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Standardization and Measurement Services in Indonesia

Authors: H. Steffen Peiser
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Office of International Relations
National Bureau of Standards
Washington, D.C. 20234

Held May 30-June 11, 1977
Issued September 1979

Survey Director: Mr. Sumantri
Deputy Chairman for Technology
Indonesian Institute of Science
Jakarta, Indonesia

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Washington, D.C. 20523

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Survey Director: Mr. Sumantri
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Mr. William H. Littlewood, USAID, Indonesia
Mr. D. Steffen Peiser, NBS, U.S.A.
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Mr. Chaiwai Sangruji, TISI, Thailand
Dr. Raymond C. Sangster, NBS, U.S.A.
Dr. Rex B. Woo-Ming, Guyana

A Report of a Survey Conducted Jointly by the National Bureau of Standards and the Agency for International Development PASA TA(CE)5-71)

U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, ***Secretary***

Luther H. Hodges, Jr., ***Under Secretary***

Jordan J. Baruch, ***Assistant Secretary for Science and Technology***

NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

PREFACE

For the past eight years, the National Bureau of Standards has offered to respond once a year to a request by a less industrialized country to survey standardization and measurement services needed by its developing industries and the existing institutional ability of the country to supply those services. The demand for these surveys has exceeded available technical resources and funding provided by the Agency for International Development. These surveys are characterized by some important common features:

For each survey, about half the team was provided by the host country; the other half consisted of about ten technical specialists, of whom about half came from third countries with similar problems in development, while the other half were the best available American specialists in technical fields of special importance to the host country. Since all these team members occupy positions of major responsibility in their own institutions, a survey period of more than two full working weeks could not be planned, but the foreign participants were expected to prepare themselves by reading material provided by NBS and the host country. The survey director was provided by the host country, which also arranged the in-country schedule of travel so that contacts could be made with governmental, industrial, and academic organizations. NBS has coordinated the writing of a report, which is given circulation at the discretion of the host country. NBS is also funded by AID for limited technical follow-up and evaluation functions in the years following a survey. At this time the impact of the completed surveys is mixed, ranging from having stimulated a great deal of local activity to virtually no visible impact.

When the Hon. Sumitro Djojohadikusumo, the Indonesian Minister of State for Research, requested that Indonesia undertake such a Survey under the auspices of the Indonesian Institute of Sciences (LIPI), we at NBS wondered whether this country might be too large and diverse to offer a reasonable expectation for a successful survey. However, we decided to proceed with this Survey because there was in place in Indonesia considerable technical recognition of the need for standardization, and there were in existence institutions that already gave effective advice on some measurement technologies. Moreover, the government was planning a policy seminar on standardization with the U.S. National Academy of Sciences to follow this Survey, so that the possibility existed for implementation of recommendations. This policy seminar has not yet been held, and at the time of writing, evaluation of our Survey is not possible. A limited dialogue with Indonesian team members has continued. Even without close contact, it is clear that the development of Indonesia continues, its human and natural resources are great, and its leaders see clearly the opportunities for more rapid development, as emphasized by the recently signed bilateral "Agreement Between the Government of the United States of America and the Government of the Republic of Indonesia for Cooperation in Scientific Research and Technological Development."

H. Steffen Peiser
Chief
Office of International Relations
National Bureau of Standards

TABLE OF CONTENTS

Page

APPENDIXES

I. EXECUTIVE SUMMARY

I.A. General

Because of her natural and human resources, Indonesia has the potential of becoming one of the world's wealthiest nations with a high standard of life for all its people. For a nation with little industrial capacity to leapfrog into prosperity and into a prominent trading position, challenges must be met in many fields. A good financial system is needed, as well as political stability, a good national plan for development, good transportation and communication infrastructure, sources of power, concern for the environment, and education. This study deals with two little-understood national systems--standardization and measurement. All highly developed countries have elaborate systems in these fields which are the result, at least in part, of government stimulation. Less developed countries, including Indonesia, on absolute and even relative terms, put far fewer resources into these two systems. There is, after all, little to excite the layman in standardization--no new product, no new profit to demonstrate easily. However, lack of standardization can lead to unexpected and heavy losses of benefits and opportunities. Exports offered to the United States from several countries show losses far greater than the cost of standardization, but this evidence appears seldom to persuade authorities to allocate funds to prevent such losses. Standards bodies are typically underfunded.

An international team organized by the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia--LIPI) and the U.S. National Bureau of Standards (NBS) visited Indonesia (mostly Java) for two weeks in June 1977 under partial funding from the Agency for International Development. The participation of leaders in standardization and metrology from Ecuador, Guyana, Korea, and Thailand was greatly appreciated by the Indonesian counterparts. The aim was to discuss with Indonesian colleagues the problems and needs in standardization and measurement services in Indonesia. The team found ample evidence of existing technical comprehension based on previous foreign studies and on the analysis of Indonesian experts. In metrology (measurement sciences), a system of cooperation between existing laboratories in calibration, instrumentation, and metrology, the so-called "KIM" system, is exemplary. Its limitations at this time are in facilities, funding, staffing, and utilization. These interconnected limitations appear to be understood by the authorities and are being gradually corrected. Certain administrative and legal changes could accelerate this desirable cooperation. The team found no basic problems and applauded the cooperation among many institutions. Examples are between the National Research Institute for Instrumentation (LIN of LIPI) and the Institute of Metrology in Bandung, and between LIN and PINDAD (Army Metal Industry).

Such cooperation will quickly surface in the standardization field in Indonesia once it is fostered by high Governmental authorities. The team concurs with previous studies that the Government of Indonesia should establish a focal point to promote this coordination. However, standardization is pervasive through all national life--every organization is in need of some aspect of standardization. All should benefit from a national focal point. This need not be a large organization. Rather, it should be one that is expert in bringing together representatives of all interested parties, helping them with information from other countries and from the technical literature, convening meetings, and proposing equitable compromises and workable solutions. Encouragement, not enforcement, should stem from this national standardization body. Mandatory standards, related to health and safety, can be enforced by specialized governmental bodies.

The Ministry of Trade is responsible for the quality of exports, the Ministry of Health for the safety of foods eaten domestically, the Ministry of Industry for the quality of engineering products, etc. It should not be an aim of the national standards body to become directly involved in the regulatory functions but only in the national coordination of all the standardization activities. Quality marking, certification, or laboratory accreditation schemes are also suitable for guidance by the national standards body. For assistance in inculcating widespread confidence in a national standards body, it may be helpful to employ temporarily a foreign adviser, perhaps from the U.N., whose integrity, neutrality, and experience may be readily accepted. Ultimately, standardization in Indonesia, as in all countries, depends on open encouragement by all agencies of government.

Apart from attending some general meetings, the survey team was divided into subgroups. Some specific conclusions and recommendations of these subgroups follow.

I.B. Food and Food Safety

When applied to food safety, standards need a mandatory control system in order to serve Indonesia best. It would affect several ministries (Agriculture, Industry, Health, and Trade) and probably could operate most effectively under a combined legal authority and be implemented in cooperation. In the formulation of the standards, all interested parties, e.g., consumers and producers, should be given an opportunity to participate. Standardization would reduce the potential for domestic food production losses, for food-related health hazards, including those from new chemicals used in the food industry, and for losses of foods intended for export but unacceptable to the consignee. The team also recommended that incidence and causes of food poisoning be statistically recorded and more carefully investigated. In the opinion of the team, benefits would accrue if the staffing of the central and local directorates of Drug and Food Control could be greatly increased. The institution of a national system on food security will be greatly beneficial. Cooperatives among food producers and small-scale processing companies could--according to one team member--provide an excellent mechanism for disseminating information on foods and food safety.

I.C. Building and Construction

As a result of its study of buildings and construction, the team came to recommend a new governmental or quasi-governmental organization specifically formed to oversee the building regulatory process. The team believes that this organization would perform more effectively if it were not part of the National Standards Organization, which has been proposed to be under the direct responsibility of LIPI. The visiting team did not feel qualified to identify alternative locations in the Governmental structure but considers that this Center should be in a governmental agency because of its regulatory function.

The National Center for Building and Construction would be responsible for the development and review of building designs and could establish a uniform and workable method of enforcing good building practices. It would be helpful to international trade in building materials if these standards could be written to conform as far as possible to the ISO standards format. The Center should also represent all groups engaged in day-to-day building activities. Further, it could make available to the interested general public useful information about building, buying, renting, or improving housing.

I.D. Quality Control in Industry

So long as products of any quality sell readily without apparent discrimination by the buyers, quality control for producing a better finished product does not appeal to manufacturers because quality control costs money. The argument that one must prepare for a competitive or export market, however true, does not convince businessmen in industrializing economies. So, despite an outstanding consumer organization, some in Indonesia still say that quality control does not pay. This conclusion is held to be false by the team. Control of uniformity in raw materials, production processes, and keeping quality of products benefits manufacturers and opens new markets. For example, one small furniture manufacturer was quick to see that standard designs reduced costs for fulfilling repeat orders.

I.E. Safety Standards

The team reported a widespread understanding of industrial hazards and technical concepts of safety standards. It believes that the creation of a national standards body would result in even wider appreciation and implementation of standard procedures for safety. Examples were encountered in which dissemination of available information by such a standards body would have helped the Ministry of Health and other ministries. Safety affects a wide cross-section of people in industry as well as in the general public. In this field, the team recommends that consideration be given to preparing translations into Indonesian of some key documents. After studying rules for wearing hard hats in the U.S. construction and machinery industry, for example, some Indonesians may come to the conclusion that protective head gear would be rewarding. Labor in industrializing economies tends to hide job-related infirmities for fear of losing jobs. It might be desirable to establish certain fiscal advantages to manufacturers that make investments or important improvements to their safety systems. Reinforcing a rule for the workplace by a lecture and discussion of the underlying standards with those employed not only deserves such a reward but will bring its own rewards as well.

I.F. Calibration, Instrumentation, and Metrology (the KIM System)

1. The existing plans for a national Indonesian KIM system are sound, and our suggestions are of an "evolutionary improvement" nature. Immediate strengthening of the KIM system is recommended.

2. The team saw a number of "centers of technical excellence," which led to the opinion that the major challenge the nation faces now is in identifying and recognizing these centers of excellence and using them as models to be duplicated many times over, in creating the technical competence that will be required as the country becomes an industrial power. Some of the specific centers of excellence noted by the team include the Institute of Technology of Bandung (ITB), the National Institute for Instrumentation (LIN), the Army Metal Industry (PINDAD), the Technical Academy of Machine Industry (ATMI), and the Leather Research Institute in Jogjakarta. A promotional effort for the wider-used services from such centers could benefit industry greatly.

3. The team sees advantages in the designation of LIN as the "National Metrology Center" with a clearly established authority in coordination and technical matters. If, in time, growth of national needs makes it difficult for LIN to fulfill both its national instrumentation and national metrology center missions, it might then be split into two separate organization; this issue could be considered five years from now in connection with development of the fourth five-year plan.

4. If LIN is assigned this mission, it may be advantageous to rename it as LIM (Lembaga Instrumentasi dan Metrologi--Institute for Instrumentation and Metrology).

5. At some time, it may be desirable to rename the proposed "National Committee for Calibration," e.g., as the "National Committee for KIM," and raise it to a higher level of official recognition than now seems to be planned.

6. The major task of the "national KIM center" now is strengthening and connecting the secondary level laboratories to itself and to each other to form the central network of a national system. The team strongly supports the present intention to delegate "national measurement standard" responsibility to key second level standards laboratories when their existing capabilities are appropriate. When a better standard is needed, it may then be appropriate for the national KIM center to take over the function.

7. The KIM system should include laboratory accreditation, set up flexibly to provide the levels of accreditation responsive to national needs.

8. Military and other governmental procurement regulations should require traceability to the national standards of measurements whenever high-precision products are involved.

9. A geographically dispersed network of lower level calibration laboratories is essential, due to the vastness and geographic dispersion of the country.

I.G. Measurements in Industry

1. A severe national technical need is that of trained manpower, especially at the technician and operator level.

2. So that the KIM program may achieve its goals, its management might consider appropriate incentives to attract highly educated technicians and scientists living overseas and in the country. Such incentives could come in the form of housing facilities and higher salary scales.

3. Increased Governmental encouragement for the wider use of the metric (SI) system would appear to be desirable.

4. All organizations visited had measurement problems. Existing instruments need verification and calibration. Improvements are needed in instrument repair and maintenance services.

5. Industry has needs for instruments for process control. The team recommends that the appropriate industrial research institutes be integrated into the national KIM system and used as channels in meeting these needs.

6. The aim to manufacture domestically all automotive parts, including those for engines and trucks, is, from the standards and engineering metrology viewpoints, the most ambitious encountered by the team. Urgent action by the KIM system and the proposed national standards body is needed to provide all possible technical assistance, but ultimate control and responsibility should not be sought by that standards body.

7. Higher quality of materials in the electrical power transmission system would appear to bring net savings. The same would happen in other sectors.

8. The use of industry associations for providing more technical services to its members might be considered.

As anticipated, the visiting team members encountered great challenges during this NBS/AID Survey of the Standardization and Measurement Services of Indonesia. In the many visits, discussions, and the subsequent correspondence, some assistance has been rendered and awareness of some opportunities may have been awakened. However, at best this Survey can only have made a small contribution to development of a country with seemingly unlimited potential, because real success in development comes only through self-reliance.

II. BACKGROUND AND INTRODUCTION

II.A.1. THE ARRANGEMENT IN THIS REPORT

The decision on how to organize the voluminous material in this report caused some difficulty owing to the divergence of interests of likely readers.

Most readers will wish to gain an impression only of the principal conclusions and ideas put forward. These readers will only wish to look at the preceding section I--Executive Summary, and then for possible further interest, turn to section V. The specialized reader should select from sections III and IV by referring to the detailed Table of Contents at the front of the book.

At the other extreme, we have the very few readers who wish to study the entire document. They will, we hope, find the report logically ordered as follows:

Section II...BACKGROUND AND INTRODUCTION...is mostly on previous foreign consultations in Indonesia on standardization and metrology.

Section III...THE INDONESIAN PAPERS...presents the view how technical specialists in Indonesia view the situation with its problems and opportunities. This long section is an acknowledgment that much of the experience of the visiting team was not new to Indonesia.

Section IV...THE ITINERARIES...is an account of about 80 visits and discussions of the visiting team and its subgroups.

Section V...CONCLUSIONS AND GENERAL REMARKS...in some ways is the real output of ideas of the visiting team, honest and forthright as the Minister wanted the remarks to be made, intended to be a constructive appraisal and fully conscious of the certainty that some of these views will be unbalanced or plainly wrong after so short an exposure to Indonesian ways.

The reader interested in the application of standardization to specific fields will read selectively within each section of the report only the subsections designated by the following letters:

A. General (remarks applicable to most fields of specialization)

B. Food and Food Safety

C. Building and Construction

D. Quality Control in Industry

E. Safety Standards

F. Calibration, Instrumentation, and Metrology--KIM by Indonesian acronym

G. Measurements in Industry

There is, unfortunately, considerable overlap between subsections in several sections, especially between D, E, and G. All the subsection coordinators (p. 10) would be willing to correspond with interested readers wishing for more detailed facts or impressions. The reader should be aware that section II is written in terms of subsections A (General) and F (KIM) only.

In this way, the section and subsection labeling is intended to save the reader from time consuming reading outside the fields of his interest. The selections are best made from the Table of Contents presented in matrix form.

II.A.2. AIMS AND ORGANIZATION OF THE SURVEY

A survey of standardization and measurement services in the Republic of Indonesia was conducted during the period from May 29 to June 10, 1977, by a team hosted by LIPI (Lembaga Ilmu Pengetahuan Indonesia--the Indonesian Institute of Sciences) and the U.S. National Bureau of Standards. Funding was supplied by the U.S. Agency for International Development and the Republic of Indonesia.

It was the eighth in a series of similar NBS/AID surveys (of Ecuador, Korea, Turkey, Thailand, Bolivia, the Philippines, and Guyana) organized at the request of the governments of industrializing countries. The previous reports (references 1-7) describe the aims and organizational features which can be summarized as follows:

A team of up to five NBS or other U.S. specialists strongly reinforced by a similar number of experts from third countries put their experience and knowledge in fields related to standardization and measurement technology at the disposal of the host government. The in-country program is organized by a survey director who is a senior official responsible for major segments of the standards and metrology systems in the host country. The two-week program includes discussions and visits to selected government agencies, private sector organizations, industries, and universities concerned with standardization and measurement services used by manufacturing, processing, and service industries. Such services are needed for grading of raw materials, control of production processes, quality assurance of products, regulation of domestic and international trade, etc.

A plan was well established by the end of 1976 under which the Government of Indonesia would request the Agency for International Development to pass to the National Bureau of Standards an invitation to hold the Survey of Standardization and Measurement Services in Indonesia along the lines described. Mr. H. Steffen Peiser, as representative of NBS, had visited Jakarta in September 1976 and held encouraging negotiations with LIPI and reported (see appendix VI.A.1) that the Minister of State for Research (Prof. Sumitro Djojohadikusumo), the chairman of LIPI (Prof. Bachtiar Rifai), and the AID Mission favored the NBS/AID Survey being conducted in 1977. After an exchange of cables from the AID Mission in Jakarta to NBS confirmed the wish of the Government of Indonesia to hold the Survey in 1977, NBS authorized and invited Deputy Chairman for Technology Sumantri of LIPI to act as Survey Director and designated Mr. H. Steffen Peiser, Chief of the NBS Office of International Relations, as organizer of the visiting team members. Unfortunately, there then occurred some delays in follow-up decisions in Indonesia on the local budget, the scope, and the fields of concentration. Some of these delays led to problems which were never resolved completely with concurrence of NBS. Fortunately, however, NBS was able to invite a very strong team. In conformity with previous surveys, the following were included from third countries:

Engineer Raul Estrada, Director General, Ecuadorian National Institute for Standardization (INEN)

Dr. Zae-Quan Kim, President, Korea Standards Research Institute (K-SRI)

Engineer Chaiwai Sangruji, Acting Director, Thai Industrial Standards Institute (TISI)

Dr. Rex Woo-Ming, Director-Designate, Guyana Bureau of Standards (GBS)

On many occasions, the inclusion of third country team members was especially appreciated and their important contributions to discussions acknowledged.

The strong interest of Indonesia in food and food processing made it imperative to secure the participation of an authority from outside NBS, and we were fortunate to secure the services of Mr. Benjamin Gutterman, Assistant Director for Coordination/Technology, Bureau of Foods, U.S. Food and Drug Administration. An incidental benefit was that his wife, a scientist and teacher of mathematics formerly on the staff of NBS, decided to accompany Mr. Gutterman at her own expense. Despite reticence to participate in official functions, she did significantly add to the survey competence and assist in the complex logistics.

The team also should have included Dr. Edward Glass, who had already accepted an invitation to join the visiting survey team. He had a distinguished career as a materials scientist and as a U.S. leader in science policy and consultation to less industrialized countries including Indonesia. However, he succumbed to a sudden heart attack. His loss was a great misfortune to this survey.

Dr. William Littlewood, Science Adviser of the USAID Mission in Jakarta, was an active participating "observer" of the survey except occasionally when other urgent duties interfered.

The NBS team members were:

H. Steffen Peiser, Chief, Office of International Relations

Noel Raufaste, Special Assistant to the Director, Center for Building Technology

Raymond C. Sangster, Program Manager for Strategic Planning, Office of Deputy Director, IBS/Boulder

The remaining doubts of the Indonesian Government on whether to organize the Survey were soon dispelled, but the consequent lack of optimum planning was to remain a problem for the survey. For instance, the Survey Director's plans for four days of lectures and discussions and subsequent splitting into six groups had not been fully understood or agreed by the visiting team members. The later program was structured into two categories: Standardization and Measurement. The visits program was split into six subgroups with coordinators--the first four in Standardization and the remaining two in Measurement. For the purpose of this report, generally applicable comments are made under letter heading A, while the coordinators of the subgroups and the designated letter headings are as follows:

B. Food and Food Safety (coordinator, Mr. Benjamin Gutterman)

C. Building and Construction (coordinator, Mr. Noel Raufaste)

D. Quality Control in Industry (coordinator, Mr. Chaiwai Sangruji)

E. Safety Standards (coordinator, Mr. Raul Estrada)

F. Calibration, Instrumentation, and Metrology (coordinator, Dr. Raymond Sangster)

G. Measurements in Industry (coordinator, Mr. H. Steffen Peiser)

Both our hosts and the visiting team had problems in manning a largely unalterable schedule of visits. Coordination of the visiting team activities was difficult. The survey might therefore have been improved by better planning, but the counterpart Indonesian team members contributed so much effort and understanding that any deficiencies seemed to be overcome. The survey was a most friendly, cooperative venture with excellent technical and personal understanding. The following is a list of Indonesians who contributed prominently to the survey as counterpart team members under the directorship of Deputy Chairman Sumantri, and Mr. Herudi Kartowisastro took over leadership of groups F and G—related to the measurement services. This list is long, but it probably fails to acknowledge several who also devoted much time, effort, and loyalty to the aims of the survey.

Mrs. Sriati Djaprie, Assistant Deputy to the Chairman for Technology, Indonesian Institute of Sciences

Mr. Zaini Djaprie, Inspectorate General, Department of Public Works and Electric Power

Mr. Gandi, Center for R&D of Metals & Engineering Industries, Ministry of Industry

Dr. B. H. Hadiwiardjo, Deputy Director, National Institute for Instrumentation, LIPI, Bandung

Mr. Aam Hamzah, Head, Research and Development Division, National Institute for Instrumentation, LIPI, Bandung

Dr. Hanauld, Ministry of Health

Dr. Djoko Hargono, Directorate of Food Control, Ministry of Health

Mr. Herudi Kartowisastro, Director, National Institute for Instrumentation, LIPI, Bandung

Mr. Moh. Ma'mun, Head, Affiliation Division, National Institute for Instrumentation, LIPI, Bandung

Mr. Maryono, Directorate of Metrology, Ministry of Trade, Bandung

Mr. Milono, LIPI

Dr. J. Prasad, UNESCO Consultant, National Institute for Instrumentation, LIPI, Bandung (Head, Optics Division, Central Scientific Instruments Organization, Chandigarh-160020, India)

Mr. G. Prina, Ministry of Transmigration Cooperation and Manpower

Mr. Palgunadi T. Setiawan, Major, Komando Perindustrian Angkatan Darat--PINDAD (Army Industrial Command), Bandung

Dr. P. S. M. Simatoepang, Directorate of Food Control, Ministry of Health

Dr. Slamet Soesilo, Provincial Director of Drugs and Food Control, West Java, Ministry of Health

Dr. A. Soemarjono, Staff Member, Ministry of State for Research

Mr. Krishna Wejawa, Provincial Directorate of Drugs and Food Control, West Java, Ministry of Health

Mr. Suwarno Wiryosimin, Atomic Reactor Center, National Atomic Energy Agency

Mr. Sri Hardjoko Wirjosumarto, Department of Mechanical Engineering, Bandung Institute for Technology

Mr. Atang Zaenudin, Executive Secretary and Head, Administration Division, National Institute for Instrumentation, LIPI, Bandung

II.A.3. INDONESIA AND ITS PRIOR PLANNING IN STANDARDIZATION AND MEASUREMENT SERVICES

Indonesia is a very large, multiple island country whose varied character and enormous potential in diverse natural and human resources we cannot begin to describe in this report. Team members found the "Area Handbook for Indonesia" (ref. 8) and other publications (ref. 9, 10) very helpful; although in its third edition, the "Handbook" is not up to date, especially not in relation to the current five year plan for Indonesia, REPELITA II (see ref. 11). The plan was of special importance to the team, whose thinking was intended to assist in developing input to REPELITA III which will take effect in 1979.

For readers not too familiar with Indonesia, we should emphasize two characteristics of special relevance. Indonesian technical specialists are of very modest disposition--one is therefore in danger of underestimating their own knowledge and comprehension of the issues. Secondly, the traditional Indonesian way of management is by encouragement of "musjawarah" (discussion) of problems to reach "mufakat" (consensus). Contrary to the preference of leaders in some countries for authoritarianism or open confrontation of adversary viewpoints, Indonesians by tradition will favor an operating attitude that is uniquely suited to the development of an effective standardization system.

The reader should therefore not be surprised to learn from section after section of this report that the Indonesian specialists know their subjects well and understand the advantages of standardization and measurement control clearly. They could reach effective compromises where conflicting interests exist. They realize that lack of quality, uniformity, and equity plague all Indonesian sectors and this lack is regarded by them as a major contributing factor to failure by Indonesia so far to achieve its undoubted potential to be one of the most prosperous regions of the world with a high quality of life for its large population.

To study the problems of standardization and metrology, Indonesia has previously consulted other foreign organizations and experts. Outstanding among them is Mr. Santosh K. Sen, former Director of the Indian Standards Institute, who under the auspices of the U.N. Industrial Development Organization (UNIDO/UNDP project) visited and reported on Indonesian standardization needs (ref. 11). When Mr. Peiser first visited Indonesia, Deputy Chairman Sumantri based his plan for a national system for standardization on the Sen Report (now a public document; copies are available through LIPI or NBS).

The excellence of the analysis of this report is best illustrated by an account of another background aspect of this survey.

It was originally the plan of the Indonesian Government and AID to request a policy review of this subject to follow the survey. A high-level team from the U.S. Academy of Sciences would visit LIPI in Indonesia under Dr. Allen V. Astin, former Director of NBS. Dr. Astin was considering joining the survey team himself in preparation for the policy review. When Mr. Peiser showed him the Sen Report, he judged it to be so useful that there seemed little more for the survey to accomplish. The previous report had analyzed convincingly the universality of standardization for development; it recognized the essential educational and training requirements, as well as the needs for technical test services staffed by capable persons of high integrity.

Chairman Sumantri also recognized the excellence of the Sen Report and hoped for the rapid implementation of its recommendations. He saw as an aim of this survey the strong endorsement of these previous recommendations, which somehow seemed not to have had strong influence among all the authorities of Indonesia. There certainly were those who believed that Sen's recommendations needed strong reinforcement before they would be fully accepted by higher authority.

Members of the visiting team prior to the survey had the impression that, despite the general excellence of the Sen Report, questions of technical coordination and cooperation between standards and measurement related activities of different public and private sector organizations needed further analysis and additional conclusions. While this view turned out to be justified for some areas in Indonesia, the team before coming to Indonesia had not fully appreciated the excellence of the planning underlying the KIM system concerned with calibration, instruments, and metrology (see appendix VI.F.1 and sections F and G throughout this report). The KIM system is in fact judged to be the best conceptually of all systems known in any rapidly developing country. Nevertheless, it is still understaffed, underfunded, or even underused. The KIM system represents one way in which a pervasive methodology can spread starting with very limited resources at a time before the benefits of that methodology are clearly understood or have been clearly analyzed.

Several other reports on Indonesia standardization and metrology were carefully studied by members of the survey team (refs. 12-15 and section II.F.2.b).

In addition to these prior reports, the visiting team received valuable background information from the Indonesian specialist papers reproduced in section III of this report. Before these presentations, the team met the Minister of State for Research, The Hon. Sumitro Djojohadikusumo, who spoke of the critical need by Indonesia for a stronger standardization program than presently exists. He referred to the planning for a calibration and standards program as well as for a national library for information collection and distribution, two of the highest priority areas in national planning. He stressed that for a developing nation such as Indonesia it is absolutely necessary to plan extensively for future needs. The team was given copies of his wide-ranging report, "Indonesia Towards the Year 2000," demonstrating dynamic leadership for progress.

The opening ceremony of the survey was also attended by Minister Sumitro who enjoined the LIPI staff to great efforts in standardization and measurement services for the benefit of the nation. He said, as summarized by Dr. Sangster:

> "Do not wait for a ceremonial opening; just start working as soon as possible. Have a conceptual framework, select a number of starting points, get started, and go ahead. Do not wait for formalities.
>
> "Let us make the research community effective by service to social necessities. Policy without a program leads to empty words. Combine policy, program, and priorities into simple programs, then 'grow as you go,' as long as you maintain consistency. The existing fragmentation of standards means that people have been active, not just sitting and feeling sorry for themselves. The current goal is to transform antagonisms into mutual goals and mutual support.
>
> "Knowledge of long-term growth patterns is needed before fixing details in the standardization and KIM (calibration-instrumentation-metrology) programs; study on these patterns has been completed recently and is available for use for this survey.

Standardization is needed for optimization of the Indonesian political and economic systems. The political system provides management of the social system.

"How do we link the system of standards to established national objectives? Do not try to design a comprehensive, detailed (i.e., closed) system. Start with a simple, conceptual framework of reference, then grow a model. Start with selected strategic objectives (priorities); do not worry about being complete—that will only confuse the policy maker. Project for the next two years, next five years, what is going to be needed.

"Legal actions without background preparation lead to empty laws, only on paper. The time will come when we will be called upon to provide standards to Indonesia—we will not have to fight to be heard. Standards start with the buying process--machinery, instrumentation, calibration, and maintenance.

"Agriculture and food processing, and ecology are problems in Java. The main problem is not food production, but distribution. Main producing areas are not the same as main population areas. Java will have 1,075 people/km by the year 2000. Soil regeneration and erosion control are urgent. In Java the urban population is growing by 3 percent per year, the rural by 1.3 to 1.6 percent. Java's food will come from Kalimantan, Lombok, and Sulawesi. Standards are needed for storage; for the whole post-harvest technology, and for consumer protection.

"Extractive industries will be a primary growth area for the next 15 years: mining/energy/oil. But these are not labor absorptive. Copra and rubber industries are currently the largest employers, and there are problems with quality standards in these fields. Value-added is not the sole concern—Indonesia must have employment. Can we help Indonesian manufacturers use local materials? Improved drying processes are needed for copra, timber, etc. Indonesia is too accustomed to using solar-sun drying. Timber is a major Indonesian industry, yet the nation imports furniture. Why? Drying of lumber is a problem.

"In the area of habitation, the Institute of Housing Materials has been asked to develop techniques that use as litte wood as possible. Wood is a limited resource, like oil. Building codes and standards are needed, for example, with respect to earthquake resistance. Kalimantan and Sulawesi are separated by a major dividing line, Sulawesi being on an eastern plate that is moving northward, thus rendering this part of Indonesia unusually prone to earthquakes.

"A water supply crisis is expected between 1985 and 2000, both for urban and agricultural purposes. Transportation and communications are vital. The satellite communication system is a political necessity for the survival of the Republic of Indonesia. The younger Indonesian scientists must provide the guideposts for the senior ministers. The national center for KIM must provide the supportive elements that make technology work.

"The usefulness of what we are doing is in developing moral authority, meanwhile preparing by persuasion. Applied work must be backed up by basic research. We are developing a frame of reference; we must build up from there, leading to a set of guideposts for the third five-year plan."

This summary of the Minister's speech may be inadequate in portraying his flow of ideas, which inspired the entire team.

The Minister's talk was followed by speeches by Professor Didin Sastrapradja on behalf of the Chairman of LIPI, Mr. Peiser, and Deputy Chairman Sumantri. These speeches are reproduced in the appendixes VI.A.2 to 4.

II.A.4. REFERENCES

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[3] Standardization and Measurement Services in Turkey, October 14-28, 1972, NBSIR 73-172.

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[11] Summary of Industrial Development Plan in the Second Five Year Development Plan (1974-79), Jakarta: Bureau of Planning, Ministry of Industry (July 1975).

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[14] M. C. Probine, Indonesia—Precision Measurement, Testing, and Calibration, Serial No. 2929/RMO.RD/SP (Paris: UNESCO, July 1973).

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II.F. CALIBRATION, INSTRUMENTATION, AND METROLOGY

II.F.1. PURPOSE AND GOALS OF THE SURVEY

This survey was undertaken as part of the process of developing input for the next five year economic development plan (REPELITA III), which will take effect in 1979. It is also being looked to for input to support and guide current decisions and actions regarding implementation of the proposed Indonesian national calibration-instrumentation-metrology (KIM) program. It was a step toward achieving the objectives of the Indonesian team of establishing a national system for standardization and measurement services, in which the development of national capabilities in those fields could be planned and carried out in an orderly, efficient, and effective way, so that standardization and measurement services could indeed give a valuable contribution to Indonesian national development efforts. The survey will be considered successful if it triggers follow-up actions by top decision-makers, so that the establishment of a national system for standardization and measurement services can become a reality in the near future.

Table F.1 presents the view of the Indonesian members of the team regarding the inputs to the measurement services survey, the nature of the survey process, and the desired outputs.

II.F.2.a. M. C. PROBINE, "PRECISION MEASUREMENT, TESTING, AND CALIBRATION," Report No. 9 on science, technology, and research policies and programs for the second five-year plan (1974-79) of Indonesia, UNESCO, Paris, July 1973.

Probine's survey and report were very well and thoughtfully done. His conclusions appear sound and valid today. The current survey, therefore, was not to repeat his work, but to assess the current state of affairs in Indonesia and to assist our Indonesian colleagues in moving effectively in implementing the basic recommendations made by Dr. Probine.

Probine's summary conclusions and recommendations can be succinctly stated as follows:

(1) As industrial technology grows in a developing country, an integrated national measurement system with a central leading organization becomes essential.

(2) The National Institute for Instrumentation (LIN) could well become the central leading body for the Indonesian measurement system; this question should be reviewed in 1975.

(3) The physical standards themselves may be held at various decentralized institutes.

INPUT:

- M. C. Probine: Precision Measurement, testing, and calibration, 1973
- M. C. Probine: Precision Measurement in Southeast Asia, 1970
- T. Barlag: Development of Instrumentation Services, 1973
- T. Barlag: Supply and demand of technician manpower, 1973
- Minutes from the KIM Meeting, 1975
- The Conclusion of First Instrumentation Seminar, 8-9 January, 1976
- The Conclusion of the First Instrumentation and Process Control Seminar, 29-30 March, 1976
- B. H. Hadiwiardjo: Instrumentation in Indonesia, 1977
- H. Kartowisastro: the KIM Program and the LIN Development, 1977
- S. Wiryosimin: National Network for Calibration, Instrumentation, and Metrology, 1977
- Palgunadi: Engineering Metrology

⇒ DISCUSSION

- measurement services in Indonesia
- the goals of the mission
- how to reach the goals
- methods of survey

⇒ SURVEY ⇒ DISCUSSION ⇒

OUTPUT:

1. National Standards for Measurements and Measurement Extension Services
2. Assessment of Instrumentation Technology in Indonesia
   - the National framework for both topics
   - the organization for KIM in Indonesia
   - the future of KIM
   - the form of LIN as center of system management of KIM, and its development phases, the inputs needed
   - the effective steps to reach the national system for KIM
   - the instrumentation development in the world and its influence in Indonesia
   - the legal aspect of KIM
   - Calibration/Metrology facilities development plan
   - the inventory of calibration facilities, equipments/instruments, technological capabilities, and manpower
   - the popularization of instrumentation technology in Indonesia

Table F.1

(4) In the short term, external assessors should visit the existing measurement institutions to help prepare a program for the improvement of their facilities.

(5) LIN should be advised and assisted by a committee composed of members of the relevant institutes and other interested organizations or industries.

(6) A survey of testing and analytical services should be carried out, and the results published in the form of a directory.

(7) A review should be undertaken of the state of the current chemical and biochemical analytical services, including the facilities for university training.

(8) Urgent attention is required to the problems of instrument repair and maintenance; especially inadequate are the allocations of funds for maintenance and some of the administrative procedures are restrictive.

(9) LIN is a key institution in the instrumentation field, with its functions including design, maintenance and repair, and technician training. It is recommended that LIN's service to industry function be expanded and training emphasis placed on specialized short courses.

(10) In the absence of an instrument industry, LIN may need to develop a commercial division to manufacture and market its products.

(11) LIN should be designated a priority institution during REPELITA II and funds allocated to enable it to extend its services and increase its staff and facilities.

We agree with all of these conclusions and recommendations, except perhaps for the recommendation limiting LIN's technician training role (in the ninth recommendation). Many of the recommendations (e.g., the fifth and eighth) are being implemented.

II.F.2.b. T. BERLAG, "DEVELOPMENT OF INSTRUMENTATION SERVICES," Report No. 10 on science, technology, and research policies and programs for the second five-year plan (1974-79) of Indonesia, UNESCO, Paris, July 1973.

Berlag's conclusions can be summarized as:

(1) The National Institute for Instrumentation (LIN) should concentrate on instruments, preventive maintenance, on repair, and on informative instruction or short, specialized courses to industry, to various institutes and staff, hospitals, etc.,

for the purpose of avoiding breakdown of installed or otherwise acquired instruments and related equipment.

(2) The economic value of such activities will far outweigh the loss by the immediate abolition of the long-term (three-year) technician courses at LIN.

(3) The physical facilities at LIN should be prepared to meet the capacity requirements of item (1); about two years will be needed.

(4) Contact with the market for these services must be established on a long-term basis. A UNDP/UNESCO expert should be obtained with good experience in marketing scientific/technological services and liaison activities between a service/research institute and industry.

Since the visiting team did not see this paper until after the survey, we consequently did not pursue explicitly the issues raised by it while in Indonesia. What we know is that the three-year technician training courses at LIN were indeed discontinued and increased emphasis placed in the area of recommendation (1). We are not clear on how much physical expansion of LIN has in fact been implemented, in line with recommendation (3). We have no knowledge that recommendation (4) has ever been implemented, and we urge that appropriate attention be given to it.

Our primary concern with Berlag's conclusions centers on the second one. This subject will be discussed at some length later in this report. We see Indonesia's needs for both trained measurement technicians and instrumentation services as so vast and urgent that no conclusion is valid that one is more important than the other. We sympathize with the concern that LIN could not be effective doing both, and agree that LIN is essentially the only national resource in the instrumentation service field, while there is an educational system in place that in principle can do an adequate job of training technicians, so that Berlag's conclusions may be inescapable.

II.F.2.c. MINUTES FROM THE KIM MEETING, SEPTEMBER 1975. (See complete document in III.F.2, Annex 1.)

Conclusions reached:

(1) A Network of National Calibration is necessary.

(2) A National Calibration Committee should be created.

(3) The Network has only a coordinating function.

(4) An initial committee is needed to form the National Calibration Committee.

(5) The National Calibration Committee should have representatives from both calibration facilities and their users.

(6) The National Calibration Committee should establish contacts with both calibration sources and users; it should prepare a budget for the National Calibration Network and establish it; it should care for related education.

(7) The National Calibration Network should be made up of Institutes which already have calibration facilities.

(8) A directory of calibration capabilities is needed.

(9) A National Standards Laboratory needs to be established.

(10) Government needs to make official regulations in calibration.

(11) Improved awareness of calibration needs is needed on a wide scale.

(12) Intercomparisons with overseas standards laboratories is needed.

(13) An effective certification program is necessary.

(14) Regional calibration laboratories are needed.

Results of the present survey support all of these conclusions.

II.F.2.d. THE CONCLUSION OF THE FIRST INSTRUMENTATION SEMINAR, 8-9 JANUARY, 1976. (See complete document in III.F.2, Annex 2.)

The verbatim conclusions are these:

(1) Guidance concerning the role of instrumentation in improving industrial products and improving the quality of research and development at the research institutes.

(2) Instrumentation training in the form of formal and non-formal education.

(3) Using Bahasa Indonesia (Indonesian) in instrumentation science and technical information.

(4) Government action to encourage and to maintain the growth of instrumentation repair and maintenance activities.

(5) Improvement in the after-sales service of instruments importers/agencies in Indonesia, which includes the availability of spare parts.

(6) Instrumentation technical information network, so updated information can be obtained and a problem solving method in instrumentation be determined.

(7) An institute which has the right to manage instruments calibration with law enforcement.

(8) Very good cooperation between the private companies and government institutes in instrumentation design and installation in Indonesia, so all instrumentation design and installation can be carried out by Indonesian personnel.

(9) An interdisciplinary/interdepartmental research and development of instruments which suit Indonesian conditions;

(10) An organization for personnel who are involved with instrumentation which included instruments design, installation maintenance, and utilization of instrumentation systems.

(11) A body that will control domestic made instruments and test the imported instruments quality complete with data.

These conclusions are found to be persuasive by the visiting team.

II.F.2.e. THE CONCLUSION OF THE FIRST INSTRUMENTATION AND PROCESS CONTROL SEMINAR, BANDUNG, 29-30 MARCH, 1976. (See complete document in III.F.2, Annex 3.)

Verbatim outline of topics and conclusions:

(1) Instrument and process control problems in industry:

° Spare parts.

° Selection of instruments suitable for Indonesian conditions.

° Lack of national standards and uniformity in measurement unit terminology.

° No national calibration network.

(2) National capability development in the field of instrumentation and process control:

° Postgraduate program at universities should be set up soon.

° Improved cooperation and personnel exchanges among universities, research institutes, and industries.

- Improved industrial training programs, shared among companies with common problems.

- Improved exchange programs with foreign organizations.

- Improved technician training.

- Suppliers must be required to provide training about instruments.

- KIM program must be implemented soon.

(3) Framework of cooperation and communication:

- Establish a communications organization.

- Publish a communications medium.

- Prepare the second seminar in this series.

- Make an inventory of personnel and institutes.

These topics were confirmed by the visiting survey team to be of great importance.

III. THE INDONESIAN PAPERS

III.A. Introduction

Owing to late planning uncertainties for the NBS/AID Survey, its Director, Deputy Chairman Sumantri, decided to arrange seminar-type presentations during the first days of the Survey. They were made to the Survey Team from abroad by Indonesian specialists in standardization and measurement services. These papers served as an excellent base point of departure for the Survey members. They were ideal for acquainting team members with their counterpart hosts and they started a meeting of the minds on the topics of the Survey. They also showed a wide-ranging comprehension of all the technical aspects of standardization and metrology in Indonesia.

The papers are reproduced here with summaries of the comments by the foreign team members, some of which were voiced before they had the more detailed knowledge of the Indonesian situation developed during the itineraries which were to follow.

III.A.1. PRELIMINARY ASSESSMENT ON THE LEGAL ASPECTS OF STANDARDIZATION IN INDONESIA

By

Mustadji
A. S. Luhulima
Sriati Djaprie

a. INTRODUCTION

Standardization activities in Indonesia have actually been conducted since before World War II. During that period some regulations concerning standardization were enacted. It was due to the growth of development that people paid more attention to matters relating to standardization. In 1960 it was felt that regulations on standardization enacted before World War II were no longer fitting since conditions had changed. Efforts have been made to issue new regulations on standardization. Since REPELITA II (the Second Five Year Plan) standardization activities have received more emphasis and efforts have been made to develop a national system on standardization.

Activities conducted to develop a national system on standardization do not only include activities aimed at setting up standards, their implementation and control, but also include the setting up of regulations as a legal basis for the mechanism, the creation of infrastructure, and the enforcement of a national system. In drawing up legislation to support a national system on standardization, the existing regulations cannot be ignored. Besides that, it is also necessary to identify the problems of standardization which need to be controlled in the regulation.

In order to get a brief picture of these matters, especially the legal aspects and problems, this paper will give a brief explanation of the existing regulations, problems, and projects in relation to the development of a national system on standardization. It must be mentioned, however, that the prospects for developing a national system on standardization as presented in this paper have just reached a phase of preliminary study.

b. LEGISLATION ON STANDARDIZATION

At present there are some regulations on standardization which were enacted before the proclamation of independence and others which were enacted afterwards. As the situation changed, it was realized that regulations originating from before the proclamation of independence were no longer fitting. This has stimulated an effort to update the existing regulations. These efforts were crystallized in Act No. 10, 1961, Act on Goods (Undang-undang Barang). This Act gives stipulations on goods, packaging of goods, labeling, and control.

According to Act No. 10, 1961, a committee, i.e., Committee on Goods, should be set up which would have the function of an advisory body. All regulations coming under Act No. 10, 1961, could only be enacted, revised, or revoked in accord with advice given by the Committee on Goods. As a matter of fact this Committee has never been established, and so there have also been no regulations enacted under the aforesaid Act with the exception of one regulation, i.e., Government Regulation No. 9, 1964, Regulation on Industrial Standards. This Government Regulation was enacted without any advice from the Committee on Goods.

Act No. 10, 1961, was enacted to rectify the Packaging Ordinance of 1935 (Verpakkings Ordonnantie, State Gazette 1935, No. 161). This 1961 Act stipulates among other things that all regulations implemented under the Packaging Ordinance will still be valid and considered as executing Act No. 10, 1961, as long as new regulations under this Act have not yet been enacted. Based on this temporary provision, regulations originating from before the proclamation of independence are still valid.

Although no basic law exists regulating standardization, standardization activities are still conducted by several departments to meet their specific needs. Standardization efforts gained a new horizon with the enactment of Presidential Decree No. 45, 1973. According to this Decree, the Minister of State for Research is entrusted with the task of developing a national system on standardization, calibration, instrumentation, and metrology. Based on this Decree, the Minister of State for Research has appointed the Indonesian Institute of Sciences (LIPI) to execute a project on the development of a national system for standardization, calibration, instrumentation, and metrology, with standardization as a sub-project. This project has been conducted since 1974. Within the scope of the sub-project, a study on the legal aspects of standardization is being conducted. This study is at a preliminary stage and it is intended to propose a basic law as the legal basis for national standardization.

c. STANDARDIZATION ACTIVITIES

During the past five years, standardization activities have taken considerable strides forward, both in government and private circles. This is largely attributable to the rapid growth of technology and development. It is now recognized that the application of standardization principles leads to benefits to be gained from their implementation. These benefits are not only limited to a small sector of economic activity, to industry and the commercial sector, but they envelop all branches of man's socio-economic activities, encompassing also agriculture, management, etc. Another factor that has been responsible for the growth of standardization activities in Indonesia is the fast pace in the change of technology.

Various government departments and agencies are now setting their own standards to meet their specific needs. A recent study identified some 104 bodies involved in standardization activities. However, the majority of these are only of minor importance due to the fact that there is a fragmented approach with no National Standards Body to coordinate the activities. Though the Yayasan Dana Normalisasi Indonesia (YDNI) was established as long ago as 1928, it is unable to perform the complex tasks of a National Standards Organization since it is a private foundation without adequate funds and since it has practically no authority. The present situation is confused by a proliferation of inconsistent standards, units and definitions, and by conflicting regulations which are likely to become chaotic unless proper direction and attention is given to them by the government. As we look forward to the next 10 or 20 years, it is a must that we speed up our standardization process and do not continue to see years taken up in the evolution of a national standardization system as a whole. We have to face reality and make our standards dynamic for present and future development. Standards are more and more becoming an indispensable instrument of government policies and programs, both at the national and international level. A principal use of standards for governmental purposes is their necessity as a component in exercising the proper role of the government in safeguarding the health, working safety, and general welfare of the peoples on one hand, and as a tool for the development of the nation as a whole on the other. For this purpose, it is essential to develop a national standardization system.

The mere formulation of standards and their publication may not achieve the ends for which they were intended. Even though most standards are formulated after prior consultation with all parties concerned, this does not necessarily mean their full implementation. There is a need for a deliberate effort to ensure their proper all-round implementation in the various relevant sectors of the economy. The government plays an important role in securing implementation of standards, both by virtue of its capacity as a regulating agency as well as an organized consumer and controller of an appreciable proportion of the industrial production capacity. Since the government of Indonesia controls certain basic industries, such as petroleum, steel, and mining, and certain public utility services such as railways, land, sea and air transportation, post and telecommunications, electric power, water supply, medical services, and supply of the main food items, the role of the government as a standards implementing authority is, therefore, extremely important. The notion of government in the context of standards implementation includes all governmental levels, i.e., state, provinces, and municipalities, which are organized in one system.

The policy, particularly in developing countries, should be that items of common interest to the public and the nation as a whole, are covered by national standards. In this manner, the interests of the general public can be properly taken into consideration, and interwoven with the government's interest. Standardization activities as a system are directly interrelated with and influenced by other systems: i.e., science and technology, economic, educational, political, national resilience, and the legal system, all of which are sub-systems when looked at from the national standpoint. We can picture the relationship between a standardization system with other systems as shown in figure 1.

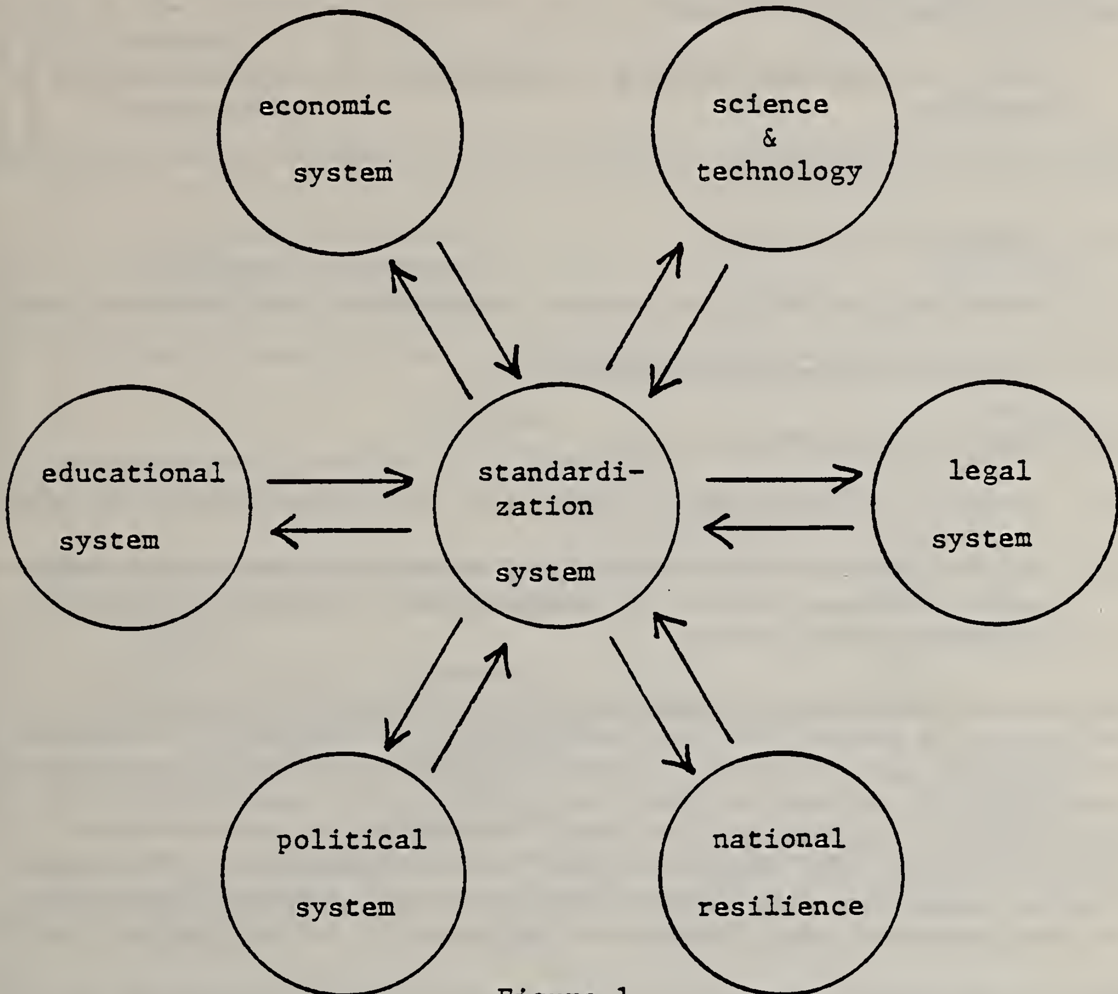

Figure 1

The character of the legal system as indicated amply emphasizes the importance of an adequate support system if standardization is to be carried out effectively. In this context it is vitally important that the government determines its role with regard to the effective implementation of standards. In countries where national standards are mandatory, the government recognizes that all standards are important enough for compulsory implementation in order to safeguard the public interest in the same manner as any other law. In other countries where standardization is a voluntary instrument, attention should be paid to the legal aspects of the implementation of standards. It has been recognized that even in these countries it has become necessary in the public interest legally to enforce some of these standards in certain sectors of the economy. The decision to enforce certain standards as mandatory standards also depends on the government's inclination and capacity to create the necessary machinery and infrastructure to ensure compliance with these standards.

Some of the subjects and items to be brought under control in this context include the following:

(1) Safety of personnel working in dangerous surroundings against accidents.

(2) Safety of machinery.

(3) Safety of structures.

(4) Safety against fire, explosions, earthquake, and "force majeure."

(5) Ensuring healthy surroundings.

(6) Purity and potency of drugs.

(7) Purity and cleanliness of foodstuffs and correct nutritive value.

(8) Matters affecting the economic development of the country and public welfare, control of quality, and preshipment inspection of export goods.

The legal problems that arise here are mainly concerned with the methods to be adopted for the incorporation of standards in legislation. It should be kept in mind, however, that standards are always subject to amendment and revision so that they will be up to date in line with the advancement of technology and time. In drawing up legislation on standardization this should be taken into consideration. The legal studies concerning this question have revealed that two alternatives for the incorporation of standards and codes in an Act are available:

(1) An acceptable standard or code is adopted in its entirety in the text of the Act. In this case, the Act will be revised as the standard or code is amended or revised.

(2) The Act only stipulates requirements to be fulfilled in setting up standards or codes. In this case the standards or codes themselves will be further described in regulations at a lower level. The requirements of the Act can be considered to have been satisfactorily fulfilled only if the relevant standard or code has been complied with.

In order that the legal aspects of standardization can be fully appreciated and discussed, we will take a closer look at standardization as an entity in itself. Standardization activities can be pictured as shown in figure 2.

Standardization Activities

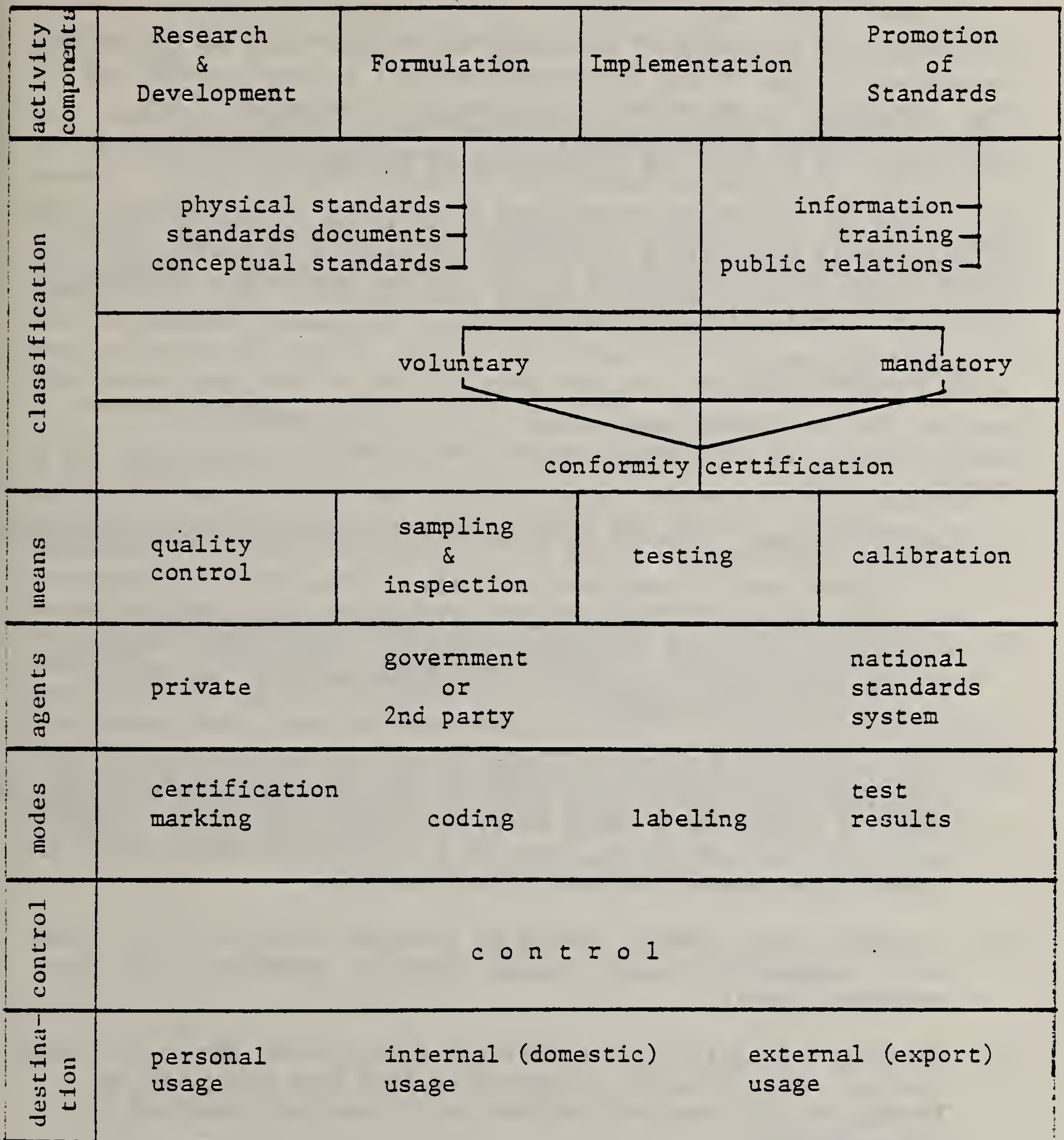

Figure 2

There are four distinct groups of activities that must be regulated in order to make the whole activities function properly, i.e.:

(1) research and development in standardization,
(2) formulation of standards,
(3) implementation of standards,
(4) promotion of standards.

Formulation and promotion of standards activities could be subdivided into sub-activities, while implementation will include elaboration of means (mandatory or voluntary), conformity to standards, which includes different means, agents, control modes, and control mechanisms, and finally the destination of the whole activity.

The objectives of this kind of approach are aimed at finding the best and appropriate alternative available. It will be necessary to determine the interrelationship of the various parameters depending on their relationship with other systems.

d. SOME CONCLUSIONS

Based on the preliminary assessment of the legal aspects of standardization as put forward above, the following conclusions can be drawn:

(1) There is a need for a legal basis for the national standardization system.

(2) The basic law should cover the total range of activities in standardization, i.e., starting from the establishment (including research and development), the implementation, and the formulation of standards.

(3) The basic law should also include methods of enforcement of the standardization system. To support the implementation of standards there is a need for a legal basis in order to establish a sound and viable infrastructure, such as a National Standards Body, and laboratories needed for testing and control.

(4) The basic law, however, should be flexible enough so that it can still accommodate future changes needed in standards or in the mechanism itself.

(5) Existing regulations and existing infrastructure cannot be totally ignored. Therefore, it is advisable that this basic law be formulated as a concerted effort of all parties concerned with standardization.

e. COMMENTS BY THE VISITING TEAM

The visiting team members were most grateful for this paper which contributed much to their understanding. They concurred with the conclusions (see Section d above) and were impressed by the persuasive emphasis on the difficulties that have arisen from the failure to appoint the Committee on Goods under the provisions of the Act on Goods, 1961.

This paper was further discussed between team members throughout the Survey and a limited consensus was quickly reached. A basic law was needed, that the establishment of a national system was a matter of great urgency and that standards must be more adaptable to change than the basic law. Contrary to the impression given by the authors, some team members felt that a hundred standards developing organizations in Indonesia was not necessarily an excessive number. The experience of other countries showed that regulation covering industrial standards and the mandatory control of the activities of other governmental departments can lead to difficulties that can overshadow the benefits of standardization.

No one organization can be so vast or so wise as to formulate and control the standards of an industrialized nation. Standardization benefits manufacturers and users, buyers and sellers, importers and exporters. The self-interests of all are so clearly served by some standards that regulatory control is sometimes a minor issue. Technical advice in conjunction with standardization because of the scarcity of the diverse specialist knowledge involved does have to be centralized in a rapidly developing economy. Linking that technical service in the eyes of manufacturers and other governmental departments with legal enforcement is liable to be counterproductive. Especially a standardization system operated by a national institute of sciences would be well to emphasize the technical service for standards, not their regulatory enforcement which other departments regard as their prerogative.

III.B.1. STANDARDIZATION OF FOOD CROP COMMODITIES IN INDONESIA

By

I. B. Teken
Acting Director
Bina Sarana Usaha Tanaman Pangan

a. INTRODUCTION

Included in food crop commodities are: rough rice/rice, corn, soyabean, ground nuts, green gramm, sesame, tapioca, etc., compared with estate commodities (rubber, tea, tobacco, sugar, palm-oil, etc.) and forest products (lumber, resin, copal, etc.). Standardization and grading of food crop commodities is not yet adequately developed, either in the form of regulations or institutions in charge of handling quality requirements.

Factors responsible for this condition are:

(1) Food crop commodities in Indonesia are produced by millions of small farmers, each producing a small quantity;

(2) Food crop commodities are mainly marketed for domestic consumption, in a market where "supply is less than demand" and this is not conducive to better grading and quality requirements;

(3) Small exports in previous years mainly to Asian countries (Singapore, Hong Kong, Japan), where sophisticated quality requirements are not demanded. This is different in the case of estate commodities, the bulk of which are exported to European and North American countries.

b. GRADING AND STANDARDIZATION EFFORTS IN PREVIOUS YEARS

Until 1970 the Government's policy was to leave grading and quality improvement efforts to the private sector, especially the Exporters Association, the Estate Association, etc.

(1) The Indonesian Food Crop Exporters Association made a regulation (in 1950) valid for all its members, on the grading of several export commodities such as: corn, ground nuts, soyabeans, and tapioca roots. There was no Government Act supporting this regulation, but it could work as a communication on quality requirements, between the Indonesian exporters and their buyers abroad.

(2) Every year the Indonesian Government purchased rice from the domestic market, to be stocked for price stabilization purposes in off-harvest periods. There was a rice grading regulation

made in 1954 by the Rice Millers Association, and valid for all its members, which stated that rice was to be supplied to the Yayasan Urusan Bahan Makanan, the Government Body in charge of rice procurement at that time.

(3) In 1974 the Directorate of Agricultural Economics, Directorate General of Agriculture, held a seminar to try to formulate standards for several commodities, such as: rough rice/rice, corn, soyabeans, ground nuts, and tapioca. Participants in the seminar were representatives of Government and private institutions involved in the problems. This resulted in draft standards for the commodities (see Annex 1 for draft standard of rough rice/rice appended to this section). But these standards have never been legalized as official ones since at that time there was no institution which had the authority to grant legalization.

(4) By the Indonesian Government decrees, KEPRES No. 44 and No. 45, 1974, the Directorate of Standardization, Normalization, and Quality Control was set up within the organization of the Department of Trade. This Directorate was authorized to handle problems of standardization, especially for export commodities.

c. <u>THE PROCEDURES IN MAKING A STANDARD, DONE BY THE DIRECTORATE OF STANDARDIZATION WERE ROUGHLY AS FOLLOWS</u>:

(1) A field and literature survey was carried out by staff members of the Directorate, quite frequently in cooperation with staff members of the other services related to the commodity being studied;

(2) The researchers made a survey report and draft of the standard/grading of the commodity;

(3) This draft then was discussed in a "Technical Meeting" by a group of people knowledgeable about the commodity;

(4) The improved draft then was discussed again in a "seminar" with more people attending, including businessmen who traded in the commodity being discussed;

(5) The final improved draft was later legalized as an official standard by a decree of the Minister of Trade.

d. <u>THE DIRECTORATE GENERAL OF FOOD CROPS WAS ALWAYS INVITED TO PARTICIPATE AND DISCUSS ALL STANDARDS OF FOOD CROP COMMODITIES</u>

Until May 1977 food crop commodities standardized by the Department of Trade were: corn, soyabeans, ground nuts, ground-nut cake, sesame, tapioca, etc. (see Annexes 1 and 2).

e. ENFORCEMENT OF STANDARDS

(1) Up to now, enforcement of food crop standards has not been implemented. For example, there is no sanction if an exporter exports an off-grade quality, as long as the buyer abroad wants to buy.

(2) During the last three years, the export of food crop commodities has diminished to nil. In reverse, the quantity of imports has grown bigger and bigger.

(3) An export market exists for estate crops and forest products. Implementation of standards for these commodities is a necessity, since in foreign markets these commodities face strong competition with the same products from other countries.

f. PROBLEMS IN STANDARDIZATION OF FOOD CROP COMMODITIES

(1) In a situation where the supply is less than the demand, any quality the seller offers will be accepted by the buyer.

(2) If in a certain locality a surplus occurs in the harvest season, the quantity usually is small and cannot promote better grading.

(3) Food crop commodities are produced by millions of small farmers, using heterogeneous seed quality, different farming methods and product handling methods. The quality of the products they offer is therefore very heterogeneous.

g. IMPROVEMENTS IN STANDARDIZATION OF COMMODITIES ARE NEEDED IN THE FORM OF:

(1) Government Act(s) regulating national standardization problems;

(2) Institutions which handle the standardization problems;

(3) Enforcement of standards in trade practices.

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h. COMMENTS BY THE VISITING TEAM

This paper points out the fact in an open manner that the standardization and grading of food crop commodities are not yet adequately developed in Indonesia. It speaks of several possible reasons for such underdevelopment. The visiting team was particularly interested to hear that exporters' associations had established export standards and grades for such things as corn, ground nuts, soyabeans, and tapioca roots, and that the Department of Trade was later authorized to establish a Standardization and Quality Control Directorate particularly for export products. The interrelation with seemingly similar programs at the Ministry of Health was the subject of some questioning.

The procedures for development of food commodity standards as set out in the paper is a good beginning and constructive suggestions for expanding on it are offered. The author speaks to the need for government regulations in support of standards, institutions to handle trade standardization problems, and proper enforcement. With this, too, the visiting team concurs.

A limited review of the quality standards for rice entitled "Quality Regulations of the JUBM" (Yayasam Urusan Bahan Makanan) 1954/1955 and the 1974 Proposal of the Rice Standards Commission of the FAO Intergovernmental Group on Rice reveals that they appear to be good standards. The latter appears to be the better of the two.

INDONESIAN STANDARDS

FOR

ROUGH RICE

BROWN RICE

MILLED RICE

A PROPOSAL

DIRECTORATE GENERAL OF AGRICULTURE

DIRECTORATE OF AGRICULTURAL ECONOMY

INTRODUCTION

To achieve the same consistency in the rice grading standards, F.A.O. Intergovernmental Group On Rice on its "Recommended Model Grading System for Rice in International Trade" has proposed description as follows :

A. Intrinsic character, i.e. the class or variety of rice.

B. Processing

C. Acquired charactoristics, i.e. qualities not inherent, but subequently acquired by the same class of rice.

The above description are not entirely used in this proposal, because of its adoption to Indonesian Rice Trade which beeing toward to Domestic consumption, especially for the Government Rice Procurement.

The criteria of this proposal is emphasized to Processing and Acquired characteristics; the intrinsic characters are less emphasized and considered as optional criteria and therefore, could be used or disregarded.
This proposal valid only for rice and not for glutinous rice.

In this concept there are 4 grades for rough rice, 3 grades for brown rice and 6 grades for milled rice.
Extra well milled rice grade (BGS) especially for wellknown rice varieties as Bulu varieties, Rajalele, Bengawan, C 4 etc. and wellknown local varieties as Cianjur, Solok etc. which have good marketing.

Jakarta, March 26, 1974.

Rice Standards Commissions.

I. STANDARDS FOR ROUGH RICE

1. TERMS DEFINED :

1.1. Chalky kernels : : Kernels, whole or broken, obtained from paddy kernels, one half or more of the surface is white like the colour of chalk.

1.2. Contrasting classes : kernels of varieties or classes of rice other than the variety or class designated, usually having different length/breadth ratio or colour.

1.3. Damaged kernels : Kernels, whole or broken, which are distinctly damaged by insects, water, fungi, sprouted or any other causes.

1.4. Empty grain : Kernels which are underdeveloped, but having a pair of glumes and which do not contain rice kernels.

1.5. Foreign material : All matter other than paddy kernels, whole, splits or broken, i.e. dust, lumps of earth, small stones, pieces of metal, husk, fragments of rice stalk, objectionable seeds, etc.

1.6. Immature kernels : Kernels which are unripe, usually consist of green and chalky kernels.

1.7. Mixed Rough Rice : Any mixture of rough rice consisting of less than 90.0 % of one class and more than 10.0% of rice of any other class (es).

1.8. Moisture content : Water content of rough rice expressed in terms of wet basis.

1.9. Paddy kernels : Unhulled paddy kernels (Oryza sativa) which been threshed from their stalk.

Notes : Rough rice shall be rice which consists of 50.0 % or more of sound paddy kernels.

1.10. Red rice : : Kernels, whole or broken, obtained from paddy kernels, which have 25 percent or more of their surface covered by red pericarp or which have red endesperm.

1.11. Yellow kernels : Kernels, whole or broken, obtained from paddy kernels, which possess yellow discoloration on a part or all of the surface due to fermentation, deterioration or other causes.

2. PRINCIPLES OF GRADE DETERMINATION :

2.1. Moisture content of rough rice shall be determined by the use of "air oven method" or determined by any method which gives equivalent results.

2.2. All results of the determination of paddy and rice kernels size obtained by the use of mechanical sizing device or other method shall be adjusted by handpicking.

2.3. Percentages determined upon the basis of weight and length/breadth ratio shall be expresses in terms of whole and tenths of a percent. A fraction of equal or greater than 0,05 shall be stated as 0.1 and if less than 0.05 shall be stated as 0.0.

2.4. Determination of empty grain, immatured kernels and foreign material by the use of a dockage tester or rectangular perforated plates or other method which gives equivalent results.

2.5. Determination of contrasting classes by handpicking.

3. GRADE REQUIREMENTS :

3.1. Qualitative Requirements :

3.1.1. Rough rice shall not contain any foreign objectionable odor (musty, sour, etc.).

3.1.2. Rough rice shall not contain heat caused by fermentation.

3.1.3. Rough rice shall have good condition and free from insect/ pest infestation.

3.2. Quantitative Requirements :

GRADING FACTORS	GRADE			SAMPLE GRADE +)
	1	2	3	
	max.%	max.%	max. %	%
Moisture content	14.0	14.0	14.0	more than 14.0
Empty grain	1.0	2.0	3.0	" 3.0
Damaged kernels	1.0	3.0	4.0	" 4.0
Yellow kernels	1.0	2.0	3.0	" 3.0
Chalky & Immatured kernels ++)	1.0	3.0	5.0	" 5.0
Red kernel rice	1.0	2.0	4.0	" 4.0
Contrasting classes	2.0	5.0	10.0	" 10.0
Foreign material	-	0,5	1.0	" 1.0

+) Sample grade shall be rough rice does not meet the requirements for any of the grades from No. 1 to No. 3 and mixed rough rice grades No. 1 to No. 3; or which contains morethan 14.0% of moisture; or which is infested by fungi; or which has any objectionable foreign odor; or which undergo fermentation or has relatively abnormal temperature as compared with surrounding temperature (for example as a result of excessive respiration); or which contains live or dead insects in excessive amounts.

++) Except for Red Varieties (which possess red endosperm).

3.3. Optional Requirements :

3.3.1. Kernel shape :

Slender paddy	:	paddy kernels having length/breadth ratio over 3.0.
Bold paddy	:	paddy kernels having length/breadth ratio between 2.0 and 3.0.
Round paddy	:	paddy kernels having length/breadth ratio less than 2.0.

3.3.2. Varieties : Bengawan, IR 5, Pelita, C 4 etc.

3.3.3. Classes : Bulu and Cere.

3.3.4. Test weight : weight of paddy kernels in a unit volume (i.e. kg./ liter.)

3.3.5. Milling yield : weight of milled rice having degree of milling of 90 percent which is produced from a unit of rough rice by the use of a laboratory testing mill and expressed in terms of percentage.

3.3.6. Cracked kernels: paddy kernels which have internal fissuring of rice kernels, but still intact.

4. GRADE DESIGNATION :

The grade designation for rough rice shall be in the abbreviation as follows :

Rough rice No. 1	: G 1
" No. 2	: G 2
" No. 3	: G 3
Mixed Rough rice No. 1	: GC 1
" " No. 2	: GC 2
" " No. 3	: GC 3
Sample Grade	: G Mutu Rendah

If necessary, optional requirements could be added at the end of the grade designation, for example G 1 (Bengawan) is Rough rice No. 1 from Bengawan paddy variety.-

II. STANDARDS FOR BROWN RICE

1. TERMS DEFINED :

1.1. Broken kernels : pieces of kernels equal to or bigger than one fourth, but smaller than three fourths of the average length of the unbroken kernels and do not pass through a British Standard Sieve No. 6 (having round perforation of 1.4 mm or 0.055 inch in diameter).

