

No.

THE KINGDOM OF THAILAND

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

TERMINAL EVALUATION REPORT

July 2007

**JAPAN INTERNATIONAL COOPERATION AGENCY
THAILAND OFFICE**

TIO
JR
07-009

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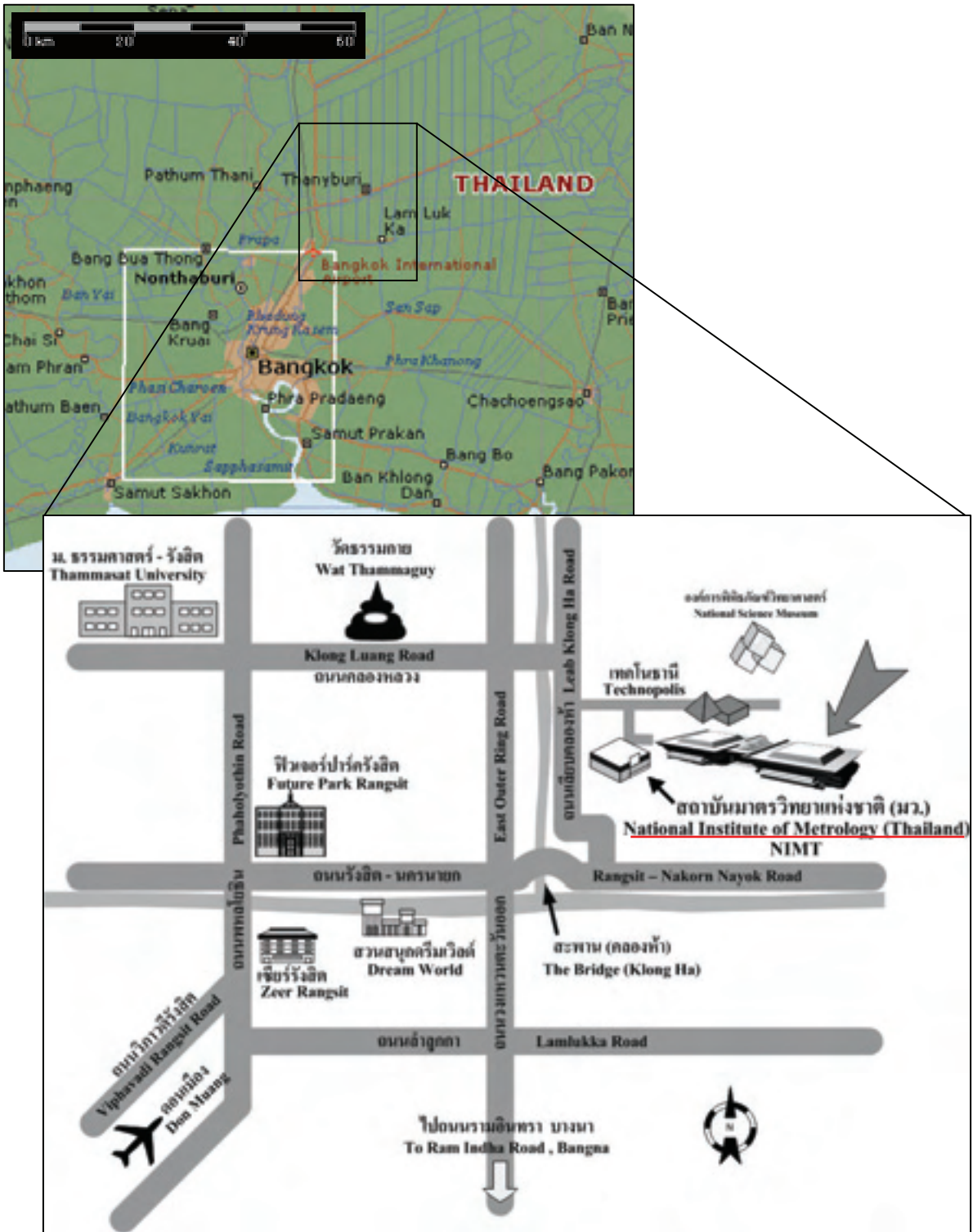
**JAPAN INTERNATIONAL COOPERATION AGENCY
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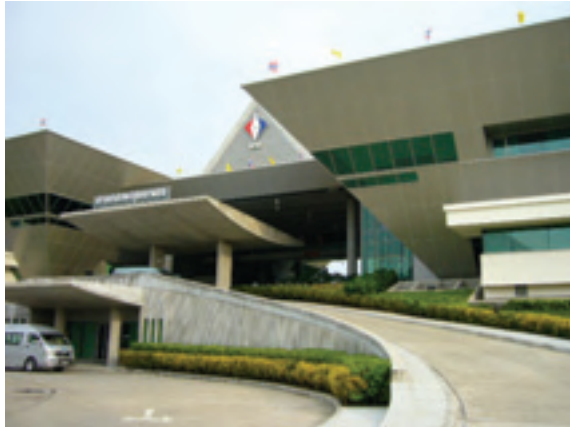
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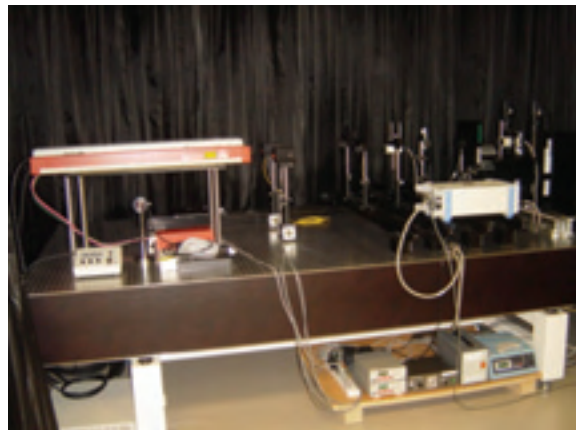


Project Location Map



Picture 1: New NIMT Building supported by ODA Loan

Picture 2: Equipment (Laser Power) supported by ODA Loan



Picture 3: Kick Off Meeting between Japan and Thai Sides (18th June, 2007)

Picture 4: The 8th Joint Coordinating Committee (Signing M/M, 22nd June, 2007)



1. Outline of the Project		
Country : Kingdom of Thailand	Project Title : The Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase 2	
Issue/ Sector : Private Development – Industrial Foundation and System		
Division in Charge : JICA Thailand Office	Cooperation Scheme : Project Type Technical Cooperation	
Period of Cooperation	16 th October 2004 – 15 th October 2007 (3 years)	Total Cost : 300 million Japanese Yen (As of the Study)
		Partner Country's Implementing Organization : National Institute of Metrology (Thailand) (NIMT)
		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)
		Related Cooperation : 24 th and 25 th ODA Loans by JBIC

1-1 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.

In response to this, JICA was considering 5-year technical cooperation project at that time. However due

to the delay of new building construction by ODA loans, finally JICA decided to divide the project into two phases. (Phase1: 2-year, Phase2: 3-year). During Phase1 cooperation, which started from Oct. 16, 2002, project only focused on limited quantities, which could be available at the previous building. Since construction of the new building also progressed without any problem, and the result of technical cooperation in Phase1 was fruitful, Phase2 cooperation was started from Oct. 16, 2004.

Through the technical cooperation including Phase1 and Phase2, project was supposed to achieve “NIMT established and manages National Measurement Standards with Internationally recognized level of accuracy” in the eight fields. (Length, Mass, Time & Frequency, Electricity & Magnetism, Photometry, Thermometry, Chemical and Acoustics & vibration)

At the time of the mid-term evaluation study was conducted on October 2006, the number of quantities for technical cooperation was set to 40 quantities, and it was also recommended that the necessary quantities shall be accredited by the end of the project from a standpoint of international reliability. Those points were reflected in the following activities.

* The most accurate standard in the country is called as “National Standard”, the lower-level standard shall be set based on “National Standard”. NIMT is required the skill and knowledge to maintain “National Standard” and calibrate the lower-level standard. To calibrate with the lower-level standard is called “Providing the standard”.

1-2 Cooperation Overview

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 from October 16, 2002, after the Record of Discussion (R/D) was signed in September 2002. The Phase 2 started from October 16, 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) Project 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.

(4) Project Inputs

Japanese side:	(): by the end		
Long term expert	5 persons	Equipment supply	3.8million Japanese Yen
Short term expert	30 persons (36)	Project cost	300 million Japanese Yen
No. of trainees	16 persons		
Received in Japan			
Thai side:			
Counterparts	37 persons (Management: 1 person, Engineering: 36 persons)		
Local cost	Approx. 15 million Japanese Yen (4 million Thai Baht)		
In kind			

2. Evaluation Team and Period

Members	Mr. Narihiro YAEGASHI (Team Leader)	Deputy Resident Representative, JICA Regional Support Office for Asia
	Mr. Yoji MATSUI	Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
	Dr. Katsuo SETA	Chief Executive, International Accreditation Japan (IAJapan), National Institute of Technology and Evaluation (NITE)
	Dr. Yoshio, HINO	Director, International Metrology Department, Metrology Standard Management Division, Advanced Industry Science and Technology (AIST)
	Mr. Kazuya MARUO Ms. Thanyatorn Singrueng	Assistant Resident Representative, JICA Thailand Office Researcher, Kokusai Kogyo (Thailand) Co., Ltd
Period of Evaluation		Type of Evaluation
11 th June, 2007 – 22 nd June, 2007		Terminal Evaluation

3. Results of Evaluation

3-1 Summary of Evaluation Results

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

Indicator

1-1: Staff and budget are allocated to the project

- The allocation of the C/P and dispatch of long-term experts were done as planned, and short-term experts were also dispatched as planned except some quantities, which the machinery and equipment were delayed. Regarding the budget for the Project in Japanese and Thai sides were secured.

(2) Output 2: The equipment is operated and maintained properly.

Indicator

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.

- The technical transfer has been completed in 37 quantities by the end of May 2007, and 42 quantities¹ are supposed to finish the technical transfer by the time of the completion of the Project. After the installation and establishment of the national measurement standard, calibration records of the equipment has been done, and the manuals of operation and maintenance management of existing machinery and equipment of the Project are provided and organized properly.

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

Indicator

3-1: Technical Cooperation Program is created.

3-2: C/Ps are appropriately assigned.

- NIMT has the technical cooperation program prepared at the beginning of the Project. C/Ps are also allocated properly.

3-3: Improvement in the uncertainty.

3-4: Point of the "Skill after training".

- The budget of uncertainty has been improved in 14 quantities while 6 quantities was planned to be improved by the time of the completion of the Project. Based on the evaluation by using the evaluation sheet, the point of "skill after training" of all C/Ps has been improved.

3-5: Number of seminars and joint training.

- According to the record of seminars, the number of seminars that were conducted by April 2007, is 33 times covering in 32 quantities.

(4) Output 4: Accuracy of national measurement standards is improved.

Indicator

4-1: Improvement in the uncertainty.

4-2: Registration of environmental data for every laboratory.

4-3: Number of international comparison implemented.

- The number of accreditation obtained during the Project reaches 14 quantities, which application procedure requires the preparation of uncertainty budget sheet and the registration of environmental data. Moreover, 23 comparisons in 12 different quantities have been implemented in the focus of

accuracy improvement.

(5) Output 5: NIMT disseminates national measurement standard properly.

Indicator

5-1: Improvement in calibration technology for reference standards.

5-2: Number of calibration procedures created.

- 41 traceability charts for each quantity available and the calibration procedure has been provided in 37 quantities while 17 quantities are in the process.

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. By the end of May 2007, the Project has been applied and got assessed for the accreditation in 14 quantities and it has plan to apply further more in 6 quantities by the time of the termination of the Project.

3-2 Summary of Evaluation Results on 5 Criteria

(1) Relevance

The relevance of the Project is assessed still high based on the following reasons; 1. There is needs from industrial sector; 2. Importance of metrology system in the 10th National Economic and Social Development Plan (2007-2011); 3. The purpose of the Project meets the Japanese policies of ODA charter.

(2) Effectiveness

The result of assessment on Outputs indicates that the degree of realization of Outputs is considerably high. Besides, the relevance of the important assumptions is confirmed as effective as before.

The project purpose has been generally achieved due to the adequate outputs generated by the inputs planned in the Project and enormous efforts from Japanese and Thai sides.

It, however, is notable that unfortunately the delay of new building construction and procurement of equipments affected the technical cooperation for some quantities and worked as a hindering factor to lower the achievement of the project purpose² to a certain extent. This factor has been identified as a precondition of the Project, which is known as uncontrollable by the Project according to the evaluation methodology.

To expedite the process of equipment procurement by ODA Loans, NIMT took action including change of bidding method and etc...

(3) Efficiency

The timing of various inputs can be evaluated highly adequate due to its flexibility in accordance with the schedule of procurement. Moreover, the management of the Project has been remarkably well done under the collaboration of Japanese loan scheme. (E.g. Training in Japan (3 months) → Self-learning (2 months) → Follow-up training with using the equipment by ODA loans (1 month))

Most of expected outputs could be generated with the appropriate practice of equipments and machineries, however, the delay of procurement influenced slightly negatively on the generation of outputs also in this aspect.

(4) Impact

Since indicators verifying the achievement of the project overall goal have emerged in some fields according to the result of the evaluation survey of document review, interview, the current status of the

impact could be considered quite positive and makes us expect the real achievement of overall goal in future if the project purpose is achieved with much higher level of satisfaction. This could imply directly the attainment of accreditation as in many quantities would promise the achievement of the project purpose and consequently project overall goal.

As a ripple effect, NIMT conducts seminars and workshop for ASEAN region on metrology periodically, therefore the visibility of NIMT in ASEAN region will increase in the future.

(5) Sustainability

Assessing comprehensively the facts and findings above, it could be concluded that the sustainability of the Project depends primarily on the firm establishment of National Measurement System with NIMT as its top organization and technical advantage of NIMT in this system under the corresponding of the current political support.

In order to confirm the sustainability of the Project, the accreditation should be attained by all means since it assures the accuracy of calibration and the traceability of quantities in the system.

3-3 Factors enhancing the Achievement

(1) Relate to Planning

- The National Metrological System Development Act stipulates NIMT to play their roles and responsibilities as the institute to develop metrology system, procure and maintain national standards and still effective. Therefore, this system could disseminate smoothly the outputs generated by the Project to the target groups/ organizations.

(2) Relate to Implementation

- A series of meetings was conducted every month since the beginning of the Project. Additionally, the JCC meeting is also conducted twice a year in order to maintain the mutual understanding between Japanese side and Thai side.

3-4 Factors hindering the Achievement

(1) Relate to Planning

None

(2) Relate to Implementation

- The precondition of the Project: “Equipment by ODA Loan for the Project is procured as planned” is not fulfilled in some components through the Project term. This affected the generation of the project outputs negatively. In order to achieve “Internationally recognized level of accuracy”, accreditation assessment shall be a part of the Project activities. Therefore it is not appropriate to terminate the Project as scheduled.

3-5 Conclusion

Technical transfer of all quantities will be completed by the end of the Project, although the construction of new NIMT building and procurement of equipment were delayed in Japanese ODA loan. However, some accreditation assessment will not be accomplished within the Project term due to the above-mentioned delay.

It is assessed based on the actual result that most of quantities³ targeted in the Project can be accredited within one year after the termination of the Project. To achieve the initial Project purpose, the term of Project shall be extended by October, 2008.

3-6 Recommendation

a. Extension of project term

In this project, the technical transfer part is almost completed on 42 quantities, however in order to achieve “Internationally recognized level of accuracy”, only 14 quantities of a total of 37 quantities for accreditation assessment have accomplished at present, due to the delay of construction of new NIMT building and procurement of equipment by Japanese ODA loan. To firmly establish the result of this technical transfer in the form of accreditation in gaining international approval, and considering the request of the Project extension from NIMT, one year extension of the Project term would be appropriate, because most of quantity can be accredited during the extension periods.

b. Chemical standard

Regarding items of measurement standard for GUIDE 34⁴ in chemistry, it is rather difficult to obtain accreditation within one year extension periods. Therefore, to establish the quality system for gaining accreditation in the extension periods is preferable. To achieve this goal, it is needed for engineers in NIMT to participate in the training course on GUIDE 34 and GUIDE 35⁵.

c. CIPM-MRA appendix C⁶

NIMT should accelerate to register the transferred quantities on Appendix C of CIPM-MRA to be recognized internationally for the improvement of technical competence.

d. Sustainable human resource development

Comparing the evaluation of C/P between just after finishing technical transfer and some months later, the skill development and self motivation were found. Therefore the foundation of their self-sustaining human resource development was built. We hope that this continuous motivation is maintained in the future.

e. Human resource

The effort by minimum number of staff is definitely deserved, however to secure maintenance and dissemination of measurement standard, it is preferable for NIMT to ensure the necessary number of engineers and to intensive staff deployment in accordance with the future importance of measurement standard.

f. 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 highly 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.

g. Facility

In case of standard gas, although the installation of equipment and technical transfer was completed, the

storage facility is unfinished. It is preferable to implement required measures by NIMT as soon as possible.

h. Safety control

The lack of safety control, such as untied high pressured gas tanks, was observed. It is highly recommended to avoid this pre-accident situation immediately.

i. Domestic dissemination

The NIMT contributes to secondary calibration organizations⁷ in domestic traceability system⁸. It is preferable to review the modalities of efficient contribution on the cooperation with accreditation body and calibration service to major users.

j. International dissemination

In the future, it is expected that NIMT can promote NIMT-traceable measurement standard and become hub-organization in the ASEAN countries by utilizing the result of the Project.

3-7 Lessons learned

Regarding the project collaborated with Japanese ODA loan, the possibility of the schedule delay (ex. The procurement of equipment is not proceed smoothly) shall be taken into the consideration in the planning stage of the Project.

3-8 Follow-up status

None

¹ After commence of the Project, NIMT requested additional two quantities, and these quantities were considered reasonable. So, the total number became 42 quantities.

² To establish National Measurement Standards with internationally recognized level of accuracy, it was defined that the project purpose contains the accreditation assessment in the mid-term evaluation.

³ NIMT is planned to accredit 35 quantities without “Inorganic Standard Solution” and “Organic Standard Solution” in the extension period.

⁴ General Requirements for the competence of reference material producers

⁵ Certification of reference materials – General and statistical principle

⁶ Database on calibration and measurement capability of National Metrology Institute.

⁷ Registered organization to have Standard, which calibrated with primary Standard.

⁸ Measure is calibrated by Standard, Standard is also calibrated by more accurate Standard. Most accurate Standard is the National Metrology Standard. These linkages are called as “traceability system”.

List of Abbreviation

AIST	National Institute of Advance Industrial Science and Technology
C/P	Counterpart
CERI	Chemicals Evaluation and Research Institute, Japan
DAC	Development Assistance Committee
DQM	Department of Quality Manual
DSS	Department of Science Service
EOJ	Embassy of Japan
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
MOST	Ministry of Science and Technology
NIMT	National Institute of Metrology (Thailand)
NITE	National Institute of Technology and Evaluation
NMIJ	National Metrology Institute of Japan
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
P/O	Plan of Operation
PCM	Project cycle Management
PDM	Project Design Matrix
QHR	Quantum Hall Resistance
R/D	Record of Discussion
TICA	Thailand International Development Cooperation Agency
TISTR	Thai Institute of Science and Technological Research

1 The Outline of the Terminal Evaluation Study

1.1 Background and the Purpose of the Study

The Project on technical strengthening of 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. The Project has already accomplished about 88% of the total technical transfer and 38% of the total accreditation review planned in the Project.

1.2 Objectives of the Evaluation Study

Before the completion of the Project, the Terminal Evaluation Study is conducted not only to evaluate the achievement in accordance with the five evaluation criteria, namely relevance, effectiveness, efficiency, impact, and sustainability, but also to assess the adequacy of termination and needs for the extension or follow-up of the project with considering above-mentioned results.

