persons
27	Mar. 23, 2006	pH Standard	Dr. Susumu NAKAMURA	Ms. Nongluck Tangpaisarnkul	Seminar on pH Measurement 1. Development of Metrology for pH Measurement in Thailand: Dr. Chainarong 2. Measurement of Hydrogen Ion Activity using the Harned Cell: Dr. Nakamura 3. How to Measure pH Value Accurately by Secondary Methods: Dr. Nakamura 4. pH Meter Calibration: Ms. Nongluck	96 persons

No.	Date	Measurement Quantity	Short-Term Expert	Counterpart	Title	No. of Participant
28	Apr. 3, 2006	Humidity Standard	Mr.Yoshihiro IMURA	Ms. Thasorn Sinhaneti	Seminar on Humidity Measurement 1. Two - Pressure Generator Standard : Mr. Imura 2. Hygrometer Calibration in Thailand : Ms. Thasorn	44 persons
29	Aug. 18, 2006	Inorganic and Organic Standard Solutions	Dr. Akiharu HIOKI	Ms. Nongluck Tangpaisarnkul	Seminar on Inorganic and Organic Standard Solutions 1. Metrology in Chemistry in Thailand - Past, Present and Future : Dr. Chainarong 2. Overview and International Situation on Elemental Standard Solutions and Titrimetry : Dr. Hioki 3. Practice on Elemental Standard Solutions at NIMT : Ms. Nongluck	57 persons
30	Aug. 18, 2006	Inorganic and Organic Standard Solutions	Mr. Katsuhiko HIGUCHI	Dr. Preeyaporn Pookrod	Seminar on Inorganic and Organic Standard Solutions 1. Overview and International Standard on Organic Standard Solutions and Chromatography : Mr. Higuchi 2. Practice on Organic Standard Solutions at NIMT : Dr. Preeyaporn	57 persons

Remark:

* ASEAN Seminar

Annex 22: Record of Joint Training

List of Participants for 1st Joint Training on Measurement Standards in Thailand

No.	Countries	Details of Participants			Standard		
					Dimensional		Chemical
		Name-Surname	Position	Age	Basic	Advance	
1.	Cambodia	Mr. SEA KIMHOUN	Deputy Chief	36			√
2.	Cambodia	Mr. CHOU BUNSEANG	Official	36	√		
3.	India	Dr. Nahar Singh	Scientist-B	38			√
4.	India	Mr. Shri M. Arif Sanjid	Technical Assistant	29		√	
5.	Indonesia	Mr. Nurul ALFIYATI	Staff of Length Lab.	28	√		
6.	LAO PDR	Mr. Oneta SULITHONE	Director, DISM, STEA	41	√		
7.	LAO PDR	Mr. Khamphay PHOUMANIVONG	Official analysis	41			√
8.	Malaysia	Mr. Khirul Anuar bin Mohd. Amin	Associate Metrologist	29			√
9.	Malaysia	Mr. Razman bin Mohd. Halim	Associate Metrologist	26	√		
10.	Mongolia	Ms. Lkhagvasuren Zoljargal	Researcher	27			√
11.	Myanmar	Dr. WAR WAR	Principal Scientist	32			√
12.	Myanmar	Dr. THAN THAN SOE	Principal Scientist	33		√	
13.	Nepal	Mr. Shailessh Kumar Jha	Chemist	36			√
14.	Pakistan	Mr. Zahid Mahmood	Scientific Officer	30			√
15.	Pakistan	Mr. MUHAMMAD SHAMSHAD	Senior Officer	33	√		
16.	Philippines	Ms. MA. THERESA E. EMPLEO	Science Research Specialist	28		√	
17.	Singapore	Dr. Wang Shihua	Senior Metrologist	39		√	
18.	Sri Lanka	Mrs. R.A.R.W. Rajamanthri	Experimental Officer	35			√
19.	Vietnam	Mr. TONG CONG DUNG	Staff of Length Lab.	24	√		
20.	Vietnam	Mr. NGUYEN TRUONG CHINH	Staff of Physical Chemical Lab.	28			√
21.	Thailand	Mr. Kitti Singson	Sales Manager	27		√	
22.	Thailand	Mr. Saksipong Lurksompoch	Senior Technician	30	√		
23.	Thailand	Mr. Montri Cammuan	Engineer	32			√
24.	Thailand	Mr. Jedsada Sela	Technician	28	√		
25.	Thailand	Mr. Pongtorn Kampangkaew	Metrology Engineer			√	