1.2. Brown rice kernels : rice kernels, whole & broken obtained from paddy kernels which the husk only has been removed.

Notes : Brown rice population shall be rice which consists of not less than 90.0 % of brown rice.

1.3. Chalky kernels : kernels, whole or broken which have one half or more of the surface is white like the colour of chalk.

1.4. C h i p s : pieces of kernels having length less than one fourth of the average length of the unbroken kernel and pass through a British Standard Sieve No. 6.

1.5. Cracked kernels : brown rice kernels which have internal fissuring but still intact.

1.6. Damaged kernels : kernels, whole or broken, which are distinctly damaged by insect, water, fungi or any other causes.

1.7. Foreign material : all matter other than brown rice kernels, whole or broken and paddy kernels, i.e. dust, lumps of earth, small stones, pieces of metal, husk, fragments of rice stalk, objectionable seeds, etc.

1.8. Head rice : kernels having length equal to or greater than three fourths of the average length of the unbroken kernel.

1.9. Milled rice : Kernels, whole or broken, which all of the germs (part of the germ in the case of round rice), outer and inner bran layers have been removed.

1.10. Moisture content : water content of brown rice expressed in terms of wet basis.

1.11. Paddy kernels : partly hulled or unhulled kernels of rice, either whole or broken.

1.12. <u>Red rice</u> : kernels, whole or broken, which have 25 percent or more of their surface covered by red pericarp or which have red endosperm.

1.13. <u>Yellow kernels</u> : kernels, whole or broken, which possess yellow discoloration on a part or all of the surface due to fermentation, deterioration or other causes.

2. PRINCIPLES OF GRADE DETERMINATION :

2.1. Moisture content of brown rice shall be determined by the use of "air oven method" or determined by any method which gives equivalent results.

2.2. All results of the determination of kernels size obtained by the use of mechanical sizing device or other method shall be adjusted by handpicking.

2.3. Percentages determined upon the basis of weight and length/breadth ratio shall be expressed in terms of whole and tenths of a percent. A fraction of equal or greater than 0.05 shall be stated as 0.1 and if less than 0.05 shall be stated as 0.0.

2.4. Determination of chips content by the use of a British Standards Sieve No. 6.

3. GRADE REQUIREMENTS :

3.1. <u>Qualitative Requirements</u> :

3.1.1. Brown rice shall not contain foreign objectionable odor (musty, sour, etc.).

3.1.2. Brown rice shall not contain heat caused by fermentation.

3.1.3. Brown rice shall have good condition and free from insect /pest infestation.

3.2. Quantitative Requirements :

GRADING FACTORS	GRADE 1	GRADE 2	SAMPLE GRADE *)
	max. %	max. %	%
Moisture content	14.0	14.0	morethan 14.0
Head rice	min.90.0	min. 80.0	less than 80.0
Brokens	6.0	12.0	morethan 12.0
Chips	0.5	1.0	" 1.0
Paddy kernels	1.0	2.0	" 2.0
Foreign material	0.5	1.0	" 1.0
Milled rice	1.0	3.0	" 3.0
Damaged kernels	1.0	3.0	" 3.0
Yellow kernels	1.0	2.0	" 2.0
Cracked kernels	3.0	5.0	" 5.0
Red rice	1.0	3.0	" 3.0
Chalky & Immature kernels	3.0	5.0	" 5.0

*) Sample grade : shall be brown rice which does not meet the requirements for any of the grades No. 1 & No. 2, or which contains morethan 14.0 % of moisture; or which is infested by fungi; or which has any objectionable foreign odors; or which undergo fermentation or has relatively abnormal temperature as compared with surrounding temperature (for example as a result of excessive respiration); or which contains live or dead insects in excessive amounts, insect webbing, insect refuse etc.

3.3. Optional Requirements :

3.3.1. Kernel shape :

Slender brown rice : brown rice kernels having length/breadth ratio over 3.0.

Bold brown rice : brown rice kernels having length/breadth ratio between 2.0 and 3.0.

Round brown rice : brown rice kernels having length/breadth ratio less than 2.0.

3.3.2. Varieties : Bengawan, IR 5, Pelita, C 4 etc. and does not mix with morethan 10 percent of other varieties.

3.3.3. Classes : Bulu and Core; each class does not mix with morethan 10 percent of the other.

3.3.4. Milling yield : weight of milled rice having degree of milling of 90%, which is produced from a unit of brown rice by the use of a laboratory testing mill and expressed in terms of percentage.

4. GRADE DESIGNATION :

The grade designation for brown rice shall be in the abbreviation as follows :

Brown rice	No. 1	: P.K. 1
"	No. 2	: P.K. 2
"	Sample Grade	: P.K. Mutu Rendah

If necessary, optional requirements could be added at the end of the grade designation.

III. STANDARDS FOR MILLED RICE

1. TERMS DEFINED :

1.1. Broken kernels ; pieces of kernels equal to or bigger than one fourth, but smaller than three fourths of the average length of the unbroken kernels and do not pass through a British Standard Sieve No. 6 (having round perforations of 1.4 mm. in diameter).

1.2. Chalky kernels : kernels, whole or broken, which have one half or more of the surface is white like the color of chalk. Those yellow kernels may be derived from immature kernels or underdeveloped kernels or geneic.

1.3. C h i p s : pieces of kernels having length less than one fourth of the average length of the unbroken kernel and pass through a British Standard Sieve No. 6.

1.4. Contrasting classes : milled rice kernels, whole or broken of varieties or classes of rice other than variety or class designated, usually having different length/breadth ratio or colour.

1.5. Damaged kernels : kernels, whole or broken, which are distinctly damaged by insect, water, fungi or any other causes.

1.6. Degree of milling : the extent of the removal of the germ, ~~s.~~ outer and inner bran layers in the milling process.

1.7. Degree of milling of 100 % : if the extent of the removal of the germ (part of the germ in the case of round rice), outer and inner bran layers is 100%.

1.8. Degree of milling of 90% : if the germ (part of the germ in the case of round rice), the outer bran layers and the greater part of the inner bran layers have been removed, but parts of the lengthwise streaks of the bran layers may still be present on not more than 10 % of the kernels.

1.9. Degree of milling of 75% : if the germ (part of the germ in the case of round rice), the outer bran layers and the greater part of the inner bran layers have been removed, but parts of the lengthwise streaks of the bran layers may still be present on not more 25 % of the kernels.

1.10. Degree of milling of 50 % : if a part of the germ and all or part of the outer bran layers but not the inner bran layers, have been removed.

1.11. Extra well milled rice : milled rice having degree of milling of 100 %.

1.12. Foreign material : all matter other than rice, whole, broken and paddy kernels; i.e. bran, rice polishings, small stones, pieces of metal, objectionable seeds etc.

1.13. Head rice : kernels having length equal to or greater than three fourths of the average length of the unbroken kernel.

1.14. Milled rice : kernels, whole and broken produced from rough rice which a part of all of the bran layers have been removed in the milling process.

1.15. Moisture content : water content of milled rice expressed in terms of wet basis.

1.16. Paddy kernels : partly hulled or unhulled kernels of rice,either whole or broken.

1.17. Reasonably well milled rice : milled rice having degree of milling of 75 %.

1.18. Red rice : kernels, whole or broken which have 25% or more of their surface are covered by red pericarp or which have red endosperm.

1.19. Undermilled rice : milled rice having degree of milling of 50 %.

1.20. Well milled rice : milled rice having degree of milling of 90 %.

1.21. Yellow kernels : kernels, whole or broken, which possess yellow discoloration on a part or all of the surface due to fermentation, deterioration or other causes.

2. PRINCIPLES OF GRADE DETERMINATION :

2.1. Moisture content of milled rice shall be determined by the use of "air oven method" or determined by any method which gives equivalent results.

2.2. All results of the determination of kernels size obtained by the use of mechanical sizing device or other method, shall be adjusted by handpicking.

2.3. Percentages determined upon the basis of weight and length/breadth ratio shall be expressed in terms of whole and tenths of a percent.

A fraction of equal or greater than 0.05 shall be stated as 0.1 and if less than 0.05 shall be stated as 0.0.

2.4. Determination of chips content by the use of a British Standard Sieve No. 6

2.5. Determination of contrasting classes by handpicking.

2.6. Determination of the degree of milling by comparing the samples with predetermined and newly prepared of milled rice standards (age not more than 3 months).

3. GRADE REQUIREMENTS :

3.1. Qualitative Requirements :

3.1.1. Milled rice shall not contain foreign objectionable odor (musty, sour, etc.).

3.1.2. Milled rice shall not contain heat caused by fermentation.

3.1.3. Milled rice shall have good condition and free from insect/pest infestation.

3.2. Quantitative Requirements :

GRADING FACTORS	GRADE					
	EXTRA WELL MILLED RICE (BGS)	WELL MILLED RICE (BGA)		REASONABLY WELL MILLED RICE (BGB)		UNDER MILLED RICE (BGC)
		1	2	1	2	
	max. %	max.%	max.%	max. %	max.%	max.%
Degree of milling	100	min.90	min.90	min.75	min.75	min.50
Moisture content	14.0	14.0	14.0	14.0	14.0	14.0
Head rice	min.85.0	min. 70.0	min. 60.0	min.60.0	min. 55.0	min. 55.0
Brokens	15.0	25.0	35.0	35.0	45.0	45.0
C h i p s	-	1.0	1.0	2.5	2.5	4.0
Paddy kernels (kernel per 100 gr.)	1/100 gr.	1/100 g.	2/100 g.	2/100 g.	2/100g.	3/100g.
Damaged kernels	-	1.0	1.5	3.0	5.0	5.0
Yellow kernels	-	1.0	2.0	2.0	3.0	4.0
Chalky kernels	1.0	3.0	5.0	3.0	5.0	7.0
R e d r i c e	-	1.0	2.0	3.0	3.0	3.0
Foreign material	-	0.1	0.1	0.2	0.2	0.2

3.3. Optional Requirements :

3.3.1. Kernel shape :

Slender rice : milled rice kernels having length/breadth ratio over 3.0.

Bold rice : milled rice kernels having length/breadth ratio between 2.0 and 3.0.

Round rice : milled rice kernels having length/breadth ratio less than 2.0.

3.3.2. Varieties : Bengawan, IR 5, Pelita, C 4 etc. and does not mix with more than 10 % of other varieties.

3.3.3. Classes : Bulu and Cere; each class does not mix with more than 10 % of the other.

3.3.4. Wellknown local rice : Cianjur, Solok etc.

4. GRADE DESIGNATION :

The grade designation for milled rice shall be in the abbreviation as follows :

Extra well milled rice		: BGS
Well milled rice	1	: BGA 1
"	2	: BGA 2
Reasonably well milled	1	: BGB 1
"	2	: BGB 2
Undermilled rice		: BGC

Extra well milled rice Bulu variety : BGS (BULU)
" " " " Cianjur : BGS (CIANJUR)

If necessary, optional requirements could be added at the end of the grade designation.-

------------AII------------

STANDARD SPECIFICATION FOR SHELLED CORN (MAIZE) IN INDONESIA

INTRODUCTION

This standard has been formulated on the basis of surveys carried out in the corn production areas, especially in Lampung and East Java, also discussions with the Chemical Research Institute (BPK) and the Central Agricultural Research Institute (LP3) Bogor.

After studying the result of the surveys and taking into consideration the corn standards of the United States, Japan, Europe, Thailand, and Singapore, it was decided to formulate the Standard Specification For Shelled Corn in Indonesia as follows:

SPECIFICATION:

1. Scope
   This standard covers all shelled corn quality requirements, quality inspection methods, and packing methods.

2. Description
   Corn from the plant, Zea mays L, is corn grain which consists of not less than 50 percent shelled corn of either dont or flint corn.

3. Grades
   There are three (3) groups of corn, yellow corn, white corn, and mixed corn. Each group is classified by three (3) grades, namely: first quality, second quality, and third quality.

   3.1. Terms defined

   3.1.1. Yellow Corn—Corn grains which consist of not less than 90 percent of yellow color and not more than 10 percent of other colors. A slight tinge of other colors not more than 50 percent should be considered as yellow corn.

   3.1.2. White Corn—Corn grains which consist of not less than 90 percent of white color and not more than 10 percent of other colors.

   3.1.3. Mixed Corn—Corn grains which consist of neither yellow corn nor white corn.

4. Standard Requirements for shelled corn

Grading factors	Grade I	Grade II	Grade III
Moisture content (max. %)	14.0	15.5	15.5
Broken kernels (%)	3.0	5.0	9.0
Foreign materials (max. %)	3.0	4.0	5.0
Damaged kernels and weevily (%)	5.0	8.0	11.0

4.1. Notes

4.1.1. Foreign materials: All materials other than corn grain, whole splits or broken, i.e., small stones, fragments of corn stall, dust, lumps of earth, etc.

4.1.2. Damaged kernels: Kernels and pieces of corn kernel which have been damaged by heat and sprouted.

4.1.3. Weevily: Corn infested by insects or pests.

4.1.4. Broken kernels: Corn which is heat damaged or otherwise mechanically damaged.

5. Sampling

5.1. Methods of sampling

Samples are taken at random, then the equal square root of the number of total bags is calculated, with a maximum of 30 bags every lot, and not more than 500 grams from each bag.

These samples are mixed homogeneously, then divided again by quartering, 2 parts of the samples are taken diagonally several times until 500 gram samples are obtained. The representative samples should be labeled.

5.2. Official sampler

An official sampler should fulfill the following requirements: experienced man or someone who has passed a special training, and working with a legalized institution.

6. Packing (exception, "in bulk")

6.1. Packing method

Corn should be packed in a gunny bag (karung). Shelled corn weighing a maximum of 100 kilograms net, clean and tightly sewed.

6.2. Marking

Each bag should be properly marked with a clear label containing the following information:

- Produce of Indonesia
- Name of commodity (Indonesian Maize)
- Name and address of exporter.

III.B.2. STANDARDIZATION AND CONSUMER PROTECTION IN INDONESIA

By

Erna Witoelar
Indonesian Consumer's Organization

a. INTRODUCTION

The Indonesian Second Five-Year Plan has given high priority to the industrial sector along with the agricultural sector. This has resulted in the increase of local manufacture of consumer goods. Coupled with a rapid increase in the importation of such goods, the Indonesian consumer is faced with a great profusion of goods in a wide range of quantities, qualities, and prices.

Because of the still incomplete nature of standardization regulation, many of the goods in circulation are below standard; and control is not yet possible since no nationwide applicable standards exist. Even some goods dangerous to the safety and health of the consumer are still enjoying free access to the markets. In a few cases different working standards exist for one particular product, some with different specifications.

This situation is confusing not only to consumers, but also to producers and the government as well. The public will be faced with products of different and irregular types and varieties. This creates difficulties in the commerce of such goods, and will make after sales service quite a complex task for the market as a whole.

Problems also arise in packaging, transportation, and distribution.

In exports, lack of standardization will cause the frequent occurrence of foreign market rejections of Indonesian commodities. This is crucial to the nation's highly needed foreign exchange earnings.

The absence of a National Standards Body makes it impossible to legitimize standards formulated for nationwide acceptance. International participation of Indonesia in standardization activities will also meet with constant difficulties.

To overcome the problems described above, prompt and serious action is needed. This would involve forming a legal basis for standardization, and strengthening of quality supervision procedures.

A National Standards Body has to be founded immediately.

b. PROBLEMS FACED

(1) The state of the consumer in Indonesia: The majority of consumers

are still in the low income and low education brackets. Hence, most of them are not capable yet of purchasing goods of high or standard quality, as price is still the major determinant of their buying patterns. The Indonesian consumer is also generally uninformed about required product specifications. They are not conscious of the disadvantages and even dangers of substandard goods.

(2) The state of the producer in Indonesia: On the producers' side, most are still quite weak in capital, skills, and technology, making them incapable of producing goods which consistently meet standards. Furthermore, their sophistication with respect to advertising, pricing, and consumer protection is also not very high, so in most cases the profit motive is not balanced with a concern for consumer interests. Those who are able to produce quality goods often have to adjust to the consumer market by producing sub-standard goods. Many producers also do this in opportunistic response to the lack of regulations.

(3) The state of the Law: Indonesia does recognize a law which also includes standardization, the 1961 Law, No. 10 (Law on Goods), but the implementation procedures have not been formulated yet. For instance, there is no Committee on Goods, a body prescribed by this law to validate implementation of regulations. The inactive state of Law No. 10 creates a status quo which is an obstacle to standardization efforts. Regulations intended to enforce this Law, promulgated by various government agencies committed to standardization, are ineffective because of lack of coordination and synchronization among these agencies, and because these regulations still leave gaps. Without the validation of the Committee on Goods, the legality of these regulations is still in doubt, despite their usefulness in the protection of consumer interests.

(4) Specific problems in standardization:

a) Formulation of standards: The reality in Indonesia is that standards are formulated by various different government or non-government agencies. Lack of coordination among these agencies causes duplication of effort, which leads to inefficiencies in cost, time, and energy. Different and sometimes conflicting standards for a certain product are confusing to consumers, producers, and also the government as the quality supervisor. Existing standards are based on consensus between Indonesian producers and consumers, so that some quality specifications are still low compared with those applied in international standards. The main consideration is still given to health and safety factors.

Because of limited financial and human resources in the standardization effort, finalized standards cover only part of the product spectrum; many products circulate without any applicable standards.

b) Implementation of standards: Standards which exist in various agencies are still not capable of full implementation. Those agreed to in principle at various seminars are for the most part awaiting activation by the agencies concerned. Announcement of validated standards to concerned parties is still minimal. Many producers are not aware of standards which have been validated, standards which should be their guide in the manufacture of their products.

c) Supervision of standards: Supervision of validated standards is still at a low level, particularly with respect to products already circulating in the market. Some efforts by regional governments, i.e., the Jakarta Government, to support standardization by measures such as the Regulation on Compulsory Testing, have not yet shown commensurate results.

d) Measures of sanction: The lack of complete regulations also means that punitive measures are not possible to violators of standardization schemes. Especially as these schemes are still stated as educational efforts. Without sanctions, violations will continue.

c. THE ROLE OF THE CONSUMER IN STANDARDIZATION

It was stated initially that the Indonesian consumer is still weak because of his/her low level of education and income. Yet internationally they are recognized as having the right to choose, to security and safety, to information, and the right to be heard. With these rights and also with the prospect of a higher consumer standard of living, where they consume more goods which stress better quality, they will eventually have a greater role in the efforts in standardization. And eventually producers will be compelled to make goods up to the standards demanded by the consumer.

This role will be amplified if the consumer joins the consumer protection organization already established in Indonesia known as Lembaga Konsumen, founded on May 11, 1973. Among its different activities, Lembaga Konsumen has an interest in Standardization, wherein Lembaga Konsumen participates in different efforts, such as:

(1) Formulation of standards: Lembaga Konsumen has participated both in directly formulating the standards and also in joining seminars discussing the standards of consumer goods with Government institutions such as the Ministry of Trade, Ministry of Industry, Ministry of Agriculture, etc. So, on the basis of test results, Lembaga Konsumen has often recommended improvements in existing standards.

(2) Implementation of standards: Lembaga Konsumen assists the implementation of standards by giving suggestions to the Government and producer. In every meeting or discussion with producers, Lembaga Konsumen always reminds them of the existence of standards and recommends that they fulfill them. As to the Government, based on test results Lembaga Konsumen always suggests that goods not yet up to standards should be attended to, so producers can employ the existing standards.

(3) Supervision of standards: Lembaga Konsumen assists in supervision by carrying out comparative testing of goods purchased from the free market. From the test it is discovered that a lot of goods do not conform to standards, although according to the Compulsory Testing Scheme the samples sent in by the producers do meet the standards.

(4) Sanction (penalties): Lembaga Konsumen always urges that the Government issue firm sanctions in cases where there is a clear case of intentional profiteering by ignoring the quality of goods, particularly with the fact in mind, that up to this moment the Government still considers these Compulsory Testing Schemes to have an educational value. On the other hand, it also appeals that the small producers, who are still struggling, are given the necessary guidance.

(5) Other efforts: In addition to those mentioned, Lembaga Konsumen has also given suggestions as follows:

- to complete Law No. 10/1961 (Law on Goods) with the Government regulation concerning packaging, labeling, advertising, obsolescence, etc., with appropriate penalties.

- to form the Committee on Goods.

- to form the National Bureau of Standards.

d. CONCLUSION

(1) The efforts in standardization have great benefits for the consumer, particularly for their safety and well-being. The consumer is an important factor in standardization.

(2) It is a fact that the Indonesian consumer is still weak, but with increasing standard of living they are becoming a deciding factor in guiding the producer to attend more to the interests of the public, especially now that the consumer is aware and participates more with the Lembaga Konsumen.

(3) Standardization in Indonesia is still at present handicapped and

needs a lot of improvement, but it is far from being neglected.

(4) There is still a long way for the establishment of standardization to go, but the first steps have been taken and will be consistently improved upon.

(5) The efforts to establish a national system on standardization must be increased. There must be greater consideration among institutions handling these matters for better coordination.

(6) Greater public awareness of the importance of standardization must be promoted. Formal and also non-formal education of the consumer/public must be increased.

(7) Finally, last but not least the Government should give even more attention to efforts concerning standardization, to ensure greater advancement in national development.

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e. COMMENTS BY THE VISITING TEAM

The visiting team found the paper presented by Mrs. Erna Witoelar of the Indonesia Consumers Organization to be excellent. This paper speaks with remarkable insight and understanding into consumer participation in standards establishment and implementation. The paper points out very well the inescapable deficiencies in standards implementation (control) in the absence of applicable national standards and strongly supports such standards. Proper reference is made to multiple standards for a single product and the consequent difficulties resulting in any attempt to protect consumers. The author also demonstrates understanding for the interests of producers, traders, and government.

The author states that many of the goods in circulation are below standard and control is not yet possible since no nationwide applicable standards exist. She frankly deplores that some goods affecting the safety and health of consumers even have free access to the marketplace.

The visiting team listened with fascination as Mrs. Witoelar spoke of the efforts her group carries out not only to protect the consumer but also to act as the conscience of government and industry. When later the team heard that the group received some funding from government sources, members felt this backing was well deserved and that the Government deserved recognition for an imaginative and effective way of spending a small amount of public money giving good return in benefits to the nation.

III.B.3. FOOD STANDARDIZATION

By

Heman
Directorate General for Drugs and Food Control
Ministry of Health

a. INTRODUCTION

According to Presidential Decision Nos. 44 and 45, 1974, on the Organization and Structure of the Department, within the Ministry of Health, the Directorate General for Drugs and Food Control has been established. Hence, besides control of drugs, which has already been done for many years, the Ministry of Health has been also been made responsible for food control.

b. INDONESIAN FOOD CODEX COMMITTEE

One of the principal tools needed to be able to carry out quality control properly is the existence of food standards, which can be used as a measure for protecting consumers' health and for ensuring fair practices in food production and distribution. The Minister of Health has established the Indonesian Food Codex Committee to prepare these standards.

The Committee should prepare food standards for all principal foods, including food chemicals and food additives, which will be published in an Indonesian Food Codex as government standards.

The Indonesian Food Codex would be used by the Government as a measure to improve quality control of food, whether processed locally or imported. And it is expected that this Indonesian Food Codex will be of use for the manufacturers to improve their manufacturing practices, to achieve both consistency and quality in the product being produced.

c. COMPOSITION OF THE COMMITTEE

Because of the enormous field which has to be covered, obviously no single institute or ministry would be competent to prepare food standards on its own; therefore, the members of the Food Codex Committee, besides officials from the Ministry of Health, are appointed from the Ministry of Industry, the Ministry of Agriculture, the Ministry of Trade, and also from the research institutes and universities, such as the National Atomic Energy Agency, the University of Indonesia, the Bogor Institute of Agriculture, the University of Pajajaran, the Bandung Institute of Technology, and the Universities of Gajah Mada and Airlangga.

Besides the chairman, the vice-chairman, the first and the second secretary, the members are divided into eight sections:

(1) Section of cereals and starch products;
(2) Section of sugar, syrup, and beverages;
(3) Section of meat, fish, and eggs;
(4) Section of milk and dairy products;
(5) Section of nuts, oils, and fats;
(6) Section of fruit and vegetables;
(7) Section of spices;
(8) Section of nomenclature and terminology.

To assist the secretary in performing the daily activities, an executive committee has been set up. This executive committee has to prepare draft standards, plan the meeting of the Food Codex Committee, prepare the material to be discussed in the meeting, and perform all the daily activities of the committee.

d. SCOPE OF THE COMMITTEE

The standards to be prepared by the Indonesian Food Codex Committee include:

(1) All the principal foods for distribution to the consumer, whether manufactured domestically or imported, with priority given to canned or other prepacked foods with a relatively large distribution area and a long-term distribution period.

(2) Chemical substances and additives being used in food processing such as food colors, non-nutritive sweeteners, antioxidants, preservatives, emulsifiers, stabilizers, etc.

The standards should contain requirements for food to ensure the consumer a safe, sound, and wholesome food, free from adulteration, correctly labeled and presented.

e. KINDS OF STANDARDS

(1) The kinds of standards being formulated by the Indonesian Food Codex Committee can be divided into seven main areas:

a) Cereals and starch products;
b) Sugar, syrup, and beverages;
c) Meat, fish, and eggs;
d) Milk and dairy products;
e) Nuts, oils, and fats;
f) Fruit and vegetables; and
g) Spices.

(2) Whereas the main areas in food chemical substances and the food additives can be divided into thirteen groups:

a) Antioxidants;
b) Anticaking and free flowing agents;
c) Acids, bases, and salts;
d) Enzyme preparations;
e) Non-nutritive sweeteners;
f) Bleaching agents, maturing agents, dough conditioning agents;
g) Dietary supplements;
h) Preservatives;
i) Emulsifiers, stabilizers, and thickening agents;
j) Firming agents;
k) Food colors;
l) Sequestrants;
m) Miscellaneous.

f. FORMAT OF STANDARDS

(1) Each standard should include the following information:

a) The name of food (title). The name will be:

- Indonesian name, and/or
- English name
- Other common names.

b) Scope.

c) Description. It should describe the food, including the definition, classification, preparation, etc., which may be useful descriptive information.

d) Identity. It should cover the characteristic properties of the food.

e) Composition. It should cover the essential compositional requirements.

f) Quality factors.

g) Food additives. It should cover the permitted food additives being used in the processing, including the maximum level of use.

h) Contaminants. It should cover the possible physical, chemical, and microbiological contamination and the maximum limit being permitted.

i) Hygiene. It should cover the hygiene requirements, such as specific sanitary and other protective measures and safeguards to ensure a good standard product.

j) Labeling. It should cover specific requirements for labeling and presentation.

k) Method of analysis. It should cover the method of testing and analyzing, including the method of sampling.

(2) Arrangement of standards on food chemical substances and food additives is more simple, and should cover:

a) The name of the substance (title);
b) Chemical formula, molecular formula, and molecular weight;
c) Definition and requirements;
d) Descriptions;
e) Identification;
f) Purity;
g) Assay;
h) Storage;
i) Functional use in foods.

g. PROCEDURE FOR THE FORMULATION OF STANDARDS

The procedure of formulation of standards is as follows:

(1) Collection of existing standards, either domestic or from other countries, or from the FAO/WHO Codex Alimentarius Commission, including the collection of related information.

(2) Testing methods.

(3) Preparation of a draft standard by the Executive Committee based on experimental laboratory examination.

(4) Discussion of draft standard by the Food Codex Committee.

(5) Completion of the draft standard by the Executive Committee based on the comments and amendments from the members of the general meeting.

(6) Circulation of the draft standard to the other institutes concerned, and also to the manufacturers' and the consumers' organizations, for comments.

(7) Rewriting of the draft standard by the Executive Committee based on the comments from the institutes, manufacturers' and consumers' organizations concerned, as a penultimate draft standard.

(8) Discussion of this draft standard in the second general meeting of the Food Codex Committee.

(9) Final completion of the draft standard by the Executive Committee based on the comments and amendments from the members of the Food Codex Committee during the second general meeting.

(10) Legalization of the standard by the Minister of Health.

h. CONCLUSION

An Indonesian Food Codex Committee has been established by the Minister of Health, which is in charge of drawing up food standards.

The members of the Committee, besides the officials from the Ministry of Health, are appointed from the other ministries concerned, the research institutes, and the universities.

It is hoped that the Indonesian Food Codex can be used by the Government as a measure for protecting consumers' health, and it is also hoped, that it will be of use to the manufacturers to improve their manufacturing practices, so as to achieve good and consistent quality in the product being produced.

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i. COMMENTS BY THE VISITING TEAM

The visiting team admired the high order of professionalism demonstrated in this paper. It clearly describes the benefits of food standards such as protecting the consumer's health and providing for fair practices in food production and distribution. Mr. Heman speaks of the Indonesian Food Codex Committee established and assigned by the Minister of Health to prepare food standards.

Although consumer groups and manufacturers' associations are consulted during food standards development, they are not represented on the committee assigned to standards development. Despite the fact that quality assurance practices, as well as good manufacturing practices regulations, were not addressed in the paper, a later discussion revealed that they are considered. The discussion following delivery of the paper emphasized the need to consider already existing standards for adoption or adaptation for use by Indonesia as national standards.

III.C.1. THE PROBLEM OF STANDARDS FOR THE CONSTRUCTION INDUSTRY IN INDONESIA

By

Zaini Djaprie
Division Council on Building and Construction

a. INTRODUCTION

Standards in the construction industry have long been needed, especially because of the technical problems connected with any kind of planning or implementation in this field. The standards in use are partly translations of existing Dutch standards and regulations of the 1960's, while other standards are of foreign origin. It is difficult to say how many standards exist and from what countries they originate.

Every expert, whether architect or constructor, uses foreign standards which he is acquainted with and which are easily applicable. His choice is most often influenced by his education or training. Naturally he is inclined to use the standards in the languages he masters and those which are easily applicable, except when the information needed is not available and standards have to be adapted to available building material. Very often, however, he has to use available building materials directly, disregarding any standards.

Of course, these factors influence the kind of design being made. There is also the influence of imported materials flooding the Indonesian market, from Japan, Singapore, and Hong Kong. Even though the language of their standards is not understood by our public, they are directly involved in the design of certain projects.

b. STANDARDS AND THEIR IMPLEMENTATION

Practically all projects in the construction industry which are financed by grants and foreign loans use the standards of the sponsoring countries. In reality not all standards reach the contractors or supervisors, and in many cases, the original language cannot be understood, so that the project is carried out merely by following the drawings. This, of course, slows down the process of transfer of knowledge from abroad. Indeed the transfer of technology to Indonesia is a very expensive and time consuming process. For example, the standards which are used in the field of plumbing are mostly American standards. For concrete the Dutch system is used, while prestressed concrete standards are derived from the country of origin. In the field of building administration and finance, standardization is well established. In the system of maintenance, even registration procedures are not yet standardized. No standards were available on the requirements for craftsmen and skilled labor.

It is clear that for the implementation of high quality and precise construction, the problem of skill has to be taken into consideration. The implementation of standards should be taught at technical vocational schools for the sake of further development. Another factor is the lack of appreciation of standardization itself by the community. Even people with higher education still consider standardization as a trifling matter.

An advantage is the existence of several information centers and institutions in Indonesia which are connected with the problems of the construction industry. However, because of the lack of good coordination between their institutions and government agencies, their development and direction are not satisfactory, especially when there is no strategy towards a definite goal.

c. THE PRESENT STATE OF STANDARDS FORMULATION IN THE CONSTRUCTION INDUSTRY

Because there is no coordinating or specific body to handle the problems of standardization dynamically on a national basis, each institution or government agency formulates its own standards to meet its own urgent needs. Standards are formulated based on immediate needs without any definite long-term program.

A reason for the possibility of standards being incomplete may also be a result of the limited interested organizations involved in their formulation. Another aspect is the lack of information.

Through a definite program, it is probable to formulate correct and appropriate standards. By using the right standards, development will become more efficient, practical, and economical. It may be that at the beginning standards formulation will seem to be rather expensive, but in the long run benefits from its implementation will be self evident.

d. THE GEOGRAPHICAL SITUATION OF INDONESIA

It is difficult to comprehend the variety of geographical conditions in Indonesia and the different kinds of environment. In the different areas people have their own methods of building houses, not only because of the difference in local culture, but also because of geological differences and variety in local building materials. There are parts of Indonesia which do not have any building material for constructions. Even foundations used in swamp country, seashore country, and mountainous areas differ, in addition to the various craftsmen with different traditional skills. There should be special studies on standards required for specific construction and local building materials. A special body would be needed to coordinate these problems.

The Indonesian islands may be classified as follows according to their different geographical conditions:

(1) Dry/barren areas
(2) Marshy (humid areas)
(3) Flat areas
(4) Mountainous areas
(5) Earthquake areas
(6) Cold areas (humid or dry)
(7) Warm areas (humid or dry)

In Indonesia we find people building houses on rivers or marshes, also in the shallows of the seashore, according to their own traditional techniques. They do not build their houses in such a manner because of lack of land, but for historical and traditional reasons. Therefore, in compiling national standards we need to pay attention to traditional construction and building techniques. These constructions are usually very elastic, earthquake resistant, and mostly made of wood.

e. PROCEDURES FOR THE COMPILATION AND FORMULATION OF STANDARDS

Procedures to form standardization committees differ. Some are formed at institutions by an official policy statement, others are established by units in government agencies, or as a coordinating endeavor. It all depends on the existing funds, the urgency, and the experts available. A standard formulated by an agency will be implemented in its own environment. When practiced on a national scale, it is ratified or legalized. However, legalization by the Government takes a long time, especially since there is no center for the registration and coordination of standards.

Within the Construction Industry Committee, a team has been formed to create a program for standards in the construction industry. After the program has been agreed upon, it is to be handed over to the head of a steering committee which draws up the outline, which is then to be followed during standards development.

The target of strategy is determined by the head of the team with the approval of the team members, after which it is legalized by a plenary session of the steering committee. Some teams make joint decisions in the steering session on the contents of standards, e.g., on the problem of how many standards (books) should be formulated. At the moment, the teams discussing standards and directives consist of government and private experts. It is only very rarely that a person is asked to join a team because of his profession. This is also one of the reasons why the standards tend to be of less use. Another reason is that there is no registration of theoretical experts, as well as experts with specific experience. In fact, there should be a special body which does this kind of inventory.

The problem of safety is rarely mentioned in building standards, probably because this is considered a specialized area. Now and then, sponsored by enterprises, some foreign speakers are invited to speak on the subject of safety. This seems to help the teams in formulating standards. It also may help to make the community more aware of the usefulness of standards, so that they will not be easily influenced by advertisements, and think more critically.

f. PROBLEMS FACED IN STANDARDIZATION

The problems faced are caused by the following factors:

(1) Lack of Understanding of the Meaning and Objectives of Standardization

Because of the lack of understanding in the community on the objectives and usefulness of standards, the process for developing and spreading standards has only little attention. Only in the last few years with the acceleration of development, people who are engaged in the field of safety, implementation, and planning of projects, feel the usefulness of standards. Due to the lack of understanding, the community receives each proposed standard without calculating its consequences and effects in the future. This is why the completion of buildings or projects is often postponed because different tools are used, or because within one project several kinds of materials and several standards from different countries are applied.

(2) Limited Funds

The problem of finance is the second inhibiting factor of standardization in the building industry. Important factors are sound directives, a solid standards program, and sufficient funds. Sometimes money is available, but because the meaning and objectives of standardization are not understood, the budget is not planned to realize a certain goal, and the available money is not made use of. In some instances there is a good program, but lack of funds. It is therefore advisable to have standardization coordinated by a dependable neutral government agency, in order to realize standardization economically and continually.

(3) No Coordination and Lack of Communication

Lack of coordination and communication creates a waste of time, money, and personnel, because of duplication. The result will be similar for standards with different systems and of different quality. Because there is no effective communication, standards become static and restricted to use in their own environments.

(4) Limited Number of Experts on Standardization in Special Fields

Lack of experts for standardization in professional fields results in different directives within different systems. This is not only a result of the experts' different educational backgrounds, but may also be due to implementation of outdated standards.

(5) A Body Does Not Exist Yet Which Handles All Problems on Standardization

Another problem to be faced is the need for a body which can handle all newly arising problems on standardization resulting from the development of science and technology. Without it, problems will stay unsolved, even though they may be very important for the implementation.

(6) Lack of Facilities for the Dissemination of Standards, and Educational Centers on the Implementation of These Standards

Standards have to be spread to the outer areas. There are many complaints that standards do not reach the outer areas. As a result, scientists and technicians who need standards have come personally to Jakarta. Dissemination of standards for the construction industry is very important and several institutions have tried to do this. It is therefore understandable that in the construction industry, each expert implements whatever standard is available. This not only complicates the implementation, but also complicates any evaluation or inspection.

g. SAMPLE OF STANDARDS FOR PROTOTYPE HOUSING IN THE CONSTRUCTION INDUSTRY

Any agency can make its own standards for its specific field. A sample of procedures in construction standards for prototype housing is as follows:

(1) The appropriate design is made based on technical standards.

(2) The design is discussed and theoretically evaluated.

(3) The house design is examined in a laboratory.

(4) If suitable it is again evaluated in the field and checked from the aspect of:

(a) Technique and financing
(b) Occupancy and environment

(5) If considered correct it becomes a prototype standard.

(6) This prototype standard is built as a sample house.

(7) The sample house is examined from the point of view of its design, and perfected.

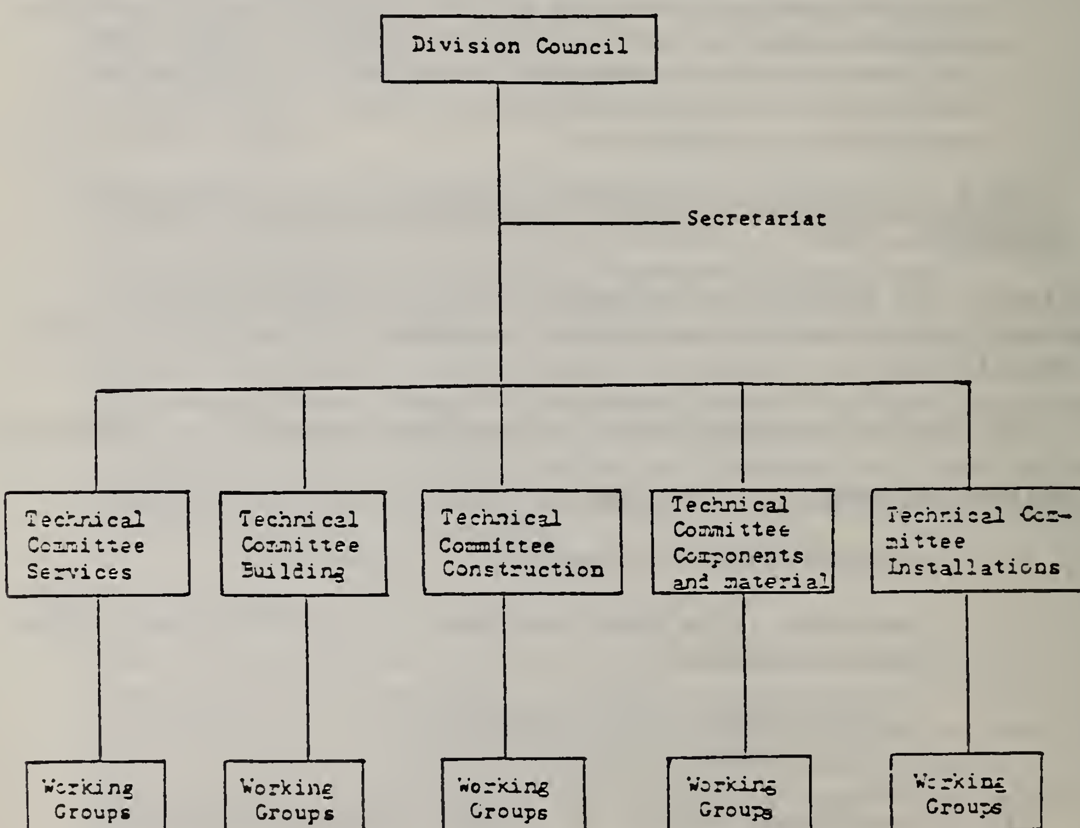
(8) Sample houses are made available to the public, as low cost standard houses of a certain prototype.

h. NUMBER OF STANDARDS NEEDED FOR THE CONSTRUCTION INDUSTRY

Not many standards have been formulated. The largest amount are inherited from the Dutch, either translated or revised. A list of standards and regulations which are available and already applied in Indonesia is available.

i. STRATEGY OF A PATTERN FOR DEVELOPMENT OF CONSTRUCTION INDUSTRY STANDARDS

In order to reach the objectives of this strategy, the units which have a strategical value have to be grouped in a logical and clear pattern. An estimate should be made of obstacles to be faced and ways to overcome them. Our present conditions form the point of departure to reach the planned goals. Below are the main outlines of the pattern for industry construction.



j. COMMENTS BY THE VISITING TEAM

Mr. Zaini Djaprie summarizes clearly many problems of standardization in the construction industry and reviews the country's building standards and codes. Most standards and codes date back to Dutch rule (pre-World War II); others are based on standards from developed countries. Mr. Djaprie implies that no information is available about how many codes and standards there are and from which countries they come. As Mr. Djaprie suggests, the standards situation in Indonesia--with particular reference to the Building Industry--is almost nonexistent. He recognizes that what little scientific investigation of housing designs and practices that is done seldom makes its way into the industry. He said that whenever a standard is drafted by a government agency, it takes a long time to be adopted and longer yet to be implemented. Since there is no central coordination among groups, such a standard is not implemented on a national scale. Moreover, individuals who develop standards usually lack the required background; that is why standards lack specificity. Also, there is little understanding of the building process and the use of building regulations. Perhaps if the organizational structure, charter, and the standards of such standards-generating groups as the American National Standards Institute or the American Society for Testing and Materials were studied, Indonesia might pattern their standards development process after those. Discussions with officials from these groups are to be recommended.

The problem in this self-criticism is one of long standing and it is common to many countries. It is not likely to be changed materially until Indonesia undertakes a major effort at developing and enforcing comprehensive building standards. A building constructed to minimum accepted standards will last longer and will be safer, with little if any extra cost. Indeed, in many instances, standardized materials and fittings are less expensive--for instance, standardized cement mixes are more economical.

This rather typical problem of the neglect of the importance of standards comes about in part because the nation has no standards that are indigenous to Indonesia. First, the Dutch and, later, standards of other nations were adopted in their entirety. Builders' and designers' creativity was constrained; they could not adequately pay attention to user needs, environmental conditions, and materials of Indonesia. Further, it is no doubt true that these non-uniform, non-standardized, and somewhat non-applicable standards encourage poor building practices. This problem was abetted by a language barrier as other nations' standards were adopted, and by a lack of education on the part of the workers.

In combination, all these problems led to further standards neglect and irrelevance. Low standards for building practices led to low standards for producing building products. Both of these led to low construction standards. Clearly the citizens deserve and sooner or later will request to receive more of the benefits of good building practices.

The Government of Indonesia would be well advised under the high priority set in their Five Year Plan for housing to concentrate on its standards setting and its enforcement powers. But both of these steps should be preceded by an analysis that would cover the varying building techniques that are associated with various cultural groups and geographical conditions.

Mr. Djaprie recommends a plan for developing construction industry standards for improving building products and systems. He identifies various technical committees on services, building, construction, components and material, and installations. The committees would report to a Division Council. The purpose of the Division Council is somewhat unclear. The Council should report directly to an organization serving as the national leader for building regulations. Also, a technical committee on environmental design loads to cover seismic, flood, volcanic, and other natural hazards should be included as a sixth committee reporting to the Division Council. This committee should have the goal of developing geophysical standards to reduce property damages and loss of life due to extreme environmental conditions.

A discussion about the research aspects associated with developing standards would have been appreciated in Mr. Djaprie's paper. In a related paper, "Standardization and Consumer Protection in Indonesia," Erna Witoelar of the Indonesian Consumers Organization suggests that existing standards are not widely known. In several cases there are many different standards governing the same product. Lack of a governmental focal point makes it difficult to centralize all standards for review, analysis, and implementation, and eventually to combine them into a model code. The general public has little knowledge of product quality. Their low literacy rate and the high percentage of low-income families contribute to a lack of knowledge about standards.

Several of the other papers also reveal that government agencies are ineffective in enforcing standards and codes because there is too little communication between them.

III.D.1. NATIONAL STANDARDIZATION SYSTEM FOR INDONESIA

By

Sriati Djaprie
LIPI (Indonesian Institute of Sciences)

a. INTRODUCTION

Standardization and related activities are important aspects of development, and they constitute an essential input for planned growth. The experience in other developing countries shows that the function of a national standards body is closely related to national planning and national development which calls for full government authority and financial support.

The fast pace of development and change in technology during PELITA I and the current PELITA II (National Plans), and others to follow compelled various government agencies and departments to set their own standards to be able to execute their respective functions. With the continuing increase in development activities, it has been recognized that in order to ensure that standardization can serve national goals and needs, an effective national body should be established which would coordinate all standardization efforts, either by government agencies or in the private sector.

b. STANDARDIZATION TRENDS

In order to put the subject into perspective, I will briefly review the background of the standardization movement in Indonesia. Standardization activities in Indonesia actually started as far back as 1928 with the establishment of the "Fonds voor Normalisatie." In 1954, this private institution was later changed into YDNI (Yayasan Dana Normalisasi Indonesia).

During the last decade, standardization activities have taken great strides on the national scene. This can be attributed to:

(1) Rapid growth of development through the implementation of the consecutive five-year development plans.

(2) Rapid growth of technology due to the increase in domestic investment as well as influx of foreign technology.

(3) Expansion of foreign trade (for goods and services).

(4) Increase in international cooperation in economic and cultural fields.

(5) Increase in consciousness of the applicability of the principles

of standardization and the benefits to be derived from their adoption.

Most of the technical departments of ministries such as those dealing with Trade, Industry, Health, Public Works, Agriculture, Transportation, Mining, etc., according to the authority vested in them, are carrying out their standardization programs. As we look to our developmental impetus, it is a necessity that these fragmented approaches should be given clear direction to avoid overlapping areas of interests or even conflicting or inconsistent standards. We must make a deliberate effort to develop a national standardization system and cannot wait to see years taken up in its evolution. The absence of a central coordinating body will be keenly felt, as standards are becoming more and more an indispensible instrument in implementing government policies and programs, and because in the regional or international context, their absence will be a handicap for Indonesia. A two-day Seminar on Standardization held in February 1973 concluded that an effective national body should be established which would be in charge of coordinating all standardization efforts. Standardization efforts received a new emphasis in Pelita II by the formation of a Project on Standardization, Calibration, Instrumentation, and Metrology (74/79). The development of a national standardization system forms one of the priority areas in the overall research and development program.

c. THE NATIONAL STANDARDIZATION SYSTEM

A systems approach to standardization requires a clear insight into its components which encompass:

(1) R&D, including planning and programming.
(2) Formulation of standards.
(3) Adoption of standards.
(4) Implementation of standards.
(5) Promotion of standards.

Of these components, R&D in standardization and adoption of national standards should be centralized and be the responsibility of a central body. This will be necessary to achieve national status. Formulation, implementation, or promotion may be decentralized, which is to say that it may be entrusted to various ministries and institutes with the central body acting as the coordinator. The number of subsystems to be integrated into the actual standardization system should be determined according to the functional characteristics of the system which should be determined through legislation.

d. OBJECTIVES

The immediate objectives of a national system include among others:

(1) Coordinating the formulation of all necessary national standards.

(2) Dissemination of information on standards and related activities.

(3) Liaison between formulation and implementation or enforcement bodies.

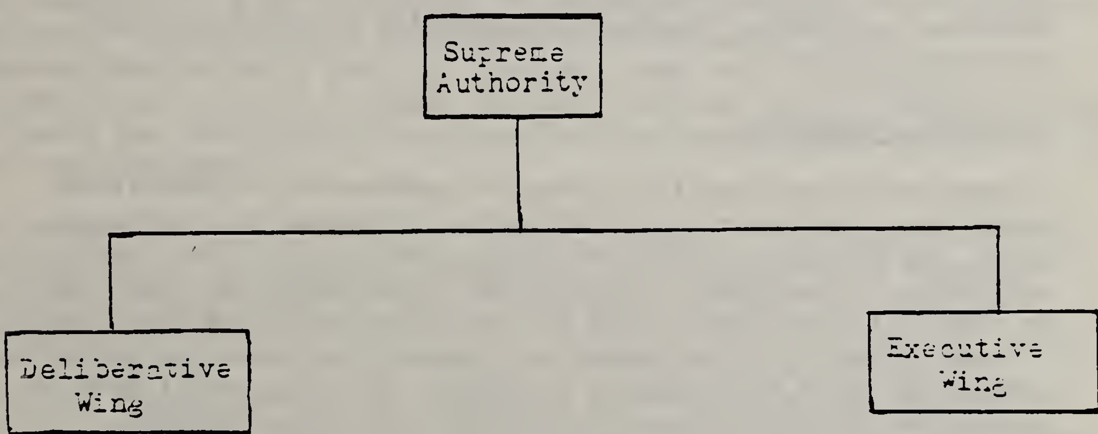
(4) Determination of priorities in the standardization program.

(5) Coordinating effective representation in regional and international standardization activities.

A memorandum for establishment of a National Standardization System in Indonesia has been presented to the Government through the Minister of State for Research. The next step would be the establishment of the Standards Council, Divisional Councils, and Technical Committees. In a given situation such as in our own case in Indonesia, it would be possible to develop a workable system. Its effectiveness would generally be related to a national development goal, and it should be specially tailored to fit the sociopolitical environment and economic conditions. In any approach, one should spell out clearly the stages needed to attain the objectives and the interrelationships between the various subsystems.

e. THE SYSTEM AND PLANNING, PROGRAMMING, AND FORMULATION

Since planning, programming, and coordination are the core functions of this system, it should include and represent a consensus of all interested parties. This could be achieved by setting up a structure as follows:



The Deliberative Wing consists of a hierarchy of councils as follows:

(1) Standards Council

Constituted with representatives from government ministries, research institutes, consumer organizations, and industry. This Council approves policies, priorities, and annual plans. The authority for adoption of national standards also is vested in this Council.

(2) Division Councils

For the formulation of national standards, it is customary to set up specialized groups to deal with specific sectors of the economy. In the initial stages, a few Division Councils need to be established in accordance with the national priority plan. Priority areas have been identified as:

(a) Agricultural.
(b) Food and Food Products.
(c) Housing, with emphasis on low-cost housing.
(d) Building Materials.
(e) Textile and Clothing.
(f) Safety Standards.
(g) Electro-technical.
(h) Structural, etc.

So far, five divisional councils have been set up, namely, electro-technical, documentation, building and construction units, and metals and machinery. It is proposed to decentralize the formulation of national standards, and various ministries and institutes with current standardization activities will continue to function within the framework of the new system. When the subject falls outside the scope of work of the now existing structure, the central authority may set up a new divisional council.

(3) Technical Committee

A technical committee is a group of persons with specialized knowledge with the task of collecting information, technical data, and preparing draft standards. Here again, the central authority, if necessary, may set up a new technical committee to deal with the formulation of standards under the supervision of one of the division councils. In our case about 49 technical committees have been formed, concerned with the formulation of standards on information, electricity, telecommunication, electrical installations in buildings and ships, symbols, technical terms, units, drawing, etc.

The concept of a National Standards system is actually an expression of the objectives and power vested in the Standards Council which are related to cooperation among existing organizations engaged in standards formulation, implementation (testing and certification), and promotion under a given set of circumstances. A workable system depends on the cooperation of all participating existing standards organizations. To understand what is meant by "existing standards organizations," one could look at the inventory work already carried out from which it has been ascertained that there are 104 organizations in Indonesia involved in standardization activities. Therefore, the first step to be taken is in the direction of coordination.

f. THE SYSTEM AND IMPLEMENTATION

As might be expected, the process of implementation of standards presents a more complex problem than that of standards formulation. It should be kept in mind that the principal use of standards for governmental purposes is to safeguard the people in areas such as health, safety, and general welfare. These standards may be implemented by mandatory enforcement through the respective responsible ministries and their agencies.

Conformity, another aspect of standards implementation, is dealt with by various agencies, either private or public, and includes such methods as inspection, testing, sampling, quality control, certification, labeling, and coding. This could involve either voluntary or mandatory implementation, but even so, some form of coordination would be necessary.

g. THE SYSTEM AND STANDARDS PROMOTION

Another important requirement for an Indonesian standards system is the promotion of standards which includes such activities as training, continuous "standard consciousness" programs to bring out the needs and benefits of standardization, information services, and consulting services. Training is a very important component, since standardization as an activity has only come to be recognized in recent years. Thus a national standards system has the responsibility of being the focal point for promoting continuing education and training programs.

As suggested earlier, it is not the intention of the central body to involve itself in the whole program of training, but a systematically designed program covering basic principles, philosophy, practices, methodology, economics, and social effects of standards can be handled most effectively by the central body. In 1976, a basic course designed for management and technical personnel was run in Jakarta (twice), Bandung, Medan, and Surabaya and was attended by 363 persons in all. This amply testifies that there is a great interest and a great need for standards promotion. Four similar courses are scheduled for 1977/78. Specialized topics such as quality control, testing, etc., if coupled with special research or testing facilities, will be best carried out by the respective agencies. The provision of information on standards by different organizations has in general been concerned with providing information on their own sphere of standards. As standards activities are increasing, the collection, collation, analysis, documentation, storage, retrieval, and dissemination of information have become important aspects. One can foresee that with the expanding standards activities at the national level, some form of central standards data bank will be required to afford ready accessibility to information on the national as well as the international level. At this moment the creation of a national standards information network joining all available information centers (YDNI, the International Organization for Standardization and the International Electrotechnical Commission publications and recommendations, and PDIN, the Information Agency within the Indonesian Institute of Sciences, etc.) would be the most practical solution.

h. CONCLUSION

I have attempted to summarize in brief our coordination efforts on standardization. It is our expectation that this framework can and will be discussed and assessed, so that we can improve our activities to promote a national standards system which will respond to Indonesia's needs.

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i. COMMENTS BY THE VISITING TEAM

Mrs. Djaprie in her paper presents a balanced view of standardization, and thereby indicated an insight which made the task of the visiting team very much easier. It helped the team from the start of the Survey to concentrate its discussions and efforts on the gap between existing know-how within LIPI and effective application of standardization through widespread knowledge, understanding, and appreciation within government, industry, the technical community, and the public.

The objectives and components of a national standardization system as set out by Mrs. Djaprie should be studied by all. She lists, very clearly, the basic organizational structure she desires for the system and its components: a National Central Coordination Supreme Authority with a subordinate executive and deliberative wing. The latter is to consist of a Standards Council with wide government and non-government representation for the approval of policies, priorities, and annual plans as well as for the adoption of national standards. Division

Councils, some of which are already established, would be more specialized to deal with specific areas of the economy.

Subordinate to the Division Councils there should be established Technical Committees having specialized knowledge. The Technical Committees would gather information and draft assigned standards.

The visiting team members were well aware that so far too little was known to them on how widely this technically sound scheme was accepted by governmental and independent authorities with major concerns and involvement in standardization.

III.D.2. THE DEVELOPMENT OF TEXTILE STANDARDIZATION IN INDONESIA

presented anonymously by

The Institute of Textile Technology

a. FOREWORD

This paper is presented as information in the discussion between LIPI and the NBS team. The contents of the paper include historical background and the development of textile standardization in Indonesia since 1920, viz., organization and activity of the Board for Indonesian Textile Standardization (DSTI), rules of procedure and enforcement of standards, conclusion, and remarks. The list of the Council Membership of DSTI and the textile standards established are submitted as annexes of the paper.

b. INTRODUCTION

The development of standards on textiles in Indonesia was started fifty years ago when the "Fonds Voor de Normalisatie in Nederlands Indie" and the "Normalisatie Raad" were founded. The objectives of these organizations were to establish standards on many kinds of materials. Unfortunately, during the Second World War, the above organizations became inactive, so that few results were achieved. Under the Government of the Republic of Indonesia, in 1951 the name of the "Normalisatie Raad" was changed into "Yayasan Dana Normalisasi Indonesia" (YDNI) and became a member of the International Organization for Standardization (ISO). In 1962, a Technical Committee on textiles was formed by YDNI. The research and development activities of this committee were carried out mostly by the Textile Research Institute (which is now known as the Institute of Textile Technology in Bandung). As in the case of the previous organizations, YDNI was also not very active, due to lack of support from the textile industry.

In 1969 a seminar on Textile Standardization was conducted by the Institute of Textile Technology in Bandung, which was attended by various representatives from textile producers, consumers, and government institutions. The seminar concluded that an Indonesian organization for textile standardization should be established. The following year Dewan Standarisasi Tekstil Indonesia (Board for Indonesian Textile Standardization) was formed, which included representatives from the producers, users, consumers, and government institutions as well. The main objective of this Board was to develop Indonesian textile standardization in the frame of the national development of the textile industry.

Apart from DSTI, there are still other bodies which also have carried out activities in textile standardization. Among them are the

Industrial Standardization Committee of the Department of Industry which has issued Industrial Standards since 1972 and the Directorate General for Standardization and Quality Control, Department of Trade, which has issued Trade Standards since 1974. In developing their textile standards, these two bodies always cooperate with DSTI with its headquarters located in the Institute of Textile Technology in Bandung.

c. THE ORGANIZATION AND ACTIVITIES IN TEXTILE STANDARDIZATION BY DEWAN STANDARISASI TEKSTIL INDONESIA (DSTI)

Dewan Standarisasi Tekstil Indonesia is a council for Indonesian textile standardization founded in 1970. It is a scientific and technical organization with the objective to develop the Indonesian standards on characteristics and performance of textile materials, products, machineries, systems and services, and also to promote related knowledge.

The organizational structure of DSTI is shown in figure 1. It consists of a Council, an Administrative Committee, an Executive Secretary, two Executive Committees on Research, and five Technical Committees on Research. The Council comprises representatives from textile producers, consumers, and government institutions and ensures balanced representation among them and parties with a general interest (see annex 1).

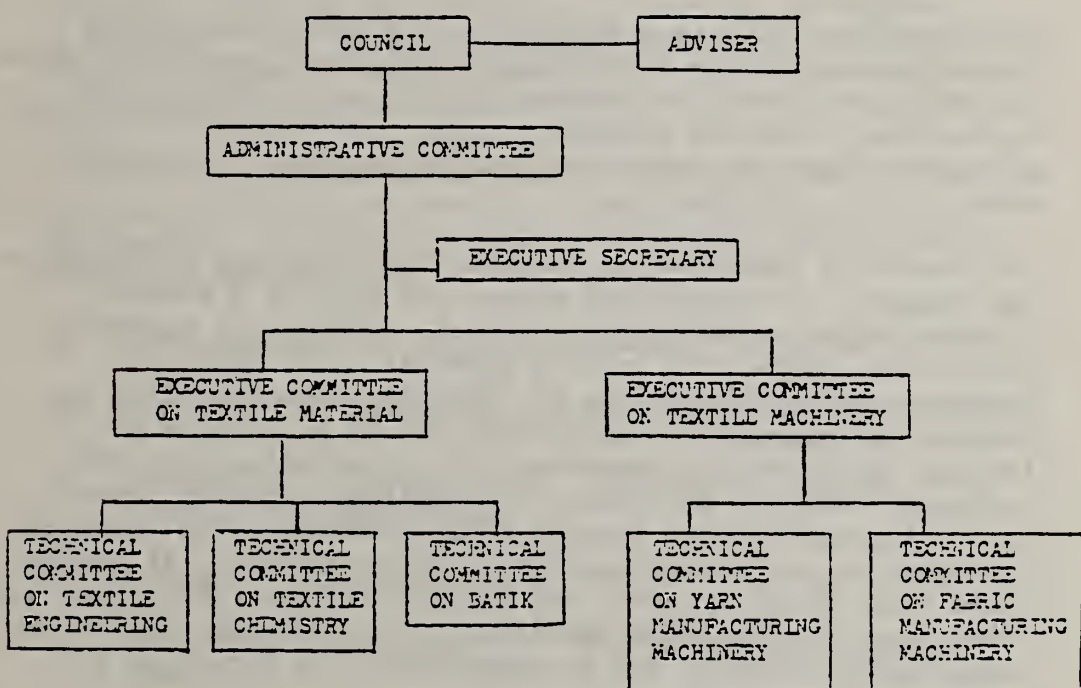

Fig. 1. THE ORGANIZATION CHART OF DSTI

In order to achieve its objective, DSTI has carried out the following activities:

(1) Established and reviewed periodically Indonesian textile standards.

(2) Gave advice on textile standards.

(3) Supplied information and promoted textile standards and quality control.

(4) Maintained collection of domestic and foreign textile standards.

(5) Cooperated with other bodies in the field of science, technology, and economics in relation to the development of textile standardization.

(6) Published and distributed textile standards.

(7) Carried out other activities which support the effectiveness of textile standards in the community.

d. <u>RULES OF PROCEDURE AND ENFORCEMENT OF STANDARDS</u>

(1) DSTI Standards

The Council of DSTI is a governing body which administers its affairs under the provisions of the Constitution and Bylaws. The DSTI Committees are responsible for every phase of the activities. Thus the strength, vigor, and authority of DSTI is derived from the widespread participation of its membership.

The Executive Committee on Research is a standing committee of the Council. It formulates policy and acts as a program planning body in the general area of research and technical activities, subject to Council approval. The Executive Committee issues directives for the execution of policy and program as approved by the Council and to be carried out through the Technical Committee. In cooperation with the Technical Commitee, the Executive Committee prepares reports for publication in the Book of DSTI Standards. The Technical Committee is a standing committee of the Council. It translates into action programs and policy developed by the Executive Committee. It functions essentially in an administrative and coordinating capacity and is responsible for directing the work of the Research Committees.

The Research Committees are appointed to carry out specific technical projects leading to the establishment of DSTI Standards, the development of scientific data or the assembly of information for the benefit of the textile industry and in the public interest.

To establish DSTI Standards, Research Committees obtain preliminary approval through the Technical Committee from the Executive Committee. Tentative Standards are published as soon as is practical in the Book of DSTI Standards following their approval. Comments received within three months are considered. If the Research Committee recommends a revision, a new Tentative Standard is circulated until no material objections exist and the Tentative Standards are accepted as Standards.

The use of DSTI Standards is purely voluntary. The existence of these standards does not preclude anyone from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

(2) Industrial Standards

The procedures for Standar Industri (industrial standards) are shown in figure 2.

e. CONCLUSION AND REMARKS

(1) The establishment of textile standards in Indonesia was started in 1951 by the Institute of Textile Technology in Bandung. The textile standards were formulated to cope with the demand of textile testing and quality control from the developing textile industry.

(2) In line with the growth rate of the textile industry development in Indonesia, the need for standardization is also increasing. At present, several bodies have activities in textile standardization:

(a) The Institute of Textile Technology in Bandung.

(b) Board of the Indonesian Textile Standardization (DSTI).

(c) Indonesian Standardization Foundation (Yayasan Dana Normalisasi Indonesia).

(d) Research and Development Center for the Textile Industry.

(e) Industrial Standardization Committee, Department of Industry.

(f) Directorate General for Standardization and Quality Control, Department of Trade.

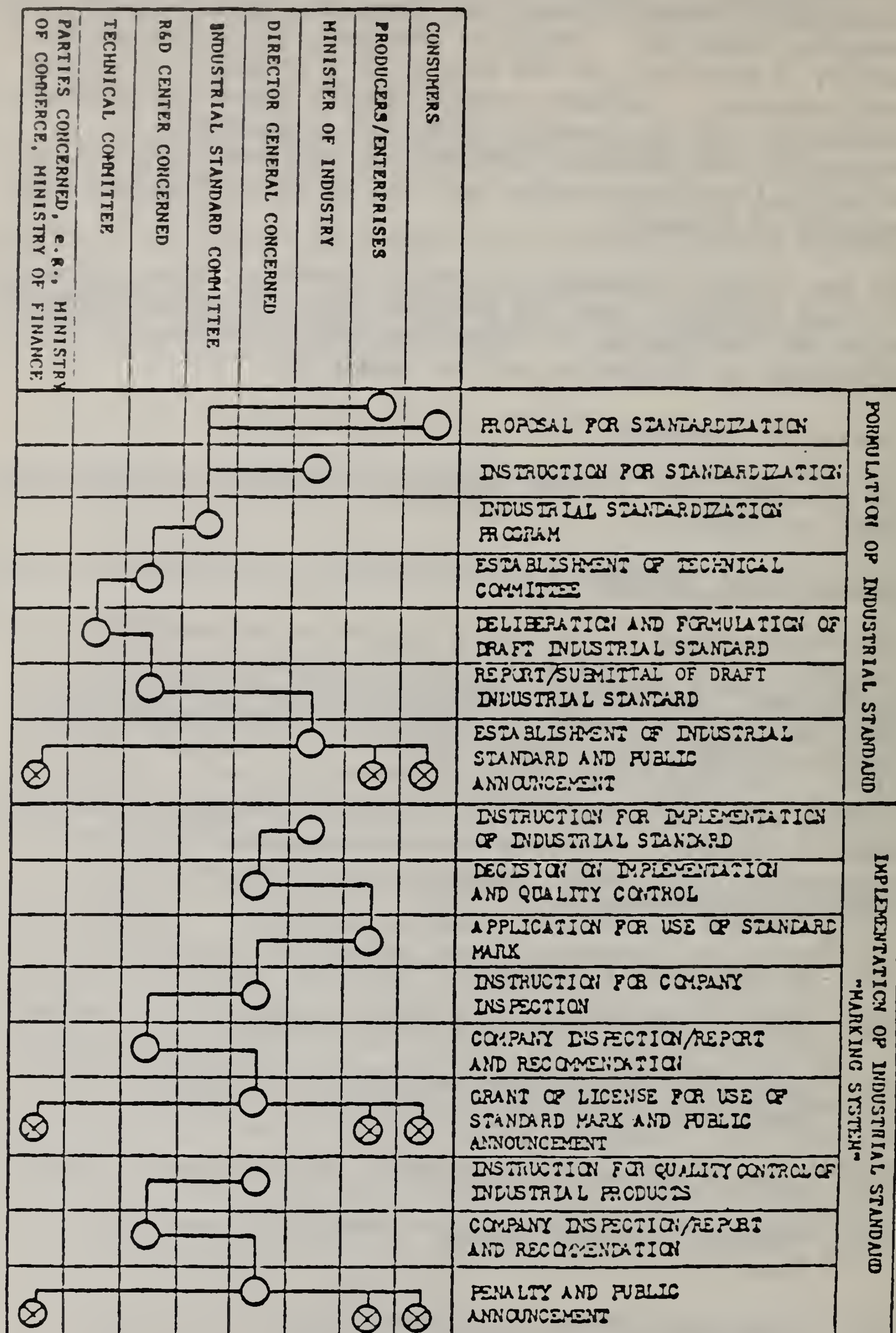

Figure 2: PROCEDURES FOR INDUSTRIAL STANDARDIZATION

In any case, research and formulation of textile standards were always carried out by the Institute of Textile Technology in cooperation with these bodies. To support the standardization activities the Minister of Industry issued Decree No. 172/M/SK/5/1976.

(3) At present 66 standards have been formulated, including standard methods for testing, performance standards, specifications, and definitions. (See annex 2.)

(4) The use of DSTI standards is purely voluntary, while the industrial and trade standards are compulsory.

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f. COMMENTS BY THE VISITING TEAM

All agreed that the Institute of Textile Technology had not only submitted a most helpful paper, but the program for textile standards in Indonesia as presented appeared as a model for other industries and other countries.

LIST OF THE DSTI COUNCIL MEMBERSHIP

(a) INSTITUTIONS

1. Department of Industry - Directorate General of Textile Industry
2. Research and Development Center for the Textile Industry
3. Institute of Textile Technology (ITT)
4. Research and Development Center - Department of Defense

(b) ASSOCIATIONS

1. Indonesian Batik Cooperation Association (GKBI)
2. Indonesian Textile Expert Association (IKATSI)
3. Indonesian Private Textile Manfacturers' Association (PERTEKSI)
4. Indonesian Textile Manufacturers' Cooperative (KOPTEKSI)

(c) PRODUCERS

1. P.N. Industri Sandang
2. Pinda Sandang West Java
3. Pinda Sandang Central Java
4. Pinda Sandang East Java
5. T.D. Pardede

ANNEX 2

DSTI 1971

* 1. Specification for Atmosphere for Testing. DSTI DT 1-1971.
* 2. Standard Recommended Practice for conditioning cotton fibers, yarns and fabrics for testing. DSTI DT 2-1971.
* 3. Standard Recommended Practice for Designation of Cotton Yarn Construction. DSTI DT 3-1971.
* .4. Method for Sampling yarn for Testing. DSTI PT 1-1971.
* 5. Standard Method of Test for Moisture Content and Moisture Regain of Textile Material (Yarns & Fabrics). DSTI PT 2-1971.
* 6. Standard Method of Test for Breaking Strength of Cotton yarn DSTI PT 3-1971.
* 7. Standard Method of Test for Cotton Yarn Count. DSTI PT 4-1971.
* 8. Standard Method of Test for Twist in Cotton Yarn. DSTI PT 5-1971.
* 9. Standard Method for Grading Cotton Yarns. DTSI PT 6-1971.
* 10. Gray Scale for color change. DSTI DT 4-1971.
* 11. Gray Scale for Staining. DSTI DT 5-1971.
* 12. Standard Method of test for Colorfastness to washing.DSTI PT 7-1971.
* 13. Standard Method of test for Colorfastness to Bleaching with Chlorine. DSTI PT 8-1971
* 14. Standard Method of test for Colorfastness to Perspiration. DSTI PT 9-1971.
* 15. Standard Method of test for Colorfastness to Crocking : AATCC Crockmeter Method. DSTI PT 10-1971.
* 16. Standard Method of test for Colorfastness to Light (Sunlight and Daylight). DSTI PT 11-1971.
* 17. Standard Method of test for Colorfastness to Heat : Hot Pressing. DSTI PT 12-1971.
* 18. Standard Method of test for Colorfastness to Light : Carbon Arc Lamp, Continuous Light. DSTI PT 13-1971.

DSTI 1972

* 19. Recommended Practice for Designation of Fabric Weave DSTI DT 6-1972.
* 20. Standard Method of Test for Dimension of Woven Fabrics. DSTI PT 14-1972.
* 21. Standard Method of Test for Breaking Strength and Elongation of Woven Fabrics. DSTI PT 15-1972.
* 22. Standard Method of Test for Identification of Mercerization in Cotton. DSTI PT 16-1972.
* 23. Standard Analysis of Textiles : Quantitative. DSTI PT 17-1972
* 24. Standard Method of Test for Wrinkle Recovery of Fabrics. DSTI PT 18-1972.
* 25. Recommended Practice for Textile Labeling. DSTI DT 7-1972.
* 26. Standard Definitions of Term Relating to "Batik", DSTI DT 8-1972
* 27. Standard Definitions of Term Relating to "Isen Batik". DSTI DT 9-1972.
* 28. Standard Requirements for Cambric : Primissima. DSTI MT 2-1972.
* 29. Standard Method of Test for Identification of Fibers in Textiles. DSTI PT 19-1972.
* 30. Standard Requirements for Cotton Yarn. DSTI MT 3-1972.
* 31. Standard Method of Test for Construction of Woven Fabrics. DSTI PT 20-1972.
* 32. Standard Method of Test for Textiles Absorbency.DSTI PT 21-1972.

DSTI 1973

* 33. Standard Requirements for Cambric : Prima. DSTI MT 4-1973.
* 34. Standard Requirements for Cambric : Biru.DSTI MT 5-1973.
* 35. Standard Method of Test for Dimensional changes in Laundering of Woven and Knitted Fabrics Except Wool. DSTI PT 22-1973.
* 36. Standard Method of Test for Water Resistance of Fabrics (Bundesmann) DSTI PT 23-1973.
* 37. Standard Method of Test for Water Repellency; Spray Test. DSTI PT 24-1973.
* 38. Standard Method of Test for Water Repellency : Hydrostatic Pressure Test. DSTI PT 25-1973.