1.3 Members of the Evaluation Team

Table 1-1: Members of The Evaluation Team

<Japanese Side>

	Member's Name	Position
1	Mr. Narihiro YAEGASHI (Team Leader)	Deputy Resident Representative, JICA Regional Support Office for Asia
2	Mr. Yoji MATSUI	Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
3	Dr. Katsuo SETA	Chief Executive, International Accreditation Japan (IAJapan), National Institute of Technology and Evaluation (NITE)
4	Dr. Yoshio, HINO	Director, International Metrology Department, Metrology Standard Management Division, Advanced Industry Science and Technology (AIST)
5	Ms. Thanyatorn Singrueng	Researcher, Kokusai Kogyo (Thailand) Ltd. (Consultant)
6	Mr. Kazuya MARUO	Assistant Resident Representative, JICA Thailand Office

<Thai Side>

	Member's Name	Position
1	Dr. Pian Totarong	Director, National Institute of Metrology (Thailand), (NIMT)
2	Mr. Veera Tulasombat	Head of Mechanical Metrology Department, NIMT
3	Ms. Ajchara Charoensook	Head of Electrical Metrology Department, NIMT
4	Dr. Chainarong Cherdchu	Head of Chemical Metrology Department, NIMT
5	Mr. Arkom Krachangmol	Asst. Head of Photometry Metrology Department, NIMT
6	Mr. Virat Plangsangmas	Asst. Head of Acoustics & Vibration Metrology Department, NIMT
7	Ms. Nattanit Pongjeerakumchorn	Asst. Manager of Policy & Strategy Dept., Acting Int'l Relations Section Head, NIMT
8	Ms. Suthanone Fungtammasan	Programme Officer, Thailand International Development Cooperation Agency (TICA)
9	Ms. Sunee Suthianun	Programme Officer, TICA

1.4 Schedule of the Evaluation Study

Table 1-2: Schedule of the Evaluation Study

Date		Schedule	Remarks	
6/11	Mon	Kick off meeting, Distribution of Questionnaire	Consultant	
6/12	Tue	Interviews with TISTR, DSS	Consultant	
6/13	Wed	Collection of Questionnaire, Compiling collected information	Consultant	
6/14	Thu	Interviews with MOST	Consultant	
6/15	Fri	Interviews with Private Sector	Consultant	
6/16	Sat	Compiling and analyzing collected information	Consultant	
6/17	Sun	Compiling and analyzing collected information	Consultant	
6/18	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
6/19	Tue	AM	Discussion (2): Confirming the Actual Results	Japanese team
		PM	Discussion (3): Confirming the Actual Results	All members
6/20	Wed	AM	Discussion (4): Confirming the Actual Results	Japanese team
		PM	Discussion (5): Confirming the Lessons Learned and Recommendations	All members
6/21	Thu	AM	Revision of the Joint Evaluation Report	Japanese team
		PM	Discussion (6): Confirming the Joint Evaluation Report	T: Dr. Pian, Ms. Nattanit J: Mr. Maruo
6/22	Fri	AM	Preparation for JCC Meeting	Japanese team
		PM	8th JCC (Signing the Joint Evaluation Report) Report to EOJ	All members Japanese team

2 The 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.

2.2.1 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.

2.2.2 Project Period

From October 2004 to October 2007 (3 years)

2.2.3 Total Amount of Cooperation

330 million Japanese Yen

2.2.4 Counterpart Agency

National Institute of Metrology (Thailand) (also known as NIMT)

2.2.5 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)

2.2.6 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 five evaluation criteria are part of the basic evaluation method set by the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD) to evaluate the project achievements. All of the JICA projects are presently evaluated by this evaluation method. The five criteria as described in Table 3-1 are applied in the evaluation grid and consequently the questionnaire. The Evaluation Grid was produced to compare the outcomes of the Project with its design.

Table 3-1: Five Evaluation Criteria

Relevance	Relevance of the project plan is reviewed based on the validity of the project purpose and the overall goal in connection with the development policy of the Government of Thailand and the needs of the beneficiaries and also the logicity of the plan.
Effectiveness	Effectiveness is assessed by evaluating to what extent the project has achieved its purpose and clarifying the relationships between purpose and outputs
Efficiency	Efficiency of the project implementation was analyzed with emphasis on the relationship between outputs and inputs in terms of timing, quality and quantity.
Impact	Impact of the project was assessed by measuring either positive or negative influences generated by the project, which were not originally expected in the project plan.
Sustainability	Sustainability of the project was assessed from organizational, technical and financial aspects based on the extent to which the achievements of the project were sustained or expanded after the project was terminated.

3.2 Method of the Study

The objectives of this evaluation study mentioned in the previous chapter were examined mainly by literature review, questionnaire survey, interview survey, and field visit.

3.2.1 Literature Review

The study team initially started its survey with the collection of materials related to the project. The literature review covered not only existing reports and documents prepared in the project, but also other related materials from various information sources such as concerned parties and websites.

3.2.2 Questionnaire Survey

After confirming those through the collected materials, the study team went on to the works for the preparation of the evaluation grid and the questionnaire distributed to twelve NIMT staff who participated in the trainings in Japan. The evaluation grid was formulated focusing especially on the five evaluation criteria described above.

3.2.3 Interview Survey

The interviewees were selected principally from both direct and indirect beneficiaries of the Project which are NIMT, MOST, DSS, and TISTR. The purpose of interviews was to evaluate the achievement or underachievement of the Project. Moreover, the interviews were intended to explore the potential impacts and sustainability that contributed to the Thai society.

3.3 Limitation and Restrictions of the Study

The plan of operation was formulated in collaborating with the building construction and the procurement of machineries and equipments by Japanese loan scheme. It is essential for the Project if the nature of the Project is carefully considered. In fact it is included in the Project Design Matrix (PDM) as the precondition, which is accounted for an uncontrollable factor from the Project.

4 Achievement of the Project

4.1 Inputs

4.1.1 Inputs from Japanese Side

The inputs from the Japanese side are summarized in the following sections.

a. Dispatch of Long Term Japanese Experts

Five Long Term Japanese Experts shown in the Table 3-1 were dispatched to Thailand during the time of Project implementation.

Table 4-1: Summary of Long Term Japanese Experts Dispatch

Measurement Standard	Duration	Name of Long-term Expert
1. Chief Advisor	Oct. 16, 2002 – Oct. 15, 2007	Dr. Yoshiaki Akimoto
2. Coordinator	Oct. 16, 2002 – Oct. 15, 2007	Ms. Ikuko Niizeki
3. Physical Standards	Oct. 16, 2002 – Oct. 15, 2006	Mr. Jiro Matsuda
4. Electromagnetic Standards	Oct. 16, 2004 – Dec. 30, 2006	Dr. Joji Kinoshita
5. Chemical Standards	Oct. 16, 2004 – Dec. 30, 2006	Dr. Akira Nomura

b. Dispatch of Short Term Japanese Experts

Since the commencement of Phase 2 up to May 2007, 30 Short Term Japanese Experts were dispatched to Thailand during the respective project periods. In this number, 2 of them were supported by NMIJ and 1 from IAJapan. The dispatch has been delayed in 5 quantities explicitly Line Scale, Pressure, Fixed Point, Group Resistance, and QHR due to the delay of machinery and equipment procured by Japanese ODA loan.

However, the dispatch of short-term experts is confirmed in 3 quantities (Line Scale, Pressure, and Fixed Point), while the other 2 quantities (Group Resistance, and QHR) have not been confirmed yet. In short, the expectation of short-term experts dispatch is 36 including one more expert in Calibration Procedure by the time of the termination of the Project.

c. Counterpart Training in Japan

A series of trainings regarding to the content of technical transfer¹ were conducted in Japan during the project period. Since the commencement of Phase 2, the total number of C/Ps has been trained in Japan is 16 persons. The dispatch of 11 C/Ps was programmed in the schedule of technical transfer while the dispatch of 5 C/Ps was requested by NIMT. Those additional requested quantities are Environment Management Technology, Mass, Watt Hour, AC Voltage and Density.

¹ In this Project, the technical transfer consists of 3 types of activities namely 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.

d. Provision of Equipment

The list of provision of equipment is shown in Annex 12. Regarding equipment procurement by ODA loan, 387 machinery and equipment were procured by the end of May 2007, however there are 7 items have not been delivered yet. (Annex 32).

e. Supporting local cost

The supporting local cost by JICA from the commencement of Phase 2 up to the time of Terminal Evaluation is 7,036,898 THB as shown in detail in Table 4-2.

Table 4-2: Supporting Local Cost by JICA

Unit: THB

JFY	2004	2005	2006	2007
1 st quarter		202,000	1,266,200	1,583,090
2 nd quarter		2,093,000	298,520	
3 rd quarter	366,000	0	489,930	
4 th quarter	420,000	121,958	196,200	
Total	786,000	2,416,958	2,250,850	1,583,090

4.1.2 Inputs from Thai Side

The inputs from the Thai side since the commencement of the project are summarized in the following sections.

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 already relocated to the new building except the Laboratory of Acoustics and Vibration which keep the station base in the DSS. The office space for the Project team was provided in the new building. In overall, the reconstruction and renovation of all laboratories are completed except the Standard Gas which has been constructed in the administrative building and now is under renovation.

b. C/P and administrative personnel

NIMT has allocated 1 administrative C/P, which is the director of NIMT, and 36 technical C/Ps responsible for every target quantity of the technical transfer in the Phase 2. Moreover, one more administrative C/P from International Relations Section has allocated to support for the communication and administration of the Project.

c. Maintenance of machinery and equipment

All machinery and equipment have been provided by Thai side as planned and operated properly.

d. Necessary budget for the implementation of the project

The necessary budget for the implementation of the Project came from 2 sources - NIMT and TICA. The total amount of budget is summarized as shown in Table 4-3.

Table 4-3: Necessary Budget for the Implementation of the Project

Unit: THB

Thai FY	2005	2006	2007
NIMT	519,600	519,600	519,600
TICA	805,170	930,405	715,038

4.2 Outputs

4.2.1 Output 1: The operation and administration of the project are enhanced

Indicator 1: Staff and budget are allocated to the project
<ul style="list-style-type: none">•The allocation of the C/P and staff for the Project was implemented as planned.•The long-term Japanese experts were also dispatched as planned while some short-term Japanese experts have not been dispatched yet due to the delay of machinery and equipment procured by ODA loan.•Regarding to the budget for the Project operation and administration, it was also allocated as shown in Table 4-2 and Table 4-3.

Based on the confirmation of input status quantitatively and qualitatively from both Japanese and Thai sides, the input contributed enough to realize Output 1.

4.2.2 Output 2: The equipment is operated and maintained properly

Indicator 1: National Measurement Standards are installed and established in the 40 quantities of the project.
<ul style="list-style-type: none">•The Project was planned to finish the technical transfer in 42 quantities². However, the technical transfer has been completed in 37 quantities by the end of May 2007.•The current condition of the technical transfer shows the delay from P/O.•This was caused clearly by the delay of the procurement of machineries and equipments. Nonetheless, it was planned to completed technical transfer in other 5 quantities by the time of the completion of the Project since the schedule of deliverance of the rest machinery and equipment has been confirmed.•Consequently, it can expected that the National Measurement Standard will be installed and established successfully as planned
Indicator 2: Registration of maintenance record and calibration record of equipment.
<ul style="list-style-type: none">•After the installation and establishment of the national measurement standard, the registration of maintenance and calibration records of the equipment has been done. In the mean time, the operation and maintenance of those equipments are conducted through the technical transfer during the training period of the project.

² After the commencement of the Project, NIMT requested two other quantities (Density and AC Voltage) to JICA. JICA had recognized that these two quantities were accepted.

Indicator 3: Manuals of operation and maintenance management are provided and organized for reference.
<ul style="list-style-type: none"> • It was confirmed that the manuals of operation and maintenance management of existing machinery and equipment of the Project are provided and organized properly.

The degree of the realization of output 2 has been improved continuously as each program of the technical transfer was completed.

All technical transfer will be completed by the end of the Project and on a parallel with this the degree of output 2 is expected to reach the adequate level as planned.

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

Indicator 1: Technical Cooperation Program is created.
<ul style="list-style-type: none"> • NIMT has the technical cooperation program prepared at the beginning of the Project.
Indicator 2: C/Ps are appropriately assigned.
<ul style="list-style-type: none"> • Refer to Indicator 1 of Output 1
Indicator 3: Improvement in the uncertainty.
<ul style="list-style-type: none"> • The improvement in the uncertainty has been defined in the Uncertainty Budget Sheet which will be prepared after the accreditation process was done. • According to the result of technical transfer, it was confirmed that the budget of uncertainty has been improved in 14 quantities while 6 quantities was planned to be improved by the time of the termination of the Project.
Indicator 4: Point of the “Skill after training”.
<ul style="list-style-type: none"> • Referring to the Point of the “Skill after training” in the Evaluation Sheet on Technical Transfer which has several criteria of the assessment on each quantity - installation, operation, calibration technology, calibration procedure, accreditation, etc., the result of assessment was demonstrated by the improvement of skill before and after training. • Since the evaluation of the “skill after training” was conducted in 30 quantities, the result defined that the point of the skill after training of all C/Ps has been increased. • It can predict that the tendency of the result of the improvement of C/Ps skill will be increased in other quantities as well.
Indicator 5: Number of seminars and joint training.
<ul style="list-style-type: none"> • The improvement of C/Ps technical capability can be indicated by the seminars arrangement in order to disseminate their knowledge to others. • According to the record of seminars, the number of seminars that were supported by the Project and implemented from February 2003 up to April 2007 is 33 times covering in 32 quantities. Among this number, 7 seminars was conducted as ASEAN seminar. Furthermore, The ASEAN seminars that covered several of quantities in were also implemented 4 times excluding 7 times mentioned above. • Moreover, there are many seminars were conducted by NIMT itself in every year as a trainer for trainee program since 2003 to 2007. • In terms of Joint Training, by the time of this Terminal Evaluation, NIMT has already conducted 3 times of Joint Training on Measurement Standards in Thailand. Participants came from ASEAN countries and other Asia-Pacific Developing countries. • According to the information from the questionnaire and interview survey, recently there is no system for regular internal training implementing in NIMT since the course is organized by case.

NIMT has been implementing technical upgrading activities by following the technical cooperation program prepared at the beginning of the Project, which enhances Output 3

realized with the great significance.

Assessing all facts and findings described above, it could be concluded that Output 3 has been realized properly.

4.2.4 Output 4: Accuracy of national measurement standards is improved.

Indicator 1: Improvement in. Indicator 2: Registration of environmental data for every laboratory.
<ul style="list-style-type: none">•The Project was planned to finish the technical transfer in 42 quantities, and 37 quantities of the total 42 quantities have been completed by the end of May, 2007. The number of accreditation obtained during the Project reaches 14 quantities, which application procedure requires the preparation of uncertainty budget sheet and the registration of environmental data with internationally recognized standards.
Indicator 3: Number of international comparison implemented.
<ul style="list-style-type: none">•Moreover, 23 comparisons in 12 different quantities have been implemented in the focus of accuracy improvement.

These facts and findings above contribute comprehensively to the improvement of National Measurement Standards by realizing Output 4 with high significance.

4.2.5 Output 5: NIMT disseminates national measurement standard properly³.

Indicator 1: Improvement in calibration technology for reference standards.
<ul style="list-style-type: none">•The traceability chart is prepared for all quantities at the time of the project formulation period in order to indicate the level of accuracy of the calibration technology that NIMT would be able to provide by using the machinery described in the chart.•Consequently, the procurement plan of machinery and equipment was prepared based on these charts. For that reason, it can be said that there are 41 traceability charts for each quantity available in order to improve the calibration technology for reference standards of NIMT as planned.
Indicator 2: Number of calibration procedures created.
<ul style="list-style-type: none">•The calibration procedure has been provided in 37 quantities while 17 quantities are in the process.•As the result of the procurement of machinery and equipment has been delayed which affected to the schedule of technical transfer so the calibration procedure for 17 quantities has not yet been prepared.
Indicator 3: Items pointed by evaluation of quality system and the way to solve the items.
<ul style="list-style-type: none">•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 May 2007, the Project has been applied and got assessed for the accreditation in 14 quantities and it has plan to apply further more in 6 quantities by the time of the termination of the Project.

National measurement network necessary for the proper dissemination of National Measurement Standards has been considerably expanding by the improvement of the traceability in Thailand. In this regard the realization of output 5 is high.

In order to achieve the higher realization of output 5, the attainment of accreditation in other quantities is essential.

³ To establish National Measurement Standards with internationally recognized level of accuracy, it was defined that the project purpose contains the accreditation assessment in the mid-term evaluation.

4.3 Project Purpose

Based on the result of the detail assessment, it was confirmed that the adequate generation of outputs contributed to the achievement of the project purpose to a certain extent. There, however, were hindering factors influencing negatively on the level of its achievement.

4.4 Overall Goal

Potential impact derived from the Project reaches its extent widely from higher hierarchy of the National Measurement System to industrial communities in Thailand. Besides, the demand of NIMT as the primary calibration laboratory increases its significance since the international competitiveness of industrial products becomes severe.

It could be a reasonable assessment by the result of interview survey that the dissemination of the Project outcomes and the international recognition of NIMT will contribute to the further achievement of overall goal.

5 Evaluation Based on Five Criteria

The results of the analysis based on five evaluation criteria are described in the following sections.

5.1 Relevance

5.1.1 Facts and Findings

Focal Points	Results
Thai National Policy	<ul style="list-style-type: none"> • In the 10th National Economic and Social Development Plan (2007-2011), there is no changed in the direction in the importance of metrology that described the significant of the metrology system development in Thai industry. It is confirmed that the overall goal of the Project still coincide with the Thai national policies. • The result of questionnaire survey also illustrates high expectation of Thailand to maintain competitively in the global market and participation in the international economic agreements.
NIMT Policy	<ul style="list-style-type: none"> • The National Metrological System Development Act defines NIMT as the key institute to develop metrology system, procure and maintain national standards and standard reference materials of the country for all fields of measurement in accordance with the international metrology system. • The duty of NIMT shall include the supporting enhancement of efficiency of study and development of metrology technology to ensure the effectiveness of the metrology system of the country as reliable and acceptable to the international metrology system.
Japanese ODA Policy and JICA Country Program	<ul style="list-style-type: none"> • The Japanese government states in its basic policies of ODA charter that supporting self-help effort of developing countries, which includes economic and social infrastructure building constituting the basis for these countries' development, is one of the most important philosophies. Besides, it also defines the target area as ASEAN countries. • According to the country approach for Thailand in ODA charter, the technical cooperation is stipulated of the mean of approach for both bilateral and multilateral cooperation around the region. • Private sector development is one of the key issues in JICA countries approach for Thailand, particularly the enhancement of science and technology.
Relevance of Selection of NIMT	<ul style="list-style-type: none"> • The National Metrological System Development Act defines NIMT as the key institute to develop National Measurement Systems in Thailand. • According to the National Metrological System Development Act, NIMT is only one institute.
Technical Advantage of Japan	<ul style="list-style-type: none"> • The National Metrology Institute of Japan is established in 1903 while NIMT is established in 1998. It is indicated that Japan has far experiences in this field than Thailand almost 100 years.

5.1.2 Conclusion

The relevance of the Project is assessed still high based on the following reasons; 1. There is needs from industrial sector; 2. Importance of metrology system in the 10th National Economic and Social Development Plan (2007-2011); 3. The purpose of the Project meets the Japanese policies of ODA charter.

5.2 Effectiveness

5.2.1 Facts and Findings

Focal Points	Results
Degree of Achievement of Project Purpose	<ul style="list-style-type: none">• The technical transfer was planned to be achieved in 42 quantities in 8 fields. In fact, it has been completed in 37 quantities up to the end of May 2007. The main obstacle that hinders the completion of the process is the delay in machinery and equipment procurement. (<u>Indicator 1; Project Purpose</u>)• The Project team has conducted the internal survey to verify the NIMT's activities (<u>Indicator 1; Project Purpose</u>).• It was planned to completed technical transfer in other 5 quantities by the time of the termination of the Project since the schedule of deliverance of the rest of machinery and equipment has been confirmed already. (<u>Indicator 2; Project Purpose</u>)• Consequently, it can be expected that the National Measurement Standard will be installed and established as planned but the process of accreditation ensuring the internationally recognized level of accuracy has not yet be completed by the time of the termination of the Project. (<u>Indicator 2; Project Purpose</u>)• In order to achieve the attainment of accreditation, the budget of uncertainty should be prepared. For time being it was completed in 14 quantities. (<u>Indicator 2; Project Purpose</u>)• The number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project. (<u>Indicator 3; Project Purpose</u>)

Focal Points	Results
Assessment of Relation between Outputs and Project Purpose	<ul style="list-style-type: none"> • There is no changed in C/P employment plan during the time of Project evaluation. (<u>Important Assumption a; Project Purpose</u>) • Referring to the result of input analysis, there is no significant change in the budget allocation and policy during the Project. (<u>Important Assumption a- Project Purpose</u>) • It was also confirmed with the Permanent Secretary of Ministry of Science and Technology that there is no negative change, respectively. (<u>Important Assumption c- Project Purpose</u>) • Referring to the result of input analysis, the procurement and installation of 10 machineries have not yet been completed. The tentative schedule of the deliverance of 4 items is the end of June 2007 while the rest is July 2007. (<u>Important Assumption d- Project Purpose & Preconditions of the Project</u>) • All NIMT staffs trained by the Project have been working in NIMT at the time of Terminal Evaluation. (<u>Important Assumption e- Project Purpose</u>) • The project made their enormous efforts to catch up the progress by making their training schedule flexible and dispatch additional 5 persons to be trained in Japan as requested by NIMT. (<u>Positive influence</u>) • The monitoring system was set up to evaluate the progress of the Project continually. (<u>Positive Influence</u>) • A series of meetings was conducted every month since the beginning of the Project. Additionally, the JCC meeting is also conducted twice a year in order to maintain the mutual understanding between Japanese side and Thai side. (<u>Positive Influence</u>) • From the filed survey, long term experts have been providing Japanese Language Course for NIMT staffs, which supports the better communication between Japanese experts and Thai C/Ps. (<u>Positive Influence</u>)

5.2.2 Conclusion

The result of assessment on Outputs indicates that the degree of realization of Outputs is considerably high. Besides, the relevance of the important assumptions is confirmed as effective as before.

The project purpose has been generally achieved due to the adequate outputs generated by the inputs planned in the Project and enormous efforts from Japanese and Thai sides.