Schedule of 1st Joint Training on Measurement Standards in Thailand – CHEMICAL STANDARD
AUGUST 1-5, 2005

DATE	TIME	DESCRIPTION	PERSON IN CHARGE	VENUE
31/7/05		Arrive Bangkok: Pick up at the airport by NIMT's car Ariston Hotel: 19 Sukhumvit Soi 24, Sukhumvit Road, Bangkok 10110	NIMT's car	Ariston Hotel Tel. (662) 259 0960-9
1/8/05	08.45-09.00	Registration	IRO	Reun Thai, 4th Floor, Ariston Hotel
	09.00-10.00	Orientation	Dr. Pian, Dr. Akimoto, Dr. Nomura & Mr. Matsuda	
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	**Presentation of Country Report** (10 minutes per country) Cambodia, India, Indonesia, Lao PDR, Malaysia,Mongolia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Thailand, Vietnam	Representative of each country	
	12.00-13.00	Lunch	IRO	1st Floor, Ariston Hotel
	13.00-13.30	Transfer from hotel to NIMT	NIMT's car	
	13.30-15.00	Lecture 1: Significance of pH measurement and its Application in economy	Dr. Chainarong CHERDCHU	Room 321, 3rd Floor, IACTB
	15.00-15.15	Refreshment	IRO	
	15.15-16.30	Practice 1: How to use pH meter (Participants divided into Group A, B, & C)		
	17.30-20.00	Reception Dinner	IRO	Rachada Room, 3rd Floor, Chaophya Park Hotel
2/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.00	Group Discussion	Dr. Chainarong CHERDCHU	Room 321, 3rd Floor, IACTB
		Lecture 2: Principles of pH measurement – Potentiometric measurement and related topics	Dr. Charun YAFA	
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	Lecture 3: pH meter calibration	Ms. Nongluck TANGPAISARNKUL	
	13.00-14.30	Practice 2: pH meter calibration		
	14.30-14.45	Refreshment	IRO	
	14.45-16.00	Practice 2: pH meter calibration (cont.)		
	16.00-16.30	Transfer from NIMT to the hotel	NIMT's car	
3/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.00	Lecture 4: How to obtain accurate pH measurement	Dr. Susumu NAKAMURA	Room 321, 3rd Floor, IACTB
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	Lecture 5: Buffer solutions	Ms. Nongluck TANGPAISARNKUL	
	13.00-16.00	Laboratory Visit: Department of Medical Science, Ministry of Public Health	NIMT's car	
	16.00-17.00	Transfer back to the hotel	NIMT's car	

Schedule of 1st Joint Training on Measurement Standards in Thailand – CHEMICAL STANDARD
AUGUST 1-5, 2005

DATE	TIME	DESCRIPTION	PERSON IN CHARGE	VENUE
4/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.00	Group Discussion	Dr. Chainarong CHERDCHU	Room 321, 3rd Floor, IACTB
		Lecture 6: Traceability system in pH measurement	Dr. Susumu NAKAMURA	
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	Lecture 7: Traceability system in pH measurement (cont.)	Dr. Susumu NAKAMURA	
	13.00-14.30	Practice 3: Harned Cell (Demonstration)		
	14.30-14.45	Refreshment	IRO	
	14.45-16.00	Practice 3: Harned Cell (Demonstration) (cont.)	Dr. Susumu NAKAMURA	Room 321, 3rd Floor, IACTB
	16.00-16.30	Transfer from NIMT to the hotel	NIMT's car	
5/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.00	Group Discussion	Dr. Chainarong CHERDCHU	Room 321, 3rd Floor, IACTB
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	Paper Preparation	All participants	
	13.00-17.00	Paper Preparation (cont.)		
	17.00-20.00	Closing Ceremony & Farewell Dinner		Krua Mahanak, 31st Floor, Prince Palace Hotel
		Summary of Training (10 minutes): Chemical:	Dr. Chainarong CHERDCHU	
		Dimensional:	Mr. Somsak CHARKKIAN	
		Group Presentation: Chemical 2 Groups & Length 2 Groups (10 minutes each)	Representative of the group	
		Comments: Chemical:	Dr. Susumu NAKAMURA	
		Length:	Dr. Kazuya NAOI	
		Closing Address	Dr. Pian TOTARONG	
	20.00-21.30	Transfer back to the hotel	NIMT's car	
6/8/05		Transfer from the hotel to the airport	NIMT's car	