* 39. Standard Quality for Single Yarn of Polyester 65% - Cotton 35% Mixing. DSTI MT 6-1973.
* 40. Standard Requirements for Colorfastness of "Batik" for Garment. DSTI MT 7-1973.
* 41. Standard Method of Test for Reflectance Blue and Whiteness of Bleached Fabric. DSTI PT 26-1973.
* 42. Standard Method of Test for Colorfastness to Drycleaning. DSTI PT 27-1973.
* 43. Standard Method of Test for Abrasion Resistance of Fabrics (Accelerator Method). DSTI PT 28-1973.
* 44. Standard Method of Test for Appearance of Durable Press Fabrics After Repeated Home Launderings. DSTI PT 29-1973.
* 45. Standard Quality for Single Yarn of Rayon and Cotton Mixing. DSTI MT 8-1973.
* 46. Standard Method of Test for Defect of Woven Fabrics. DSTI PT 30-1973,

DSTI 1974/1975

47. Standard Method of Test for Colorfastness to Light : Water-Cooled Xenon - Arc Lamp (Alternate Light and Darkness). DSTI PT 31-1974.
48. Standard Method of Test for Fluidity of Dispersions of Cellulose from Bleached Cotton Cloth. DSTI PT 32-1974.
49. Standard Method of Test for Finishes in Textiles Analysis. DSTI PT 33-1974.
50. Standard Method of Test for Colorfastness to Sea Water. DSTI PT 34-1974.
51. Standard Method of Test for Dimension of Knitted Fabrics. DSTI PT 35-1974.
52. Recommended Practice for Designation of Knitted Fabric Structure. DSTI DT 9-1972.
53. Recommended Practice for Designation of Range Traveller. DSTI DT 10-1974.
54. Recommended Practice for Designation of Dimension of Paper Cone. DSTI DT 11-1974.
55. Definition of Term relating to the measurement of ready made garment. DSTI DT 12-1974.
56. Standard Size Designations for Men's shirts. DSTI MT 9-1974.

DSTI 1975/1976

57. Standard Method of Test for Constructions of Weft Knitted Fabrics. DSTI PT 36 - 1975.
58. Standard Method of Test for Tearing Strength of Woven Fabrics by the Tongue Method (Constant Rate of Traverse Tensile Testing Machine) DSTI PT 37-1975.
59. Standard Method of Test for Identification of Dye Classes on Polyamide Fibers. DSTI PT 38-1975.
60. Designation and Standard Method of Test for Dimension and Construction of Spindle Tape. DSTI DT 13-1975.
61. Standard Method of Test for Identification of Dye Classes on Polyester Fibers. DSTI PT 39-1975.
62. Standard Method of Test for Dimension of Apron. DSTI PT 40-1975.

DSTI 1976/1977

63. Standard Method of Test for Stiffness of Fabrics. DSTI PT 41-1976.
64. Standard Method of Test for Maturity Index of Cotton Fibers (by the causticaire Method). DSTI PT 42-1976.
65. Standard Recommended Practice for Sampling Cotton Fibers for Testing. DSTI DT 14-1976.
66. Standard Method of Test for Linear Density of Cotton Fibers (Micronaire). DSTI PT 43-1976.
67. Standard Method of Test for Measuring men's shirt.DSTI PT 44-1977.

** 68. Standard Size Designations for Men's shirts. DSTI MT 9-1974 (1977).

69. Definitions of terms Relating to Textile Fibers and Recommended Practice for Use of These Terms on Permanently attached Labels. DSTI DT 15-1977.
70. Definitions of terms Relating to Care of Consumer Textile Products and Recommended Practice for Use of These terms on Permanently attached Labels. DSTI DT 16-1977.

** 71. Standard Requirements for Colorfastness of "Batik" for Garment. DSTI MT 7-1973 (1977).

* DSTI Standards approved as Industrial Standards (S.I.).

** DSTI Standards approved as Commercial Standards (S.P. - SIP).

III.E.1. ACCIDENT PREVENTION THROUGH SAFETY STANDARDS

By

G. Priwa

a. BRIEF HISTORY AND EARLY SAFETY LEGISLATION

Looking back into the past, there had been no regulations whatsoever until 1852 when the first Boiler Law was enacted. The Dutch Authority at that time considered the law important because the number of boilers in use had been tremendously increasing to meet the needs of industrial development. Bigger industrial units were built so that the first Safety Law was promulgated in 1905. This Law was replaced by a newer Safety Law in 1910. For illustration, the number of factories between 1910 and 1920 was 1,500; this rose to 5,585 in the next decade, which clearly showed the remarkably rapid growth.

In the mining sector, a Police Mine Regulation was issued in 1916. This Law, among other things, contained provisions for hygiene requirements concerning mining operations. In 1927 the Public Nuisance Law came into being; and later on, the Dutch Government revised the Boiler Law in 1930.

The years 1931-1936 were a period of economic depression and no further development could be seen regarding legislation. Similarly no progress was made during the period of the Second World War from 1942 to 1945, until the Dutch era ended.

In 1945 Indonesia declared her Independence. Two years later in 1947, the Accident Compensation Law was enacted, and then in 1948 the Labor Law passed Parliament and gradually became effective. These two laws provided only general measures, and were not specific in nature; therefore Government or Ministerial decrees were required for their implementation. Due to many reasons, it was only in 1964 that Ministerial Decree No. 7 on Hygiene and Health Requirements in workplaces was issued.

Indonesia has been an I.L.O. member since 1950; therefore, in 1969 the Government ratified I.L.O. Convention No. 120 concerning hygiene in offices and trades. This broadened the scope of inspection from those engaged in labor management relations to others like the self-employed and those engaged in trades, etc.

It was easy to observe that two kinds of legislation were still effective: first, that inherited from the Dutch time, and second, that which had been enacted since Independence. In order to change the system, since the enactment of the Basic Labor Law in 1969, the philosophical background has also changed. This Law is now the basis for all regulations concerning labor problems. Since industrial hygiene, occupational safety, and health are three aspects in labor maintenance and protection, these matters are mentioned in the Basic Law. One year later in 1970, a new Safety Law was enacted, and this has since replaced the Safety Law promulgated in 1910 and also the regulations based on the Law. According to article 17 of the new Safety Law, all the special regulations/codes are still effective until the issuance of new ones.

Safety and health legislation is administered by the Directorate of Safety, Health, and Industrial Hygiene of the Ministry of Manpower. To ensure uniformity in the application of safety and health legislation throughout the Indonesia territory, the work of the safety inspectors has to be directed and coordinated by the central administration, whose function includes responsibility for formulating standard methods of inspection, supervising enforcement activities, and providing the inspectors with documentation dealing with sound labor conditions.

To provide the inspectors with up-to-date developments and needs concerning safety and health problems of a general character, the central authority has a number of sub-directorates under its management.

These are:

(1) Sub-directorate for Electrical Safety.
(2) Sub-directorate for Mechanical Safety.
(3) Sub-directorate for Boiler Safety.
(4) Sub-directorate for Fire Safety.
(5) Sub-directorate for Industrial Health and Hygiene.

There are 26 provincial offices which cover one or two provinces throughout the archipelago and each provincial office has a number of regional offices, and another 86 sub-regional offices subordinate to 22 regional or district offices whose function is to coordinate the activities of their corresponding sub-regional offices. In order to carry out the responsibilities of the Directorate of Occupational Safety, Health, and Hygiene, there are a total of 238 safety and health inspectors and 12 physicians engaged in the actual work of enforcement and 21 specialized inspectors in the central office. All the offices have their own administrative staff. They vary in number according to status and importance.

b. FORMULATION OF SAFETY STANDARDS

Statutes are laws enacted by a legislative body. Codes (regulations) are systematic bodies of regulations having the force and effect of law, usually drawn up by a governmental agency so authorized by the legislature. Standards are guides established as a result of common usage, custom, or general consent as being proper or adequate for a given purpose.

Every branch of science or engineering, every profession, every line of industry must have its own set of standards. As each new field of endeavor is developed, standards must be set up as a basis for further progress, and this basis in turn plays its part in the development of additional standards. Industrial safety is still a new and steadily developing field. The standards in use have been developed through two different channels. These standards fall into two groups:

(1) Voluntary, self-applied standards. The various interests, groups, and individuals engaged in the work of accident prevention have developed standards representative of good practice. Since the purpose is to prevent accidents, the standards amount to a crystallization of experience and are accepted and observed only by virtue of their practical value as aids to prevention.

(2) Regulatory standards. Laws, or rules having the force and effect of law, have been adopted by governments for the purpose of securing the correction of specific hazardous conditions and of setting forth certain requirements deemed necessary for safety.

c. <u>VALUE OF SAFETY STANDARDS</u>

(1) Standards represent the result of experience, eliminating trial and error.

(2) Standards are the basis for progress--suggest other methods and encourage the creation of other, or better standards.

(3) Standards are guides for action--serve as guides for improvement for those situations not meeting desired quality or condition.

(4) Standards give the means of comparison--provide a method by which actual conditions or methods can be compared to accepted practices.

(5) Standards are the foundations for performance--they set the stage for its achievement.

d. <u>BOARD FOR SAFETY STANDARDS</u>

The Board for Safety Standards was formed by the Directorate of Occupational Safety, Health, and Hygiene, having legislative power within the Ministry of Manpower and subordinate to the Bureau for Legal Matters. This Board has general supervision over the development of safety standards. It is composed of representatives (chiefs and deputies) of the five sub-directorates and safety inspectors, having special knowledge in their respective fields. The Board is under the chairmanship of the Chief of the Directorate of Occupational Safety, Health, and Hygiene.

e. SCOPE AND FUNCTIONS

The scope and functions of the Board for Safety Standards are as follows:

(1) To collect data and information on labor conditions with regard to safety and occupational health problems.

(2) To improve labor conditions in factories, industrial, and agricultural undertakings, etc.

(3) To formulate, define, and determine the scope of safety standards.

(4) To consider the interrelations of safety standards.

(5) To formulate uniform methods for inspection with documentation dealing with sound labor conditions.

(6) To revise the safety standards in conformity with modern industrial operations involving hazards.

f. DRAFTING OF SAFETY STANDARDS

The general practice in the Directorate for Occupational Safety, Health, and Hygiene when drafting safety standards is along one of the following lines:

(1) (a) Each Sub-directorate collects data and information through the safety inspectors of sub and regional offices all over the country.

(b) A priority proposal can be put forward by the various sub-directorates through the chief of the directorate or directly to the Board for Safety Standards.

(c) After formulation of a tentative draft standard, copies of the draft are sent to the regional offices.

(d) The sub-regional office distributes copies of the draft to representatives of manufacturers, employers, employees, and safety committees to arrive at a consensus.

(e) Proposals for revision and additions to the tentative draft standard are submitted to the Board for Safety Standards for correction or revision.

(f) These tentative safety standards are passed on to the Bureau of Legal Matters for final approval as Directives or Ministerial Decrees, or as Government Regulations.

(2) Formerly safety codes approved by YDNI were used for drafting of safety rules or adopted directly as safety rules by approval as Directive or Ministerial Decree. An example is the National Electrical Code.

(3) Safety codes from foreign countries can be adapted or simply adopted; or

(4) Indonesia, as an I.L.O. member since 1950, can ratify I.L.O. conventions, e.g., the I.L.O. convention No. 120 concerning hygiene in offices and trades.

g. THE PROBLEMS OF ENFORCEMENT OF SAFETY REGULATIONS

It is well known that many ingredients comprise a successful industrial safety program; the engineering which builds adequate safeguards into new processes and new equipment; the training that gives workers the skills needed to perform safely; the constant review of work methods for causes of job accidents; and the education which produces a safe working attitude. All these are necessary in an organized management-labor effort to produce a working environment free from accident risks.

However, while law and its enforcement are not enough, their necessity is well established. The outdated laws enacted between 1920-1940 which are now still in effect cannot fully accomplish their important purpose. Most of the statutes are about 40 years old, and they have failed to keep pace with the rapidly changing conditions. The development of the factory system brought with it complex and potentially dangerous machinery, not to mention a crowded and frequently unsafe working environment.

The original safety laws were drawn up in rather broad and general terms. This left it up to the individual factory safety inspector to make the final determination as to whether a hazard existed and, if so, what should be done to correct it. A wide variation in the enforcement of safety standards naturally resulted. Moreover, the orders of safety inspectors were sometimes sharply challenged by industrial executives on the grounds that the statutes did not call for such action. Very clearly the outdated industrial safety statutes and regulations are in urgent need of a thorough overhaul. The new laws which were also drawn up in broad and general terms (e.g., Act No. 1 of 1970) needed support by specific regulations containing details necessary for the adequate coverage of the diversity of the many industrial undertakings.

If a reviewed safety standard is to become of real practical value, it is just as necessary that its provisions represent a consensus from among those interested, as it is that there be a generally recognized need for it. A committee for a safety standard, therefore, must include a balanced representation of those concerned. This representation covers manufacturers, employees, employers, governmental bodies, qualified specialists, and insurance representatives.

From the sum total of experience gained in the drafting and use of such standards, the following general conclusions can be made:

(1) The method of development of safety rules insures that they are representative of good practice.

(2) The method of their development and the degree of their acceptance give practical assurance that their provisions are in fact sound and necessary for safety and health.

(3) The aim should be to construct, by means of mandatory requirements, a basis for safety and health at a level representing the minimum conditions that may be permitted in workplaces.

(4) Performance above this level should be supported by advisory rules and recommendations. Incidentally, much of the job of accident prevention must be done above this minimum in acceptable performance.

(5) Greater adoption of I.S.O. safety standards and the establishment of an Indonesian Standards Body are desirable in Indonesia.

Standards are very important in all phases of safety work. They lie at the heart of educational programs and of safety research; they are an essential part of safety equipment, both in its manufacture and in its use. Safety codes are themselves safety standards.

More and more organization officials and safety engineers have come to realize that safety standards, if they are to be effective, must be developed and used on a national basis. Individual and groups of safety standards suffer obsolescence. Where they are kept beyond their time, confusion, cost, and danger can result. Conflicting requirements cause inconvenience and unnecessary loss in the manufacture, distribution, and use of safety apparatus. This in itself demonstrates the need for uniform national safety standards.

An Indonesian National Standards Body is a logical and effective body needed to help in the creation of national safety standards. A recognized clearing house for standards in Indonesia and an officially recognized agency to work with foreign countries in the field of international standards is desirable. As a governmentally financed scientific and educational organization in the interest of those concerned, it could serve:

(1) To simplify development of industrial, engineering, consumer, and safety standards.

(2) To eliminate duplication, overlapping, and variations of standards activities among other bodies, either governmental or private, in the country.

(3) To weld conflicting standards into a single, generally accepted standard, designated as an "Indonesian safety standard."

(4) To serve as a central clearing point for information on all standards in this country and abroad.

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h. <u>COMMENTS BY THE VISITING TEAM</u>

The author was commended for his clear vision of the need for safety standards in manufacturing and processing industries as well as in all kinds of workplaces. Such understanding is indeed rare in industrializing economies. Historically, suffering from job-related injuries and diseases has been serious and widespread.

The team questioned the author on compilation of statistical data on accidents and unforeseen occupational hazards. They also wanted to know how scarce scientific and technical resources could be mobilized to help in the often challenging problems to create safer and healthier workplaces.

III.F.1. STANDARDIZATION OF UNITS IN INDONESIA

By

M. Barmawi
Chairman, Division Council on Units

This report is a summary of work done by the Division Council on Units established by the Project for the Development of a National System for Standards.

Its task is mainly to study problems in Indonesia related to the use of units and to submit recommendations as to how these problems can be approached.

The Division Council on Units consists of eight members representing LIPI, BATAN (National Atomic Board), the Directorate of Metrology (Ministry of Commerce), and various universities. On nearing the completion of its task, the Council was fortunate to be able to consult Mr. S. K. Sen who recommended that a study of the situation of units in the country be undertaken. However, no comprehensive survey has been made and information on the situation has been gathered through technical committees using informal channels.

a. HISTORICAL BACKGROUND

The need to define weights and measures in Indonesia was felt as early as the 17th century, when the United East India Companies were operating in Indonesia. The oldest document on weights and measures was dated 1673.

All the rules issued during the following years were withdrawn by a decree of the Governor-General issued on December 11, 1907, and a new rule was introduced on the calibration of instruments used for measurement and weighing which were utilized by the Government, both metric and non-metric systems being allowed.

In 1923 gradual compulsory calibration of instruments in the Netherland Indies was introduced which only allowed the metric system.

This decree also prohibited the introduction of new instruments which were non-metric; however, a transition period was allowed.

A revision of this decree came in 1928. It was then mentioned that metric instruments had to be calibrated. However, non-metric instruments were allowed until January 1, 1938. The last decision was made in 1933.

After the Second World War, in 1949 the decree for standardization of weights and measures was revised and in the context of an overall change to the metric system all units in addition to those of weights and measures were to be included.

In 1977 a draft for a metrology law was drawn up by the Department of Commerce. Before presenting it to Parliament, a team was established to study it, consisting of representatives of the Departments of Industry, Mining, Finance, Public Works, and LIPI.

From the above, it can be seen that efforts at metrication of standards of units had been started at a much earlier date in this country than, e.g., in India.

b. PROBLEMS RELATED TO THE USE OF UNITS

As soon as the Division Council on Units was established, it recommended the adoption of the International System of Units. It also completed a translation of the General Conference on Weights and Measures (CGPM) publication, "SI—the International System of Units," which was immediately released for distribution.

In March 1976 the Council arrived at the following conclusions concerning problems related to the use of units:

(1) Although the metric system has been in use in Indonesian textbooks for high schools and in education in general, several other systems are also in use, such as the static and dynamic systems in mechanics and the esu, emu, Gaussian, and Giorgi systems in electricity. There is a definite need to introduce SI at all levels of education.

(2) In industry and trade:

a) Despite the laws mentioned above, there are still production machines in operation using non-SI as well as SI units. This will be harmful when efforts are being introduced towards rationalization.

b) SI units are not too well-known by people involved in trade. Transactions with foreign countries are still conducted in non-SI units. A striking example is the oil trade.

c) Adequate conversion tables are still lacking to assist people in trade and industry.

d) Incidental activities related to the use of SI units do exist in various fields, but an authoritative coordinating body is lacking.

c. EFFORTS AND RECOMMENDATIONS TO OVERCOME THE DIFFICULTIES

The Council has made some efforts to overcome the difficulties related to the dissemination and introduction of SI in education, as well as to the community at large, by writing up booklets for information on SI at high school and at university levels and also by setting up tables for conversion from non-SI to SI units.

Recommendations to overcome other difficulties can be summarized as follows:

(1) To establish a clearing house for SI units, adopting CGPM recommendations.

(2) To set up a systematic plan for transition into SI in Government bodies (this could be triggered off by the various departments).

(3) To make efforts in persuading trade associations to adopt SI, with guidance and directives from the Government.

(4) To make a more intensive inventory of units used in trade and industry.

Realizing the importance of a coordinating body for the efforts in standardization, the Council supports the recommendation made by Project S-KIM ("Standardization-Calibration Instrumentation Metrology") concerning the National Standards Body as described in the "Memorandum for the Establishment of a National Standardization System," with some minor modifications:

(1) To include the Minister of Communications and Transportation in in the Supreme Standardization Council. We consider this necessary because a lot is still to be done in the rationalization of the government transportation companies, e.g., PJKA (railroads); PTT (postal and telephone); GIA (airline); etc.

(2) The Supreme Standards Council in its daily work should be supported by an executive committee composed of members from the corresponding Ministries. This executive committee would be very helpful in assisting government efforts to introduce rationalization of government corporations and industries as stated above.

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d. <u>COMMENTS BY VISITING TEAM MEMBERS</u>

We agree with the thrust and direction of the recommendations of this paper. Our observations during the study tour visits strongly supported them. For instance, we were astonished to find in a textile factory the use of "grains" to measure the weight of cotton fiber and of inches and yards to define the dimensions of the finished cloth, even for the domestic market. We did not get close enough to this problem to state with confidence a set of recommendations of our own.

Nevertheless, it is our sense that even more vigor and drive should be put into standardization of the measurement units in Indonesia than Mr. Barmawi suggests in this paper. It is certainly true that Indonesia should no longer passively accept measurement instrumentation from the United States or elsewhere that is calibrated in non-SI units. All industrial countries of the world are now committed to SI, the United States being one of the slowest to do so, and it is appropriate for Indonesian importers of measurement equipment to point out if need be "that your own U.S. Congress has stated a national intent to establish the widest possible use of metric SI units, and that we, the Indonesians, want metric measuring equipment."

III.F.2. INSTRUMENTATION IN INDONESIA

By

B. H. Hadiwiardjo
Deputy Director, National Institute for Instrumentation

a. INTRODUCTION

In the outline of government policy and in PELITA (Indonesian five-year development plan) the aim of our economic development must be directed towards economic structures that are well-balanced, where the ability and the strength of modern industries are supported by ability and strength in the agricultural field. During PELITA I, the priority in the development plan was in development of agriculture, but during PELITA II, development in the industrial sector is also very important. Included in the industrial sector are the agricultural industries, which are expected to use better and modern technology. Technology that is used in Indonesian development must fulfill the following requirements:

- give more work opportunity
- give more manpower productivity
- use as much domestically made production equipment as possible, which can be self-maintained by users
- be a support agent to reach development goals
- provide a better skill for a better and advanced technology in the future.

In using and developing this technology we must utilize, as a very important tool, the right and proper instrumentation. Considering instruments and knowledge, the role of instrumentation is very broad and also the working field is very wide and crosses many sectors. To guarantee that research will be successful, it cannot be separated from the availability of instrumentation, which must be adequate. Instrumentation which is used in the research institutes has a very important role in research for the development of the nation.

Better communication between industries and research institutes could improve the role of instrumentation for the development of the nation. This is an important thing that must be accomplished.

In the national research program, which is coordinated by the Minister of Research, the KIM program (Calibration, Instrumentation, and Metrology) is the responsibility of the Indonesian Institute of

Sciences as a center of management. This is a very big and heavy responsibility and, of course, the National Institute for Instrumentation (LIN), as a research institute under the Indonesian Institute of Sciences which works in the field of instrumentation, has to cope with and work under this program. This KIM program is stated in PELITA II as one of the main development plans in the next five years. This means that KIM has great national value.

Instrumentation in industries, research institutes, in the field of communications, agriculture, etc., has a broad scope, from the primitive to the modern and this makes the decisions in choosing the instrument rather difficult. We must consider a lot of things, maintenance, repair, and later the calibration, in order to make a good decision.

The growth of instrumentation must be very carefully watched by the National Institute for Instrumentation and steps taken to adapt the advancement of technology to the Indonesian condition.

Research and development in the field of instrumentation must be stimulated to lessen the dependency on foreign countries and to save foreign exchange. A design system for solving instrumentation problems must be introduced, because in every situation the conditions are not the same, especially in Indonesia, where a lot of factors are not under control yet, such as the climate, skilled labor, national culture, etc. Research and development data collection are still needed. It is clear that research and development must stress more the technology and instrumentation that are right and proper for Indonesia, without eliminating modern technology.

b. THE SITUATION

In a developing country such as Indonesia, where the right and proper technology must be used, instrumentation has a very important role. Technology must be supported by instrumentation. Even what we call "traditional technology" needs to be supported by simple instrumentation to improve the products and their quality.

In the National Development Plan, the agricultural sector has been emphasized as a priority area and instrumentation is already playing a role, e.g., for agricultural data collection, rice estates project, irrigation, etc. In the long run, especially in Java where there is a high population density, the development plan must emphasize industrialization. This means that the role of instrumentation is very important.

Nowadays, the national resources that are used as the backbone of technology in Indonesia are oil, natural gas, nickel, etc. It is clearly understood here that we need to compete in the world market, where quality and standards are very important. This means that instrumentation has a very important role. It is not only the world market that is very important; the Indonesian market, with a consumer population of about 130 million people, must not be neglected. It can be concluded here that instrumentation already has an important place, and it will be more important in the near future. We must understand the situation in the field of instrumentation more deeply even though the future prospect is very good. Looking at the fast growing technology in the field of instrumentation, we must look and observe the problem in the proper perspective, especially in the new and big industries where the role of instrumentation is very important. Many papers state that in industry the instrumentation cost is about 25 percent of the capital cost. Looking at this high cost, the role of planning the system and choosing the right instruments is very important. We must be aware that we do not have this kind of judgment yet.

Another problem that we must be aware of in planning the system and choosing instruments is the absolute life of the instruments. With the rapid growth of new inventions which are more reliable and cheaper, it is hard to maintain and obtain spare parts for the older instruments. The transfer of technology in the field of instrumentation is very complicated and slow. Some short cuts and a consistent policy must be formed to solve this problem. Some important phases in instrumentation are:

(1) Research and Development

Research and development in the field of instrumentation and process control has not been well established in Indonesia. Some research institutes such as LIN and others have already begun R&D in this field, especially in the adaptation of instrumentation that is suitable for the Indonesian condition and climate. As we know, R&D in process technology and control can be carried out as an integrated process and coordinated by research institutes, universities, and industries. Usually industries agree with and appreciate this alternative, because this will help to lighten their problems. The result will also be used as a source of information for industries and training centers.

(2) Repair and Maintenance

It is a must that every instrument manufacturer has its own representative in Indonesia. What usually happens is that there are representatives or sole-agents in Indonesia, but they do not offer an after-sales service. In general, research institutes in Indonesia do not have the ability to repair and maintain their instruments. In this case LIN can help them a little.

So far, the maintenance of instruments and process control in industries are done by their own technicians or operators in their spare time. The problem is the lack of experienced and qualified technicians.

Changing spare parts and/or instruments is usually done from the stocks that are available, but sometimes they must be ordered from abroad. Purchasing usually takes more than three months. Fortunately, some spare parts can be made by technicians. It is a necessity to have a center for repair and maintenance that is capable of helping industries or research institutes which do not have the facility and want more efficiency in their work.

(3) Information

Based on former experience, information in the field of instrumentation can be included in the science information network. LIN has already begun preparing documentation and giving information services in the field of instrumentation.

(4) Installation

In general, installation is done by a foreign construction organization or by instrumentation manufacturers. Considering that instrumentation costs are very high for a factory (for a modern industry up to 25 percent), we can profit greatly if Indonesian resources and experts are used. As an example, an installation can be done by Indonesian people and from this experience the design of a new system can be carried out.

(5) Calibration

The old and the new industries and also research institutes need to calibrate their instruments to make sure that they are still reliable. In this case, the Indonesian situation is far from satisfactory. There is no place or channel which can act as a national calibration center. Only a few instruments which have a connection with aviation are calibrated abroad.

In Indonesia there is no institute yet with a national status which is responsible for metrology calibration as a whole. The activities of LIN are limited to filling this gap and to administering the inventory. There are some research institutes which have their own calibration facilities, such as: BATAN (Research Institute for Atomic Energy) for atomic radiation; LMK (Power Research Institute) for electrical quantities; Metal Industries Development Center for engineering metrology; LIN for physical quantities such as temperature, pressure, electrical quantities, acoustics, etc.; Post and Telecommunication Research Institute for frequency; PINDAD (The Army Mechanical Industry) for engineering metrology; the Institute of Technology, Bandung; etc.

In 1976 and at the beginning of 1977, LIN began to publish a kind of directory which contains the calibration facilities owned by a research institute or industries and the services they offer. The directories that have been published are for the National Institute for Instrumentation and for the Institute of Technology of Bandung. At the moment we are preparing directories for other institutes.

Jawatan Metrology (Office of Metrology) under the Department of Trade is responsible for legal metrology for weights and measures and also calibration metrology which is connected with consumers, e.g., balances and container volumes, but no other physical measurements. In international relations, Jawatan Metrology represents Indonesia in the General Conference on Weights and Measures (CGPM) which owns the laboratory, "International Bureau of Weights and Measures (BIPM)," in Sevres, France. Nearly all countries in the world are members of CGPM.

(6) Manpower in Instrumentation

Up till now, manpower in the field of instrumentation is very small, maybe less than 200 personnel. There is always a demand for instrumentation technicians. From newspaper ads we frequently read requests for instrumentation technicians, especially from LIN. Another indication showing that manpower in the field of instrumentation is far from enough can be seen from the information gathered by LIN. A lot of institutes own instruments that are not suitable to their needs, unrepaired instruments, and others.

From the data collected, it can be seen that in the field of instrumentation the most urgent requirements of instrument personnel are:

(a) Capability and know-how in process control systems.
(b) Ability to repair and maintain instruments/equipment.

Training and education in the field of instrumentation are really musts. By training we can fill the existing gaps. It can be carried out by formal or non-formal education, academic training, or short courses.

The development of instrumentation manpower is still difficult, since there are not many institutes involved in such training. In this field, LIN is giving a small contribution to meet the need for qualified instrument technicians by carrying out instrument technician training.

From the former discussion, we can see that the infrastructure of instrumentation is still far from satisfactory, and the instrumentation problems cannot be managed by a single body only; they must be worked out and solved as an integral problem.

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c. COMMENTS BY THE VISITING TEAM:

We agree. Results of the present survey support all of these conclusions.

MINUTES FROM THE KIM MEETING SEPTEMBER 1975

The participants in the meeting, 8-9 September, 1975, were divided into three working groups or discussion groups dealing with the following subjects:

(1) The National Calibration Committee
(2) The Network of the Calibration Centers
(3) The needs of the market for calibration

The conclusions from the three groups were found to contain no contradictions and were finally discussed in plenum and unanimously approved:

I. THE WORKING GROUP FOR THE NATIONAL CALIBRATION COMMITTEE

(1) A network of National Calibration is considered necessary for Indonesia: a National Calibration Committee should be created with the task of investigating how a calibration organization can best improve the situation for the customer.

(2) It is a characteristic of the Network that it only has a coordinating function without altering the status of the member institutions.

(3) An initial committee is needed to care for the formation of the National Calibration Committee; the latter will consist of members from:

a) National Institute for Instrumentation
b) National Atomic Energy Institute
c) Universities
d) Directorate for Metrology (Legal Metrology)
e) Calibration unit in the Ministry of Defense.

It is suggested that the members of the Initial Committee should be selected from among those living in Bandung to facilitate communications and the work. The initial committee is expected to finalize its task before the end of 1975.

(4) The National Calibration Committee should consist of representatives of Institutes having calibration facilities and of the users, the customers.

(5) The duties of the National Calibration Committee are the

following:

a) To establish contact with other research institutions, with industry and with the sector of education which is related to calibration subjects.

b) To prepare the budget for the National Calibration Network.

c) To establish the National Calibration Network.

d) To care for education related to calibration.

(6) As long as KIM is still a project, the National Calibration Committee should assume the responsibility for it, towards LIN/LIPI and the Ministry of Research, and consider the steps to be taken in the future.

(7) LIN is charged with the responsibility for the secretariat and the administration of KIM.

II. THE WORKING GROUP ON THE NETWORK OF CALIBRATION CENTERS

(1) Some ideas which came out of the discussions:

a) A Network for calibration is much needed.
b) The Network should be made up of institutes which already have calibration facilities.
c) The institutes' equipment for calibration may be different.
d) The institutes should be checked on their willingness to join the Network.

(2) The first step will be to create a committee called the National Calibration Board (in fact, the same as the National Calibration Committee mentioned above); its secretariat will be with LIN.

The task of the committee was suggested to be as follows:

a) Thinking how to strengthen the potential of the Calibration Centers.

b) Solving the level of accuracy.

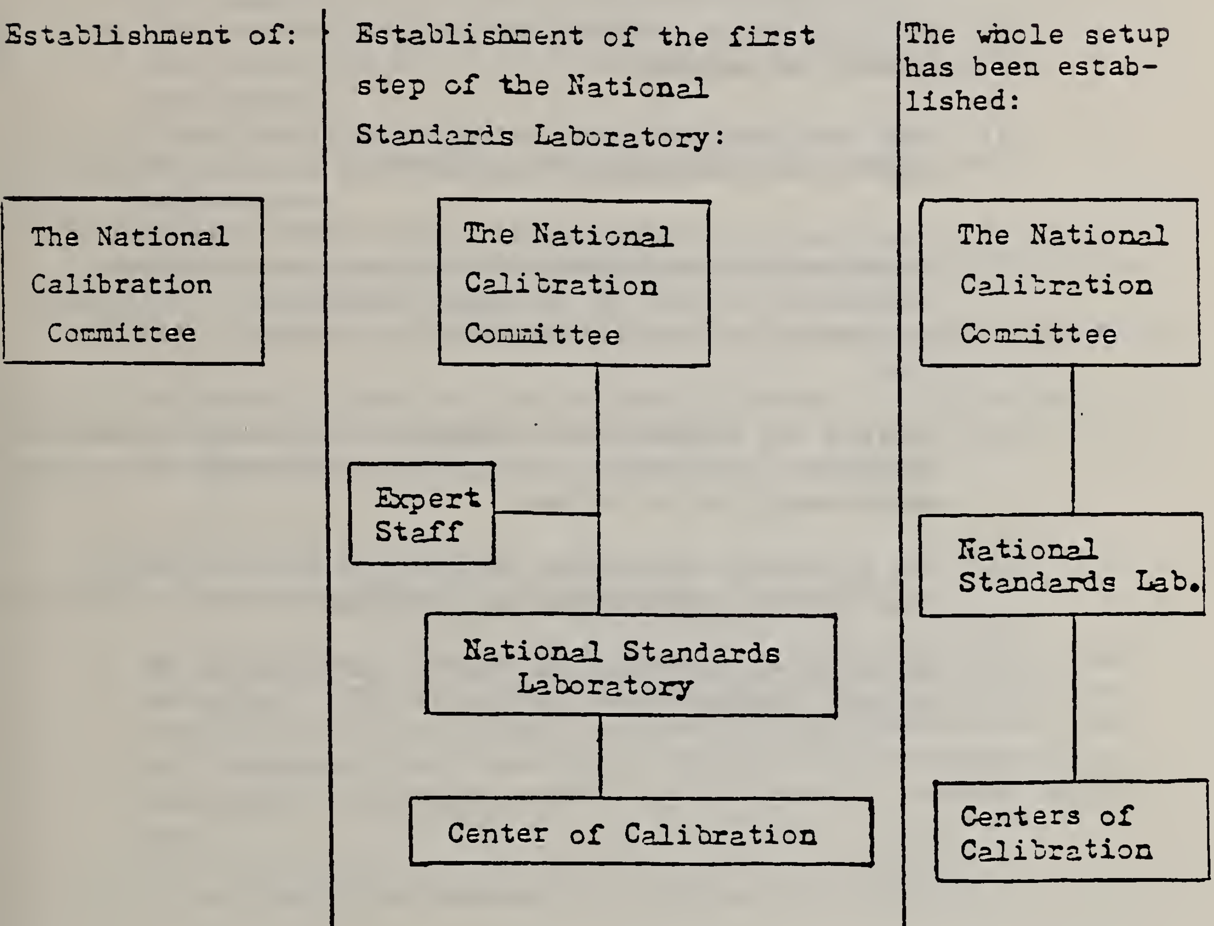
c) Determining which consensus standards are being used in Indonesia and how to establish a certificate System for the Center of Calibration.

d) Asking each institute to participate in the Network of Calibration.

e) To publish the directory giving information on the ability of the Centers of Calibration.

f) To make a concept (draft) for the establishment of the National Standards Laboratory.

g) Proposed the block diagram as follows:



III. THE PROBLEM OF THE CUSTOMERS WHO NEED CALIBRATION

(1) In the discussion it was determined that the customers who need calibration are: industry, trade, research, military purposes, communication, education, health, work safety, etc.

(2) The usage, ability, service of calibration which is needed by the customer are as yet still unknown; therefore, it was suggested to carry out a survey to find out the calibration necessities.

(3) To manage the calibration activities, the following tasks have been suggested:

a) It is good to have a National Calibration Committee.

b) Insist that the government make official regulations in calibration.

c) The calibration problem that already exists must be studied and solved.

d) Both the government and private institutes have to improve the awareness of calibration on a large scale.

e) There must be collaboration with overseas calibration laboratories about "inter-laboratory checking" and "traceability" and to exchange experiences. This will be carried out by the Committee on National Calibration.

f) Solving the certificate problem is necessary so that authority, regulation, trust, and the ability of measurement can be solved.

g) The directory concerning calibration must be easily read and the information must be distributed.

h) Calibration laboratories must be established in several places.

THE CONCLUSION OF FIRST INSTRUMENTATION SEMINAR 8-9 JANUARY, 1976

I. INTRODUCTION

To become conscious that there are weaknesses in instrumentation infrastructure in Indonesia:

- the process of technology transfers in the field of instrumentation is very complicated and slow.

- the limited capability of instrumentation research and development.

- the limited capability of instrumentation repair and maintenance.

- the limited number of instrumentation personnel in Indonesia.

- there are no technical information services on instrumentation.

It is a necessity to back up the National Program on Calibration, Instrumentation, and Metrology by organizing the First Instrumentation Seminar in Indonesia.

II. THE OBJECTIVES

The objectives of the First Instrumentation Seminar are:

- to support the Program of Calibration, Instrumentation, and Metrology (KIM) by giving adequate data and information on Indonesia which is closely related to instrumentation, such as: manpower, instrumentation research and development in Indonesia, instrument repair and maintenance, system design, etc.

- to exchange instrumentation technical information.

- to improve relations among personnel who are concerned with or using instrumentation.

III. THE IMPLEMENTATION

The seminar was organized by the Academy of Instrumentation (National Institute for Instrumentation) from 8-9 January, 1976, at Bandung.

The seven papers which were discussed included:

- research and development
- industry
- manpower

The number of participants was 92, from research institutes, industries, importers, universities, and the army, from all over Indonesia.

IV. CONCLUSION

The first Instrumentation Seminar concludes that it is a necessity to have:

(1) Guidance concerning the role of instrumentation in improving industrial products and improving the quality of research and development at the research institutes.

(2) Instrumentation training in the form of formal and non-formal education.

(3) Use of Bahasa Indonesia (Indonesian) in instrumentation science and technical information.

(4) Government action to encourage and to maintain the growth of instrumentation repair and maintenance activities.

(5) Improvement in the after-sales service of instrument importers/agencies in Indonesia, which includes the availability of spare parts.

(6) In instrumentation technical information network, so that updated information can be obtained and a problem solving method in instrumentation be determined.

(7) In institute which has the right to manage instrument calibration with enforcement by law.

(8) Very good cooperation between the private companies and government institutes in instrumentation design and installation in Indonesia, so all instrumentation design and installation can be carried out by Indonesian personnel.

(9) In interdisciplinary/interdepartmental research and development of instruments which suit Indonesian conditions.

(10) In organization for personnel who are involved with instrumentation, which includes instrument design, installation and maintenance, and the utilization of instrumentation systems.

(11) A body that will control domestic made instruments and test the imported instruments' quality complete with data.

THE CONCLUSION OF THE FIRST INSTRUMENTATION AND PROCESS CONTROL SEMINAR BANDUNG, 29-30 MARCH, 1976

The conclusion can be divided into three main points, namely:

I. Instrumentation and process control problems in industry.

II. National capability development in the field of instrumentation and process control.

III. Framework for cooperation and communication.

I. INSTRUMENTATION AND PROCESS CONTROL PROBLEMS IN INDUSTRY

The problems that can be put forward are as follows:

I.1. Difficulties in obtaining spare parts which cannot be produced in Indonesia yet.

I.2. Difficulties in selecting the instruments which are suitable to Indonesian conditions, i.e.:

I.2.1. which conform to safety regulations.

I.2.2. which can be maintained and repaired in Indonesia.

I.2.3. which can be easily operated by Indonesian personnel.

I.3. There are no national standards and uniformity in measurement unit terminology yet.

I.4. There is no national calibration network yet.

II. NATIONAL CAPABILITY DEVELOPMENT IN THE FIELD OF INSTRUMENTATION AND PROCESS CONTROL

For this program, the following can be developed:

II.1. The setting up of a Post Graduate Program at Universities soon, with cooperation between research institutes and industries.

II.2. Improvement in the cooperation program between universities, research institutes, and industries, especially in the form of problem and experience exchanges:

II.2.1. The lecturer and the research worker work in industry for a certain period.

II.2.2. To improve and guide a student practical program in industry.

II.2.3. To improve the short-term training program at universities for industrial technicians.

II.3. To improve training programs which are organized by industries with the same problems.

II.4. To improve the personnel exchange program among universities, research institutes, and industries in foreign countries.

II.5. To improve technician training in the field of instrumentation and process control.

II.6. In purchasing instruments, it must be a regulation for a supplier to give training about the instruments. This must be properly controlled.

II.7. The program of Calibration, Instrumentation, and Metrology must be implemented soon.

III. THE FRAMEWORK OF COOPERATION AND COMMUNICATION

To develop cooperation and communication between universities, research institutes, and industries, it is suggested that the Work-group on Dynamics and Process Control, Institute of Technology of Bandung, National Institute for Instrumentation, other agents, and industries, should in a cooperative effort:

III.1. Establish a communications organization.

III.2. Publish a communications media such as a bulletin/journal.

III.3. Prepare the second Seminar of Instrumentation and Process Control, with a detailed program, especially concerning communications, organization, and training.

III.4. Make an inventory of the personnel, institutes, and agents working on instrumentation and process control.

III.F.3. NATIONAL CALIBRATION, INSTRUMENTATION, METROLOGY SYSTEM

By

Herudi Kartowisastro
Director, National Institute for Instrumentation

a. INTRODUCTION

One of the key national research programs under the direction of the Minister of State for Research, within the framework of the second five-year plan, 1974-1979, is the development of a national system for Calibration, Instrumentation, and Metrology (KIM). In this respect the Indonesian Institute of Sciences (LIPI) will act as a center for systems management in cooperation with the other institutes concerned. The execution of this project is the responsibility of the National Institute for Instrumentation (LIN). This is a great challenge which will need the full effort and attention of all of us.

We know the techno-economical aspects of these activities and I am not going to put them forward again in this paper. I will mainly stress the goal, the approach, the constraints, and some background information needed to understand more clearly.

Even though there are in other countries models to solve the problem, I am sure they cannot be transferred directly; adaptation is needed to suit the situation and environment in Indonesia. This survey is an opportunity to discuss in depth the KIM approach with you. And I do hope positive and practical results will result so as to strengthen the measurement system in Indonesia.

I am sure certain conditions are needed when we implement the system and maybe there will be some sacrifices, but one thing we must be sure about is that the incidence of costs and benefits must be on the positive side. To achieve favorable conditions new inputs are needed; of course, the government will provide the main portion and we expect industry will help.

There is no doubt that technical assistance, soft-ware and hard-ware, will speed up the process of effective measurement services in this country.

b. CALIBRATION, INSTRUMENTATION, AND METROLOGY (KIM) PROJECT

The project is not to be taken in the limited sense as stated in the title of the project. We have to understand it in the broader sense, which includes soft-ware and hard-ware inputs, the management system, the centers, the users, the means of enforcement, the dissemination of information, training, the skills and know-how, and the technology. A project to establish a National Measurement System can be described according to the NBS definition, as all of the activities and mechanisms that provide physical measurement data to allow the creation of the objective, quantitative knowledge required by our society. Of course, instrumentation and its technology must be included.

We define the project clearly as K, I, and M with the purpose that the approach and the implementation of each activity can be programmed more specifically.

For Calibration we will stress the setting up a network, strengthening the existing facilities, and communicating to the users. The Calibration matters have been discussed in depth in the last KIM-75 Meeting, which is distributed to you (see section III.F.2, annex 1).

Instrumentation and metrology are not only the technology itself but also maintenance and serviceability, information, formal and non-formal training, skills and know-how, and the dissemination effort. The assistance and promotion of the establishment of instrument industries in this country is included.

You cannot neglect the importance of social awareness, especially to people who are indirectly or directly involved in KIM decisions, like top managers in industries, planners, designers, technicians, supervisors, etc. They have to know the KIM impact on their productivity.

c. THE PRESENT STATE INFRASTRUCTURE

The first five year plan started in 1969 and the government invited foreign, joint-venture, and private companies to invest their capital in industry and other sectors. And also the government-owned state companies have made new investments and supported rehabilitation. It is quite clear that at that moment the awareness and the necessity of KIM was not felt. I think the main reason is that for two decades (1951-1969) no meaningful investment had been made.

Even though there are laboratories with capability in various classes of measurement, the level of skill in measurement and the accuracy of the equipment across the entire spectrum of precision measurement is very uneven, and in some classes of measurement, there are no precision measurement facilities at all.

Each organization provides what it requires for its own purposes, without regard for the needs of other groups who might also have a need for precision measurement in that field. There is no coordination on the basis of national needs.

This abrupt change has created a new KIM pattern, which can be divided as follows:

(1) Foreign and Joint venture investment.
(2) New private and government investment.
(3) Rehabilitation.
(4) Small-scale industry.

We have to keep in mind that these pattern changes have also created certain consequences that have never arisen before.

The foreign and joint-venture companies for their KIM activities could depend on their mother organizations abroad. Of course, this has a direct influence on our balance of payments.

The Government and new private investment industries do not show any concern at the beginning when the equipment is still new, but after a while the lack of KIM capability is felt, mostly in the field of skill and know-how of their technical personnel.

In rehabilitation projects, KIM is directly felt and sometimes it influences their bargaining position. This direct impact has already been shown in the slowness of the rehabilitation process.

Much attention has never been given to small-scale industries, although we know only limited KIM activities are actually involved, but this sector absorbs the largest employment and no doubt KIM activities could give substantial meaning to their productivity.

The same problems arise at most technical schools, universities, and R&D institutions.

d. KIM AND THE NATIONAL DEVELOPMENT PLAN

The KIM system cannot exist and develop separately from the state of industry, and it must be synchronized with the industrialization program.

KIM activity in the National Development program is expected to take an active part in the agriculture sector, heavy industry, the chemical industry, the mining industry, and even small-scale industry. From the KIM side, we can divide the activities into three groups:

(1) Agriculture and agriculture-based industries.
(2) Chemical and mining industries.
(3) Heavy and mechanical-based industries.

During the last several years, it seems that KIM support is not sufficient and even cannot be synchronized with industrial development. If the KIM development continues at the present rate, the gap will widen and it will be very difficult to close it. We have to say that the progress of KIM activities is not very spectacular at the moment, because the awareness of KIM is not yet there.

The "growth centers" policy of the Government means that industrialization will be centered in Jakarta, Surabaya, Ujung Pandang, and Medan. This will influence KIM, which will have to concentrate its activities in and stress these regions. Geographically these locations are scattered at great distances.

e. THE KIM APPROACH

The answer to the problems of this project is a specific one and has to match the situation and environmental conditions, but it must still be a practical one, where new inputs can take a lead in speeding up the process. Comparative studies of models from other countries will be very valuable, and we could learn to avoid the mistakes they have made.

There is no doubt that the initiative for this project must come from the government side, since in developing countries like Indonesia, it is impossible to leave it to the users. The government has to take the lead and give full support; it is called a "push effort." This will create a multiplying effect on the users, who will engage in a "pull effort." I am sure we all agree that the "pull effort" cannot happen by itself. This means that government has to provide substantial support and also a budget so that the impact can be felt nationally.

As I mentioned earlier, the creation of an effective National KIM system is a process. The process itself must be programmed in such a way that the active participation of all concerned will occur. This approach is taken mainly because the KIM resources we have are limited, whether it is manpower or precision equipment.

The KIM short-term program will stress:

(1) Broadening the awareness of KIM,
(2) Setting up a National Calibration Network,
(3) Manpower development, and
(4) Strengthening LIN capability.

The awakening of awareness of KIM is the first necessary step to establish the national KIM system; this effort must be concentrated first on the group who are directly involved in KIM activities. All available media, the newspapers, professional organizations' technical newsletters, TV, and radio can be very valuable tools for dissemination of information. For example, we have just held a two days' course on KIM activities given to the press people, which was attended by 19 journalists. Continuous contact by distributing KIM information to society is another effort that we have taken. By this approach, "pull" action hopefully will happen.

The formation of a National Calibration Network is another step that has to be taken to create a service system for Calibration (see KIM-75

Meeting Report, annex 1 to paper III.F.2). There are still barriers to overcome, but it seems quite promising. We hope that a National Calibration Committee can be established in the coming months. The executive committee and the secretariat will be run by and located at LIN.

Manpower development is another effort needed to meet the demand originating from industry and R&D institutions. Most is effected by short courses or training through the formal education institutions, such as ITB, or through some R&D institutions, such as MIDC and LIN. Even private companies and instrument manufacturers have taken part, and we are still urging that they should increase their efforts. We are now thinking of whether other methods are available to speed up the program, like programmable courses or packaged courses, on-the-job training, and we are even considering the use of a computer.

LIN as a center for systems management in cooperation with the other institutes concerned should have substantial KIM capability. As a center, this capability is essential since only then can real support to others be realized.

One of the important points is the management system to coordinate the network. Coordination activities will be centered also at LIN. Here once again this institute should have adequate management capability.

At the moment, the National Institute for Instrumentation (LIN) has certain capability as the embryonic center for Calibration, Instrumentation, and Metrology. However, new inputs are needed to strengthen LIN as a nucleus for the national system for Calibration, Instrumentation, and Metrology by expanding the available activities to lay down a base which later on will be developed into a National Calibration, Instrumentation, and Metrology center.

f. GOVERNMENT AND EXTERNAL INPUTS

The success of the system lies in the effort that has to be made by the Government through the institutions. We have to create a "push" to produce a multiplying effect so that a "pull" and spiral action will happen. To encourage this spiral action more rapidly, there must be a center and LIN will be the center. It means substantial capability must be there. All coordination and technical support must come from this center and government input is a must.

Using an approach that calls for total involvement, all institutes which have a certain KIM capability have to be supported, and here again LIN can take a leading role.

Besides government resources, we have tried to stimulate industry and its associations to support KIM activities, but I have to admit no positive results have emerged yet.

Technical assistance could play a very important role to strengthen the national KIM system, in the form of soft-ware and hard-ware, such as SRM, SRD, technical training, consultancy, etc.

I do hope this NBS-LIPI Survey on Standardization and Measurement Services can give guidance and maybe new methods to speed up the establishment of our national KIM system.

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g. COMMENTS BY THE VISITING TEAM

The comprehensive and clear presentation of the KIM system as it is operating and as it is planned impressed the visiting team members. Discussion of the relevant issues was lively and lasted throughout the Survey. In this report these discussions are reflected in the comments and conclusions in later sections. Suffice it here to emphasize that the team was immensely impressed by the existing technical comprehension and lively leadership in the KIM system given especially by the author of this paper.

III.F.4. CALIBRATION CENTER, ITS POTENTIAL IN SUPPORTING THE NATIONAL NETWORK ON CALIBRATION

By

Suwarno Wiryosimin

a. HISTORICAL BACKGROUND

In the process of development, particularly in this country, many activities in various fields such as agriculture, industry, mining, communications, and commerce which use instrumentation are rapidly increasing. The activities include research and development, production, and services. All good experimental and technological activities require reliable instruments and equipment. The reliability of such instruments and equipment should be checked periodically and continuously, using higher precision and accurate instruments. Therefore these kinds of services become a must.

Provisional results of surveys show a tendency in industries in this country to try to provide the best instruments that they can and then to base their production processes on those instruments for the rest of time. How can we rely on an instrument after a long extended period if we are not able to recheck or to recalibrate its quality or its performance? Is there still a meaning to "standardization" and "normalization" without having well-calibrated instruments?

Depending on their views on future needs or on their present own needs, some institutions have been developing facilities for calibration, or at least have been continuously developing know-how and capability towards calibration.

Lembaga Instrumentasi Nasional (National Institute for Instrumentation) has been developing and maintaining calibration facilities and capabilities for electricity, pressure, temperature, and humidity (KALIBRASI 1976, Lembaga Instrumentasi Nasional, LIPI).

Institut Teknologi Bandung (Institute of Technology Bandung) has been developing and maintaining a calibration facility and capability for industrial metrology (KALIBRASI 1976, Lembaga Instrumentasi Nasional, LIPI).

Badan Tenaga Atom Nasional (National Atomic Energy Agency) has a program to establish a secondary Standards Laboratory for radionuclides and dosimetry. There are many other institutions developing and maintaining their own calibration facilities such as various centers belonging to the Ministry of Communication, Ministry of Public Works and Electrical Energy, Ministry of Commerce, and some enterprises.

All those activities are mostly not coordinated, no interconnection, no intercalibration program, and sometimes are not well-known by outsiders or by potential users, who frequently need calibration services and advice. Unfortunately, these potential users do not know where to go and who to contact.

The above said situations give stimulus to several people who are aware of the severe problem to think of having a National Authority on Calibration and Standardization, having a National Reference Laboratory for the purpose of Calibration.

The possibilities of using the present facilities or laboratories for establishing a coordinated Network on Calibration has been thought about. Efforts on realizing those thoughts have been made for several years. LIPI has the task in coordinating the efforts. Surveys, scientific discussions, and contacting various people and institutions have been done since then.

b. PROPOSED CALIBRATION CHAIN

All activities on Calibration should be coordinated nationally. Procedures, qualification, and classification should be approved. Certification should be issued by the highest authority, the so-called National Committee on Calibration (N.C.C.). The Committee will be backed by the National Reference Laboratory which might be Primary Level internationally or might be Secondary Level. The Reference Laboratory may issue certificates on behalf of the N.C.C. The Reference Laboratory can be managed and owned by various institutions, but always acts on behalf of the N.C.C. The technical standards of the Reference Laboratory will be maintained through international comparison. Lower level laboratories, which might be operated by various institutions, can be classified as Calibration Centers. They are technically supervised by the National Reference Laboratory (NRL) and should be responsible to the NRL. They are allowed to give calibration services to others and to issue certificates on behalf of the N.C.C.

Still lower level calibration facilities owned by various institutions or manufacturers should be used only for their own needs. This type of facility (called Calibration Facility or C.F.) is not authorized to issue calibration certificates.

The national network on calibration should consist of all those types of calibration facilities, though with different responsibility and authority.

c. APPROACHING THE NATIONAL NETWORK ON CALIBRATION

Sooner or later, the National Network on Calibration should be established. The problem is when and how. There is no doubt among us, no matter where they belong, whether they are in research institutes, manufacturing industries, hospitals, public utilities institutions, etc., that the calibration services should be made available now.

Safety instruments should be well and properly calibrated. Manometers and thermometers are examples of safety instruments for large industrial installations. Radiological measuring instruments are examples of safety instruments in radiotherapy, nuclear installations, etc. Quality control instruments should also be well and properly calibrated. The quality of end products is dependent on the accuracy of measurements during the production process. Weight, length, and volume are very essential for commercial activities. It should be well-defined and measuring instruments should be properly calibrated.

How should we start the coordinated calibration services or so-called starting the network on calibration? From the survey made by the Committee on Calibration, Instrumentation, and Metrology, differences have been noticed in quality, purpose, and planning for future developments among the calibration facilities available presently. It will be very difficult to evaluate from so many calibration facilities. It is recommended to start to appoint one or two laboratories as Calibration Center or even push one or two of them to become a Reference Laboratory. It can be done only if the Committee on Calibration (N.C.C.) has already been established. Later on, other calibration facilities which are interested in joining the network can be appointed after being evaluated technically. For those who are not appointed for the first time, there is no need to worry, because it is just an action to start for entering to a bigger action.

d. CONCLUSION

It can be concluded with a very straight-forward approach.

(1) The needs are there.

(2) The calibration facilities with a potential to serve others are also there.

(3) The national program on standardization and calibration has been issued.

(4) Why don't we start now by standing in a queue to reach the N.C.C. counter?

e. COMMENTS BY THE VISITING TEAM

(1) We are concerned about the emphasis on calibration and lack of acknowledgement about the needs for measurement capability verification or measurement assurance, needs which usually will require calibration capabilities but which are not in any sense satisfied with certainty by providing calibrations alone.

(2) Having the "National Reference Laboratory" "always" act on behalf of the "National Calibration Committee" does not seem consistent with other proposals put forth, and seems to us inappropriate. It appears to us that the National Reference Laboratory has the primary responsibility for issuing or authorizing certificates, not the National Calibration Committee. The Committee would seem to be an advisory, not an executive agency. The issue is: Is the National Reference Laboratory expected to take orders from the Committee, or simply to receive advice?

(3) We agree with the basic thrust of the paper.

III.F.5. ENGINEERING METROLOGY IN INDONESIA

By

Palgunadi T. Setiawan
Komando Perindustrian Angkatan Darat

a. INTRODUCTION

This is a presentation of ideas on some fundamental problems of the application of engineering metrology in Indonesia. I hope to spark further discussion on the matter, more specifically for the application of metrology in the field of the metal and machinery industry, as well as to give a broader picture of the role of engineering metrology, since it is less understood in practice compared to legal metrology which has been commonly used in commerce and trade.

b. THE MEANING OF MEASUREMENT

Metrology is the science of measurement.

Measurement is the language of science.

Language is used to communicate about size, quantity, position, condition, and time. Measurement is the process used to answer the questions how many and how much. The information sought by the measurement process is always a comparison of the measurand with a reference quantity of the same kind known as a standard.

With measurement as a language, people:

- innovate
- make things
- communicate with others scientifically.

All these are fundamental factors that make development possible.

"Whenever man has developed civilization, he has invented a measuring system."

c. MEASUREMENT PROCESS

Measurement begins with the definition of a quantity, condition, property, or other characteristic that is to be determined.

The definition of measurables may be conceptual or operational.

If conceptual, they must be converted to operational definitions in preparation for measurement.

That is, they must be defined in terms of the sequence of steps or operations that describe a procedure for accomplishing the measurement.

The measuring instrument is an embodiment of these operational steps.

If the measurand is not fully defined, the measuring process becomes itself an essential part of the definition:

Hardness test
Octane number of gasoline

d. MEASURING INSTRUMENTS

Instruments used in the measurement process range from simple tools to large and complex systems, from the meter or yardstick to the instrument systems used in the launch and control of a space vehicle.

We will limit this presentation, as mentioned before, to that of dimensional measurement used in the metal and machinery industry (here in Indonesia).

Classification of measuring instruments:

Linear	Angular	Plane surface measurement
Steel rule	Combination set	Level
Caliper	Bevel protractor	Straightedge
Divider	Sine bar	Surface gauge
Micrometer	Square	Vernier height gauge
Vernier caliper	Dividing head	Profilometer
Depth gauge	Adjustable	Optical flat
Vernier height gauge		
Surface gauge		
Telescoping gauge		

	Fixed	Adjustable
	Ring gauge	Micrometer
	Plug gauge	Caliper
	Feeler gauge	Surface gauge
	Steel scale	Vernier height gauge
	Gage blocks	Vernier caliper
	Optical flat	Telescoping gauge
	Thread-pitch gauge	Depth gauge
	Leaf gauge	Dial indicator
	Flush pin gauge	Bevel protractor

Direct reading	Indirect reading	Nonreading
Micrometer	Divider	Plug gauge
Vernier caliper	Caliper	Ring gauge
Vernier height gauge	Surface gauge	Snap gauge
Bevel protractor	Sine bar	Flush pin gauge
Dial gauge	Planer gauge	Electrolimit gauge
	Telescoping gauge	Air gauge
		Optical flat

Ultimate measuring instruments	
Gauge block	Use of high-frequency sound and light waves
Optical flat	Laser beam
Optical comparator	
Profilometer	
Microscope	

e. QUALITY AND RAISING OF PRODUCTIVITY

Raising productivity for the benefit of mankind is a legitimate aim for all of us. In Indonesia this is particularly true.

Raising productivity is linked with raising the quality level of the Industry.

One of the most important acquisitions of modern production methods is undoubtedly interchangeability, which makes mass production possible.

It can be stated that interchangeable manufacturing is a means of raising productivity and flexibility in production. It offers extensive possibilities for raising quality and improving quality control.

Maintaining high level quality, as in the case of the high precision products of Switzerland, is another example of how quality influences productivity.

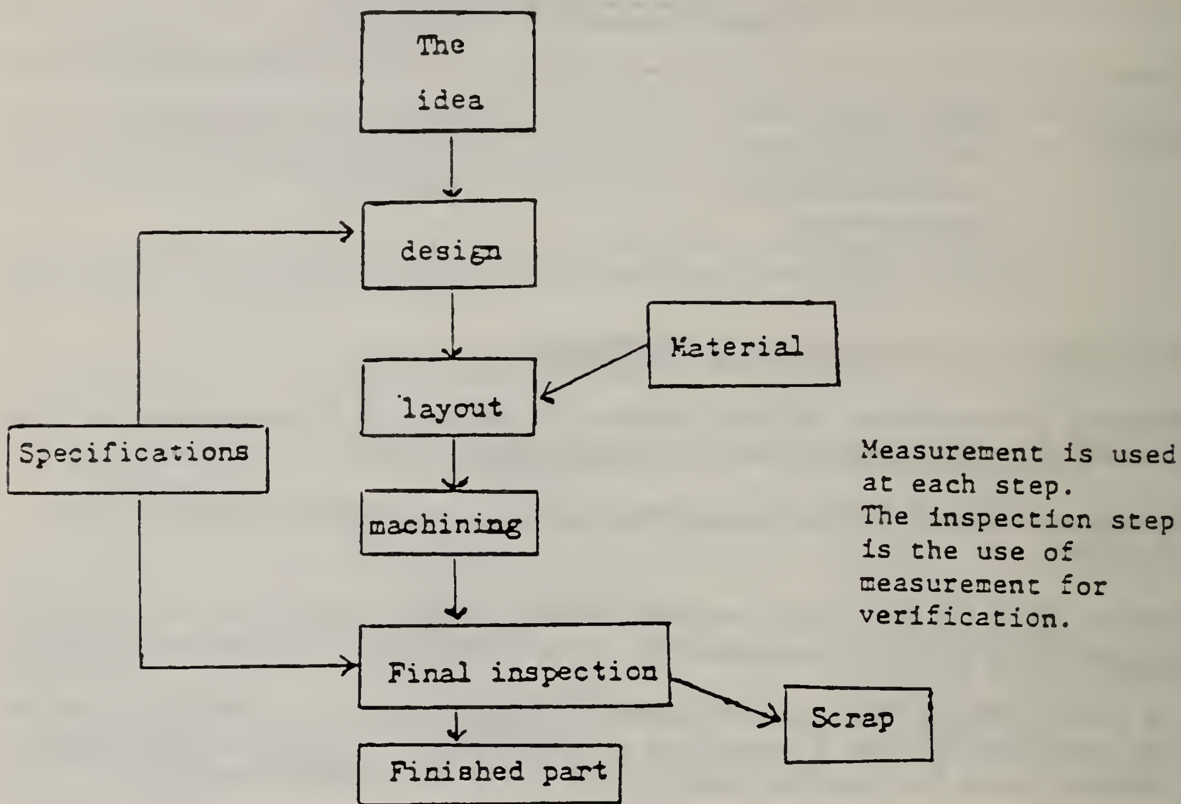
Indonesian experience has shown that poor quality products cause many problems and lead to higher costs, unnecessary wastage, and extra work.

f. MEASUREMENT AND QUALITY CONTROL

Quality can be defined as:

> "The quality of a product is the measure of agreement with the expectation of the customer."

In order to meet these expectations, the product has first to be designed according to a fair specification of the customers' requirements and then it has to be manufactured according to that specification. And when it is finished, it has to be checked for its agreement with the specification. Measurement is needed and used in each step of that process. Quality has to be built into the product by using those measurements.



g. ACCURACY, PRECISION, AND RELIABILITY

With measurement we can make more accurate interchangeable products or parts, and that is possible because of the use of reliable instruments in quality control. We can make more sophisticated products because we can manufacture more precise parts.

In measurement we must consider widely different sizes. If we are talking about one thousandth of a millimeter to one meter, which is commonly found in the precision industry, it is the same as one meter to the distance between Jakarta and Denpasar in Bali.

Here it is most important that the meanings of accuracy, precision, and reliability are clearly understood. In practice the terms are often misused.

Measurement shows the deviation from perfection. The measured conformity in relation to the dimension is the accuracy.

The refinement with which this can be calculated is the precision. The effect of accuracy and precision on attaining the desired results is reliability.

Precision is essential for reliability but alone cannot produce it. Increased reliability requires increased accuracy, and that requires increased precision.

TERMINOLOGY*

	PRECISION	ACCURACY	RELIABILITY
General meanings:	Exactness Degree of exactitude	Desirability	Probability of achieving desired results
Measures:	Fineness of readings	Ratio of correct to incorrect readings	Probability of correct readings
Method of stating:	Within a 3-inch circle plus or minus one thousandth inch	5 out of 10 50 percent of full scale	90 percent reliable
Specific meaning:	The lower the standard deviation of measurement, the higher the precision.	The number of measurements within a specified standard as compared to those outside.	The probability of performing without failure a specific function under given conditions for a specified period of time.

*Juran, J. M., Quality Control Handbook, New York McGraw-Hill Book Co., 1962, 2nd edition, pp. 9-4 and 13-5.

h. PROBLEMS WE FACE

(1) From the political, economical, and social viewpoint, in accordance with the strategy of the development of the country, interchangeable parts and products have to be manufactured evenly throughout the vast area of the country.

(2) Industrial areas will then be geographically separated which needs a good communication system in all aspects, including measurement as the basic language of communication.

(3) Engineering metrology, as a science, gives the "grammar" of measurement as a language. As a technique, it gives the practice for mastering the "art" of the composition of that language.

(4) Having a good language to communicate means that productivity can be raised through production methods and quality.

(5) It is essential that the whole system of that language is always maintained and developed.

And from this aspect, what we are doing here during these few days is very important. Therefore, it is a great honor and pleasure to speak in front of you today. Thank you.

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i. COMMENTS BY THE VISITING TEAM

An excellent, very thoughtful paper, portraying an innovative and refreshing outlook. The visiting team regretted that its members did not include a specialist in dimensional metrology who could follow up and comment in some more detail on many of the questions raised.

III.G.1. STANDARDIZATION OF METALS AND MACHINERY IN INDONESIA

By

Harsono Wirjosumarto
Chairman, Division Council on Metals
and Machinery

a. PRESENT SITUATION

(1) Product Standardization

Standards and standardization have been used more or less by most metal and machine industries in Indonesia, especially by those which are working with foreign companies. Since Indonesia does not have its own standards system yet, industries use foreign standards for their products, performance, and work. The standards which are used depend on those applied in the country which is ordering the commodity. In this way, standards and standardization systems from foreign countries such as the United States (SAE, ASTM, API), the Netherlands (NEN), Germany (DIN), Japan (JIS), and other countries have been introduced into Indonesia.

Difficulties may arise, however, when the customer in ordering does not specify any standard. When this happens, the manufacturer usually tries to work according to a certain standard as far as possible. But if the raw materials, machinery, and equipment do not allow this, then they start to modify the intended standards. This situation is worse for small, home industries which are usually producing non-standard products.

(2) Government Enforcement on Standards

As has been mentioned above, the working standards in Indonesia are foreign standards. Many standards concerned with public needs and safety are enforced by the government through government regulations. Since Indonesia does not yet have a national standards system, the basis for the enforcement is still a problem. Many standards which have been enforced have to be reassessed to meet modern technology. The absence of a national system of standardization has caused some misunderstanding, disputes, and frustation among the producers, users, and the government inspectors.

(3) The Demand for a National Standards System

Most producers, consumers, professional, and industrial organizations are aware that standards are urgently needed, and they have launched a demand for a National Standards System. In fact, the government has also realized the need for standards. It can be seen from the government organization in which "a division of standardization" has been established in almost every department. Unfortunately, there is still a lack of coordination and information among those departmental sections which are involved in standardization. This situation can be considered as a drawback in the government's attempt at standardization, which hinders any standardization activity. In order to improve this situation, the Government should take steps to establish a National Body for Standardization; otherwise, the situation will worsen.

b. THE COMMISSION FOR METALS AND MACHINERY

(1) Standardization Project

The Government has been aware of the above mentioned problems, and a project on standardization has been in operation since 1974. The Indonesian Institute of Sciences (LIPI) was appointed to handle the project. The first and foremost task of the project is naturally to evolve the concepts for a national standardization system. As a starting point, a number of commissions have been formed by LIPI, one of which is the "Commission for Metals and Machinery."

(2) The Working Scope of the Commission for Metals and Machinery

The relation between metals and machinery is very close, and the present situation of both fields in Indonesia is in the developmental stage, so that the problems of both fields can be handled by one body called "the Commission for Metals and Machinery." The working scope of the Commission for Metals and Machinery involves all problems concerning metals and machinery. Regarding the present situation, the Commission is expected to solve the problems which are on the border between metal and machinery, i.e., engineering drawing, material specification, fits and tolerance, etc. It has been considered that if industrialization in Indonesia develops further, the Commission will be split up into two commissions, one for metals and one for machinery.

(3) The Working Program of the Commission

In accordance with the decree established by the Standardization Project, the working program of the Commission involves:

(a) Carrying out inventorization of standards and standardization in metals and machinery.

(b) Studying the needs and priorities of standardization in these fields.

(c) Determining priorities and guidelines for executing of working programs in these fields.

(d) Proposing and administering the formation of technical committees, and then guiding and coordinating their activities.

(e) Evaluating, revising, and distributing the concepts of standards made by the technical committees.

(f) Carrying out other activities which are relevant to the problem of standardization in the field of metals and machinery.

c. EXECUTION OF THE WORKING PROGRAM

(1) Formulation of Standards

A draft standard is worked out or formulated by a Technical Committee or Technical Group. This draft is then discussed, assessed, and revised by the Commission for Metals and Machinery and then discussed in a seminar attended by consumers, producers, association members, and Government personnel. After having passed the seminar stage, the concept is then rearranged and reformulated by the Technical Committee (Group) and the Commission to a form called "standard." This standard is then distributed to the concerned communities. After a certain period of time for feedback (if any), the standard is published, circulated, and regarded as a National Standard.

(2) Priorities

Based on the urgent needs and present condition, the Commission has determined the priority of problems to be handled; they are: unit, dimension, material specification, engineering drawing, and testing.

(3) Technical Committee

A Technical Committee is formed by the Commission and its members consisting of a group of engineers or scientists, and its task is to formulate a concept of a standard in accordance with the priorities which have been laid down by the Commission.

(4) Drafts of Standards

Since 1975 the Commission has formulated three drafts of standards; they are: Tensile Strength Test of Metals, Design of Bolts and Nuts, and Engineering Drawing.

d. EVALUATION

(1) The Structure of the Commission

The members of the Commission consist of part-time people representing universities, producers, consumers, and research institutes. In that way, it is expected that the Commission will be able to obtain a general idea of the existing situation in Indonesia. The fact is that none of these members are involved completely in standardization in their institutions. This situation produces ineffective results because:

(a) Data is not available in their offices.

(b) The tasks of the Commission members are not parallel to or closely associated with their main tasks for their employers.

(c) Their time is limited.

(2) Working Program of the Commission

It was expected that a National Body for Standardization would be established immediately. The Commission considered that one of the tasks of this National Body would be drafting of standards. This idea led the Commission to form Technical Committees in order to produce drafts of standards. Another important aspect was that of convincing the community of the importance of standards by giving lectures and distributing information. What was most necessary is the "immediate establishment of a National Standardization Body" to coordinate and unite all standardization activities. From the above analysis, the Commission considered that efforts should be made by the Commission to strengthen the Standardization Project in order to realize the National Standards Body.

e. SOME PROPOSALS

(1) Structure of the Commission

In order to carry out the tasks as described in the Decree, the Commission proposed that this body should be equipped with a support service having full-time, capable administrative personnel. Further, the members of the Commission should be persons having official authority.

(2) Working Program

Based on the above analysis, for the working year of 1977 to 1978, the Commission proposed the following program:

(a) Supporting the Standardization Project in realizing a National Standards Body.

(b) Conducting inventorization of the existing standards and standardization in Indonesia.

(c) Selecting and determining fields of activities which are not tackled by industries, but which are important to standardization such as engineering drawing, fits and tolerances, etc.

(d) Promoting personnel capability.

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f. COMMENTS BY THE VISITING TEAM

The visiting team members were greatly impressed by the urgent need for standards development and dissemination in this industry when they were told of the Government's decision for all motorcar, truck, and engine parts to be manufactured in Indonesia by the mid 1980's. This is a most serious challenge to the domestic Indonesian technical community. It closely parallels the great advances in standardization and measurement services which were needed as essential infrastructure by the automotive industry in the United States. The team regretted that Indonesia had not requested a specialist in the field of dimensional and mechanical metrology to be included in this NBS team.

III.G.2. ELECTROTECHNICAL STANDARDIZATION

By

Prasodjo Soerjowidjojo
Chairman, Division Council on Electricity

a. PREFACE

Electrotechnical standardization activities in Indonesia represent a part of the development effort under the "Five-Year Development Plan." Having laid the basis which will enable development to be carried out, the Five-Year Development Plan has been framed to raise the standard of living and at the same time lay a solid foundation for national development in subsequent years. The plan takes into account present capability and keeps constantly in mind the perspective of long-term objectives. Our long-term objective is to build an economic structure in which agriculture, industry, and services are balanced. In order to attain this long-term objective the process of development takes place gradually. The development plan has been formulated using a realistic and pragmatic approach, based on the aspirations of the people.