It, however, is notable that unfortunately the delay of new building construction and procurement of equipments affected the technical cooperation for some quantities and worked as a hindering factor to lower the achievement of the project purpose to a certain extent. This factor has been identified as a precondition of the Project, which is known as uncontrollable by the Project according to the evaluation methodology.

To expedite the process of equipment procurement by ODA Loans, NIMT took action including change of bidding method and etc...

5.3 Efficiency

5.3.1 Facts and Findings

Focal Points	Results
Degree of Achievement of Inputs	<ul style="list-style-type: none"> • Referring to the result of input analysis, the allocation of short term experts has been delayed in 5 quantities due to the delay of machinery and equipment procured by ODA loan. (<u>Indicator 1-1; Outputs</u>) • Nonetheless, for time being 36 short terms experts were dispatched and it is considered that the allocation is appropriate in terms of number and timing. (<u>Indicator 1-1; Outputs</u>) • The allocation of Thai C/Ps is considered appropriate in both administrative and technical staff. (<u>Indicator 1-1; Outputs</u>) • According to the result of the budget analysis for the implementation of the Project, it is confirmed that the budget was allocated as planned. (<u>Indicator 1-1; Outputs</u>) <hr/> <ul style="list-style-type: none"> • By the end of May 2007, the installation of 384 machinery and equipment procured by ODA loan are completed. (<u>Indicator 2-1-1; Outputs</u>) • There are 10 items have not been delivered yet. Anyhow, the tentative schedule of the deliverance has been confirmed. Consequently, the rest items will be delivered within July 2007. (<u>Indicator 2-1-1; Outputs</u>) • It is confirmed that all procured equipments are utilized effectively since these equipments are the important component for their performance. (<u>Indicator 2-1-1; Outputs</u>) <hr/> <ul style="list-style-type: none"> • Technical cooperation program has been prepared and components are implemented by the Project (<u>Indicator 3-1; Outputs</u>) • Allocation of C/P has been properly done. (<u>Indicator 3-2; Outputs</u>) • Budget sheet of uncertainty has been prepared increasingly as accreditation in quantities was attained. (<u>Indicator 3-3; Outputs</u>) • Evaluation sheet of technical transfer was prepared by the Project (<u>Indicator 3-4; Outputs</u>) • Regarding to the information from the questionnaire and interview survey, there is no particular system for internal training in NIMT. The course is organized irregularly. (<u>Indicator 3-5; Outputs</u>) <hr/> <ul style="list-style-type: none"> • Based on the fact that the process of technical transfer and accreditation have not yet been completed in all quantities; it is fair to say that the establishment and maintain of measurement standards have not yet achieved as planned. (<u>Indicator 4-1; Outputs</u>) • The environmental management system will be established after the completion of accreditation process. (<u>Indicator 4-2; Outputs</u>) • The accreditation process has been completed in 14 quantities. This means the environmental management of some laboratories has been improved. (<u>Indicator 4-2; Outputs</u>) • At the time of the terminal evaluation, it was confirmed that it has participated in 23 international comparisons as to 12 different quantities, which increased 8 comparisons in 2 quantities from the time of Mid-term evaluation. (<u>Indicator 4-3; Outputs</u>) <hr/> <ul style="list-style-type: none"> • The improvement of calibration technology is referred to the traceability chart of NIMT. It is confirmed that this chart is available in all quantities of technical transfer which automatically lead to the improvement of calibration technology. (<u>Indicator 5-1, 5-2, 5-3; Outputs</u>)

Focal Points	Results
Assessment of Relation between Inputs and Outputs	<ul style="list-style-type: none"> • Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation. (<u>Important Assumption; Outputs</u>) • The countermeasure to prevent the resignation of skillful NIMT staff trained by the Project could secure the adequate generation of outputs comprehensively. (<u>Positive Influence & Important Assumption; Outputs</u>) • The delay of the procurement of machinery and equipment might have hindered the achievement of Project outputs. (<u>Negative Influence; Precondition</u>)
Degree of Achievement of Outputs	<ul style="list-style-type: none"> • The result of output analysis, the enhancement of the operation and administration of the Project is satisfactory. (<u>Output 1</u>) • According to the result of questionnaire survey, the most of answers from respondents indicates more than fairly. (<u>Output 1</u>) • The result of output analysis, all equipment are operated and maintained properly. (<u>Output 2</u>) • According to the result of questionnaire survey, most of respondents rate very much and much. (<u>Output 2</u>) • The technical capability of C/P is assessed with the satisfactory level. (<u>Output 3</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 3</u>) • The accuracy of measurement standards is obviously improved in some quantities which accreditation processes have been completed. (<u>Output 4</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 4</u>) • The dissemination of national measurement standards has been conducted properly in some quantities which accreditation processes have been completed. (<u>Output 5</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 5</u>)

5.3.2 Conclusion

The timing of various inputs can be evaluated highly adequate due to its flexibility in accordance with the schedule of procurement. Moreover, the management of the Project has been remarkably well done under the collaboration of Japanese loan scheme. (E.g. Training in Japan (3 months) □ Self-learning (2 months) □ Follow-up training with using the equipment by ODA loans (1 month))

Most of expected outputs could be generated with the appropriate practice of equipments and machineries, however, the delay of procurement influenced slightly negatively on the generation of outputs also in this aspect.

5.4 Impact

5.4.1 Facts and Findings

Focal Points	Results
Degree of Achievement of Overall Goal	<ul style="list-style-type: none"> • NIMT has already participated in the Global MRA and quantities are increasingly listed in Appendix B and C of the Global MRA. However new registration to appendix C for transferred quantities have not been finalized yet. (<u>Indicator 1-1, 1-2; Overall Goal</u>) • The number of calibration laboratories that available on NIMT's website by the time of the evaluation is 78. (<u>Indicator 2-1; Overall Goal</u>) • The traceability charts for quantities shall describe the measurement network in Thailand and have been established increasingly as their accreditation was obtained. • The National Measurement Network with NIMT as its top has already encompassed more than 130 laboratories in its network according to the interview result from a director of NIMT. (<u>Indicator 2-2; Overall Goal</u>)
Assessment of Relation between Project purpose and Overall goal	<ul style="list-style-type: none"> • The National Metrological System Development Act stipulates NIMT to play their roles and responsibilities as the institute to develop metrology system, procure and maintain national standards and still effective (<u>Important Assumption; Overall Goal</u>) • This important assumption is assessed as applicable as before. (<u>Important Assumption; Overall Goal</u>)
Assessment of Unexpected Factors	<ul style="list-style-type: none"> • No particular unexpected factor has been identified through the evaluation.
Assessment of Ripple Effect from the Project	<ul style="list-style-type: none"> • NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training as well. The recognition of NIMT in the ASEAN region has been growing gradually since the Project started.

5.4.2 Conclusion

Since indicators verifying the achievement of the project overall goal have emerged in some fields according to the result of the evaluation survey of document review, interview, the current status of the impact could be considered quite positive and makes us expect the real achievement of overall goal in future if the project purpose is achieved with much higher level of satisfaction. This could imply directly the attainment of accreditation as in many quantities would promise the achievement of the project purpose and consequently project overall goal.

As a ripple effect, NIMT conducts seminars and workshop for ASEAN region on metrology periodically, therefore the visibility of NIMT in ASEAN region will increase in the future.

5.5 Sustainability

5.5.1 Facts and Findings

Focal Points	Results
Technical Aspect	<ul style="list-style-type: none"> • After the process of technical transfer and accreditation process were completed, NIMT staffs were given the opportunity to share their knowledge and experience with others staffs by assessing the record of seminars conducted by the Project. (<u>Indicator 3-5; Outputs</u>) • Most of respondents in the questionnaire survey evaluated that the technology of equipments and knowledge transferred through the Project were appropriate. (<u>Positive Factor of Sustainability</u>) • The technical and maintenance manuals have been prepared in the Project. (<u>Positive Factor of Sustainability</u>) • It was confirmed by the field observation that those manuals are utilized very much because of the guidance of accreditation. (<u>Positive Factor of Sustainability</u>)
Organizational Aspect	<ul style="list-style-type: none"> • Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation. (<u>Important Assumption; Outputs</u>) • 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 standard development of Thailand. (<u>Assessment of Effectiveness and Efficiency</u>) • According to the result of the interview survey, some it was revealed that the Quality System plays an important part to promote the competitiveness of Thai industry toward the international trading. NIMT is expected as a core organization to strengthen the national measurement system with the recognition of the international level. (<u>Interview Survey</u>)
Political Aspect	<ul style="list-style-type: none"> • The 10th national Economic and Social Development Plan described the importance of enhancing the competitiveness of Thai industry to the global market. In term of the international trading, the Quality System is required to build up consumers' confidence in the products. As a result, the measurement standard activity becomes a part of the system to ensure the quality of the products. (<u>Assessment of Relevance</u>) • Considering the roles and responsibilities of NIMT, the National Metrology System Development Act is still effective to encourage the activity of NIMT to play its role as the primary measurement standard organization and contribute to the firmly establishment of traceability system in Thailand ultimately. (<u>Assessment of Relevance</u>)
Financial Aspect	<ul style="list-style-type: none"> • Considering the annual government budget allocated to NIMT from 2004–2006, the trend is predicted as increasing. (<u>Input Analysis</u>)

5.5.2 Conclusion

Assessing comprehensively the facts and findings above, it could be concluded that the sustainability of the Project depends primarily on the firm establishment of National Measurement System with NIMT as its top organization and technical advantage of NIMT in this system under the corresponding of the current political support.

Once the improvement of mentioned aspects above reaches the certain level, the financial stability of NIMT would be promised because NIMT becomes indispensable among the system.

In order to confirm the sustainability of the Project, the accreditation should be attained by all means since it assures the accuracy of calibration and the traceability of quantities in the system.

6 Conclusion

Technical transfer of all quantities will be completed by the end of the Project, although the construction of new NIMT building and procurement of equipment were delayed in Japanese ODA loan. However, some accreditation assessment will not be accomplished within the Project term due to the above-mentioned delay.

It is assessed based on the actual result that most of quantities⁴ targeted in the Project can be accredited within one year after the termination of the Project. To achieve the initial Project purpose, the term of Project shall be extended by October, 2008.

⁴ NIMT is planned to accredit 35 quantities without “Inorganic Standard Solution” and “Organic Standard Solution” in the extension period.

7 Recommendation and Lesson Learned

7.1 Recommendation

1. Extension of project term

In this project, the technical transfer part is almost completed on 42 quantities, however in order to achieve “Internationally recognized level of accuracy”, only 14 quantities of a total of 37 quantities for accreditation assessment have accomplished at present, due to the delay of construction of new NIMT building and procurement of equipment by Japanese ODA loan. To firmly establish the result of this technical transfer in the form of accreditation in gaining international approval, and considering the request of the Project extension from NIMT, one year extension of the Project term would be appropriate, because most of quantity can be accredited during the extension periods.

2. Chemical standard

Regarding items of measurement standard for GUIDE 34⁵ in chemistry, it is rather difficult to obtain accreditation within one year extension periods. Therefore, to establish the quality system for gaining accreditation in the extension periods is preferable. To achieve this goal, it is needed for engineers in NIMT to participate in the training course on GUIDE 34 and GUIDE 35⁶.

3. CIPM-MRA appendix C⁷

NIMT should accelerate to register the transferred quantities on Appendix C of CIPM-MRA to be recognized internationally for the improvement of technical competence.

4. Sustainable human resource development

Comparing the evaluation of C/P between just after finishing technical transfer and some months later, the skill development and self motivation were found. Therefore the foundation of their self-sustaining human resource development was built. We hope that this continuous motivation is maintained in the future.

5. Human resource

The effort by minimum number of staff is definitely deserved, however to secure maintenance and dissemination of measurement standard, it is preferable for NIMT to ensure the necessary number of engineers and to intensive staff deployment in accordance with the future importance of measurement standard.

6. 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 highly 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

⁵ General Requirements for the competence of reference material producers

⁶ Certification of reference materials – General and statistical principle

⁷ Database on calibration and measurement capability of National Metrology Institute.

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.

7. Facility

In case of standard gas, although the installation of equipment and technical transfer was completed, the storage facility is unfinished. It is preferable to implement required measures by NIMT as soon as possible.

8. Safety control

The lack of safety control, such as untied high pressured gas tanks, was observed. It is highly recommended to avoid this pre-accident situation immediately.

9. Domestic dissemination

The NIMT contributes to secondary calibration organizations⁸ in domestic traceability system⁹. It is preferable to review the modalities of efficient contribution on the cooperation with accreditation body and calibration service to major users.

10. International dissemination

In the future, it is expected that NIMT can promote NIMT-traceable measurement standard and become hub-organization in the ASEAN countries by utilizing the result of the Project.

7.2 Lessons Learned

Regarding the project collaborated with Japanese ODA loan, the possibility of the schedule delay (ex. The procurement of equipment is not proceed smoothly) shall be taken into the consideration in the planning stage of the Project.

⁸ Registered organization to have Standard, which calibrated with primary Standard.

⁹ Measure is calibrated by Standard, Standard is also calibrated by more accurate Standard. Most accurate Standard is the National Metrology Standard. These linkages are called as “traceability system”.

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Minutes of Meeting (M/M)

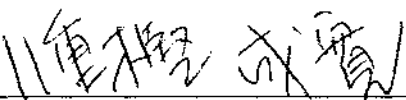
MINUTES OF MEETING
BETWEEN THE JAPANESE TERMINAL EVALUATION TEAM
AND
THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THAILAND
ON
THE JAPANESE TECHNICAL COOPERATION FOR
THE PROJECT ON THE TECHNICAL STRENGTHENING OF
NATIONAL INSTITUTE OF METROLOGY (THAILAND) PHASE 2

The Japan International Cooperation Agency, together with National Institute of Metrology (Thailand), (hereinafter referred to as “the organizations concerned”) conducted the joint terminal evaluation for the Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase 2 from 16th October, 2004 to 15th October, 2007.

During this period, the organizations concerned had a series of discussions and exchanged views on the project, and jointly evaluated the achievements of the project.

As the result of the discussions, the organizations concerned agreed to record the matters in the documents attached hereto.

Bangkok, June 22, 2007



Mr. Narihiro Yaegashi
Leader, Joint Evaluation Team,
Japan International Cooperation Agency
Japan



Dr. Pian Totarong
Director
National Institute of Metrology (Thailand)
Kingdom of Thailand

1 The Outline of the Terminal Evaluation Study

1.1 Background and the Purpose of the Study

The Project on technical strengthening of 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. The Project has already accomplished about 88% of the total technical transfer and 38% of the total accreditation review planned in the Project.

1.2 Objectives of the Evaluation Study

Before the completion of the Project, the Terminal Evaluation Study is conducted not only to evaluate the achievement in accordance with the five evaluation criteria, namely relevance, effectiveness, efficiency, impact, and sustainability, but also to assess the adequacy of termination and needs for the extension or follow-up of the project with considering above-mentioned results.

1.3 Members of the Evaluation Team

Table 1-1: Members of The Evaluation Team

<Japanese Side>

	Member's Name	Position
1	Mr. Narihiro YAEGASHI (Team Leader)	Deputy Resident Representative, JICA Regional Support Office for Asia
2	Mr. Yoji MATSUI	Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
3	Dr. Katsuo SETA	Chief Executive, International Accreditation Japan (IAJapan), National Institute of Technology and Evaluation (NITE)
4	Dr. Yoshio, HINO	Director, International Metrology Department, Metrology Standard Management Division, Advanced Industry Science and Technology (AIST)
5	Ms. Thanyatorn Singrueng	Researcher, Kokusai Kogyo (Thailand) Ltd. (Consultant)
6	Mr. Kazuya MARUO	Assistant Resident Representative, JICA Thailand Office

<Thai Side>

	Member's Name	Position
1	Dr. Pian Totarong	Director, National Institute of Metrology (Thailand), (NIMT)
2	Mr. Veera Tulasombat	Head of Mechanical Metrology Department, NIMT
3	Ms. Ajchara Charoensook	Head of Electrical Metrology Department, NIMT
4	Dr. Chainarong Cherdchu	Head of Chemical Metrology Department, NIMT
5	Mr. Arkom Krachangmol	Asst. Head of Photometry Metrology Department, NIMT
6	Mr. Virat Plangsangmas	Asst. Head of Acoustics & Vibration Metrology Department, NIMT
7	Ms. Nattanit Pongjeerakumchorn	Asst. Manager of Policy & Strategy Dept., Acting Int'l Relations Section Head, NIMT
8	Ms. Suthanone Fungtammasan	Programme Officer, Thailand International Development Cooperation Agency (TICA)
9	Ms. Sunee Suthianun	Programme Officer, TICA

1.4 Schedule of the Evaluation Study

Table 1-2: Schedule of the Evaluation Study

Date		Schedule	Remarks
6/11	Mon	Kick off meeting, Distribution of Questionnaire	Consultant
6/12	Tue	Interviews with TISTR, DSS	Consultant
6/13	Wed	Collection of Questionnaire, Compiling collected information	Consultant
6/14	Thu	Interviews with MOST	Consultant
6/15	Fri	Interviews with Private Sector	Consultant
6/16	Sat	Compiling and analyzing collected information	Consultant
6/17	Sun	Compiling and analyzing collected information	Consultant
6/18	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
6/19	Tue	AM Discussion (2): Confirming the Actual Results	Japanese team
		PM Discussion (3): Confirming the Actual Results	All members
6/20	Wed	AM Discussion (4): Confirming the Actual Results	Japanese team
		PM Discussion (5): Confirming the Lessons Learned and Recommendations	All members
6/21	Thu	AM Revision of the Joint Evaluation Report	Japanese team
		PM Revision of the Joint Evaluation Report	T: Dr. Pian, Ms. Nattanit J: Mr. Maruo
6/22	Fri	AM Preparation form JCC/ Discussion (7) (if necessary)	Japanese team
		PM 8th JCC (Signing the Joint Evaluation Report)	All members
		Report to EOJ	Japanese team

2 The 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.

2.2.1 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.

2.2.2 Project Period

From October 2004 to October 2007 (3 years)

2.2.3 Total Amount of Cooperation

330 million Japanese Yen



2.2.4 Counterpart Agency

National Institute of Metrology (Thailand) (also known as NIMT)

2.2.5 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)

2.2.6 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 five evaluation criteria are part of the basic evaluation method set by the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD) to evaluate the project achievements. All of the JICA projects are presently evaluated by this evaluation method. The five criteria as described in Table 3-1 are applied in the evaluation grid and consequently the questionnaire. The Evaluation Grid was produced to compare the outcomes of the Project with its design.

Table 3-1: Five Evaluation Criteria

Relevance	Relevance of the project plan is reviewed based on the validity of the project purpose and the overall goal in connection with the development policy of the Government of Thailand and the needs of the beneficiaries and also the logicity of the plan.
Effectiveness	Effectiveness is assessed by evaluating to what extent the project has achieved its purpose and clarifying the relationships between purpose and outputs
Efficiency	Efficiency of the project implementation was analyzed with emphasis on the relationship between outputs and inputs in terms of timing, quality and quantity.
Impact	Impact of the project was assessed by measuring either positive or negative influences generated by the project, which were not originally expected in the project plan.
Sustainability	Sustainability of the project was assessed from organizational, technical and financial aspects based on the extent to which the achievements of the project were sustained or expanded after the project was terminated.

3.2 Method of the Study

The objectives of this evaluation study mentioned in the previous chapter were examined mainly by literature review, questionnaire survey, interview survey, and field visit.

3.2.1 Literature Review

The study team initially started its survey with the collection of materials related to the project. The literature review covered not only existing reports and documents prepared in the project, but also other related materials from various information sources such as concerned parties and websites.

3.2.2 Questionnaire Survey

After confirming those through the collected materials, the study team went on to the works for the preparation of the evaluation grid and the questionnaire distributed to twelve NIMT staff who participated in the trainings in Japan. The evaluation grid was formulated focusing especially on the five evaluation criteria described above.

3.2.3 Interview Survey

The interviewees were selected principally from both direct and indirect beneficiaries of the Project which are NIMT, MOST, DSS, and TISTR. The purpose of interviews was to evaluate the achievement or underachievement of the Project. Moreover, the interviews were intended to explore the potential impacts and sustainability that contributed to the Thai society.

3.3 Limitation and Restrictions of the Study

The plan of operation was formulated in collaborating with the building construction and the procurement of machineries and equipments by Japanese loan scheme. It is essential for the Project if the nature of the Project is carefully considered. In fact it is included in the Project Design Matrix (PDM) as the precondition, which is accounted for an uncontrollable factor from the Project.



4 Achievement of the Project

4.1 Inputs

4.1.1 Inputs from Japanese Side

The inputs from the Japanese side are summarized in the following sections.

a. Dispatch of Long Term Japanese Experts

Five Long Term Japanese Experts shown in the Table 3-1 were dispatched to Thailand during the time of Project implementation.