Schedule of 1st Joint Training on Measurement Standards in Thailand – LENGTH STANDARD
AUGUST 1-5, 2005

DATE	TIME	DESCRIPTION	PERSON IN CHARGE	VENUE
31/7/05		Arrive Bangkok: Pick up at the airport by NIMT's car Ariston Hotel: 19 Sukhumvit Soi 24, Sukhumvit Road, Bangkok 10110	NIMT's car	Ariston Hotel Tel. (662) 259 0960-9
1/8/05	08.45-09.00	Registration	IRO	Reun Thai, 4th Floor, Ariston Hotel
	09.00-10.00	Orientation	Dr. Pian, Dr. Akimoto, Dr. Nomura & Mr. Matsuda	
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	**Presentation of Country Report** (10 minutes per country) Cambodia, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Thailand, Vietnam	Representative of each country	
	12.00-13.00	Lunch	IRO	1st Floor, Ariston Hotel
	13.00-13.30	Transfer from hotel to NIMT	NIMT's car	
	13.30-15.00	Lecture: World Trend on Roughness Standard	Dr. Kazuya NAOI	Metrology Technology Building, NIMT
	15.00-15.15	Refreshment		
	15.15-16.30	Lecture: Introduction & Maintenance of Contact Type Roughness Tester	Mr. Samana PIANGBANGYANG	
	15.15-16.30	Lecture: Introduction External Micrometer Calibration (JIS B 7502: 1991)	Mr. Anusorn TONMEANWAI	Library, NIMT
	17.30-20.00	Reception Dinner	IRO	Rachada Room, 3rd Floor, Chaophya Park Hotel
2/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-12.00	Basic: Lecture: Calibration of External Micrometer Using Gauge Block (I & II)	Mr. Anusorn TONMEANWAI	Length Laboratory, NIMT
		Advance: Lecture: How to Carry out Int'l Comparison of Roughness Standard (I&II)	Mr. Samana PIANGBANGYANG	
	10.00-10.15	Refreshment	IRO	
	13.00-14.30	Basic: Lecture: Vernier Caliper Calibration (JIS B 7507: 1993)	Mr. Anusorn TONMEANWAI	
		Advance: Lecture: Terms, Definitions and Surface Texture Parameters (ISO 4287)	Mr. Samana PIANGBANGYANG	
	14.30-14.45	Refreshment	IRO	
	14.45-16.00	Basic: Lecture: Calibration of Vernier Caliper Using Gauge Blocks	Mr. Anusorn TONMEANWAI	
		Advance: Lecture: Metrological Characteristics of Phase Correct Filters (ISO 11562)	Mr. Samana PIANGBANGYANG	
	16.00-16.30	Transfer from NIMT to the hotel	NIMT's car	

Schedule of 1st Joint Training on Measurement Standards in Thailand – LENGTH STANDARD
AUGUST 1-5, 2005

DATE	TIME	DESCRIPTION	PERSON IN CHARGE	VENUE
3/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.30	Basic: Lecture: Introduction of Dial Gauge & Calibration Tester	Mr. Anusorn TONMEANWAI	Length Laboratory, NIMT
		Advance: Lecture: Rules and Procedures for Assessment of Surface Texture (ISO 4288)	Mr. Samana PIANGBANGYANG	
	10.30-10.45	Refreshment	IRO	
	10.45-12.00	Basic: Lecture: Calibration of Dial Gauge Using Calibration Tester	Mr. Anusorn TONMEANWAI	
		Advance: Practice: Calibration Method of Specimens (R_a and R_y)		
	13.00-16.00	Basic & Advance: Laboratory Visit: Toyota Motors (Thailand) Co., Ltd.	NIMT's car	
	16.00-17.00	Transfer back to the hotel	NIMT's car	
4/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.00	Basic: Practice: Calibration of External Micrometer	Mr. Anusorn TONMEANWAI	Length Laboratory, NIMT
		Advance: Practice: Calibration Method of Specimens (R_z)		
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	Basic: Practice: Calibration of Vernier Caliper and Dial Gauge		
		Advance: Practice: Evaluation of Measurement Results		
	13.00-16.00	Basic & Advance: Practice: Uncertainty Evaluation of Measurements		
	14.30-14.45	Refreshment	IRO	
	16.00-16.30	Transfer from NIMT to the hotel	NIMT's car	
5/8/05	08.00-08.30	Pick up at hotel's lobby to NIMT	NIMT's car	
	08.30-10.00	Group Discussion	Mr. Somsak CHARKKIAN	Length Laboratory, NIMT
	10.00-10.15	Refreshment	IRO	
	10.15-12.00	Paper Preparation	All participants	
	13.00-17.00	Paper Preparation (cont.)		
	17.00-20.00	Closing Ceremony & Farewell Dinner		Krua Mahanak, 31st Floor, Price Palace Hotel
		Summary of Training (10 minutes): Chemical:	Dr. Chainarong CHERDCHU	
		Dimensional:	Mr. Somsak CHARKKIAN	
		Group Presentation: Chemical 2 Groups & Length 2 Groups (10 minutes each)	Representative of the group	
		Comments: Chemical:	Dr. Susumu NAKAMURA	
		Length:	Dr. Kazuya NAOI	
		Closing Address	Dr. Pian TOTARONG	
	20.00-21.30	Transfer back to the hotel	NIMT's car	
6/8/05		Transfer from the hotel to the airport	NIMT's car	