In general, the strategy of development is to emphasize three strategic sectors, i.e., agriculture, industry, and mining, and their infrastructures. One of the infrastructures is the electric power supply. Electricity serves as one of the vital power resources in promoting economic activities and social welfare. Conversely, economic growth and the increase of prosperity require more power resources, particularly electricity. There is a mutually dependent relationship between the electric power supply and economic growth, so that it is important to plan thoughtfully for the improvement of the electric supply and to consider the effect of general economic development upon it. As a consequence of industrial development and reconstruction, it is clear that the need for an electric power supply increases; also, household articles utilizing electric power increase in number, too. In this industrial production context, there must be the guarantee or security of an electric power supply and there must be an established system. This system may be called the "National Electrotechnical System." Related to this national system is a "particular system" of electrotechnical goods, like prime movers, generator equipment, and a "network" (transmission and distribution lines), etc.

"Manpower" and "safety" are also particular systems in the above mentioned system. The prime movers, electric generators, and equipment, etc., must be guaranteed quality and construction. Also, safety is needed.

For the above developments, it is clear that standards are needed. The intent standards are the test standards (including acceptance, commissioning, maintenance, and operation test), construction standards, etc. The "manpower particular system" as a subsystem of the National Electrotechnical System (comprehensive) consists of these components:

(1) Producers
(2) Consumers
(3) Institutes of Education
(4) Government Institutes (as regulating bodies)
(5) Consultants
(6) Institutes of Sciences
(7) Research Institutes

As described above, the need for an electric power supply increases as a consequence of development and reconstruction; therefore, the community must be guaranteed this facility. Moreover, the community needs the ability to interchange the same parts of a product between different factories producing the same article, and therefore, construction standards are needed. Quality must also be similarly regulated. These standards are also necessary from the point of view of the producers.

The first Five-Year Development Plan is now completed, so there are new industries producing electrical equipment, articles, electric wire and cables, etc. All these considerations have induced the "electrotechnical community" in Indonesia to stress the need for standards. This may be done by improving the existing standard-systems or by designing a new electrotechnical standards system. Since 1973-74 a project for the establishment of a national standardization system has been established within the Indonesian Institutes of Sciences.

b. ELECTRIC POWER SUPPLY IN INDONESIA

This chapter will give a brief outline of the history, present condition, and the future picture of State Electricity Enterprise as a state-owned enterprise endowed with the authority and exclusive rights in the generation, transmission, and distribution of electric power throughout Indonesia.*

Before the Second World War, the electric power business in Indonesia was commercially managed by several privately owned Dutch power enterprises such as Aniem, Gebeo, and Ogem. The electric power supply was limited to the big cities through separated systems. Big industries and estates generated their own power supply. During the Japanese occupation period the enterprises were continued by the Japanese administration. After Indonesian Independence they were

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* The material is largely taken from a presentation given by Mr. Ir. Sardjono, Director of Planning, PLN.

returned again to their respective owners. In the meantime, the Government had made some arrangements with respect to generation and transmission activities in several places by giving certain assignments to the PLN (State Electricity Enterprise), which was established at the end of 1945. In 1958 all Dutch private electricity enterprises were conglomerated into the PLN. This conglomeration was a nationalization and consolidation process.

The total installed capacity of the enterprise in 1958 was only 262,5 MW. At the first part or beginning of the Five-Year Development Plan (REPELITA), the installed capacity increased to 652,4 MW. Most of the electric generating equipment taken over by the enterprise was from the thirties. It is known that in the past the enterprises were operated on a purely commercial basis. But now the PLN must take into account social and political aspects of the operation. The development of electric power under the first Five-Year Development Plan included the following activities:

(1) Rehabilitation of power plants, transmission, and related facilities.

(2) Construction of new projects which supported other economic activities.

During the rehabilitation period, various spare parts were needed for replacing the damaged or old parts. After rehabilitation of the prime movers, they would undergo several tests following as in the past standards of the foregoing enterprises or owners.

Outside Java, the electrical network is locally operated with power generating units, so that it is only supplied over limited distances. In Java there are five separate electrical networks, i.e., in West Java, Ketenger, Tuntang, Kalikonto, and Madiun. The highest transmission voltage is 150 kV (Jatiluhur Jakarta-Bandung). There are also transmission networks of 70 kV and 30 kV. After the construction of new projects, the installed capacity increased.

The quality of the electric power has been improved by changing the voltage from the 127/220 volt system to the 220/380 volt system. The implementation of this change has been gradual. The second Five-Year Development Plan was prepared and based on the results achieved during the first Five-Year Development Plan.

Comprehensive and integrated planning for the development of power projects, including the "rural electrification" program, was based on a sectoral as well as a regional approach by the optimum utilization of all prime energy resources. The second Five-Year Development Plan consists of:

(1) Generation	Total installed capacity
(a) Hydropower plants including micro-hydro equipment	133 MW
(b) Diesel power plants	182 MW
(c) Gas turbine power plants	355 MW
(d) Steam power plants	425 MW
(e) Geothermal power plants	10 MW
Total	1.105 MW

(2) Transmission

(a)	150 kV	1920 km circuit
(b)	70 kV	1600 km "
(c)	30 kV	180 km "
(d)	Substations	2490 MVA

(3) Distribution

(a) Medium voltage (primary)
(b) Low voltage (secondary)
(c) Transformers 5640 units

c. RURAL ELECTRIFICATION

Since the beginning of the first five year plan, many kilometers of distribution lines have been built by the Indonesian State Power Company in order to synchronize the 15 percent annual increase in the Electric Power Generating System in the whole archipelago.

Different design criteria of these distribution network systems have been proposed by the numerous electric consultants from donor countries, who have come to Indonesia in connection with loan agreements.

Electrical equipment specifications and system design criteria are mostly closely related to the national standards of loan giving countries and until recently, no efforts have been made in taking steps towards the coordination or unification of these standards.

As a consequence of the adoption of these different standards, which seem like an electrical mosaic to the Electrical Power Company, Indonesian engineers in general foresee that this will create many difficulties in the further development of the National Electric System.

Although great efforts are now under way to unify these different primary and secondary distribution systems, such as grounding systems, single or three phase systems, and other related systems, whether they originated from the United States or from Europe, it is a formidable task to achieve a satisfactory national standard.

On the other hand, rural electrification, which officially started last year with a Symposium held by the Department of Manpower, Cooperation, and Transmigration seems to have a better future, as far as standardization is concerned, when tackled right from the beginning with sound basic concepts.

Since Indonesia comprises some large islands and many thousands of smaller islands (some of them with abundant raw materials), a common philosophy for the rural electrification system valid for all local conditions is of primary importance.

The basic concepts for a rural electrification act should be drawn up as soon as possible by committee members coming from all the parties concerned. Members should come from the PLN, local government, and the Directorate General of Cooperation and Transmigration. PLN should play the major role in describing the difficulties which have had to be faced in their distribution systems.

For information, the NRECA has proposed twelve locations to the Indonesian Government (one-half to come under either the Manpower Department and the other half under the PLN), each of which will comprise approximately 500 km lines of 20 kV and low voltage distribution.

After that, all legal aspects, financial problems, national considerations, local conditions, and managerial consequences should be discussed, and a technical working draft on a Rural Electrification System should be written and discussed. This means that a general standardization system for the rural electrification network should be set up.

One committee consisting of three working groups on wooden poles has already been set up in Bogor, but a general committee on rural electrification has not yet come into existence. Whether a three phase, four wire system, or a two phase, three wire system is to be proposed should be determined. A light construction and a reduced protection or insulation level should be considered. Different conditions for the power source should be stipulated and adopted for the different local conditions. The power source could be either an existing nearby PLN network through a distribution transformer owned by the Rural Electrification Authority or through a micro-hydropower plant, or even a diesel generator set should be considered. All these technical criteria are of primary importance for one Rural Electrification System in Indonesia.

d. ELECTROTECHNICAL STANDARDIZATION ACTIVITIES IN INDONESIA

(1) General

(a) Electric Power

With the expansion of the electric power supply and the increase of development in Indonesia, the need for national standards in the electrotechnical field is felt more and more. As a matter of fact, various standards in electrotechnics are applied in Indonesia. First, the application of standards of enterprises that later became the PLN, the State Public Electricity Enterprise (Gebeo, Ogem, Aniem). Those enterprises had their own standards that were derived from their countries of origin. The Labor Security Act (Veiligheidswet) was also valid at that time for estates and private enterprises. In the recent development period, Indonesia has acquired loans in the electricity field and both donors of loans and contractors (including consultants) have their own standards depending on their countries of origin. Besides the standards mentioned above, the PLN itself has issued circulars on standards to be valid within the PLN. These standards concentrate on power supply (transmission and distribution, including construction of equipment).

(b) Electric Installation Equipment

If the above standards concentrate on the production of electric power and the arrangement of transmission/distribution, the same thing also occurs in industries which produce electric equipment in construction. Some years ago, Indonesia started producing electric installation equipment to be used in building construction. This equipment includes: electric lamps, fittings, stickers, overload contacts, PVC pipe, junction boxes, etc.

Producers of this equipment have made contact with test institutes to ask for information about several kinds of of standards utilized for their products. This has been a result of consumer pressure and also self-awareness. There also has been a growth of new industries producing panels, transformers, and other equipment.

Standards are needed for the producers of panels and transformers such as various measures, equipment position area, the way of marking symbols, etc. Consumers of these products need a standard of mechanic rating, current rating, and also their various components. The test experts in the laboratories need a manual to describe ways of inspecting and testing products. For the producers of electric equipment, standardization is a condition sine qua non, if mass production for stockpiling is required.

(c) Telecommunications

Similar to what has been stated above, the expansion of development which affects the standard of living of the community creates an increase in the use of telecommunications equipment, for which standards are clearly required. Telecommunications as an infrastructural component plays a role that cannot be ignored in national economic development. Government policies in this field are designed to improve services by the gradual replacement of inefficiently operating equipment and new construction in some areas. The telecommunications network is still far below the level where it should be able to cope with the rising demand. The following institutions have been making a considerable contribution to the improvement of telecommunications:

1) The Post and Telecommunications Research and Development Institute

2) The Post and Telecommunications Training Institute

(d) Electric Network Installation in Rural Areas

Thanks to the penetration of agricultural technology into rural areas with all its consequences, it is felt that electricity is not a luxury. Several hundreds of villages in the outskirts of cities without electricity from PLN have succeeded in establishing rural electricity projects by way of cooperation. Generally diesel generators have a capacity of 2 to 7,5 kVA with a water cooling system. Their panels are generally equipped with fuses and indicators. People who live near forests use bamboo or wooden poles as distribution posts and they are set in the ground with some kinds of residues, asphalts, or plastic sheets. The average height is 3 meters. Traverses are made from wood, and isolators are used as insulation. Distribution cables are the NYA or NGA of 1,5 and 2,5 mm. Distribution to home installations is directly connected without using limitation equipment. People only notice the wattage and the installation power factors. Considering the above matters and information from some diesel generator-assemblers, there ought to be a standard for "rural electric installations" that does not delay the establishment of rural electric projects.

(2) Electrotechnical Commission

People who work in the "electrotechnical world" are mindful of the above mentioned matters and feel the need for national standards and national standardization activities. This can be seen with the issue of a formal policy statement from the head of the Standardization, Calibration, Instrumentation, and Metrology Project (SKIM), No. 85/Kep/A/76, about the basis of the Electrotechnical Commission. The SKIM project is a project within LIPI (The Indonesian Institute of Sciences) and the Ministry of Research has been appointed by the Government to encourage standardization.

The establishment of the Electrotechnical Commission is meant to deal with the standardization problem in the electrotechnical field, and it is expected to work efficiently. The members of the Electrotechnical Commission are taken from among consumers, producers, government officials, research/test experts, and universities.

The tasks to be accomplished are:

(a) Formulating the scope of electrotechnical standardization.

(b) Gathering problems concerning electrotechnical standards.

(c) Determining priorities in standardization in the electricity field.

(d) Setting up programs.

(e) Giving suggestions about the scope of technical committees and the choice of administrative personnel of the technical committees.

(f) Directing, controlling, and coordinating the technical committees.

(g) Other activities concerning electricity standardization problems.

The Electrotechnical Commission has agreed that its scope should include heavy current and low voltage current (power, communications, computers, and control) on the national level.

The Commission programs are:

(a) When the National Standardization Bureau (NSB) has been established, the Electrotechnical Commission will hand over the standards document to the NSB for enforcement.

(b) While the NSB is not yet established, the Commission will hand over the document (after circulation) to the related

Institute or Department for enforcement.

(c) To develop and issue standard documents which are not yet made by the institutes.

(d) To follow the activities of the IEC (International Electrotechnical Commission) and ISO (Indonesia being a member of those organizations).

Based on the fact that several departments or institutes have made or are making standards, the Electrotechnical Commission:

(a) Requests that technical committees in those institutes continue their activities.

(b) Collects the products of standardization which have been developed by the institutes.

(c) Coordinates all standardization activities in those institutes.

(d) Establishes technical committees to develop and issue standard documents which have not yet been made by the institutes.

The work procedure and tasks of the Technical Committee have been based on the procedures used by the IEC, adapted to meet the conditions in Indonesia.

As a follow-up to the establishment of the Electrotechnical Commission it has been agreed to establish the following committees:

(a) The Basic Standards Committee

Priority is given to the establishment of this committee. This technical committee will consider all draft standard documents about terms, definitions, and graphic symbols. It is known that at the national level, there are many electrotechnical terms used with various meanings and interpretations. Therefore, it is important to have the same interpretation of each term, definition, and graphic symbol for the needs of lecturers, industries, and institutes.

(b) Power Units Committee

The supply of electric power is not only provided by the PLN, but also by a number of electric power units possessed by individuals, enterprises, industries, etc., which supply electrical power for their own needs. Therefore, it is clear that complete manuals, regulations, and standards are needed. LIPI has established an Electric Committee to revise the general regulations on electric installations and it concentrates on electricity installations in buildings. However, the clauses on electric power generating units are not considered fully. An electric power generating unit included "prime movers" such as water turbines, steam turbines, gas turbines, and diesel engines. The standards are technical specifications, commission tests, maintenance tests, and operation tests.

(c) Transmission and Distribution Committee

This Committee is expected to produce standards for transmission and distribution which are applicable in Indonesia, so that National Standards do not hamper development. This Committee must take into account the conditions in Indonesia and the validity of the security and safety act.

(d) Installation Committee

This Committee is a continuation of the Committee for the Revision of General Regulations in Electric Installation.

(e) Electric Equipment Committee

As explained previously with the development of electric equipment industries in Indonesia, the Committee has given priority to determining standards for panels, transformers, panel-components, PVC pipes, etc.

(f) Radio Communications Committee

With the growth and expansion of the radio industries with their respective parts and components, the Committee is expected to make manuals and regulations on their construction. The technical Radio Communications Committee has given priority to the following equipment and areas: receivers, broadcasts, aerials, and safety.

(g) Electric Installation Within Ships Committee

Because of specialized installations in ships and considering that Indonesia is an archipelago in which ships form a primary inter-insular means of transportation, the Committee is expected to produce national standards and follow the standardization activities in this field at the international forum (IEC).

The Commission has a secretariat which is responsible for seeing that the work is carried out efficiently and effectively to bring it to an early satisfactory conclusion. The secretariat of the Commission works in close liaison with the chairman, and the chairmen of the technical committees. There are two secretaries in the Commission, who carry out their duties on the national level. The secretaries are elected from among the Commission members, likewise the chairman.

The secretaries, as the chief executive officers of the Commission, carry out the instructions of the Commission. The secretariat is responsible for:

(1) Preparing of all basic documents which are required for achieving "national" standardization on a given subject (preparation of drafts).

(2) Calling meetings.

(3) Preparing of discussions.

(4) Noting all decisions taken.

(5) Preparing summary reports or treatises and the official minutes.

(6) Taking the necessary steps to implement the decisions taken.

(7) Preparing the final text of a draft which has been approved for publication and sending it to the Indonesian Institute of Sciences (LIPI).

The technical work of the Commission is carried out through technical committees, each dealing with a particular subject. The setting up of technical committees is considered by the Commission when proposed by one of the members of the Commission. Each technical committee has a chairman and a secretary, appointed by the Commission with LIPI approval.

The terms of reference of a technical committee (T.C.) are defined by the Commission after consultation with the members of the T.C. The consultation is made by the secretaries and the chairman of the Commission. The terms of reference may be altered or added to only with the approval of the Commission. There are two ways to produce a standard:

(1) Members propose the formulation of a standard; then the Commission will consider it and take a vote. If consensus is achieved, then the appropriate T.C. will be appointed to work on the standard. The secretary of the Commission has the assignment to consider standards with the T.C. and later establish a working group which makes a draft standard document. Moreover, the secretary tries to obtain a formal policy statement from LIPI. When the draft document is ready, the draft will be handed over to the T.C. for consideration, and if

consensus is achieved, then the document will be handed over to the Commission. The Commission will also consider the document, and if consensus is achieved the Commission assigns the secretary to prepare the document for circulation. When the document has been circulated among the "community," the commission will hand it over, with any necessary alterations, to LIPI.

(2) A proposal originates from a T.C. and is considered by the Commission. If approval is given by the Commission, then the same procedure as above is carried out.

This brief presentation will hopefully give you an illustration of the history and present condition of electrotechnical standardization activities in Indonesia.

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e. COMMENTS BY THE VISITING TEAM

The team greatly appreciated this overview over electrotechnical systems in Indonesia and their current standardization activities. They wondered whether the huge tasks could not be carried out more effectively by a greater emphasis on the adaptation and adoption of selected international standards or the standards of other nations.

Any vigorous standards policy may seem to involve gradual but costly improvements of equipment and installations, but is it not true that consequent savings in electricity, failures, and accidents could more than compensate for that cost? The challenge may be to demonstrate the facts clearly to higher authorities by careful economic analysis.

III.G.3. INDUSTRIAL STANDARDIZATION

presented anonymously by the

Center for Research and Development
Of Metal and Engineering Industries
Ministry of Industry

a. PREAMBLE

Standardization as defined by the International Organization for Standardization is as follows:

"Standardization is the process of formulating and applying rules for an orderly approach to a specific activity for the benefit of and with the cooperation of all concerned, and in particular for the promotion of optimum overall economy taking due account of functional conditions and safety requirements. It is based on the consolidated results of science, techniques, and experience. It determines not only the basis for present but also future development, and it should keep pace with that progress."

(ISO/STACO N 255 1961)

b. PURPOSE

Industrial standardization in the Ministry of Industry has the purpose of promoting fair competition in the industrial business sector, of assuring rationalization of production, distribution and use of industrial products, and of protecting the interests of consumers. In general, the advantages which may be derived from industrial standardization are:

(1) Increased efficiency in production and lower prices.
(2) Improvements in product quality.
(3) Preservation of material.
(4) Rationalization in use and consumption of products.
(5) Simplification of business transactions.
(6) Advancement of technology.

c. INDUSTRIAL STANDARDIZATION ACTIVITIES

Industrial standardization activities in the Ministry of Industry have been in existence since the First Five-Year Development Plan. Activities carried out include:

(1) Formulation of industrial standards, on which a consensus has been reached by all parties concerned in a meeting for the development of industrial standards. Representatives from producers, consumers, government, universities, and research

institutes participate in the deliberations on industrial standards.

(2) Promotion of industrial standardization to increase awareness on standards, especially in industry, by holding lectures and seminars in several capital cities of the provinces, in Java, Sumatra, and Bali.

(3) Preparation for the implementation of industrial standards; for example, a meeting and a seminar on standards implementation were held in the Ministry of Industry.

After Presidential Decrees Nos. 44 and 45 were issued, and by the decree of the Ministry of Industry, industrial standardization is carried out by the four centers for Research and Development, namely:

(1) Center for R&D of Miscellaneous Industries and Handicraft
(2) Center for R&D of Chemical Industries
(3) Center for R&D of Metal and Engineering Industries
(4) Center for R&D of Textile Industries

The Center for R&D of the Metal and Engineering Industry is charged with the coordination of industrial standardization in the Ministry of Industry. Research and testing for the purpose of industrial standardization are carried out in testing and research institutes within the Ministry of Industry as follows:

(1) Industrial Research Institute, Jakarta
(2) Chemical Research Institute, Bogor
(3) Cellulose Research Institute, Bandung
(4) Ceramic Research Institute, Bandung
(5) Materials Testing Institute, Bandung
(6) Metal Industry Development Center, Bandung
(7) Batik and Handicraft Research Institute, Jogjakarta
(8) Leather Research Institute, Jogjakarta
(9) Chemical Research Institute, Semarang
(10) Chemical Research Institute, Surabaya
(11) Chemical Research Institute, Medan
(12) Chemical Research Institute, Banjarbaru
(13) Chemical Research Institute, Menado
(14) Chemical Research Institute, Ujung Pandang
(15) Textile Testing Laboratory, Medan
(16) Textile Testing Laboratory, Jakarta
(17) Materials Testing Laboratory, Jakarta

d. <u>THE PROCEDURE FOR INDUSTRIAL STANDARDIZATION</u>

The procedure for industrial standardization which involves the formulation and the implementation of industrial standards is as follows:

A project for industrial standardization may originate from a proposal for standardization put forward by the public (producers or consumers) or on instruction from the Ministry of Industry. Research on the proposed industrial standard comprises research in laboratories, practical testing, research on local production, and a comparison with other national standards or international standards carried out by the centers for R&D and research and testing institutes under the Ministry of Industry. Deliberation on industrial standards is the task of a technical committee consisting of representatives from producers, consumers, distributors, government, and scientific and research institutes. The formulation of a draft industrial standard is based on the consensus reached during the deliberations and on consideration of comments from other parties concerned. Approval and establishment of an industrial standard is by decree of the Minister of Industry. To keep pace with progress and to be in conformity with conditions, industrial standards are periodically revised. Based on the results of evaluation and assessment by producers, distributors, and consumers of an industrial product which is already standardized, the Minister of Industry, or the Director General concerned, will decide and regulate the implementation of industrial standards. Figure 2 in Section III.D.2. shows the procedure and the scheme of operation of industrial standardization.

e. LEGAL BASIS

Industrial standardization, executed by the Ministry of Industry, is based on:

(1) Law No. 10, 1961.

(2) Government Regulation No. 9, 1964, concerning Industrial Standard.

(3) Decree of the Minister of Industry, No. 589/M/SK/10/1975, October 23, 1975, concerning the coordination of research and development.

(4) Decree of the Minister of Industry, No. 172/M/SK/5/1976, May 17, 1976, concerning Industrial Standardization and Quality Control of Industrial products (available in English).

f. NUMBER OF INDUSTRIAL STANDARDS FORMULATED

The number of industrial standards formulated and established by the decree of the Minister of Industry to date is 139. The list of industrial standards is available upon request.

g. COMMENTS BY THE VISITING TEAM

This excellent summary provided the team with an overview which proved invaluable. In response to visiting team members' questions it became clear that technical cooperation with the LIPI structure was not only possible but already largely in effect.

IV.A.1. Visit to the Ministry (Department) of Trade, Directorate for Standardization and Quality Control

Jakarta, June 2, 1977

In the absence of the Director General, one of his assistants, Mrs. Darmawan, a professional microbiologist, explained the activities of the Department to the visiting team consisting of Mrs. Djaprie, Eng. Estrada, Mr. Gutterman, Mr. Raufaste, Mr. Chaiwai, Deputy Chairman Sumantri, and Dr. Woo-Ming. The Ministry of Trade is concerned primarily with the export program of the country. It established its own standards applicable to export commodities. Since 1974, 49 standards for agricultural export commodities have been developed by this group. An additional 30 agricultural commodity standards have been proposed. Commodities are selected for standards based on (1) exportability--a market overseas, (2) the needs of public health, or (3) employment--their production could yield an increase in the work force. The standards are not only for the product but also for packaging in bulk. The specifications and standards of the importing countries are made available to the exporters. All products to be exported are examined to determine compliance with both the Indonesian export standards as well as the requirements of the buyer. The Ministry of Trade certifies and licenses inspectors of export products who may be employees of government agencies or from the private sector. It does the same for analytical laboratories which may be, again, located in other government agencies or in the private sector. The producer pays a fee to the testing laboratory for this service. If the product is certified by the laboratory, it is automatically approved for export by the Directorate and by the Customs Agency. Twice each year, approved testing laboratories are reviewed for accreditation. Depending on the resources of the laboratory, it may be certified to test more than one commodity. A sub-directorate on Inspection and Advisory Service is responsible for evaluating these inspectors. In the opinion of the team, this system should increase the effectiveness of enforcement.

Whereas the Ministry of Trade's primary concern is with the end product, they may call upon other agencies to inspect the product in process. For example, for frozen shrimp intended for export, the Indonesian Department of Agriculture (fisheries) is called upon to check and certify the freezing process. The Department of Agriculture charges a fee to the manufacturer for the service. All "commercial laboratories," which may be public or private and which charge fees, are periodically checked and recertified by the Ministry of Trade, as are the inspection staffs.

Although other agencies, such as the Ministry of Health, are often consulted by the Ministry of Trade concerning food products, there is no specific requirement that it do so. No formal arrangements exist for coordination and consultation. The team noted that, when the Ministry of Trade denies an export license for a lot of food because of the presence of pathogenic organisms, it assumes no responsibility concerning local distribution of the lot. For that matter, answers to questions led the team to believe that often the Ministry of Health may not be notified of the existence and intended distribution of a health hazard lot. Increased cooperation and coordination between the departments would be found rewarding.

The Ministry of Trade is considering the establishment of laboratories for the collaborative testing of coffee and shellfish. With both of these products, there have been problems. Often, receiving countries deny entry because of health or sanitation type defects. Establishing collaborative laboratories is a good approach to resolving such problems because it will lead to standardization of inspection and testing.

Mrs. Darmawan has visited the Food and Drug Administration twice and studied the U.S. inspection and testing procedures for fish, fisheries products, and coffee. With that exposure, she says she has been able to impart to others what she has learned.

IV.A.2. Visit to the Secretary General of Industry in the Ministry (Department) of Industry

Jakarta, June 2, 1977

The team, including Mrs. Djaprie, Eng. Estrada, Mr. Gutterman, Mr. Raufaste, Mr. Chaiwai, Deputy Chairman Sumantri, and Dr. Woo-Ming, was privileged to be personally received by Secretary General Achmad Slamet, whose office coordinates the establishment and implementation of standards prepared within that Department. Each of the Directorates General (Handicraft, Textiles, Metals and Engineering, and Chemical) has its own research and development operation. Coupled with strong emphasis on science and technology for industry is a determination to cooperate effectively with LIPI. The Ministry of Industry has 160 standards of which some are used by other ministries. The team was also informed that some may be duplicative or incompatible with developments elsewhere. Whereas the Ministry of Trade is primarily concerned with promoting exports, the Ministry of Industry is primarily concerned with promoting production. As in most other countries, it appears that these different concerns are criticized by some planners as rather narrow and not always for the greatest benefit of the nation as a whole. The view was expressed within the visiting team that these problems were not serious, provided the incumbent ministers insisted on good interagency cooperation.

In talking with Secretary General Slamet and his staff, one develops the impression that a national centralized coordinated standardization program is not yet universally desired in Indonesia. He informed us further that a number of manufacturers of different products claim to comply with established standards, but there is no concrete program to check on this.

The team then entered into a dialogue concerning mandatory versus voluntary standards. It is commendable that small factories are invited to send samples to government testing laboratories to determine quality level as an aid to the manufacturer. Secretary General Slamet stated that, except for export and safety standards which are mandatory, all others are voluntary. Whereas the steel standards are voluntary, the building codes, which concern safety and set out requirements for steel, are mandatory. Some team members questioned why within LIPI a leaning towards wider enforcement seemed to persist.

Concerning certain food standards, there is an attempt to avoid some duplication. For example, both the Ministry of Trade and the Ministry of Health participated in a standard for fortification of wheat flour. However, team members were told that there is lack of agreement concerning enforcement. Agreement on the source of personnel for the technical committees has not been reached.

IV.A.3. Discussion on Industry Associations

Jakarta, June 3, 1977

While at the office of Yayasan Lembaga (see IV.B.2), the team had an opportunity to discuss the matter of industry associations with several representatives of GAPMMI (Gabungan Pengusaha Makanan and Minuman Seluruh Indonesia). The secretary of the organization, Mr. N. Adisaputra, acted as spokesman. However, here we did have some language problems which seemed to limit the success of our dialogue. We were told that the association numbers among its members both large and small manufacturers. However, it was not made clear to us what the number of total members was, how many of those were small and how many were large, and what technical aid they required. It appeared that the primary purpose of this particular association was to obtain bank loans. We failed to comprehend what assistance this association provided to its members, other than obtaining bank loans.

Later questioning on several occasions confirmed the general impression that industrial company associations in Indonesia tend to provide economic and commercial information and advice, but are not a strong force for the dissemination of technical experience and quality control information. Team members believe that, at least for test procedures of raw materials, the industry association could provide a useful service to their members.

IV.B.1. Visit to the Directorate General for Drugs and Food Control, Ministry of Health

Jakarta, June 3, 1977

The team was received by Mr. Sunarto Prawirosujanto, Directorate General for Drugs and Food Control of the Ministry of Health, and his staff. This Directorate has only recently added foods to its long-standing operations in drugs and cosmetics. It is responsible for medical devices also. Mr. Sunarto spoke briefly and then turned the meeting over to Mr. Heman, the representative of the Directorate for the opening and closing sessions of the Survey.

Mr. Heman described the organizational structure of the Directorate and its activities in direct drug control, food control, cosmetic and medical device control, traditional drug control, narcotics, and dangerous drug control, as well as the training program carried out by the Directorate.

The team was told that the Directorate encourages manufacturers to apply good manufacturing practices to their production and it produces regulations requiring products to be correctly labeled. It also registers production by product. Products must be made from appropriate raw materials and manufactured in accordance with acceptable processes. Drugs must comply with safety, efficacy, and quality requirements. Licenses are issued to qualified firms upon payment of an appropriate fee.

Mr. Heman then referred to the Basic Health Law of 1960, the Commodities Law of 1961, the Hygiene of Public Enterprises Law of 1962, and the Hygiene Law of 1962. He mentioned the following regulations made by the Minister of Health on the production and distribution of food: compulsory registration; registration procedure; permitted food colors, preservatives, antioxidants, and sweeteners; sale and labelling of sweetened condensed milk; food containing pig substances and alcoholic beverages. He commented that the Directorate has established guidelines for good manufacturing practices and for sampling practices. Mr. Heman described the drug, food, cosmetic, and devices firms and their products, including traditional drugs, etc. Their numbers are quite large (see table 4). He also listed the number of product standards, including food standards and food chemical standards (see table 5). It appeared that the elaboration of standards is quite good, although the participation and cooperation by consumers and other departments is somewhat limited. Mr. Sumitro then briefly explained about the Central Laboratory of Drugs and Food Control prior to the visit by the team to the Laboratory and the library. Before our departure, there was a presentation of one copy each of "Farmakope Indonesia," 2nd edition, 1972, and "Ekstra Farmakope Indonesia," 1974, to each member of the team (see table 6).

Table 1

DIRECTORATE FOR FOOD CONTROL

(up to December 1976)

REGISTRATION DATA

I. Registered foods:

Total	7234
Domestically produced	5738
Imported	1496

II. Manufacturers that registered their products

Total	2148
Local	1866
Foreign country	282

III. Importers that registered their products

Total	145

Table 2

DIRECTORATE FOR DRUGS CONTROL

(up to May 1977)

GENERAL DATA

I. Pharmaceutical manufacturers:

Total	245	
Include:		
- with foreign capital investment		32
- with domestic capital investment		35

II. Pharmaceutical distributors:

Total	6790
Domestically produced	6661
Imported	129

IV. Manpower:

Pharmacists	1878
Assistant pharmacists	18607

Table 3

DIRECTORATE FOR TRADITIONAL DRUGS CONTROL

I. Manufacturers:

Factories	40
Home industries	36
Total	76

II. Registered traditional drugs

Total	1556

III. Imported crude drug

Total	about 256.8 tons/year

Table 4

DIRECTORATE FOR COSMETIC CONTROL

(up to May 1977)

REGISTRATION DATA

I. Registered cosmetics and medical devices:

1. Cosmetics:

Total	3163
Local made	1908
Imported	1255

2. Medical devices:

Total	891
Local made	610
Imported	281

II. Manufacturers:

Total	380
Local	259
Foreign country	121

Table 5

INDONESIAN FOOD CODEX COMMITTEE

(up to March 1977)

I. Food standards:

Draft of Standards proposed to the General Meeting of IFCC	65
Regarded as complete draft standards	47
Regarded as incomplete draft standards	18

II. Food chemical standards:

a.	Preservatives	37
b.	Antioxidants	21
c.	Food colors	25
d.	Color fixatives	5
e.	Dietary supplements	50
f.	Non-nutritive sweeteners	6
g.	Flavorings	69
h.	Emulsifiers, stabilizers, anticaking agents	22
i.	Salts, acids, bases	47
j.	Leavening agents	8
k.	Seasonings	20
l.	Bleaching agents	7

Table 6

INDONESIAN PHARMACOPOEIA

(Second Edition)

I. Legalized by Minister of Health on November 12, 1972.

II. Reports:

Total	658
Substances	239
Preparations	419

INDONESIAN EXTRA PHARMACOPOEIA

(First Edition)

I. Legalized by Minister of Health on August 1, 1974.

II. Reports:

Total	739
Substances	409
Preparations	330

IV.B.2. Visit to Yayasan Lembaga Konsumen

Jakarta, June 3, 1977

The team then visited the Lembaga Konsumen, a group of consumer representatives in Jakarta. The team met with Mrs. Erna Witoelar, who had spoken earlier at the formal presentation of papers by the hosts at LIPI (see III.B.2), and Mr. Permadi. Mrs. Witoelar is a housewife and an active, nontechnical member of the consumer group. Mr. Permadi is an attorney who serves as their paid secretary. Mrs. Witoelar and Mr. Permadi both served as the spokespersons for a number of active members who volunteer their own time in the pursuance of the goals of the group. The meeting was joined later by Dr. Yetty Rizali Noor, who is a volunteer and the Vice President of the group. Her full-time occupation is Dean of the Faculty of Dentistry at Trisakti University. All appeared most dedicated to consumer protection.

This consumer group, which has national participation and is recognized internationally, was begun in 1973 by some consumer and social activists for the purpose of protecting local products from unfair competition and primarily for protection of consumers. Although it is a private nongovernment organization, it does receive some subsidy from the local government of Jakarta, some funds from the Office of the President, as well as grants from the Ministry of Trade. In addition, it does engage in private fund raising and periodically publishes a paper describing its activities. It also engages in certain joint studies with government agencies such as LIPI. It publishes consumer oriented booklets, but receives very little income from them. The essential goal of the group is to reach all of the population of Indonesia. However, in a vast country with many language groups and some illiteracy, this small group is bound to face considerable problems of communication. Therefore, this group attempts primarily to reach the Government, the universities, and various activist groups. It also attempts to educate teachers of consumerism. It is interesting to note that the Chamber of Commerce, which is a private group of business members, provides office space to this consumer group.

Another aim of the group is to obtain more and more representation in technical committees for the purpose of participating in the development of standards. In particular, it would like to become a member of the Indonesian Food Codex Committee (IFCC) in the Ministry of Health. Although it is not a member of the committee at this time, it is permitted to comment on drafts of standards. It cannot attend official meetings because it is not a governmental organization. However, the group is permitted and does attend and participate with Ministry of Trade committees for standardization.

One of the functions of the consumer group is to collect samples at the marketplace and arrange for their examination by commercial laboratories or government laboratories, for which it pays a fee.

When an analysis shows that the sample is not what consumers have the right to expect, the information is brought to the attention of the appropriate government agency or to the manufacturer to bring about corrections. The group also publicizes its activities and invites consumers to bring complaints to its notice. At the present time, the group is active in Jakarta primarily, but it is slowly moving into other cities on Java and then intends to move into other parts of Indonesia. The team was very much impressed with the enthusiasm and dedication of the group. Encouragement and support of these efforts should be increased. Indonesia is well served by this group.

IV.B.3. Visit to the Central Food Industrial Corporation (Fabrik Kecap ABC)

Tangerang Jakarta, June 3, 1977

The team visited the C.V. Central Food Industrial Corporation located in Jakarta, which has been producing soy sauce for approximately six months. This company had originally been and continues to be in the lead battery business. They have brought in experts from China for assistance in building the new food factory and especially for the purpose of instructing and guiding them for the first few years in the production of soy sauce. The manufacture of soy sauce from wheat flax and soybeans was quite modern and very efficient. It appeared that they had the capability to convert a semi-automatic filling and capping operation to hand-filling and capping so that in times of lessened production they would not need to release personnel, thereby contributing to raising the unemployment level. It is the opinion of team members that, from a technology point of view, a good product is being produced in accordance with modern practices. However, from a sanitation point of view, the opposite applies. Wide-open doors and wide-open windows permitted birds to fly about inside the buildings dropping their waste matter over the food. We found rodent pellets in and around the plant. Management appeared satisfied with the end product because it was being sterilized, but we were of the opinion that what they were doing was simply sterilizing foods produced under insanitary conditions. One would agree that this type of product and the way it is handled in its final stages is safe. But, it is being produced under less than hygienic conditions and supports a potential hazard to health. While we were at the plant the product was being hand-filled and hand-capped because of lessened production. However, we observed a significant number of insanitary practices on the part of those who were filling the bottles and capping them.

From a technologist's point of view we were satisfied that a high level of standardization of product was being achieved during production. For example, there was knowledge obtained from frequent sampling to determine and control the level of protein in the finished product. The aspergillus oryzae mold was well controlled. The sugar content and salt content in the various kinds of soy sauces produced also were controlled and sufficient laboratory tests were conducted to determine when the product was ready. Formulations were set out in chart form and shown to us for the several production batches that were ongoing at the time of our visit. We noted that samples were being continually taken to determine the status of the product.

However, it was quite a different situation for the filling operation. We noticed that the people filling the bottles were filling to a level determined by eye. There was no marking other than the person's concept of how high to fill in the neck of the bottles. We also noted that the finished product labels did not contain a statement of the volume of contents. Upon questioning the management, we were informed that on their semi-automatic filling operation they were able to fill to a more constant quantity. Many of the bottles came from different bottle manufacturers, and many were returns from previous sales. As a result, the bottles were not standard due to different thicknesses, different heights, and different diameters so that each bottle could very well contain a different amount. This illustrated a lack of standardization on the part of the bottle and food manufacturers. In one respect, the consumer could be receiving considerably less than expected, or the manufacturer might be selling the product at less cost than he intended.

We were informed by the management that the protein content in the product being produced was approximately eight percent, whereas the "government standards" required only six percent, and that much of the local production of competitive manufacturers was less than even that. This, our host told us, he had determined upon his competitors' products.

The management informed us that they were considering entering into the production of "soy milk." We are of the opinion that a product of this sort, if handled in an insanitary manner, could become a serious hazard for consumers. We recognize that screening windows and doors in the high temperature and humidity climatic conditions of the area in which the plant is located could be a problem. We recommend that, despite that problem, one should install the screens but use appropriate exhaust fans so that the working environment within the plant is not changed for the worse.

IV.B.4. Visit to the Nutrition Research and Development Center at Bogor

Bogor, June 4, 1977

Dr. Mulihal, head of the Division of Nutritional Biochemistry of the Nutrition Research and Development Center (NRDC), met with the group. In a discussion of aflatoxin, it was his comment that the Indonesian authorities should not force out of business those small farmers who cannot control aflatoxin. Dr. Mulihal added that he had been to visit the United States in 1976 and had discussed the subject of aflatoxin with various members of the Food and Drug Administration. The team also had discussions with Mrs. Soekartijah Martoatmodjo, head of the Division of Community Nutrition, and Mr. Hermani, head of the Division of Food Sciences.

At present there are only 80 on the staff of NRDC. It is hoped that number will increase to approximately 300. We were informed that NRDC is one of six Centers for Health Research and Development under the Ministry of Health. The other Centers are in health services, biomedical research, health ecology, drug research, and cancer control and radiology. NRDC, in a special assignment, had reviewed the Ministry of Industry standards for fortified wheat flour developed by that Ministry and anticipated that it would continue to comment on standards as they were developed. However, NRDC did not represent the Ministry of Health on the Committee formulating the Standard for the Fortification of Wheat Flour. NRDC is presently engaged in research and development for the fortification of salt with iron and iodine in order to participate in the establishment of a new standard for salt. Another of its efforts at the present time is the development of a high protein vegetable mixture supplement for pre-school children's foods. It is also engaged in a study of the various seeds that people eat in order to attempt to develop new and more nutritious varieties of these seeds. In addition, NRDC has developed 70 recipes for pre-school children's foods prepared from rice with soybeans, and it is now preparing others from cassava with soybeans and corn with mucuna pruriens (koro). The recipes are developed for different regions based upon available products and differences in eating practices. One of the projects planned for the future concerns shelf life studies of various foods.

IV.B.5. Visit to Roti Orion Bakery at Surakarta

Jogjakarta, June 6, 1977

We then visited a small bakery called "Roti Orion" in Surakarta, a suburb of Jogjakarta. This bakery has a small number of employees. Its baking equipment, measuring devices, and its procedures are antiquated. They were eagerly looking forward to a new baking oven. The sanitary facilities in this operation could be much improved. Much of the mixing and sorting of products was out of doors at ambient temperatures. The eggs and other bakery ingredients showed positive evidence of insects, rodents, and birds. The sanitary facilities for the personnel working in the plant were almost absent. There were no records kept of the production and the baking was being carried out as an "art form." The weighing instruments were inaccurate and the materials were added based upon observations and not by specified weight or volume. This bakery could benefit from some technical assistance as well as better measuring devices. However, this suggestion is not to be misconstrued to mean that they are not providing necessary and nutritious food. They should be helped to improve. Fortunately, the baking process is also a sterilizing process.

IV.B.6. Visit to the American Bakery

Jogjakarta, June 6, 1978

While in Jogjakarta, we then visited a somewhat larger bakery. This bakery was called "American Bakery." We were received by the manager, Mr. R. Ahmad Sudarso and his food technologist, Mr. Sudarmadji. In it we found much more in the way of accurate mechanical equipment than at Roti Orion. We found more automatic controls, better measuring equipment, and record keeping. Further, at each control point products being manufactured at the time were listed on a board with the requirements for the station's operation. In general, we found good quality control in operation. However, again, we found some lack of good sanitary practices. The dough mixer and other equipment were cleaned and the baking pans washed with soap and hot water only once a week. There were no signs to notify employees that they must wash their hands before resuming work. We found egg storage, egg breaking, and fillings not handled in a sanitary manner. Of particular concern should be the fillings, inasmuch as they are added to products after baking. Some preservatives, such as sodium benzoate, were being used, but we were not assured that they were used in such manner as to overcome the possible dangerous contamination in the food.

As in the other bakery, there appears to be a practice of permitting filth to be added to foods and then sterilizing it. Also, there is a significant problem of "returns" for breads because of mold. We have been told that sometimes the proportion of returns runs quite high. These returns, due to mold, are obviously costly to the bakery operation. When questioned by management, we suggested that it might be to their benefit to exercise better control of their pie filling operation. We further suggested that the high incidence of moldy bread returns might be checked with the Ministry of Health (or Trade or Industry) to see if the cause can be located and cured or at least reduced. We also are of the opinion that the food factory "Good Manufacturing Practice" document, which is now being considered by the Ministry of Health, would be the type of document that would be helpful to factories producing foods such as this.

The management of the factory indicated to us that they receive no technical guidance or help from the Ministries of Health, Trade, or Industry, and said that they would welcome some sort of technical help from any source. Bakery products are eaten by virtually all the people in Indonesia. It is an important, but fortunately, by no means the only, source of protein. The problem may be serious because of the pernicious debilitating influence from the microorganisms and their by-products which these bakeries may be distributing. Fortunately, the use of preservatives apparently serves as a safety factor, although this is a potentially hazardous practice also. This may not be a national problem or one with a high order of priority because of the local impact of these small bakeries.

IV.B.7. Visit to the P. T. Sari Husada Instant Food Plant

Jogjakarta, June 7, 1977

At the P. T. Sari Husada Instant Food plant in Jogjakarta, we were met by Mr. Rukma, the President Director, and Mr. Weldell Tjahjagoenarsa, the Commercial Director. The operation is a joint venture between the government and the private sector. It produces five baby foods. Its principal and most popular product is SGM, which is prepared in 400-gram cans at a volume of 600,000 per month. The second most popular is SCN, which is a weaning food. It is, in fact, SGM plus rice flour. Another product is FCM, a full cream milk which is spray dried. It is imported in spray dried form from New Zealand and simply packaged here. Another product of some interest to Indonesia is a low lactose milk called LLM, which is a baby food for lactose intolerant children. It is imported from Holland and packaged here. This product is extremely important in Indonesia because of the relatively high proportion of lactose intolerance in its population.

Another product of some interest is S-26, which is very similar to SMA as produced in the United States. Although the product is manufactured in Indonesia, the ingredients are obtained from the United States. Another product is called "Quaker Oats," which is imported from Australia. All of their products are packaged either in tin or in pouches. The ingredients used are all obtained with warranties. The carbohydrates, fats, salt, and iron that are added are locally obtained. The iron is in the form of ferrous sulphate. All products are also packed under nitrogen. In our opinion, this plant has good quality control but a lesser quality assurance system. It appeared to emphasize quality control more than quality assurance. The methodology and standards used are those of the American Dry Milk Institute (ADMI) and of the New Zealand Standards Association. They also use American Public Health Association (APHA) methods. Chemical analyses are conducted to determine compliance with their own standards.

At the time of our visit, they were unable to analyze for protein because of equipment unavailability. However, they were not sending the samples elsewhere for analyses, which, we believe, left them vulnerable concerning proof of control of the protein content of their food.

We think it is commendable that all of the products are sold with a one-year warranty and that records for each product are maintained for three years. Further, samples of each batch are also kept for three years. Codes on all of their products are changed every three hours during production. We thought that the sanitary cleanup procedures were of a high order, although we felt that the building would profit by being screened and provided with the use of exhaust fans to maintain a comfortable working environment. The pasteurization programs, the storage facilities, etc., were functional and of modern design. Microbiological samples were being obtained at the critical control points of their production and, in our opinion, provided assurance of a safe product.

IV.B.8. Visit to the Canning Factory P. T. Indouma

Bandung, June 8, 1977

The next day we traveled to Bandung and upon arrival were met by Mr. Slamet Soesila, the Provincial Director of Drug and Food Control for West Java. He was accompanied by Mr. Krishna Wijaya and Drug and Food Inspector, Mr. Suleiman. We were also met by Mr. Sulaiman and Mr. Milono of LIPI. We visited the canning factory of P. T. Indouma of Indonesia, a Division of P. T. Mantrust. Our host was the Product Development Manager, Mr. S. Tjandra. One of the principal operations at this location is to maintain a Quality Control Program over the products produced in the different divisions of the operation located in different parts of Java. There are eight factories in Java. Some produce food; some manfacture cans; etc. This particular one maintains production control, marketing control, can making control, and final production control. They examine each of the products, as necessary, against physical, bacteriological, organoleptic (sensory), and chemical standards. Concerning raw products, they standardize them only against organoleptic and chemical standards. Insofar as health and safety are concerned, they aim for commercial sterility and each product is sampled and incubated for 14 days. If the sample shows no swelling of the can after 14 days, the lot is released. Records are kept of the processes to be followed for different products and different formulations. They receive some technical guidance from the American Can Company. The firm produces a number of products in cans, including meat dishes such as corned beef, luncheon meat, and braised corned beef; fish products, such as sardines in a tomato sauce (they manufacture their own sauce or import paste puree from which they make the tomato sauce). They also pack tuna fish (Tonino) in oil for export and also pack a spiced Indonesian fish. They produce a canned mushroom for shipment to different world markets. This includes Poeland brand for the United States. They prepare and grow their own mushrooms and develop their own compost for growing the mushrooms. Other products that they produce are vegetables mixed with meats and chicken in broth or sauce. Another group of products consists of fruit juices. These are not truly single strength juices, but juices diluted with water. There seems to be no standard for how much water can be added to a juice and still be called "juice." They also pack fruits in heavy syrups (25 percent sugar), such as fruit cocktail, mango slices, guava slices, and papaya chunks. And finally, they pack a canned shrimp in brine. They provide warranties for their acid food products of up to 6 months and for their low acid foods of up to 12 months. Salesmen pick up samples on the shelf that are more than one-year old or demonstrate swelling. It appears that occasionally the Ministry of Health has brought to their attention that swollen cans were found on the shelves of retail stores, and until now they have not responded. Mr. Tjandra said he would look into it.

We were later informed by Mr. Djoko and Mr. Simatoepang that if there is no government standard, the producer sets his own requirements and these must be approved by the Ministry of Health in its registration program, thereby exercising some measure of control. The Quality Control Program of the canned food company is centered in Headquarters and complaints about products must be picked up and followed through by the plant which produced the particular product. Despite the fact that this Quality Control Program is at corporate level, they do not interfere with the assigned operation of the individual plants. They train the Quality Control people who operate within the plant, but these people are responsible only to plant management and not to Corporate Headquarters. Upon inquiry by us as to whether or not Mr. Tjandra could go into a plant and shut it down because its quality control procedures were improper, we were advised that it could not be done. It appears that only the plant or someone else at Corporate Headquarters (other than Quality Control) could order that a product should not be produced because of unacceptable practices.

Management informed us that they favored national standards, but based upon the needs and capabilities of Indonesia and not foreign standards. Standards should be reasonable and meet consumer tastes. We were cautioned by management that we must be careful not to over-protect consumers but balance the protection of consumers with that of manufacturers and, particularly, "the home factories." He added that it might be proper to set lower safety values until the home industries can produce a better quality product. Because of the fact that much of the production is labor intensive, it may be that one may have to sacrifice a certain amount of safety in the end product.

We were asked to comment concerning the capabilities of the laboratories and their personnel. We did offer a few comments and suggested, for instance, that the analysts we observed should not record their work on scraps of paper hoping to transfer the information from those scraps to bound notebooks. We suggested that bound notebooks be used initially and no erasures be permitted. Instead, whenever a mistake is made, the analyst should simply cross it out and initial so as to show that he had made the change. This change would reduce the danger of errors.

IV.B.9. Factory Producing Tempe and Oncom

Bandung, June 8, 1977

In the vicinity of Bandung, we visited an unnamed home industry producing tempe and oncom, which can be described as national foods of Indonesia. We were hosted by Mr. Oeben Sjarim, who was not only the proprietor of the particular business we were visiting, but was also the chairman of a cooperative of oncom and tempe manufacturers and marketers. The cooperative arranged for the purchase of ingredients used in manufacturing and also provided for an orderly marketing of the finished product. Both tempe and oncom are fermented products. Mr. Oeben Sjarim was good enough to explain to us the procedures of manufacturing both products. The tempe is manufactured from soybeans. Mr. Oeben Sjarim said that he was somewhat distressed because the soybeans being used are purchased from foreign countries, as far away as the United States, Canada, Brazil, and South Africa. Some of the best come from Mainland China and Thailand. His complaint was that the Indonesian soybeans were of inadequate quality to make an acceptable product. He said one of his most serious problems, and that of the members of his cooperative, was to obtain good soybeans. The Indonesian soybeans should be improved and he believes that this is a function of government. It was his hope that the Ministry of Agriculture would promote a search for better quality Indonesian soybeans.

The procedure for the manufacture of tempe is generally as follows: the soybeans are soaked for approximately 24 hours in hot water. They are then washed and peeled. The peeled soybeans are then boiled for 3 hours and filtered through bamboo baskets while still hot. The residue on the basket is cooled and then it is mixed with cassava flour so that the mixture is approximately 98 percent soybeans and 2 percent cassava flour. The measuring is not precise. They then add about 4 tablespoons of rhizopus oryzae mold per 5 kg. This is not accurately measured. The mold is maintained in their own propagating rooms during certain parts of the year on banana leaves. It is rubbed over a cake of the soy-flour mixture. During the "dry" season, mold is purchased from a cooperative member who specializes in its manufacture. After the mold and soybeans are mixed, allowed to cool, and placed in plastic-lined trays for approximately 24 hours for fermentation, the tempe then is sent to market.

We were advised that the shelf life for tempe is approximately 3 days and they produce only enough to meet the demand. Tempe contains a large amount of protein, and although this food is prepared under insanitary conditions, it does provide a high protein food for the Indonesian diet. It approximates 18.3 percent protein on a 64 percent moisture basis.

The other food which was being prepared while we were there was oncom, a fermented peanut product. Following the pressing of the oil from peanuts, the resulting cake is soaked in water for approximately 8 hours. It is then drained and cleaned of debris. Cassava flour is added for binding. The product is then steamed and formed into cakes to which mold is added after cooling. The mold is Neurospora sitophila and allowed to set for approximately 24 hours in plastic covered frames. This food has a shelf life of approximately 5 days. It lasts longer if it is dried. For that matter, it is exported overseas in that form to Holland. Here we find a protein level of 8.6 percent at a 77.1 percent moisture. It also contains 3.6 percent fat. Again, we see a rather high protein food available to the poor people of Indonesia, despite the fact that it is prepared under most insanitary conditions. It, like tempe, is eaten boiled, fried, in soup, etc.

It was interesting to note that both of these products demonstrate less aflatoxin than a control if it had not been treated with mold. Apparently the mold is antagonistic to the Aspergillus flavus mold which produces aflatoxin. However, the finished foods do contain aflatoxin in excess of limits imposed in many countries. It is, of course, impossible to ascertain from our brief study in Indonesia how serious this problem really is, and its true significance would warrant a separate study.

The cooperative consists of approximately 250 members and each of the members operates an individual factory. We were informed that the cooperative utilizes approximately 15,000 kilograms of soybeans daily for the manufacture of tempe. Mr. Oeben Sjarim expressed pride in the fact that the manufacture of tempe and oncom was so well recognized by the government. In fact, a food technology student has recently studied the manufacturing processes of the members of his cooperative and written a report fully illustrating the entire process. We were advised that LIPI desires to study and upgrade the product. This study will be joined by the Indonesian Management Institute.

IV.B.10. Visit to the Provincial Directorate for Drug and Food Control

Bandung, June 9, 1977

Later during the day we visited the offices and laboratories of Mr. Slamet Soesilo, the Provincial Director for Drug and Food Control of the Ministry of Health. We found that the technical personnel in the laboratories, as well as his inspectors, were of the highest caliber. However, they are seriously under-staffed. They had some sophisticated equipment but insufficient personnel to operate it to the fullest capacity. The analysts that were on hand were fully capable of operating this sophisticated equipment, but there were too few relative to their responsibilities. We noted, too, that Mr. Slamet had only 5 inspectors who were pharmacists and originally had been responsible only for the inspection of manufacturing and retailing of pharmaceuticals. Now that the Directorate was also responsible for foods, these men are now additionally responsible for the food activities of an area encompassing approximately 24 million people with many food and drug manufacturing operations. Mr. Slamet informed us that he had requested budgeting sufficient to obtain approximately 30 more people. In our opinion, there is a great need for an increased staff. It is a credit to his people that much is accomplished.

The staff that Mr. Slamet has assigned to him consists of two pharmacists, eight assistant analysts, and one microbiologist. The equipment referred to above consists of the standard modern equipment including an infrared and ultraviolet spectrophotometer and a thin layer chromatograph, with which they test foods for pesticides. It is anticipated that they will soon be obtaining gas liquid chromatographic and atomic absorption equipment. In this particular laboratory, the equipment is assigned to a single specialist. If another analyst has need for that equipment, he submits his samples to the assigned operator who conducts the analyses for him. For obvious reasons, this is excellent for maintaining the equipment. The laboratory is sorely in need of additional reference material and reference standards for drugs and pesticides. At the present time, they are importing U.S. Pharmacopeia and National Formulary Standard drugs.

IV.B.11. Visit to the P. T. Ultra Jaya Milk Industry

Cimareme, June 9, 1977

We visited P. T. Ultra Jaya Milk Industry at Jl. Raya Cimareme 143 in Cimareme about 15 kilometers out of Bandung. This factory was producing a high temperature short-time (HTST) sterilized milk. We met with Mr. Sabana (Managing Director), Mr. Bent Munch Ipsen (Plant Manager), and Mr. Y. Tsnandar (Assistant Plant Manager). We were shown the operation of this particular factory, which mixes both fresh and reconstituted milk. They use approximately 10 percent to 20 percent of locally obtained fresh milk and the remainder consists of a reconstituted product obtained as dry milk from New Zealand. The incoming fresh milk is heated for approximately 10 minutes at 80°C, clarified (removal of debris), cooled immediately to 4-5°C, and stored until ready for mixing with the reconstituted whole milk. The mixture is sterilized at 140°C for 4 seconds, flash cooled to 70°C, and then packed at 30°C. Packing is by the Tetrapak System from Sweden. The products are coded and we were advised that shelf life approximates 6 months to 1 year. A guarantee is provided for 7 months. We were told that they pack in 250 ml and 500 ml containers. The retail cost for 250 ml is approximately Rps 100 or a bit over 25 cents (U.S.). There is a complete quality control system in this factory. Mercury thermometers and recording thermometers are used, with good automation and control. Visual and physical inspection of the entire line, as well as the packing system, is continuous. The seams of the packages are all checked in the laboratory. Packages are removed every 15 minutes from the line with a recording of the code number and the time of removal. If there is a problem regarding quality or safety, packages are removed every 5 minutes. The filled packages are incubated at 35°C for approximately 5 to 7 days. They are then checked organoleptically and also checked for pH and viscosity. If these tests show that they are acceptable, then the product is released for sale. On rare occasions they do microbiological studies on selected batches after incubation. If the product is not sterile, it will be demonstrated organoleptically, by pH, and by viscosity studies after the incubation period. The chocolate milk product contains 1.8 to 2 percent milk fat, whereas the white milk contains from 3 to 3.2 percent with a target of 3.1 percent. We are advised that the best flavor development occurs in approximately one month. The milks produced are flavored with chocolate, strawberry, and coffee. Also, they produce the unflavored product. The entire production is distributed locally. There is no export.

IV.C.1. Visit to the P. T. Arcon Prima Company

Jakarta, June 2, 1977

Mr. Raufaste and Eng. Estrada visited the P. T. Arcon Prima Company. Arcon is a metal fabrication plant dealing in structural steel shapes and galvanized iron products, mostly for commercial and industrial construction. They also have developed an experimental "low-cost" house. The plant layout is based on a similar production facility in England. The equipment is both British and German. Shaped steel parts are imported from Japan, but cut and fabricated at the plant. Approximately 200 persons are employed; 25 in design/specifications/administration and the others in the works. Most of the laborers have a middle-school education followed by six-year technical training in metal working. During the four years Arcon has been in existence, they have had little turnover in personnel. The pay is good, and with jobs scarce, the trained people remain with the company.

The structural shapes are prepared by automated heavy cutting/drilling equipment. The shop produces gutters and downspouts and uses labor-intensive operations. No automatic tools were observed in the galvanized metal shop.

Little consideration has been given to occupational safety. Workers are not required to wear hard hats, safety shoes, or wear protective goggles when welding (most hold a mask in front of their face when welding). No warning lights or horns were observed; there were no safety-marked walk areas.

Inspection of welds, drill holes, etc., is performed by contracted inspectors. The plant does not have the inspection experience or equipment to carry out this important job.

The total output of the plant presently averages between 200 to 250 tons per month. The facility is capable of producing about twice this amount.

Recently, a prototype low-cost house was constructed on the plant site. The house, a duplex, contains about 70 m^2 per unit. The walls (produced by a contractor) are a sandwich panel of gypsum board between two sheets of asbestos. The wall appears to be about 30 to 40 mm thick by 1.25 m wide and 2.5 m high. The structural systems are metal columns with metal roof trusses spread approximately 1.5 m on center. Corrugated galvanized iron is used for the roof.

Two units are produced; one is better finished than the other. The finished unit has full-height wall partitions, a finished ceiling, and glass jalousie windows. The other has none of these. Windows are sheets of plywood hinged on the side. The price for the finished unit is 22,000 rupiahs (U.S.$53) per m^2; the unfinished unit is 18,000 rupiahs (U.S.$44) per m^2. Note these costs are similar to those of PERUMAS (see IV.C.4 below).

These duplex buildings can be produced at a rate of four per day, too few to make the venture profitable. The present production rate is limited by the wall panels which are produced under contract. Eventually, Arcon hopes to produce ten units per day, a cost breakeven figure.

The duplex design and construction practice appeared satisfactory. However, the doors should be moved away from the corner of the building to improve its structural stability. Further, the roof clip to truss channel is not a rigid connection. This could lead to displacement under abnormal load, especially since the clip is screwed on from beneath and the screws tend to back off.

IV.C.2. Visit to the Ministry of Public Works and Electric Power, Directorate of Roads and Highways

Jakarta, June 3, 1977

To assist the better flow of commerce, modern highway construction would help Indonesia greatly. The highway system in Indonesia is not adequate for the flow of present-day commerce. Large building components such as pre-cast panels and other structural elements are difficult to transport from factory to job site. However, a toll road is currently being constructed south to Bogor, and plans are underway to build a toll road east to Bandung. Also, a beltway around Jakarta is being planned.

It seems no longer possible to depend solely on the national budget to provide funds for road planning. The traffic problem in most large cities is severe—major construction should begin at once, if development plans are not to be seriously retarded. Indonesia's President is considering establishing a highway corporation that will have overall planning and implementing authority for roads and highways.

The Roads and Highways staff commented that road standards are the responsibility of the Ministry but are not enforced. The staff suggested that an international road construction standard be developed and coordinated in conjunction with the Association of Southeast Asian Nations (ASEAN), which besides Indonesia includes Thailand, Singapore, the Philippines, and Malaysia, four Southeast Asian countries with similar socio-economic/geographic conditions to those of Indonesia. In this way, planning and costs could be shared and each country would benefit equally.

IV.C.3. Visit to the Building Information Center of Jakarta

Jakarta, June 3, 1977

Mr. Raufaste gave a short introduction to the purpose of the NBS/LIPI study. The Information Center coordinates building information for 22 of Indonesia's 26 provinces. The Center stated that Indonesia requires 440,000 new or renovated houses each year. This statistic is based on an annual 3 percent population increase. During 1976 only 90,000 homes were constructed, however, and fewer were renovated.

Housing has, and deserves to have, high priority in the Government's programs.

IV.C.4. Visit to the National Housing Development Company (PERUMAS)

Jakarta, June 3, 1977

The National Housing Development Company (PERUMAS) is a private organization responsible for constructing houses for low middle-income and low-income families, using government funds. Funds for meeting village housing needs (these are for very low-income families) are provided by the World Bank; these family groups comprise over 80 percent of the population.

Residential construction for higher middle-income families is provided by the real estate corporations. Affluent individuals contract directly with an architect and a building company, but they represent only about 1 to 2 percent of the population--a statistic approximating architect designed buildings in the United States.

PERUMAS puts up 4 types of low-cost houses and provides sites-and-services assistance. The four types of houses have floor areas of 36 m^2, 45 m^2, 54 m^2, and 70 m^2. Their cost ranges from 18,000 to 23,000 rupiahs (U.S.$44 to 56) per m^2. They are built with concrete floors, timber walls, wood, and asphalt/cement roofs in Java and the large island of Kalimantan, and with galvanized iron or aluminum sheet roofs on the island of Sumatra.

The sites-and-services activities include providing to low-income families an unfinished shelter of 20 m^2 (which later may be expanded to 45 m^2). The building includes land, water, electric power (in some locations), and a waste drain system. The cost for each unit ranges from 10,000 to 15,000 rupiahs (U.S.$24 to 36) per m^2. The building is made of a lightweight steel frame, hollow-block walls, a concrete floor, and a cement/asphalt corrugated roof. No partition walls or furnishings are included.

Minimum floor space standards developed by the Institute of Technology in Bandung are used as planning guides by PERUMAS. PERUMAS has served on-going housing projects in Jakarta and is beginning to build on three sites at Surabaya (East Java).

PERUMAS officials said that, as far as their activities are concerned, building permits are required to build houses. This is the general rule in Jakarta and to some extent in Surabaya. Contractors to the government are required to obtain such permits. Building plans are then submitted to the local government housing authority. The building may be constructed only after recommended changes are made. The team was informed that each building must be inspected twice while under construction. The inspector usually is a high-school graduate with some on-the-job training, and has authority to halt construction. No information is available on how often construction is stopped.

The PERUMAS staff did not have details about housing activities performed by the World Bank or about the real estate corporations (both together provide services to about 15 percent of the population).

IV.C.5. Visits to Various Housing Construction Sites

Java, June 1977

Several residential building sites in and around Jakarta and Surabaya were visited by Raufaste. Although these represented the various income ranges, the small sample cannot be considered representative of Indonesian building practices or even those on Java.

Most buildings in Java are constructed primarily of masonry, since wood is scarce. Building practices varied; buildings were observed while under construction which could have been greatly improved without additional overall cost. For example, there were several instances of buildings with: inadequately designed bond beams (underdesigned, not continuous or totally lacking), insufficient (too few or no) roof-to-wall connections, and underdesigned roof trusses to support roof tile under abnormal loadings. Brick infill walls were large in area in relation to the column; they could have been better constructed, and, at times, they were not tied to the columns. There also were numerous examples of unsatisfactory mortar joints (too thick); much irregular (broken) brick; and walls often out of plumb. Reinforced columns tend to be underdesigned. Concrete quality varied from site to site; usually only large-size aggregate is used and it often is unwashed. The sand (sometimes containing quantities of foreign matter) to cement ratio appeared to be high and inadequately measured. Scrap boards, improperly oiled, are used for form work rather than plywood. When the boards are removed, there is a tendency for the concrete to pull off with the board. A sewer pipe on one site was installed backward with the flange at the base rather than the top. In this position, the waste water is able to seep around the joint. Moreover, inadequate workmanship is often covered up with a cosmetic finish that hides the flaws. Consequently, during visits to completed buildings it was difficult to assess quickly the construction quality. Nevertheless, most of the government-funded low middle-income and low-income houses appeared to be adequately constructed. No water stains on ceilings or walls were found, nor were settlement cracks observed. Electrical wiring, however, is a serious problem throughout Indonesia, as little insulation or few standoff insulators are used. At one housing site (upper-income), electrical service is supplied from underground resulting in visual benefits. Electric power losses in transmission are significant.

IV.C.6. Visit to the P. T. James Hardie Company Ltd.

Jakarta, June 4, 1977

Mr. Raufaste visited the P. T. James Hardie Company--a manufacturer of asbestos cement pipes, roofing, and wall sheets. This factory began operation about a year ago. It was set up as a joint venture between the governments of Indonesia and Australia. Hardie is the largest of six or seven asbestos cement product manufacturers in Indonesia.

The firm is proud of its products; they have placed importance on quality control. Both physical (crushing, bending, and flexing) and chemical tests are performed at the plant. They are based on ISO standard test methods. Samples are routinely sent to Sydney (headquarters) for verification. Equipment calibration was reported to be performed bi-monthly. The company has in its laboratory three proving rings: 5 kN, 20 kN, and 100 kN.

James Hardie, the other Indonesian cement asbestos plants, the Ministry of Industry, and the Materials Testing Institute in Bandung have spent considerable time in developing two draft asbestos cement standards. They are "Asbestos Cement Flat Sheets" and "Asbestos Cement Corrugated Sheets." By late June 1977, the drafts will have been reviewed for adoption as national standards. Because of this consensus review process, if the proposed standards are adopted, chances are good they will be followed by the other materials producers and enforced by the government.

There seems to be little effort made to assure worker safety at the plant. While hard hats, safety shoes, and overalls are available for the workers, none are used. The weather is hot and humid and old work habits may discourage use of such equipment. Also, the air has not been sampled for asbestos dust or other contaminants. A serious occupational hazard is to be suspected.

The factory staff appears fairly well-qualified. Management personnel have university degrees; the workers are usually middle or high school graduates and some came in with technical training. Understandably, in an environment with 25 percent unemployment, the turnover rate at the plant is low.

IV.C.7. Various Meetings with Members of the Indonesian Structural Engineers Association (HAKI) and the Indonesian Institute of Architects (IIA)

Jakarta, June 1977

Mr. Prawirohardjo, President of the Indonesian Institute of Architects (IIA); Mr. Hakim, Vice Chairman, the Indonesian Structural Engineers Association (HAKI); Mr. Liman, Secretary, HAKI; and Mr. Boen of HAKI, separately and together visited with Mr. Raufaste to discuss the Indonesian building process. These individuals said that siting, design, and construction practices vary widely in Indonesia. Rarely, so they alleged, is attention given to properly siting buildings or to using land in the best manner. At times, the owner requests detailed drawings even before the site has been surveyed. Soil analysis may never be performed simply to save the cost. There also is a lack of experienced testing laboratories to perform the analysis; if there are data available from a nearby site, they may be extrapolated for use, which could prove unreliable.

During the schematic design and design development phase, more coordination between the architect and the structural, mechanical, and electrical engineers would be beneficial. The architect normally takes the lead. He prepares the architectural layout and architectural working drawings. The structural engineer, working independently of the architect, designs the building's structural system to the architect's drawings. Then the mechanical and electrical engineers independently perform their tasks. These separate steps can lead to major errors.

The plans are next submitted to the governor's building approval office within the province (there are 26 in Indonesia as stated earlier). That office (they have little review expertise except in Jakarta) approves the plans (time varies) and releases them after a predetermined fee is paid. This fee is based on the type of building and its location.

During the construction phase, buildings are not often inspected, except those in Jakarta. The inspection process is thus voluntary and up to the designers, who usually do not have time. Liability for building failure resides with the designers (up to the limit of their fee). In case of fatal accidents, they could be liable to criminal action.

With the exception of Jakarta, building regulations and codes tend to remain unenforced. Of the various Ministries with building responsibility, each has its own enforcement authority. There is no central coordinated agency with interagency responsibility. None of the ministries work together enough to coordinate enforcement, except for government-sponsored construction in Jakarta.

As previously mentioned, there are few building developers in Indonesia. The National Housing Development Company (PERUMAS, IV.C.4) in Jakarta, the real estate corporations, other private developers, and cement, asbestos, and metal fabricating organizations are the few organized groups involved in building. The less organized groups consist of labor groups (without legal status) and general contractors who comprise the majority of construction manpower. The upper income individual contracts for construction, while over 90 percent of the people must construct their own buildings.

Designers in Jakarta are either university-educated or have sufficient years of experience to qualify. With the exception of Jakarta, designers and contractors need not be certified, though the government is talking about certifying designers in large cities in the future. In Jakarta, architects and engineers are licensed to design 4 classes of structures: (1) any kind of building; (2) buildings less than 40 meters in height; (3) only single story building; (4) non-building designs such as service systems or sewage projects. A similar breakdown exists for contractors.

Laborers usually are not skilled. With the very large Indonesian population, labor is plentiful and very inexpensive and no training is necessary. Contractors usually subcontract, and it is common for six, seven, or even eight levels of subcontracting. Consequently, in this informal organized system, there is little control over quality of work because subcontractors do not perform as specialists. Those specialized contractors provide services of advanced nature such as on mechanical and electrical systems, use of heavy construction equipment, pre-stressing equipment, etc.

Generally, banks do not lend money for purchasing a house because it is difficult to collect if the owner defaults. The unwritten social code in Indonesia says that man has a right to a roof over his head; in that shelter he has a right to remain. Therefore, if banks do not loan money, individuals must save for the total cost of the house; they pay for the major cost of the building before construction and the remainder at time of occupancy. This amount ranges from about 18,000 rupiahs ($45) per m^2 for a low-cost house to over 70,000 rupiahs ($175) per m^2. The government recognizes that 95 percent of the population is unable to purchase, but on a trial basis the government is providing guarantees to banks. This could open the way for low-income people to purchase houses.

There are few testing laboratories; most are not equipped to perform anything but routine tests. Some have testing machines, measuring equipment, and recording apparatus; few have calibration apparatus such as proving rings or a capability to perform nondestructive testing. Some of the larger private laboratories and government agencies, as well as some factories (plants), have modern equipment with good facilities; some follow test procedures developed in other countries; others follow no approved procedure. Maintenance of this equipment appears to be a problem; expertise is not readily available and parts are generally difficult to order with long-time delays since most parts are foreign made.

Few educational institutes have substantive courses in engineering. There are about 40 recognized colleges and universities throughout Indonesia for a population of 130,000,000 persons. Of the top 5, only 2 have courses in earthquake engineering, a subject that needs attention due to Indonesia's location in a seismically active area. There is need to establish a better balance between course work in theory and practice. Increased opportunity for real world experience would make the studies more useful for later development in career positions.