Table 4-1: Summary of Long Term Japanese Experts Dispatch

Measurement Standard	Duration	Name of Long-term Expert
1. Chief Advisor	Oct. 16, 2002 – Oct. 15, 2007	Dr. Yoshiaki Akimoto
2. Coordinator	Oct. 16, 2002 – Oct. 15, 2007	Ms. Ikuko Niizeki
3. Physical Standards	Oct. 16, 2002 – Oct. 15, 2006	Mr. Jiro Matsuda
4. Electromagnetic Standards	Oct. 16, 2004 – Dec. 30, 2006	Dr. Joji Kinoshita
5. Chemical Standards	Oct. 16, 2004 – Dec. 30, 2006	Dr. Akira Nomura

b. Dispatch of Short Term Japanese Experts

Since the commencement of Phase 2 up to May 2007, 30 Short Term Japanese Experts were dispatched to Thailand during the respective project periods. In this number, 2 of them were supported by NMIJ and 1 from IAJapan. The dispatch has been delayed in 5 quantities explicitly Line Scale, Pressure, Fixed Point, Group Resistance, and QHR due to the delay of machinery and equipment procured by Japanese ODA loan.

However, the dispatch of short-term experts is confirmed in 3 quantities (Line Scale, Pressure, and Fixed Point), while the other 2 quantities (Group Resistance, and QHR) have not been confirmed yet. In short, the expectation of short-term experts dispatch is 36 including one more expert in Calibration Procedure by the time of the termination of the Project.

c. Counterpart Training in Japan

A series of trainings regarding to the content of technical transfer¹ were conducted in Japan during the project period. Since the commencement of Phase 2, the total number of C/Ps has been trained in Japan is 16 persons. The dispatch of 11 C/Ps was programmed in the schedule of technical transfer while the dispatch of 5 C/Ps was requested by NIMT. Those additional requested quantities are Environment Management Technology, Mass, Watt Hour, AC Voltage and Density.

¹ In this Project, the technical transfer consists of 3 types of activities namely 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.

d. Machinery and Equipment procured by ODA Loan

By the end of May 2007, the procurement of 387 machinery and equipment procured by ODA Loan are completed. There are 7 items have not been delivered yet. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for rest is in July 2007.

e. Supporting local cost

The supporting local cost by JICA from the commencement of Phase 2 up to the time of Terminal Evaluation is 7,036,898 THB as shown in detail in Table 4-2.

Table 4-2: Supporting Local Cost by JICA

JFY	2004	2005	2006	2007
1 st quarter		202,000	1,266,200	1,583,090
2 nd quarter		2,093,000	298,520	
3 rd quarter	366,000	0	489,930	
4 th quarter	420,000	121,958	196,200	
Total	786,000	2,416,958	2,250,850	1,583,090

Unit: THB

4.1.2 Inputs from Thai Side

The inputs from the Thai side since the commencement of the project are summarized in the following sections.

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 already relocated to the new building except the Laboratory of Acoustics and Vibration which keep the station base in the DSS. The office space for the Project team was provided in the new building. In overall, the reconstruction and renovation of all laboratories are completed except the Standard Gas which has been constructed in the administrative building and now is under renovation.

b. C/P and administrative personnel

NIMT has allocated 1 administrative C/P, which is the director of NIMT, and 36 technical C/Ps responsible for every target quantity of the technical transfer in the Phase 2. Moreover, one more administrative C/P from International Relations Section has allocated to support for the communication and administration of the Project.

c. Maintenance of machinery and equipment

All machinery and equipment have been provided by Thai side as planned and operated properly.

d. Necessary budget for the implementation of the project

The necessary budget for the implementation of the Project came from 2 sources - NIMT and TICA. The total amount of budget is summarized as shown in Table 4-3.

Table 4-3: Necessary Budget for the Implementation of the Project

Unit: THB

Thai FY	2005	2006	2007
NIMT	519,600	519,600	519,600
TICA	805,170	930,405	715,038

4.2 Outputs

4.2.1 Output 1: The operation and administration of the project are enhanced

<p>Indicator 1: Staff and budget are allocated to the project</p> <ul style="list-style-type: none"> • The allocation of the C/P and staff for the Project was implemented as planned. • The long-term Japanese experts were also dispatched as planned while some short-term Japanese experts have not been dispatched yet due to the delay of machinery and equipment procured by ODA loan. • Regarding to the budget for the Project operation and administration, it was also allocated as shown in Table 4-2 and Table 4-3.
--

Based on the confirmation of input status quantitatively and qualitatively from both Japanese and Thai sides, the input contributed enough to realize Output 1.

4.2.2 Output 2: The equipment is operated and maintained properly

<p>Indicator 1: National Measurement Standards are installed and established in the 40 quantities of the project.</p> <ul style="list-style-type: none"> • The Project was planned to finish the technical transfer in 42 quantities. However, the technical transfer has been completed in 37 quantities by the end of May 2007. • The current condition of the technical transfer shows the delay from P/O. • This was caused clearly by the delay of the procurement of machineries and equipments. Nonetheless, it was planned to completed technical transfer in other 5 quantities by the time of the completion of the Project since the schedule of deliverance of the rest machinery and equipment has been confirmed. • Consequently, it can expected that the National Measurement Standard will be installed and established successfully as planned
<p>Indicator 2: Registration of maintenance record and calibration record of equipment.</p> <ul style="list-style-type: none"> • After the installation and establishment of the national measurement standard, the registration of maintenance and calibration records of the equipment has been done. In the mean time, the operation and maintenance of those equipments are conducted through the technical transfer during the training period of the project.
<p>Indicator 3: Manuals of operation and maintenance management are provided and organized for reference.</p> <ul style="list-style-type: none"> • It was confirmed that the manuals of operation and maintenance management of existing machinery and equipment of the Project are provided and organized properly.

The degree of the realization of output 2 has been improved continuously as each program of the technical transfer was completed.

All technical transfer will be completed by the end of the Project and on a parallel with this the degree of output 2 is expected to reach the adequate level as planned.

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

Indicator 1: Technical Cooperation Program is created.
<ul style="list-style-type: none"> • NIMT has the technical cooperation program prepared at the beginning of the Project.
Indicator 2: C/Ps are appropriately assigned.
<ul style="list-style-type: none"> • Refer to Indicator 1 of Output 1
Indicator 3: Improvement in the uncertainty.
<ul style="list-style-type: none"> • The improvement in the uncertainty has been defined in the Uncertainty Budget Sheet which will be prepared after the accreditation process was done. • According to the result of technical transfer, it was confirmed that the budget of uncertainty has been improved in 14 quantities while 6 quantities was planned to be improved by the time of the termination of the Project.
Indicator 4: Point of the "Skill after training"
<ul style="list-style-type: none"> • Referring to the Point of the "Skill after training" in the Evaluation Sheet on Technical Transfer which has several criteria of the assessment on each quantity - installation, operation, calibration technology, calibration procedure, accreditation, etc., the result of assessment was demonstrated by the improvement of skill before and after training. • Since the evaluation of the "skill after training" was conducted in 30 quantities, the result defined that the point of the skill after training of all C/Ps has been increased. • It can predict that the tendency of the result of the improvement of C/Ps skill will be increased in other quantities as well.
Indicator 5: Number of seminars and joint training.
<ul style="list-style-type: none"> • The improvement of C/Ps technical capability can be indicated by the seminars arrangement in order to disseminate their knowledge to others. • According to the record of seminars, the number of seminars that were supported by the Project and implemented from February 2003 up to April 2007 is 33 times covering in 32 quantities. Among this number, 7 seminars was conducted as ASEAN seminar. Furthermore, The ASEAN seminars that covered several of quantities in were also implemented 4 times excluding 7 times mentioned above. • Moreover, there are many seminars were conducted by NIMT itself in every year as a trainer for trainee program since 2003 to 2007. • In terms of Joint Training, by the time of this Terminal Evaluation, NIMT has already conducted 3 times of Joint Training on Measurement Standards in Thailand. Participants came from ASEAN countries and other Asia-Pacific Developing countries. • According to the information from the questionnaire and interview survey, recently there is no system for regular internal training implementing in NIMT since the course is organized by case.

NIMT has been implementing technical upgrading activities by following the technical cooperation program prepared at the beginning of the Project, which enhances Output 3 realized with the great significance.

Assessing all facts and findings described above, it could be concluded that Output 3 has been realized properly.

4.2.4 Output 4: Accuracy of national measurement standards is improved.

Indicator 1: Improvement in
Indicator 2: Registration of environmental data for every laboratory
<ul style="list-style-type: none"> • The Project was planned to finish the technical transfer in 42 quantities, and 37 quantities of the total 42 quantities have been completed by the end of May, 2007. The number of accreditation obtained during the Project reaches 14 quantities, which application procedure requires the preparation of uncertainty budget sheet and the registration of environmental data with internationally recognized standards.
Indicator 3: Number of international comparison implemented
<ul style="list-style-type: none"> • Moreover, 23 comparisons in 12 different quantities have been implemented in the focus of accuracy improvement.

These facts and findings above contribute comprehensively to the improvement of National Measurement Standards by realizing Output 4 with high significance.

4.2.5 Output 5: NIMT disseminates national measurement standard properly.

Indicator 1: Improvement in calibration technology for reference standards
<ul style="list-style-type: none"> • The traceability chart is prepared for all quantities at the time of the project formulation period in order to indicate the level of accuracy of the calibration technology that NIMT would be able to provide by using the machinery described in the chart. • Consequently, the procurement plan of machinery and equipment was prepared based on these charts. For that reason, it can be said that there are 41 traceability charts for each quantity available in order to improve the calibration technology for reference standards of NIMT as planned.
Indicator 2: Number of calibration procedures created
<ul style="list-style-type: none"> • The calibration procedure has been provided in 37 quantities while 17 quantities are in the process. • As the result of the procurement of machinery and equipment has been delayed which affected to the schedule of technical transfer so the calibration procedure for 17 quantities has not yet been prepared.
Indicator 3: Items pointed by evaluation of quality system and the way to solve the items
<ul style="list-style-type: none"> • 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 May 2007, the Project has been applied and got assessed for the accreditation in 14 quantities and it has plan to apply further more in 6 quantities by the time of the termination of the Project.

National measurement network necessary for the proper dissemination of National Measurement Standards has been considerably expanding by the improvement of the traceability in Thailand. In this regard the realization of output 5 is high.

In order to achieve the higher realization of output 5, the attainment of accreditation in other quantities is essential.

4.3 Project Purpose

Based on the result of the detail assessment, it was confirmed that the adequate generation of outputs contributed to the achievement of the project purpose to a certain extent. There, however, were hindering factors influencing negatively on the level of its achievement.

4.4 Overall Goal

Potential impact derived from the Project reaches its extent widely from higher hierarchy of the National Measurement System to industrial communities in Thailand. Besides, the demand of NIMT as the primary calibration laboratory increases its significance since the international competitiveness of industrial products becomes severe.

It could be a reasonable assessment by the result of interview survey that the dissemination of the Project outcomes and the international recognition of NIMT will contribute to the further achievement of overall goal.



5 Evaluation Based on Five Criteria

5.1 Results of Evaluation Based on Five Criteria

The results of the analysis based on five evaluation criteria are described in the following sections.

5.1.1 Relevance

a. Facts and Findings

Focal Points	Results
Thai National Policy	<ul style="list-style-type: none"> • In the 10th National Economic and Social Development Plan (2007-2011), there is no changed in the direction in the importance of metrology that described the significant of the metrology system development in Thai industry. It is confirmed that the overall goal of the Project still coincide with the Thai national policies. • The result of questionnaire survey also illustrates high expectation of Thailand to maintain competitively in the global market and participation in the international economic agreements.
NIMT Policy	<ul style="list-style-type: none"> • The National Metrological System Development Act defines NIMT as the key institute to develop metrology system, procure and maintain national standards and standard reference materials of the country for all fields of measurement in accordance with the international metrology system. • The duty of NIMT shall include the supporting enhancement of efficiency of study and development of metrology technology to ensure the effectiveness of the metrology system of the country as reliable and acceptable to the international metrology system.
Japanese ODA Policy and JICA Country Program	<ul style="list-style-type: none"> • The Japanese government states in its basic policies of ODA charter that supporting self-help effort of developing countries, which includes economic and social infrastructure building constituting the basis for these countries' development, is one of the most important philosophies. Besides, it also defines the target area as ASEAN countries. • According to the country approach for Thailand in ODA charter, the technical cooperation is stipulated of the mean of approach for both bilateral and multilateral cooperation around the region. • Private sector development is one of the key issues in JICA countries approach for Thailand, particularly the enhancement of science and technology.
Relevance of Selection of NIMT	<ul style="list-style-type: none"> • The National Metrological System Development Act defines NIMT as the key institute to develop National Measurement Systems in Thailand. • According to the National Metrological System Development Act, NIMT is only one institute.
Technical Advantage of Japan	<ul style="list-style-type: none"> • The National Metrology Institute of Japan is established in 1903 while NIMT is established in 1998. It is indicated that Japan has far experiences in this field than Thailand almost 100 years.

b. Conclusion

The relevance of the Project is assessed still high based on the consistency of Thai and Japanese policies and the demands from target groups.

5.1.2 Effectiveness

a. Facts and Findings

Focal Points	Results
Degree of Achievement of Project Purpose	<ul style="list-style-type: none"> • The technical transfer was planned to be achieved in 42 quantities in 8 fields. In fact, it has been completed in 37 quantities up to the end of May 2007. The main obstacle that hinders the completion of the process is the delay in machinery and equipment procurement. (Indicator 1; Project Purpose) • The Project team has conducted the internal survey to verify the NIMT's activities (Indicator 1; Project Purpose). • It was planned to completed technical transfer in other 5 quantities by the time of the termination of the Project since the schedule of deliverance of the rest of machinery and equipment has been confirmed already. (Indicator 2; Project Purpose) • Consequently, it can be expected that the National Measurement Standard will be installed and established as planned but the process of accreditation ensuring the internationally recognized level of accuracy has not yet be completed by the time of the termination of the Project. (Indicator 2; Project Purpose) • In order to achieve the attainment of accreditation, the budget of uncertainty should be prepared. For time being it was completed in 14 quantities. (Indicator 2; Project Purpose) • The number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project. (Indicator 3; Project Purpose)

Focal Points	Results
<p>Assessment of Relation between Outputs and Project Purpose</p>	<ul style="list-style-type: none"> • There is no changed in C/P employment plan during the time of Project evaluation. (Important Assumption a; Project Purpose) • Referring to the result of input analysis, there is no significant change in the budget allocation and policy during the Project. (Important Assumption a- Project Purpose) • Referring to the result of input analysis; there is no significant change in the budget allocation and policy during the Project. (Important Assumption b; Project Purpose) • It was also confirmed with the Permanent Secretary of Ministry of Science and Technology that there is no negative change, respectively. (Important Assumption c- Project Purpose) • Referring to the result of input analysis, the procurement and installation of 10 machineries have not yet been completed. The tentative schedule of the deliverance of 4 items is the end of June 2007 while the rest is July 2007. (Important Assumption d- Project Purpose & Preconditions of the Project) • All NIMT staffs trained by the Project have been working in NIMT at the time of Terminal Evaluation. (Important Assumption e- Project Purpose) • The project made their enormous efforts to catch up the progress by making their training schedule flexible and dispatch additional 5 persons to be trained in Japan as requested by NIMT. (Positive influence) • The monitoring system was set up to evaluate the progress of the Project continually. (Positive Influence) • A series of meetings was conducted every month since the beginning of the Project. Additionally, the JCC meeting is also conducted twice a year in order to maintain the mutual understanding between Japanese side and Thai side. (Positive Influence) • From the filed survey, long term experts have been providing Japanese Language Course for NIMT staffs, which supports the better communication between Japanese experts and Thai C/Ps. (Positive Influence)

b. Conclusion

The result of assessment on Outputs indicates that the degree of realization of Outputs is considerably high. Besides, the relevance of the important assumptions is confirmed as effective as before.

The project purpose has been generally achieved due to the adequate outputs generated by the inputs planned in the Project and enormous efforts from Japanese and Thai sides.

It, however, is notable that unfortunately the delay of new building construction and procurement of equipments worked as a hindering factor to lower the achievement of the project purpose to a certain extent. This factor has been identified as a precondition of the Project, which is known as uncontrollable by the Project according to the evaluation methodology.

5.1.3 Efficiency

a. Facts and Findings

Focal Points	Results
Degree of Achievement of Inputs	<ul style="list-style-type: none"> • Referring to the result of input analysis, the allocation of short term experts has been delayed in 5 quantities due to the delay of machinery and equipment procured by ODA loan. (Indicator 1-1; Outputs) • Nonetheless, for time being 36 short terms experts were dispatched and it is considered that the allocation is appropriate in terms of number and timing. (Indicator 1-1; Outputs) • The allocation of Thai C/Ps is considered appropriate in both administrative and technical staff. (Indicator 1-1; Outputs) • According to the result of the budget analysis for the implementation of the Project, it is confirmed that the budget was allocated as planned. (Indicator 1-1; Outputs) • By the end of May 2007, the installation of 384 machinery and equipment procured by ODA loan are completed. (Indicator 2-1-1; Outputs) • There are 10 items have not been delivered yet. Anyhow, the tentative schedule of the deliverance has been confirmed. Consequently, the rest items will be delivered within July 2007. (Indicator 2-1-1; Outputs) • It is confirmed that all procured equipments are utilized effectively since these equipments are the important component for their performance. (Indicator 2-1-1; Outputs) • Technical cooperation program has been prepared and components are implemented by the Project (Indicator 3-1; Outputs) • Allocation of C/P has been properly done. (Indicator 3-2; Outputs) • Budget sheet of uncertainty has been prepared increasingly as accreditation in quantities was attained. (Indicator 3-3; Outputs) • Evaluation sheet of technical transfer was prepared by the Project (Indicator 3-4; Outputs) • Regarding to the information from the questionnaire and interview survey, there is no particular system for internal training in NIMT. The course is organized irregularly. (Indicator 3-5; Outputs) • Based on the fact that the process of technical transfer and accreditation have not yet been completed in all quantities; it is fair to say that the establishment and maintain of measurement standards have not yet achieved as planned. (Indicator 4-1; Outputs) • The environmental management system will be established after the completion of accreditation process. (Indicator 4-2; Outputs) • The accreditation process has been completed in 14 quantities. This means the environmental management of some laboratories has been improved. (Indicator 4-2; Outputs) • At the time of the terminal evaluation, it was confirmed that it has participated in 23 international comparisons as to 12 different quantities, which increased 8 comparisons in 2 quantities from the time of Mid-term evaluation. (Indicator 4-3; Outputs) • The improvement of calibration technology is referred to the traceability chart of NIMT. It is confirmed that this chart is available in all quantities of technical transfer which automatically lead to the improvement of calibration technology. (Indicator 5-1, 5-2, 5-3; Outputs)

Focal Points	Results
Assessment of Relation between Inputs and Outputs	<ul style="list-style-type: none"> • Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation. (<u>Important Assumption; Outputs</u>) • The countermeasure to prevent the resignation of skillful NIMT staff trained by the Project could secure the adequate generation of outputs comprehensively. (<u>Positive Influence & Important Assumption; Outputs</u>) • The delay of the procurement of machinery and equipment might have hindered the achievement of Project outputs. (<u>Negative Influence; Precondition</u>)
Degree of Achievement of Outputs	<ul style="list-style-type: none"> • The result of output analysis, the enhancement of the operation and administration of the Project is satisfactory. (<u>Output 1</u>) • According to the result of questionnaire survey, the most of answers from respondents indicates more than fairly. (<u>Output 1</u>) • The result of output analysis, all equipment are operated and maintained properly. (<u>Output 2</u>) • According to the result of questionnaire survey, most of respondents rate very much and much. (<u>Output 2</u>) • The technical capability of C/P is assessed with the satisfactory level. (<u>Output 3</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 3</u>) • The accuracy of measurement standards is obviously improved in some quantities which accreditation processes have been completed. (<u>Output 4</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 4</u>) • The dissemination of national measurement standards has been conducted properly in some quantities which accreditation processes have been completed. (<u>Output 5</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 5</u>)

b. Conclusion

The timing of various inputs can be evaluated highly adequate due to its flexibility in accordance with the schedule of procurement. Moreover, the management of the Project has been remarkably well done under the collaboration of Japanese loan scheme.

However, most of expected outputs could be generated with the appropriate practice of equipments and machineries. So far, the delay of procurement influenced slightly negatively on the generation of outputs also in this aspect.

Under such a difficult situation the generation of outputs has been achieved with the certain level of satisfactory. This can prove that the efficiency of the Project is high.

5.1.4 Impact

a. Facts and Findings

Focal Points	Results
Degree of Achievement of Overall Goal	<ul style="list-style-type: none"> • NIMT has already participated in the Global MRA and quantities are increasingly listed in Appendix B and C of the Global MRA. However new registration to appendix C for transferred quantities have not been finalized yet. (Indicator 1-1, 1-2; Overall Goal) • The number of calibration laboratories that available on NIMT's website by the time of the evaluation is 78. (Indicator 2-1; Overall Goal) • The traceability charts for quantities shall describe the measurement network in Thailand and have been established increasingly as their accreditation was obtained. • The National Measurement Network with NIMT as its top has already encompassed more than 130 laboratories in its network according to the interview result from a director of NIMT. (Indicator 2-2; Overall Goal)
Assessment of Relation between Project purpose and Overall goal	<ul style="list-style-type: none"> • The National Metrological System Development Act stipulates NIMT to play their roles and responsibilities as the institute to develop metrology system, procure and maintain national standards and still effective (Important Assumption; Overall Goal) • This important assumption is assessed as applicable as before. (Important Assumption; Overall Goal)
Assessment of Unexpected Factors	<ul style="list-style-type: none"> • No particular unexpected factor has been identified through the evaluation.
Assessment of Ripple Effect from the Project	<ul style="list-style-type: none"> • NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training as well. The recognition of NIMT in the ASEAN region has been growing gradually since the Project started.

b. Conclusion

Indicators verifying the achievement of the project overall goal have emerged in some fields according to the result of the evaluation survey of document review, interview, etc. However, it may be reasonable that the level of this achievement is assessed under the satisfactory level because of the degree of the achievement of the project purpose.