List of Participants for 2nd Joint Training on Measurement Standards in Thailand (Mass)

No.	Countries	Details of Nominees		
		Name-Surname	Position	Age
1.	Bangladesh	Md.Mazaharul Haque	Inspector (Metrology)	38
2.	Cambodia	Mr.PHOENG Sam-Ang	Officer of Department of Metrology	36
3.	Fiji	Mr.Bimal Kant SINGH	Divisional Inspector	43
4.	Fiji	Mr.Anand Kishore Rohit	Senior Technical Assistant	36
5.	India	Mr.Shri Gautam Mandal	Scientist 'B'	31
6.	Indonesia	Mr.Gigin Ginanjar	Staff of Mass Metrology Sub Division; especially in Mass and Pressure Laboratory	27
7.	Lao PDR	Mr.Kadingthong SINGDALA	Head of Mechanics Sector	37
8.	Malaysia	Mr.Mukhtar bin Sawi	Senior Metrologist	42
9.	Mongolia	Ms.Darmaa Unurbileg	Researcher, Mass Standard Laboratory	38
10.	Nepal	Mr.Dinanath Mishra	Metrologist	37
11.	Pakistan	Mr.Muhammad Rafique	Technical Officer	43
12.	Philippines	Mr.Jerome G Engay	Science Research Specialist -1	23
13.	Vietnam	Mr.Duong Xuan Thien	Engineer	30
14.	Thailand	Mr.Surachai Sangsrikaew	Head of Northern Weights and Measures Center (Thailand)	45

List of Participants for 2nd Joint Training on Measurement Standards in Thailand (Acoustics)

No.	Countries	Details of Nominees		
		Name-Surname	Position	Age
1.	Cambodia	Mr.MENG Sereyvath	Deputy Director, Department of Metrology	35
2.	India	Dr.Mahavir SINGH	Scientist 'E-I'	44
3.	Indonesia	Mr.Denny Hermawanto	Acoustical & Vibration Metrology Laboratory Staff	25
4.	Lao PDR	Mr.Viengkham SINGSONEXAY	Deputy Director of Metrology Division	36
5.	Malaysia	Mr.Wan Aziz bin Wan Salleh	Senior Metrologist	37
6.	Mongolia	Mr.Batmonkh Zorigkhuu	Researcher, Electric Standard Laboratory	38
7.	Vietnam	Ms.Nguyen Thi Hang	Engineer	25
8.	Thailand	Mr.Prawetch KLUAYPA	Research Officer	34
9.	Thailand	Ms.Katesara In-nurak	Scientist	29