As stated earlier, many qualified instructors are leaving the academic environment for a better salary or are working part-time to supplement their income. Since it is difficult to hire qualified instructors, some less qualified individuals must be employed, with inevitable harm to the educational system.

There are eight professional building technology related societies in Indonesia. The two largest are the Structural Engineers Association and the Institute of Architects. The other six are just getting started: Geo-Technicians, Environmental Engineers, Mechanical Engineers, Electrical Engineers, Designers, and Planners. Eligibility for membership requires that an individual be either a graduate or have "sufficient" experience to match the university training of other members. Engineers are not licensed as in the United States in order to practice architectural or structural engineering. Only those in Jakarta are certified, based mostly on previous experience, to design certain building types based on height and volume (as noted earlier).

The professional societies could do more to represent the building community or have a significant influence on improving building practices. The government could gain greatly by recognizing the organizations and assisting the societies in the publication of professional journals, as in other industrializing countries such as the Philippines.

IV.C.8. Visit to the Building Information Center

Surabaya, June 5, 1977

Surabaya is in the process of strengthening its building standards and trying to improve the overall design process. The governments of some provinces using funds from the Ministry of Public Works and Electric Power and from the Ministry of Interior are rehabilitating rural and urban houses. In 1976, 2,650 rural houses were improved, and in 1977 funding was made available to improve 3,450 houses. The Government hopes this start will serve as a stimulus for adjacent homes and neighboring villages to start individual improvements.

IV.C.9. Visit to the Directorate of Building Research

Bandung, June 8, 1977

Attending the meeting were Mr. Kartahardja, Director; Mr. Hariman, Associate Director; Mr. Buerbo, Project Coordinator on Human Settlements; and Mr. Raufaste. The Directorate of Building Research (DBR), Ministry of Public Works and Electric Power, serves as the United Nations Regional Housing Center within the hot and humid areas of Southeast Asia. DBR was established in 1955. It is the only recognized building research group in Indonesia. The organization has a staff of 180 individuals, of which 24 are researchers, 33 are supporting technicians, 121 are administrative staff and personnel, and 2 are librarians and document specialists. The ratio of professionals to support staff appears to be small. This group is performing research on building materials and construction, and research in the field of human settlements. They have a limited budget but are making progress that has significant benefits to building technology. The professional staff are competent, and many have received their advanced degrees from overseas universities.

As an example of the pace of standards activity in Indonesia, the "Manual for Building" of 1941 is being reviewed by DBR for suggested revision. This document serves as the basis for building regulations. DBR is coordinating the review with the other ministries and appropriate universities for comment. DBR is also working with various Indonesian cities to revise and implement building codes and standards.

The Institute of Technology in Bandung (ITB) enrolls approximately 60 percent of the Indonesian architecture and engineering students. ITB is the most prestigious university in Indonesia. Their building research laboratory facilities are the best in the nation. Many of the ITB staff are associated with DBR. These individuals are qualified and well motivated. Undoubtedly, ITB is a great center of learning giving a stimulating research and university environment. At that level, it seems to be unique in Indonesia. (See IV.F.7.)

IV.C.10. Visit to the Development Technology Center

Bandung, June 9, 1977

A meeting was held with Dr. Wirjosumarto and Dr. Kartasasmita, who provided an overview of their activities in working with small-scale industries. The Development Technology Center (DTC, part of the Directorate of Building Research, Ministry of Public Works and Electric Power) is involved in the application of intermediate technologies to meet the needs of rural development. DTC collaborates with the Institute of Technology at Bandung (ITB) and the East West Center in Hawaii to develop and transfer technology throughout the nation. ITB provides guidance and technical assistance and engineering support to Indonesia's building community. For example, bricks and tile are commonly used building products; they vary in quality and size. Staff members of DTC are testing brick and tile to develop methods that small-scale industries can use to improve their quality and uniformity.

Materials suppliers also turn to Bandung to have their building materials and components tested (usually for marketing reasons). Rarely is testing performed outside the large cities in Indonesia: Jakarta, Surabaya, Medan, Ujung, Palembang, and Bandung. Bandung now serves as the "standard reference" testing laboratory for building in the nation. Except for these larger cities, Indonesia is not using the skills at the Directorate of Building Research.

IV.D.1. Visit to the Furniture Factory, Gabungan Perajin Kayu Pondok Pinang

Jakarta Selatan, June 2, 1977

The team visited three home industry furniture factories in Jakarta. Members met with Mr. Mhd. Sardjan, who, after a political career, had become the director of a cooperative of approximately 60 families operating small furniture factories. The cooperative was primarily concerned with buying materials and selling finished products as well as acting as agent for the borrowing of money from the commercial banks. There was very little, if any, effort to improve the technological capability of the members or to assure that minimum standards of quality are met. After some reticence, Mr. Sardjan appreciated the great value for himself in some written standards, for instance, for fulfilling repeat orders, rather than having to produce and store one sample in excess of those ordered for all items.

The three factories were of different levels of quality and complexity of finished product. Of particular concern was that factory producing furniture for the very low-income market. The cooperative might be strengthened by answering questions on whether the glues, wood treatment, stability, etc., are sufficient to provide value for the money spent. Provision of more standardized tools would be helpful.

We would not advocate that a home craft industry should be held to rigid standards that are often unattainable because of costs. To do so may ruin an industry supporting many people. On the other hand, some protection must be provided for customers. There is some on-the-job training and the Ministry of Industry has assisted in running six courses since 1970. The team would advocate that this training program be expanded and appropriate subsidies be considered. The training program might be scaled to levels commensurate with the capabilities of the manufacturers. Care should be exercised to avoid reducing the level of arts and crafts inherent in these "home" or "cottage" industries. However, the industry must recognize the obligation it has to the consumer.

IV.D.2. Visit to the National Gobel Electronic Factory

Jakarta, June 3, 1977

Mr. Aam and Mr. Gandi, among others, with Mr. Chaiwai and Mr. Peiser were received by Dr. Th. M. Gobel, member of Parliament and the People's Consultative Assembly, president of the Electrical and Electronic Home Appliance Association, Deputy Chairman of the second strongest political party, and owner of several firms in different sectors. Also present were many high level staff members of Gobel National, the oldest TV manufacturing company in Indonesia, including Dr. Lukman Hakim, Engineer Akmal Mukman, Manager, and Hendarman

Lesmana, Assistant Manager. The firm assembles tropicalized Matsushita TV's and radios and innovative Indonesian appliances. Plans exist for imported TV components to be gradually replaced by domestic manufacture to strict Japanese standards. This process has successfully started with cabinets. National's reject rate runs around 1.5 percent compared with Matsushita's home production of 0.7 percent. Complaints from consumers often refer to well-worn sets. A nation-wide service agent system exists. The Government--as in all countries--comes in for some criticism. For example, in Indonesia Dr. Gobel says the length of import release from customs is about 1 month compared with 1 or 2 days in neighboring countries. Another example is the Indonesian Government's refusal to give rebates on import taxes on re-exported items with value added, such as on plastic for a cover plate on a tape recorder. This latter complaint appears to be very significant when compared with complaints elsewhere that Indonesian industry has so far proved incapable of competing with neighbors in home appliances. The above-named Association publishes an informative periodical with attractive advertisements. Dr. Gobel backs the KIMS program (Calibration, Instrumentation, Metrology, and Standardization, a program under LIPI) wholeheartedly and says he will in conversation with ministers press for implementation which will also help to protect against inferior products.

IV.D.3. Visit to the Chemical Research Institute (Ministry of Industry)

Bogor, June 4, 1977

Accompanied by some of our host team, including Mr. D. Hargono and Miss V. Warjani, the Food and Food Safety Group visited the Chemical Research Institute at Bogor. That group met with Dr. Dardjo Somaatmadja, Director of the Chemical Research Institute. This Institute is under the Directorate General of Handicrafts and Miscellaneous Industries in the Ministry of Industries.

We were informed by Dr. Somaatmadja that the Chemical Research Institute is one of the oldest research institutes in Indonesia, having been established in 1909. There are records to show that laboratories existed at Bogor doing agricultural research for the Dutch as early as 1890. After being given a brief history of the Institute, we were informed that the Institute has had a long history in the establishment of standards. Since its establishment, the Institute has been a pioneer in research:

a. On exploration of various materials, agricultural, estate, as well as mineral products for export and for domestic use in industries.

b. On utilization of by-products of existing industries and development of new or improved processes of possible industrial value.

c. On food technology aimed at better conservation and more efficient utilization of food materials available in the country.

The results of its research on various essential oils indigenous to Indonesia has become the basic knowledge of these essential oils in the world today.

At present, the Institute has not only facilities for research but also for testing and education. It provides testing and analytical services to industries on raw materials, half-finished and finished products for conformance to standards, and it issues certificates of quality for export of several commodities such as essential oils, copra, seaweed, spices, sulphur, cinchona bark, and other products.

The Institute also provides technical assistance to industry and government. It operates schools graduating laboratory analysts and other technical personnel needed by industry. The analysts are either at the technician level or at the Bachelor's level, depending upon how much schooling they receive. It supports academies for specialization in such fields as leather technology, management, administration, etc. One of the functions of the Institute is to improve processes for various industries such as ceramics, leather, textiles, and foods. It also develops standards for those industries. It has established standards for such commodities as Portland cement, leather, building materials, wheat flour, soy sauce, cooking oils, corn meal, tapioca, syrups, margarines, etc. It should be noted that these standards were developed by the Ministry of Industries for the purpose of increasing the "value added" factor. Although there may have been some participation by other departments such as the Ministry of Trade and the Ministry of Health, their advice is not necessarily sought nor are the standards used by those other departments. It was the opinion of our host that the Ministry of Health was primarily concerned with food hygiene and not with production factors. In his opinion, health problems were the responsibility of the Department of Health. When products are examined for compliance with standards of the Ministry of Industries, health related factors are not normally considered.

Dr. Somaatmadja informed us that he favored national standards, but he was reluctant to comment on how a suitable system should be organized. He went on to discuss with us, further, the differences between the Ministry of Trade Standards and the Ministry of Industry Standards. He indicated that his Ministry's standards could require a minimum amount of oil in a drum which could be different from that required as a minimum by the Ministry of Trade. The same could be true for the quality of the oils. He commented, further, that the Ministry of Industries is concerned primarily with the quantity produced.

Dr. Somaatmadja told us that implementation and enforcement of his Ministry's standards begins with education of a manufacturer who is not in compliance with a standard. In the event that the educational program does not succeed, then they attempt to place restrictions on the manufacturer's further activities.

We were then apprised of the Ministry's continuing program of standards improvement. There are approximately 160 industry standards already approved by the Minister of Industry. There are at present 30 standards in the process of being considered for approval. (Compare Section IV.F.1.)

IV.D.4. Visit to the Industrial Division of the Special Capital District of Jakarta (DKI)

Jakarta, June 4, 1977

The capital, Jakarta, encompasses 500 sq. kilometers, an area about the size of the District of Columbia, with a population of 5 million people. Mr. Chaiwai Sangruji, accompanied by Eng. Wilman Tampubolon, was received by Eng. Martono Soemodinoto, Chief of the Industrial Division of the Special Capital District of Jakarta, along with several colleagues. They are officials of the Ministry of Industry, yet are controlled by the Governor of the city, with the task of encouraging industrial development and creating job opportunities within the city.

Work on standards first started in 1969 with the aim of educating people. The city, for example, gives partial support to the Consumers Union (about 4 million rupiahs per year equaling about U.S.$10,000). Standards were prepared and revised by active committees with cooperation of concerned people. They were circulated for comments as widely as possible, and they were promulgated by the Governor himself. Thirty-seven products are now under enforcement including some foods, cosmetics, building materials, textiles, salt, etc. Producers must have licenses. The Division inspects factories and evaluates their quality control procedures. Its agents take samples and send some to be tested at suitable Government and private laboratories. A lump sum fee on the producers is imposed to cover testing and administrative costs. Follow-up visits were also said to be made at 4 to 12 inspections and sample takings per year. The team may have misunderstood but did not pursue the question of frequency of inspections. Discussion with a statistician could well be rewarding.

When low quality is found, the Division gives a first written warning. Repetition of the same will lead to a note in the newspaper. This is said to be very effective. However, withdrawal of license may become necessary for repeat offenders.

The main benefit of Mr. Soemodinoto's work is that it educates the people to quality consciousness and gives visibility to effective city government. The visiting team warmly applauded this effort. The Governor of Jakarta is not eligible for re-election. One hopes that this person will take his insight into good standardization practices to his next assignment in the service of Indonesia.

IV.D.5. Visit to Supreme Cable Manufacturing Corporation P. T. SUCACO

Jakarta-Tangerang, June 4, 1977

Engineer Wilman Tampubolon accompanied Mr. Chaiwai Sangruji to the Supreme Cable Manufacturing Corporation where they were received by the Plant Manager, Eng. Bob Wirajendi, who had spent ten years in Germany; Development, Sales, and Quality Control Engineer, Djoni Setyadi; and Plant and Manufacturing Engineer, Purnawan Arijanto.

SUCACO produces the larger sizes of single and multi-core low-voltage polyethylene insulated PVC sheathed cables, PVC armored cables, and telephone cables, all of copper wire (220 ton/month with a capacity of 270 ton/month). SUCACO also makes pressed melamine sheet (Formica). Future plans are for PVC wire and cables for home wiring, enameled copper wire, aluminum wire and cable, and cross-linked polyethylene if the Government decides to approve cross-linked polyethylene.

SUCACO is entirely Indonesian owned and operated, but uses Japanese and German machines. It employs 350 persons including five engineers and one chemist. All others have been trained within the company.

The senior staff appeared very energetic and competent. They can be very proud of their achievement in developing and running the factory without continued help from abroad, although the original machines were purchased from Japan with a few Japanese technicians coming over to help in installing and running them during the first year. German machines were also used and Eng. Wirajendi was rightly proud that they could mix these with the Japanese ones in the same production line. A huge machine in the production line for armored cables was claimed to be the only one in the country. It, too, was working smoothly. There was mention of the younger generation that was said to be more energetic than the older ones, especially in government. The young people would like very much to get many things done; for instance, to make standards mandatory for all wires and cables. The right blend of vitality with wisdom of experience is indeed a key to good development.

Six of the larger companies have formed an Association of Electric Cable Manufacturing Industries. Four of these members have received licenses to use the LMK quality mark awarded by the Electric Power Research Center. The rest of the members have applied to use the LMK mark. Bob complained that manufacturers who could use the LMK mark were at a disadvantage, because they (even though willingly) had to supply high quality products while the authorities still allowed substandard cables to be made and sold to the consumer. This is a typical complaint. If action were taken to prohibit the sale of substandard cables, it would benefit the consumer, the country, and themselves. However, the contrary opinion should be recognized; while the total demand cannot be met by production, the quality mark can still supply benefits once the consumer recognizes the advantages of quality. The 6 members of the association now supply 80 percent of the country's requirements. The other 20 percent are shared among other local manufacturers and imported products.

SUCACO wholeheartedly supports the standardization and certification programs of the State Electrical Enterprise (PLN). They also support the idea of a national system for standardization and would like to see the standards on wire and cable enforced nationwide.

SUCACO was among the first four companies who were licensed to use the LMK mark. They received one warning for a case of non-compliance, but have not experienced any subsequent threat or penalty. PLN has sent inspectors on several occasions to check their record of tests and to take samples. The system used was not to take samples of all sizes in a series of the same type of product, but rather to take two to three sizes as samples of the series depending on the type of product. This is judged to be a sound system provided that the factory has a very good QC system of its own and strictly follows the system.

Copper rods are imported from Australia and drawn by SUCACO which has its own shop for making dies, both diamond and carborundum type A. Supersonic grinding machinery was shown to the team. SUCACO was not aware of the National Research Institute for Instrumentation (LIN), so has not made good use of LIN's services so far. PVC and polyethylene are also imported from Japan (Sumitomo) and Germany. SUCACO generated their own electricity.

SUCACO has two control laboratories at opposite corners of the factory. Both were inspected by the team; one is for electric cables and the other for telephone cables. The team observed that one was best suited for electrical and the other for mechanical tests. The ovens used here, as well as at PLN visited on the previous day, were of the natural draft stationary type whereas the forced draft rotating type may be needed in the future when quality of the plastic needs to be carefully specified and strictly enforced.

Production lines are installed with automatic control devices, e.g., for checking the electrical insulation (standard specified 1,000 volts, control setting at 3,000 volts) and controlling the concentricity of telephone wire.

A sample of PVC electric cable with the LMK mark was shown to the team at PLN. An observation was made of appreciable departure from concentricity. It was explained that the requirement for thickness of insulation was met in all directions. It is true that telephone wire needs more precise control than electric wire, but it would be quite a lot of savings on PVC if more precise specifications were laid down and controlled for thickness of insulation, concentricity, and outside dimensions of the cable. This is a problem engaging other countries also. Certainly, Indonesia should benefit from a good system of control of concentricity. Lack of concentricity is a common cause of breakdown and causes users to employ unduly large cables.

The hosts showed us their manufacture of high pressure melamine sheet. The press is from Japan, and the plastic imported. The unit worked on three shifts since the demand was so great.

The team obtained the impression that the company enjoys good relations with PLN and deserves a good share of the market. Enforcement of minimum standards for smaller PVC insulated copper wire and cable for house wiring will greatly benefit their plan to enter into the small size range. They are now being made only by various small-scale producers. A producer bent on high quality might stimulate also the smaller producers to market more satisfactory domestic wire products than appear presently to be readily available in the market.

IV.D.6. Visit to the Drug Manufacturer of Air Mancur

Wonogiri, Surakarta, June 6, 1977

In the company of Mrs. Djaprie of LIPI, Mr. Hanauld, Mr. Djoki, Mr. Hargono, and Mr. Simatoepang of the Ministry of Health, and Mr. Permadi, the Executive Secretary of the Consumers Group, Dr. Woo-Ming and Mr. Gutterman of the visiting team flew to Jogjakarta. Our first visit in that more Eastern part of Java was to a traditional drug manufacturing plant, Air Mancur at Wonogiri, Surakarta. We were met by Mr. Sardiman, the Director; Mr. Purwono, a biologist; Mr. Harun Al Rasyed, responsible for laboratory and production; and Mr. Zaenal Arifin, responsible for Quality Control.

The traditional medicines and the methods of production have come down through generations of Indonesians. We were informed that, of course, the methods of production have been continuously improved and modernized. Air Mancur aims for traditional medicine to keep pace with modern medicine and science. A physician is on the staff as are technical people of the medical allied sciences for production. The plant visited was only one of three that participated in the manufacture of the drugs. One plant selects the drugs, and the other is for packaging and labeling. The one visited was responsible for compounding and standardization. We were shown charts of the processing schemes for traditional drugs and medicines, called "jamu," and we observed the manufacturing of cosmetics, and their demonstration gardens of the various plants that are used for drug manufacture. Medicinal plants of special significance to Indonesia are cultivated in these gardens. Pot plant experimentation was carried out to increase contents of active principles. There is considerable liaison with the medical school and many of their drugs are standardized, not only in the chemical and biological laboratories, but, also, with human patients. There appeared to be good quality control adherence to appropriate standards and good sanitary practices. A number of the manufacturing practices were being carried out in open areas where they could be contaminated from the environment. However, we were advised that these areas were primarily for production of cosmetics.

They buy raw materials from growers who have been selected as having acceptable herbs, leaves, and barks for particular products. Samples of each are analyzed for content of the particular ingredient or ingredients desired. The raw products are then stored, sorted, hand-picked to remove large adulterating materials, and then winnowed to remove any dirt. The cleaned products are then disinfected by washing with potassium permanganate. The product is then washed and dried either in ovens or in the sun and stored in a clean area. Each batch is then sampled to determine the active constituents and their quantity. The average is determined and a production standard adhered to. This is a production standard established by the manufacturer. The standard is determined on the basis of an average of ten samples from different batches. They then compound the standardized raw materials according to prescription needs and the products are stored in accordance with their prescriptions. Within the operation, the many different departments include the milling, pulverizing, sifting, mixing, and storage departments. The products are finished in liquid, capsule, and tablet forms. Usually the externals are herbal cosmetics although there are a number of medications prescribed for external use only. The internal forms are for therapy and for prophylaxis. They prepare therapeutic drugs for tropical sprue, kidney stones, malaria, influenza, croup, coughs, menstrual disturbances, asthma, and high blood pressure. For prophylactic medication, they have substances for dieting and fat reduction.

Approximately 140 kinds of raw materials are used. Different kinds are used for stimulants, antipyretics, antibiotics, analgesics, diuretics, sedatives, cough remedies, and expectorants. Drugs are of both the prescription and nonprescription types. Laboratory checking of samples of finished products is quite an important feature. The products are analyzed and rechecked several times and not distributed until such time as the laboratory reports that they are acceptable for release. The pharmacology department checks products at many points. It checks them prior to blending, for active components and blends of the product, as necessary. The pharmacognosy department checks the raw product anatomically and microscopically for genuineness and purity. It collects, identifies, and determines unknown medicinal plants and is developing a herbarium of authentic specimens. The "vital chemical" department checks the product for the active principles and they do a chemical standardization here for such substances as alkaloids, glucosides, volatile oils, etc. The microbiology department determines the bacterial count of the product. They check for coliforms and other pathogenic organisms. The toxicology department routinely screens each product for the toxicity of each material and checks for therapeutic value using mice, rats, rabbits, and dogs. A quality control activity is carried on at all stages to determine the homogeneity of the product, the sizes of the particulate matter, and the dosages. Disintegration tests of tablets are also carried out. Plant management referred to a problem of excessive bacterial counts; "luckily" they were non-pathogenic. They advised that there are no government regulations for bacterial count, but they are anxious that the government would set limits soon. There is a scheduled cleaning of the area using such substances as paraformaldehyde and potassium permanganate for sterilization. Each batch of the product produced had LD_{50} tests performed and had to be found acceptable prior to release. Clinical studies on humans are being performed at the university associated medical research group. A complete library of wet and dry forms of the raw materials, samples of each batch of end-products, and the records of the tests by the various departments were maintained.

IV.D.7. Visit to the Institute of Textile Technology

Bandung, June 8, 1977

Mr. Chaiwai Sangruji, accompanied by Deputy Chairman Sumantri, was received at the Institute of Textile Technology (Institut Teknologi Tekstil) by its Director, Mr. Wibowo Moerdoko. He explained that the Institute was started in 1922 as an experimental station with an aim to train Indonesians in weaving. The present functions of the Institute are research, development, and education. The Institute employs 150 university graduates, 200 technicians, and 350 others (700 in all). The Institute is now in the second phase of a UNDP assistance project (first 1972-1976, second 1977-1980). The experts stationed there are on weaving, knitting, and products development. There is also a project manager and one expert in Jakarta on marketing. The U.N. is recruiting another expert on dyeing.

The Institute plans to have ten textile service centers throughout the country. At this time, five have already been established, one of which is in Jogjakarta with a principal interest in batik. The available testing facilities at Bandung were shown to the visitors.

Textile standards are prepared by the Institute in cooperation with textile manufacturing industries using the usual consensus method. Sixty-six standards on testing methods, performance, specification, and definitions have been published. All standards are voluntary, but may be adopted for enforcement by authorities concerned.

Typical examples of the Institute's services are arbitration on conflicting test results, and inspecting and certifying products under contract from a buyer, such as the army. A team from the Institute would be sent to the textile mill to evaluate its control instruments. After approval, the production is allowed to proceed. The product is then inspected and an ITT mark is stamped on it.

The team gained the impression that the Institute is well organized for handling standards preparation work since the Institute has the advantages of its own R&D, testing laboratories, documentation, and industrial contacts. The Institute is well equipped with testing facilities and gains greatly from services provided by the U.N. On request, the Institute could easily accept additional testing as well as consultation for industries such as quality control measures. The Institute should give a little more attention to standard atmospheric conditions in testing in the laboratories. A statement, "If a sample comes in during the morning, we can give a test result on the same day," seems dangerous. A sample may need a longer time to equilibrate to laboratory conditions than is given in a workday.

IV.D.8. Visit to Bio-Farma

Bandung, June 9, 1977

The Food and Food Safety Group visited Bio-Farma in Bandung, Indonesia, Jl. Pasteur 20. We met with Dr. A. Koesdarminta, Production Manager, and Mrs. Wenas, Head of Quality Control. Bio-Farma produces a large number of vaccines and sera. The vaccines are for diptheria, tetanus, cholera, pertussis, typhoid, smallpox, rabies, and BCG, which is an anti-tuberculin vaccine. The sera are anti-diptheria, anti-snakebite, anti-rabies, and anti-tetanus. This particular manufacturing laboratory performs biological (animal), physical, and chemical assays of the materials it produces. In the team's opinion, the controls, the standards, and laboratory practices are of a high order of professionalism.

Dr. Koesdarminta says that he believes that national standards are an absolute necessity. He prefers general participation and believes that all who have interest should be invited. The standards that he presently uses are either those of the World Health Organization (WHO) or the U.S. Pharmacopeia (USP). His personnel are eminently well qualified, consisting of pharmacologists, biologists, chemists, biochemists, medical doctors, etc., all graduates. They obtain international reference standards from WHO in Copenhagen and then prepare their own standards against the imported. They also use the in-process control requirements found in the technical reports of WHO for each product they manufacture. The plant also produces infusions such as glucose in saline and "lactate ringers" solutions. Concerning the lactate ringers solution, we were advised there does exist some problem. Apparently 20 percent of the patients who are infused with lactate ringers solution produced by this laboratory were suffering adverse reactions. It was hoped, by our host, that we could assist them in analyzing the problem and offering a suggested solution. Because our time was too short, we did not have an opportunity to examine the manufacturing process in depth. Therefore, we suggested that a team of persons, knowledgeable of production procedures, but not involved in the actual production of the solution in this plant, be called upon to study all of the critical control points of the process so that a determination could be made as to whether or not pyrogens or other problems are encountered. Then, if a defect is found a change in the manufacturing system could be suggested. Mr. Gutterman suggested that they may wish to send him a detailed description of the process and reports of all the studies they have made to date. He would see that the appropriate people would receive them and possible solutions might then be offered. No such request has been received at the time this report was prepared.

IV.E.1. <u>List of the More Important Visits Performed by Group E on Safety Standards</u>

1. Director General Bina Marga, Jakarta
2. Directorate of Standardization and Quality Control, Department of Trade, Jakarta (see also IV.A.1)
3. Directorate for Safety and Industrial Hygiene (see also IV.B.1)
4. Ministry of Communication, Air Safety Department, Jakarta
5. Fire Brigade Department, Jakarta
6. Indonesian Classification Bureau, Jakarta
7. Electric Power and Dam Site, Karang Kates
8. Penataran Angkatan Laut (Naval Establishment), Surabaya
9. Central Railways Depot Department, Bandung
10. Direcktorat Penyelidikan Nasalah Banguman, Bandung
11. P. T. Nurtanio, Bandung (see also IV.F.3 and IV.G.18)
12. Balai Penelitian Bahan, Bandung

Details may be obtained from Engineer Raul Estrada.

IV.F.1. Visit to Chemical Research Institute

Bogor, June 2, 1977

Another visit to the Chemical Research Institute has been described under Section IV.D.3. The primary contact for Dr. Kim and Dr. Sangster was Dr. Dardjo Somaatmadja, Director. The Chemical Research Institute in Bogor is organizationally under the Ministry of Industry. Instrumentation problems were described. They included questions of choice of sources of instrumentation, the supply of spare parts, maintenance, etc.

The Institute wants repair and maintenance help from LIN in addition to private engineering services for these purposes. One such service in Bandung is called the "Engineering Bureau." Some suppliers provide monthly maintenance service. In any case, the Institute must obtain spare parts from them. The Institute also needs calibration services, but these could mostly be in the form of standard reference materials. For instance, the Institute checks now pH meters by buffer solutions obtained from commercial suppliers located in Jakarta. Some suppliers, such as Beckman and Varian, have technicians available to help in servicing instruments; the capabilities of these representatives vary widely.

The Institute could well employ graduates from the former "National Academy of Instrumentation (AIN)." This school formerly existed within LIN but had to be discontinued as a result of a higher level governmental decision to centralize all formal training programs under the Department of Education. By contrast, the institutes located in the Bogor area still maintain an "Academy of Chemical Analysis." They find it exceedingly valuable. Four years after completion of junior high school and entering the Academy, students graduate at age 18 or 19. There are also still functioning academies of leather and textile technologies. An Academy of Management requires three years of study after senior high school. Some suppliers provide two- or three-day instrumentation courses in Jakarta.

The services this Institute provides to industry include the development of industrial standards for commodities and materials, such as batik, leather, and building materials; testing and research for industry; know-how on the chemistry of agricultural products, etc. The Institute has a division of industrial materials from plant products. It deals in such areas as medicinal plants and chemurgy, such as for the production of rayon from cellulose or pine latex for sizing.

Further discussion on instrumentation revealed that it may take one month to obtain supporting services when they have trouble with an instrument. It takes two months to obtain simple glassware after the order has left their Institute. Electronic instruments pose a special problem. There is no repair or maintenance shop for such instrumentation. We discussed the possible need for a regional pool workshop in the Bogor area. This particular Institute does not have a particularly high frequency of demand for its services. Typically, it has a problem only every three or four months, but when a problem arises, help is needed urgently.

There are significant problems of reproducibility of material composition analyses in Indonesia. LIPI and the consumers organization recently had a seminar in Bandung on this subject. While this particular research Institute trains chemical analysts, it does not now do routine analytical testing, despite the fact that it was established in 1909 as a testing institute. Strong leadership in the use of standard reference materials would prove rewarding.

Dr. Somaatmadja would like to see calibration work in Indonesia done efficiently. He sees the need for an institute for repair, maintenance, and recalibration of instruments. In his Institute, it is the practice to make corrections "for the instrumental readings," not calibrations. However, he feels that calibrations are more needed by food processing plants than by research institutes. For instance, this Institute never calibrates its burettes, other volumetric glassware, or thermometers.

A basic problem is that U.S. equipment is designed for 60 cycle power supplies and Indonesia has 50 cycles. It is often not known what the suppliers do about this difference, and whether statements that equipment is functioning properly on 50 cycle Indonesian power are correct. Another problem is the electronic revolution. Indonesia, as most countries, is having difficulty in keeping pace. Instruments become obsolete rapidly, and there are problems with obtaining spare parts for older equipment. This Institute would like to see the Government through LIPI stabilize the price of equipment and chemicals.

The team posed a question about LIPI/LIN standardizing imported measurement equipment. That idea was not rejected, but may not be very practical. Technical assistance from abroad often comes in the form of grants. This may come from many countries and often is accompanied by gifts of equipment, which inevitably leads to proliferation of models of equipment.

It would seem that a need exists for a periodic "consumers'" report for users of scientific instruments. Dr. Somaatmadja, who was trained in the United States and is familiar with the "Consumer's Report," feels that an exact parallel to that in the scientific measurement instrumentation field would be very valuable in Indonesia.

We toured several functioning laboratories, which were air conditioned. We saw four Varian gas chromatographs. The voltage stabilizers seem to be functioning. A problem with such instrumentation was that helium gas must be imported. We saw an infrared spectrometer with which they have had extensive service problems. They have UV and visible spectrophotometers, and a Varian atomic absorption spectrometer. For the latter, they are having a problem with the acetylene gas supply; the acetylene available is made locally in Indonesia and of technical grade only. Nitrous oxide must be imported.

Another laboratory visited was in biochemistry. It was generally in good order and appeared adequate, but was not air conditioned. We saw one very expensive piece of gas chromatographic equipment that was not working due to alleged poor service by the supplier. It seemed to have its own air conditioned enclosure.

In summary, the Chemical Research Institute seemed a very alive organization doing significant work for Indonesia.

IV.F.2. Visit to Research Institute for Industrial Crops

Bogor, June 2, 1977

The Research Institute for Industrial Crops in Bogor is under the Department of Agriculture. The Director of the Institute, Mrs. Nanan A. M. (Ir.), was the primary contact for Dr. Kim and Dr. Sangster.

The measurement instrumentation work of this Institute relates primarily to the chemical analysis of soil, plants, essential oils, fiber, spices, medicinals, and the like; specific substances mentioned included coconut, lemon grass, and cotton. Equipment used included flame photometers, spectrophotometers, pH meters, titrators, and gravimetric apparatus. Physical property testing in this field is mostly done elsewhere; however, they do have optical refraction, polarization and reflection measurements, and specific gravity.

The biggest problem they have in the instrumentation area is the manpower problem of their suppliers. The suppliers have too few people and too many instruments to cover. The Institute has no instrument maintenance and repair capability internally, and has no plans to acquire one; thus it must rely on its instrument suppliers for such services. They would welcome a new external service specializing in this field. They use only one operator for a given instrument to reduce the incidence of problems. Inter-institute round robins and reference materials are used to keep their part of the measurement system under control.

Procurement of new instruments is based on specifications copied from catalogs. Decisions to buy are shaped by talking with experienced people. Spare parts can be hard to get from suppliers. They buy equipment with spares, but have troubles when these are gone. Typically, two or three months are required for delivery after the order is placed.

Engineers can be obtained from the academies and universities, but technicians are especially in short supply. Suppliers train the staff when a new instrument is procured; then the staff does whatever additional training is needed. While there is a joint training program within the Department of Agriculture among its various research institutes, there are still unmet needs. The first thing brought up, with respect to support they would like to have from LIN, was the training of manpower in the operation, repair, and maintenance of specific instruments.

Another specific desire with respect to LIN is that it promote consistency among the various laboratories in Indonesia. When there is lack of agreement among laboratories now, there is always uncertainty about the source of the problem. Is it with the operators or with the instruments?

Currently, the staff included two university graduates and two academy-level people (from which they graduated at age 18). They need more university-level people. They can get technical chemists, but not instrumentation specialists. The Institute has around two hundred employees, most of whom work in the experimental plantations and fields.

During a tour of the laboratory, instrumentation was noted which came from Japan, Germany, and the United States. Air conditioning in the instrumentation laboratory was not on. Line voltage regulators were in use. The laboratories generally appeared to be effective, albeit old. They said that they did not at this time have any instruments out of service because of lack of spare parts or trained manpower. The machine shop was rudimentary. We saw a semi-pilot scale still, developed here, which could handle a hundred kg of raw material at a time; other labs have copied this design. The working pace and sense of certainty about the value of their work at this Institute may benefit from revitalization.

IV.F.3. Visit to Aircraft Factory, Nurtanio

Bandung, June 3, 1977

The primary contact for Dr. Kim and Dr. Sangster at Nurtanio was Dr. Harsono Djuned. Among the other individuals met were Mr. Subaran (chief engineer of the fixed wing division), Mr. Salim A. Dimyati (chief of quality control and laboratories), Mr. Sansudin (from the rotary wing division), and Mr. Harjono (quality assurance and general workshops).

At the present time, Nurtanio is doing only assembly work, but it intends to integrate backwards gradually into complete manufacturing, except for the engines. Two aircraft are now being assembled, a STOL named CASA from Spain and a helicopter of German design.

Subaran stressed that the instruments (mechanical, electronic, and optical) used in production must be of assured quality. This has led them to the conclusion that their master standards must be verified at LIN. They currently have instruments out of service due to calibration problems. Supplier firms claim to be able to calibrate some of their instrumentation, but they are unable to provide calibration certificates. Mr. Salim commented that there are many sources for their instruments, and that they have a wide variety of equipment needing calibration now. They really do not know how to calibrate their plant master standards.

A LIN/Nurtanio joint program exists, consisting of the following elements:

(1) Awareness by Nurtanio of LIN and its capabilities.
(2) A calibration network, which includes measurement assurance programs.
(3) Manpower development.
(4) An intent that LIN be strong enough to support the first three elements.

An illustration of some of their problems was provided by Mr. Sansudin, who commented that the BO-105 helicopter includes engines from the United States measured in inches and an airframe from Germany with metric dimensions.

Mr. Herudi told us later that the license to build at Nurtanio included 60 fixed wing aircraft and 80 helicopters.

Nurtanio represents a pioneering technological advance in Indonesia, which has been accompanied by both admiration and resentment. It is important for the future of precision industry in Indonesia that it succeed, and LIN is doing everything it can to support it. (See also IV.G.18.)

IV.F.4. Visit to Directorate of Metrology

Bandung, June 3, 1977

The Directorate of Metrology is under the Department of Commerce. Its Director, Mr. Martoyo, was host to Dr. Kim and Dr. Sangster. This Directorate has been functioning for approximately one hundred years in the field of weights and measures in commerce. Mr. Martoyo is the Republic of Indonesia's representative to the General Conference on Weights and Measures (CGPM) and head of the Indonesian Committee for the kilogram and the meter. A multi-stage modernization building program is underway, as part of the current five-year plan. The first of the new buildings is just now being occupied, and old buildings are being torn down.

This Directorate relates directly to the consumer-producer interface. It currently functions under a 1949 law, which is to be replaced by a new one now being drawn up. Their work in legal metrology includes weighing machines and measurement devices in general for mass, volume, and length, among the 13,000 islands of Indonesia. Indonesia exported its first liquified natural gas in June 1977, and this Directorate has been significantly involved in the measurement problems associated with this product. Work is also done in such fields as moisture testing in crops.

The head office of the Directorate is in Bandung. There are 20 branch offices around the country on a regional basis. The head office supplies the branch offices with equipment, personnel, and budgets. It has five subdivisions:

(a) Flowmeters, for gasoline, gas, water, and oil.

(b) Length and volumetric measurements, including measuring tapes and measurements of tanks for gasoline, petroleum, and coconut oil.

(c) Mass and weighing equipment, the kinds of which allowed in Indonesia are limited by law.

(d) Enforcement.

(e) Administration.

The Directorate has two operating budgets--a routine budget and a development budget.

The new law will require the use of SI units in Indonesia. This Directorate has custody of the standard SI BIPM meter bar and kilogram, which will be installed in a new laboratory shortly. The branches have third class standards that are calibrated at five-year intervals against the second level working standards maintained at headquarters. In the question and answer portion of this visit, we were told that in the public utilities field, their priorities were gas, electrical, and water meters, in descending order, and that none had yet been brought under control. They provide schooling for weighers of export goods, and have had no problems reported to them yet in this field. The export of ores, for instance, involves conveyor belt weighing machines in West Irian that must be calibrated. The Institute of Geology in this Department and the Department of Mining are also interested in this particular issue.

This Directorate obviously has played a major role for many years in establishing an Indonesian national measurement system, and will continue to play a key role as the system expands to encompass the measurements needed for modern mass production and for the regulation of environmental, health, and safety effects of modern technology. Good working relations between LIN and the Directorate of Metrology are essential, and appear to exist. The two organizations have weekly contact. There seems to be genuine appreciation on both sides that the establishment of Indonesian national KIM system (Kalibrasi-Instrumentasi-Metrologi) will require both some changes in the role this Directorate now plays, and a thorough recognition by the newer elements of the system of its continuing vital functions in the area of measurements in commerce.

The key issues relate to who will represent Indonesia in international organizations such as CGPM and OIML (International Organization for Legal Metrology), who will have custody of the prototype meter and kilogram standards, and how traceability to these standards will be established throughout the different major branches of the Indonesian national measurement system. It is also apparent that there is much to be done to meet expanding national needs within the field of commerce. It appears that the work done to resolve these issues and move to meet the needs has been effective, and that what is required is full support of the programs and changes currently underway or being planned.

In summary, the Directorate of Metrology seemed competent, clear about why it existed, and to be responding effectively in meeting the national needs in its field. (See also IV.G.19.)

IV.F.5. Visit to Metal Industries Development Center

Bandung, June 3, 1977

The Metal Industries Development Center (MIDC) is a research center of the Department of Industry. Eng. Paribowo Soetigno, Head of the Technological Development Division, was host to Dr. Kim and Dr. Sangster. The Department of Industry maintains research and development centers in the fields of the chemical, textile, and miscellaneous and handicrafts industries.

Plans in the area of calibrations include publicity and education of industry regarding needs, followed by a decree by the Minister, as part of a five-year plan to require local manufacturers to calibrate their manufacturing processes. MIDC has metrology equipment. It has a program to calibrate its own machine shop equipment every six months. The biggest obstacle to implementation of documentary standards in Indonesia is the limited national measurement capability.

Architecturally, this Institute was modern and very attractive. As in several other research institutions visited, the staff would respond well to enthusiastic technical leadership in terms of clearly stated purposes. We later learned that MIDC has problems paying competitive salaries and that its staff is preoccupied with consulting and other outside activities in order to maintain their standard of living. The staff receives the standard low government salaries but does not get compensating official governmental employee status and privileges. (See also IV.G.20.)

IV.F.6. Visit to National Institute for Instrumentation (LIN)

Bandung, June 3, 1977

The National Institute for Instrumentation (Lembaga Instrumentasi Nasional--LIN) is a major operating agency of the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia--LIPI). It is located in Bandung, near the Institute of Technology of Bandung (ITB). The presence of ITB and a number of other major Indonesian research and development organizations makes Bandung the leading educational and research center in Indonesia. High on the central plateau of Java, Bandung is also one of the most delightful places in the country to live.

Mr. Herudi Kartowisastro, Director of the National Institute for Instrumentation, was the primary contact in Indonesia for Dr. Kim and Dr. Sangster. He accompanied them on most of their Survey Team visits. Other staff members of LIN also participated in the team visits in the Bogor, Bandung, and Tasikmalaya areas.

LIN is the leading measurement-oriented technical institution in Indonesia, and LIN and Mr. Herudi have been primary driving forces behind the development and establishment of the national KIM program--Kalibrasi-Instrumentasi-Metrologi. The basic facts about LIN, its program, and its plans are presented elsewhere in this report, and are therefore not stressed here.

LIN is the largest technical organization reporting to LIPI. Its total staff was around 160 people at the time our visit, including 27 M.S. level engineers, 38 B.S. graduates, and 80 technicians. While some of the college level people have been educated abroad, most are from ITB.

LIN has a visiting expert from India on its staff now, Dr. J. Prasad, a UNESCO consultant and head of the Optics Division of the Central Scientific Research Organization in Chandigarh, India. They have had similar visiting experts with them for extended periods of time in the past, for instance, from the Australian National Measurement Laboratory, and intend to have more in the future.

LIN originated in 1962 with an idea in the mind of a man who became its first Director, Professor Adluwijogo. In 1966 he obtained a Dutch grant of $1.3 million, and LIN started up in 1967 with a total funding of 2 million rupiahs. The period 1967-71 was spent in internal training; the years 1971-73 were spent in trial runs working with people outside the organization. Since 1973 they have worked with people outside on a general basis.

Mr. Herudi commented that the pending USAID project would not be adequate to do everything that he feels must be done. He is working very hard to get a loan abroad of at least $5.5 million by 1980. By that time he expects to have 280 people working at LIN, including 80 professionals and 160 technicians. LIN's current "routine" budget (approximately equals "overhead" in U.S. terms) is around 100 million rupiahs per year ($250,000).

Salaries at LIN are about 1/3 paid for by the government as part of the routine budget and about 2/3 by their development budget, which includes outside research contracts. A starting engineer gets approximately 80,000 rupiahs ($200) per month. The minimum technican's salary is 30,000 rupiahs per month. The maximum engineer's salary is 160,000 rupiahs. LIN recruits may wait over a year to become official government employees. They are currently in the process of adding four engineers, six B.S. people, and six technicians. They will start their own internal post-graduate training program this year.

Education is a critical problem for LIN and Indonesia. There is plenty of interest by students in science and technology--that is where the demand is in the country. The problem is in the supply of instructors. This is, of course, a much wider issue than corresponds to the topic of this report. However, it would be well to understand that the country is expecting a crisis in 1980 when it will have the first crop of elementary school graduates out of the compulsory, universal elementary education program: What is Indonesia going to do with this flood of partially educated young people?

Indonesians trained abroad return to their country whenever they have a reasonable chance. The fact that they want to do so we can only regard as good. However, the other side of this fact is that there is no large pool of highly skilled Indonesians abroad to be attracted back. It is quite evident that the large pool of highly trained Koreans working abroad, for instance, is one of the most valuable technical resources of Korea.

Problems at LIN include a shortage of government housing for LIN staff members, of providing security for staff members, of providing a sense of belonging, and of being able to see the results of their work. LIN is young; the staff members are young. They have to guide their own path.

Mr. Herudi stresses what he calls a workshop approach, coupling research to system design to the workshop where the hardware is actually made. LIN has shops for glass blowing, machining, optics, and electronics. Simply acquiring competence in these shops and running them has taken a large part of their total effort. To a substantial extent, they have to do everything for themselves and, in their field, for the total nation. For example, they do repair and maintenance on instruments owned by other organizations, and maintain major inventory stocks of all raw materials they need. They cannot order things rapidly.

In response to a question, we were told that LIN does not do quality control testing, but develops test methods and systems, including design and development of instrumentation for such purposes. Mr. Herudi stressed to us that LIN currently accepts only the outside contracts that truly fit its program.

Five different levels of governmental involvement in economic activities exist in Indonesia:

Level 1 - Persero. Private enterprise, which may or may not have government capital. If government capital is involved, the only requirement by the government is that it receive an appropriate return on its investment.

Level 2 - P.N., which signifies a Government-owned company, such as Pertamina, the state oil company. These are nominally independent of the government, but in fact can be controlled by it, especially in times of crisis, such as Pertamina had recently.

Level 3 - Perum. Such as the national telecommunications company.

Level 4 - Perusahoan Jawatan. Government firms. These are free to set their own salaries, to take industrial contracts and the like, but they are subject to the government auditing system and may receive total budget support from the government. They are "non-profit economic units."

Level 5 - Government institutions. Such as LIN at the present.

The Minister of State for Research proposed that LIN be shifted from level 5 to level 4, but no regulation has been issued so far. In any event, LIN would hope to remain in the LIPI organization.

Inflation rates in recent years have been: 1974, 24 percent; 1975, 19.7 percent; 1976, 12.3 percent. Investment capital is available at the government bank at 12 percent per annum. Interest rates for other purposes are 18 percent and up. Foreign investment is encouraged, but not in all geographical or business areas. For instance, investment in the Jakarta area is limited to certain especially desired fields. Instrumentation, for instance, is completely open. The United States is the largest source of foreign investment, Japan is second, and Germany third.

Since we spent so much time with Mr. Herudi in so many different locations, it is difficult to put our report on our visit to his institute in the same perspective as the other places we visited. For one thing, Mr. Herudi's driving, demanding impatience--his urge to get on with the job--is infectious. While it is true that LIN is undoubtedly one of the centers of technical excellence in Indonesia, it is also true that it has a key role to play in the development of the national economy, and the challenges it faces are truly monumental. So we came away from our visit to LIN with both a sense of admiration and something of a sense of disappointment arising from the fact that many important goals cannot be fully achieved by so small an organization.

The current physical facilities are not really adequate. We agree with Mr. Herudi in his statement that he needs a new laboratory and new buildings. His existing structures are quite similar to those of other laboratories we visited and are probably not a serious limitation on the current effectiveness of LIN. A source of some of our sense of disappointment and frustration was probably in the relatively primitive level of work that is currently essential to be conducted at LIN for long-term training purposes. They are and need to be doing some major projects that are not in the measurement instrumentation field but focus on the development of a national instrumentation industry. For instance, the project on design and prototype fabrication of a pre-production model of a student microscope fell in this category. While we see and respect the logic of a drive to stimulate the private manufacturing of such instrumentation in Indonesia, we still fear that this might not be the best use of LIN resources. Similarly, we heard later from another source of a case in which LIN was developing, at the insistence of a contract customer, instrumentation for a nuclear reactor which would, at best, suit very long-range Indonesian needs.

In summary, LIN is an organization that in a span of a few years has pulled itself up by its own bootstraps to become a center of technical excellence in Indonesia. Mr. Herudi commands our admiration. We believe the plans (discussed elsewhere in this report) for the development of LIN and of the KIM system to be ambitious and sound. Mr. Herudi, LIN, and KIM have earned and need all of the support they can get. (See also IV.G.10 and appendix VI.F.2.)

IV.F.7. Visit to Institute of Technology

Bandung, June 4, 1977

Mr. Sri Harjoki Wirjosumarto and Mr. Tatasurdia were the primary contacts for Dr. Kim and Dr. Sangster at the Institute of Technology of Bandung (ITB). ITB is the leading engineering school in Indonesia and produces about half of the total number of engineering graduates in the country.

There are approximately 6,500 total students in ITB. The government wants it to grow to 10,000, but it has space problems. The academic departments include civil, electrical, mechanical, chemical, industrial and sanitary engineering, engineering physics, physics, mining, geology, geodesy, architecture, fine arts, mathematics, and astronomy. ITB is concentrating now to improve its existing laboratories. From 1978 on, the focus will be on new buildings. A graduate program in production engineering is to start in 1978; they will have approximately four foreign Belgian or Dutch experts in the program each year. Currently, they can meet only 50 percent or less of the demand for their engineering graduates. On the other hand, graduates in pure mathematics and physics do not find getting jobs as easy.

Other engineering schools in Indonesia include the Institute of Technology in Surabaya, which is associated with the University of Wisconsin and with the Midwest Research Association, both under contract to help it develop and expand.

ITB has about 150 entering students per year in mechanical engineering. About 50 percent drop out, mostly due to economic pressures. They award two to three doctorates per year. This year they are in the process of converting from a basically European-type doctoral program to one more similar to that in the United States. The new program will require about one and a half years of lectures after the bachelor's degree, then completion of a thesis.

Boarding costs alone run about 25,000 rupiahs ($60) per month. Scholarships amount to only 7,500 rupiahs. Tuition is modest—about $150 (60,000 rupiahs) per year. Salaries at ITB are met about one-third by the government and two-thirds by consulting.

Currently, ITB offers only one course in metrology for two credits under the title "Dimensional Quality Control." It is available to both mechanical and industrial engineering students in their third year. About 200 enroll per year. Other mechanical engineering departments in the country do not have adequate laboratory facilities. They send their students to ITB for two months to get all of their laboratory experience.

ITB runs a training course for technicians from industry in such fields as machine tool overhaul. ITB has proposed a joint LIN/ITB mechanical engineering metrology training course. LIN in the future will have six people per year in post-graduate training at ITB. They will do their research at LIN and will complete their work by receiving an M.S. degree.

The engineering metrology laboratory is in the old World War II Allied Headquarters bunker, with 1.5 meter thick concrete walls, sunk into the ground. It appears ideal for metrological purposes. Mr. Harjono took it over a few years ago when it was lying unused and rehabilitated it into quite a good facility. Primary calibrations are carried out at 20°C and 60 percent relative humidity. Since working instruments are used at much higher temperatures, there is a current debate about whether to calibrate them at 20, 23, 25, or 28°C, with a lot of sentiment for the highest temperature, for practical use in Indonesian industry.

Other laboratories mentioned at ITB were the high voltage laboratory, the electronics lab, and the computer lab, the latter of which is expecting to receive shortly a Honeywell/Bull 2000 computer.

The following priorities were expressed for the KIM program:

a. Set up the calibration system--and then look at measurement in the metal working industry. A sub-contracting system will be needed soon in this industry in Indonesia. To make such a system work, the calibration system needs to be in place.

b. A standardization program should be developed and standardization should be taught in all technical schools. The subject is not widely understood in Indonesia.

c. Technical school teachers need to be trained in the fields of calibration and standardization.

d. The government should encourage opening of more testing and calibration laboratories.

The machine and metal working industries in Indonesia are operating at a very low level. The skills of the people need to be elevated. The entire industry needs to become accuracy-minded.

We were told that they felt that LIN should be relocated to the new science city site at Serpong, some forty kilometers southwest of Jakarta. As a primary laboratory, it should provide a uniform approach to calibration services, a fee structure, etc. It should lead industry to manufacture simple measurement instrumentation, such as vernier calipers and micrometers.

In summary, our visit to ITB confirmed our impression of it as a first rate educational institution. (See also IV.G.9.)

IV.F.8. Visit to Atomic Energy Research Institute

Bandung, June 4, 1977

The Atomic Energy Research Institute in Bandung possesses the only nuclear reactor in Indonesia. Hosts for the visit by Dr. Kim and Dr. Sangster were Mr. Suwarno Wirjosimin and Mr. Markam. Other units of the parent agency, the National Atomic Energy Agency (NAEA), are located in Jakarta and Jogjakarta.

This reactor project was originally proposed by ITB, and close cooperation with ITB exists today. The TRIGA V reactor was officially inaugurated in 1965. It is used now for training purposes, isotope production, and research, including academic research and theses at ITB. It has a staff of around 60, including 6 nuclear physicists. It has difficulty competing with industry for people. Its funding this year is about 400 million rupiahs (U.S.$1 million) for its operational budget. This budget increases about 15 to 20 percent per year. Salaries are covered by another budget.

There is at this location only a small measurements laboratory. They have cobalt and strontium standard sources, some calibrated measuring instruments, and a standard dosimeter. They can do calibrations of radiation measuring instruments and try to help others with needs in this field.

The NAEA plans to establish a calibration laboratory in Jakarta. Construction of the building is to begin in August or September 1977, with operational status to be achieved in late 1978 or early 1979. This will be a reference laboratory for measurements of nuclear radiation, x-rays, and radionuclides. It will supervise other NAEA calibration centers. NAEA is now in a state of transition and suspense, waiting for the new laboratory and its equipment. People are abroad for training--two in France and one in the United States (under an International Atomic Energy Agency fellowship), in areas such as neutron activation analysis. These people trained abroad must agree to continue to serve the Indonesian government at least twice as long as the period of training.

The reactor staff is represented on the LIPI calibration activities committee. They feel that the calibration network should be started as soon as possible by appointing qualified laboratories as national calibration centers. It should start with the reference laboratories and then fan out. LIN will be the reference laboratory in such fields as temperature and electricity, the ITB engineering metrology laboratory in mechanical measurements, and the new NAEA laboratory in the ionizing radiation measurements field. This new lab is being designed as part of the national KIM system to be one of the national calibration centers.

Needs in the ionizing radiation measurement field in Indonesia include:

(a) Medical x-rays, used in both diagnosis and therapy, need both calibration and dosimetry. Standardization of imported x-ray equipment is needed; only a limited number of types should be allowed. Some imported instruments have hazards due to inherent deficiencies, some due to Indonesian environmental effects. The number of medical x-ray units is increasing rapidly, and only a few radiologists are available in the country. Most users are general physicians who have only a few months of training in radiology and do not fully appreciate the potential hazards, just as it was in the United States. Indonesia has no medical linacs. There are three radioactive scanners--two in Jakarta and one in Semarang.

(b) Industrial radiography, both isotope and x-ray, for welding inspection.

(c) Radiation thickness gages and oil well logging.

(d) Applications of isotopes in agriculture--tracers, mutation production, gamma irradiators for food preservation, etc.

(e) Hydrology and flood control.

(f) Prospecting--both field use and ore analysis.

(g) Environmental measurements, especially measurements before any nuclear power plant goes into operation. Also, near volcanoes. And fall-out from any resumption of French atmospheric nuclear bomb testing in the South Pacific.

We visited on a Saturday, a day on which this laboratory does not work, and we did not tour any laboratory facilities. Generally, we sensed the usual difficulties of staff motivation in an institute dedicated to long-term goals. However, when we asked about the specific fields needing measurement support, we did receive a crisp and spontaneous flow of information. Among the miscellaneous items transmitted was the fact that the reactor had been shut down for a week or more due to problems with the city cooling water supply. Discussions of our impressions with our Indonesian colleagues later confirmed them. This Institute is tied to the long-term goals of Indonesia.

IV.F.9. Visit to Army Metal Industry, PINDAD

Bandung, June 4, 1977

The primary host at PINDAD for Dr. Kim and Dr. Sangster was Major Palgunadi T. Setyawan. Other principal contacts included Col. Lufti Zakaria, Ms. Sudiartl S., and Mr. Soedarno. Major Palgunadi was a principal contributor during the survey team meetings in Jakarta and is one of the major moving forces behind the development of the Indonesian KIM system. We knew before our visit that he had an outstanding conceptual grasp of the significance of measurement. During our visit we found that his practical and managerial grasp of the subject was equally outstanding. Unquestionably, PINDAD is a center of excellence from which the whole country can learn and benefit. The spirit and atmosphere were truly exciting. Even Mr. Herudi was surprised and impressed at what we saw; the progress in the several years since he last visited was substantial, especially in the support areas.

Briefly, PINDAD is a manufacturing arsenal for the Indonesian Army. It was set up to manufacture small arms and their ammunition, and other small metal fabricated items. Large caliber guns are handled by the Indonesian Navy. It covers an area of one square kilometer and may be the largest industrial plant in Indonesia. When any of its units have idle capacity, they are allowed to work for the civilian sector--agriculture, mining, etc. An outside "private" company called Purna Sadana has been set up by the Army to sell the excess production capacity of PINDAD.

Typically, civilian requests come in without detailed specifications. Indonesian military specifications do now exist, and it would be valuable for the civilians to look at them and use them whenever possible. It is much easier when all specifications are clear and all allowable modifications are spelled out, e.g., in the materials used in military equipment.

Major Palgunadi is responsible for a variety of support activities. One of these is a military engineering metrology standards laboratory, which now also calibrates MIDC, ITB, and the textile industry. Control of PINDAD production line measuring equipment is located on the production floor in the production environment. While the primary standards laboratory is air-conditioned, the standards people also realize that they have to bridge the gap out into the real world of the production floor.

Another of Major Palgunadi's groups makes special tools, gages, jigs, and dies, including threading dies, for both internal and external customers. For instance, we saw assembly jigs being made for the automobile industry. They cannot compete economically with Japanese imports for standard items.

PINDAD is pulling itself up by its own bootstraps in the repair and maintenance of machine tools. We saw a Cincinnati milling machine that had been inoperative for above twenty years, which they were overhauling from the ground up, learning as they went. They intend to become able to serve outside industry in this field.

PINDAD has been in existence long enough that it is generating military retirees, who are hired very, very rapidly by industry. Also, it accepts people for on-the-job training from industry and such institutions as MIDC.

Both tax and supply problems exist for raw materials. The automotive industry often has delivery problems because they cannot get the right raw material fast enough. "Luxury" raw materials, such as stainless steel sheet, bear a 60 percent import tax. As a result, local manufacturers cannot compete with imported stainless steel sprayers, which are admitted duty-free as a necessary item for Indonesian agriculture. The Government is aware of the problem, but has not yet seen a way around it that does not become administratively burdensome.

During the discussion, the concept of "total involvement" came up, as something very significant in the minds of our hosts. Mr. Herudi used it in the context of the advancement of the Indonesian economy; Major Palgunadi regarding military defense.

Early forms of numerically controlled machine tools are in use in the country. For instance, in Surabaya there are two being used in manufacturing diesel engine pistons. Both of the primary driving forces for the adoption of such machines are valid in Indonesia—complexity and cost. Superficially, complexity would seem to be the primary factor, but Mr. Herudi feels that cost may also be very important, for instance, the cost in time to train skilled workers for production using standard machines. Even cheap labor cannot compete if it is not adequately skilled. Mr. Herudi feels that numerically controlled machines are a must.

In response to the question, "Is the U.S. Mil Spec standards laboratory system appropriate for Indonesia?" we were told, "Yes, as a next step." Now, civilian suppliers rely on military testing laboratories. They also need material and structural testing. When asked if PINDAD could produce "standard reference things" for use in measurement verification programs, they told us that they were already doing so to some extent. The R&D hierarchy in the Indonesian Army starts a center for R&D in the Army, then an intermediate level R&D institution, then PINDAD R&D. In summary, we greatly enjoyed our visit to PINDAD, and we wish to repeat our assessment that it is truly a center of excellence.

IV.F.10. Visit to Air Force Project for Mechanics

Tasikmalaya, June 6, 1977

Hosts for the visit by Dr. Kim, Dr. Sangster, Mr. Herudi, and Mr. Soemarjono were Mr. Sumantri, Mr. R. Kartosujono, and Major Purnomo. Organizationally, the Air Force Project for Mechanics is equivalent to PINDAD. However, the facility does not have the option of manufacturing for private industry and is substantially functioning only on a standby basis. Maybe this could cause difficulties in duplicating the spirit and sense of purpose of PINDAD.

This Project was set up in the 60's; the machines came in after 1967. It is located in a less densely populated area, on ground that the government already owned. Their purpose is to make small parts in the thousands for armaments; for instance, rockets or rocket launchers. High interchangeability is required, and accurate dimensional measurements are essential. The production plant looked more modern than PINDAD, but much smaller. They discussed quite openly their problems of start/stop operation. They do not know from year to year whether it is "Go" or "Stop." In the meantime, they have their people doing gardening and machine shop maintenance.

When queried about their needs in the field of standardization and measurement, they said they needed "everything." Specific needs include dimensional measurements, and rocket thrust, pressure, and speed. Their plant measurement standards came from Switzerland. Trained personnel are a major lack. In general, they rely on in-plant training, and also use PINDAD and MIDC. Many of their instruments have never been used, because of lack of skills, no operators, or no production yet. A surface measurement bench, erected in 1969, was operated only once in trial, never again. A rocket launch tester bought in 1969 has never been used. Currently, they send their instruments abroad for maintenance, repair, and calibration. They have problems in testing incoming raw materials. Metals, chemicals, and measuring equipment come mostly from foreign suppliers.

In the instrument room, the air conditioner appeared to be malfunctioning. We saw such equipment as Rockwell hardness testers, a torque-meter, a Mettler P-3 balance, a Keller balance, and granite surface plates.

In response to a question by Mr. Herudi, "Are the decision makers aware of the meaning of measurements for productivity?" the answer was that the higher decision makers are usually interested only in the end product. It is up to "us" to present the case. Now they are aware.

IV.F.11. Visit to University of Gajah Mada

Jogjakarta, June 7, 1977

Mr. P. C. Suratman hosted the visit to the University of Gajah Mada by Dr. Kim, Dr. Sangster, Mr. Herudi, and Mr. Soemarjono. Mr. Suratman is in charge of the university plant facilities, including their instrumentation center.

This is one of the five main universities in Indonesia. It has 18 faculties--e.g., electrical, mechanical, and chemical engineering, architecture, and geodesy--in four schools (agriculture, science, humanities, and medicine), plus several institutes such as those for administration development and for public services including a hospital. The University was established in 1950 on 100 hectares of land. It now has 15,000 to 16,000 students. Academically, Gajah Mada does not have the reputation of such institutions as ITB. However, it has achieved major successes in developing students who end up really devoted to the service of their nation, willing, for instance, to work for the government or in the more remote and less developed areas. ITB graduates go mostly to industry and the cities.

Most of the teaching staff are regular staff members, living and working at the University. There are about 30 foreign visiting professors teaching at the University, but not in the School of Engineering. A cooperative program with the University of California terminated in 1960, and they now have no such agreements with universities abroad in technical fields. Gajah Mada does have a cooperative program with several younger universities in Indonesia.

This is the only Indonesian University with a teaching hospital. However, to avoid the problem of draining funds from the University, the hospital is being transferred to the Ministry of Health. It will be available as a training institution. The Ministry of Health supports the hospital instrumentation system nation-wide. The medical school gets instrumentation support from both the University and the Ministry of Health.

The University currently has a center for educational facilities, primarily educational equipment, covering activities from purchasing through fabrication to maintenance and repair. There is a Central Instrumentation Laboratory, which is now almost exclusively devoted to chemical analyses, with spectrographs, chromatographs, etc. It is an "Institution" within the University, reporting directly to the Rector, not under any faculty. The University has a "Board" (i.e., committee) system for managing their interdepartmental operations. The Board for the Central Instrumentation Laboratory deals with what it should be, how it should be organized, etc. Creation of more central equipment facilities is being considered, e.g., for electron microscopy. Other boards advise on instrument maintenance and on instrumentation development (requests for special purpose equipment). The problem of a shortage of technician personnel came up again. They have facilities for training such people and would like to expand them. Personnel working in these interdepartmental areas normally would be classed as administrative with correspondingly low salaries. To get competitive salaries, staff members must also be classed as "educational," which means that there must be educational and research programs as part of the Central Instrumentation Laboratory. About 60 people in the University are now related to the instrumentation field, including 4 or 5 Ph.D.'s. There are about 150 people in the shops, many of whom are retiring soon. During our tour we saw glass blowing, fine mechanics, and electronics shops.

When asked his opinions about LIN, Mr. Suratman replied that one center will not be enough to cover the country. In the future, there will be a need for several centers, coordinated by LIN. He would like to have a small standards lab for the University, a unit in the KIM system. Mr. Suratman commented that the training received by their people at LIN has sometimes been rather too advanced for their comprehension and not too practical for them.

In summary, the University of Gajah Mada also looked like a center of excellence to us, in the way in which it is relating to the broad needs of the country. In the instrumentation field, it appeared to offer a very strong base on which to build.

IV.F.12. Visit to Research Institute for Leather

Jogjakarta, June 7, 1977

Hosts for Dr. Kim, Dr. Sangster, Mr. Herudi, and Mr. Soemarjono at the Reseearch Institute for Leather were Ir. Pietoyo Soekarbowo, Director, and Mrs. Sumarmi, research department head. We found this Institute to be perhaps the most significant center of excellence that we visited, in its ability to focus on the technical needs of the industry and provide effective technical support for national development.

This is the only leather research institute in Indonesia. They fully recognize that at this time they are not really doing research, but consulting and development. The Indonesian leather industry is at a very early stage. Before 1974 essentially all hides generated in the country were exported as rawhides. In 1974 such export was banned, requiring the export of processed or semi-processed hides. This required alignment of production techniques and the quality of the product with those abroad. However, the industrial problems are often more financial and administrative than technical. This Institute focuses its consulting support on upgrading the production of the industry; when it meets financial or administrative problems, it refers its clients to appropriate sources for such assistance. When appropriate, it does give management advice directly.

The Institute has assisted 14 to 18 former rawhide exporters to establish their own leather processing plants. It provides technical advice in such areas as quality control, process control, and operator training. The technical problems are mainly at the finished product stage. Problems they are now getting are becoming more complex; for instance, the cause of "brown spots at the pickle stage" in processing. Such problems can be very frustrating. In this case, it was felt to be very important to determine whether the problem was in the raw material (the hides), in the chemicals used in processing, or in the processing technology. Unfortunately, since the hides had already been processed and apparently were long gone, resolution of the issue was very difficult.

The industry is asking for more and more from the Institute. Industry expects its staff members to know everything. They have to keep moving to stay ahead of this demand.

The strategy of the Institute is to help the Indonesian leather industry to grow to the point that it needs and can and will finance research. The philosophy of the Institute has been to do whatever technical work was currently appropriate to support the industry. It has built a strong position of respect and prestige in the industry. The game plan is to continue having this position, so that when the time comes that research is in fact appropriate to support the industry, it will come asking and paying for it.

The Institute has a staff of about 200 people, including 30 academy graduates and 7 with college degrees. They maintain quality control offices in 33 shoe factories for the Indonesian armed forces; in each case they have one quality control officer and one production control person. They have a state budget of 130 million rupiahs (U.S.$300,000) for routine expenses and 103 million rupiahs (U.S.$250,000) for development purposes, plus a contract income of 103 million rupiahs.

We were greeted with the comment that they were very glad that at last someone had taken the initiative in the KIM program. The problems that they have they think are common to many other similar institutions. The measurements they make are usually of the leather in shoes. These are often chemical (e.g., pH), but they can also be physical such as tensile strength, bursting strength, resistance to fading under abrasion, abrasion testing, water permeability, etc.

The Indonesian tradition is handicraft, a matter of art, not science. Standardization is foreign to this tradition, yet the tradition of excellence associated with handicrafts can become a source of strength in the drive to control quality and achieve excellence in modern technological production.

This Institute has no contact yet with any similar institutions outside of the country. They are working to set their own specifications. They must check the specified factors to determine the reproducibility of the materials coming into the Institute. Doing this is new to the workers. They overlooked the need for training their workers in the operation and maintenance of measurement instrumentation. In addition, they have problems with suppliers. Sometimes they receive incomplete instruments. They had four to five inoperable instruments when we were there. Often they do not even receive the instrument manual (as for their tensile strength testing machine). While we were touring the laboratories, the Director received a report that one of his staff had figured out the problem with one of these inoperable instruments and had it working; they were rightly happy and proud. They are currently moving into electronics. New instruments coming in involve electronics and they have problems in simply using them. Up until now, they have not had a source for calibration support.

In summary, we felt the Research Institute for Leather to be a model that Indonesia would do well to duplicate many times over.

IV.F.13. Visit to Textile Factory "Pabrik Cambrik" GKBL

Medari, June 7, 1977

Mr. R. Harsono, Deputy Manager, and Mr. Soepardi Wirosumario of the planning and production control department, were hosts for Dr. Kim, Dr. Sangster, Mr. Herudi, and Mr. Soemarjono. This was an operating factory that we visited to get a feel for Indonesian industry. It produces cotton cloth for batik fabric purposes.

A measurement quality control laboratory is maintained for measuring tensile strength, fabric fineness, fiber weight, etc. The laboratory was "air conditioned," but the environment was not well controlled. They were having problems with a microbalance, apparently due to sensitivity to humidity. We found to our surprise that because of the influence of the English system of units of weights and measures in international trade, weights were measured in grains and the length of the cloth they produced in yards.

They process 50 bales of cotton per day (bought from the United States). During early stages of the process, intermediate rolls of cotton fiber are weighed. They would like to have these large capacity scales calibrated, but have no simple way to get that done. The Directorate of Metrology will not do it, because these scales are not used in commercial transactions. Similarly, they would like to have their tensile strength equipment calibrated.

In summary, we suspect that what we observed at this textile factory is typical of the textile industry in Indonesia. There is a substantial amount of measurement equipment in use in the laboratory and on the production line. The people using it are conscious that they really do not know for sure just what the measurements mean, and they would like to have a source of calibration service. Currently, such sources are lacking.

IV.F.14. Visit to Technical College ATMI (Akademi Tehnik Mesin Industri)

Surakarta, June 8, 1977

Father J. B. Casutt, Director, and Mr. Werner Frick, Chief Instructor, received Dr. Kim, Dr. Sangster, Mr. Herudi, and Mr. Soemarjono. This school is the result of a joint effort between a Catholic mission and the Swiss Foreign Aid Foundation. Thirty percent of its initial funding was a Swiss government gift; seventy percent came from churches and industry. Currently, the sale of products from its associated factory provides the funds to maintain the school. The school started eight years ago, on a primitive basis, to pull itself up by its own bootstraps, building its own benches, cabinets, etc. The teaching staff consists of 16 practical instructors and 6 in theory. The school can run now without the Swiss top management.

Students enter the three year course at age 19 or 20, after their SMA senior high school diploma. They cannot take students after the SMP (junior high school) because the boys simply are not strong enough physically at that early age. At any one time they have about 90 students in the school. Every year they receive about 650 applications which they reduce by 50 percent by inspection, then by testing down to 60, and then by a final test to the 30 entering students. The students pay 20,000 rupiahs (U.S.$50) per year tuition. Students live outside the school and support themselves. Some do get scholarships and pay no tuition. Students know that their work affects the future of the school, and have a feeling of commitment and belonging. They have 150 graduates already, working all over, but mostly in Jakarta and the local (Jogjakarta) area. There are approximately three job openings for every graduate. A problem faced by their graduates is lack of formal recognition for having completed the academy work. Those with the STM (college) diploma typically get around 36,000 rupiahs in government-run organizations, whereas academy graduates get only 28,000 to 30,000 rupiahs. Industry pays much more.

The school uses the European approach in teaching metal working. They have four stages in their successive classes. The first stage starts with simple sheet metal work, everything being done by hand. They start with all handwork, which turns out to be very good for operating in the Indonesia craftsmanship tradition. Their students must go beyond craftsmanship to precision. Parts must fit just so, without forcing. The emphasis is on precision without machines--filing, handsawing, etc. The intent is to give the students the feel for the nature of the metal and of precision. The second stage teaches the use of basic machine tools. The third stage employs advanced machine tools. In the fourth stage they have welding. In these later stages, they "make as an exercise, then sell the product."

The profitability of the associated production unit is allowing them to expand it. They manufacture tool cabinets, executive chairs, hospital beds, medical examination benches, and other similar items. They aim to produce only top-of-the-line quality goods that do not compete with Indonesian industry. Their prices are about 20 percent lower than in Switzerland, and about 50 percent lower than similar Swiss goods delivered in Indonesia. The factory does have some paid staff workers. Neither it nor the school gets any subsidy from either the Indonesian Government or industry. And now they are dealing with a move by the Government to tax their production. They are concerned with this threat to the viability of both institutions, especially since they must generate enough surplus income so that they will be able to replace some of their 20 and 30 year old machines in the near future.