The current status of the impact could be considered quite positive and makes us expect the real achievement of overall goal in future if the project purpose is achieved with much higher level of satisfaction. This could imply directly the attainment of accreditation as in many quantities would promise the achievement of the project purpose and consequently project overall goal.

5.1.5 Sustainability

a. Facts and Findings

Focal Points	Results
Technical Aspect	<ul style="list-style-type: none"> • After the process of technical transfer and accreditation process were completed, NIMT staffs were given the opportunity to share their knowledge and experience with others staffs by assessing the record of seminars conducted by the Project. (<u>Indicator 3-5; Outputs</u>) • Most of respondents in the questionnaire survey evaluated that the technology of equipments and knowledge transferred thought the Project were appropriate. (<u>Positive Factor of Sustainability</u>) • The technical and maintenance manuals have been prepared in the Project. (<u>Positive Factor of Sustainability</u>) • It was confirmed by the field observation that those manuals are utilized very much because of the guidance of accreditation. (<u>Positive Factor of Sustainability</u>)
Organizational Aspect	<ul style="list-style-type: none"> • Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation. (<u>Important Assumption; Outputs</u>) • 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 standard development of Thailand. (<u>Assessment of Effectiveness and Efficiency</u>) • According to the result of the interview survey, some it was revealed that the Quality System plays an important part to promote the competitiveness of Thai industry toward the international trading. NIMT is expected as a core organization to strengthen the national measurement system with the recognition of the international level. (<u>Interview Survey</u>)
Political Aspect	<ul style="list-style-type: none"> • The 10th national Economic and Social Development Plan described the importance of enhancing the competitiveness of Thai industry to the global market. In term of the international trading, the Quality System is required to build up consumers' confidence in the products. As a result, the measurement standard activity becomes a part of the system to ensure the quality of the products. (<u>Assessment of Relevance</u>) • Considering the roles and responsibilities of NIMT, the National Metrology System Development Act is still effective to encourage the activity of NIMT to play its role as the primary measurement standard organization and contribute to the firmly establishment of traceability system in Thailand ultimately. (<u>Assessment of Relevance</u>)
Financial Aspect	<ul style="list-style-type: none"> • Considering the annual government budget allocated to NIMT from 2004-2006, the trend is predicted as increasing. (<u>Input Analysis</u>)

b. Conclusion

Assessing comprehensively the facts and findings above, it could be concluded that the sustainability of the Project depends primarily on the firm establishment of National Measurement System with NIMT as its top organization and technical advantage of NIMT in this system under the corresponding of the current political support.

Once the improvement of mentioned aspects above reaches the certain level, the financial stability of NIMT would be promised because NIMT becomes indispensable among the system.

In order to confirm the sustainability of the Project, the accreditation should be attained by all means since it assures the accuracy of calibration and the traceability of quantities in the system.



6 Conclusion

Technical transfer of all quantities will be completed by the end of the Project, although the construction of new NIMT building and procurement of equipment were delayed in Japanese ODA loan. However, some accreditation assessment will not be accomplished within the Project term due to the above-mentioned delay.

It is assessed based on the actual result that most of quantities targeted in the Project can be accredited within one year after the termination of the Project. To achieve the initial Project purpose, the term of Project shall be extended by October, 2008.

7 Recommendation and Lesson Learned

7.1 Recommendation

1. Extension of project term

In this project, the technical transfer part is almost completed, however only 14 quantities of a total of 37 quantities for accreditation assessment have accomplished at present, due to the delay of construction of new NIMT building and procurement of equipment by Japanese ODA loan. To firmly establish the result of this technical transfer in the form of accreditation in gaining international approval, and considering the request of the Project extension from NIMT, one year extension of the Project term would be appropriate, because most of quantity can be accredited during the extension periods.

2. Chemical standard

Regarding items of measurement standard for GUIDE 34² in chemistry, it is rather difficult to obtain accreditation within one year extension periods. Therefore, to establish the quality system for gaining accreditation in the extension periods is preferable. To achieve this goal, it is needed for engineers in NIMT to participate in the training course on GUIDE 34 and GUIDE 35³.

3. CIPM-MRA appendix C

NIMT should accelerate to register the transferred quantities on Appendix C of CIPM-MRA to be recognized internationally for the improvement of technical competence.

4. Sustainable human resource development

Comparing the evaluation of C/P between just after finishing technical transfer and some months later, the skill development and self motivation were found. Therefore the foundation of their self-sustaining human resource development was built. We hope that this continuous motivation is maintained in the future.

5. Human resource

The effort by minimum number of staff is definitely deserved, however to secure maintenance and dissemination of measurement standard, it is preferable to ensure the necessary number of engineers and to intensive staff deployment in accordance with the future importance of measurement standard.

6. 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 highly 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

² General Requirements for the competence of reference material producers

³ Certification of reference materials – General and statistical principle

between the each department, and prepare a system to deal with management system and required items which are in common among the departments.

7. Facility

In case of standard gas, although the installation of equipment and technical transfer was completed, the storage facility is unfinished. It is preferable to implement required measures as soon as possible.

8. Safety control

The lack of safety control, such as untied high pressured gas tanks, was observed. It is highly recommended to avoid this pre-accident situation immediately.

9. Domestic dissemination

The NIMT contributes to secondary calibration organizations in domestic traceability system. It is preferable to review the modalities of efficient contribution on the cooperation with accreditation body and calibration service to major users.

10. International dissemination

In the future, it is expected that NIMT can promote NIMT-traceable measurement standard and become hub-organization in the ASEAN countries by utilizing the result of the Project.

7.2 Lessons Learned

Regarding the project collaborated with Japanese ODA loan, the possibility of the schedule delay (ex. The procurement of equipment is not proceed smoothly) shall be taken into the consideration in the planning stage of the Project.

List of Abbreviation

AIST	National Institute of Advance Industrial Science and Technology
C/P	Counterpart
CERI	Chemicals Evaluation and Research Institute, Japan
DAC	Development Assistance Committee
DQM	Department of Quality Manual
DSS	Department of Science Service
EOJ	Embassy of Japan
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
MOST	Ministry of Science Technology
NIMT	National Institute of Metrology (Thailand)
NITE	National Institute of Technology and Evaluation
NMIJ	National Metrology Institute of Japan
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
P/O	Plan of Operation
PCM	Project cycle Management
PDM	Project Design Matrix
QHR	Quantum Hall Resistance
R/D	Record of Discussion
TICA	Thailand International Development Cooperation Agency
TISTR	Thai Institute of Science and Technological Research

Annex 1: Project Design Matrix (PDM)

Annex 1: PDM (after the revision)

Project Design Matrix (PDM)

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, 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 accuracy	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. 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 COP 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 Improvement 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 COP employment plan which has had influence on the Project. b There is no change in budget allocation and policy which has had 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 COP 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 COP and administrative personnel (1) Administrative COP (2) Technical COP (3) Staff in charge of the Project Maintenance of machinery and equipment 3 Necessary budget for the implementation of the Project. 4	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 Mass and Weights (MA)
 f Mass in Volume (Q) or (Q)
 g Radiance Spectrometry (RS)
 h Term of Surface VIMC.

Annex 2: Plan of Operation (PO)

Annex 2 Progress of Plan of Operations (PO)

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

□ : Plan
 ■ : Implemented




Annex 3: Annual Plan of Operation (APO)



Annex 3 Progress of Annual Plan of Operation (APO) for 2004^{IF}








Calendar Year	2004						2005		
Japanese Fiscal Year	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation									
	Actual								
1. The operation and administration of the Project are enhanced.									
1-1 To allocate necessary personnel as planned	Advice by long term expert Implement Actual								
1-2 To make budget plan and execute properly.	Advice by long term expert Implement Actual								
1-3 To make action plan and implement as planned.	Advice by long term expert Implement Actual								
2. The equipment is operated and maintained properly.									
2-1 To install and commission equipment.	Advice by long term expert Implement Actual								
2-2 To operate and maintain equipment.	Advice by long term expert Implement Actual								
2-3 To make manuals of operation and maintenance management.									
(1) RF Attenuation	Advice							DoE	
	Documentation							CoM	
	Self Study							DoE	
(2) Group Resistance	Advice							DoE	
	Documentation							CoM	
	DoE								
(3) Angle	Advice							DoE	
	Documentation							CoM	
	Self Study							DoE	
(4) Flatness	Advice							DoE	
	Documentation							CoM	
	Self Study							DoE	
3. The technical capability of C/P is upgraded.									
3-1 To make Technical Cooperation Program.									
3-2 To asses existing level of basic technical capability of Counterpart personel.	Assessment								
	Nominate								
	Evaluation								
	Evaluation								
3-3 To evaluate of technical capability of counterpart personel after technical transfer.									
4. Accuracy of National measurement standards is improved.									
4-1 To establish and maintain measurement standards.									
(1) RF Attenuation	Advice							DoE	
	Self Study							IEM	
	Self Study							DoE	
(2) Group Resistance	Advice							DoE	
	Self Study							IEM	
	DoE								
(3) Angle	Advice							DoE	
	Self Study							IEM	
	Self Study							DoE	
(4) Flatness	Advice							DoE	
	Self Study							IEM	
	Self Study							DoE	

Annex 3 Progress of Annual Plan of Operation (APO) for 2004^{JFY}

Calendar Year	2004						2005		
Japanese Fiscal Year	2005								
	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation									
4. Accuracy of National measurement standards is improved.									
4-2 To improve environmental management technology of calibration laboratories.	Actual								
	Advice by long term expert								
	Implement								
	Actual								
4-3 To implement International comparison.	Advice by long term expert								
	Implement								
	Actual								
5. NIMT disseminates national measurement standards properly.									
5-1 To improve the calibration technology for reference standards based on national standard.									
(1) RF Attenuation							Advice		DoE
							Self Study		ICT
							Self Study		DoE
(2) Group Resistance							Advice		
							Self Study		ICT
							DoE		
(3) Angle							Advice		
							Self Study		ICT
							Self Study		DoE
(4) Flatness							Advice		DoE
							Self Study		ICT
							Self Study		
5-2 To make calibration procedure.									
(1) RF Attenuation							Advice		DoE
							Documentation		CCP
							Self Study		DoE
(2) Group Resistance							Advice		
							Documentation		CCP
							DoE		
(3) Angle							Advice		
							Documentation		CCP
							Self Study		DoE
(4) Flatness							Advice		DoE
							Documentation		CCP
							Self Study		
5-3 To establish Quality System.									
	Advice by long term expert								
	Implement								
	Actual								

 : Japanese side
 : Thail side
 : Actual

 : Counterpart training in Japan
 : Confirmation of Calibration Procedure

 : Advice
 : Documentation
 : Dispatch of Expert
 : Confirmation of Maintenance Management Manual
 : Self Study
 : Implement of Establish and Maintaining
 : Improvement of Calibration Technology

Annex 3 Progress of Annual Plan of Operations (APO) for 2005^{FFY}

Calendar Year (Thailand) Japanese Fiscal Year	2005						2006														
	4	5	6	7	8	9	10	11	12	1	2	3									
Term of Technical Cooperation	Actual																				
1. The operation and administration of the Project are enhanced.																					
1-1 To allocate necessary personnel as planned	Advice by long term expert Implement Actual																				
1-2 To make budget plan and execute properly.	Advice by long term expert Implement Actual																				
1-3 To make action plan and implement as planned.	Advice by long term expert Implement Actual																				
2. The equipment is operated and maintained properly.																					
2-1 To install and commission equipment.	Advice by long term expert Implement Actual																				
2-2 To operate and maintain equipment.	Advice by long term expert Implement Actual																				
2-3 To make manuals of operation and																					
(1) Large Weight	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training</td> <td>Advice</td> <td>Do</td> </tr> <tr> <td>Trained</td> <td>Documentation</td> <td>Co</td> </tr> <tr> <td>C/P</td> <td>Self study</td> <td>DoE</td> </tr> </table>												Training	Advice	Do	Trained	Documentation	Co	C/P	Self study	DoE
Training	Advice	Do																			
Trained	Documentation	Co																			
C/P	Self study	DoE																			
(2) Pressure	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training in</td> <td>Advice</td> </tr> <tr> <td>Trained in</td> <td>Documentation</td> </tr> <tr> <td>C/P</td> <td>Self study</td> </tr> </table>												Training in	Advice	Trained in	Documentation	C/P	Self study			
Training in	Advice																				
Trained in	Documentation																				
C/P	Self study																				
(3) Standard Gass	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training in</td> <td>Advice</td> </tr> <tr> <td>Trained in</td> <td>Documentation</td> </tr> <tr> <td>C/P</td> <td>Self study</td> </tr> </table>												Training in	Advice	Trained in	Documentation	C/P	Self study			
Training in	Advice																				
Trained in	Documentation																				
C/P	Self study																				
(4) <u>Vickers Hardness</u>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training</td> <td>Advice</td> </tr> <tr> <td>Trained</td> <td>Documentation</td> </tr> <tr> <td>C/P</td> <td>Self study</td> </tr> </table>												Training	Advice	Trained	Documentation	C/P	Self study			
Training	Advice																				
Trained	Documentation																				
C/P	Self study																				
(5) Chemical Analysis	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training in</td> <td>Advice</td> </tr> <tr> <td>Trained in</td> <td>Documentation</td> </tr> </table>												Training in	Advice	Trained in	Documentation					
Training in	Advice																				
Trained in	Documentation																				
(6) Laser Power	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training in</td> <td>Advice</td> </tr> <tr> <td>Trained in</td> <td>Documentation</td> </tr> <tr> <td>C/P</td> <td>Self study</td> </tr> </table>												Training in	Advice	Trained in	Documentation	C/P	Self study			
Training in	Advice																				
Trained in	Documentation																				
C/P	Self study																				
(7) <u>Environment Management</u>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>T in J</td> <td></td> <td></td> </tr> <tr> <td>F in J</td> <td></td> <td>C/P</td> </tr> </table>												T in J			F in J		C/P			
T in J																					
F in J		C/P																			
(8) Magnetic	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training in</td> <td>Advice</td> </tr> <tr> <td>Trained in</td> <td>Doc</td> </tr> <tr> <td>C/P</td> <td>Self study</td> </tr> </table>												Training in	Advice	Trained in	Doc	C/P	Self study			
Training in	Advice																				
Trained in	Doc																				
C/P	Self study																				
(9) Spectral Irradiance	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Training in</td> <td>Advice</td> </tr> <tr> <td>Trained in</td> <td>Doc</td> </tr> <tr> <td>C/P</td> <td>Self study</td> </tr> </table>												Training in	Advice	Trained in	Doc	C/P	Self study			
Training in	Advice																				
Trained in	Doc																				
C/P	Self study																				

Calendar Year (Thailand)	2005												2006		
	Japanese Fiscal Year												2005		
	4	5	6	7	8	9	10	11	12	1	2	3			
(10) Flux/Intensity							Training in	A	DoE						
							Trained in	Doc	CoM						
							C/P	Self study							
(11) QHR										Training in	A				
										Trained in	Doc				
										C/P	SS				
(12) Mass										Training					
										Trained					
										C/P	SS				
(13) Destructive Inspection										Training					
										Trained					
(14) Flatness				Advice	DoE										
				Documentation	CoM										
				Self study	DoE										
(15) Acceleration of Vibration				Advice			DoE								
				Documentation			CoM								
				Self study				Do							
(16) Time and Frequency				Advice				Do							
				Documentation				Co							
				Self study					DoE						
(17) Force				Advice				Do							
				Documentation				Co							
				Self Study									DoE		
(18) Humidity				Advice						DoE					
				Documentation						CoM					
				Self Study									DoE		
(19) Inorganic				Advice						DoE					
				Documentation						CoM					
				Self Study											
(20) Standard Solution				Advice						DoE					
				Documentation						CoM					
				Self Study											
(21) Fixed Point				Advice									DoE		
				Documentation									CoM		
				Self Study											
3. The technical capability of C/P is upgraded.															
3-1 To make Technical Cooperation Program.															
3-2 To assess existing level of basic technical capability of Counterpart personnel.				Nominate		Assessment		Assessment							
								Evaluation							
3-3 To evaluate of technical capability of counterpart personnel after technical transfer.													Evaluation		
4. Accuracy of National measurement standards is improved.															
4-1 To establish and maintain measurement standards.															
(1) Large Weight						Trained in J	Advice	Do							
						Trained in J	SS	IE							
						C/P	Self study						DoE		
(2) Pressure						Training in Japan	Advice								
						Trained in Japan	Self Study								
						C/P	Self study								

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
(3) Standard Gass				Training in						Advice					
				Trained in						Self Study					
				C/P						Self study					
(4) <u>Vickers Hardness</u>				Training						Advice					
				Trained						Self Study					
				C/P						Self study					
(5) <u>Chemical Analysis</u>									Training in						
									Trained in Japan						Advice
															Self Study
(6) <u>Laser Power</u>									Training in						
									Trained in Japan						Advice
															Self Study
									C/P						Self study
(7) <u>Environment Management</u>									T in J						
									T in J						
															C/P
(8) <u>Magnetic</u>									Training in						
									Trained in						Advice
															Self Study
									C/P						Self study
(9) <u>Spectral Irradiance</u>									Training in						
									Trained in						Advice
															Self Study
									C/P						Self study
(10) <u>Flux/Intensity</u>									Training in						A
									Trained in						DoE
														SS	IEM
									C/P						Self study
(11) <u>QHR</u>															Training
															A
															Trained
															SS
															C/P
															SS
(12) <u>Mass</u>															Training
															Trained
															C/P
															SS
(13) <u>Destructive Inspection</u>															Trained in J
															Trained in J
(14) <u>Flatness</u>															Advice
															DoE
															Self Study
															IEM
															Self study
															DoE
(15) <u>Acceleration of Vibration</u>															Advice
															DoE
															Self Study
															IEM
															Self Study
															DoE
(16) <u>Time and Frequency</u>															Advice
															Do
															Self Study
															IE
															Self study
															DoE
(17) <u>Force</u>															Advice
															Do
															Self Study
															IE
															Self Study
															DoE
(18) <u>Humidity</u>															Advice
															DoE
															Self Study
															IEM
															Self Study
															DoE
(19) <u>Inorganic</u>															Advice
															DoE
															Self Study
															IEM
															Self Study
(20) <u>Standard Solution</u>															Advice
															DoE
															Self Study
															IEM
															Self Study

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
(21) Fixed Point	Advice												DoE		
	Self Study												IEM		
	Self Study														
4.2 To improve environmental management Technology of calibration laboratories	Advice by long term expert														
	Implement														
	Actual														
4.3 To implement International comparison.	Advice by long term expert														
	Implement														
	Actual														
5. NIMT disseminates national measurement standards properly.															
5-1 To improve the calibration technology for reference standards based on national															
(1) Large Weight	Training			Advice			Do								
	Trained			Self Study			IC								
	C/P			Self study									DoE		
(2) Pressure	Training in			Advice											
	Trained in			Documentation											
	C/P			Self study											
(3) Standard Gass	Training in			Advice											
	Trained in Japan			Documentation											
	C/P			Self study											
(4) Vickers Hardness	Training			Advice											
	Trained			Documentation											
	C/P			Self study											
(5) Chemical Analysis	Training in			Advice											
	Trained in			Self study											
(6) Laser Power	Training in			Advice											
	Trained in			Self Study											
	C/P			Self study											
(7) Environment Management	T in J														
	T in J												C/P		
(8) Magnetic	Training in			Advice											
	Trained in			Self Study											
	C/P			Self study											
(9) Spectral Irradiance	Traing in			Advice											
	Trained in			Self Study											
	C/P			Self study											
(10) Flux/Intensity	Training in			A			DoE								
	Trained in			SS			ICT								
	C/P			Self study											
(11) QHR				Training			A								
				Trained			SS								
				C/P			SS								
(12) Mass				Training in J											
				Trained in J											
				C/P			SS								
(13) Destructive Inspection				Training in J											
				Trained in J											