SCHEDULE OF 2nd JOINT TRAINING ON MEASUREMENT STANDARDS IN THAILAND
September 18 – 22, 2006

DATE	TIME	DESCRIPTION	PERSON IN CHARGE	VENUE
17/9/06		Arrive Bangkok : Pick up at the airport by Amari Airport Hotel's Staff Amari Airport Hotel: 333 Chert Wudthakas Road, Moo 10, Srikan, Don Muang, Bangkok 10210	Amari Airport Hotel's Staff	Amari Airport Hotel Tel. (662) 566 1020 Fax. (662) 566 1941
18/9/06	08.00 – 08.15	Registration	IRO	At Yukondhorn Room, Amari Airport Hotel
	08.15 – 08.45	Orientation	Dr.Pian, Dr.Akimoto, Mr.Uchikawa & Mr.Fujimori	
	08.45 – 10.15	Training in "Uncertainty on Measurement"	Mr.Bunjob, Mrs.Ajchara	
	10.15 – 10.30	Refreshment	IRO	
	10.30 – 12.20	Training in "Uncertainty on Measurement" (cont.)	Mr.Bunjob, Mrs.Ajchara	
	12.20 – 13.00	Lunch	IRO	
	13.00 – 14.30	Training in "Uncertainty on Measurement" (cont.)	Mr.Bunjob, Mrs.Ajchara	
	14.30 – 14.45	Refreshment	IRO	
	14.45 – 17.30	Training in "Uncertainty on Measurement" (cont.)	Mr.Bunjub, Mrs.Ajchara	

DATE	TIME	Acoustics Standard	Mass Standard	Acoustics	Mass	
19/9/06	08.00 – 09.00	Pick up at hotel's lobby to NIMT		NIMT's car		Acoustics – Rama 6 Mass - Technothani
	09.00 – 10.30	Lecturer 1: Introduction - Traceability of acoustic standard - Laboratory Standard Microphone	Lecturer 1: Introduction (new definition, Some research works or interesting in your point of view)	Mr.Takeshi FUJIMORI	Mr.Keizaburo UCHIKAWA	
	10.30 – 10.45	Refreshment		IRO		
	10.45 – 12.00	Lecturer 1: Introduction (cont.) - Traceability of acoustic standard - Laboratory Standard Microphone	Lecturer 1: Metrological and Technical Requirements	Mr.Takeshi FUJIMORI	Mr.Keizaburo UCHIKAWA	
	12.00 – 13.00	Lunch		IRO		
	13.00 – 14.30	Lecturer 1: Primary Calibration and Its Uncertainty for Laboratory Standard Microphones	Lecturer 1: Metrological and Technical Requirements (cont.)	Mr.Takeshi FUJIMORI	Mr.Keizaburo UCHIKAWA	
	14.30 – 14.45	Refreshment		IRO		
	14.45 – 16.00	Lecturer 1: Primary Calibration and Its Uncertainty for Laboratory Standard Microphones (cont.)	Lecturer 2: Demonstrate/ Practice in volume and magnetism	Mr.Takeshi FUJIMORI	Mrs.Rungsiya SUKHON	
	16.00 – 17.00	Transfer from NIMT to the hotel		NIMT's car		

SCHEDULE OF JOINT TRAINING ON MEASUREMENT STANDARDS IN THAILAND
September 18 – 22, 2006

DATE	TIME	Acoustics Standard	Mass Standard	Acoustics	Mass	VENUE
20/9/06	08.00 – 09.00	Pick up at hotel's lobby to NIMT		NIMT's car		Acoustics – Rama 6 Mass - Technothani
	09.00 – 10.30	Lecturer 1: Free-field calibration and its uncertainty for acoustic instruments (Uncertainty caused by the reflected wave in the anechoic room)	Lecturer 2: Traceability of Mass Standard	Mr.Takeshi FUJIMORI	Mrs.Rungsiya SUKHON	
	10.30 – 10.45	Refreshment		IRO		
	10.45 – 12.00	Lecturer 1: Free-field calibration and its uncertainty for acoustic instruments (Uncertainty caused by the reflected wave in the anechoic room) (cont.)	Lecturer 1: Mass determination (Direct Comparison and Subdivision)	Mr.Takeshi FUJIMORI	Mr.Keizaburo UCHIKAWA	
	12.00 – 13.00	Lunch		IRO		
	13.00 – 14.30	Lecturer 2: Calibration of LS microphone at NIMT	Lecturer 1: Mass determination (Direct Comparison and Subdivision) (cont.)	Mr.Virat PLANGSANGMAS	Mr.Keizaburo UCHIKAWA	
	14.30 – 14.45	Refreshment		IRO		
	14.45 – 16.00	Lecturer 2: Lecturer 3: Lecturer 4: } Workshop on LS Microphone Calibration	Lecturer 2: Mass determination for 1kg : Transfer Standard of Mass	Mr.Virat PLANGSANGMAS Ms.Surat PATTARACHINDANU WONG Mr.Priwann PROMASA	Mrs.Rungsiya SUKHON	
	16.00 – 17.00	Transfer from NIMT to the hotel		NIMT's car		
21/9/06	08.00 – 09.00	Pick up at hotel's lobby to NIMT		NIMT's car		
	09.00 – 10.30	Lecturer 2: Calibration of Sound calibrator	Lecturer 2: Uncertainty Calculation and an approximation formular	Mr.Virat PLANGSANGMAS	Mr.Keizaburo UCHIKAWA	
	10.30 – 10.45	Refreshment		IRO		
	10.45 – 12.00	Lecturer 3: Lecturer 4: } Workshop on Sound calibration	Lecturer 2: Uncertainty Calculation and an approximation formular (cont.)	Ms.Surat PATTARACHINDANU WONG Mr.Priwann PROMASA	Mr.Keizaburo UCHIKAWA	
	12.00 – 13.00	Lunch		IRO		
	13.00 – 14.30	Lecturer 2: Calibration of Sound level meter	Lecturer 2: Practice on Mass Measurement – Uncertainty Calculation	Mr.Virat PLANGSANGMAS	Mrs. Rungsiya SUKHON and mass staff	
	14.30 – 14.45	Refreshment		IRO		