All manufactured parts pass through an inspection. Equipment we saw included a Brinell hardness tester, calipers, micrometers, granite surface plates; a grinder's gearhobbing machine; and other machine tools of German, Swiss, and American makes.

Father Casutt and Mr. Frick made a very pointed comment that most foreign experts come in to do a pre-conceived job, and that job does not do the Republic of Indonesia any good. Frick would like to see a school for the "fine mechanics" for instrument makers in cooperation with European industrial firms. Again, the subject came up that the biggest problem in Indonesia is the lack of the basics of technical education. In response to a question, we were told that this academy could develop a calibration instrumentation measurement course for training technicians under contract to the Government. In response to leading questions like, "Would ATMI be interested in becoming the Surakarta mechanical engineering college or the technical university of Surakarta?" the answer was that they have to earn their own way, and succinctly, no. Indonesia needs the missing in-between level people, and an ATMI in every big town, with quality control on the graduates of those institutions.

In summary, we found ATMI an inspiring place to visit, another center of excellence. We agree with their final comment that Indonesia does need an ATMI in every big town, with standards and quality control of the graduates. Of all possible recommendations that we could make that could be implemented in Indonesia, duplicating and reduplicating ATMI would have the most profound effect for the industrial future of the country.

IV.F.15. Visit to Batur-jaya, Batur, Ceper, Surakarta

June 8, 1977

This institution is a small cast iron foundry, which includes a finishing machine shop run cooperatively with a number of other similar foundries in the area. Mr. Oreip Mursyidi, Manager, was host for Dr. Kim, Dr. Sangster, Mr. Herudi and Mr. Soemarjono.

There are four thousand people in the geographical area in the metal industries. MIDC provides technical advice. Coke is imported from Taiwan and pig iron from Australia. There are no import duties on either. They cast iron, aluminum, and bronze. They require about 1 kg of coke for 5 kg of iron. Prices charged are 320 rupiahs ($0.80) per kg for iron castings without finishing, and about 400 rupiahs per kg when parts are finished. Currently, they are operating at about 75 percent of capacity, which is about 40 tons per month of cast iron. Their profitability is "sufficient."

The cooperative arrangment had been running for about a year. Before that, each of the local foundries was on its own. A Government program assists and encourages the formation of such cooperatives among small firms. Money up to 5 million rupiahs ($25,000) is available from the Government at 12 percent interest. Their machine tools are loaned to them by the Government. They have no problems due to the diversity of sources of this machinery (which included Chinese, Japanese, and sources in English-speaking countries).

They pay 600 rupiahs ($1.50) per day for unskilled labor and up to 30,000 to 50,000 rupiahs per month for skilled workers. For comparison, rice costs approximately 100 rupiahs per kg, a bicycle costs 15,000 rupiahs ($37), and a motorcycle costs 150,000 to 300,000 rupiahs.

Measuring devices that we saw were vernier calipers and industrial type scales. The temperature of their molten iron is measured only by eye. When they have gone to YDNI to find appropriate documentary standards, they could not find them. The management is acutely aware of their lack of quantitative quality control. They would like to have better methods available to them, and I believe that if simple, improved methods were made available, they would eagerly adopt them.

We saw cast iron water pumps, cast iron water pipes, bronze stair bannister pieces, etc. The operations are very labor intensive. For instance, we noted that the water pump used to supply water to the foundry was a man sitting on a ledge above an open well, dropping a bucket down into the well, hauling it up, and emptying it into an elevated storage reservoir beside him, from which it flowed out through an ordinary garden hose into the foundry. Sometimes he was busy drawing up water; sometimes he was just sitting, apparently waiting for the water level in the reservoir to drop down to the point where he needed to replenish it. And all this despite the fact that this very same foundry was manufacturing water pumps.

In the foundry itself, sand molds were spread out over the floor, and further insulated with additional sand poured on top and around them. The casting operation was performed by workers carrying yellow-hot molten iron from the melting furnace in approximately one-gallon ladles across the floor to the waiting molds. The workers simply pour the iron from the ladle on the end of a long pole into the mold until by visual observation they are satisfied that enough iron has been poured in, and then they move on to the next mold. And all this was being done in bare feet.

The total manpower doing one thing or another around that foundry was impressive. This is the way that Indonesia has to operate at this time. It would be a gross mistake to put all those people out of work. They need jobs that are meaningful and they have them.

Among the philosophical points discussed during our many hours riding together in the car was the rate of progress of Indonesia. Indonesia has far to go. It must proceed in distinct and observable jumps. However, a great leap forward might put a substantial portion of the people in the economy out of work. What is appropriate is a rapid series of small leaps, which will enable an existing worker to become more productive in his own particular job, so that he can produce more at a lower price, earn more, etc.

In summary, we think Mr. Herudi planned our visits very well. The visit to the foundry as the final stop was most effective. By that time, we were probably able to appreciate and assimilate what we were seeing, whereas a week earlier we might not have been able to do so. Mr. Herudi picked this foundry because he knew that they existed in this area and because it was geographically convenient for us to stop. Maybe he picked this one also because it did have the cooperative machine shop. All told, we got a significant sample of Indonesian industry to look at. The foundry and the textile mill may have been uncharacteristically susceptible to improvements in measurement methods; nevertheless, I believe that there are many, many other such plants in Indonesia which would be equally receptive, after only a little bit of discussion, or after they saw the competitive pressure from those that were receptive.

We enjoyed the visit to the foundry. We think it represents effective Indonesian industry, a basis on which the development of the country can build.

IV.G.1. Visit to GARUDA

Jakarta, June 2, 1977

Mr. Herudi, Mr. Mamun, Mr. Gandi, and Mr. Peiser were well received at the quality assurance facilities of GARUDA, the National Indonesian Airlines, which now services DC8's, DC9's and F28's. The relationship is excellent with LIN and extends from calibration to training services. Altimeter calibration to ±10 feet and that for electronic weighing devices to 10 lb. in 30,000 are not yet available but would be of immediate use.

Top management does not resist expenditures for quality assurance when training and instrumentation costs can be justified.

GARUDA has a good safety record but it flies outside Indonesia to less than capacity when in competition with Singapore Airlines, for example. There are many companies that own aircraft mostly for their own intra- or inter-island use.

IV.G.2. Visit to the Director General for Chemical Industries, Department of Industry

Jakarta, June 2, 1977

Major General and Engineer Agus Sujono, Director General for the chemical industries of Indonesia, received Mr. Herudi, Mr. Mamun, Mr. Gandi, and Mr. Peiser in a cheerful mood with Engineer Soetatmo, head of the R&D Center for Chemical Industries, in attendance. Eng. Sujono laid out the third five-year plan for the chemical industry of Indonesia, following closely the priority needs of the people for clothing, food, and housing.

He listened to our statement on the use of standard reference materials and other devices for control of processes and products of the chemical industry. He had no previous knowledge of LIPI's KIMS systems and was surprised that LIN already was in the position to supply services. However, he gave orders on the spot for his Directorate to be active, cooperative, and supportive to KIMS.

We were to use the authority of his name to see anything within the Indonesian chemical industry, and he asked us to speak to him again on any problem or with any advice.

IV.G.3. Visit to the Office of the Minister of State for Research

Jakarta, June 2, 1977

Mr. Herudi, Mr. Mamun, and Mr. Peiser were received by Dr. Eng. Achmad Soemarjono, who represents the KIMS program in the Minister's Office and is Dean of Graduate Studies in the Electronic Engineering School of the University of Indonesia. He himself returned to Indonesia only two years ago after sixteen years in Japan. He is supported at the graduate school by fifteen visiting professors from Japan, who come for one month a year and each gives a concentrated technical course (in English) to about 20 postgraduates on their way to M.S. or Ph.D. degrees.

Mr. Benito Kodijat described to us the impressive plans for the Serpong Science Center on a 350 hectare site for the non-departmental science institutions: LIPI, BATAN (atomic energy), BIKOSURTANAL (survey), and LAPAN (aeronautics and space) with their headquarters buildings and an office complex for the Minister of Research. KIMS has highest priority. It is a nine-year development plan, the implementation of which started now.

IV.G.4. Visit to the General Directorate for Metals and Engineering, Ministry of Industry

Jakarta, June 3, 1977

Mr. Aam, Mr. Gandi, himself in the R&D Center as division chief in the Ministry of Industry, and Mr. Peiser were received by the Director for the Automotive Industry, Mr. Sajuti. He was accompanied by Mr. Trisura Suhardi, the head of the R&D Center. The conversation was general and strongly supportive for KIMS. The "Deletion" program, whereby foreign-made component parts of cars and especially commercial vehicles, engines, and diesels must be replaced by locally produced components by 1984, is causing major problems. They will be addressed by a seminar in which KIMS will be a special topic to be presented by the Director General himself. Foundry, forging, forming, and welding facilities are being upgraded where needed with high priority. Uniformity of measurements is essential and diversity of types from European, American, and Japanese companies is another major problem. A special topic of conversation was the operational contact with the definition of the meter. Quality control is being strongly urged by a seminar for industrial leaders.

IV.G.5. Visit to P. T. Succofindo

Jakarta, June 3, 1977

Mr. Gandi, Mr. Aam, and Mr. Peiser were received by Engineer A. Ganis, Director of Operations of this private consulting and inspection firm in the well-known Superintending Company group (Societe Generale de Surveillance SA of Geneva, Switzerland), but with 80 percent participation by the Government of Indonesia. They work in close support of the Ministry of Trade, for example, in export control to standards of 49 commodities such as essential oils. Apart from NDT equipment in the field (mostly in Northern Sumatra), they have wet chemical, refractometry, atomic absorption, and other facilities. They use rather time-consuming methods for calibration of some of their measurements such as, for example, of trace elements. They say that they are not yet succeeding in operating profitably in Indonesia and that they would greatly welcome KIM type services.

In East Kalimantan, Succofindo is said to have obtained an order for testing and supervising the installation of a large relay for electric power control. In this instance, this Company is seeking reimbursable services and LIN has at this time proposed 16 tests to be carried out. The tendency away from merely visual inspection to quantitative measurements, such as on SIR (Standard Indonesian Rubber), poses a challenge to be met with basic facilities.

IV.G.6. Visit to the Electrical Power Research Center

Jakarta, June 4, 1977

The Electric Power Research Center is known as PLN: Perusahaan Umum Listrik Negara Pusat Penyelidikan Masalah Kelistrikan-Laboratorium Listrik at Kalibata, Jakarta.

Mr. Aam, Mr. Gandi, and Mr. Peiser, and on a separate occasion, Mr. Wilman and Eng. Chaiwai, were received by Mr. Imam Sugandi, head of the Planning Division, Mr. Pramono, Mr. Istigno, and Mr. Sudjanadi of the Fuel and Chemical Laboratory and Mr. Komar, Mr. Huzwar Lukman, and Mr. Irhaf Ibrahim of the Electrical Laboratory, at the Electrical Power Research Institute of the Electrical State Enterprise (PLM). It maintains impressive laboratories for the basic units derived from Japan's Electrotechnical Laboratory with admitted problems of drift but with good dissemination to the 15 regions of Indonesia which each maintain a third level calibration facility. Physical standards are needed not only for electrical, but for temperature, pressure, flow and sound (hum and whine) measurements. A special need exists to establish the power efficiency of power stations, for example, for establishing conformity with specifications on acceptance from suppliers. Transmission lines up to 150kV in AC have experienced no corona or synchronization problems that may be met when higher voltages and more complex nets are established. There is strong verbal endorsement of the KIM system, but their Committee member, Mr. Rossid, was recently moved to a completely different post. He had not yet briefed his successor who would be Mr. Komari. No direct relation is maintained with the Ministry of Commerce Institute for Legal Metrology. Mr. Sugandi had visited Dr. M. Meyerson at NBS and had started in 1975 a voluntary appliance labeling scheme for Indonesia, which the Mayor of Jakarta hopes to make mandatory. The cable and fittings testing laboratory was very impressive with many equipments designed and built on contract by LIN. A visit was also made to the equally impressive high voltage and electrical calibration facilities. It is hoped that the building of a new high voltage laboratory with German aid at ITB has been considered as cost effective.

The State Electricity Enterprise, providing 85 percent of Indonesia's electric power, is divided by function into Generation; Distribution in Jakarta, West Java, and 14 other regions; Finance; Planning; Construction; Operation; Administration; and Research. The last function is executed by PLN which itself has divisions for Planning, Science, Standardization, Industrial Relations, Administration, Electrical Laboratory (under Engineer Komari who received the team with Eng. Masgunatro Budiman, trained as an electromechanical engineer in Moscow, and Eng. Bampang Prajitno), Hydropower, Fuel and Gas Chemical Laboratory Survey, and Power Systems Analysis.

The Electrical Laboratory has 8 engineers, 37 technicians, and 15 non-professionals. The Standardization Division deals with product standards (8, mostly for wire and cable, are approved by the State Electric Enterprise and 8, mostly for plugs and sockets, in process) and codes. Engineers cooperate in LIPI committees.

Certification so far is given for only one product, namely, cable. Four manufacturers have been under annually renewable agreement since 1975. Four or five applications are now under consideration. There are a total of four large, six medium, and many small-scale cable manufacturers in Indonesia. The small manufacturers cannot qualify under this certification program because they do not in general have the required test facilities. The remainder can qualify after plant inspection, product-testing on recommendation of a committee formed by two members of the electrical laboratory, and one from the Industrial Relations Division of PLN. On approval by the Director of PLN, the applicant company can use the LMK quality label.

The Laboratory is divided into three sections: high voltage, low voltage, and calibration. A service team provides field testing of relays in the control boards of all regional distribution centers. The regions are given facilities and expertise to test domestic meters and to inspect wiring before a new customer receives connection.

The survey team members took away an excellent impression of the staff and facilities of the PLN that could be made available on an advisory basis also to other agencies.

IV.G.7. Visit to Jakarta District Vocational Center

Jakarta, June 4, 1977

Mr. Aam, Mr. Gandi, and Mr. Peiser, in the absence of the Director, Mr. Soehardig Mattews, were received by his deputy, Mr. Harsono Tutonegoro, graduate of Temple University, and Mr. Sudarsono, trained in Germany. All Vocational Centers operate under the Director General for Manpower Development, Mr. Tatang Mahmud. The team was fortunate also to meet Mr. H. Aburisman, deputy to one of the Directors for Manpower Development. The Center has excellent facilities for elementary training (in 480 class hours of 45 minutes each, of which 70 percent are in practical work) for 1) Building Trades, 2) Technology, 3) Electrical and Radio, TV Repair, 4) Automotive Repair, 5) Commercial Arts (mostly for secretarial typing and English), and 6) Small Scale Industry (like barbershops). There are 41 instructors who first study in Bandung, then are assistant instructors for 2 to 3 years, and qualify fully after further training abroad from between 6 months to 2 1/2 years. The course costs the equivalent of U.S. $40 per student. The team was told that 60 percent of the students were previously unemployed, 20 percent are sent and supported by companies, and 20 percent by other institutes. There are up to 30 students per class. The Colombo Plan and AID have supported the Center, but there is a great need for very simple training manuals, which Mr. Peiser promised to send. A high percentage of the students move into jobs after graduation, but naturally for the purposes of the Survey, this excellent training is at a level of only indirect concern.

IV.G.8. Visit to the Tiga Roda (Three Circles) Cement Factory

Citeureup, June 4, 1977

Mr. Aam, Mr. Gandi, and Mr. Peiser were first received at the Tiga Roda Cement Factory by the Maintenance Engineer, Mr. Lee Chu-Shin, who admitted no problems and professed no interest in standardization and measurement services. The plant manager and the chief chemist, Mr. Tsai Ming Ku, were much more forthright and interested in discussions with us. The owners are Taiwanese Chinese and take a cautious attitude towards Government services. They are said to have benefited from the Kaiser Cement Company that explored the excellent quality local raw materials. Only the gypsum is currently imported. The plant has two tubular kilns using the wet process. Output is 500,000 tons/year each. An expansion program for 1,000,000 tons/year in one kiln is being implemented. The plant is mostly of Japanese manufacture. The original builders provided help in start-up, but the plant is self-sufficient now. LIN services are not yet used. Wet analysis is used for process control, but with the expansion project they are purchasing an X-ray fluorescent analyser. Only type No. 1 cement is made (bagged in paper) with a strength far in excess of ASTM and other recognized standards with consequent waste of fuel. There is interest in participating in a standards committee to discuss an Indonesian standard, which (most unusually) according to Tiga Roda, appears to have developed by users outvoting the manufacturers.

IV.G.9. Visit to the Institute of Technology

Bandung, June 5, 1977

Dr. Sri Hardjoko, in the former headquarters bunker of General Wheeler, has built up an excellent dimensional metrology laboratory for engineers. From next year it will be a compulsory course for all engineers of the Bandung Institute of Technology. Half of Indonesian's engineers are trained here. The question naturally arises in what areas facilities and staff here at ITB provide the best nucleus for a primary calibration facility for Indonesia in support of KIM. The cooperation with LIN is excellent within the KIM group.

The entire ITB campus is beautiful. It has 1,000 students entering each year for a four year program completed by about half of that number. (See also IV.F.7.)

IV.G.10. Visit to Lembaga Instrumentasi Nasional (LIN) of LIPI

Bandung, June 5 and 9, 1977

Mr. Aam, Mr. Mamun, Mr. Kim, and Mr. Peiser visited the empty laboratories over the weekend but obtained an excellent impression of the glass-blowing (excellent in very few places in the world and clear evidence of the Dutch tradition), machine, instrument, and optical shops and of the mechanical drawing office. A student microscope is being developed, a rice quality sampler for BULOG (the rice trading authority) is being built in a larger lot, and many test equipments are designed and built on an individual basis. A remote water level indicator is built for a dam project. Teaching and training, as much as the instruments themselves, are the desired output. Modular electronic design is illustrated against some reservations by staff members. All LIN facilities are crowded. There are some avoidable safety hazards.

Mr. Peiser had not been able to visit the Calibration Division on his first visit to LIN. The opportunity was therefore taken by Mr. Suhud to show the team this impressive facility on Mr. Peiser's return to Bandung. It is interesting to note that Director Herudi Kartowisastro is aware of the limitations of this facility and is almost too modest in describing its capabilities. They are desperately needed by Indonesian industry, as was attested on most of the team's industrial visits. No other institute in Indonesia offers an alternative service at the level of LIN. (See also IV.F.6 and appendix VI.F.2.)

IV.G.11. Visit to P. T. PUSRI Fertilizer Plant

Palembang, Sumatra, June 6, 1977

Mr. Aam, Mr. Gandi, Mr. Chaiwai, and Mr. Peiser were received by Engineer Zaini Muhibat, General Manager, Dr. A. Noor, the Laboratory Superintendent, and others. This fertilizer plant is one of three large government-owned urea plants; it operates essentially three units with a fourth under construction. Units 3 and 4 are for 1,000 ammonia and 1,750 urea tons per day. Units 1 and 2 are smaller. A relatively insignificant amount of NH_3 is sold for the rubber industry, refrigeration, and household use. The ammonia plant is under license from M. W. Kellog (U.S.) and the urea plants from Mitsui/Watsu. Most plants use local natural gas from Pertamina (70 percent CH_4, 10 percent CO_2, plus ethane, ethylene, propane, etc). The 46 percent nitrogen content is near theoretical. Biuret, harmful to some plants, is kept below 1 percent in the crystallization process. If a higher content is permissible for many crops, there might be a case for two grades with a saving of product. Bags of local polypropylene are lined with polyethylene all to standard properties. The natural gas is paid by computed BTU value (1 million BTU costs U.S. $0.40) from flow and composition (from gas chromatography) data. Differences of .5 percent between Pertamina and their own flow data do occur. The company has excellent staff training and recreational facilities for its 3,000 operating employees. The electrical and flow meter calibration facilities do not at present maintain traceabilities. The chemical laboratory is outstandingly equipped mostly with modern U.S. instruments (atomic absorption, spectroscopy, chromatography, flame photometry, etc.). Dr. Noor is interested in:

1) The NBS guest worker program while taking a Ph.D. in the United States
2) SRM catalog
3) Information on the electrode calibration of the Beckman KF3 Aquameter
4) Mass calibration by a standard
5) IR standard for triethylene glycol, etc.

Control of the nickel oxide catalyst has led to outstandingly long life.

The facilities of the laboratories could be made available to other government and university departments on a reimbursable basis, but Mr. Gandi believes there could be procedural difficulties.

IV.G.12. Visit to Pertamina Refinery

Palembang, Sumatra, June 6, 1977

Mr. Aam, Mr. Gandi, Mr. Chaiwai, and Mr. Peiser arrived at the Pertamina Office and were told a senior welcoming party was at the airport to meet a supposed arrival flight. After an hour's wait, the team did meet the head of the instrumental control department, Mr. Kliman Bin Kliwon. Some significant information was exchanged. The Refinery operates by Shell Company standards. Cracking asphalt and polypropylene plants are included in this impressive refinery.

Present interest in KIM appears to be confined to LIN's electronic training program. However, the Legal Metrology Institute of the Commerce Ministry executes important measurement control functions, about which favorable comments were voiced.

IV.G.13. Visit to Shipbuilding Company at Tanjung Perak

Surabaya, June 7, 1977

Mr. Aam, Mr. Gandi, Mr. Chaiwai, and Mr. Peiser were received at the Surabaya shipyard by the Managing Director, Mr. Soedarsono, and his technical consultant, Engineer Djandar. This state-owned enterprise builds ships up to 1,700 tons and has repair facilities including three floating docks, the largest of which can accommodate ships up to 4,000 tons. They have one transversal and one longitudinal slipway with a 300 ton limit, and extensive machine and paint shops, an iron foundry, and equipment for hand and automatic welding. Non-destructive inspection is carried out by the Classification Society (BKI), Ministry of Communications. Welding rods are mostly imported from Japan (Kobe) in preference for domestic Philips production which is said to be equally good, but more expensive. If the Indonesian Philips rods really conform to standards and the Indonesian subsidiary can itself supply an adequate volume, this might be a case for protective tariffs. Paints are mostly from domestic manufacturers licensed by the Ministry for Industry.

Relationships with the Institute of Legal Metrology, BKI, MIDC (for training of welders), and LIN for instrumentation and training, appear to be sound, as seems the technical capability of the staff. For repair of barges and ships for island trade, this yard does a competent job with a hard working labor force of about 750 men.

IV.G.14. Visit to the Boma-Bisma-Indra

Surabaya, June 7, 1977

Mr. Aam, Mr. Gandi, Mr. Chaiwai, and Mr. Peiser were received by the Bisma Unit Manager, Engineer Hariono Soemarsono, trained in Dresden in the German Democratic Republic. The shares of the entire horizontally integrated company are owned 100 percent by the Indonesian Government. The unit visited makes a range of Diesel engines under license from Deutz (West Germany). Many component parts are as yet imported, but Mr. Hariono is confident that all can soon be made in Indonesia. With the modern machinery of his brand new plant, beautifully laid out and with metrology laboratories equipped by Hahn and Kolb, there is little doubt that he can succeed. He is aware that he needs training and calibration aid from LIN and ITB. He pressed the team to be aware of the urgency. He was aware that, now that all of his instruments are new, he may be lulled into a false sense of security.

The ASEAN pact countries have not assigned large Diesel engines to Indonesia, but to Singapore. However, this factory is said to be exempt because it was planned prior to the Pact signature.

IV.G.15. Visit to Udatimex Car Factory

Surabaya, June 7, 1977

Mr. Aam, Mr. Gandi, Mr. Chaiwai, and Mr. Peiser were greeted by the General Manager who was prevented by other duties from remaining with the group for discussions which were attended by many members of the senior staff. The plant assembles Holden and Datsun sedans, and Iatte and Steyer trucks. Almost all parts are still imported except tires, batteries, mufflers, and paint. They listed about 30 types of instruments about which they did not know whether they needed calibration and if so, where they could obtain the service. The team described LIN, and Mr. Peiser gave a little talk on the philosophy of measurement for interchangeability of parts and for production control, recommending that one senior plant manager might well make it his responsibility to think and advise colleagues about adequate but not excessive measurement procedures.

A plant visit showed why the Director of Automotive Industry had indicated we would not see much at this plant. Failing apparently to adapt to the changing needs of Indonesia, this company claims that it is unable to market its products to its manufacturing capacity--a sad sight in a country badly in need of engineering products. The question one would tend to ask is whether dynamic leadership could have prevented a decline of this plant or could now reverse this trend.

IV.G.16 Visit to Glass Factory (IGLAS)

Surabaya, June 7, 1977

Mr. Aam, Mr. Gandi, Mr. Chaiwai, and Mr. Peiser were received by the Managing Director, Mr. Sechono Notoadhiwinoto, the Plant Manager, Mr. Djoko Sotmoko, and many other senior members of this outstanding plant manufacturing bottles (e.g., for Coca Cola) under good process and quality control. It is one of 60 manufacturers of glass bottles in Indonesia. It has manufactured prototype standard bottles for pharmaceutical products and would appreciate partial patent or design protection and acceptance of the sizes in a national standard. The cost of mold-making and stock keeping gives strong incentive to pharmaceutical manufacturers to limit their demand to a choice of a limited range sizes and fewer top closure sizes, all of functional simple design. This plant had its instruments installed and calibrated by LIN and supports all KIMS activities with enthusiasm. A plant tour led by the Managing Director showed an impressive mix of authority, encouragement of initiative, and alert listening for useful ideas and innovations. The chemical control laboratory was weaker on instrumentation and its maintenance (advice from LIN might be requested) than the quality assurance departments. They wish to receive membership information from the American Society for Testing and Materials (ASTM) and the Glass Container Manufacturers' Institute (GCMA), which Mr. Peiser promised to obtain for them.

IV.G.17. Visit to the Town Office of the Gempol Krep Sugar Factory

Surabaya, June 8, 1977

Shortage of scheduled time led to our failure to execute this visit to the sugar refinery operated by the Ministry of Agriculture, not by the Ministry of Industry, as would be the custom in some other countries.

Although most of the sugar cane production is to be transferred to islands other than Java, there are said to be still 58 refineries, some of which are being combined. Others are being rehabilitated by a loan from the World Bank. LIN is given the job of instrumenting such a renovated plant. Advisors, for instance, from Australia, perform a useful task. LIN also trains technicians for sugar refineries. The Materials Testing Institute of the Ministry of Industry gives non-destructive services said to be especially needed for the drive trains of the old cane shredders.

Development work is being implemented for using the bagasse for the paper making industry.

IV.G.18. Visit to P. T. Nurtanio (Aircraft Factory)

Bandung, June 9, 1977

Time was short for the team visit to the aircraft industry, till recently a part of Pertamina. This remarkable manufacturing facility hardly needs advice from the NBS/AID Survey team. However, the visit illustrated the potential of Indonesia. It is generally acknowledged that it is through the personal ability and drive of Dr. B. J. Habibie, backed by an excellent German trained staff, that within a year of starting an aircraft industry some aircraft under license from Poland, Spain, and Germany with purchased engines were delivered.

Today several aircraft and helicopters (two Messerschmidts, BO-105 helicopters per month; one STOL 212 CASA Spain per month, etc.) are completed each month with an ever greater fraction of homemade components although raw materials are virtually all imported.

Dr. Habibie himself was out of the country, but the NBS/AID team was well received by members of his staff headed by Engineer Rahardi Ramelan, chief of the Rotary Wing Division, and Engineer Sundoro Marjoseputro. Conversation centered on safety standards, quality control, and licensing by the Department of Transportation. The Directorate of Civil Aviation follows US-FAA requirements through an Airworthiness Group disseminating Civil Aviation Standard Regulations. Yet again the team heard spontaneous praise of services given by LIN, MTI, and MIDC. The importance of physical standards is understood and requests for NBS training may well be submitted.

Discussion with the quality control radiographer, Engineer Salim A. Dimyati, showed technical awareness and competent applications of established methodologies.

The team had the opportunity of inspecting the shops and was greatly impressed by the layout, by the quality control management, and the constant aim to expand into new areas of component manufacture. Elsewhere the team heard muted complaints that the aircraft that are made here are expensive, which may be true, but the long range value to Indonesia should not be gauged on current output alone.

Within Indonesia, however, aircraft are an important product. Air links between the islands can contribute vitally to national coherence. Besides, with this industry, Indonesia has taken a leap ahead acknowledged by the ASEAN group of countries by allocating aircraft manufacture to Indonesia. (See also IV.F.3.)

IV.G.19. Courtesy Visit to the Directorate of Metrology

Bandung, June 9, 1977

As Indonesian representative under the Treaty of the Meter to the International Bureau of Weights and Measures, the Directorate of Metrology is the counterpart organization to the U.S. National Bureau of Standards. Mr. Peiser as leader of the NBS/AID team regretted that time for a visit to the Institute could not be found. However, Dr. Sangster and Dr. Kim had visited the Institute and reported on their findings (see IV.F.4). Moreover, Mr. Peiser had sent the small collection of publications on Weights and Measures Regulations in the States of the U.S.A. and their safe delivery was reported by representatives of the Ministry of Industry on this day. Mr. Peiser therefore paid only a courtesy visit to this organization. Good evidence of its programs had been found throughout the NBS/AID team visits.

IV.G.20. Visit to the Metal Industries Development Center

Bandung, June 9, 1977

The NBS team was received by Engineer Paribowo Sutigno and other senior staff at the Metal Industries Development Center (MIDC) which strongly supports technical developments in the industry under the Ministry for Industry. MIDC concentrates on product development with consumers, keeping export and import substitution in mind. There are training programs coupled with pilot plant activities, especially for welding, casting, machining (including surface finishing and die making), and heat treatment facilities. Chemical and metallurgical laboratories were briefly visited. Documentation, information, and consultation sections are enthusiastically led. Contact with counterpart institutions in other ASEAN countries is maintained in part through UN agency assistance (especially UNIDO). Much help has been given by Belgian and German contributions, in part through technical advisers and equipment.

MIDC has facilities in fields important to the metals industry; it has staff with potential; but, in relation to the tasks set, for instance, under the "depletion program," MIDC must surely be strengthened. A good sign is the cooperation with LIN for calibration and instrumentation services. (See also IV.F.5.)

IV.G.21. Visit to the Materials Testing Institute of the Ministry of Industry

Bandung, June 9, 1977

The NBS team also briefly visited the Materials Testing Institute (MTI), another important laboratory facility under the Ministry of Industry. In the absence of the Director in Jakarta, his four division chiefs and Mr. Gandi himself (an Indonesian Survey team member) informed the team well for what should be perceived as an important technical mission implied in the name of the institute. Like similar institutions in other countries it was started following a disaster—the catastrophic explosion of a boiler.

MTI concentrates on materials testing, calibration of instruments (well-coordinated with KIM and LIN), standardization of test methodology, research, consultation, information, discussion and training.

The team visited all too briefly the Divisions of Metal Testing (under Eng. Trisno), Chemical Analysis (under Eng. Mustarsid), and Building Materials (under Mr. Sumardi). There are other divisions such as organic chemistry (under Mr. Rustandi), physics, and administrative services.

Despite impressive staff, attitude, available space, and some projects, MTI does not seem to be given support commensurate with its important mission.

IV.G.22. Interview with Voice of America

June 10, 1977

Mr. Peiser and Eng. Herudi Kartowisastro were interviewed by Mr. Arjono Tirtohardjo of the Voice of America, who is a USIS Information Specialist and evidently a TV quiz master well known to all high school students. The team does not know how much, if any, use was made of the recorded discussions describing the Survey in terms likely to be understood by the general public.

There was little press coverage by contrast with NBS/AID surveys in other countries.

V. CONCLUSIONS AND GENERAL REMARKS

V.A. GENERAL COMMENTARY

Standardization of products and services and the ability to measure so as to describe quantitatively materials and phenomena--these are two features of a nation's life which are all pervasive. Thus, standardization and metrology are fields of endeavor which from the most primitive start are essential to the successful development of agriculture and industry, commerce and trade, law and order, education and communication, and health and welfare.

Without programs in standardization or without metrology, a country is severely handicapped; such services are an essential element of the technological infrastructure of any industrial nation, just as, for example, financial and human resources, transportation, sources of usable power, or an organized legal system. In the judgment of the NBS/AID team, to reach its development goals Indonesia needs a stronger national effort in standardization and metrology. Without this, for example, the ambitions to produce in Indonesia all components for its automotive industry cannot succeed. Without improved sanitary handling of foods, the vitality of the Indonesian people will be unnecessarily drained. Without effective building codes, shelter for the people will remain sources of unnecessary danger. Without export inspection, many billions of rupiahs per year will continue to be lost through Indonesian products being denied entry into the countries that had depended upon Indonesia to supply to a specification. Without metrological expertise, Indonesia cannot defend its goods whose quality has been unreasonably challenged or determine the quality of goods for needed imports.

As a team, therefore, we strongly endorse the advice of previous advisers to the Indonesian Government, including the principal conclusion of the Sen Report (see section II), that the Indonesian standards system should be greatly strengthened. Equally true is the implication of the Probine Report (see also section II) that Indonesia now needs improved services in metrology. However, we take no position on the suggestion that a central national standards body should be given the principal responsibility for organizing and delivering most of these services and for assuming associated functions such as testing of products, disseminating technical information, etc. Certainly this would be one way of organizing the standardization and metrology systems. Several countries have chosen such systems; very few are considered to be totally successful.

This team limits its advice on how to organize the standardization and metrology systems in Indonesia to say only that there must be legal authority and there must be a central focal point for such systems. The action might be strongly decentralized only with central coordination for the establishment of national policies, maintenance of national standards of measurement, avoidance of unproductive duplications of effort, harmonization of potential conflicts, management of national campaigns of education and publicity, and other similar efforts that can be efficient and effective only when managed at a national level.

Let us make a comparison of the standardization system with the financial system of a country. There will probably be a cabinet level focal point for national financial policy, serving public and private sectors. The ministry, however, will not give financial services to every organization. Most organizations will have a financial specialist group or person to work in the organizations' own interests high in the management of the organizations' affairs. University and in-service study will keep the financial specialist up to the level of knowledge useful to the organization. If financial specialists fail their employers, the entire organizations can fail.

A parallel analysis could be made of the government's role in transportation, the environment, the power, the communication, and other systems. Most of these systems have a voice at high level in Government and other organizations, but not all governments choose to put, say, all aspects of electrical power into a single ministry. That system is so closely bound up with transportation, manufacture, standardization, etc., that it may be more important to create organizations where experts in these different sectors are linked in common endeavors. For example, in a steel company we may have a power specialist in electrical supply to arc furnaces, in high frequency induction heaters and power conservation in annealing furnaces. The transportation manager specializes in bringing in raw materials, handling scrap, and delivering products by heavy truck. The quality control (standards) specialist is familiar with spectrographic reference materials, mechanical, and non-destructive tests. If any of these functions are neglected, the factory can fail. Would it be effective to have that factory rely on experts or equipment loaned from the national transportation body? Sometimes, perhaps yes--but generally, probably no.

What about the specialties in standardization and metrology? In most countries, they do not have a voice in the highest levels of government. It is true, however, that all countries that have done well in development have strong standards organizations. We find frequently that in the most successful companies, the highest quality control specialist reports only to the highest executive official of that company. We also find that many companies have failed for lack of good technical control. However, any organization could succeed by different management procedures.

The advantage that a standards specialist and a metrologist brings to an organization lies in the broad applicability of standardization and measurement principles, enabling these fields to be applied in most diversified disciplines. Besides, the transfer of, say, steelworks practice may be constrained by restricted proprietory knowledge, whereas the technology inherent in standards and measurements are as a rule openly available. Perhaps most important, the principle of consensus and compromise, which is an essential element of the standardization process, is also the characteristic outlook of the Indonesian people.

If Indonesia decides against a near cabinet level focal point for standardization, and chooses a highly decentralized system such as is found in the United States, good coordination is essential. We observe the start of such coordination for the metrology system of Indonesia.

Let us cite our own experience as illustration of how better coordination can help towards improved results. As Mr. Peiser emphasized in his opening speech, the foreign team included experts in the field of standardization from five countries. They had placed their experience at the disposal of the Government of Indonesia to use at its discretion in the very limited time of two weeks.

Despite uncertainties of Survey implementation, the heavy burden of planning for it had been carried by Deputy Chairman Sumantri, Secretary General Didin Sastrapradjo, Director Herudi Kartowisastro, Mrs. Sriati Djaprie, and their many colleagues in LIPI and the committees responsible for the SKIM systems (Standardization, Calibration, Instrumentation, and Metrology).

Their skillful work was much appreciated and is generously acknowledged by all team members. Nevertheless, it is the feeling of the team that their work could have been even more effective if greater effort had been given to detailed planning and to explanations of the intent of the survey visits. Serious omissions were at times impossible to correct in an already overloaded program, deletions from which would have offended people who had already planned to receive the visitors.

This criticism is not made lightly and is duly included in this report for two reasons:

1. The team had promised to give its impressions and views in a forthright, factual manner.

2. Good planning, coordination, and explanation of intent are the keys to good standardization activities, especially in a system of Government such as the Indonesian where standardization responsibilities are widely distributed over many ministries and agencies.

V.B. COMMENTARY ON FOOD AND FOOD SAFETY

V.B.1. Introduction

Before summarizing other conclusions, we wish to give due praise for the capabilities, conscientiousness, enthusiasm, and dedication of the people of LIPI, the people of other government agencies with whom we met, and the consumer group. We believe that any appropriate policies of the Government of Indonesia can be implemented by these persons. In our opinion, their ability and desire to serve the best interests of the nation are of a high order.

As a result of our study of the papers presented, the personal discussions among our team members and our Indonesian hosts, our visits and discussions with manufacturers of foods, drugs, and cosmetics, we are of the opinion that the highest levels of Government should establish, authorize, and support the establishment and implementation of national and centrally coordinated standardization and metrology programs. In an attempt to assist in the matter of establishment of such programs, we suggest consideration of the concepts and recommendations set out below. We must hasten to add that much of what follows is already known to many of the Government officials with whom we met. Their papers should be read carefully by all concerned. These programs only await the full authorization and support by the Government to move ahead. The benefits to Indonesia will be many in almost all areas of development.

Having been invited to participate as members of the survey team because of our specialized knowledge and experience in the field of standardization, we, the members of the food group, emphasize that subject in this portion of the report and not the equally important recognized needs of Indonesia in the field of metrology. We leave metrology to the team members who are more expert in that science and technology.

The organizational structure of a national standardization system should be patterned to be consistent with the governmental and economic realities of Indonesia. Although the available expert technical personnel appear to be fully capable, they seem seriously insufficient in number. A better coordinated and flexible program with specific assignments will surely render the expenditures for technological expertise more effective. We have observed that present costs result in part from overlapping and duplicative efforts.

A study of the history of standardization in Indonesia reveals that it is receiving increasing emphasis through some Presidential, legislative, and ministerial support. However, we understand that this increase in emphasis is to be better defined and accelerated during REPELITA III for Indonesia. The idea is to move more rapidly into an acceptable level of standardization for the betterment of the international trade position of Indonesia and for the promotion of its own domestic industries. Such increase in emphasis will improve the health, safety, and economic well-being of all its citizens.

V.B.2. Benefits of Standards

A centrally coordinated national standardization program will accelerate attainment of the goals and needs of Indonesia. A fragmented program with little coordination, such as we find in Indonesia now, wherein a number of departments operate under different actual or assumed legal authorities, can only delay Indonesia from the assured goal of properly serving its citizens and from taking its proper place in the international community. The rapid advances in technology; the rapid expansion of foreign trade in both goods and services; the increasing needs of the Indonesian people in the fields of nutrition, health, and safety, as well as material and social benefits; and the need for acquisition and conservation of hard currency all demand an expedited development of a centrally coordinated standardization program. Standardization is a useful tool for the implementation of government policies and programs, both domestically and internationally.

We concur with Deputy Chairman Sumantri and Mrs. Sriati Djaprie of the Indonesia Institute of Sciences (LIPI) and many others when they state that establishment of priorities for research and development and the adoption of national standards could be centralized and could be the responsibility of a central body. They add correctly that the formulation, implementation and promotion can well be decentralized. That is, the latter functions should be assigned to various ministries and institutes. We fully concur with their analysis. The central body, however, should be established by law and should be provided with the necessary authority and some funding.

In any consideration of a centrally coordinated national standards program, we believe it is helpful to list some of the general benefits of standards. Admittedly, the listing set out here is not complete nor is it in any fixed order of priority. However, in our opinion, these issues are important and are not limited in application to foods, drugs, and cosmetics, but may apply to many products and services.

a. Using standards, ground rules for manufacturing and commerce can be established for all, thereby reducing the risk of error and waste.

b. Fair competition can be encouraged when the ground rules are known to all and applicable to all.

c. Waste is reduced when the capabilities of industry are matched with the expectations and needs of consumers.

d. Consumer confidence in industry is enhanced when the product obtained is in accordance with expectations.

e. The health, safety, and welfare of consumers can be protected when standards are established with those factors considered.

f. Industry and government can expect a reduction in costs when a channel for communication is available concerning the products that are available, those to be made available, and those desired.

g. Inventories can be reduced when tool and equipment standards provide for an interchangeability of parts capability thereby providing savings in many ways. For example, savings result from reduced annual purchase costs, reduced storage and administration costs, and reduced costs for the training of assembly and maintenance workers.

h. International trade and confidence can be enhanced by conformance to standards. Fewer exports are rejected at destination and higher quality products are received thereby leading to support of policies such as conserving hard currency or improving the balance of trade.

i. As the confidence in domestic products improves, dependence on imports will decrease, thereby also conserving hard currency and improving the balance of trade.

j. Efforts by international standards groups are more apt to consider the needs of Indonesia, when she herself places emphasis on standardization programs.

k. Government regulatory efforts become more efficient and are better received when the rules (standards) are seen as just "measuring sticks" for determining compliance.

We do not advise against the use of recognized grades of a product. Nevertheless, we feel that the use of several standards for the same product increases misunderstandings and disagreements concerning quality and identity requirements, thereby causing disputes and frustration among producers, users, and government officials. This is especially so in an economy containing a mix of sophisticated manufacturers and less sophisticated home industries and in the absence of a national standards system. Further, the absence of a clear-cut authority to establish and implement standards inhibits and sometimes makes useless an ongoing inspection program. One solution with which we would agree is based on a proposed Memorandum for Establishment of a National Standardization System in Indonesia as presented to the Government through the Minister of State for Research.

V.B.3. Authority for a National Standardization Law

We, the visiting team members, concur with our hosts that it is indeed unfortunate that Act No. 10, 1961, the Act on Goods, has not been fully implemented as yet. It could provide the necessary authority to regulate the identity and quality of goods as well as their packaging and labeling. It could authorize that control necessary to see that all relevant requirements are met. Absence of the establishment of the Committee on Goods is seen as inhibiting the growth of a nationally coordinated standardization system.

Presidential Decree No. 45, 1973, assigned to the Minister of State for Research the task of developing a national system on standardization, calibration, instrumentation, and metrology. By virtue of this decree the Minister of State for Research had appointed the Indonesian Institute of Sciences (LIPI) to execute a project on the development of a national system for standardization, calibration, instrumentation, and metrology.

The standardization subproject has been studied since 1974, particularly in its legal aspects. However, it seems to have moved more slowly than anticipated and is said to be meeting resistance from some quarters. We recommend that this study be expedited so that a basic law on standardization with widespread consensus can be recommended to the national legislative process. The enactment of such a law would seem now to be of high priority for Indonesia to assume its rightfully desired place in the community of trading nations. A national standardization program centrally coordinated can function far better with full legal authorization. It need set out only very general rules of practice so that the standardization body may more flexibly promote the function of establishing and implementing standards. The other extreme alternative is to enact a separate law for each standard. This method would be, in our opinion, inefficient. Further, it would be wasteful of the time of the law-making bodies. Standards, subject to the coordination and control of a national standardization body, can best react expeditiously to changing needs and changing technology. The law could require the national standardization body to make assignments for standardization in specific fields to ministries or institutes having the best qualified technical group to establish and implement particular standards. Further, it could require that all with interest shall be invited to participate with the assigned ministry or institute for the development of standards in specific fields.

In our view, it is imperative that in addition to provisions for a sound and viable technical infrastructure, there should be provided the necessary authority and funds to support a full standardization program. The necessary provisions would include administrative support to the ministry assigned a particular standards project. Funds and general authorization are needed also for the personnel selected to conduct necessary research and development; for publishing and publicizing standards; for government inspection and testing (all or part of the testing may be done by certified non-government laboratories); for necessary training; and for inspection of export goods having requirements different from domestic needs. The law should also contain authority for exchanges of information among government agencies on changes in practices as well as on industry noncompliance with standards.

It is firmly believed that the government of Indonesia, controlling the production of a large number of basic industries providing goods, public utilities, and services, would itself benefit directly from standardization of such goods and services.

As stated below, a standards program must consider both mandatory and voluntary types. Therefore, the authority of government to enforce the mandatory standards should be clearly incorporated into the law.

V.B.4. Components and Functions of a National Standards Body

A national standards body, established by law, should have at least two basic components. One component should be responsible for the planning, programming, coordinating, and adoption of national standards. The other component should be responsible for providing administrative, financial, secretarial, and other supporting services.

The component responsible for planning, programming, coordinating, and adoption of national standards must have broad representation. With such representation, Indonesia will be assured that the standards established would result from a national consensus. The national standards body may be made responsible for obtaining the necessary financial appropriation and to allocate funds on the basis of both equity and priority. The authority for final adoption of standards should be delegated by law to this body. Except for general guidelines set out in such law, the means to accomplish adoption of the standards could be delegated to the national body.

The day to day research efforts requiring specialized knowledge within a sector of the economy should be assigned to the ministry or institute selected for a particular standard project. Specialist groups could be established as necessary, practical, and in accordance with priorities established by the national standards body in consulation with the ministry or institute concerned. Each specialist group should be representative of the various bodies with relevant interests and could be required to report direct to the national standards body.

The planning and programming component of the national body would also be responsible for establishing policy, coordinating an entire program, and resolving problems related to the establishment and implementation of standards. It would be responsible for establishing necessary policies for the encouragement of efficient transfers of personnel and technology, the training of personnel, publicizing of needs and output, maintenance of a library system, and other overall functions of a general nature.

The administrative component of the national standards body would provide administrative support to each specialized group as well as to the central planning, programming, coordinating, and standards adoption component. It would act as a clearinghouse for all standards development and implementation related activities. It would be responsible for obtaining and disbursing funds necessary for day-to-day operations and maintenance of the program. Included would be such things as financing of the publication, distribution, and promotion of each standard. Further, this administrative body would be responsible for carrying out the policies of the major component or to see that those responsible for such compliance do, in fact, comply.

Our concurrence with the idea of a national standards body, assigned to a neutral group placed high in the government hierarchy and established by law, is predicated on the provision that various ministries and institutes with current standardization activities should continue to function, but within the rules established for the national system.

Because of the quantity of work to be done, it would be necessary for the national coordinating body to establish priorities for its program giving due attention to national priorities and Governmental policies. Those standards necessary to protect the health, safety, and welfare of the people of Indonesia might be assigned the highest priority.

Products or practices where serious abuses are found might also be assigned high priorities. Further, priority assignments within any grouping should consider cost/benefit analyses. One should also weigh the "cost" of not establishing a meaningful and reasonable standard against the benefits (or effectiveness) of doing so. Those standards which will promote an improved balance of trade by improving the value of domestically produced exports, or by making Indonesian exports more desirable in foreign trade, can be assigned a relatively high ranking. Further, in any development of priorities, one might consider the benefits of providing a climate for fair competition in the industry sectors. Additionally, one should consider the need for an improved national use of resources as well as a need for improved interchangeability of parts, and so forth.

For optimum benefits from a national standardization system, all sectors of Indonesia should become involved and fully participate. Participants should be drawn from manufacturers, government (including all ministries and constituent units), the legal community (both government and nongovernment), distributors, technical and scientific associations, consultants (both domestic and foreign), library specialists, retailers of goods and services, consumers, educational institutions, and from those groups particularly capable of advising at all levels on standards establishment and implementation.

V.B.5. Assignments to Develop and Implement Standards

In making the assignment to a ministry or institute for lead responsibility for the establishment of a standard, such assignment should be made on the basis of a blend of greatest expertise and experience, primary responsibility for regulatory control of the product or service, availability of technical personnel, and capability for implementation. The national coordinating agency should be authorized to require the ministry or institute so assigned to a project to obtain a broad base of representation for input consideration. Other ministries or institutes, consumer representatives, manufacturer representatives, educational and research bodies, and others with interest and in a position to provide expert advice should be required to be invited by the lead unit to participate.

The ministry or institute assigned the standard or group of standards for development would, in turn, reassign the project to subordinate divisional units. However, it should be expected to assume the responsibility for assuring that the subordinate unit obtains full and necessary participation from all sectors willing and capable. Necessary studies would be performed at this lower level. They should consist of, among other things, a survey of industry capabilities; the needs and desires of consumers; the potential capabilities of industry; both the minimum and the optional requirements for a product of acceptable quality; the pricing of the product; the existing related and applicable standards (both domestic and foreign); the available methodology and that which must be developed for determination of compliance with the requirements of the proposed standard; the good manufacturing practices and the quality assurance procedures necessary for a quality product; the necessary sampling procedures; and the specific acceptance and rejection "decision" points to be used upon examination of samples. An efficient standardization program also requires the setting of reliable target dates, milestones, time frames, coordination points, assigned responsibilities, etc.

The central body in consultation with ministerial authorities might study the level of capability of home industries, determine their need for technical and financial assistance, and establish a schedule of milestones and goals for their improvements so that the standards establishment and their enforcement would be reasonable, helpful, and meaningful.

The central body should ensure that the standards established not only consider the present needs but are dynamic. It should ensure that standards are instruments of government at both national and international levels and that they assist in the progressive development of Indonesia, protect the health, safety, and welfare of the working people and consumers, and also protect and promote the benefit of the manufacturing, distributing, retailing, and servicing community.

The implementation of standards, including inspection, testing, sampling, quality assurance, certification, labeling, coding, enforcement, etc., are functions which can best be performed by separate ministries, certified and licensed individuals or companies. The central planning and programming component could directly or in consultation with ministries call upon the services of others where to do so would reduce the costs, provide for use of the best available expertise, and reduce time requirements.

It is important that training and education in all aspects of standards development and implementation should be centrally coordinated so as to conserve resources. A central information bank should also be established and maintained by the national coordination authority with links to other similar centers abroad.

Some other countries maintain that a private body is unsuitable for coordinating, establishing, and implementing a national standardization program. We do not intend to detract from the efforts of organizations such as Yayasan Dana Normalisasi Indonesia (YDNI). Whether in the private or public sector, a national center with full governmental authority and financial support is important for all countries, especially for developing countries such as Indonesia.

V.B.6. Problems With Noncoordinated Standards

We were advised by our hosts that they have identified some 104 bodies in Indonesia involved in standardization activities. Obviously in this situation, one needs excellent coordination. However, we found a number of inconsistent standards, units and definitions at variance with each other, and varying levels of implementation. In some instances, we found standards for certain food items being independently established by the Ministry of Trade, the Ministry of Industry, and the Ministry of Health. These were found to be sometimes duplicative and sometimes incompatible. In some instances, they were significantly different when applied to products designated for export, import, or domestic use. Further, in some instances, those established for the purpose of supporting development of an industry vary from those designed to protect the health, safety, and welfare of consumers. Standards that are not in the interest of all of Indonesia but mainly for a segment of the economy to the detriment of others should in time be replaced or improved.

V.B.7. Benefits of a National Coordination Process

On an international basis, the participation of Indonesia will be strengthened if backed by a national standards body, and the country will benefit from a uniform standards program espoused by a single voice. In any standardization forum, these benefits lead to significant advantages. For example, Malaysia, Singapore, and Thailand of the ASEAN countries, by having a national standardization system, seem to have gained stature and credibility in their participation in international forums.

The policies for coordinating the implementation of standards in an evenhanded manner, of necessity, should be the function of the central national body. The broad base principles of quality control, research for quality improvement, and transfer of appropriate technology where needed can best be established by such a body. Education and assistance, both technical and financial, are made available more efficiently.

With a national coordinating body, the transfer of technology relating to standardization could be better managed. This seems particularly important for Indonesia. Although Indonesian technologists and scientists are as capable as any we have met in many parts of the world, they are still very few in number. The knowledge held by this limited number should be made available to all who have need for it and in accordance with reasonable priorities.

V.B.8. Voluntary Versus Mandatory Standards

Through the years many have debated the advantages and disadvantages of voluntary versus mandatory standards. Each country must decide for itself what is the proper mix for its own use. A general rule to pursue would be that those standards that are necessary to protect the health and safety of Indonesians should be mandatory. To these one might add those products involved in international trade so that hard currency is not wasted because of the lack of specific rules. Also, for those domestic products wherein major quality defects are not recognizable until after purchase and use and which result in serious economic loss to consumers, mandatory standards could be of benefit. However, each of these would be of a lower priority for establishment and enforcement than those affecting health and safety. Most importantly, mandatory standards must be established and enforced by government.

Voluntary standards need not be established and implemented by government. However, government should not be excluded from exercising the option to function in this area. Voluntary standards may be established by associations of manufacturers, academic institutes, etc. Voluntary standards are, for the most part, applicable to those products and services which are not hazards to health and safety. That is, they are generally of an economic nature. Violation of these standards generally affects only the pocketbook of the consumer and not his health and safety. There could be "grade" standards concerning such things as factors affecting an extended shelf-life or extended usability, aesthetic values, and other non-serious defects in a quantity not in excess of an absolute maximum. However, voluntary standards and their use should be audited by government to assure the citizens that their confidence is not being abused, that discrimination is not applied against the conscientious small-scale producer, or that free competition is not inhibited.

V.B.9. Quality Level of Standards

In a developing nation, as is the case for Indonesia, we find a wide variation in the quality of products. The range is from those capable of meeting high standards of quality to those unable to attain acceptable quality levels necessary for consumer health and safety. Those manufacturers unable to meet the minimum levels of acceptability usually lack the funds, experience, advice, or equipment necessary. We noted, with interest and admiration, the almost universal social conscience of those Indonesians with whom we associated. All had concern for the small manufacturers and the need for avoidance of standards of such a high level that cottage industries as well as other small industries and crafts could be destroyed thereby causing unemployment, social discomfort, and loss of domestic production. Moreover, we observed willingness of individuals to cooperate and where necessary compromise with colleagues across organizational lines. This type of effort was not so clearly discerned between the organizations themselves.

To recognize this need to protect home industries, we suggest that during the research and development stage for the establishment of a standard, particular studies should be made of the contribution of the small manufacturers of a particular industry, their level of technology, their potential as contrasted with their present practices, their financial needs, and their marketing areas. With this information in hand, the central coordinating body could, as necessary, provide or recommend funding for the improvement of production capabilities and for any necessary technological training and assistance. Particular emphasis should be placed first on those problems adversely affecting the health, safety, and welfare of consumers.

Newly developed national standards should first be identified as "tentative." Personnel in need of related training should be provided with such training. During the tentative period, faults in the standard should be identified and corrected. Further, comments as to how to improve the standard should be invited, debated, and if persuasive, acted upon. Inspection procedures and laboratory methodology for determining compliance should be evaluated. Necessary training and retraining as well as certification of inspectors and analysts should be conducted and their number adjusted to fit the needs. The assigned ministry or institute should assure itself that the most efficient use of inspectors and analysts is made. A continuing program of research for quality improvement and a program of periodic review of each standard should be a function of the assigned unit.

After a reasonable period of review and the necessary adjustments and training are conducted and necessary revisions of the standard are incorporated, the tentative standard should be made final. However, each final standard and its level of compliance should be subject to periodic review.

V.B.10. Encouragement and Support of Standards

The arguments that food standards for a number of items are difficult, if not impossible, to establish and enforce in Indonesia are compelling. With the quantity of food production significantly less than required by the nation; with production coming from many small unsophisticated farmers using different seeds, cultivation, and harvesting practices; with processing often carried out in cottage industries at low technology levels; and with the need to maintain acceptable employment levels, we would agree that uniform standards are difficult to establish and enforce. To resolve these problems, one should consider the establishment and support of cooperatives of both farmers and manufacturers; development of a corps of trained personnel to educate, assist, and guide the small farmers and manufacturers; a meaningful step-wise program with beginning emphasis on health and safety factors; and an even-handed reasonable enforcement program. The entire program can be encouraged by providing full support from the government, by full participation by all concerned, by a central organization for establishment and implementation speaking with one voice, by even-handed enforcement and, as necessary, by subsidies. A universal educational program directed toward consumers should be included.

In particular, the educational program referred to above should include assistance to small farmers and producers concerning seed purchase, fertilization, soil conditioning, and handling of products during storage as well as from farm to processor or market. They should be helped not only to understand the standards and how they operate for their benefit, but also how with standards the nation can improve production practices. The formation of cooperatives could be encouraged to assist in the buying of commercial equipment, in proper seed selection and purchase, in the study and institution of improved agricultural practices, in the attainment and chaneling of economic assistance, in the distribution and marketing of products, and, very importantly, in the promotion of technological advancements.

Professional and technical standards associations should be encouraged and might even be provided financial support. They are a ready source of scarce skills; they facilitate mutual development of knowledge by improving communication among experts; they improve the professional image of members; they can foster and encourage development of programs for education and training of younger people; and they can provide expert teams to consider and propose solutions to widespread and complex problems. Groups of professional and technical personnel in industrialized countries constitute an invaluable reservoir of talent for the development and implementation of national standards as well as other national projects.

In the development of specific standards for Indonesia, one should consider a number of factors such as the present and potential capabilities of the producers, the long-term development of the nation, and existing domestic, foreign national, and international standards. After an in-depth study of the applicability of existing standards, one should decide whether they might be adopted in whole or in part but keeping in mind the needs of Indonesia, both domestically and internationally. Methodology to determine the level of compliance with a standard also may be obtained from many already available sources such as the Association of Official Analytical Chemists, the American Society for Testing and Materials, and many others headquartered in many parts of the world. These techniques should be considered for adoption in whole or modified as necessary.

All standards, tentative or final, should require a significant improvement of practices upon the part of some manufacturers, causing them to reach out for attainment. Standards simply recognizing existing or poor practices are unworthy of a national standardization program. An ideal standard should, among other things, define the identity and the minimum quality of the product concerned. It should define the terms used so there will be no confusion as to their meaning.

The intent of a standard should be made crystal clear. It should prescribe the particular labeling necessary to inform the consumer of what is necessary for the exercise of a rational choice from among comparable items. The standard should also prescribe the quantity of the product in a container.

V.B.11. Enforcement of Standards

Methodologies to be practiced in the laboratories and the equipment required should be of the sophistication necessary for the level of consumer protection desired. We have noted that much of the needed facilities are already available in Indonesia. Although we have interviewed many capable technical scientists, we find, unfortunately, that in these specialties, too, they are still too few in number. The sophisticated laboratory equipment required for today's advanced methodology is also in short supply. In passing, let us emphasize that as industry must continue to advance its capabilities, so too must its technical community. All must be continually encouraged and supported in their need to improve their expertise.

To provide a proper level of enforcement, appropriate inspection practices must be established. A number of applicable sampling schedules and acceptance and rejection schedules are already available in Indonesia. Others may be obtained from other countries. Suitable schedules, amendable to the needs and capabilities of Indonesia, should be adopted or appropriately modified. These schedules are integral parts of any standards program. Inspectors and analysts should be well-versed in them. Most established schedules can be applied to wide ranges of industry capabilities and consumer needs.

No mandatory standards should be established unless it is intended by Indonesia that they are to be enforced. The existence of mandatory standards, regulations, and laws which are not enforced develops a lack of consumer confidence and an increase in the cost of living. We also find that it encourages carelessness and resultant waste, unfair competition, and, very importantly, disrespect for law. Enforcement should be even-handed. As necessary, specific penalties for noncompliance should be incorporated in any enforcement program. These may consist of one or more of the following: warning letters, mandatory attendance at training programs, seizure and removal from the marketplace of offending products, injunction, financial penalties such as fines payable to the government or restitution to customers, and, in severe cases, incarceration of those persons responsible for serious repeated and deliberate violations.

V.B.12. Good Manufacturing Practices Rules

For such things as foods, drugs, and cosmetics, one should include in standards the rules for, or the identification of, those ingredients which are required, as well as those which are permitted for use and those which are prohibited. The means of determining compliance must be included. Further, for foods, drugs, and cosmetics, good manufacturing practices (GMP) should be included. These GMP's should be so stated that, if complied with, they will provide a reasonable assurance of a safe and sanitary product and within prescribed parameters of nutrition or efficacy, as applicable.

In setting out the good manufacturing practices portion of a standard, one should study intensively each industry operation subject to the standard. Standards should be set at such a level that some manufacturers must improve to attain compliance. A standard simply recognizing the lowest level of current practices would be a sham. This is not to say that the standards should be unreasonable or that they should force failure of those businesses who wish to comply and have the potential for doing so. The level of good manufacturing practices required must be within reason and attainable. GMP's are not of benefit only to mandatory standards affecting foods, drugs, and cosmetics. They need not apply only for sanitation and health. GMP's may be designed to bring about on-the-job safety, economy of operation, etc. GMP's produced for all food and drug industries should be used as guidelines or educational tools at first, but then, as operations improve, appropriate portions should be made mandatory. GMP's are already established in other countries, as well as in certain industries in Indonesia, and they should be studied and usable portions, with modification as necessary, considered for incorporation in the national GMP's. We know of no reason to expend time and money developing GMP's if they already exist elsewhere and are usable.

Qualified teams of experts should study each type of food and drug manufacturing operation to determine the critical control points and an appropriate hazard analysis should be conducted. With these points in mind, meaningful GMP's can be developed which will be helpful to industry and will further the interests of consumers.

Our visits to the home industries producing tempe and oncom (favorite Indonesian fermented foods) were revealing. These items are produced under unsanitary conditions which lacked the most fundamental controls. Although they no doubt are produced and sold with consequent health hazards, they appear to contribute greatly to the nutritional needs of the population. Improvements must come gradually. We believe that the government should develop good manufacturing practice guidelines for the manufacturers of these products to bring about improvements. Guidelines should be simply advisory at first, and specific assistance should be provided to the manufacturers so that they may upgrade their practices. As a minimum, a good manufacturing practices document for food, drugs, and cosmetics should include provisions concerning:

a. Personnel training, qualifications, operational requirements, condition of health, and sanitary practices.

b. Plant and grounds including provisions for ventilation, lighting, and pest exclusion, roads, draining, and storage space and condition; necessary separation of operations by partition, air flow, space, time, enclosed systems, or other effective means so that cross contaminations are avoided; and placement of equipment and furnishings for required controls.

c. Sanitary facilities and controls including adequate personnel and equipment clean-up provisions; avoidance of such things as plumbing which permits backflow or cross-connections between potable water and sewage systems; sewage disposal, handwashing, and toilet facilities sufficient to accomplish their intended purpose; provisions for rubbish disposal.

d. Sanitizing operations for equipment and utensils as well as controls for toxic materials used in sanitizing and cleaning; animal and vermin control and storage and handling of cleaned equipment.

e. Maintenance and use of equipment, utensils, and ingredients; regulating and/or recording controls, thermometers, etc.

f. Processes, parameters and technical operations, raw material and finished product handling, coding, and record keeping.

g. Warehousing and distribution.

V.B.13. Cost/Benefit Analysis for Standards

In order to convince all government agencies, industry, and consumers of the value of a standard, a cost/benefit analysis, as referred to earlier for determining priorities, should be supplied along with each proposed standard and its means of implementation. Cost/benefit analyses should be prepared by specialists in this type of effort. A team effort should be considered and personnel should be recruited from economists, statisticians, budget experts, social psychologists, technologists specializing in the standard being considered, marketing specialists, etc.

V.B.14. Information Distribution

In our discussions and field visits, we learned that in some instances one department may have neglected to inform other departments of problems of mutual concern, such as the existence of products seriously detrimental to the health, safety, and welfare of the people of Indonesia. Such neglect is wasteful of limited resources and reduces consumer confidence in domestic production. It is wasteful of available technical personnel if each department must seek out its own information when such information already may be known to another department. The needs of the people of Indonesia should take precedence over any desire for personal leadership.

If a food is not exportable because of a heavy load of pathogenic microorganisms or other health or safety problem, it should not be distributed domestically. There should be instituted, by the central body, a requirement for an instant communication alert system established among the ministries with interests in trade, industry, and health. Causes of unsafe conditions and contamination should be sought out and eliminated. We were informed of this problem concerning products designated for export but denied such export and then released for domestic consumption.

V.B.15. Standards for Exports

Concerning exports, it is imperative that the receiving country's standards and other requirements are known and the food is found in compliance prior to shipment. Also, it is imperative to make certain that the conditions of shipment will retain the quality of the food. The records show that some of the foods exported to a number of countries, including the United States of America, are denied entry and thereby are causing the loss of much needed hard currency by Indonesia. These foods denied entry must be destroyed, or reconditioned, or returned to Indonesia, or transhipped to another country which may or may not accept them. A study of one year's U.S. denial of Indonesian foods reveals losses to the people of Indonesia of many millions of dollars. A strong centralized standardization program, as recommended, should significantly reduce these losses at a fraction of the cost of losses.

V.B.16. Quality and Quantity of Analysts and Inspectors

Inasmuch as our area of expertise is that of foods, drugs, and cosmetics, and particularly in the area of food standards and their implementation, our activities during "field" visits were primarily concerned with foods. At this point, therefore, we believe it is germane to comment further on some features of the inspectional and analytical needs of the Directorate of Drugs and Foods. There appears to be little, if any, increase in the inspectional and analytical staffs since foods were added to the responsibility of the Directorate of Drugs. For example, we were informed that there are approximately 16 to 20 people (the sum of both analysts and inspectors) on the staff of Mr. Slamet Soesilo, the Provincial Director for Drugs and Foods at Bandung. This is the same staff he had when his responsibilities were for only drugs. For a geographic area containing approximately 24 million people and numerous drug and food factories, this, in the opinion of our team, is seriously insufficient. The operation is not only in need of additional personnel but also of additional equipment, analytical standards, and standards for those products for which the organization has assigned responsibility. Not to increase staff and equipment will permit the facade of protection to be perpetuated.

Concerning inspectors and analysts, they should be subject to continual educational improvement. As necessary, they should be sent to other countries to study and called upon to teach their associates. Foreign experts may be invited to instruct in Indonesia. The inspectors and analysts should be recognized as an elite corps of government. Their moral character should be of the highest order. Further, they should be trained to serve as teachers to industry, to consumers, and all others who have a concern or an interest in the government's standards program. The corps of inspectors and analysts should be of sufficient number to permit them the time to carry out their functions in a professional and even-handed manner, thereby promoting the interests of Indonesia.

V.B.17. Product Quality Assurance

Our visit to P. T. Ultra Jaya Milk Industry revealed that the quality control effort in production, as in other food plants, is primarily concerned with the examination of the end-product. More effort should be exercised to build quality assurance into each step of production. For example, more effort should be made to assure cleaner milk coming into the factory from suppliers. This is not to say that the milk should be rejected, at this time, but government should provide assistance to the raw milk suppliers to improve their products. The present practice appears to be simply to receive any and all contaminated raw milk and then rely on cleanup and final sterilization. The potential for losses is great.

At the canned food operation (subsidiary of P. T. Mantrust), the information provided us also appeared to place considerable emphasis on end-product evaluation and an insufficient emphasis on raw material and in-process assurance of acceptable quality. In any GMP there should be in-process assurances built in. We observed similar conditions, often to a much greater degree, in other operations and not always limited to food production. The waste of products and the waste of energy, manpower, and other factors, let alone the resultant increased cost of the acceptable products due to high rejection rates of finished products, should be reduced as soon as possible. Indonesia can benefit materially from improved "quality assurance" systems that do not rely solely on end-product analysis controls.

Another change in practice we would recommend to those desiring to produce a better quality product at less cost is to restructure operations so that quality control and quality assurance personnel should be responsible to the top echelon of management. That staff should be insulated from those whose responsibility it is to produce a target number of products. To make these people responsible to production managers encourages conflict-of-interest situations. One cannot readily serve two masters having divergent functions.

In our opinion, the practice of a department certifying and licensing "commercial" inspectors and laboratories, whether they are located in the private sector or in "sister" government agencies, is an excellent practice. It makes efficient use of limited capable personnel and analytical facilities. We commend the periodic evaluation and recertification of laboratories as a practice which should be continued and enlarged upon. Also, establishment of collaborative laboratories goes far to standardize acceptable laboratories and improves professional competence.

V.B.18. Government Shields of Approval

A number of countries authorize the use of a mark, shield, or certificate for those who comply with a government mandatory or voluntary standard. The use of the shield signifying an acceptable level of quality should be monitored by the government to control abuse. Also, shields signifying levels of quality may be established by private sector groups and authorized for use. These, too, should be monitored by government to control abuse. If the shield is indicative of government recognition of product acceptablity, but established and authorized by the private sector, then the government will not only insist on being invited to participate in the establishment of the relevant standards, but will also exercise veto power concerning the standards and the use of the shield.

At the moment we see no pressing need for shields, denoting compliance with mandatory standards, since by definition all products must comply with such standards; otherwise, they may not appear on the market. However, if confusion should develop as a result of some products bearing a shield for compliance to a voluntary standard, then Indonesia may decide to consider a shield for all products complying with a government standard of whatever type. The significance and coverage of each shield should be made clear to consumers.

V.C. COMMENTARY AND RECOMMENDATIONS ON BUILDING PRACTICES

V.C.1. Introduction

Indonesian building practices vary widely. There are few uniform building codes and standards, and they are seldom enforced. Buildings are constructed according to: the traditional method (post and beam structures and thatch roof and walls); the transitional method (mix of the traditional with modern materials); and the modern method (adopting building designs from the Western world). With the exception of commercial and industrial buildings that are designed and constructed under supervision from developed countries, building practices and standardization need to be improved if greater economy and durability is to be achieved.

The Economic Facility, University of Indonesia, has projected that the Gross Domestic Product for construction activities will double by 1980 from 262 billion rupiahs (U.S.$639 million) in 1973 and will achieve an almost sevenfold increase by the year 2000. With such expansion in building output, improved building practices could reduce the increase in near and long-term construction costs and could be better directed to meet the housing needs of the nation.

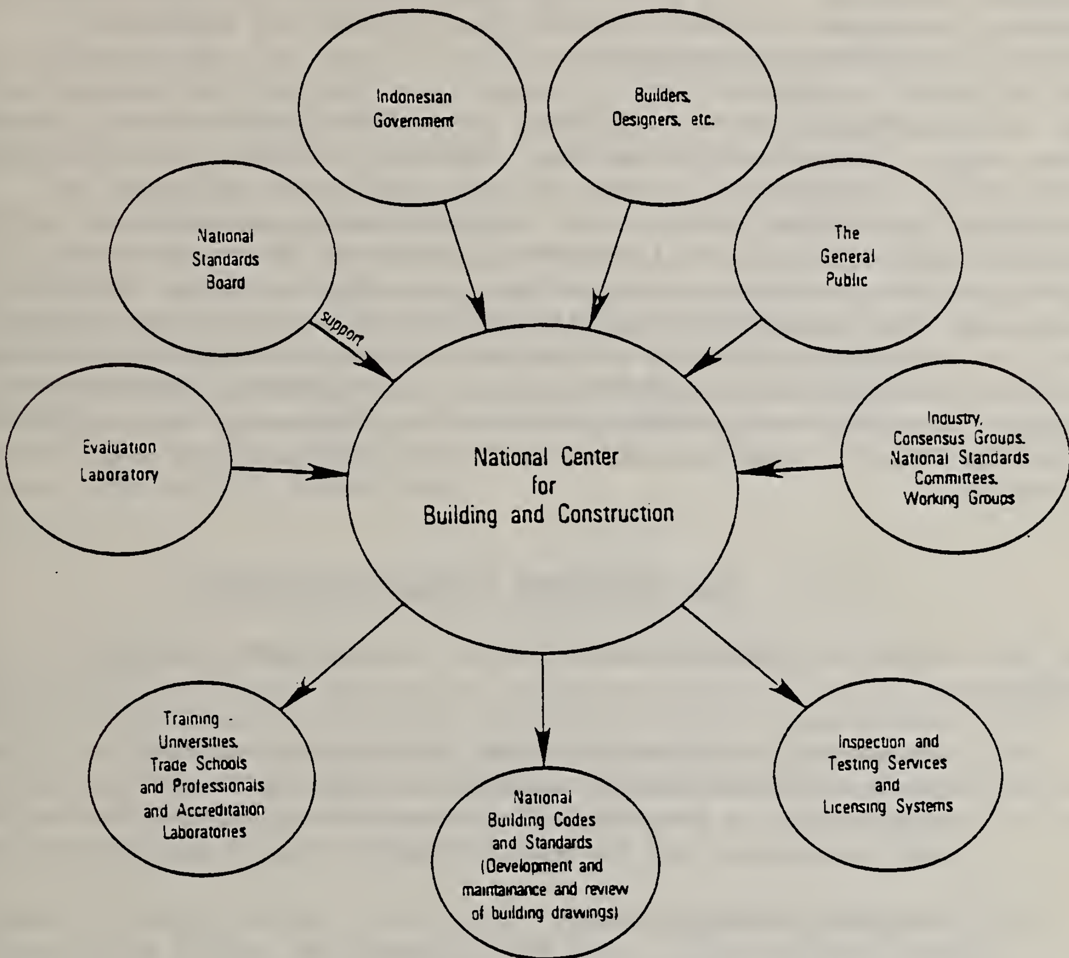
With this as a background, the following portions of this section are used to comment on certain areas relevant to good building practices and to offer recommendations. Many of these recommendations are stated in general terms and, if followed, will require detailed technical implementation. They are made in the hope that they will help to define objectives and establish guidelines for improving building practices in Indonesia. These suggestions are not all interdependent but are mostly interrelated. Some require action by various groups making up the building community; others are directed specifically at one group. They are offered with full understanding that, while it may not be possible to do everything at once, some effort is better than none at all.