Calendar Year (Thailand)	2005												2006				
Japanese Fiscal Year	2005																
	4	5	6	7	8	9	10	11	12	1	2	3					
(14) Flatness			Advice	DoE													
			Self Study	ICT													
			Self Study	DoE													
(15) Acceleration of Vibration									Advice	DoE							
									Self Study	ICT							
									Self Study		DoE						
(16) Time and Frequency																	
											Do						
											IC						
												DoE					
(17) Force																	
											Do						
											IC						
																	DoE
(18) Humidity																	
																	DoE
																	ICT
																	DoE
(19) Inorganic																	
																	DoE
																	ICT
																	Self Study
(20) Standard Solution																	
																	DoE
																	ICT
																	Self Study
(21) Fixed Point																	
																	DoE
																	ICT
																	Self Study
5-2 To make calibration procedure.																	
(1) Large Weight																	
									Training	Advice	Do						
									Trained	Documentation	CC						
									C/P								DoE
																	Self study
(2) Pressure																	
									Training in		Advice						
									Trained in		Documentation						
									C/P								Self study
(3) Standard Gass																	
									Training in		Advice						
									Trained in		Documentation						
									C/P								Self study
(4) Vickers Hardness																	
									Training		Advice						
									Trained		Documentation						
									C/P								Self study
(5) Chemical Analysis																	
									Training in		Advice						
									Trained in		Documentation						
(6) Laser Power																	
									Training in		Advice						
									Trained in		Documentation						
									C/P								Self study
(7) Environment Management									T in J								
									T in J								C/P
(8) Magnetic																	
									Training in		Advice						
									Trained in		Doc						
									C/P								Self study
(9) Spectral Irradiance																	
									Training in		Advice						
									Trained in		Doc						
									C/P								Self study
(10) Flux/Intensity																	
									Training in	A	DoE						
									Trained in	Doc	CCP						
									C/P								Self study

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005												1	2	3
	4	5	6	7	8	9	10	11	12						
(11) QHR													Training	A	
													Trained	Doc	
													C/P	SS	
(12) Mass													Training		
													Trained		
													C/P	SS	
(13) Destructive Inspection													Training		
													Trained		
													C/P	SS	
													Training		
													Trained		
(14) Flatness													Advice	DoE	
													Doc	CCP	
													Self Study	DoE	
(15) Acceleration of Vibration													Advice	DoE	
													Documentation	CCP	
													Self Study	Do	
(16) Time and Frequency													Advice	Do	
													Documentation	CC	
													Self Study	DoE	
(17) Force													Advice	Do	
													Documentation	CC	
													Self Study	DoE	
(18) Humidity													Advice	DoE	
													Documentation	CCP	
													Self Study	DoE	
(19) Inorganic													Advice	DoE	
													Documentation	CCP	
													Self Study		
(20) Standard Solution													Advice	DoE	
													Documentation	CCP	
													Self Study		
(21) Fixed Point													Advice	DoE	
													Documentation	CCP	
													Self Study		
5-3 To establish Quality System.													Advice by long term expert		
													Implement		
													Actual		

Japanese side
Thai side
Actual

- A : Advice
- Doc : Documentation
- DoE : Dispatch of Expert
- CoM : Confirmation of Maintenance Management Manual
- SS : Self Study
- IEM : Implement of Establish and Maintaining
- ICT : Improvement of Calibration Technology
- CCP : Confirmation of Calibration Procedure
- C/P : Counterpart training in Japan

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand)	2006												2007		
Japanese Fiscal Year	2006														
	4	5	6	7	8	9	10	11	12	1	2	3			
Term of Technical Cooperation															
1. The operation and administration of the Project are enhanced.															
1-1 To allocate necessary personnel as planned	Advice by long term expert												Implement		
1-2 To make budget plan and execute properly.	Advice by long term expert												Implement		
1-3 To make action plan and implement as planned.	Advice by long term expert												Implement		
2. The equipment is operated and maintained properly.															
2-1 To install and commission equipment.	Advice by long term expert												Implement		
2-2 To operate and maintain equipment.	Advice by long term expert												Implement		
2-3 To make manuals of operation and maintenance management.															
(1) Fixed Point	Advice												Documentation		
(2) Photometry	Advice												Do		
	Documentation												Co		
(3) Radiometry	Advice												Do		
	Documentation												Co		
(4) Pressure	Advice												Documentation		
(5) Magnetics	Advice												DoE		
	Documentation												Co		
(6) Laser Power	Advice												DoE		
	Documentation												Co		
(7) QHR	Advice												Documentation		
(8) Inorganic	Advice			DoE											
	Documentation			Co											
(9) Standard Solution	Advice			DoE											
	Documentation			CoM											
(10) Standard Gas	Advice												DoE		
	Documentation												Co		
(11) Chemical Analysis	Training in			Advice											
	Trained in			Documentation											
(12) Watt Hour	Training in			Advice											
	Trained in			Documentation											
(13) Standard Scale	Training in			Advice											
	Trained in			Documentation											

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand)	2006												2007		
Japanese Fiscal Year	2006												1	2	3
	4	5	6	7	8	9	10	11	12						
(14) AC Voltage														Training	Trained
(15) Density														Traini	Train
3. The technical capability of C/P is upgraded.															
3-1 To make Technical Cooperation Program.															
3-2 To assess existing level of basic technical capability of Counterpart personnel.				Assessment			Assessment								
	Nominate						Evaluation								
3-3 To evaluate of technical capability of counterpart personnel after technical transfer.														Evaluation	
4. Accuracy of National measurement standards is improved.															
4-1 To establish and maintain measurement standards.															
(1) Fixed Point															
(2) Photometry														Do	
														Co	
(3) Radiometry														Do	
														Co	
(4) Pressure															
(5) Magnetics														DoE	
														Co	
(6) Laser Power														DoE	
														Co	
(7) QHR															
(8) Inorganic														DoE	
														Co	
(9) Standard Solution														DoE	
														CoM	
(10) Standard Gas														DoE	
														Co	
(11) Chemical Analysis															
(12) Watt Hour															

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand) Japanese Fiscal Year	2006						2007					
	4	5	6	7	8	9	10	11	12	1	2	3
(13) Standard Scale							Training in	Advice				
							Trained in	Documentation				
(14) AC Voltage								Training				
								Trained				
(15) Density										Train		
										Train		
4.2 To improve environmental management Technology of calibration laboratories	Advice by long term expert											
	Implement											
4-3 To implement International comparison.	Advice by long term expert											
	Implement											
5. NIMT disseminates national measurement standards properly.												
5-1 To improve the calibration technology for reference standards based on national												
(1) Fixed Point	Advice											
	Documentation											
(2) Photometry	Advice										Do	
	Documentation										Co	
(3) Radiometry	Advice										Do	
	Documentation										Co	
(4) Pressure	Advice											
	Documentation											
(5) Magnetics	Advice										Do	
	Documentation										Co	
(6) Laser Power	Advice										DoE	
	Documentation										Co	
(7) QHR	Advice											
	Documentation											
(8) Inorganic	Advice		DoE									
	Documentation		CoM									
(9) Standard Solution	Advice		DoE									
	Documentation		CoM									
(10) Standard Gas	Advice										DoE	
	Documentation										Co	
(11) Chemical Analysis	Traing in		Advice									
	Trained in		Documentation									

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand) Japanese Fiscal Year	2006												2007		
	2006														
	4	5	6	7	8	9	10	11	12	1	2	3			
(12) Watt Hour			Training in Trained in												
(13) Standard Scale							Training Trained		Advice Documentation						
(14) AC Voltage										Training Trained					
(15) Density										Train Train					
5-2 To make calibration procedure.															
(1) Fixed Point									Advice Documentation						
(2) Photometry									Advice Documentation		Do Co				
(3) Radiometry									Advice Documentation		Do Co				
(4) Pressure									Advice Documentation						
(5) Magnetics									Advice Documentation		Do Co				
(6) Laser Power									Advice Documentation		DoE Co				
(7) QHR									Advice Documentation						
(8) Inorganic									Advice Documentation	DoE Co					
(9) Standard Solution									Advice Documentation	DoE CoM					
(10) Standard Gas									Advice Documentation		DoE Co				
(11) Chemical Analysis				Training in Trained in					Advice Documentation						
(12) Watt Hour				Training in Trained in											
(13) Standard Scale							Training in Trained in		Advice Documentation						
(14) AC Voltage										Training Trained					

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand)	2006									2007		
Japanese Fiscal Year	2006											
	4	5	6	7	8	9	10	11	12	1	2	3
(15) Density											Traini	Train
5-3 To establish Quality System.	Advice by long term expert											
	Implement											

Japanese side
Thai side

A	: Advice
Doc	: Documentation
DoE	: Dispatch of Expert
CoM	: Confirmation of Maintenance Management Manual
SS	: Self Study
IEM	: Implement of Establish and Maintaining
ICT	: Improvement of Calibration Technology
CCP	: Confirmation of Calibration Procedure
C/P	: Counterpart training in Japan

Annex 3 Annual Plan of Operations (APO) for 2007^{JFY}

Calendar Year (Thailand)	2007											
Japanese Fiscal Year	2007											
	4	5	6	7	8	9	10	11	12			
Term of Technical Cooperation												
1. The operation and administration of the Project are enhanced.												
1-1 To allocate necessary personnel as planned	Advice by long term expert						Impleme					
1-2 To make budget plan and execute properly.	Advice by long term expert						Impleme					
1-3 To make action plan and implement as planned.	Advice by long term expert						Impleme					
2. The equipment is operated and maintained properly.												
2-1 To install and commission equipment.	Advice by long term expert						Impleme					
2-2 To operate and maintain equipment.	Advice by long term expert						Impleme					
2-3 To make manuals of operation and maintenance												
(1) Fixed Point	Advice			D			Documentation			Co		
(2) Pressure	Advice			Do			Documentatio			Co		
(3) Standard Scale	Advice			Do			Documentati			Co		
(4) QHR	Advice			D			Documentation			Co		
3. The technical capability of C/P is upgraded.												
3-1 To make Technical Cooperation Program.												
3-2 To assess existing level of basic technical capability of Counterpart personnel.	Assessment				Assessment				Evaluation			
3-3 To evaluate of technical capability of counterpart personnel after technical transfer.	Nominate											
4. Accuracy of National measurement standards is improved.												
4-1 To establish and maintain measurement standards.												
(1) Fixed Point	Advice			D			Documentation			Co		
(2) Pressure	Advice			Do			Documentatio			Co		
(3) Standard Scale	Advice			Do			Documentati			Co		
(4) QHR	Advice			D			Documentation			Co		
4.2 To improve environmental management Technology of calibration laboratories	Advice by long term expert						Impleme					
4-3 To implement International comparison.	Advice by long term expert						Impleme					

Annex 3 Annual Plan of Operations (APO) for 2007^{JFY}

Calendar Year (Thailand)	2007											
Japanese Fiscal Year	2007											
	4	5	6	7	8	9	10	11	12			
5. NIMT disseminates national measurement standards properly.												
5-1 To improve the calibration technology for reference standards based on national												
(1) Fixed Point	Advice		D									
	Documentation		Co									
(2) Pressure	Advice		Do									
	Documentation		Co									
(3) Standard Scale	Advice		Do									
	Documentation		Co									
(4) QHR	Advice		D									
	Documentation		Co									
5-2 To make calibration procedure.												
(1) Fixed Point	Advice		D									
	Documentation		Co									
(2) Pressure	Advice		Do									
	Documentation		Co									
(3) Standard Scale	Advice		Do									
	Documentation		Co									
(4) QHR	Advice		D									
	Documentation		Co									
5-3 To establish Quality System.	Advice by long term expert											
	Implement											

Japanese side
Thai side

A	: Advice
Doc	: Documentation
DoE	: Dispatch of Expert
CoM	: Confirmation of Maintenance Management Manual
SS	: Self Study
IEM	: Implement of Establish and Maintaining
ICT	: Improvement of Calibration Technology
CCP	: Confirmation of Calibration Procedure
C/P	: Counterpart training in Japan





Annex 4: Technical Cooperation Program (TCP)

Annex 4 Progress of 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																
1. Acoustics and Vibration																	
(1) Vibration																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) Acceleration of Vibration																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
2-1 Electricity and Magnetism (Low Frequency)																	
(1) Group Resistance																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) QHR																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(3) Magnetics Flux/Intensity																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
2-2 Electricity and Magnetism (High Frequency)																	
(1) Laser Power																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) RF Standard (Attenuation)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(3) RF Standard (Power)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(4) RF Standard (Voltage)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(5) Time and Frequency																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
3. Hardness																	
(1) Hardness																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	

Calendar Year	2004				2005				2006				2007				2008
Japanese Fiscal Year	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	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 Standard	[Bar from FY 2004 Q3 to FY 2006 Q3]																
Calibration Technology	[Bar from FY 2004 Q3 to FY 2006 Q3]																
Accreditation	[Bar from FY 2004 Q3 to FY 2006 Q3]																
(3) Organic (Standard Gas)																	
Establishment of Measurement Standard	[Bar from FY 2005 Q2 to FY 2007 Q1]																
Calibration Technology	[Bar from FY 2005 Q2 to FY 2007 Q1]																
Accreditation	[Bar from FY 2005 Q2 to FY 2007 Q1]																
(4) Organic (Standard Solution)																	
Establishment of Measurement Standard	[Bar from FY 2004 Q3 to FY 2005 Q2]																
Calibration Technology	[Bar from FY 2004 Q3 to FY 2005 Q2]																
Accreditation	[Bar from FY 2004 Q3 to FY 2005 Q2]																
8. Thermometry																	
(1) Thermometry (Fixed Point)																	
Establishment of Measurement Standard	[Bar from FY 2004 Q3 to FY 2005 Q2]																
Calibration Technology	[Bar from FY 2004 Q3 to FY 2005 Q2]																
Accreditation	[Bar from FY 2004 Q3 to FY 2007 Q1]																
(2) Humidity																	
Establishment of Measurement Standard	[Bar from FY 2004 Q3 to FY 2006 Q3]																
Calibration Technology	[Bar from FY 2004 Q3 to FY 2006 Q3]																
Accreditation	[Bar from FY 2004 Q3 to FY 2006 Q3]																
(3) Radiation																	
Establishment of Measurement Standard	[Bar from FY 2004 Q3 to FY 2006 Q3]																
Calibration Technology	[Bar from FY 2004 Q3 to FY 2006 Q3]																
Accreditation	[Bar from FY 2004 Q3 to FY 2006 Q3]																

-  : Counterpart training in Japan
-  : Self Study
-  : Dispatch of Expert
-  : Assessment

Annex 5: Annual Technical Cooperation Program (ATCP)

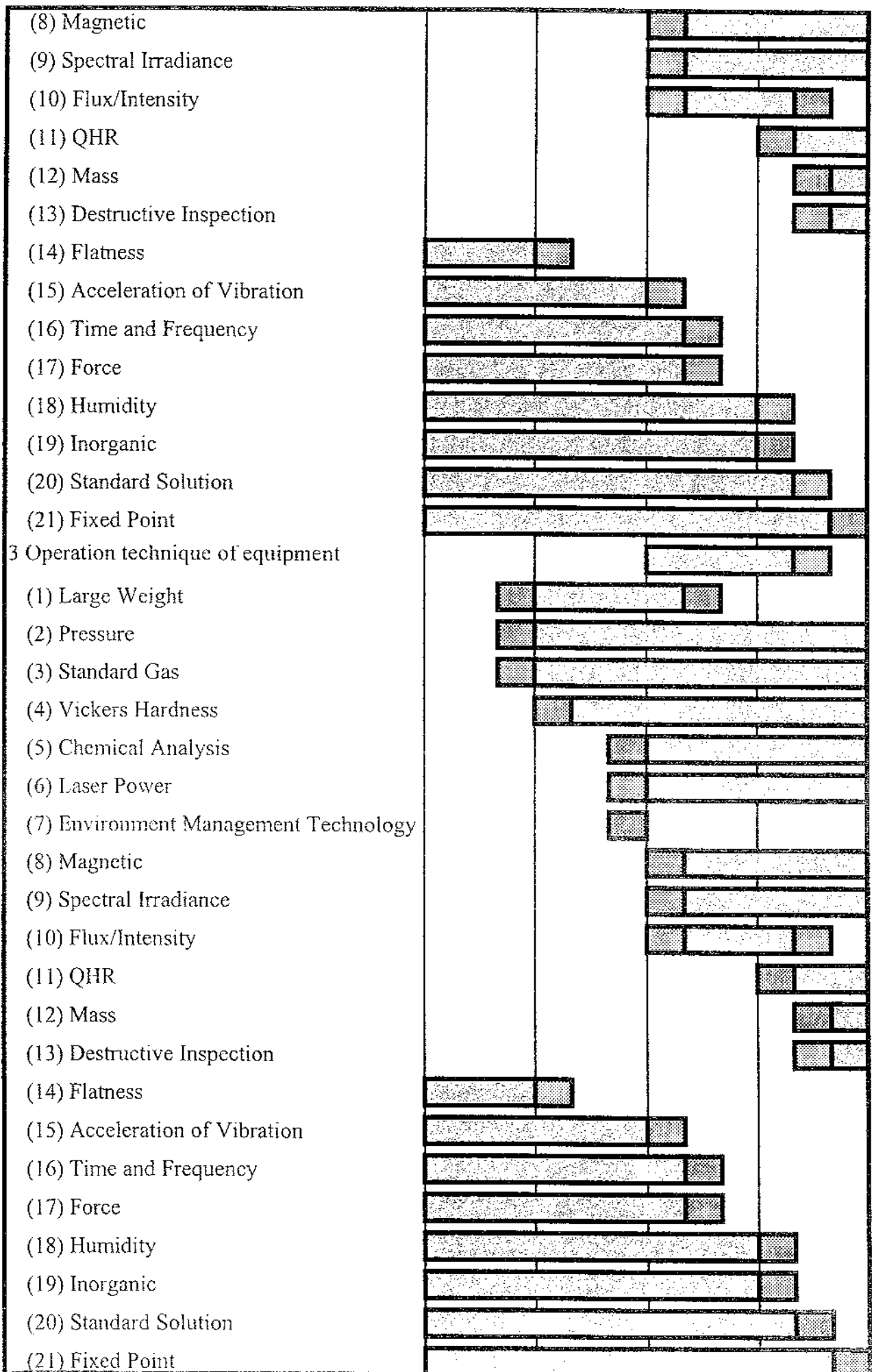
Annex 5 Annual Technical Cooperation Program (ATCP) for 2004

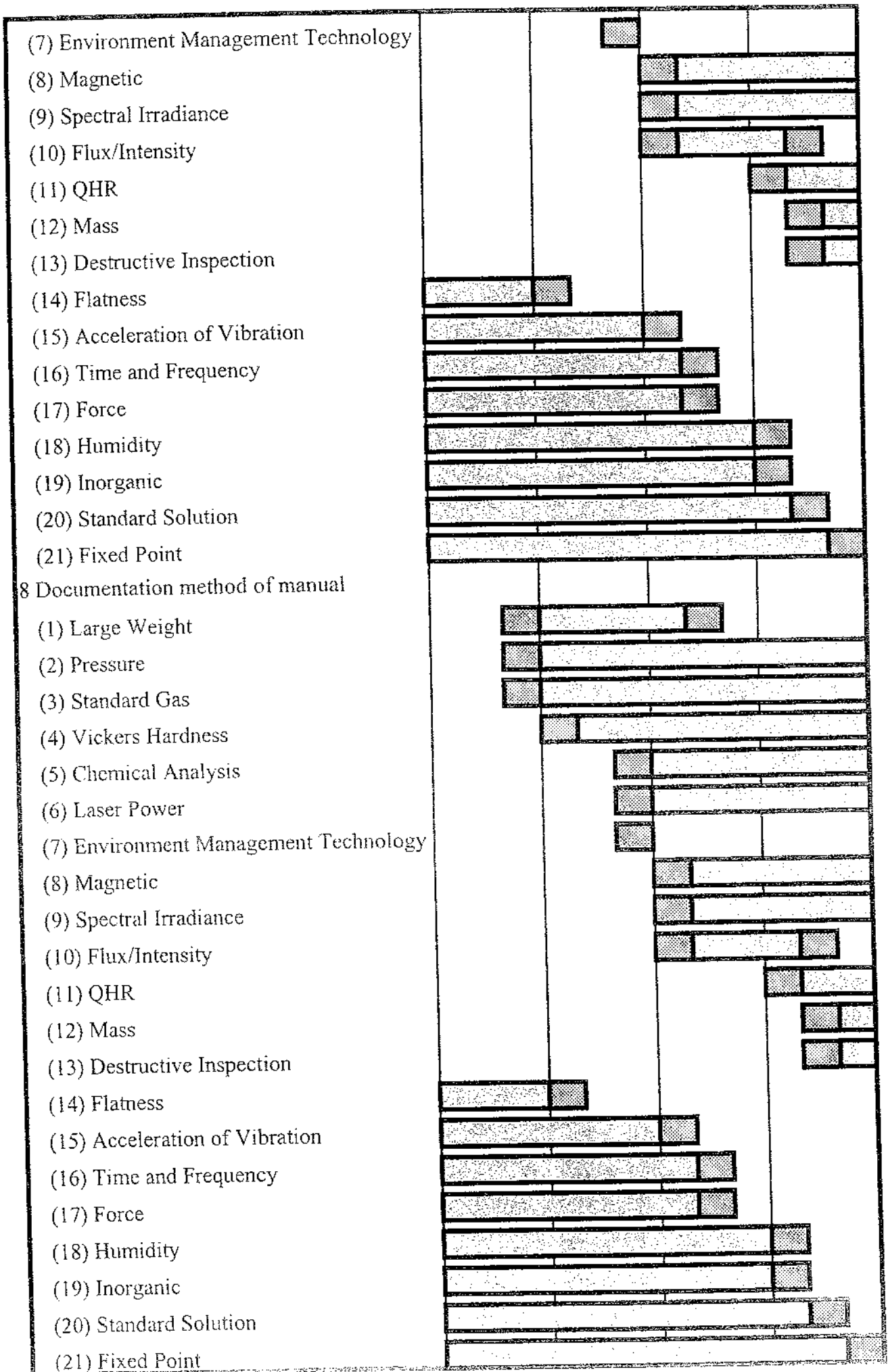
Calendar Year	2004						2005		
Japanese Fiscal Year	2004								
	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation									
1 Installation technique of equipment									
(1) Acceleration of Vibration	■						■		
(2) RF Attenuation	■						■		
(3) Group Resistance	■						■		
(4) Angle	■						■		
(5) Flatness	■						■		
(6) Fixed Point	■						■		
2 Commission technique of equipment									
(1) Acceleration of Vibration	■						■		
(2) RF Attenuation	■						■		
(3) Group Resistance	■						■		
(4) Angle	■						■		
(5) Flatness	■						■		
(6) Fixed Point	■						■		
3 Operation technique of equipment									
(1) Acceleration of Vibration	■						■		
(2) RF Attenuation	■						■		
(3) Group Resistance	■						■		
(4) Angle	■						■		
(5) Flatness	■						■		
(6) Fixed Point	■						■		
4 Maintenance method of equipment									
(1) Acceleration of Vibration	■						■		
(2) RF Attenuation	■						■		
(3) Group Resistance	■						■		
(4) Angle	■						■		
(5) Flatness	■						■		
(6) Fixed Point	■						■		