SCHEDULE OF JOINT TRAINING ON MEASUREMENT STANDARDS IN THAILAND
September 18 – 22, 2006

DATE	TIME	Acoustics Standard	Mass Standard	Acoustics	Mass	VENUE
21/9/06	14.45 – 16.00	Lecturer 3: } Workshop on Lecturer 4: } sound level meter and paper preparation for September 22, 2006	Lecturer 2: Practice on Mass Measurement – Uncertainty Calculation (cont.) and paper preparation for September 22, 2006	Ms.Surat PATTARACHINDANUWONG Mr.Priwann PROMASA	Mrs. Rungsiya SUKHON and mass staff	Acoustics – Rama 6 Mass - Technothani
	16.00 – 17.00	Transfer from NIMT to the hotel		NIMT's car		
22/9/06	08.00 – 09.00	Pick up at hotel's lobby to NIMT		NIMT's car		NIMT Technothani
	09.00 – 10.30	Lab Visit		All participants		
	10.30 – 10.45	Refreshment		IRO		
	10.45 – 12.00	Group Discussion		All Participants		
	12.00 – 13.00	Lunch		IRO		
	13.00 – 17.00	Paper Preparation		All Participants		
	17.00 – 21.00	**Closing Ceremony & Farewell Dinner at Anodard, Amari Airport Hotel**				Anodard, Amari Airport Hotel
		Presentation of Country Report (5 minutes per country) Bangladesh, Cambodia, Fiji, India, Indonesia, Lao PDR, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Thailand, Vietnam		Representative of each country		
		Group Presentation (10 minutes per group) : Acoustic 2 Groups : Mass 2 Groups		Representative of the group		
		Summary of Training (10 minutes): Acoustics:		Mr.Virat PLANGSANGMAS		
		Mass:		Mrs.Rungsiya SUKHON		
		Comments: Acoustics:		Mr.Takeshi FUJIMORI		
		Mass:		Mr.Keizaburo UCHIKAWA		
		Closing Address		Dr.Pian TOTARONG		
23/9/06		Transfer from the hotel to the airport		Amari Airport Hotel's staff		

※20/9 was sudden holiday due to coup d'etat, therefore, the schedule of 20/9 was carried out by combining with the schedule of 21/9 and 22/9.

Annex 23: Survey and Verify NIMT'S Activities

1. **Participation in CGPM**

   Since the establishment of National Institute of Metrology (Thailand), NIMT participated in CGPM twice as following:

   - 1999, Mr. Prayoon Shiowattana, Former Director, participated in the 21st CGPM and also signed the Mutual Recognition Arrangement (MRA).
   - 2003, Dr. Pian Totarong, Director, and Mr. Somsak Charkkian, Assistant Director, participated the 22nd CGPM.

2. **Participation in APMP**

   Thailand has been the membership of APMP since 1979 and since the establishment of NIMT in 1998, NIMT has been participated in APMP Meeting, Symposium and General Assembly every year.

3. **Hold DEC-WG**

   NIMT and APMP joint orgainzed APMP IPRT/LIGT Comparison Workshop during February 16-19, 2004 in Bangkok by the sponsorship of PTB and supervision of NML. There were participants from 8 economies to participate the workshop as follows: Australia, Indonesia, Malaysia, Nepal, Philippines, Singapore, Thailand, and Vietnam.