V.C.1.a. Recommendations:

The study team recommends that an organization, proposed as the National Center for Building and Construction (NCBC), serve as the national leader for a new system of building regulation. This NCBC should be part of the Indonesian governmental structure and would be responsible for the development and review of all building designs and would establish a uniform and workable method of enforcing good building practices. The Center would represent all groups engaged in day-to-day building activities. Further, it could make available to the general public useful information about building, buying, renting, or improving housing.

Specific recommendations about (1) Regulations and (2) the Role and Scope of NCBC to achieve a better building environment in Indonesia are given below. The proposed Center is shown schematically in the accompanying figure.

Proposed National Center for Building and Construction



V.C.2. <u>The Regulatory System</u>

Needed is (a) a system of nationally accepted building standards and codes and (b) a method for their maintenance and enforcement. The standards and codes should be developed as part of a national consensus process. Standards produced in this manner will be broadly accepted within the Indonesian building community.

NCBC also should work closely with the governors of the Indonesian provinces in developing appropriate building codes and standards and in their enforcement. Implementation of these standards ought to be stressed. The standards should be tailored to local conditions: Java uses masonry construction; the other islands, wood. Unenforced codes are no better than no codes at all.

A workable inspection service is vital to any real improvement in building practice. It is essential that inspectors be trained in building practices and their regulations so they can adequately enforce the codes and standards.

The building organization should not follow the U.S. system or that of other highly industrialized nations. However, NBS has in its files considerable information on this subject that could be useful to Indonesia. Likewise, private U.S. organizations, universities, and national building research laboratories of other countries have experience in this area, and these sources could be tapped with advantage. An appointed Indonesian task force will want to consult with the International Union of Testing and Research Laboratories for Materials and Structures (RILEM) and the International Council for Building Research Studies and Documentation (CIB), who are compiling worldwide building test methods as well as building codes and standards.

V.C.3. Role and Scope of the Organization

The NCBC could be organized according to its separate responsibilities:

a. Developing, coordinating, and maintaining building codes and standards, in which function the closest cooperation is desirable with the national standards body (wherever that body is located).

b. Reviewing building plans.

c. Inspecting building construction.

d. Testing and approving the testing of building materials.

e. Licensing of professionals.

f. Providing training in the building trades.

The organization's concerns should be with goals, principles, ideas, approaches, and consequences of building practices. It should identify the institutional and programmatic constraints that hinder the advancement of good building practices, focus attention on identifying national building needs, and develop uniform building regulations and methods for implementation. The NCBC should have a simple structure and be independent of any single ministry if it is to operate effectively under present Indonesian ministerial assignments. It is important that the staff have a thorough knowledge of their mission to organize and operate the organization, be given an appropriate level of funding, and be highly motivated. The present practice of government agencies giving only part-time attention to building can cause significant problems.

The organization also should readily relate to and communicate with other members of the building community, both government agencies and private groups. NCBC should be a part of the total system, a link in the chain, but a link with stature and leadership.

The new building organization should focus upon the basis of good building practice and technology. That is, it should concentrate on molding the best of the present building practices and standards into a unified system for codes and standards. Rather than look to basic research, it should initially concentrate on making uniform improvements to buildings and building products throughout the country by working through existing successful building practices. When this applied approach is sufficiently mastered, then attention may be given to more theoretical approaches.

V.C.4. Materials

Most residential buildings in Java, which house 65 percent of the nation's 130 million population, are constructed of brick and concrete block. Buildings on the other islands are usually made from timber. Java's inclination toward brick is accentuated because most of the forests have been cut down to make way for planting rice. Indonesia has an ample quantity of clay and shale deposits. These materials are used for making bricks and roof tiles.

Cottage industry groups throughout Indonesia produce most of the bricks, clay tiles, and bamboo woven mats. These materials are generally produced by unskilled (untrained) workers and are not uniform as to strength, size, or durability. Since the cost of construction is high, the owner will usually accept a cheaper product over one of better quality. These buying habits further contribute to the desirability of planning better quality for building products.

Manufacturers generally do not really try to produce uniform (standardized) products. Clay tile and bricks are examples. This is due in part to a lack of consistent and uniform standards and to a lack of enforcement. These products are uneven in quality, shape, and cost. Concrete tends to be mixed from inadequate materials at the job site without adequate control of proportions. Steel reinforcing bars have been known to be smaller than their identified size. For example, a 25-mm bar may in fact measure 20-mm or even 18-mm.

Similar problems in the Indonesian concrete industry were noted by Torben C. Hansen, UNIDO adviser in concrete technology, in an article published in "Masalah Bangunan" (June 1977). He found in a survey of building practices that the variability of the grading of aggregate was tremendous... The moisture content of the aggregate and the quantity of water added at the mixer were not measured. The amount of water was judged by the mixer operator by eye from the appearance of the mix." Also, "...frequent separations of the concrete mix provided a gloomy picture of the actual strength of the concrete in the structure."

V.C.4.a. Recommendations:

Material standards are needed. A standard for cement is used, but it calls for excessive quick setting strength, leading to high production cost and low keeping quality in the humid climate of Indonesia. Simple standards in grading the aggregates are needed, as well as on weight batching in concrete mixing, acceptance testing, and measuring out the water more accurately than is currently being performed, which would improve the quality of buildings.

Uneven product quality may result in unsafe buildings. Also, it makes for higher costs because each product must be hand-selected before purchasing, and the designer must overdesign to compensate, for instance, for the anticipated undersized reinforcement bars.

The cost of importing portland cements is high. Using lime-pozzolana as a substitute for portland cement would have a significant effect on reducing costs of masonry building construction. Guidelines for using the pozzolana/lime/trass cement are required.

A review of Indonesian use of timber fasteners generally shows them to be adequate. However, when timber and masonry are used, there are problems of tying the building components together so they act as an integral unit.

V.C.5. Building Practices

Housing projects in Jakarta and Surabaya (cities representative of West and East Java, respectively) were visited to view building practices. These buildings were found to vary in quality since construction practices lack uniformity. This situation is understandable since the nation has not given much attention to building practices and has no uniform national building regulatory system. Buildings are being built, however, and generally withstand years of normal use, serving the function for which they were intended—to provide shelter. Yet little is known about their actual performance under either normal or abnormal (earthquake) conditions.

While building practices vary throughout the world, examples of some of the poorer practices observed in Indonesia (mostly for low-rise buildings) are noted for informational purposes. They included lack of attention to joint connections (such as poorly made bond beams not adequately connecting load-bearing masonry). Mortar joints were of uneven thickness; in some cases, they were 30 mm thick. From job to job, the masonry cement mortar mix was not consistent. Masonry walls at times were not tied to columns with horizontal reinforcement. Lintels were not cast well; some were constructed of brick, with little or no reinforcement. Some houses lacked steel reinforcement of sufficient length to extend beyond the bond beam to tie the roof trusses to the walls. Load-bearing walls were occasionally observed to be out of plane. Such deficiencies do not save cost; they reduce the expected building performance.

Other buildings observed had adequate reinforcement and had good connection details. These buildings will better serve the user at little or no extra cost.

V.C.5.a. Recommendations:

Basic prefabrication principles should be established and implemented throughout the country; Indonesian building practices would improve, as would the quantity of new housing stock. For example, use of simple molds uniformly applied throughout Indonesia for making building components, such as window lintels, window and door frames, stair treads, columns, joists, beams, and masonry and paving blocks, would reduce the cost of such basic building units. Initiating on-site inspections while buildings are being constructed would improve the quality control of houses and improve their overall building practice.

Further, buildings should be designed in such a manner that inspectors may check on maintenance and alterations of buildings without undue difficulty. Such checks should be performed periodically. Owners and builders should be encouraged to use materials requiring a minimum of maintenance.

V.C.6. Education

Approximately 900 architectural and engineering students are graduated annually. Over 50 percent find work in Jakarta. Not surprisingly, most of the better professional practices dealing with commercial and industrial buildings are found in this same city. In Jakarta, the architect, engineer, and contractor must be certified to design and construct specific building types. Little information was found to assess the impact of this certification on the quality of building construction. Other large cities are considering passing a similar certification requirement.

The education system in Indonesia generally is under the influence of the Dutch method of teaching and the Dutch curriculum. Much emphasis is still placed on social studies and the arts. Some changes are being proposed at the university level to strengthen building design and engineering courses, but little has occurred to date. Also, educators are not paid a salary commensurate with their counterparts in private industry. As a result, good instructors are leaving the university for higher salary positions or on part-time jobs, which reduces their teaching effectiveness. Less-qualified instructors then must be hired to fill the gap. The quality of education varies widely from one university to another. The combined effect of these features is to contribute to the variability in the quality of building design and construction. For example, with regard to the Indonesian clay products industry, B. M. Sedalia, UNIDO adviser on the structural clay industry, published an article in "Masalah Bangunan" (June 1977) that surveyed the industry's problems. His solution, in part, was a vigorous training and demonstration program that would extend to virtually all of the nation's brick and tile-making organizations.

V.C.6.a. Recommendations:

All Indonesians in building crafts and technologies should be encouraged to improve their management skills, their knowledge of the building regulatory system, and their technical experience. There is a special need to train at the craftsmen level: contractors, masons, plumbers, general contractors, welders, electricians, general laborers, and laboratory personnel. Technical training is also needed in narrow subject areas such as testing and calibrating equipment, earthquake-resistant designs, and low-cost housing. Also needed are qualified versatile professionals who, while they are specialists in one area, should have a broad working knowledge of the various aspects of building design, construction, and contract awards.

Communications among Indonesia's designers and contractors should be encouraged. Dialogue with the building community may be achieved by holding regular workshops and conferences on both broad and specific areas, such as understanding the meaning of specifications, standards, and codes. The latter—specifications, standards, and codes—has caused problems in Indonesia because different groups perceive different meanings for these words.

Another critical area of communications involves the general public. Information should be available, for example, on buying approved building plans, identifying where to go for ordering building materials and components, and learning about financing. An excellent way to convey this information is through brochures, newspaper articles, radio and TV announcements, posters, and talks at public gatherings. "How To Manuals" have been found to be especially helpful in improving building practices in other developing nations.

Also, there is a need to produce methods to effectively transfer and use technology from developed and developing countries. Technology should be identified that can be used with the existing financial and human resources; the resulting output should be improved product quality and technical know-how. Such transfer could be performed through bilateral exchanges; through joint working arrangements, such as the Japanese Ministry of Construction which sent a housing consultant to Indonesia in 1976 and the U.S. NBS June 1977 Survey in Indonesia; and through multi-national corporations. Developing countries also could pool their human and financial resources for a mutual advancement of building technology.

In conjunction with the task of identifying needed technology, an appointed task force should review available literature from previous surveys and studies. A synthesis of existing material properly packaged and transferred to the appropriate influential building community decision makers could help shape the future direction of Indonesia's building technology.

As building specifications, standards, and codes are being rewritten, attention should be given to producing them in simple, easy to understand language. Specifications, standards, and codes are complex, yet buildings are built by the common laborer. So, the language must be readily understood by individuals at the working level.

V.C.7. Housing

The Government is aware that there are too few adequate houses to accommodate its rapidly growing population, that resources must be made available to reduce the housing shortages, that the building process requires revisions to make it more responsive to the user, and that an effective building regulatory system is needed. Even today, the Government is providing a small amount of housing assistance to Indonesians through research at the Institute of Technology at Bandung--Indonesia's prestigious university which has well-equipped building research laboratories--and limited funds for low-cost houses in some provinces for sites-and-services projects.

This constitutes a modest but important start, giving justification for optimism. Moreover, professionals themselves in Indonesia recognize that standardization and regulation are essential to attain effective housing.

V.C.7.a. Recommendations:

Certain provisions of the approved future building codes could, and should, be relaxed for low-income housing. The high cost of regulation and of building materials could obstruct the production of low-cost houses and sites-and-services assistance. Worse, what may originally be intended as housing for the poor could end up as subsidized middle-class housing. Building practices for such houses might be relaxed, so as not to bog down the construction of low-cost housing. Or, perhaps a separate set of housing regulations should be developed for just low-cost houses. Such provisions are discussed in the paper by Dr. Keith Eaton, "Low-Income Housing in Seismic Zones"; copies are available from the author at the Building Research Establishment, Garston, Watford, WD27JR, United Kingdom.

At some point in the future, the Government of Indonesia may wish to provide low-income families with land on which to build their houses. Here, the concept of "self-help," where the owner contributes his labor during the construction or renovation of the house, should be encouraged. Also, the concept of "sites-and-services" should be considered as it is now practiced in many developing countries such as Jamaica and India. Under this concept, the very poor families are provided with a small amount of land with water and drainage and a shelter consisting of a roof only. Walls and partitions are then constructed by the owner as his finances permit. The National Buildings Organization in Delhi, India, has found that 100 m^2 is a convenient amount of land area to provide each family. The NCBC could provide technical expertise to the Government in helping to establish a plan to further the "self-help" concept.

V.E. COMMENTARY ON SAFETY STANDARDS

Engineer Raul Estrada, Director General of the Ecuadorian National Institute for Standardization (INEN), was the only visiting team member in group IV on safety standards. He came with the following prepared statement on the development and use of safety standards.

V.E.1. Development and Use of Safety Standards

Ever since the origin of civilization, man has tried to achieve certain levels of safety and quality from goods and services utilized in all his activities. This need is even higher in the modern world, where the risks and dangers have become bigger due to growing sophistication in technology. This increase results from working in extreme conditions (high temperatures, pressures, speeds, great power, etc.) and especially because of the large number of artificial products with which man is in contact. In fact, about a thousand new chemical substances become part of commerce every year, plus about 30 thousand already in use in many fields.

Concepts about safety and quality change as society and technology change. It is necessary to achieve valid definitions for an ever larger number of occupations and circumstances. For this reason it is necessary to establish by means of technical standards, valid technical criteria from experience and knowledge which advance more and more rapidly.

Such criteria are at present greatly influenced by the relation of cost to benefit. This influence is good for fixing reasonable levels of safety and quality.

Ultimately, the fundamental criterion upon which safety standards are based is the need to protect man and the environment from unreasonable risks to which they are exposed by goods, processes, or services.

Problems of standardization which become more and more complex require the active contributions of more people with special interests, not only producers, scientists, and technicians, but also consumers who must seek joint representation to try to defend their right for safety by providing technical criteria in their interest.

Figure 1 can give an idea of areas covered by safety standards in relation to objectives, risk agents, wider functional activities related to them, and the different support areas. Figure 2 illustrates the scientific and technical information flow which underlies the standards assessment and supports the control procedures. Finally, figure 3 has been proposed by the U.S. Environmental Protection Agency (EPA) illustrating how the law on toxic substances (Public Law 94-469, October 11, 1976) is implemented and how the relations between premarket testing, reporting, and

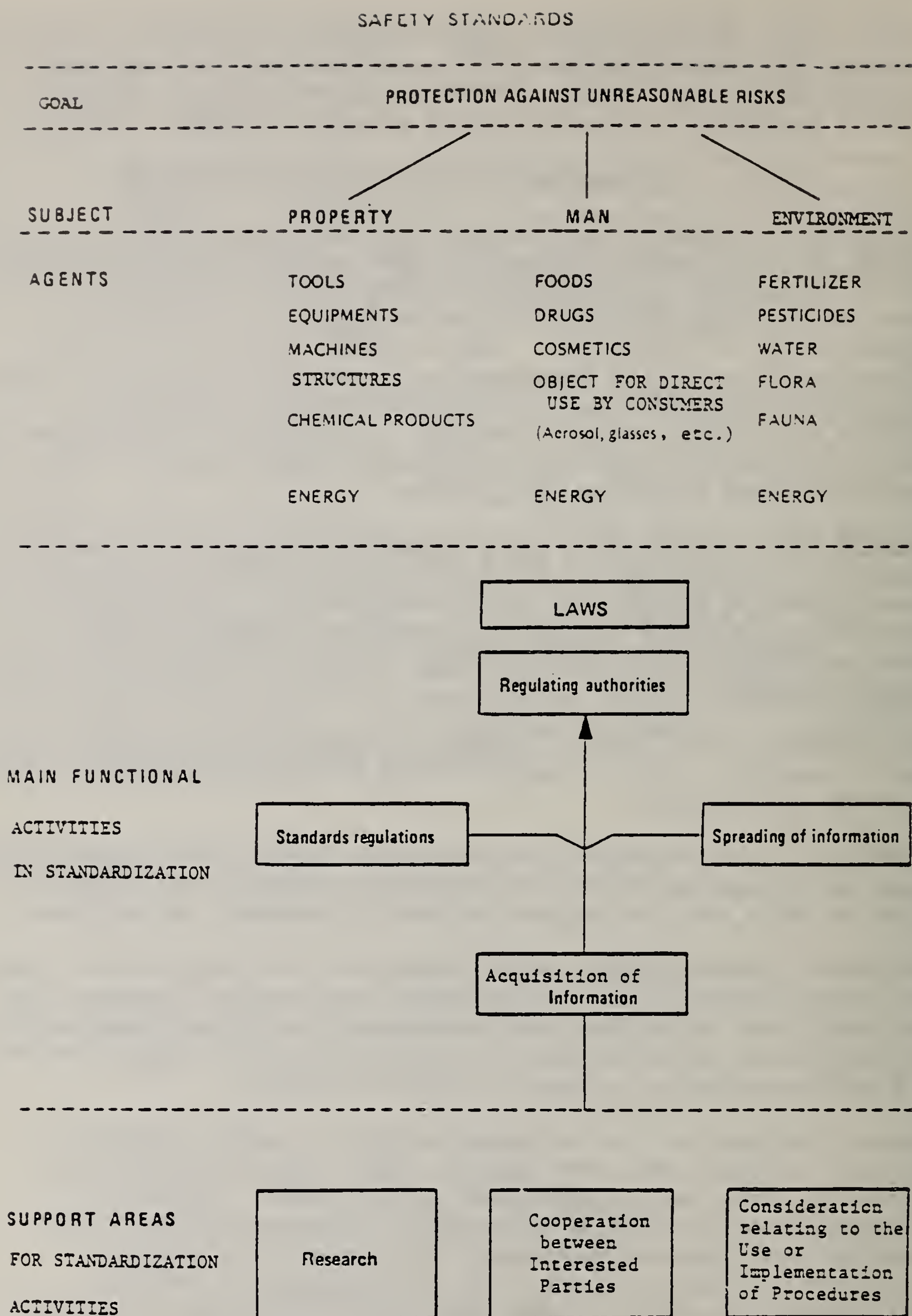

SAFETY STANDARDS
GOAL
PROTECTION AGAINST UNREASONABLE RISKS
SUBJECT
PROPERTY
MAN
ENVIRONMENT
AGENTS
TOOLS
EQUIPMENTS
MACHINES
STRUCTURES
CHEMICAL PRODUCTS
ENERGY
FOODS
DRUGS
COSMETICS
OBJECT FOR DIRECT USE BY CONSUMERS (Acrosol, glasses, etc.)
ENERGY
FERTILIZER
PESTICIDES
WATER
FLORA
FAUNA
ENERGY
LAWS
Regulating authorities
MAIN FUNCTIONAL ACTIVITIES IN STANDARDIZATION
Standards regulations
Spreading of information
Acquisition of Information
SUPPORT AREAS FOR STANDARDIZATION ACTIVITIES
Research
Cooperation between Interested Parties
Consideration relating to the Use or Implementation of Procedures

FIGURE 1.

INFORMATION:

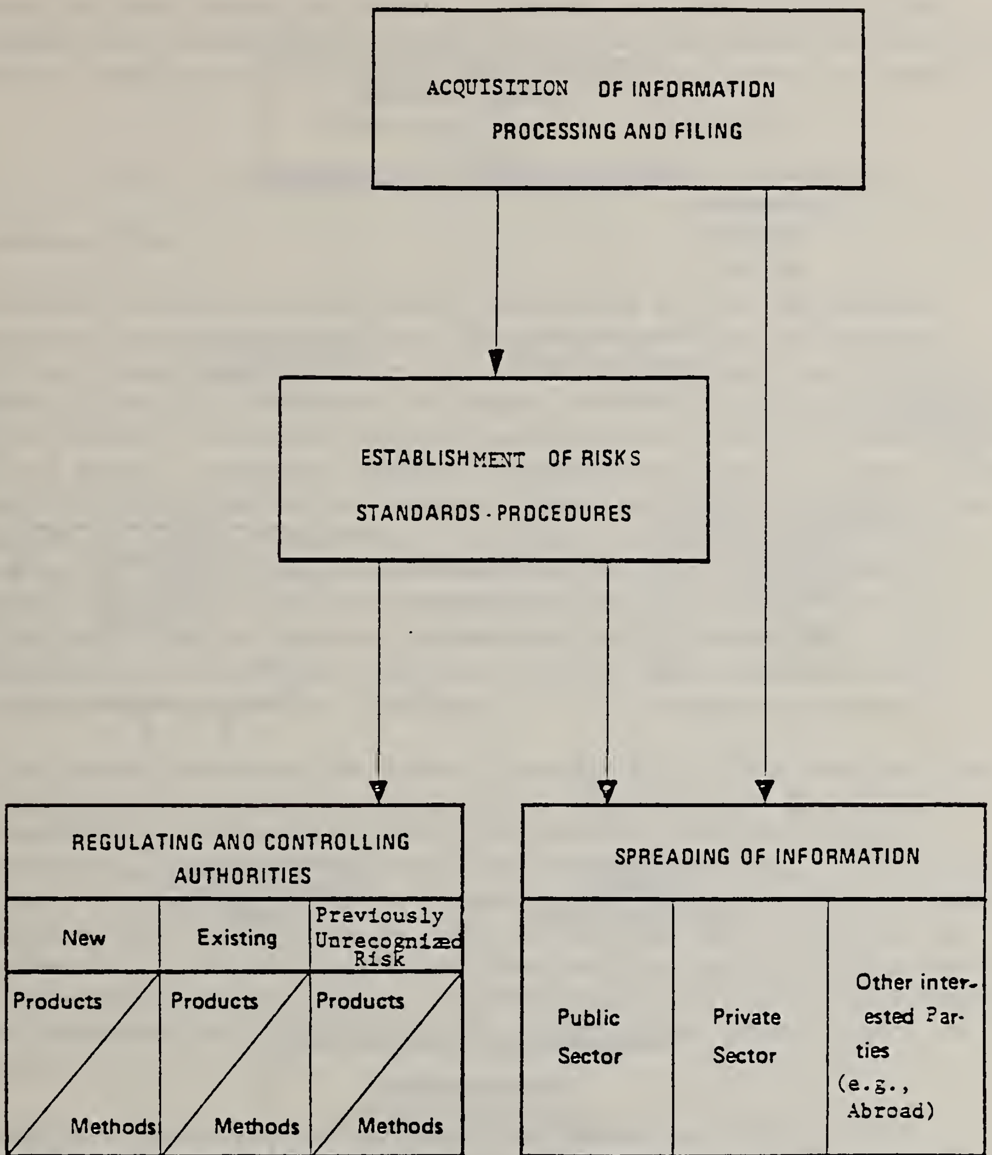


FIGURE 2.

SELECTED RELATIONSHIPS BETWEEN PREMARKET TESTING, REPORTING, AND REGULATORY REQUIREMENTS FOR TOXIC SUBSTANCES

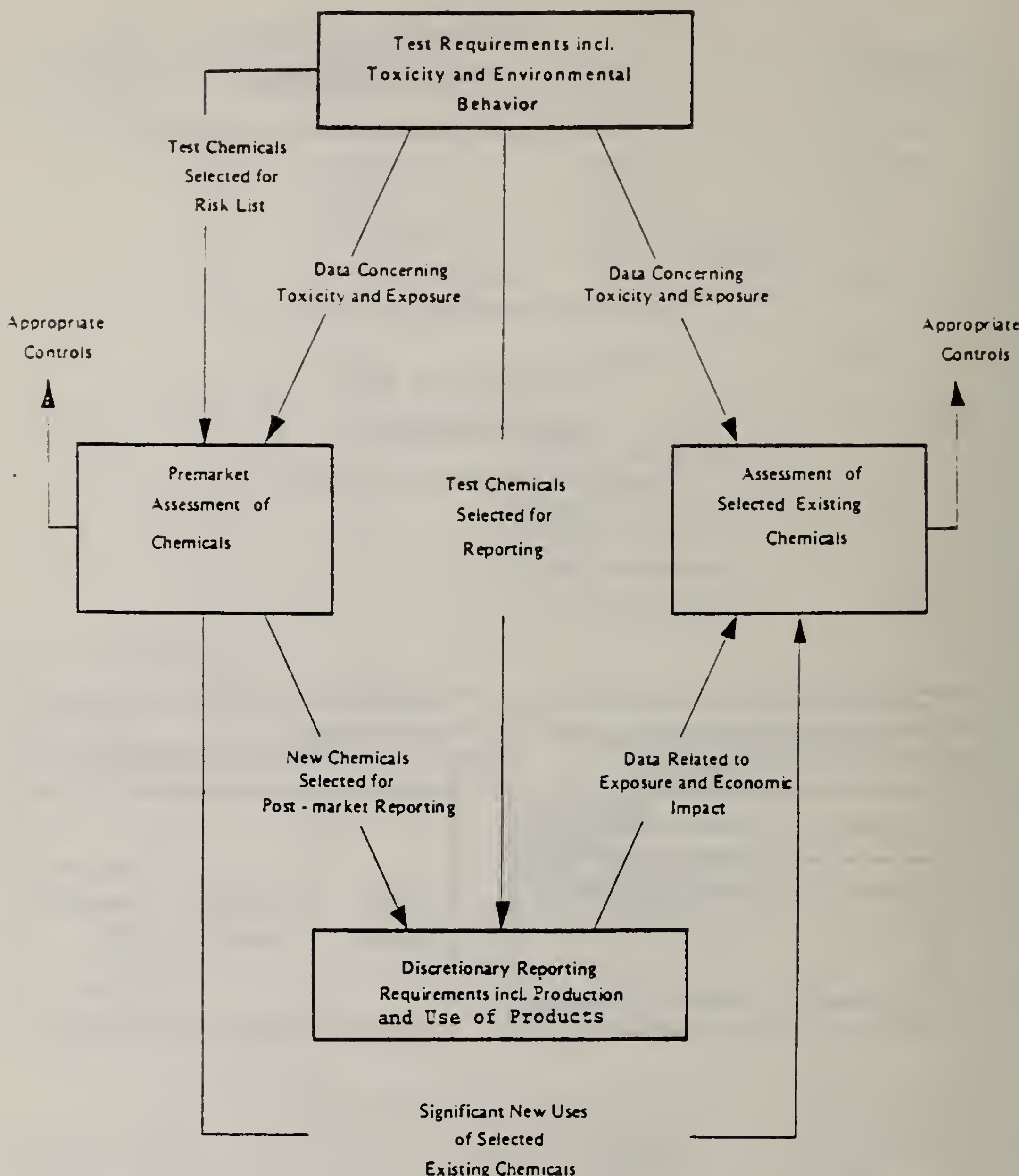


FIGURE 3.

regulatory requirements are established. This diagram could be applied equally to safety systems such as for protection against radiation, noise, dust, etc.

Cooperation among different interested nationalities becomes more desirable with the progress of time. International information exchange is also needed in these subjects, so that risk can be maintained at an economically acceptable and adequately low level to assure the quality of life which man deserves all over the world.

V.E.2. Comments on Indonesian Safety Standards

a. Introduction

Great credit is due for the effort displayed by the Indonesian counterpart participants of the Indonesian Institute of Sciences (LIPI) and other organizations of the Government and particularly to those who presented documents of great interest about standardization, quality control technology, and metrology with special emphasis in foods and drugs, textiles, safety, construction, etc. A good overall insight of the situation in Indonesia was obtained throughout the discussion of those documents. The status of development of technology in the subjects to be studied by the team was well described and objectives and accomplishments of the different institutions, that in one way or another participated in standardization activities, quality control, and metrology in Indonesia, were accurately analyzed.

From the expositions and following discussion, it was deduced that right now there are in operation about 105 different institutions of the Government in standardization activities, quality control, certification, and metrology in their different forms. It is evident that the coordination, complementation, and collaboration of these institutions leaves much to be desired in terms of achieving the objectives of a national technical standardization plan. In the same way, the quality and metrology certification and control activities are not adequate for fulfilling the economic and social goals of Indonesia.

The institutional technical committees appear to work more on regulations and codes of practice than on individual standards. That situation could be due to dependence on importation and to the big industries being capable of developing standards or generally depending on standards of parent countries or an enterprise standard.

There seems to exist a variety of basic understandings of the aims of standardization between the technical personnel of the different institutions. It is desirable to unify some concepts, through discussion by the creation of a central organization that embraces all the aspects related with standardization, or else to unify concepts at a national level by means of periodic conferences. It would help a great deal if an Indonesian Society of Engineers in Standardization (Indonesian Society of Standards Engineers) could be created.

The problem of creating a recognized set of qualifications for professionals in all the techniques related with standardization seems to be one of the first to be solved in a satisfactory way. A good base exists now in LIPI and other organizations, but it would be necessary to introduce good training opportunities not only in concepts, but also in the methodology for the development of standards.

Too little use is made of other national or international documentation in the field of standardization. The private organization that exists--DYNI (Dada Yayasin Normalisasi Indonesia)--evidently is not capable of obtaining that information and of making adequate use of it.

Standardization efforts by the Ministry of Health, for example, seem to lack technical information. For instance, they begin their standardization efforts by a definition of a standard of standards, that is, work already done at an international level. The job to be performed at most is one of adaptation whereas in fact their work now is more seriously incomplete and not satisfactory. In that standard, on the one hand, nothing is said about packing, objections, inspection, or documental references and cross references with other standards; whereas on the other hand, divisions are made that do not agree with established international concepts. Another example of deficiencies of the new standards is that it does not mention the maximum or minimum percentages permitted for, nor their compatibility with others, etc.

It is evident that the Indonesian Consumers' Organization is sincerely interested in improving the quality of national production. It has capable personnel well prepared and enthusiastic. They lack adequate methods, suitable laboratories, reference standards, and appropriate legal support, and consequently they are greatly hampered in their work. Evidently for them it is also not easy to understand the work of methodology or the technical value of standards about quality control (statistical methods of sampling, statistical analysis, inspection for variables, and attributes, etc.).

The effort accomplished by LIPI and its associates to present the papers that have been discussed by the survey team is praiseworthy. They will find it constructive for internal debate about these tasks to provide more documentation, preferably from ISO, NBS, BSI (the British Standards Institution), ISI (the Indian Standards Institute), or other suitable sources.

b. Visits Program

The program of visits was performed with complete success, thanks to the outstanding organization of the LIPI technical personnel and the collaboration given by all the authorities and executives of the visited institutions.

The list of principal visits performed is shown in section IV.E. During all of them, LIPI technical personnel participated and guided Engineer Estrada all the time.

Special reference should be made to the cooperation given by the Directorate for Safety and Industrial Hygiene, the Electric Power and Waterdam authority (Karan Kates), and Penataran Angkatan Laut (Navy yard)-Surabaya, who had the kindness to call their principal executives for discussions that were of great help and gave a good overview of the general problems.

The appraisals given during the first part of the Survey were confirmed throughout the conversations held in the different institutions and factories visited. It was evident that there was enthusiasm, and capabilities were devoted to the development and application of safety standards in important aspects such as: fire control, electric hazards, industrial hygiene, transportation safety, chemical poisons, etc. However, we also found a lack of appropriate updated technical documentation, a lack of national and coordinated effort of standardization. All this limits activities and applications of benefit.

The emphasis that is made on the application of codes without the necessary concurrence on the specific technical standards, transforms the control activities to police actions, without major impact on the essence of the technical problem. A coordinated effort of technical standardization will undoubtedly accomplish positive effects that are likely to be more permanent.

Lack of updated technical documentation makes the modernization of the technical codes and other regulations difficult. The situation is aggravated by the existence of industries and services which in some cases are compared with those in existence in more developed countries, which utilize sophisticated technical elements and require modern safety standards.

The use of recommendations about safety by recognized institutions in this field such as the American Safety Association, the American Fire Association, and others would greatly reduce the need for accumulating a national experience in a complex technical subject.

The problem of translating that documentation into the Indonesian language should be faced by technical personnel specialized in technical standardization, in support of a central specialized body, that performs such tasks and later submits the results to public consultation with all interested parties. In this way not only will the linguistic and technical correctness be assured, but the needed adaptation to the predominant local conditions will also be provided.

c. National Standardization Body

There is a widespread agreement on the idea of creating a central standardization body, with enough authority to coordinate all the national efforts in standardization, to issue Indonesian technical standards officially and also to coordinate all the national efforts directed to the application of its standards in the required places while furnishing the necessary technical assistance. Team members are inclined to the view that a central body should also assume the obligations of a national authority for quality certification and administer a national certification mark.

Furthermore, it may be advisable for the central standards body to assume metrological activities in all their aspects: scientific, industrial, and legal. In countries which have accomplished that integration of functions it has become clear that there are great advantages in this strategy. This set-up permits the integration of the limited technical and scientific çapabilities available, along with the economic resources and technological information. In this way, all the activities are coordinated efficiently, and the problems are solved in a more complete manner.

The diagram of figure 1 gives an idea of Engineer Estrada's opinion about the possible central organization, and tentatively he has given it the name of: Indonesian Institution for Standardization, IIS.

d. Miscellaneous

In figures 2 to 8 are shown some charts of a conceptual type prepared by Engineer Estrada specifically to collaborate in the process of unification of technical criteria about the subject which constitutes an essential need that has to be faced with priority by the IIS.

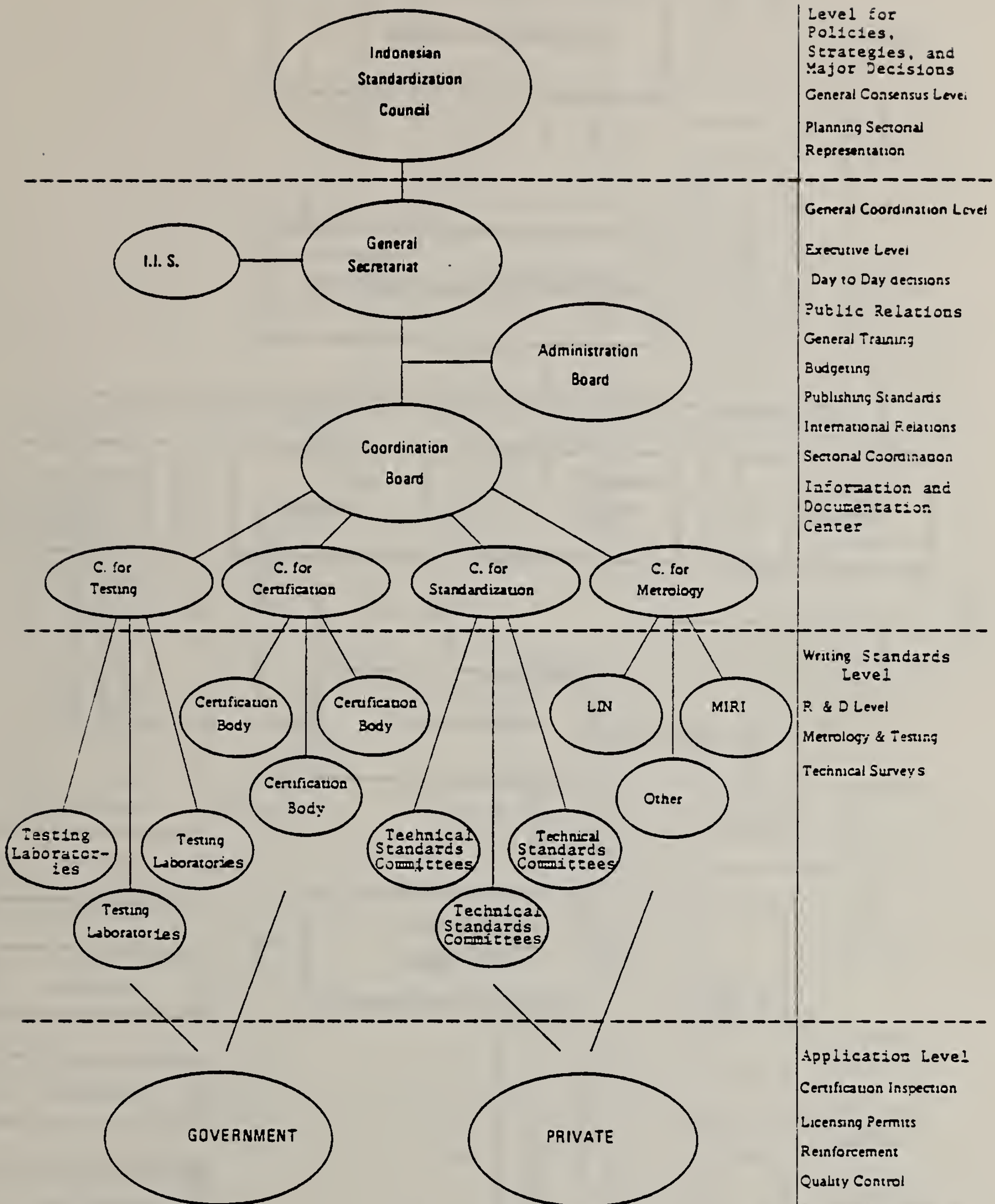

Indonesian Standardization Council
Level for Policies, Strategies, and Major Decisions
General Consensus Level
Planning Sectoral Representation
General Secretariat
I.I. S.
General Coordination Level
Executive Level
Day to Day decisions
Public Relations
General Training
Budgeting
Publishing Standards
International Relations
Sectoral Coordination
Information and Documentation Center
Administration Board
Coordination Board
C. for Testing
C. for Certification
C. for Standardization
C. for Metrology
Writing Standards Level
R & D Level
Metrology & Testing
Technical Surveys
Certification Body
Certification Body
Certification Body
LIN
MIRI
Other
Testing Laboratories
Testing Laboratories
Testing Laboratories
Technical Standards Committees
Technical Standards Committees
Technical Standards Committees
Application Level
Certification Inspection
Licensing Permits
Reinforcement
Quality Control
Research & Development
GOVERNMENT
PRIVATE

FIGURE 1.

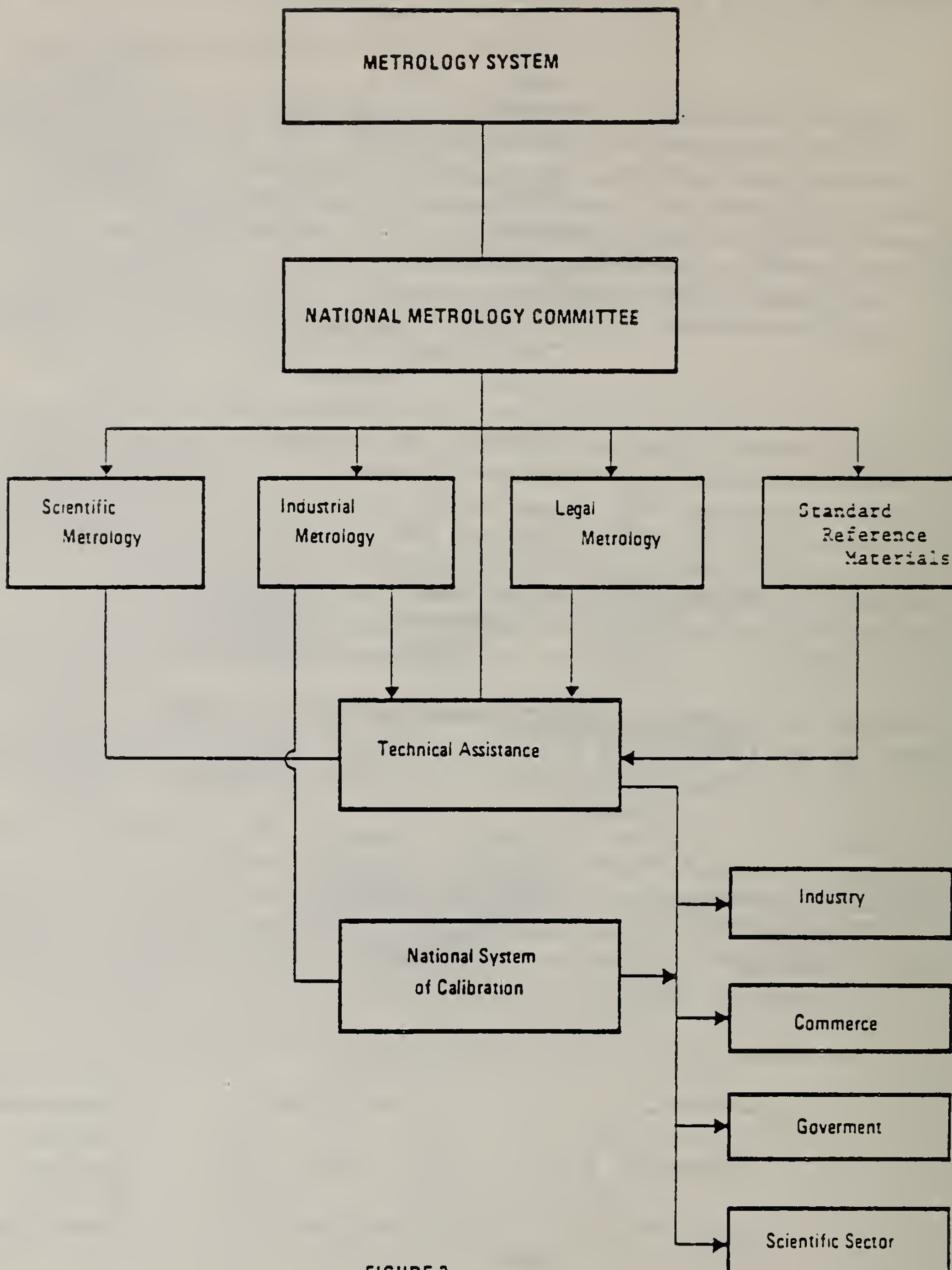

METROLOGY SYSTEM
NATIONAL METROLOGY COMMITTEE
Scientific Metrology
Industrial Metrology
Legal Metrology
Standard Reference Materials
Technical Assistance
National System of Calibration
Industry
Commerce
Goverment
Scientific Sector

FIGURE 2.

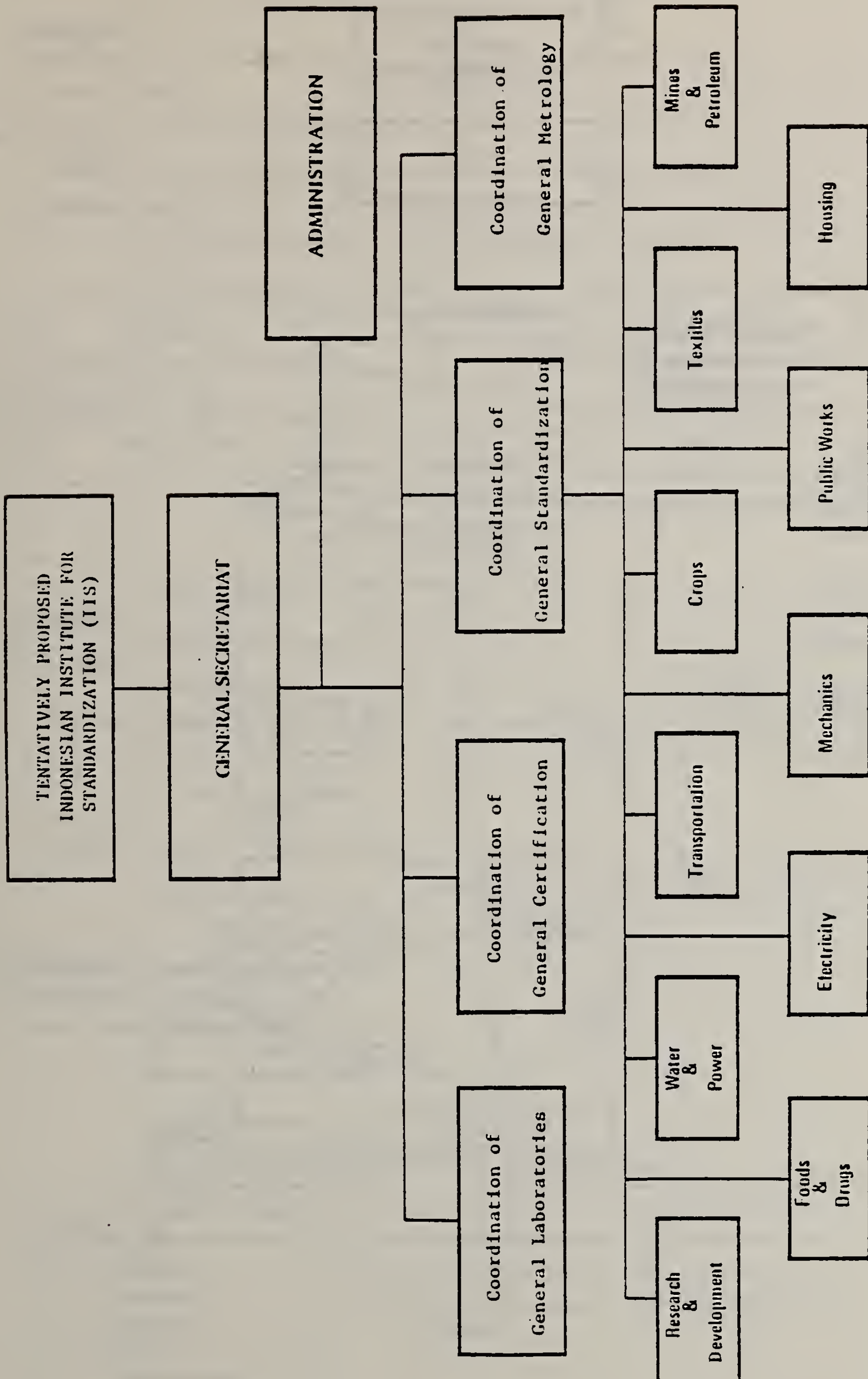

TENTATIVELY PROPOSED INDONESIAN INSTITUTE FOR STANDARDIZATION (IIS)
GENERAL SECRETARIAT
ADMINISTRATION
Coordination of General Metrology
Coordination of General Standardization
Coordination of General Certification
Coordination of General Laboratories
Mines & Petroleum
Housing
Textiles
Public Works
Crops
Mechanics
Transportation
Electricity
Water & Power
Foods & Drugs
Research & Development

FIGURE 3.

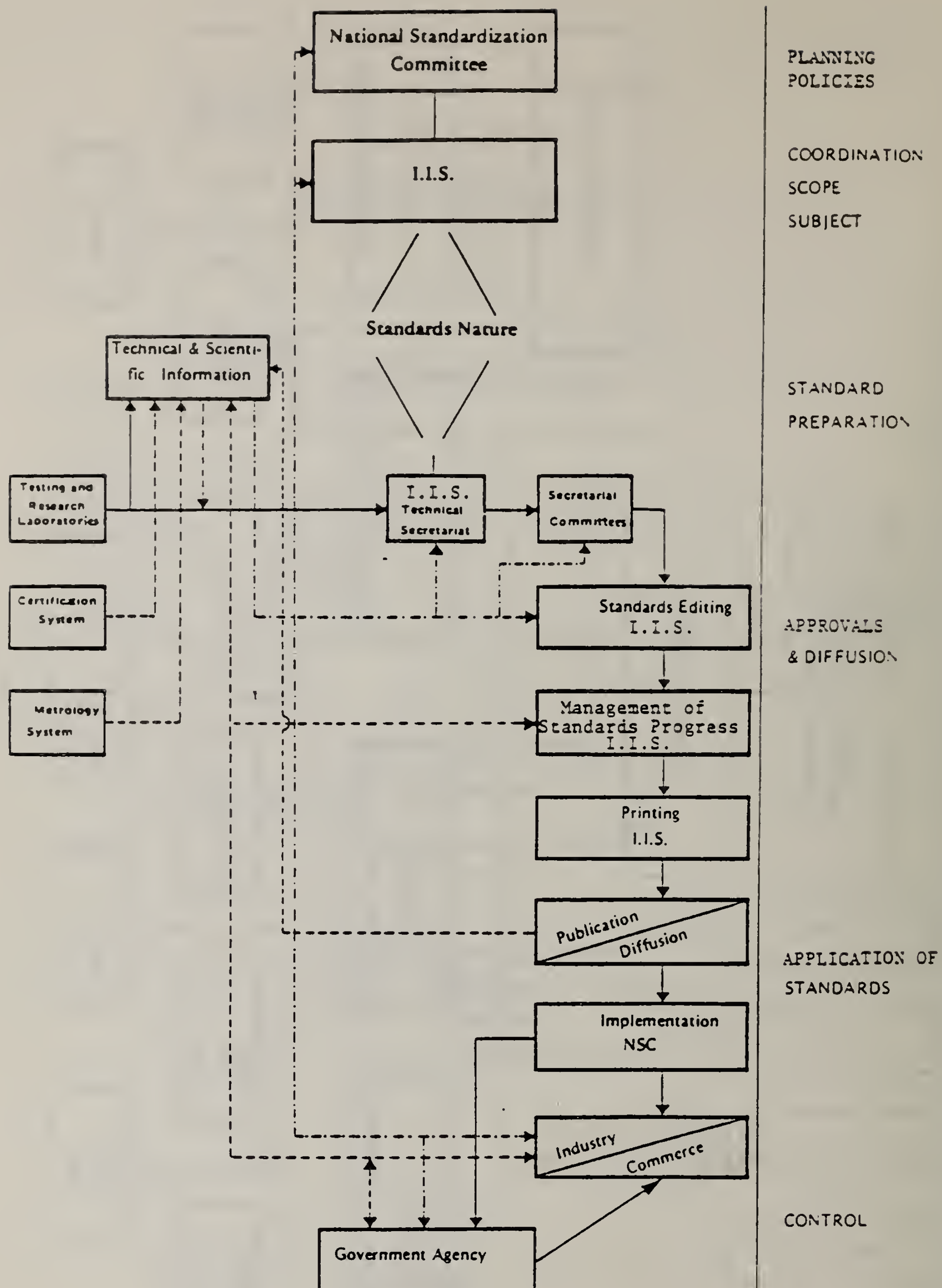

National Standardization Committee
PLANNING POLICIES
I.I.S.
COORDINATION
SCOPE
SUBJECT
Standards Nature
Technical & Scientific Information
STANDARD PREPARATION
Testing and Research Laboratories
I.I.S. Technical Secretariat
Secretarial Committees
Certification System
Standards Editing I.I.S.
APPROVALS & DIFFUSION
Metrology System
Management of Standards Progress I.I.S.
Printing I.I.S.
Publication
Diffusion
APPLICATION OF STANDARDS
Implementation NSC
Industry
Commerce
CONTROL
Government Agency

FIGURE 4.

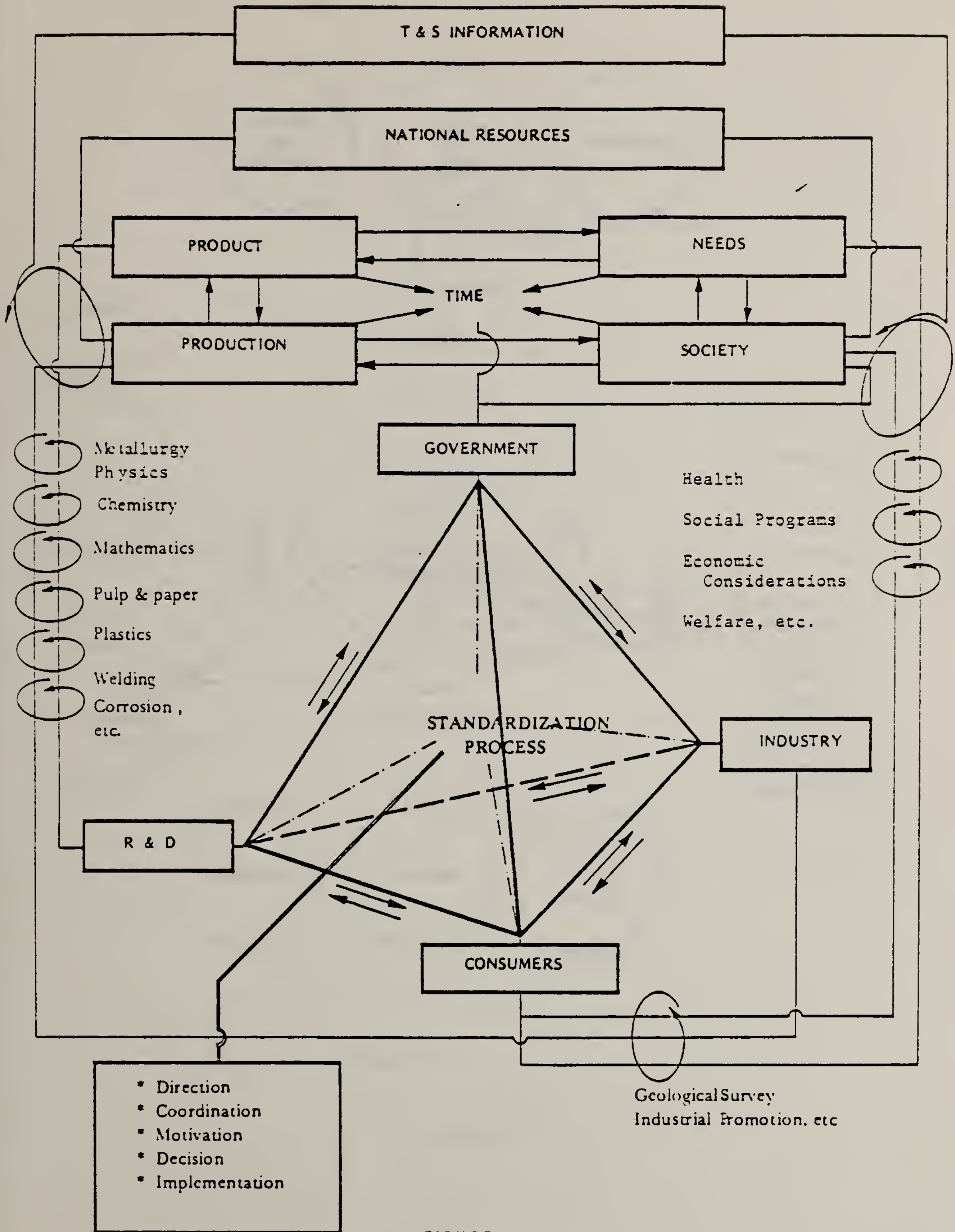

T & S INFORMATION
NATIONAL RESOURCES
PRODUCT
NEEDS
TIME
PRODUCTION
SOCIETY
GOVERNMENT
Metallurgy
Physics
Chemistry
Mathematics
Pulp & paper
Plastics
Welding
Corrosion,
etc.
Health
Social Programs
Economic
Considerations
Welfare, etc.
STANDARDIZATION
PROCESS
INDUSTRY
R & D
CONSUMERS
Geological Survey
Industrial Promotion, etc
* Direction
* Coordination
* Motivation
* Decision
* Implementation

FIGURE 5.

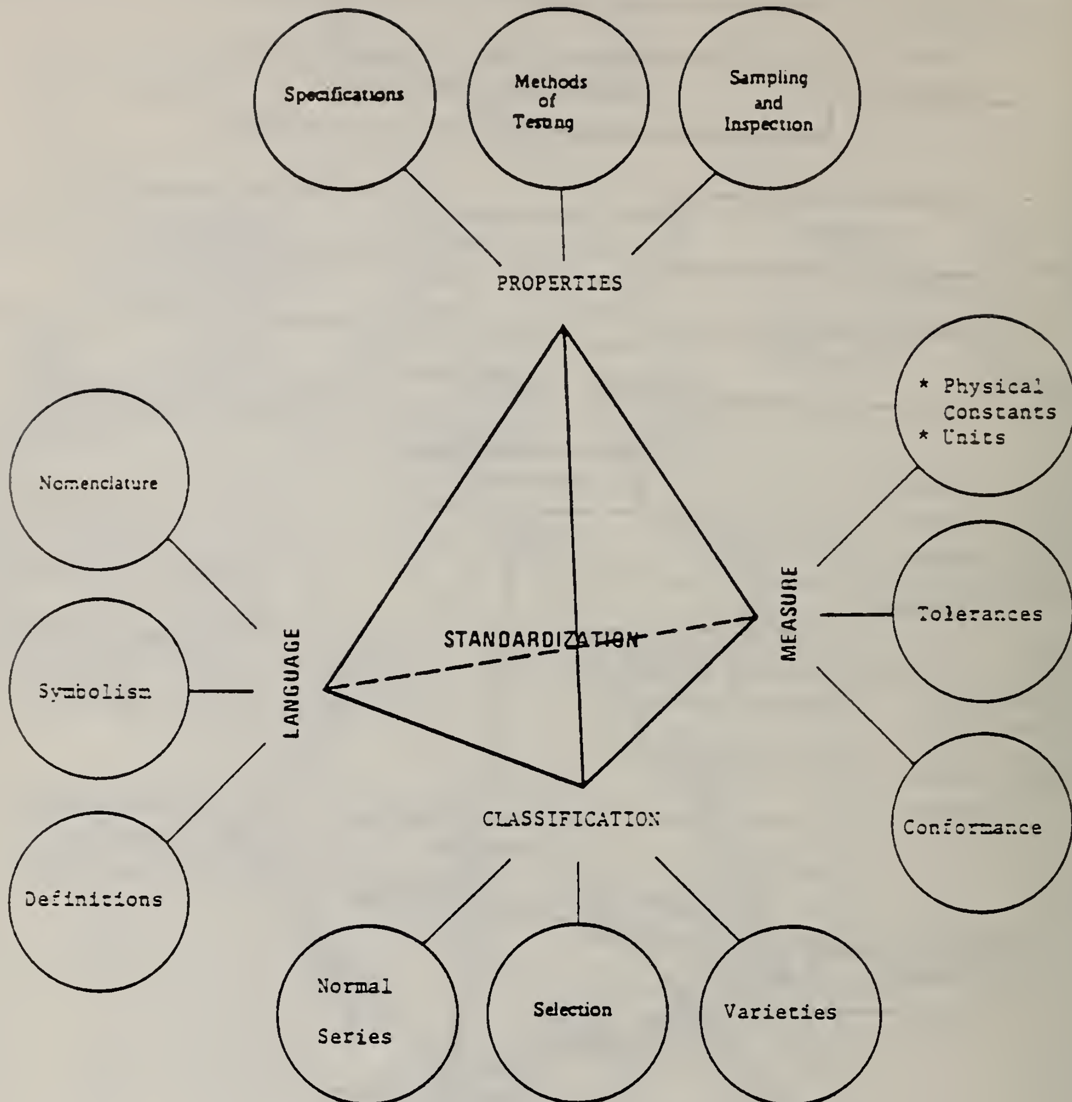

Specifications
Methods of Testing
Sampling and Inspection
PROPERTIES
Nomenclature
Symbolism
Definitions
LANGUAGE
STANDARDIZATION
MEASURE
* Physical Constants
* Units
Tolerances
Conformance
CLASSIFICATION
Normal Series
Selection
Varieties

FIGURE 6.

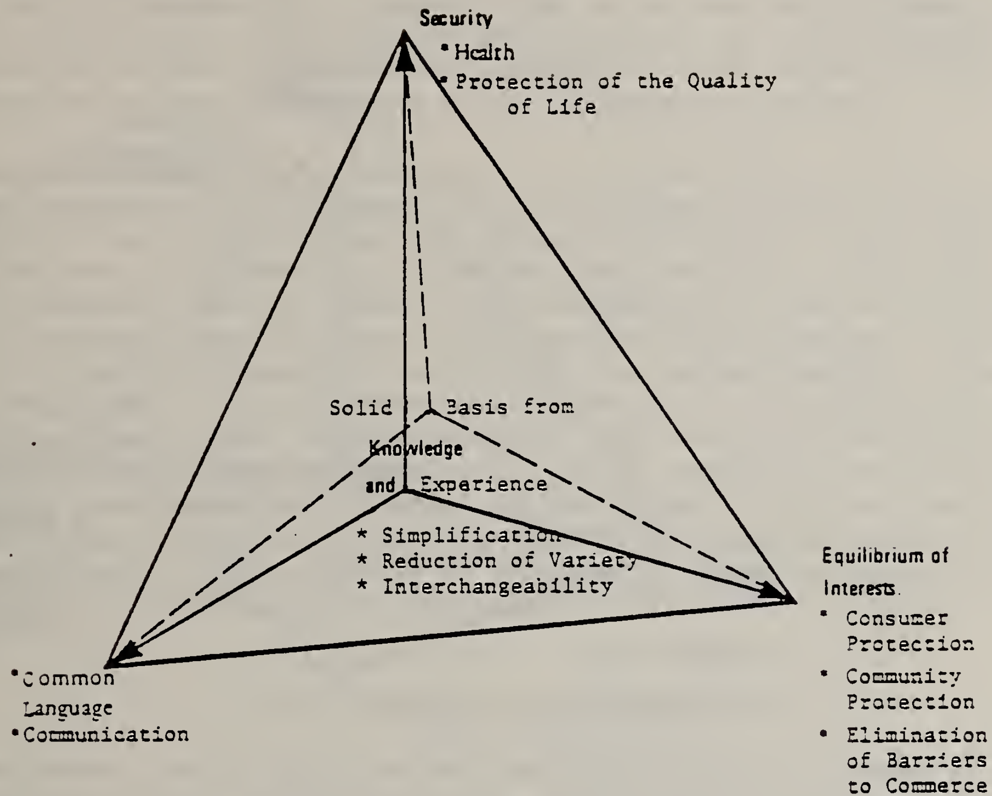

Security
• Health
• Protection of the Quality of Life
Solid Basis from Knowledge and Experience
* Simplification
* Reduction of Variety
* Interchangeability
Equilibrium of Interests.
• Consumer Protection
• Community Protection
• Elimination of Barriers to Commerce
• Common Language
• Communication

FIGURE 7.

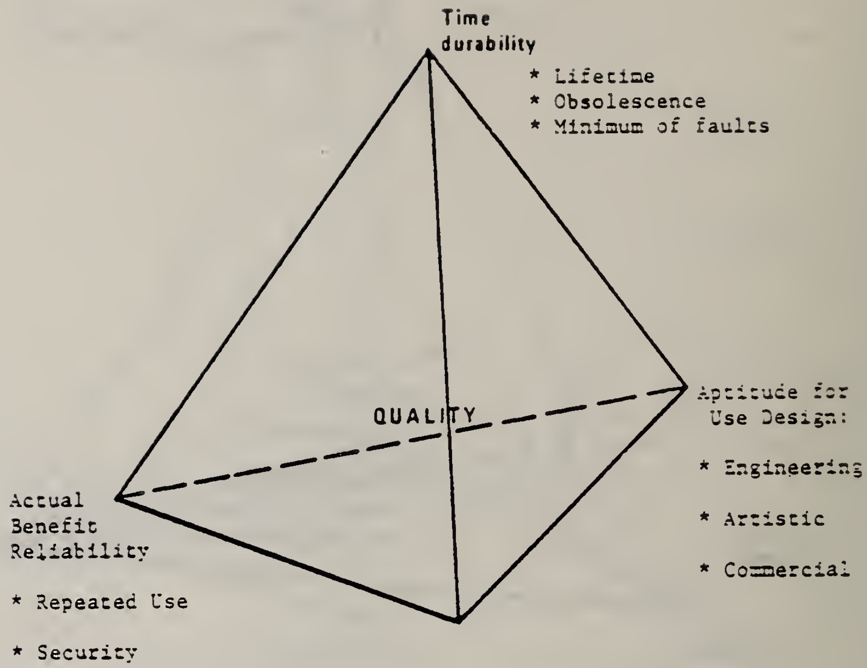

Time
durability
* Lifetime
* Obsolescence
* Minimum of faults
QUALITY
Aptitude for
Use Design:
* Engineering
* Artistic
* Commercial
Actual
Benefit
Reliability
* Repeated Use
* Security

FIGURE 8.

V.F.1. Introduction

The plans for a national Indonesian KIM (calibration-instrumentation-metrology) system that have been developed by our Indonesian counterparts are sound. Our suggestions and recommendations for improvement can best be described as of an "evolutionary improvement" nature, not as fundamental. Nevertheless, we do see several areas which may not be receiving adequate attention and in which long-term and top-level support are absolutely essential to the success of the KIM system and to the advancement of the Indonesian economy.

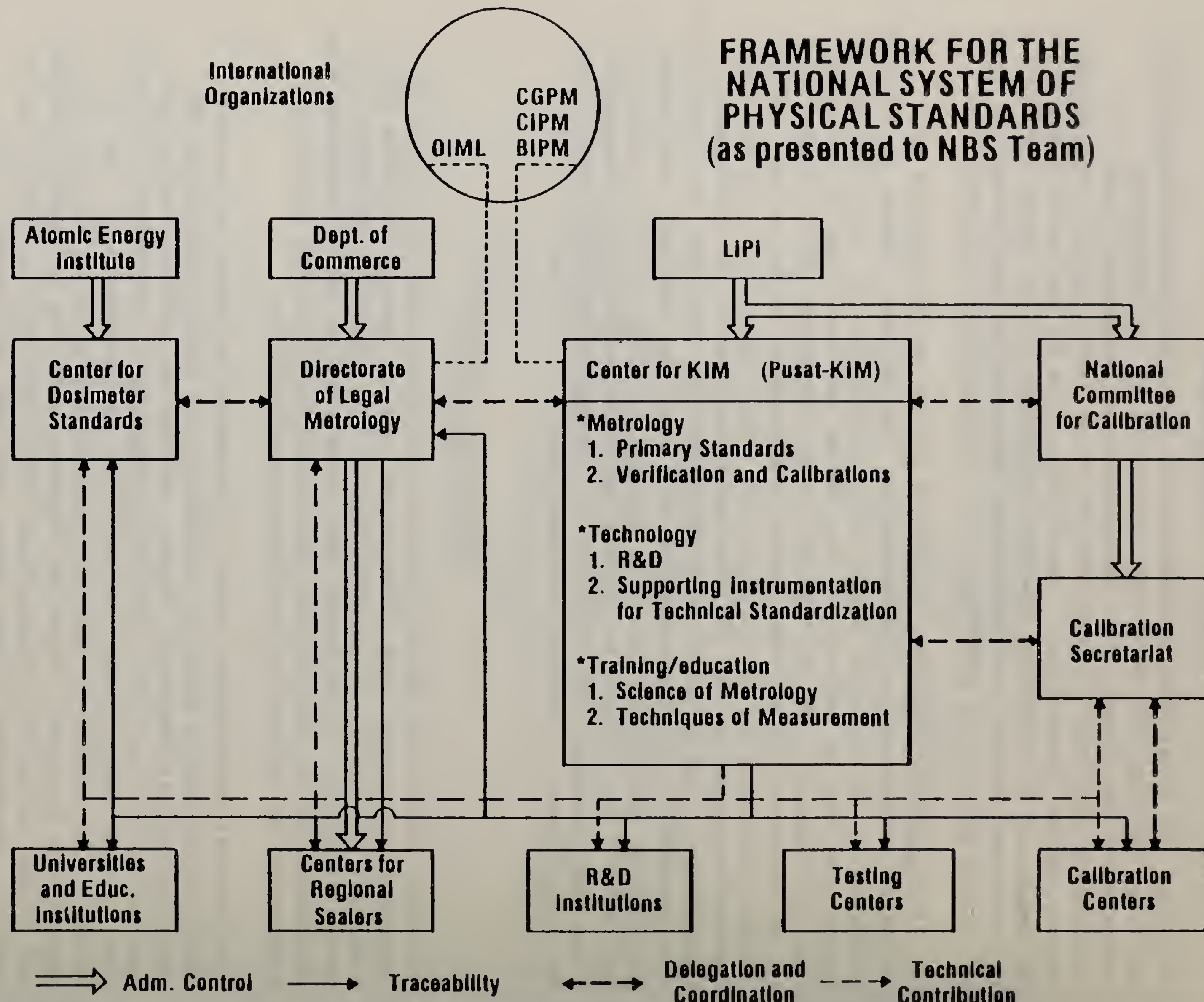
Two diagrams are presented, figures 1 and 2, which describe two different versions of a "Framework for the National System of Physical Standards." The first of these was presented to the NBS study team during its tour in Indonesia. The second was developed by President Kim, Dr. Sangster, and Mr. Peiser after completion of the study tour. It was presented to our Indonesian counterparts in an earlier draft version, slightly different in detail from the current version. The version suggested by the NBS team embodies many of the conclusions, observations, and general recommendations that resulted from the study mission visits plus consideration of all of the available background and working paper material. The initial portions of this section of this report will therefore largely be organized around a discussion of these two diagrams, with emphasis on discussion of the rationale for any significant differences between them.

V.F.2. Overview and Summary

As stated above, the basic plans for the operational KIM system in Indonesia are sound. The differences between the two diagrams are ones that can easily be accommodated as the presently envisaged KIM system develops. It is hoped that steps will be taken immediately to implement the KIM system described by figure 1 and the documents reproduced in section III.F.3 and appendix VI.F.1.

The national measurement needs in Indonesia are great and urgent. We found an impressive level of recognition of these needs among the senior technical personnel we met, so that we project a widespread (although certainly not universal) enthusiastic reception of anything that is done toward rapid and effective implementation of the KIM system. The leaders of the proposed KIM system exist and are eager to get on with the job. We see no inherent barriers to getting started, and we see no adverse consequences from proceeding as rapidly as the available managerial talent, time, and money will permit. The starting points can be defined rapidly and development of the system can begin.