5 Establishment of Measurement Standard	
(1) Acceleration of Vibration	
(2) RF Attenuation	
(3) Group Resistance	
(4) Angle	
(5) Flatness	
(6) Fixed Point	
6 Maintaining of measurement standard	
(1) Acceleration of Vibration	
(2) RF Attenuation	
(3) Group Resistance	
(4) Angle	
(5) Flatness	
(6) Fixed Point	
7 Calibration Technology	
(1) Acceleration of Vibration	
(2) RF Attenuation	
(3) Group Resistance	
(4) Angle	
(5) Flatness	
(6) Fixed Point	
8 Documentation method of manual	
(1) Acceleration of Vibration	
(2) RF Attenuation	
(3) Group Resistance	
(4) Angle	
(5) Flatness	
(6) Fixed Point	
9 Estimation of Measurement uncertainty	
(1) Acceleration of Vibration	
(2) RF Attenuation	
(3) Group Resistance	
(4) Angle	
(5) Flatness	
(6) Fixed Point	

Annex 5 Annual Technical Cooperation Program (ATCP) for 2005

Calendar Year	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
Term of Technical Cooperation															
1 Installation technique of equipment															
(1) Large Weight															
(2) Pressure															
(3) Standard Gas															
(4) Vickers Hardness															
(5) Chemical Analysis															
(6) Laser Power															
(7) Environment Management Technology															
(8) Magnetic															
(9) Spectral Irradiance															
(10) Flux/Intensity															
(11) QHR															
(12) Mass															
(13) Destructive Inspection															
(14) Flatness															
(15) Acceleration of Vibration															
(16) Time and Frequency															
(17) Force															
(18) Humidity															
(19) Inorganic															
(20) Standard Solution															
(21) Fixed Point															
2 Commission technique of equipment															
(1) Large Weight															
(2) Pressure															
(3) Standard Gas															
(4) Vickers Hardness															
(5) Chemical Analysis															
(6) Laser Power															
(7) Environment Management Technology															





9 Estimation of Measurement uncertainty				
(1) Large Weight	■	■	■	■
(2) Pressure	■	■	■	■
(3) Standard Gas	■	■	■	■
(4) Vickers Hardness	■	■	■	■
(5) Chemical Analysis	■	■	■	■
(6) Laser Power	■	■	■	■
(7) Environment Management Technology	■	■	■	■
(8) Magnetic	■	■	■	■
(9) Spectral Irradiance	■	■	■	■
(10) Flux/Intensity	■	■	■	■
(11) QHR	■	■	■	■
(12) Mass	■	■	■	■
(13) Destructive Inspection	■	■	■	■
(14) Flatness	■	■	■	■
(15) Acceleration of Vibration	■	■	■	■
(16) Time and Frequency	■	■	■	■
(17) Force	■	■	■	■
(18) Humidity	■	■	■	■
(19) Inorganic	■	■	■	■
(20) Standard Solution	■	■	■	■
(21) Fixed Point	■	■	■	■

Annex 5 Annual Technical Cooperation Program (ATCP) for 2006

Calendar Year	2006												2007			
Japanese Fiscal Year	2006															
	4	5	6	7	8	9	10	11	12	1	2	3				
Term of Technical Cooperation																
1 Installation technique of equipment																
(1) Fixed Point																
(2) Photometry																
(3) Radiometry																
(4) Pressure																
(5) Magnetics																
(6) Laser Power																
(7) QHR																
(8) Inorganic																
(9) Standard Solution																
(10) Standard Gas																
(11) Chemical Analysis																
(12) Watt Hour																
(13) Standard Scale																
2 Commission technique of equipment																
(1) Fixed Point																
(2) Photometry																
(3) Radiometry																
(4) Pressure																
(5) Magnetics																
(6) Laser Power																
(7) QHR																
(8) Inorganic																
(9) Standard Solution																
(10) Standard Gas																
(11) Chemical Analysis																
(12) Watt Hour																
(13) Standard Scale																
3 Operation technique of equipment																
(1) Fixed Point																

(2) Photometry				
(3) Radiometry				
(4) Pressure				
(5) Magnetics				
(6) Laser Power				
(7) QHR				
(8) Inorganic				
(9) Standard Solution				
(10) Standard Gas				
(11) Chemical Analysis				
(12) Watt Hour				
(13) Standard Scale				
4 Maintenance method of equipment				
(1) Fixed Point				
(2) Photometry				
(3) Radiometry				
(4) Pressure				
(5) Magnetics				
(6) Laser Power				
(7) QHR				
(8) Inorganic				
(9) Standard Solution				
(10) Standard Gas				
(11) Chemical Analysis				
(12) Watt Hour				
(13) Standard Scale				
5 Establishment of Measurement Standard				
(1) Fixed Point				
(2) Photometry				
(3) Radiometry				
(4) Pressure				
(5) Magnetics				
(6) Laser Power				
(7) QHR				
(8) Inorganic				
(9) Standard Solution				

Annex 5 Annual Technical Cooperation Program (ATCP) for 2007

Calendar Year	2007											
Japanese Fiscal Year	2007											
	4	5	6	7	8	9	10	11	12			
Term of Technical Cooperation	[Bar chart showing duration from month 4 to 11]											
1 Installation technique of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
2 Commission technique of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
3 Operation technique of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
4 Maintenance method of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
5 Establishment of Measurement Standard	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
6 Maintaining of measurement standard	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											

7 Calibration Technology			
(1) Fixed Point			
(2) Pressure			
(3) Standard Scale			
(4) QHR			
8 Documentation method of manual			
(1) Fixed Point			
(2) Pressure			
(3) Standard Scale			
(4) QHR			
9 Estimation of Measurement uncertainty			
(1) Fixed Point			
(2) Pressure			
(3) Standard Scale			
(4) QHR			

Annex 6: Tentative Schedule of Implementation (TSI)

Annex 6 Progress of Tentative Schedule of Implementation (TSI)

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														
Japanese Side															
I. Dispatch of Mission															
(1) Mid-Term Evaluation															
(2) Final Evaluation (Management Consultation Team will be dispatched, if necessary)															
II. Dispatch of Long-Term Experts															
(1) Chief Advisor	Chief Advisor														
(2) Coordinator	Coordinator														
(3) Physical Standards	Physical Standards														
(4) Electromagnetic Standards	Electromagnetic Standards														
(5) Chemical Standards	Chemical Standards														
III. Dispatch of short-term Expert	Necessary Number of Short-term Experts (Approximately 35)														
(1) Electromagnetic	■	■													
(2) Environmental Management Technology		■	■												
(3) Acceleration of Vibration					■										
(4) RF Attenuation			■			■									
(5) Flatness			■												
(6) Fixed Point				■											
(7) QHR					■										
(8) Time and Frequency					■										
(9) GB/Scale										■					
(10) Force										■					
(11) Large Weight										■					
(12) Flux/Intensity														■	
(13) Inorganic						■									
(14) Standard Solution										■					
(15) Magnetic Flux										■					
(16) Magnetic Intensity											■			■	
(17) Laser Power												■		■	
(18) Pressure											■				
(19) Spectral Irradiance														■	
(20) Hydrogen ion Activity														■	
(21) Humidity*															■
(22) Calibration Procedure															■

Calendar Year	2004			2005			2006				2007			2008	
Japanese Fiscal Year	2004			2005			2006				2007				
Term of Technical Cooperation	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Term of Technical Cooperation															
(23) Accreditation															
- Form															
- Thermometry															
- Time and Frequency															
- Vibration															
- Dimension															
- Resistance															
- RF Standard															
- Photometry															
- Force															
- Pressure															
- pH Standard*															
- DC High Voltage*															
Max. 10 persons during the Project															
IV. Training of C/P Personnel in Japan															
(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*															
(14) AC Voltage*															
(15) Density*															
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 7: Annual Tentative Schedule of Implementation
(ATSI)**

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2005^{JFY}

Calendar Year (Thailand)	2005									2006		
Japanese Fiscal Year	2005											
	4	5	6	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation												
Japanese Side												
I. Dispatch of Mission												
II. Dispatch of Long-Term Experts												
(1) Chief Advisor												
(2) Coordinator												
(3) Physical Standards												
(4) Electro-magnetic Standards												
(5) Chemical Standards												
III. Dispatch of short-term Expert												
(1) Surveillance			==									
(2) Flatness				=====								
(3) Calibration Procedure						=====						
(4) Acceleration of Vibration							=====					
(5) Time and Frequency								=====				
(6) Accreditation (Form)									=====			
(7) Large Weight										=====		
(8) Force											=====	
(9) Humidity												=====
(10) Inorganic												=====
(11) Flux/Intensity											=====	
(12) Standard Solution												=====
(13) Fixed Point												=====
(14) Hydrogen Ion Activity*												=====
Note: *Planned for 2006 ^{JFY}												
IV. Training of C/P personnel in Japan												
(1) Large Weight												=====


Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
Term of Technical Cooperation															
(2) Pressure			██████████	██████████											
(3) Standard Gas			██████████	██████████											
(4) <u>Vickers Hardness</u>				██████████	██████████										
(5) Chemical Analysis							██████████	██████████	██████████						
(6) Laser Power							██████████	██████████	██████████						
(7) <u>Environment Management</u>										██████████					
(8) Magnetic								██████████	██████████						
(9) Spectral Irradiance								██████████	██████████						
(10) Flux/Intensity								██████████	██████████						
(11) QHR										██████████	██████████	██████████			
(12) <u>Mass</u>											██████████	██████████			
(13) <u>Destructive Inspection</u>												██████████			
Note: Standard Scale is postponed to 2006.															
Thailand side															
I. Building and Facilities															
II. Machinery and Equipment															
III. Allocation of C/P Personnel and necessary staff															
IV. Allocation of Budget															

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2006^{JFY}

Calendar Year (Thailand)	2005			2006									2007		
Japanese Fiscal Year	2005			2006									2007		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation															
Japanese Side															
I. Dispatch of Mission															
Mid-term Review															
II. Dispatch of Long-Term Experts															
(1) Chief Advisor															
(2) Coordinator															
(3) Physical Standards															
(4) Electro-magnetic Standards															
(5) Chemical Standards															
III. Dispatch of short-term Expert															
(1) Fixed Point															
(2) Photometry															
(3) Radiometry															
(4) Pressure															
(5) Magnetism															
(6) Laser Power															
(7) Inorganic															
(8) Standard Solution															
(9) Standard Gas															
(10) Calibration Procedure															
(11) Accreditation (Quality System)															
(12) Accreditation (Time and Frequency)															
(13) Accreditation (Vibration)															
(14) Accreditation (pH Standard)															
(15) Accreditation (DC High Voltage)															
IV. Training of C/P personel in Japan															
(1) Chemical Analysis															
(2) Watt Hour*															

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2006^{JPY}


Calendar Year (Thailand)	2006												2007		
Japanese Fiscal Year	2005			2006									2007		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation															
(3) Standard Scale															
(4) AC Voltage*															
(5) Density*															
Thailand side															
I. Building and Facilities															
II. Machinery and Equipment															
III. Allocation of C/P Personnel and necessary staff															
IV. Allocation of Budget															

 : Actual

Note : *Additional quantities by NIMT's request

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2007^{JFY}

Calendar Year (Thailand)	2007											
Japanese Fiscal Year	2006			2007								
	1	2	3	4	5	6	7	8	9	10	11	12
Term of Technical Cooperation												
Japanese Side												
I. Dispatch of Mission												
Final Evaluation												
II. Dispatch of Long-Term Experts												
(1) Chief Advisor												
(2) Coordinator												
III. Dispatch of short-term Expert												
(1) Fixed Point												
(2) Pressure												
(3) Standard Scale												
(4) QHR												
(5) Chemical												
(6) Electro-magnetic												
(7) Calibration Procedure												
(8) Accreditation (Quality System)												
(9) Accreditation (AC Power)												
(10) Accreditation (RF - Power, Voltage, Attenuation)												
(11) Accreditation (CMM)												
(12) Accreditation (Humidity)												
Thailand side												
I. Building and Facilities												
II. Machinery and Equipment												
III. Allocation of C/P Personnel and necessary staff												
IV. Allocation of Budget												

 : Actual

Annex 8: Table of Achievement & Evaluation Grid

Table of Achievement

(The Project for Strengthening the National Institute of Metrology (Thailand) Phase 2

Target Group:

- Thai Institute of Science and Technological Research (TISTR) and Department of Science Service (DSS) as Calibration Service Agencies
- Domestic Industries in Thailand (Especially export industries and enterprises applying for ISO9001, and ISO14001)

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

Narrative summary	Objectively verifiable indicators	Achievements
<p>Overall Goal To strengthen the national measurement system in Thailand</p>	<ol style="list-style-type: none"> 1. NIMT actively participates in the Global MRA. 2. The traceability system of Thailand is firmly established. 	<ul style="list-style-type: none"> • According to the report of “Survey and verify NIMT’s activities” and “List in Appendix B and C of Global MRA”, NIMT has already participated in the Global MRA and quantities are increasingly. However new registration to appendix C for transferred quantities have not been finalized yet. • The traceability chain and roles of respective organization of measurement network in Thailand have been established, and to make each organization function under this system, it is necessary to strengthen each organization to play each role. • According to the number of calibration laboratories directory on NIMT’s website, the National Measurement Network with NIMT as its top has already encompassed among 78 laboratories. However, there have been more than 130 laboratories in its network according to the interview result from a director of NIMT.
<p>Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accuracy</p>	<ol style="list-style-type: none"> 1. The technical ability of counterparts in 8 fields of measurement standards in NIMT is strengthened. 	<ul style="list-style-type: none"> • The technical transfer was planned to be achieved in 42 quantities in 8 fields. In fact, it has been completed in 37 quantities up to the end of May 2007. The main obstacle that hinders the completion of the process is the delay in machinery and equipment procurement. The Project team has conducted the internal survey to verify the NIMT’s activities. • It was planned to completed technical transfer in other 5 quantities by the time of the termination of the Project since the schedule of deliverance of the rest of machinery and equipment has been confirmed already. • Consequently, it can be expected that the National Measurement Standard will be installed and established as planned but the process of accreditation ensuring the internationally recognized level of accuracy has not yet be completed by the time of the termination of the Project.
	<ol style="list-style-type: none"> 2. Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 	<ul style="list-style-type: none"> • According to the Interview and Questionnaire Survey, it was confirmed that the number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project.

Narrative summary	Objectively verifiable indicators	Achievements
	<p>3-2 The quantities of calibration services are increased.</p> <p>3-3 The range of calibration services is widened.</p>	
<p>Inputs: Thai side</p>	<p>1. Building, facilities and space for the Project</p> <p>2. C/P and administrative personnel</p> <p>3. Maintenance of machinery and equipments</p> <p>4. Necessary budget for the implementation of the project</p>	<ul style="list-style-type: none"> • The construction of the new NIMT building by a Japanese ODA Loan was completed, and NIMT has already relocated to the new building except for the Laboratory of Acoustics and Vibration, which keeps a station based in the Department of Science Service. Office space for the Project team was provided in the new building. Overall, the reconstruction and renovation of all laboratories are complete, except Standard Gas, which has been constructed in the administrative building and is now being renovated. • NIMT has assigned the director of NIMT as the administrative C/P, and 36 technical C/Ps responsible for every target quantity of the technical transfer in Phase 2. Moreover, one more administrative C/P from the International Relations Section was assigned to the Project. • There have been no technical C/P resignations since the Mid-Term Evaluation. • All machinery and equipment have been provided as planned and operated properly.
<p>Inputs: Japanese side</p>	<p>1. Experts</p>	<ul style="list-style-type: none"> • Annual budget allocation for the Project from NIMT for each Thai fiscal year of 2005, 2006 and 2007 is 519,600 THB. • Annual budget allocation for the Project from TICA is 805,170 THB for the Thai fiscal year of 2005; 930,405 THB in 2006 and 715,038 THB in 2007. • 5 long-term experts - namely Chief Advisor, Coordinator, Physical Standards, Electromagnetic Standards and Chemical Standards - have been dispatched as planned. • Since the beginning of Phase 2 until May 2007, 30 short-term experts were dispatched. The dispatch of 5 quantities has been delayed, explicitly Group Resistance, QHR, Line Scale, Pressure and Fixed Point, due to the delay of machinery and equipment procured by the Japanese ODA loan. • However, the dispatch of short-term experts is confirmed in 3 quantities (Line Scale, Pressure, and Fixed Point), while the other 2 quantities (Group Resistance, and QHR) have not been confirmed yet. In short, the expectation of short-term experts dispatch is 36 including one more expert in Calibration Procedure by the time of the termination of the Project.

Narrative summary	Objectively verifiable indicators	Achievements
	<p>2. C/Ps training in Japan</p> <p>3. Machinery and Equipment procured by ODA Loan</p> <p>4. Supporting local cost</p>	<ul style="list-style-type: none"> ● A series of trainings regarding to the content of technical transfer¹ were conducted in Japan during the project period. Since the commencement of Phase 2, the total number of C/Ps has been trained in Japan is 16 persons. The dispatch of 11 C/Ps was programmed in the schedule of technical transfer while the dispatch of 5 C/Ps was requested by NIMT. Those additional requested quantities are Environment Management Technology, Mass, Watt Hour, AC Voltage and Density. ● By the end of May 2007, the procurement of 387 machinery and equipment procured by ODA Loan are completed. There are 7 items that have not yet been delivered. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for the remainder will be in July 2007. ● The supporting local cost by JICA from the commencement of Phase 2 up to the time of Terminal Evaluation is 7,036,898 THB.

¹ In this Project, the technical transfer consists of 3 types of activities namely 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.

Narrative summary	Objectively verifiable indicators	Achievements	Important assumptions
<p>Outputs</p> <p>1. The operation and administration of the project are enhanced</p>	<p>1-1 Staff and budget are allocated to the project.</p>	<ul style="list-style-type: none"> - The allocation of C/Ps was implemented as planned. NIMT requested additional technical transfer in 5 quantities so that several persons were allocated in this regard. From the beginning of Phase 2 to present, there have been no technical C/P resignations. - The long-term Japanese experts were also dispatched as planned, while some short-term Japanese experts have not yet been dispatched due to the delay of machinery and equipment procured by ODA loans. - The budget for Project operation and administration was allocated as planned. 	<ul style="list-style-type: none"> a. There is no change in the C/P employment plan, which would have a negative influence on the project. b. There is no change in budget allocation and policy which would have a negative influence on the project. c. There is no change in organization which would have a direct influence on the project. d. Procurement, installation and setting up of all machines are properly completed. e. NIMT takes preventive measures against the resignation of C/Ps trained in the project.
<p>2. The equipment is properly operated and maintained.</p>	<p>2.1 National Measurement Standards are installed and established in the 40 quantities of the project.</p>	<ul style="list-style-type: none"> - In this Project, the technical transfer of 42 quantities was planned for completion. In fact, the technical transfer for 37 quantities was completed as of the end of May 2007. There was a slightly effect from the delay in the schedule of the dispatch of short-term experts in a few quantities, but the main cause for incomplete technical transfer was the delay of machinery and equipment procurement. <p>However, the technical transfer in the other 5 quantities is planned for completion by the time the Project concludes since the delivery schedule for the remainder of the machinery and equipment has been confirmed. Consequently, it can be expected that the National Measurement Standard will be installed and established successfully as planned.</p>	
	<p>2.2 Registration of maintenance record and calibration record of equipment.</p>	<ul style="list-style-type: none"> - After the installation and establishment of the National Measurement Standard, operation and maintenance are implemented and trained by means of the technical transfer. It was confirmed that the manuals of operation and maintenance management of existing machinery and equipment of the Project are provided and organized properly. 	
	<p>2.3 Manuals of operation and maintenance management are provided and organized for reference.</p>		
<p>3. The technical capability of C/P is upgraded.</p>	<p>3.1 Technical Cooperation Program is created.</p>	<ul style="list-style-type: none"> - The technical cooperation program is created since the beginning of the Project. 	
	<p>3.2 C/Ps are appropriately assigned.</p>	<ul style="list-style-type: none"> - It was confirmed that the C/Ps are appropriately assigned based on the program. 	