4. **Entry to CMC in July 2003**

   NIMT's electrical measurement capability has been putting in the Appendix C of BIPM Website since July 18, 2003.

5. **Host to organize the TC Chair Meeting**

   NIMT was the host to organize the 3rd APMP TC Chair Meeting in May 2004, and the 6th APMP TC Chair and DEC Meeting in May 2005.

6. **Host to organize the APMP Workshop**

   NIMT is the host to organize the 2nd Pressure and Vacuum Workshop in Sep. 2004, the APMP DEC Planning Workshop in May 2005, and the APMP/TCQM Workshop on Gas CRM in Feb. 2006.

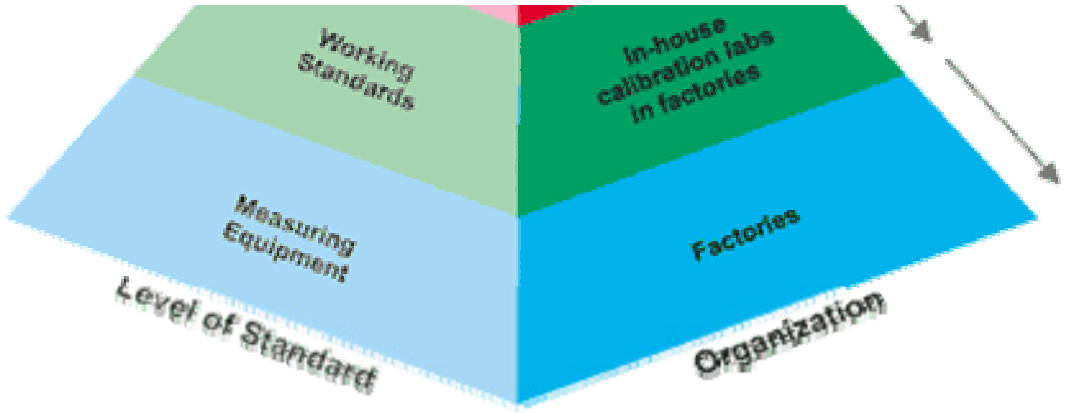
7. Accreditation by DKD

NIMT applied for an accreditation to DKD and was accredited by DKD in Mass, Electrical, Pressure and Length standards in 2002, and extended in Mass, Electrical, Pressure and Length standards in November 2003 and in process of accreditation in Temperature.

8. Accreditation by IA Japan

NIMT obtained accreditation on Acoustics and Wavelength standards in March 2004. NIMT also obtained accreditation on Rockwell Hardness Standard (HRC) in January 2005. The Accreditation assessment on Form standard (Plug/Ring gauge, Flatness standard, Roughness standard, Roundness standard, and Angle standard) was executed by IAJapan in November 2005, and in process of accreditation.

Annex 24: Traceability Chain and Roles of Respective Organization



Annex 25: Financial Operation Report of NIMT

National Institution of Metrology (Thailand)
Financial Operation Report
At December 31 2004 and 2005

	Remark	2005 (Baht)	2004 (Baht)
Operating Revenue			
From government:			
Budget allocation		97,691,671.21	105,997,025.31
Government loans	3.12	5,499,889.44	8,585,626.93
Total		103,191,560.65	114,582,652.24
From other sources:			
Services		10,956,583.39	10,718,712.56
Donation		428,801.73	333,667.88
Interest		1,926,582.73	2,833,609.27
Others	3.13	695,646.57	280,282.92
Total		14,007,614.42	14,166,272.63
Grand total		117,199,175.07	128,748,924.87
Operating Expense			
Personnel	3.14	38,136,024.17	29,769,033.09
Operation	3.15	36,405,593.05	25,871,420.23
Value depreciation and disposal		48,552,194.36	35,998,255.42
Total		123,093,811.58	91,638,708.74
Revenue higher/ (lower) than operating expense		**(5,894,636.51)**	**37,110,216.13**
Profit/(loss) from foreign currency exchange (net)		123,180.60	(58,786.91)
Total non-operating revenue/(expense)		123,180.60	(58,786.91)
Revenue higher/ (lower) than net expense		**(5,771,455.91)**	**37,051,429.22**

Data Source: Annual Report of NIMT 2005

Annex 26: Field Observation Report of Mid-term Evaluation Team

Team Members:

Yoji Matsui	Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
Norio Ishizaki	Managing Director, IA Japan, National Institute of Technology and Evaluation (NITE)
Yoshio Hino (Observer)	Director, International Metrology Cooperation Office, National Metrology Institute of Japan (NMIJ)

1. Field Observation of NIMT's New Facility

The inverted pyramid-styled building has 3 stories. The 2 laboratory buildings and a building for air-conditioning machineries are separated in order to avoid the laboratories from vibratory motion caused by the air-conditioning machineries. Therefore, the 2 laboratory buildings are connected by a gangway corridor at the third level, which has made it unique in appearance.

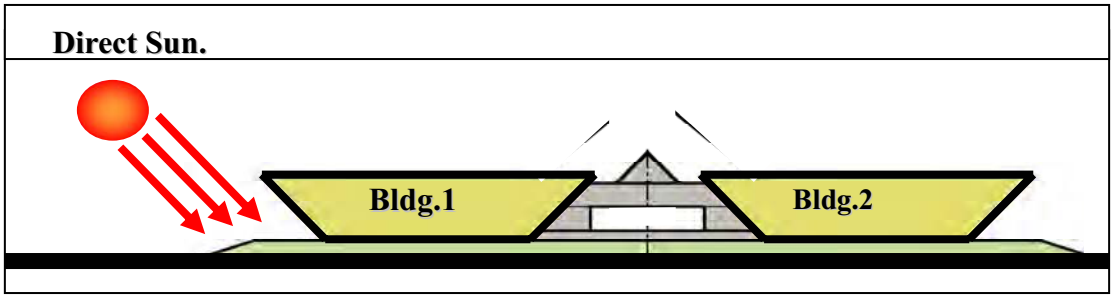
Inside the building, each floor has corridor, and basically there are offices and calibration rooms with large glass windows inside and outside the corridors. It seems very functional and strongly regarded for the external influence on calibration rooms. In addition, the doors of the corridors and calibration rooms have red or blue colors depending on the level of strictness on temperature management, and those calibration rooms whose uncertainty of the measurement can be affected by temperature range and dust have an anterior chamber with double doors. Those calibration rooms, which already have standard and calibration facilities installed, have sufficient space, and it seems there is no problem in their maintenance. However, it is surprising to see prototype of the kilogram distributed by BIPM in the cabinet with the glass sliding doors, which enable the general visitors observe it through the window of the calibration room.

The facilities such as air-conditioning, electricity and water are controlled centrally at the basement, and the power distribution switchboards for each calibration room are allocated at the corridor side of the laboratories in order to facilitate the maintenance. It seems the building is newly designed and functional.

Doors indicate the temperature management

Offices allocated outside the corridor

Switchboard installed at corridor



2. Collaboration with other organizations

(1) Collaboration with JETRO (Japan External Trade Organization) and JCC (Japanese Chamber of Commerce)

In order to establish the traceability system in Thailand with NIMT at the top of hierarchy, it is important for NIMT to provide national measurement standards to more calibration laboratories. The Project has already held an informative session about the Project with the JCC, Bangkok, and it introduced the activities to each committee of Japanese enterprises through the JCC. Also it coordinated informative sessions with JETRO, Bangkok, for the committees on automobile and chemical products, and requested to utilize the results of the Project. In addition, the news letter of the JCC for October, 2006 carries an article about the Project, explaining its activities and results. In 22 of November, NIMT will hold an open house for 20 – 30 visitors from the committee on electrics. The further collaboration with JETRO and JCC to promote the utilization of NIMT will be one of the strategies to disseminate the measurement standards to Japanese enterprises as results of

technical transfer. It is necessary to promote the benefit of NIMT's service to those Japanese enterprises.

(2) Collaboration with TLAS (Thai Laboratory Accreditation Scheme)

In Thailand, TLAS was established in 1987 as an accreditation body for testing and calibration laboratories in order to support TISI (Thai Industrial Standards Institute) in the certification of products. TLAS has been providing services in accreditation of calibration bodies based on the ISO/IEC17025.

After the completion of the Project, it can be assumed that the cost of accreditation with IA Japan will be a financial burden for NIMT, although the accreditation is highly important as authentication of third party for NIMT, in order to maintain the national measurement standards with internationally recognized level continuously. Therefore, it will be a practical alternative for NIMT to switch the accreditation from IA Japan to TLAS. In addition it is important for NIMT to collaborate with TLAS in order to promote the traceability system in Thailand.