Narrative summary	Objectively verifiable indicators	Achievements	Important assumptions
	<p>3.3 Improvement in the uncertainty.</p> <p>3.4 Skill after training</p> <p>3.5 Number of seminars and joint training.</p>	<ul style="list-style-type: none"> - The improvement in the uncertainty has been defined in the Uncertainty Budget Sheet, which will be created after the accreditation process has been done. According to the result of technical transfer, it was confirmed that the budget of uncertainty has been improved in 14 quantities, while 6 more quantities were planned to be improved by the time of Project termination and 5 quantities cannot be implemented due to the lack of adequate facilities of NIMT to apply for the accreditation process. - Referring to “Skill after training” in the Evaluation Sheet on Technical Transfer, which contains several criteria of the assessment on each quantity - installation, operation, calibration technology, calibration procedure, accreditation, etc - the result of assessment was demonstrated by the improvement of skill before and after training. Evaluation of the “skill after training” was conducted in 23 quantities, resulting in the assessment that skill of all C/Ps had increased after training. It can predict that the tendency of the result of the improvement of C/Ps skill will be increased in other quantities as well. - The improvement of C/Ps technical capability is indicated by the seminars arranged in order to disseminate knowledge to others. According to the record of seminars, there were 33 seminars supported by the Project and implemented from February 2003 up to April 2007 covering in 32 quantities. Among this number, 7 seminars was conducted as ASEAN seminar. Furthermore, the ASEAN seminars that covered several of quantities were also implemented 4 times excluding 7 times mentioned above. - There are many seminars were conducted by NIMT itself in every year as a trainer for trainee program since 2003 to 2007 except 2006 because there were many internal affairs that NIMT staff have to manage due to the relocation to the new building. - In terms of Joint Training, by the time of this Terminal Evaluation, NIMT has already conducted 3 times of Joint Training on Measurement Standards in Thailand. Most participants came from ASEAN countries. - According to the information from the questionnaire and interview survey, recently there is no system for regular internal training implementing in NIMT since the course is organized by case. 	

Narrative summary	Objectively verifiable indicators	Achievements	Important assumptions
4. Accuracy of national measurement standards is improved.	<p>4-1. Improvement in uncertainty.</p> <p>4-2. Registration of environmental data for every laboratory.</p> <p>4-3. Number of international comparison implemented.</p>	<p>- The Project was planned to finish the technical transfer in 42 quantities, and 37 quantities of the total 42 quantities have been completed by the end of May, 2007. The number of accreditation obtained during the Project reaches 14 quantities, which application procedure requires the preparation of uncertainty budget sheet and the registration of environmental data with internationally recognized standards.</p> <p>- The number of international comparison is 23 as to 12 different quantities have been implemented in the focus of accuracy improvement.</p>	
5. NIMT disseminates national measurement standards properly.	<p>5-1 Improvement in calibration technology for reference standards.</p> <p>5-2 Number of calibration procedures created.</p> <p>5-3 Items pointed by evaluation of quality system and the way to solve the items.</p>	<p>- The traceability chart is prepared for all quantities at the time the Project plan was formulated in order to indicate the level of accuracy of the calibration technology that NIMT can provide by using the machinery described in the chart. Consequently, the procurement plan of machinery and equipment was prepared based on these charts.</p> <p>For that reason, it can be said that there are 41 traceability charts for each quantity available in order to improve the calibration technology for reference standards of NIMT, as planned.</p> <p>- The calibration procedure has been provided in 37 quantities, while 17 quantities are in progress. The delay in the procurement of machinery and equipment affected the schedule of technical transfer, so the calibration procedure for 17 quantities has not yet been prepared.</p> <p>- 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 May 2007, the Project has been applied and got assessed for the accreditation in 14 quantities and it has plan to apply further more in 6 quantities by the time of the termination of the Project.</p>	

Evaluation Grid

(The Project for Strengthening for National Institute of Metrology (Thailand) Phase 2

Target Group:

- Thai Institute of Science and Technological Research (TISTR) and Department of Science Service (DSS) as Calibration Service Agencies
- Domestic Industries in Thailand (Especially export industries and enterprises trying to acquire ISO 9000s, ISO14000s)

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

Relevance

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Does the project match the needs of Thailand?	Does the overall project goal coincide with the Thai national policies?	Survey and verify the Thai national policies and guidelines on measurement standards from the industrial and scientific aspects.	<ol style="list-style-type: none"> 1. 10th National Economic and Social Development Plan 2. National Metrology System Development Act of Thailand 3. Comments from C/P 	In the 10 th National Economic and Social Development Plan (2007-2011), there is no change in the direction in the importance of metrology that described the significance of the metrology system development in Thai industry. It is confirmed that the overall goal of the Project still coincide with the Thai national policies. The result of questionnaire survey also illustrates high expectation of Thailand to maintain competitively in the global market and participation in the international economic agreements. The National Metrological System Development Act defines NIMT as the key institute to develop metrology system, procure and maintain national standards and standard reference materials of the country for all fields of measurement in accordance with the international metrology system. The duty of NIMT shall include the supporting enhancement of efficiency of study and development of metrology technology to ensure the effectiveness of the metrology system of the country as reliable and acceptable to the international metrology system.
Is the project consistent with the needs of NIMT?	Is the project purpose consistent with the policy of NIMT?	Survey and verify the NIMT's activities.	<ol style="list-style-type: none"> 1. NIMT report of Activities 2. List of Global MRA 3. Comments from C/P 	The Project activities are programmed similarly to the contents of global MRA. Therefore, the implementation of the project activities directly supports NIMT's performance in comparison with international level of accuracy.

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Is the project consistent with Japanese ODA policy and JICA's country programs?	Is the project consistent with Japanese ODA policy?	Survey and verify the Japanese ODA policy and JICA country program.	<ol style="list-style-type: none"> 1. Japanese ODA policy 2. JICA's country programs 	<p>The Japanese government states in its basic policies of ODA charter that supporting self-help effort of developing countries, which includes economic and social infrastructure building constituting the basis for these countries' development, is one of the most important philosophies. Besides, it also defines the target area as ASEAN countries.</p> <p>According to the country approach for Thailand in ODA charter, the technical cooperation is stipulated of the mean of approach for both bilateral and multilateral cooperation around the region.</p> <p>Private sector development is one of the key issues in JICA countries approach for Thailand, particularly the enhancement of science and technology.</p>
	Is the project consistent with the field of assistant in JICA's country programs?			
Is the selection of C/P organization for the project appropriate?	Is there any other institute/ organization which should correspond to National Measurement Systems in Thailand?	Survey and verify the current situation of measurement and calibration standard activities.	<ol style="list-style-type: none"> 1. Existing documents 2. Comments from C/P 3. Comments from experts 	<p>The National Metrological System Development Act defines NIMT as the key institute to develop National Measurement Systems in Thailand.</p> <p>According to the National Metrological System Development Act, NIMT is only one institute.</p>
	Is there any other institute/ organization involved consequently in the project?			
Does Japan have an advantage in extending technical cooperation in the related sector or sub-sector?	Is there any other donor or supporting agency cooperating in the field of the national measurement systems?			<p>The National Metrology Institute of Japan is established in 1903 while NIMT is established in 1998. It is indicated that Japan has far experiences in this field than Thailand almost 100 years.</p>

Effectiveness

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Has the project purpose been achieved?	Is the set up of the project purpose appropriate in accordance with the nature of NIMT?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. NIMT reports of activities 2. Project reports 3. Comments from C/P 	The objectives of the establishment of NIMT are quite consistent of the project purpose.
	Did NIMT staff have trainings in 8 fields of measurement standards sufficiently?			
Did the expected outputs contribute to the achievement of the project purpose?	Are the number, accuracy and range of calibration services improved by the project?		<ol style="list-style-type: none"> 1. NIMT report of activities 2. Comments from C/P 	<p>It was planned to completed technical transfer in other 5 quantities by the time of the termination of the Project since the schedule of deliverance of the rest of machinery and equipment has been confirmed already. Consequently, it can be expected that the National Measurement Standard will be installed and established as planned but the process of accreditation ensuring the internationally recognized level of accuracy has not yet be completed by the time of the termination of the Project.</p> <p>The number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project.</p>
	Is there any change in C/P employment plan during the project?			
	Is there any significant change in budget allocation and policy during the project?		<ol style="list-style-type: none"> 1. Financial operation report of NIMT 2. NIMT report of activities 3. Comments from C/P 	<p>Referring to the result of input analysis, there is no significant change in the budget allocation and policy during the Project.</p> <p>Referring to the result of input analysis; there is no significant change in the budget allocation and policy during the Project.</p>

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
	<p>Is there any change in organizational structure?</p> <p>Are procurement and installation of the all machineries properly completed?</p> <p>Are NIMT staffs trained by the project still working in NIMT?</p> <p>Is there any incident positively/ negatively influencing the achievement of the project purpose?</p>		<ol style="list-style-type: none"> 1. NIMT report of activities 2. Comments from C/P 3. Project reports 	<p>It was also confirmed with the Permanent Secretary of Ministry of Science and Technology that there is no negative change, respectively.</p> <p>There are 7 items that have not yet been delivered. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for the remainder will be in July 2007.</p> <p>All NIMT staffs trained by the Project have been working in NIMT at the time of Terminal Evaluation.</p> <p>The project made their enormous efforts to catch up the progress by making their training schedule flexible and dispatch additional 5 persons to be trained in Japan as requested by NIMT.</p> <p>A series of meetings was conducted every month since the beginning of the Project. Additionally, the JCC meeting is also conducted twice a year in order to maintain the mutual understanding between Japanese side and Thai side.</p> <p>From the filed survey, long term experts have been providing Japanese Language Course for NIMT staffs, which supports the better communication between Japanese experts and Thai C/Ps.</p>

Efficiency

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results		
Main Questions	Sub-Questions					
Are all activities implemented properly?	Is the allocation of Japanese experts and Thai C/P sufficient in terms of number and timing?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Comments from C/P 	<p>Referring to the result of input analysis, the allocation of short term experts has been delayed in 5 quantities due to the delay of machinery and equipment procured by ODA loan.</p> <p>Nonetheless, for time being 30 short terms experts were dispatched and it is considered that the allocation is appropriate in terms of number and timing.</p> <p>The allocation of Thai C/Ps is considered appropriate in both administrative and technical staff.</p>		
	Is the budget for O&M of the project allocated as planned?				<ol style="list-style-type: none"> 1. Financial operation report of NIMT 2. Comments from C/P 	<p>According to the result of the budget analysis for the implementation of the Project, it is confirmed that the budget was allocated as planned.</p>
	Are all equipment, which are mainly procured by ODA loan, installed as planned?				<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Price list of calibration service 4. Field survey 5. Comments from C/P 	<p>By the end of May 2007, the procurement of 387 machinery and equipment procured by ODA Loan are completed. There are 7 items that have not yet been delivered. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for the remainder will be in July 2007.</p>
	Are these equipment utilized effectively?					<p>It is confirmed that all procured equipments are utilized effectively since these equipments are the important component for their performance.</p>
	Is there any internal training system in NIMT?					<p>Technical cooperation program has been prepared and components are implemented by the Project.</p>
	Are measurement standards established and maintained as planned?					<p>Based on the fact that the process of technical transfer and accreditation have not yet been completed in all quantities; it is fair to say that the establishment and maintain of measurement standards have not yet achieved as planned.</p>
	Is the environmental management of laboratories improved during the project?					<p>The environmental management system will be established after the completion of accreditation process.</p> <p>The accreditation process has been completed in 14 quantities. This means the environmental management of some laboratories has been improved.</p>
						<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Training documents 4. Comments from C/P
		<ol style="list-style-type: none"> 1. File of environmental management sheet 2. Project reports 3. NIMT reports of activities 4. Comments from C/P 	<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Results of equipment inventory 4. Comments from C/P 			

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
	How many international comparisons were conducted?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Record of international comparison on measurement standards 2. Project reports 3. NIMT reports of activities 4. Comments from C/P 	<p>At the time of the terminal evaluation, it was confirmed that it has participated in 23 international comparisons as to 12 different quantities, which increased 8 comparisons in 2 quantities from the time of Mid-term evaluation.</p> <p>The improvement of calibration technology is referred to the traceability chart of NIMT. It is confirmed that this chart is available in all quantities of technical transfer which automatically lead to the improvement of calibration technology.</p>
	Is the calibration technology for reference standard improved?			
Is the set up of important assumption adequate?	Did NIMT take any countermeasure to prevent the resignation of C/P trained in the project?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Policy of employment in NIMT 2. Project reports 3. Comments of C/P 	<p>Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation.</p>
	Is there any factor enhancing/ hindering the project outputs?			
Is the output generation adequate?	Are the operation and administration of the project enhanced?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Project reports 2. Comments of C/P 	<p>The countermeasure to prevent the resignation of skillful NIMT staff trained by the Project could secure the adequate generation of outputs comprehensively.</p> <p>The delay of the procurement of machinery and equipment might have hindered the achievement of Project outputs.</p>
	Are the equipment operated and maintained properly?			
	Is the technical capability of C/P upgraded?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Staff allocation list 2. Budget chart 3. Organizational chart 4. Comments from C/P 	<p>The result of output analysis, the enhancement of the operation and administration of the Project is satisfactory.</p> <p>According to the result of questionnaire survey, the most of answers from respondents indicates more than fairly.</p>
			<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Result of equipment inventory 4. Comments from C/P 	<p>The result of output analysis, all equipment are operated and maintained properly.</p> <p>According to the result of questionnaire survey, most of respondents rate very much and much.</p>
			<ol style="list-style-type: none"> 1. Evaluation sheet of technical transfer 2. Project reports 3. Comments from C/P 	<p>The technical capability of C/P is assessed with the satisfactory level.</p> <p>According to the result of questionnaire survey, the answer from most respondents is very much or much.</p>

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
	Is the accuracy of measurement standards improved?		<ol style="list-style-type: none"> 1. Records of the accuracy of national measurement standards 2. Project reports 3. Comments from C/P 4. File of environmental management sheet 5. Project report 6. Comments from C/P 	<p>The accuracy of measurement standards is obviously improved in some quantities which accreditation processes have been completed.</p> <p>According to the result of questionnaire survey, the answer from most respondents is very much or much.</p>
	Does NIMT disseminate national measurement standards properly?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Traceability charts of NIMT 2. Calibration certificate 3. Manual or guideline of calibration procedure 4. Project report 5. Project reports 6. NIMT report of activities 7. Comments from C/P 	<p>The dissemination of national measurement standards has been conducted properly in some quantities which accreditation processes have been completed.</p> <p>According to the result of questionnaire survey, the answer from most respondents is very much or much.</p>

Impact

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Is the national measurement systems of Thailand established nationwide?	How many were calibration laboratories increasingly registered during the project?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> List of laboratories Project reports Comments from C/P 	<p>NIMT has already participated in the Global MRA and quantities are increasingly listed in Appendix B and C of the Global MRA. However new registration to appendix C for transferred quantities have not been finalized yet. The number of calibration laboratories that available on NIMT's website by the time of the evaluation is 78.</p> <p>The traceability chain and roles of respective organization of measurement network in Thailand have been established.</p> <p>The National Measurement Network with NIMT as its top has already encompassed more than 130 laboratories in its network according to the interview result from a director of NIMT.</p>
	How much is the measurement network in Thailand established?			
Did the achievement of the overall goal result from the project purpose?	Is there any change in the role of NIMT as the institute for maintaining national measurement standard?		<ol style="list-style-type: none"> 10th National Economic and Social Development Plan Organizational structure of Ministry of Science and Technology Project reports Comments from C/P 	<p>The National Metrological System Development Act stipulates NIMT to play their roles and responsibilities as the institute to develop metrology system, procure and maintain national standards and still effective.</p> <p>This important assumption is assessed as applicable as before.</p>
	Is there any unexpected factor on attainment of the overall goal, either positively or negatively?			
Is there any unexpected positive or negative influences including ripple effects?	Is there any unexpected positive or negative influences including ripple effects?			NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training as well. The recognition of NIMT in the ASEAN region has been growing gradually since the Project started.

Sustainability

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Is the achievement of the project going to be sustained after the termination of the project?	Is the technology of equipments and knowledge installed by the project appropriate for the technical capacity of C/P?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Project report 2. NIMT reports of activities 3. Comments from C/P 	After the process of technical transfer and accreditation process were completed, NIMT staffs were given the opportunity to share their knowledge and experience with others staffs by assessing the record of seminars conducted by the Project. Most of respondents in the questionnaire survey evaluated that the technology of equipments and knowledge transferred thought the Project were appropriate.
	Are the technical and maintenance manuals prepared in the project utilized effectively?		<ol style="list-style-type: none"> 1. Evaluation sheet of technical transfer 2. Project reports 3. Comments from C/P 	The technical and maintenance manuals have been prepared in the Project. It was confirmed by the field observation that those manuals are utilized very much because of the guidance of accreditation.
	Did NIMT take any countermeasure to prevent the resignation of C/P trained in the project?		<ol style="list-style-type: none"> 1. Policy of employment in NIMT 2. Project reports 3. Comments from C/P 	Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation.
	Does the 10 th National Economic and Social Development Plan still emphasize the significance of the metrology system in Thai industry?		<ol style="list-style-type: none"> 1. 10th National Economic and Social Development Plan 2. Project reports 3. Comments from C/P 	The 10 th national Economic and Social Development Plan described the importance of enhancing the competitiveness of Thai industry to the global market. In term of the international trading, the Quality System is required to build up consumers' confidence in the products. As a result, the measurement standard activity becomes a part of the system to ensure the quality of the products.

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results		
Main Questions	Sub-Questions					
	Is the National Metrology System Development Act (1995, enacted in 1997) still effective to encourage the activities of NIMT?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. National Metrology System Development Act 2. Project reports 3. Comments from C/P 	<p>Considering the roles and responsibilities of NIMT, the National Metrology System Development Act is still effective to encourage the activity of NIMT to play its role as the primary measurement standard organization and contribute to the firmly establishment of traceability system in Thailand ultimately.</p>		
	Is the financial assistant from Thai Government to NIMT for the coming years secured enough to operate and maintain the facilities?				<ol style="list-style-type: none"> 1. Financial operation report of NIMT 2. Price list of calibration services 3. Project reports 4. Comments from C/P 	<p>Considering the annual government budget allocated to NIMT from 2004–2006, the trend is predicted as increasing.</p>
	Is the status of revenue from the calibration services improving?					<p>According the interview result of the director of NIMT, it indicated that NIMT does not have a policy to raise its own funds by providing more calibration services at this moment. It is shown that NIMT emphasis its role on the improvement of the development of measurement standard as the primary standard organization of Thailand.</p>
	Does the community of the Thai industry still need NIMT as the high level measurement standards as before?		<ol style="list-style-type: none"> 1. Project reports 2. Comments from C/P 3. Others 	<p>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 standard development of Thailand.</p>		

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

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

JFY	2002												2003												2004												2005												2006												Training in Japan Duration (month)	Remarks
	1				2				3				4				5				6				7				8				9				10				11				12																	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4														
Name of C/P																																																														
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																																																														
(3) Assistant Project Director																																																														
Mr. Somsak Charakkian																																																														
(4) Project Coordinator																																																														
Mrs. Ajchara Charoensook																																																														
2. Technical C/P																																																														
(1) Vibration																																																														
Mr. Pairoj Rattamangkul																																																														
(2) Humidity																																																														
Ms. Thasorn Sinhaneti																																																														
(3) Weight Evaluation																																																														
Ms. Rungsuya Wongsudin																																																														
(4) Radiation Thermometry																																																														
Mr. Narudom Noulkhow																																																														
Mr. Uthai Norranim																																																														
(5) pH Standard Solution																																																														
Mr. Bunthoon Laongsri																																																														
(6) Hardness																																																														
Mr. Tassanaï Samponput																																																														

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

JFY	2002												2003												2004												2005												2006												Training in Japan Duration (month)	Remarks
	1			2			3			4			5			6			7			8			9			10			11			12																												
	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																										
Name of C/P																																																														
Term of Technical Cooperation																																																														
(31) Mass Standard Ms. Rungsiya Sukhon																																																													
(32) Watt Hour Standard Mr. Voraphol Phapukdee																																																													
(33) Chemical Analysis Dr. Charun Yafa																																																													
(34) Standard Scale Mr. Yuttana Hongaromkij																																																													
(35) AC Voltage Standard Mr. Somchai Pitipat																																																													
(36) Density Standard Mr. Tosaporn Pangviwate																																																													

Note: — Allocated Training in Japan - - - - - Study Abroad