FRAMEWORK FOR THE NATIONAL SYSTEM OF PHYSICAL STANDARDS
(as presented to NBS Team)



FRAMEWORK FOR THE NATIONAL SYSTEM OF PHYSICAL STANDARDS
(as suggested by NBS Team)

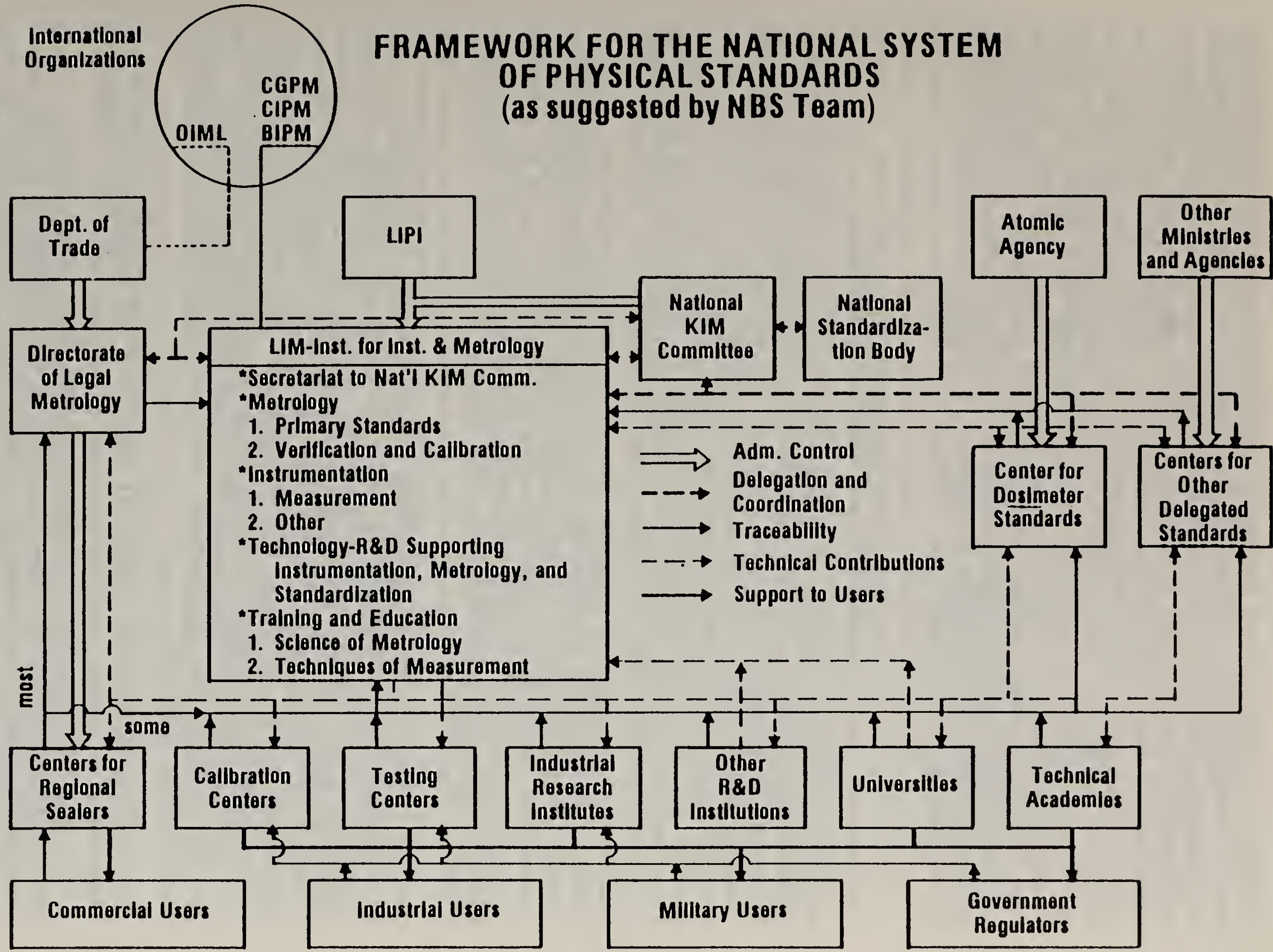


FIGURE 2

The NBS team members were impressed by the progress that Indonesia has made in recent years. Our background reading and previous impressions of Indonesia had failed to prepare us for the bustling, prosperous, and cheerful reality that we observed. There is an air of confidence and optimism about the future, despite the continued existence of living conditions and circumstances that all wish to see improved. While it is obvious that enormous problems remain to be resolved, it appears to us that a sound basis for further national growth (in all dimensions, not just economic) has been established, and that we can look forward to even greater achievements in the future. Indonesians can justly take pride in what has been accomplished and look forward to the future with realistic optimism. We appreciate the opportunity to do what we can to assist in creating this future.

V.F.3. National Technical Competence

We saw a number of "centers of technical excellence" during our study mission that prove to us that Indonesia has demonstrated in some organization somewhere many and probably all of the critical technical capabilities required for its industrial advancement. It is our opinion that the challenge the nation faces at this time is not in finding out how to do the things that need to be done nor in proving that they can in fact be done, but rather in identifying these centers of technical excellence and using them as models to be duplicated and followed or adapted, in creating the vast volume of technical competence that will be required as the nation becomes an industrial power. These centers of technical excellence need to be identified, recognized, encouraged, supported, and consciously held up as examples or models from which others can learn. In many cases, direct governmental action to duplicate such successful organizations will probably be necessary.

Some of these centers of excellence are well enough known that discussion is unnecessary for present purposes; for instance, ITB (Institute of Technology of Bandung--see section IV.F.7), LIN (National Institute for Instrumentation--see section IV.F.6), and PINDAD (Army Metal Industry--see section IV.F.9). Others are apparently not so obvious. Two in particular are immediately relevant to a discussion of the significant differences between figures 1 and 2: namely, ATMI (Technical Academy of the Machine Industry--see section IV.F.14) and the Research Institute for Leather in Yogjakarta (see section IV.F.12).

The one area of national technical need that was expressed to us everywhere we visited was the shortage of skilled manpower, especially at the skilled operator or technician level (and also at the university graduate and Ph.D. levels). A vast expansion of the vocational educational academies or similar institutions will be needed if Indonesia is to achieve her development goals. Without such an expansion, the nation will find that it technically will consist of all "officers" and "privates," with a great lack of technical "non-commissioned officers" in between. In the Western industrial economies, we have similar problems in creating skilled operators and technicians, but our economic and educational systems have found ways of filling this intermediate level void even though we have relatively few formal institutions devoted to producing skilled personnel at the operator or technician level. The circumstances in Indonesia do not appear to be such that this void will be effectively filled by the "spontaneous" mechanisms that have worked in the Western countries. Indonesia does not have the long cultural tradition of industrial precision and mass production. It does not have a vast system of higher education with students who fail to complete their professional technical degree work and often perform superbly at the technician level. It does not have a large ongoing technical industry that can train its replacement and expansion staff internally. If the country is to have the large number of people that it needs in this category--probably a number ten times larger than the number of graduates from all the technical schools in its university system--it must create the educational institutions that can produce people with the needed intermediate-level, operational technical skills. These are people who work with both their hands and their brains to make technology routinely effective in industrial (or military) reality. Their jobs may not be intellectually glamorous, but they are essential and generally satisfy the ambitions of the people so employed.

We found ATMI (see section IV.F.14) to be doing a superb job in training young Indonesians at the skilled operator or technician level. We heard in Bogor (see section IV.F.1) of the similarly very effective work of technical academies for training chemical technicians. We strongly recommend a high priority national attention to expanding this portion of the national educational system. And, in particular, we strongly recommend a major drive by the leaders of the KIM system toward the creation of technical academies in this field. They are urgently needed to produce the large number of skilled operators and technicians who will use and maintain the measurement instrumentation upon which the whole KIM system rests. Indonesia will need only a few people (10 to 50) educated at the Ph.D. level in metrology. She will need perhaps ten times as many at the M.S. or university graduate level. To achieve her development goals, she will need thousands at the operator and technician levels. Addition of the block labeled "Technical Academies" is perhaps the most significant difference between figures 1 and 2. Without adequate attention to this problem, Indonesia will never have a truly effective KIM system disseminating precision and control throughout the manufacturing and processing industry.

Along with the creation of technical academies to train the people needed at the skilled operator and technician levels, must come suitable recognition of these people. Industry does recognize them now. ATMI graduates are well paid in industry, and there are many openings available for every graduate. The governmental wage structure does not appear to recognize them equitably, let alone adequately. The most serious formal lack is the absence of any certificate of accomplishment, a diploma, or award that recognizes formally that these people have achieved an unusual level of capability. Such diplomas or certificates, recognized by the State, need to be established. This recognition system if properly set up can also achieve another imperative objective: namely, quality control on the graduates of the expanded technical academy system. The skills to be learned are not easily acquired and often not easily checked by a potential employer. A person certified as skilled should in fact be skilled, and a person who can demonstrate his skill should be so certified. The two should go together.

V.F.4. Orientation of National Needs

The most obvious difference between the two figures 1 and 2 is the addition of the bottom row of boxes representing the users of the system. It is for the support of these users that the whole system exists. The reality of their needs and of the flow of support to meet these needs must always be kept in mind. While we fully acknowledge the consciousness of these needs in the minds of our Indonesian counterparts, we cannot stress too strongly the necessity of explicitly recognizing the existence of such needs in diagrams such as these. Failure to do so can create confusion in the minds of those to whom these diagrams must communicate, and in the long term can lead to "ivory-tower" mentalities among the institutions at other levels in the system, so that they lose sight of the real needs that they exist to serve.

Inclusion of the array of user groups and consideration of the flow of technical support that they need are two of the factors that led to the strength with which we wish to express our recommendations of the immediately preceding section. The shortage of operators and technicians is serious for research institutions. However, when the vast numbers of such people that are needed by modern technological industry are considered, the problem becomes far more than just serious. It appears to us an urgent national need.

A strong supporting connection is shown flowing from the technical academy block to the user groups in figure 2 and the connection shown from the universities implies that academic laboratories should use their equipment for metrological services to users. Industry and other users will need some university-trained metrologists in their operations. But the numbers required will be small in relation to the total output of the technical university departments and to the total number of metrologically trained people that the user groups will require. It is a fact that even in the United States there is essentially no university or technical institute anywhere that is formally producing graduates trained in metrology as a self-contained specialty. NBS and other metrologically-oriented institutions acquire people trained in conventional scientific and engineering fields and teach them whatever else is needed so that they become trained metrologists on the job. We project that a similar system would work in Indonesia, which is mentioned not at all to dissuade anyone from establishing formal programs of metrological education at the university level: we know they would be very useful and would like to see them established, but we do anticipate that there may be problems in making them viable, simply because only a few are needed in each country.

Both the observations during the study mission tour (see sections IV.F.6) and the background and working papers (see sections II.F and III.F) stress the importance of measurement instrumentation for process control, and the absence of a national pool of talent and knowledge in this field, or of supporting calibration and maintenance services. Therefore, we have inserted another block among the operational measurement system supporting groups on the next to the last level in figure 2 labeled "industrial research institutes," by which we mean Government organizations operating under general guidance of LIN and the KIM system. It is our opinion that the existing industrial research institute system in Indonesia should be expanded both in numbers and technical scope to handle the problems of industrial process and quality control, industry by industry. No one institution such as LIN can hope to be close enough to all of the detail in all of the different industries to be responsive on a timely basis to those needs. Similarly, a network of calibration, verification, and maintenance service institutions is needed to keep all of this instrumentation functioning adequately. The industrial research institutes appear to be strategically placed to do much of this job. It appears to us that the national KIM system should integrate the measurement efforts of, and work through, the appropriate industrial research institutes to get this part of the Indonesian national measurement system under control.

As indicated in section IV.F.12, we found the Leather Research Institute in Jogjakarta to be another center of technical excellence, doing a very effective job in providing appropriate technical support to its industry. It appears to us that if Indonesia has or can create another 50 to 100 "ATMI's" and another 10 to 30 "Leather Research Institutes" (both in a variety of technical fields, of course), it will be well on its way to solving its most critical technical problems.

As in most countries, some of the more advanced technical institutions visited would gain from the infusion of a clear sense of mission and a feeling that they are integrated into priority national goals. Others could be strengthened by a significant expansion in their existing levels or scope of technical competence. Our specific assessments of these institutions are known to our Indonesian counterparts, so that detailed discussion is unnecessary here. A point that does need to be made is that caution must be exercised in entrusting to these institutions major roles in the national KIM system. Care must be exercized that such problems as may exist of this nature do not carry over to limit their effectiveness as part of the KIM system.

V.F.5. Salaries

One of the major sources of problems of the types alluded to in the previous paragraph is an inadequate salary structure for the scientific or engineering graduate staff members in many governmentally funded institutions. So that the KIM program may achieve its goals, the governing management should provide incentives to attract highly educated scientists and technicians, living either in the country or overseas. Such incentives may come in such forms as adequate housing facilities and accommodations or, more importantly, higher salaries. The situation, as we see it, is that there is a shortage of qualified technical manpower available now (especially those with Ph.D. degrees) who can in turn be counted upon to gradually guide other technicians and institutions. As for the staff already on board, their performance is hindered by a lack of coordinated systems know-how to develop their capabilities. Attention must be paid to these problems of acquiring and developing still further the leadership talent that the KIM system demands. Effective national systems cannot be developed and led by mediocre talents. Indonesia is fortunate to have in place now a number of key people in this field who know what needs to be done and are capable of doing it. But they cannot long do it alone.

Just as in the previous section we pointed out that some research institutions are unclear about their mission, despite a great need for their output to industry, so also it can be said that some university graduates find it difficult to locate a suitable employment niche. You can at times hear an opinion voiced that Indonesia has an oversupply of university trained engineers. By our analysis, this is an entirely wrong conclusion. Developing industry in Indonesia needs nothing more than to put these talents to work. It is a major challenge to the Government to generate the outlook and organizational structure that are needed for development which must be led by teams that include technically trained staff.

V.F.6. Measurement System Needs

All organizations visited had measurement or measurement instrumentation problems. The most urgent needs are verification and calibration of existing instruments, training of operators, and very extensive improvements in repair and maintenance services.

The "Pusat KIM" (National Center for Calibration-Instrumentation-Metrology) should be clearly identified as a specific institution and its coordination and technical authority be clearly established.

While it must have a technical competence to warrant such authority, it must also have official legitimacy to be able to move rapidly and decisively enough in meeting the National needs.

We concur that LIN (Lembaga Instrumentasi Nasional—National Institute for Instrumentation) should be the organization to be designated as "Pusat KIM." This will require an expansion in scope and size of LIN (see appendixes VI.F.1 and VI.F.2).

We note that there are in fact really two distinct jobs involved in this expanded LIN—one for national leadership in the instrumentation field broadly, the other for leadership of the national K and M (calibration-metrology) portion of the system. At some later time, perhaps during the fourth five-year plan, consideration could be given to separating the expanded LIN-Pusat-KIM into two organizations—one for instrumentation, one for K and M. However, at this time, these two functions strongly support each other, and we believe that there will be no justification for such a split during the duration of the coming five-year plan and probably not for quite some time after that. Therefore, we strongly recommend establishing the expanded LIN-Pusat KIM with the assurance that it is intended to remain as a single, stable organization for at least the next five to ten years.

Lembaga Instrumentasi Nasional—National Instrumentation Institute (LIN)—may be the wrong name for the expanded LIN-Pusat-KIM. We suggest that a renaming as LIM—Lembaga Instrumentasi dan Metrologi (Institute for Instrumentation and Metrology)—would be desirable. "LIM" as the leader of "KIM" has a nice ring to it.

We believe that it may possibly in the future become desirable to rename the proposed "National Committee for Calibration," e.g., as the National Committee for KIM, and to raise it to a higher level of recognition. However, it appears appropriate at this time to proceed as now planned, on a more informal basis, to get started without excessive delay by organizational formalities.

We recommend that the Secretariat for the National Calibration and Metrology Committee not be administered directly by that Committee, as is implied in figure 1. We have proposed in figure 2 that Pusat-KIM (LIM) provide the secretariat services to the Committee. Alternatively, LIPI could handle this function. The Committee, of course, will provide all of the policy guidance and will exercise full control over the nature of the output of this Secretariat. What we are saying is simply that the Committee should not be burdened with administering salaries or providing space, etc., for its secretariat.

The major task of Pusat-KIM currently is strengthening and connecting the secondary level laboratories to itself and to each other to form the central skeleton of a national system. These secondary laboratories would be organizationally independent of Pusat-KIM, but strongly connected to it technically and required to establish traceability to the national measurement standards designated by the KIM Committee and Pusat-KIM. (Note, in passing, that all of the "traceability" arrows in figure 1 have been reversed in figure 2 to reflect the fact that traceability proceeds from the bottom up.)

We strongly support the intention of LIN-Pusat-KIM to delegate "national measurement standard" responsibility to key second level standards laboratories when their existing capabilities are appropriate and whenever or as long as the Republic of Indonesia does not need or cannot yet afford a better standard. Whenever a better standard is needed and affordable, normally Pusat-KIM will acquire it, but not always (e.g., probably not in the radiation field for many years to come, if ever). This intention is reflected in the central blocks at the far right in figure 2 and the central one at the left in figure 1.

A laboratory accreditation system should be established as part of the national KIM system. This can occur at different levels for different circumstances. Evidence of "accreditation" can take the form of calibration certificates, training certificates, special certification documents, complete laboratory certifications, and perhaps others. We recommend that Indonesia study the Australian and New Zealand systems in this field.

The Indonesian Armed Forces in their procurement regulations and in operation of their own manufacturing facilities should require all measurements made to establish the performance and qualifications of material being supplied to them, to be traceable to the national standards designated by Pusat-KIM. As far as possible, all government procurement of precision products should have this requirement.

The vastness of the country and the diversity of its industry require a geographically dispersed network of secondary, tertiary, and other lower level calibration and metrology (KIM) laboratories.

A major source of the KIM problems in Indonesia is the large variety of instruments in the current operational inventory. These have come from many different manufacturers in many different countries at many different times. This diversity seriously complicates an already difficult problem of acquiring spare parts or replacing missing operation manuals or specification sheets.

Implementation of a "Consumers' Report" system for current model instrumentation should be considered by LIN. The objective would be to query recent purchasers of instrumentation to establish a pool of national experience regarding specific models of specific instruments for use by those considering buying additional instruments.

The possibility of establishing some national standardization, or at least recommendations on certain models of some kinds of instrumentation, should be examined—e.g., for pH meters or tensile strength testers. Completely uncontrolled proliferation of types and models of instruments is not in the national interest. Similarly, importation of metric instrumentation should be encouraged and non-metric discouraged or outlawed.

We are concerned about the possible future adverse effects on LIN-Pusat-KIM of some of the resource-draining (especially of its limited skilled manpower) activities in which it is now engaged. For instance, while the problem of adequate instrument maintenance and repair services is clearly of major importance for Indonesia, it is essential that Pusat-KIM take the lead in developing such capabilities in organizations other than itself, and that it take care (as LIN is now doing) to keep its own burden of repair service within bounds and appropriate for meeting national needs.

While we agree with the feeling by our Indonesian counterparts of a need for widespread publicity about KIM, we see some evidence that the plans for such publicity may be somewhat misdirected. Specifically, there appears to be relatively little need for publicity to arouse awareness among technical people in industry or scientific institutions of the need for a national KIM system. These people are already aware, or become so very rapidly once the subject is brought up. Publicity to mobilize this awareness is appropriate, and publicity to develop a corresponding awareness among top managers is essential. Publicity regarding the availability of national KIM support, as that develops, will be needed. Publicity for KIM in the mass media, such as newspapers, radio, and television, seems largely inappropriate until such time as there are clearly understandable operational achievements to boast about. An exception would be publicity to attract students into the metrology technical academies as they develop. This statement contrasts with, but in no way contradicts, the team's conviction that consumer product standardization is an eminently suitable topic for the mass media; and we support publicity of all kinds and at all levels to raise quality consciousness in Indonesia—of the managers, the consumers, and the industrial workers.

We sensed a dependence on a voluntary approach toward establishment of a national calibration network that is appropriate and that for some fields should be continued for the duration of the next five-year REPELITA. There are some measurements—such as those made today in commerce—for which the public interest requires consistency and accuracy. Some mandatory requirements may then have to be introduced by executive order.

We commend the use of the terms "verification" and "calibration" as a set or pair in the KIM planning documents. Both activities are needed by Indonesia, not just the calibration function that might be implied by consideration of the name "KIM" alone.

We strongly recommend establishment of a calibration and verification system that relies as much as possible on calibration/verification services conducted directly at the site at which the measurement instrumentation is used, working directly with its normal operator(s). Only in this way can the whole measurement operation be calibrated and verified. A lot of operator training can also occur as an important by-product of such a system.

Standard reference materials or standard reference artifacts need to be incorporated into the calibration and verification system. These can allow much self-calibration and verification by the normal instrument operator without the need for direct participation by the central calibration laboratory personnel.

V.F.7. The Future

Achievement of the entire 1986 organizational plan for LIN-Pusat-KIM may require an increase in the planned staffing (see appendix VI.F.2). Specifically, manning of every proposed "laboratory" would provide only seven to eight people per laboratory, and it is probable that some such units would be too small to be fully effective as separate organizational subdivisions. In general, we feel that the "KIM 1986" plan is a good and workable one. It may be more ambitious than can actually be achieved, but a ten-year plan should be a challenging one.

The needed effective steps to reach the national system for KIM are to get started doing what obviously needs doing now:

a. Achieve a sufficiently complete KIM committee that it can function, and let it begin providing overall advice. Do not insist on completeness at this time. Do be sure, however, that it operates in such a way that additional members can be accommodated and brought up to speed rapidly.

b. Develop methods of allowing the KIM committee to function effectively without requiring frequent complete meetings.

c. Conduct or complete the inventory of the top echelon measurement capabilities in the country, and begin the process of designating "de facto" national measurement standards, which will be used on a provisional basis until improved standards are found or become available. Some of these are apparent at this time; for instance, the National Atomic Energy Agency in the field of ionizing radiation measurements has certain de facto national standards now. There is no need to wait until a complete set has been identified to begin using ones already identified.

d. Give priority to measurement areas where national uniformity is most urgently needed. Dimensional metrology certainly appears to be one such area. The de facto national standards should be identified at an early date and round robins planned and implemented to connect the other laboratories with high level capabilities to the defined national standards. Get this round robin program started on at least a preliminary trial basis without waiting for organizational decisions and longer-term developments. Some simple standard reference artifacts, such as a stable set of gage blocks, can be used to begin the process of tying the national dimensional metrology measurement system together.

e. Follow up this getting-started process by getting Pusat-KIM clearly defined and initiated. Identify the more challenging urgent problems that cannot be attacked in so simple an ad hoc manner as the one suggested above. Set up projects within or under the coordination of Pusat-KIM to get these problems resolved. Similarly, identify the most significant gaps in the national reference standard measurement capabilities, and initiate projects to fill them.

f. Identify industries--perhaps such as the leather industry--where a capable industrial research organization exists through which work can be effected in improving the industrial process control system. Develop joint programs between Pusat-KIM and those industrial research institutes to begin to meet the industrial process control measurement needs of those industries: survey the industry, on a sampling basis. Identify some of the most urgent needs. Define potential solutions. Implement the solutions. Make them available on a trial basis. Debug them. Expand the program and publicize it.

We suggest that the measurement conferences initiated in 1976 (see section III.F.2) be developed into a continuing series of annual or biennial meetings. A national professional "Society for Instrumentation and Metrology" could well be created.

We concur with the proposal that Pusat-Kim assume the responsibility of representing Indonesia in the General Conference on Weights and Measures (CGPM), and that representation in the International Organization for Legal Metrology remain with the Directorate of Metrology in the Department of Commerce.

We support the intent of LIN to acquire expertise in the field of application of microcomputers to measurement instrumentation.

LIN could well develop a position of world leadership in the development of measurement instrumentation specifically designed to function in tropical environments.

Using as reference our experience in other developing countries, it is our opinion that in Indonesia the basic technical plan for a national measurement standards (metrology) system is one of the very best—it is workable, realistic and it means to build on existing competences without wishing to take over from existing organizations. The technical seed groups are also in place, but manufacturing and processing industries and Government need much more help from the KIM system than they now realize, let alone request. If they did seek all the help they actually need, they would swamp an already overburdened, and in some fields not yet existing, KIM service. To break that vicious circle is the real challenge to LIPI management or Indonesian interagency authority.

VI. APPENDIXES

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

SUMMARY FOREIGN TRIP REPORT

From: Mr. H. Steffen Peiser
Chief
Office of International Relations

Location Visited: Jakarta, Indonesia
September 27 - October 1, 1976

Purpose of Trip: To confer and help in establishing industrial standardization to facilitate international trade with the U.S.

Accompanied by: Unaccompanied

Trip Summary

9-28-76 USAID Mission (Mr. William Littlewood, formerly of TA/OST), and U.S. Embassy Jakarta (Mr. Stanley Ifshin) gave helpful briefing on economic and technological conditions in Indonesia. Indonesia, despite its resources has much poverty, and industrial development is likely to continue only slowly. USAID funds might well be available for suitable NBS related activities, but Dr. Habibie's enterprises are not considered to be in need of financial support. (Dr. Habibie visited NBS earlier this year as science adviser to the President of Indonesia who now shares his time between PERTAMINA and a position in FGR [West Germany] as Vice President of the Messerschmidt Aircraft Company).

Dinner and discussion at the Petroleum Club with a high-level PERTAMINA group headed by Dr. Burham Napitupulu and Dr. S. P. Napitupulu, arranged by Eng. Hanggoro Marsetio who had also visited NBS. Besides William Littlewood and myself, Eng. Rahardi Ramelan, Assistant to the head of the Advanced Technology Division of PERTAMINA, Mr. Gunawan, and Eng. Sofjan Helmi Nasution, interested in equipment, attended the function. All leaders of PERTAMINA appear to be trained in Germany and strongly oriented towards German-type industrial development. Most had studied at Hamburg University. There was clearly some disappointment that I had not come to Indonesia solely as their guest with time to visit laboratories in Bandung. Dr. Kwi Hartman of NBS may be right that this group alone in Indonesia is sufficiently advanced in technology to understand and be understood by the majority of NBS staff. For further technical discussions, see program 9-30-76.

9-29-76 An early interview was given by Mr. Tom Niblock, USAID Mission Director in Indonesia, who was Director in the Philippines during the NBS/AID Survey and the NBS high-wind load studies on low rise buildings. My impression is that Mr. Niblock will encourage appropriate projects (such as training for human development) requested by the GOI in NBS fields of interest and that he will insist that his staff closely follow planning and execution of NBS involvements.

Meeting with Mr. D. Terrell, USAID Training Officer, to determine the conditions of attendance of Eng. Herudi Kartowisastro at the NBS/AID Workshop and Instrument Course at Denver Research Institute. The Mission will pay international travel and subsistence. NBS will pay registration fees from the AID/RSSA.

At 8:30 a.m., Professor Dr. H. Tb. Bachtiar Rifai, Chairman of LIPI (Lembaga Ilmu Pengetahuan Indonesia--Indonesian Institute of Sciences) received Mr. Littlewood and myself. Also present were Ms. Sjamsiah Achmad and Mr. Sumantri, an old-time friend of NBS, Deputy Chairman for Technology. The discussion was lively, cordial, positive, and forward looking. It centered around the UNIDO report of Mr. Santosh K. Sen, formerly Director General of the Indian Standards Institute, in which the establishment of a National Standards Body (precisely as advocated by ISO) was urged. LIPI strongly supported this conclusion as a key to progress in standardization and measurement services. Yet despite the Chairman's strong position through reporting directly to the President of Indonesia (in practice through the Minister of Research, The Hon. Sumitro, with whom we were to meet on the following day) and despite a proposal having been submitted to BAPPENAS--the GOI Planning Agency--no decision had been made by the Government. There is apparently some concern by some ministries (e.g., the Ministry of Commerce) that a central standardization function would subtract from their own field of responsibility. In further conversations with Mr. Sumantri and Mr. Littlewood, it was stated that an NBS/AID Survey would not be strong enough to mobilize GOI action on an NSB. They favor a US/NAS study and report, presumably with NBS participation, to re-discuss the entire question from the national policy viewpoint. It would be hoped that this study would come out with an even stronger recommendation for an NSB of Indonesia. The NAS would carry the necessary prestige to bring about the desired action.

While hoping that NBS would agree to participate in such a study, my own inclination as always is aimed at lower level action. I favor establishing a few badly needed specific services in some organization to make an NSB grow slowly into a leadership position in standardization and measurement services. The formal establishment of an institution as the NSB may then follow almost as a recognition of fact without taking responsibilities from any ministries. An NBS/AID survey, at an early date, is much more likely to uncover specific services of importance to industrial development of Indonesia than an NAS study to make more preliminary recommendations on the basic organizational structure.

LIPI was established by Presidential Decree in 1967 as a Governmental body funded by the GOI, for guidance in scientific and technological research. LIPI is governed by a Chairman (Dr. Rifai) assisted by an Executive Secretary and three Deputy Chairmen, respectively for Natural Sciences, Technology, and Social Sciences and Humanities. Each Deputy Chairman develops and gives direction to an impressive list of LIPI research institutions in his field. Mr. Sumantri's institutions are six in number. Five of these are called National Institutes for Physics, Chemistry, Metallurgy, Electrotechniques, and Instrumentation. The sixth is the National Scientific Documentation Center. The Chairman is also assisted by an Advisory Council of eight members. The administrative arm has ten bureaus. LIPI has an impressive output of publications including a quarterly "LIPI News" (Berita Lipi).

At the Ministry of Industry, we received a most friendly greeting by the Secretary General for Industry, Achmad Slamet, accompanied by both Mr. Sumantri and Dr. Benito Kodijat, special assistant to Secretary General whose visit to NBS I recall clearly because he had shown insight and quick understanding of NBS roles in the U.S.A. In this interview, it became clear that LIPI had the strongest support from this Ministry and that there existed in Indonesia an understanding of quality control, standardization, and related extension services to industry.

A large meeting followed, attended by the following additional list of officials.

1.	Ir. Trisura Suhardi	- Director, R & D Center for Metal & Engineering Industry
2.	Ir. Satijatmo	- Director, R & D Center for Chemical Industry
3.	Santoso Text Eng.	- Director R & D Center for Textile Industry.
4.	Drs. Fachar Bermawl	- Staff of the R & D Center for Light Industry & Handicraft
5.	Sunoko B. Sc	- Staff of the R & D Center for Textile Industry
6.	Ir. Gatut Sudomo	- Staff of the R & D Center for Light Industry and Handicraft
7.	Ir. A. Syorfai	- Division Chief, Foreign Economic Relations, Bureau of Finance

8.	Giatika Hamdani S.H.	- Staff of the Bureau of Planning
9.	Dra. Koesbandia	- Staff of the Bureau of Planning
10.	Ir. Sridati	- Staff of the Bureau of Planning
11.	Ita Gambiro S.H	- Staff of the R & D Center for Metal & Engineering Industry
12.	Nurachma Bakar S. H.	- Secretary of the Secretary General

Dr. Kodijat chaired the meeting and introduced everyone; then gave Mr. Littlewood and myself opportunity to describe our organizations and functions, followed by a brief question in which the topics of voluntary versus mandatory standards, international standards organizations and stringent requirements of some U.S. acceptance standards predominated. Time was too short; I would have liked to have been available to those of the audience who were prepared to sacrifice lunch or evening time for a longer exchange of views.

In the afternoon, we visited with Mr. Ifshin BAPPENAS of the National Development Planning Agency. We were met by Eng. Sugeng Sunjaswadi, Chief of the Bureau of Mining, Industry and Electrical Power, who seemed embarrassed, as he was unsure why we were visiting BAPPENAS. He obviously was unaware of LIPI's application (February 1975) for an NSB to be formed. He acknowledged receiving a statement from the Ministry of Industry on the importance of standardization and quality control, but said that a formal program application was needed which could be reviewed against other priority projects. He pointed out that his Agency did not have to be involved if existing agencies with their own funds and organizational units wanted to support relevant projects.

My following discussions with Mr. Sumantri were short and I have the impression he feels frustrated by the apparent blockage of the NSB scheme, which he regards as essential.

9-30-76 Writing and discussions at the USAID Mission. The AID Loan 497-T-040 for Technical Assistance/Consulting Services was signed on July 28, 1976. NBS might well propose some sub-projects under this loan. The requirements are spelled out in the attachment. This Loan is by no means the only mechanism by which suitable NBS assistance can be reimbursed by the Mission. The Participant Training Program is strong and well directed towards human resource development for appropriate technology. Mr. Littlewood, furthermore, is developing wide-ranging possible draft sub-projects under a proposed AID concessionary "S&T Loan" to be implemented through LIPI. To meet administrative deadlines there was great urgency to enter a tentative sub-project proposal without commitment for illustrating the type of NBS assistance that may be feasible. Recognizing the great interest by the Indonesian authorities for instruments and their calibration (see below) I entered a paper on a $500 k three year sub-project under which NBS would assist in purchasing instruments, SRM's and SRD, provide training and local workshops, and, with the help of an NBS representative in Jakarta, assist in developing suitable delivery systems. Such a project might be given high priority by the GOI and, in fact, have considerable impact.

The evidence for this assessment comes in part from an audience with the Hon. Sumitro, Minister for Research. Also present were Mr. Littlewood, Mr. Sumantri, Mr. Herudi Kartowisastro, Dr. Iman Suripto, Executive Secretary of the Ministry, and two other senior ministerial assistants, Eng. B. Joedono and Eng. Sutrisno. The last named had to be refused by NBS/AID for the Denver course on Instrument Specification Writing. Instead he was given encouragement to plan for a specially programmed visit to the U.S. funded by USAID. During the discussions I described NBS, its services to U.S. organizations and industry, as well as examples of international activities. The Minister came through to me as a forceful character, who directs rather than coordinates LIPI and other S&T institutions. He has sound, vigorous opinions; yet his staff find it difficult to discuss possible over-emphasis of some aspects of a complex system of technical services. He has a strong feeling about instrumental needs and calibrations and therefore Eng. Herudi is given special license as Director of the National Institute for Research Instrumentation. The Minister, I understand, has previously held more senior portfolios and is respected as an elder statesman. I think I detected some reservation towards LIPI's plan to create by decree a National Standards Body. It may be preferable to create services rather than a new organization. The Minister has a plan to create a science city near Jakarta to which many institutes are to move. In the first group of four will be LIPI's National Institute for Instrumentation.

Mr. Littlewood and I next met at LIPI with the Standards Committee under Mr. Sumantri's Chairmanship. Dr. Benito Kodijat from the Ministry of Industry also joined. It should be noted that Dr. Rustamsjah, former guest worker at the NBS, is now Deputy Director of the National Chemical Research Institute. His interaction with me illustrates the hidden benefits of the guest worker program at NBS. As a long-time friend of NBS he not only could describe NBS to his colleagues far more convincingly than I could, but he immediately gave me insights into situations within his country such as are not exchanged between strangers. The list of Committee Members follows:

1. Ir. Sumantri - Project Leader of Standardization, Calibration, Instrumentation and Metrology/Deputy Chairman for Technology - Indonesian Institute for Sciences

2.	Prof. Dr. Barmawi	- Divisional Council on Units, Chairman/ Department of Physics - I.T.B., Chairman
3.	Dr. Suwarto Martosudirdjo	- Divisional Council on Units, Secretary/ National Institute of Physics, Director
4.	Dr. Harsono Wirjosumarto	- Divisional Council on Metals and Machines, Chairman/Department of Mechanical Engineering I.T.B., Chairman
5.	Ir. A. Sulaiman	- Divisional Council on Metals and Machines, Secretary/National Institute of Metallurgy
6.	Luwarsih Pringgoadisurjo M.Sc.	- Divisional Council on Library, Documentation and Information, Chairman/National Scientific Documentation Centre, Director
7.	Kosasih Prawirasumantri M.S.L.	- Division Council on Library, Documentation and Information, Secretary/National Scientific Documentation Centre, Secretary
8.	Ir. Prasodjo Surjowidjojo	- Divisional Council on Electrical Engineering, Chairman/Ministry of Public Works and Electric Power
9.	Civ. Ing. Suwarno Suardjo	- Divisional Council on Electrical Engineering, Secretary/Power Research Institute
10.	Ir. Herudi Kartowisastro	- Sub-Project Leader of Calibration, Instrumenttion and Metrology/National Institute for Instrumentation, Director
11.	Dr. Rustamsjah	- National Chemical Research Institute
12.	Ir. B. Kodijat	- Staff, Secretary General - Ministry of Industry
13.	Ir. Trisura Suhardi	- R & D Centre for Metals & Machines, Director Director
14.	Dr. Nilyardi Kamar	- Polymer Physics

A standards committee without industry or consumer participation is contrary to U.S. practice. It again illustrates LIPI's wish--encouraged by the UNIDO report of Sen's--to start a new organizational National Standards Body immediately, even though there has not been adequate preparation and support from those to be served. It is true that an affiliation with LIPI would reflect from the start an image of integrity, independence and technical competence.

Mr. Sumantri ran an interesting meeting on the subject of the UNIDO report which he paraphrased extensively. From the Indonesian side, much new information was supplied on LIPI's SKIM program--S stands for standardization, K for calibration, I for instrumentation and M for metrology; a striking acronym!

The private standards organization of Indonesia (acronym YDNI) is weak. It lacks funds and can give few services. LIPI would plan to absorb YDNI if the NSB were created under its umbrella. Considerable interest was shown in NBS and its relations to international standards organizations.

At PERTAMINA, we were met by the same group met on my first day. We learned much about the capabilities and enterprises of this unusual organization which is recovering from severe financial problems. It has started an aircraft company, to make light planes for inter-island communications based on imported aircraft engines. Dr. Habibie is gathering a large organizational structure originally with German ties. Nevertheless, now they are seeking an association with NBS.

PERTAMINA, interested in transportation, petrochemistry, agronomy, liquid natural gas and fertilizers, also harbors an "embryo" new Governmental Board. It is being formed with the intent that it will eventually take its place besides and on the same level as BAPPENAS. It is to be called Board for Technical Development and Applications. It will have divisions for

- Aeronautics
- Steel
- Maritime Affairs
- Equipment and Instrument Technology
- Operations Research and Technical Analysis
- Agriculture

and ° Engineering Design.

The Board will have institutes for

- Static and Dynamic Testing
- Hydrodynamics and Vibrational Analysis
- Technological Processing
- Composite Materials
- Electrotechnical Laboratories
- New Energy Sources
- Thermodynamics
- Propulsion Units
- Computers
- Mathematical Services.

They are seeking NBS planning and training assistance. Mr. Littlewood held out some hope that participant training for suitable candidates or guest worker assignments could be funded by USAID.

My short stay in Indonesia ended with a most enjoyable function hosted by the LIPI Chairman, Dr. Rifai, to which the following were invited:

1.	Ir. Achmad Slamet	- Secretary General - Ministry of Industry
2.	Ir. Benito Kodijat	- Staff, Secretary General - Ministry of Industry
3.	Soejoto S. H.	- Deputy for Social and Culture - Bappenas
4.	Dr. Astrid Susanto	- Chief, Bureau of Information, Science and Culture - Bappenas
5.	Drs. M. T. Zen	- Assistant to Minister of State for Research
6.	Ir. Herudi Kartowisastro	- Director, National Institute for Instrumentation
7.	Dr. Rustamsjah	- National Chemical Research Institute
8.	Dr. Suwarto Martosudirdjo	- Director, National Institute of Physics
9.	Mr. H. Steffen Peiser	- Chief, International Relations, National Bureau of Standards
10.	Mr. W. Littlewood	- Science and Technology Officer, AID, Jakarta
11.	Dr. Kenneth M. Kauffmann	- Deputy Director, AID Jakarta
12.	Prof. Dr. Ir. H. Tb. Bachtiar Rifai	- Chairman, Indonesian Institute of Sciences
13.	Ir. Sumantri	- Deputy Chairman for Technology, Indonesian Institute of Sciences
14.	Prof. Dr. Didin S. Sastrapradja	- Secretary, Indonesian Institute of Sciences
15.	Sjamsiah Achmad M.A.	- Chief, Bureau of International Relations Indonesian Institute of Sciences

Conversation was informal, friendly, but still mostly on technical subjects.

Attachment

Signed by

H. Steffen Peiser

H. Steffen Peiser
Chief
Office of International Relations

LIPI/NBS SURVEY ON STANDARDIZATION AND MEASUREMENT SERVICES

Opening Address

by

Dr. Rifai Bachtiar
Chairman, Indonesian Institute of Sciences (LIPI)
Jakarta, Indonesia

(Presented by Dr. Didin Sastrapradja, Executive Secretary, LIPI)

First of all, I would like to extend to all of you my heartfelt welcome, and to the guests from abroad, my sincerest appreciation and gratitude for your willingness to come over here to undertake a survey on standardization and measurement services in collaboration with the Indonesian counterpart team. To the Indonesian participants, of course, I would also like to express my thanks for your interest, assistance, and cooperation in this activity.

Since April 1974 a number of national projects have been entrusted by the Minister of State for Research to the Indonesian Institute of Sciences (LIPI) for implementation, one of which is the Project for the Development of a National Standardization System. A year later the project was given a wider scope to cover also calibration, instrumentation, and metrology.

The rationale of the project is quite evident. Standardization is an essential element in any process of development. A little reflection will show that there is evidence of standardization all around us--both in nature and in societies. Any human society exhibits a multitude of standardized behavior patterns in culture, habits, food, clothing, recreation, laws, and a host of other modes of living. These patterns may change from one historical period to another, but they change from one standardized form to another.

It is not difficult to see why it should be so. A community becomes a community only when the members are basically the same, that is, standardized to an extent that a group identity can be established. The group or community can then sustain and develop by organizing itself to meet the common needs of life. Thus begins the cycle of standardized production, distribution, and consumption of goods and services.

As long as production, distribution, and consumption of goods and services are primitive, standardization can be left to a natural process of evolution. In today's industrialized societies, however, the pace of development in many respects is too fast for the evolutionary process. In the modern world, therefore, standardization proceeds in several ways; these are:

a) A natural process of selection.
b) Promulgation by authority (mandatory standard).
c) Formulation by consensus (consensus standard).

The natural process of standardization differs from the other two in the sense that they are the result of conscious efforts by the community. Mandatory and consensus standards are deliberately created by men to serve some purpose of community life. Depending on the nature of the purpose, some of them have to be mandatorily used, while others may be left to individual judgement or voluntary agreement among members. Laws and regulations for the system of weights and measures are examples of mandatory standards. Standards for quality of goods and services are examples of consensus standards, as they are primarily the subject of agreement between the parties concerned.

Consensus standards naturally cover many areas of human activities. They have a special significance for industry and trade. Whenever a product changes hands from a supplier to a consumer, the parties must have a common understanding of the quality and quantity of the product. This common understanding is the consensus standard between the two. The standard may be a simple, elementary oral agreement or a sophisticated written document, depending on where the transfer point is located. In any modern society, there are many complex transfer points. The product may travel from a farm to a trader, from a trader through a transport system to a factory, from the factory (after processing) to a distribution channel, and finally to the consumer. Within the factory, the product is received as raw material, stored, released for processing through various production units, packaged, and stored again for distribution. At every point of transfer, whether from one organization to another or from one department to another in the same organization, a consensus standard forms the basis on which the transfer takes place.

This complex interrelationship of consensus standards needs a coordination system; otherwise, the wheels of production and distribution, which are interlinked and interdependent, get clogged. The linkages and interdependency increase as the technology of production and distribution become more and more refined. It is impossible to operate a mass production and distribution system without the rigorous discipline of standardization.

The urgency of coordination of consensus standards grows in geometric progression with the industrialization of a country. Lack of coordination results in a proliferation in varieties of materials, parts, and end-products. By fragmenting the demand, excessive variety on the one hand pushes up the cost of production and on the other makes the application of improved technology redundant. Lack of coordination of standards also leads to non-interchangeability of parts and products. There was a time when an electric plug of one make could not fit into a socket of another make in the same country. Today worldwide coordination of consensus standards has progressed sufficiently to remove such incompatibility.

Coordination of consensus standards on a national scale involves a vast multitude of organizations, institutions, enterprises, and individuals. It cannot possibly be accomplished without a system which can be understood and followed by all concerned and which can exercise a cohesive force to bind all the related activities into an organic pattern. Thus, at the national level, a national system for standardization is essential.

A developing country has additional compelling reasons for establishing a standardization system at the national level. Utilization of limited resources to the best advantage of the people is of utmost importance for a developing nation. This calls for institutional planning on a national scale. In the industrial sector, planning presupposes the possibility of transferring appropriate technology to the enterprises that are to execute the plans. The "appropriateness" of technology depends on the standards of the products in question. Thus, standardization is a prereqisite of national planning for industrial growth. National standardization and industrial expansion must proceed simultaneously at a coordinated pace. Otherwise, substantial wastage from unsatisfactory products, unnecessary variety, or from the utilization of uneconomic technology is bound to occur.

Standardization of units of measurements may be considered as the most basic function of the discipline of standardization in its generalized sense, for measurements pervades almost all fields of human endeavor. In order that measurements are sufficiently accurate for the various purposes for which they are intended, it is important that they be carried out in terms of a well-defined and well-understood system of units. All scientific, technological, and industrial pursuits and procedures depend on such measurements. Furthermore, they are most essential in the daily life of the man in the street or the housewife in her home. Above all, their importance in connection with the preparation and utilization of standards at all levels must be emphasized. With the exceptions of a few standards, such as those concerned with abstract matters like terminology, most of the other standards dealing with any concrete subject or aspect must necessarily define quantitatively the characteristics of the product or process covered. The quantitative definition of a characteristic required needs to be given in terms of a specific system of measurements consisting of scientifically and precisely defined units for each quantity. This is essential because in the realm of standardization, measurements to be made in different places by different operators at different times must be consistent in themselves and comparable with one another. Otherwise, their value as criteria for judgment would be considerably lost. That is why, besides a national system for standardization, a national system for measurement services is also crucial.

Proposals have been submitted concerning the setting up of the above-mentioned national systems for standardization and measurement services. We are anxious to read your findings about those proposals in your Survey report and also your recommendations on actions to be taken to strengthen our capabilities in the fields of standardization and measurement services.

In conclusion, I would like to express my gratitude to NBS and USAID, without whose assistance this joint endeavor could not have been realized. I wish you a pleasant stay here in Indonesia, and I hope that the Survey will be successful.

APPENDIX VI.A.3

LIPI/NBS SURVEY ON STANDARDIZATION AND MEASUREMENT SERVICES

Opening Address by Spokesman of the NBS Team

by

Mr. H. Steffen Peiser
Chief, Office of International Relations, NBS

On behalf of the National Bureau of Standards, the Agency for International Development, and of course, the Government of the United States, I thank you for the privilege and the confidence you have shown by asking this team to come and to put the experience of its members at your disposal in any way you choose to use our brief stay in this great island nation.

This is the eighth country that has requested such a survey of its standardization and measurement services. By my experience, this opening is the worst moment for us, the team members. We have arrived from many far parts of the world. On this our first or second day we have already had our eyes opened to a wonderful new country. You have clearly demonstrated by the papers you have distributed that we will here learn both from your culture and from your technical planning. But, what about that necessary flow of thoughts the other way of which Dr. Didin Sastrapradja spoke? This is the time when we wonder whether you, our hosts, will really be able to benefit from our experience. Judging by previous surveys, this fear will quickly disappear as we move to subsequent days when we will find that your opportunities and your problems have many parallels with our problems. Now, we do not believe we have solutions to all problems. The United States has itself lots of unsolved problems. All our countries have severe problems. As we develop an awareness of how to deal with one problem, so new ones emerge and challenge our improved technical capabilities. Only by looking back, we receive encouragement from the realization that we have moved towards many of our national goals and that we have improved the standards and qualities of the lives of our citizens.

I have been told I am too serious, and so I must tell at least one funny story--I choose one that is relevant to my background--of a close friend (I forget his name--as you know I always seem to forget names of my friends). He is a high-brow research scientist like me who decided he could consult in less-developed countries. He had an elaborate money-earning scheme for a tropical island nation--I forget which,it must have been somewhere in the Atlantic. There on an uninhabited rock, sticking out of the ocean he had the idea of building by modular construction a cat farm. I will spare you some of the details but you must know that the product of about 60,000 cats a year would be their skins for the fur trade. To feed the cats he would build right next door a rat farm. The principal food for the much larger number of rats would be the carcasses of the cats after they had been skinned. The only problem left was how to skin the 60,000 cats a year on an uninhabited rock in the middle of the Atlantic. My friend wanted to have some snakes on this island also--they skin themselves, you know. So I asked my friend what was the relevance of self-skinning snakes to the problem of skinning thousands of cats. He answered: "Ah, that is where a bit of research comes in--some genetic engineering."

Well, Mr. Chairman, this team is not in danger of losing its grip on realities because it has a strong contingent from third countries who have made down-to-earth progress in standardization and measurement services. Let me therefore introduce first of all these third-country members in reverse alphabetic order:

Dr. Rex Woo-Ming is a Government Analyst from Guyana.

Mr. Chaiwai Sangruji is Acting Director of the Thai Industrial Standards Institute.

Dr. Kim, Zae Quan is President of the Korea-Standards Research Institute.

Engineer Raul Estrada is Technical Director of the Ecuadorian National Institute for Standardization and was Director of the first NBS/AID Survey of Standardization and Measurement Services.

Introducing the participants from the United States also in reverse alphabetic order:

Dr. R. C. Sangster, originally from MIT, has led diverse research activities at GTE Laboratories, Inc., Texas Instruments, and NBS.

Mr. Noel J. Raufaste, architect, is special assistant to the Director of the NBS Center for Building Technology and has led a building technology project in the Philippines.

Mr. Benjamin Gutterman is Associate Director in the Technology Office of the Bureau of Foods and has advised other governments on the acceptability of foods in the U.S. market.

We the team members have studied much about Indonesia, and we mean to listen and see much more. We are here to discuss with you your problems and opportunities. We will not knowingly hurt feelings or commit any other discourtesy. But, we are not here just to be polite. By inviting us, Indonesia wants us to offer straight and honest views. For us to do otherwise would render this survey worthless. From the many reports, we see that you, our hosts, have done much preliminary thinking. Let us appraise it and let us express openly any reservations. For example, maybe we will enquire whether you have extolled the power and advantages of standardization too simply, thereby discrediting your own arguments in the eyes of your politicians and economists who tend to know better than scientists and technologists that: nothing costs nothing.

Moreover, throughout this Survey we must remember that technical standardization and measurement services are certainly far from being the only ingredient for development. However, standardization is needed; it involves planning, adoption, and implementation at all levels of Government by manufacturers and consumers, all in constructive cooperation. Standardization must earn the confidence and the support from the highest in the land and the poorest. No country has yet industrialized, and no country has developed rapidly without strong technical standards programs.

This empirical rule, I believe, has at most one exception: Saudi Arabia, and even that is questionable because credit balances by themselves do not constitute development in my eyes.

So, no progressive Government can afford to neglect the support of standardization and measurement services. There is no longer any reason to suspect that such neglect would be permitted to occur here. But, if Indonesia were to aim to reach its national development goals without the support of this great LIPI program, Indonesia would be in danger of embarking on a well-trodden path strewn only with failures.

So, let this Survey begin and let us hope it will serve the people of Indonesia.

LIPI/NBS SURVEY ON STANDARDIZATION AND MEASUREMENT SERVICES

Address by Leader of the Indonesian Team

by

Mr. Sumantri
Deputy Chairman for Technology
Indonesian Institute of Sciences (LIPI)

On behalf of the Indonesian Steering Committee, I would like to express my appreciation and gratitude to Prof. Didin Sastrapradja and to all of you for your presence here at the opening ceremony of the LIPI/NBS Survey on Standardization and Measurement Services.

A warm welcome and special thanks I would like to extend to our foreign guests, who have come from far away, for their willingness to share their experiences and expertise with us by conducting the joint survey.

It is quite evident that the preparations for the Survey cannot possibly be carried out by LIPI on its own; very much depends on the collaboration and assistance of a great number of other agencies, for which we are truly thankful.

As Chairman of the Indonesian Steering Committee, I would like to thank all the members of the Steering Committee and also all the members of the Organizing Committee for their hard work in making all the preparations for the Survey.

Last but not least I would like to thank also all those who have prepared the working papers for the discussions.

We have organized the Survey in such a way that part of the time will be spent for discussions and another part for visits to various industries, laboratories, universities, and Government officials, the ratio of time allocation being approximately 50 percent to 50 percent. To participate in the discussions we have invited the most knowledgeable people we have for each field, and we do hope all the information concerning our situation can be readily furnished by our Indonesian participants. Of course, it is not at all intended that the discussions will be a one-way flow of information; we do hope that it will be a fruitful exchange of experiences and ideas, for the benefit of all of us.

All of the Indonesian participants do believe in standardization and measurement services, in that they are necessary ingredients to achieve among others the following objectives:

(1) To secure optimum utilization of all financial, material, and human resources in the interest of achieving overall economy.

(2) To ensure an integrated and coordinated development of all industrial, agricultural, and other enterprises, so that at all points of transfer of the products and services from one hand to the other, a minimum of effort is involved.

(3) To ensure interchangeability of all products, which should not only include dimensional interchangeability but also functional interchangeability and adequate reliability.

(4) To maintain a cross-check on unnecessary and wasteful growth of variety of products and practices required for guiding design, construction, and maintenance.

Although we do believe in standardization and measurement services, we feel that our ranks and standing are apparently too low to be able to influence the process of top decision making. In this respect, we do hope that the NBS team might be more successful.

We do not consider this Survey as an end in itself; to us it is just a means of achieving our objective to establish a national system for standardization and measurement services, in which the development of our national capabilities in those fields could be planned and carried out in an orderly, efficient, and effective manner, so that standardization and measurement services could indeed give a valuable contribution to our national development efforts.

The Survey Report, which I think will also contain recommendations for action, we will consider successful if it is able to trigger follow-up actions by our top decision makers, so that the establishment of a national system for standardization and measurement services can become a reality in the near future.

I fully realize that those criteria for success are too demanding, depending a great deal on external factors beyond your knowledge, let alone control. But that is the hard reality of life in which external factors are often decisive for success.

We do hope sincerely that our joint endeavor will be successful. In conclusion, we apologize for the shortcomings you may encounter during your Survey, and we wish you a pleasant stay here in Indonesia.

BIOGRAPHICAL DATA ON TEAM MEMBERS FOR NBS/AID SURVEY

Estrada, Ing. Raul

Ing. Estrada, born in Quito, Ecuador, graduated from the National Polytechnic University in 1963 with a degree in Industrial Chemical Engineering. From 1963 to 1970, he was Director of the Institute of Technical Research of the National Polytechnic University. Since 1970 he has been Director General of the Ecuadorian Institute of Standardization in Quito. He has published around 70 scientific and technical papers in the standardization field, quality control, metrology, industrial safety, and industrial planning.

Gutterman, Mr. Benjamin M.

Mr. Gutterman, born in Cincinnati, Ohio, did graduate work in Chemistry and Food and Drug Law at Georgetown, George Washington, and Howard Universities in Washington, D.C., as well as at the Department of Agriculture Graduate School. For most of his professional career, he has been closely involved in the evaluation and the establishment of domestic and international food standards and food control programs. At present he is Assistant Director for Coordination/Technology, Bureau of Foods, U.S. Food and Drug Administration, Washington, D.C.

Kim, Dr. Zae-Quan

Dr. Kim, born in Kyungki-do, Korea, received his Doctorate degree in Mechanical Engineering from the Munich Technical University in 1961. He has been Vice President, Agency for Defense Development; Assistant Minister for Heavy Industry; and Director General of the National Industrial Standards Research Institute. From 1975 to the present, he has been President, Korea Standards Research Institute.

Littlewood, Mr. William H.

Mr. Littlewood, born in Detroit, Michigan, received a Master of Science degree in Zoology from the University of Michigan in 1949. He was a Fulbright Scholar at the University of Copenhagen in Oceanography between 1953-54, and a Supervisory Oceanographer at the U.S. Naval Oceanographic Office in 1950-53 and 1954-59. He has been Deputy Scientific Attache at the American Embassies in Stockholm and Tokyo. In 1970 he became an Associate Director of the Office of Science and Technology at the Agency for International Development. Since 1976 he has been the Science and Technology Advisor at the AID Mission in Jakarta, Indonesia.

Peiser, Mr. H. Steffen

Mr. Peiser, born near Berlin, Germany, received an M.A. degree in 1943 from St. John's College, Cambridge University, having taken the Natural Sciences Tripos with Chemistry, Physics, Mineralogy, and Advanced Mathematics. In 1957 he joined the National Bureau of Standards first as a guest scientist. Between 1958-61 he was Chief of the Mass and Scales Section and then Chief of the Crystal Chemistry Section, 1962-68. In 1969 he became Chief of the Office of International Relations.

Raufaste, Mr. Noel J., Jr.

Mr. Raufaste, born in Englewood, New Jersey, received degrees in architecture and industrial engineering from Iowa State University. Between 1967 and 1972 he served with a private consulting research firm specializing in economic analysis and program evaluation. In 1972 he joined the National Bureau of Standards, Center for Building Technology, as Federal Building Program Coordinator. His present position is Assistant to the Director of CBT--Program Planning.

Sangruji, Eng. Chaiwai

Eng. Sangruji, born in Bangkok, Thailand, received a Master of Science degree in Chemical Engineering Practice from Massachusetts Institute of Technology in 1957. In 1967 he became Chief Engineer attached to the Thai Under-Secretary of State for Industry. In addition, since 1969 he has been Acting Director, Thai Industrial Standards Institute, Bangkok.

Sangster, Dr. Raymond C.

Dr. Sangster, born in Lyons, Kansas, received a Ph.D. in Inorganic Chemistry from Massachusetts Institute of Technology in 1951. Following associations with M.I.T., Hughes Aircraft, Texas Instruments, and GTE Laboratories, he became Chief of the National Bureau of Standards Electromagnetics Division from 1969-74. Since 1974 he has been at the NBS Boulder laboratories.

Sumantri, Mr. (single name)

Mr. Sumantri, born in Indramayu, Indonesia, received a Master of Science degree in Engineering Physics in 1954 from the Bandung Institute of Technology. Following positions at the Indonesian Ministry of Industry, he held concurrent positions at the Indonesian Institute of Sciences (LIPI): Deputy Chairman of Technology, Director of the National Institute of Chemistry, and Director of the National Research Center. In 1978 he became Chairman, General Assembly, Executive Committee, Indonesian Foundation for the Advancement of Standardization (YDNI).

Woo-Ming, Dr. Rex B.

Dr. Woo-Ming, born in Buxton, Guyana, received a Ph.D. degree in Medicinal Chemistry from the University of the West Indies in 1975. Since 1966, he has been the Government Analyst in Georgetown, through which he is the Principal Scientific Advisor to the Minister and Permanent Secretary of the Ministry of Health, Guyana, in scientific, regulatory, and compliance matters under the Food and Drugs Act and on Forensic Science.

INDONESIAN INSTITUTE OF SCIENCES
NASIONAL INSTITUTE FOR INSTRUMENTATION

KIM

CALIBRATION INSTRUMENTATION METROLOGY

1986

OBJECTIVES

To push, to stimulate and to improve science and technology as the essential basis for the nation development by establishing, maintaining and propogating the Calibration, Instrumentation and Metrology.

(illustration deleted)

INSTITUTIONAL FRAMEWORK

The Government Authority responsible for the KIM Project is the Minister of State for Research of the Republic of Indonesia as stated in the Presidential Decree No. 43 - of 1976.

In carrying out his function - the Minister of State for Research - is assisted by an Advisory Board - consisting of the Minister of State for Economic Affairs, Financial Affairs and Industry/Chairman of the National Planning Body (BAPPENAS), - the Minister of State for Administrative Reform/Vice Chairman of the National Planning Body, the Minister of State/Secretary of State, - the Minister of Public Works and - Electric Power and the Minister of Internal Affairs.

The Lembaga Instrumentasi Nasional - LIN (National Institute - for Instrumentation) will be the - executing institute for KIM under - the guidance of Lembaga Ilmu Pengetahuan Indonesia - LIPI (Indonesian Institute of Sciences).

FUNCTIONS

- To maintain basic units of measurements involving the procurement and custody of national prototypes af all standards.
- To maintain international-traceability of national - prototypes to international units through the international organization.
- To assist regularly agen - cies by providing measurement expertise to public - authorities.
- To support secondary level laboratories which offer calibration services to industry and other organization, to prepare and to - supply Standard Reference-Materials, to maintain and to disseminate up-to-date Standard Reference Data.
- To conduct research and development and coordinate measurement science and calibration technology, offer a consulting service and training facilities in metrology, disseminate information on metrology, measurement techniques and industrial technology.
- To cooperate with other national and international - bodies concerned with scientific and industrial metrology, and offer comprehensive metrology and instrumentation oriented educa - tions and technical training.
- To undertake R&D and - applied development in instrumentation technology - for industrial and scientific purpose.
- To provide facilities for-precision equipment design and manufacture and for precision mechanical, electronic and electrical - engineering.
- To provide tecnical information on instruments and associated equipments.
- To carry out instrumentation contract research and evaluation.
- To assist and promote the establishment of instrument industries in Indonesia.

STRUCTURAL ORGANIZATION

- DIRECTOR
  - Planning & Development Committee
  - DEPUTY DIRECTOR SERVICES
    - AFILIATION DIVISION
      - Industrial Afiliation Section
      - Research Afiliation Section
      - International Relation Section
      - Public Relation Section
      - Technical Information Section
    - TRAINING DIVISION
      - Educational Lab.
      - Training Development Lab.
    - ADMINISTRATION DIVISION
      - Accounting Section
      - Procurement & Supply Section
      - General Affairs Section
      - Personnel Section
  - DEPUTY DIRECTOR TECHNOLOGY
    - TECHNICAL SERVICES DIVISION
      - Electronics Shop
      - Optics Shop
      - Mechanical Shop
      - Glass blowing Shop
      - Mechanical Design Shop
      - Utilities Shop
      - Repair & Maintenance Shop
      - Supply Shop
    - RESEARCH & DEVELOPMENT DIVISION
      - Agricultural Instr.Lab.
      - Industrial Process Instr.Lab.
      - Natural Resources Instr.LAb.
      - Biomedical Instr.Lab.
      - Optics and Precision Mechanical Lab.
      - Analysis Instr. Lab.
      - Electronic Circuitry & Application Lab.
  - DEPUTY DIRECTOR METROLOGY
    - Mechanical Lab.
    - Electrical Lab.
    - Thermal Lab.
    - Optics Lab.
    - Acoustics Lab.
    - Radiation Lab.
    - Differentiated Unit Lab.
    - Materials Lab.
    - Calibration Lab.

SCOPE OF ACTIVITIES

1. METROLOGY - CALIBRATION

MECHANICAL	Mass, length, angle, force, pressure, density volume, fluid flow, acoustics, hardness, vibration and viscosity.
ELECTRICAL	DC, AC, electronics, radio frequency and microwave, time and frequency.
OPTICS	Intensity, illuminations, radiometry.
THERMAL	Thermometers, pyrometers, humidity, thermocouples
MATERIALS	Standard Reference Materials.
DOCUMENTATION	Standard Reference Datas.

2. INSTRUMENTATION TECHNOLOGY

1. INSTRUMENTATION DEVELOPMENT

   Design, develop, repair and maintain instrument. Instrument prototype developments.

2. RESEARCH AND DEVELOPMENT.

   Carry research and development on tropicalized industrial instrumentation. Develop test methods and relevant technology transfer-supervision.

3. CALIBRATION.

   Support secondary level calibration agencies.

4. METROLOGY SERVICE.

   Provide mobile calibration- and consultation services, project development.

5. TECHNICAL SERVICES SHOP.

   Support instrument prototype developments by --- development of fabrication of mechanical, optical, glass, electronics - parts and vacuum technology.

6. TECHNICAL INFORMATION.

   Provide technical information on instrumentation and Standards Reference Data.

7. TECHNICAL ASSISTANCE.

   Provide expert technical assistance to small and medium scale industries and research institutes on instrumentation - trough in-plant technical guidance consulting services.

(illustration deleted)

3. METROLOGY TRAINING

One of the task of institute is to help- another institutes and industries in supplying the instrumentation - and metrology technici- an demands by provi - ding the proper instru- mentation technology - training for technician and engineer levels.

This training in- cludes industrial metro logy, electronic instru ment technology, mecha- nical instrument techno logy, laboratory opera- tion and industrial - standards.

The institute will be come the center of Instru mentation Metrology train ing which will carry out- training to refine and to upgrade the skill and - techniques of proffissio- nal metrologists engaged- in industry, commerce and secondary level calibrati on agencies and research- institutes.

(illustrations deleted)

INTERNATIONAL COOPERATION

The institute will represents the Republic of Indonesia in the various conferences, seminars, symposia and meetings on Calibration, Instrumentation and Metrology

The institute will maintain its close relationship with international organizations such as :

- Bureau of International Weights and Measures (BIPM).
- International Organization for Standardization (ISO).
- International Electrotechnical Commission (IEC)

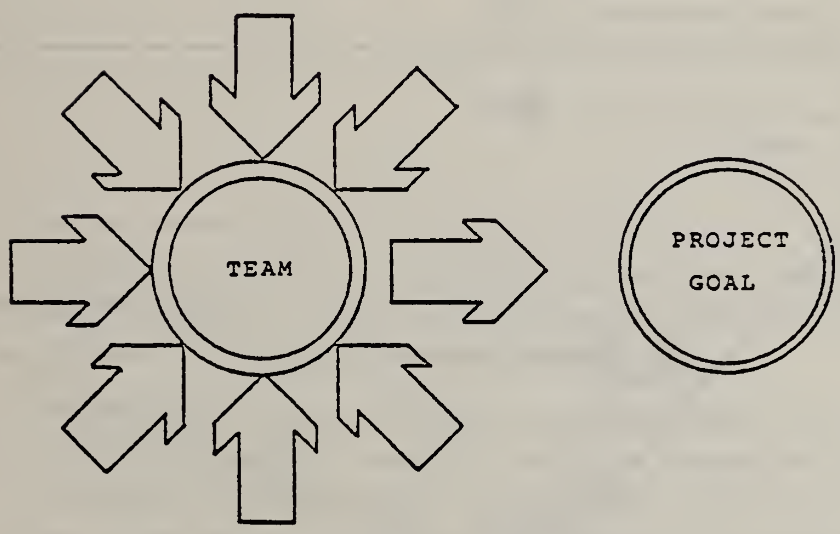
and other national organizations.

INSTITUTIONAL COOPERATION :

- ASEAN Countries
- Physikalisch Technische Bundesantalt, West Germany
- National Measurement Laboratory, Australia.

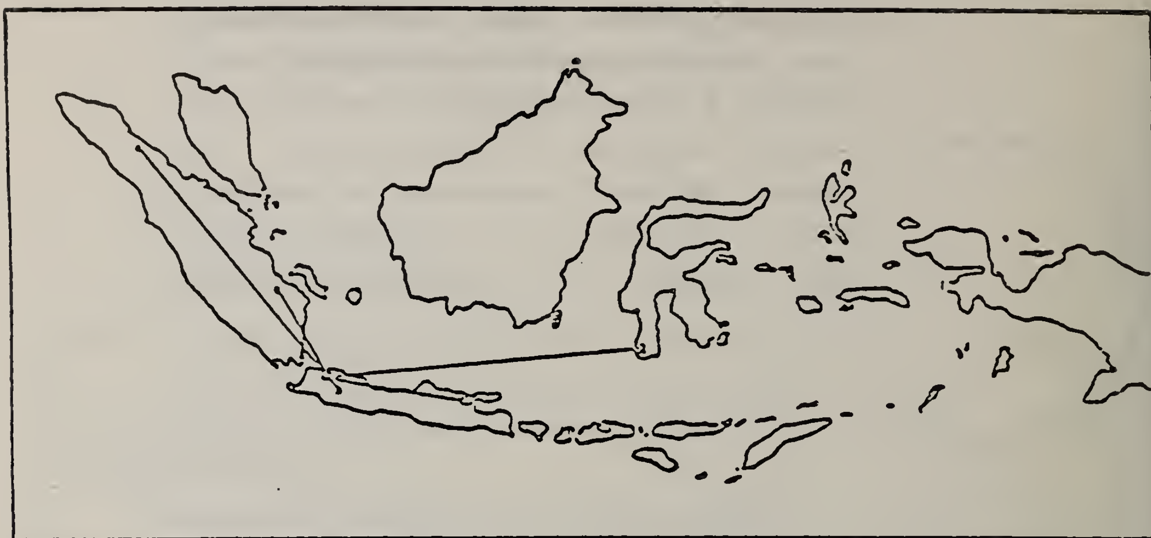
ORGANIZATION

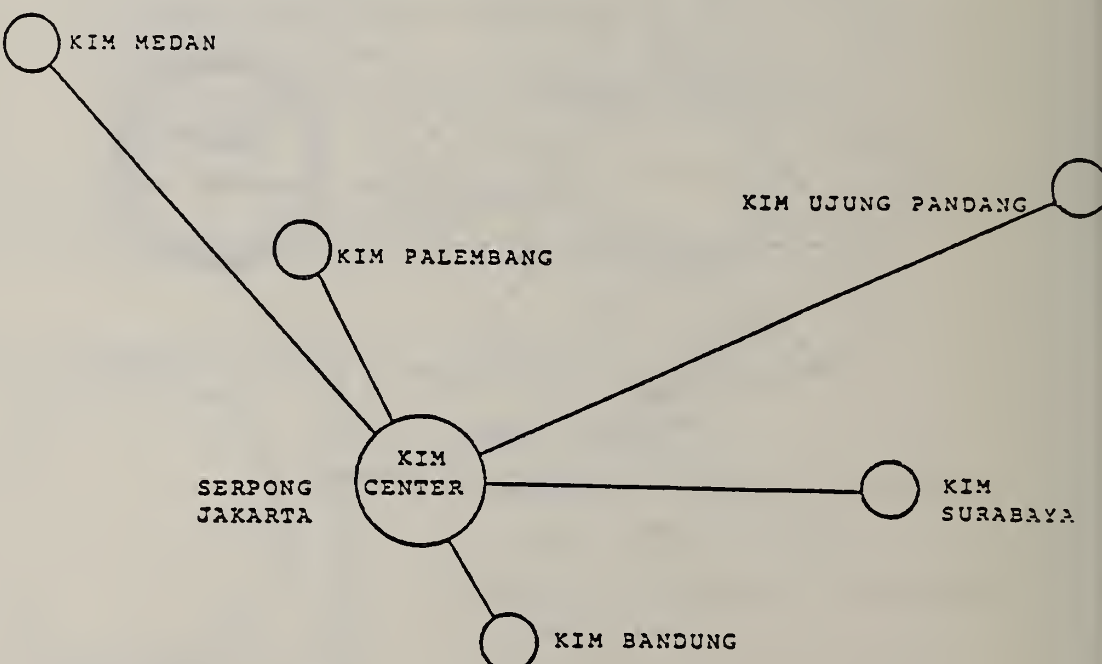
Besides maintaining a structural pattern, this institute is adopting the project - management system under which specialists from various divisions participate in - forming a multidisciplinary research team for the execution of project work. As - needed, external consultants or specialists will be included in the research projects on a contract basis for specific problems.



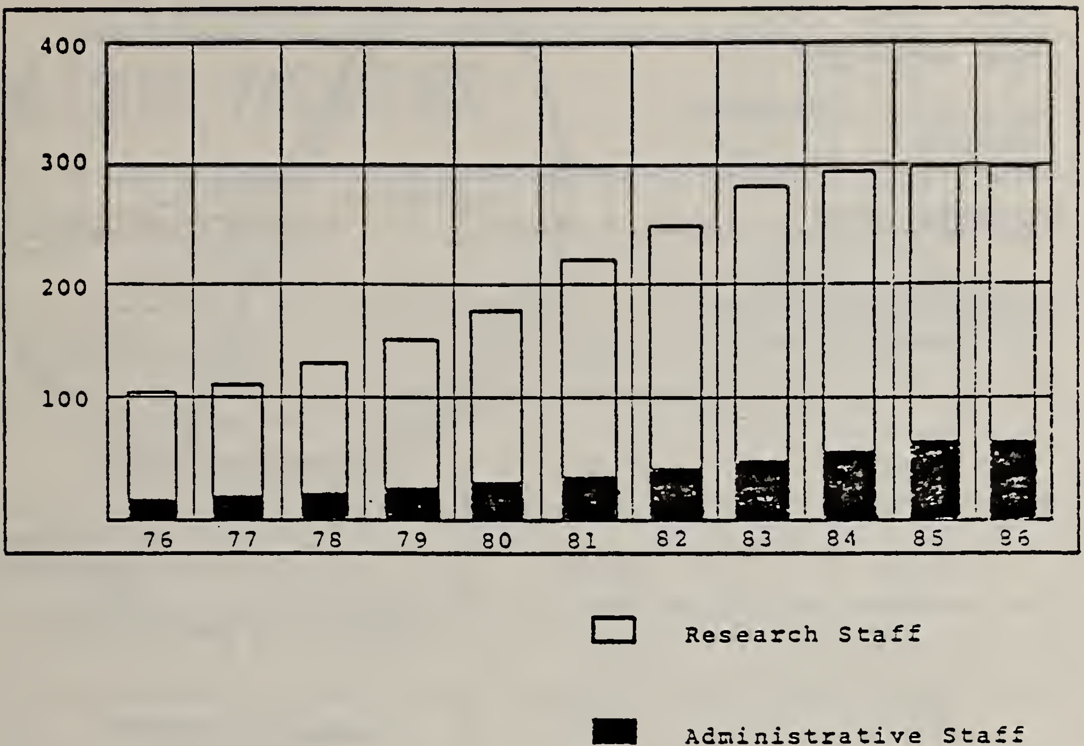
PROJECT MANAGEMENT SYSTEM

KIM SUPPORTS
REGIONAL DEVELOPMENT CENTRES





MANPOWER DEVELOPMENT



By the development of working facilities and well-oriented programme for supporting National Development Programme, the total manpower in 1981 will be 225 and will increase up to 300 in 1986.

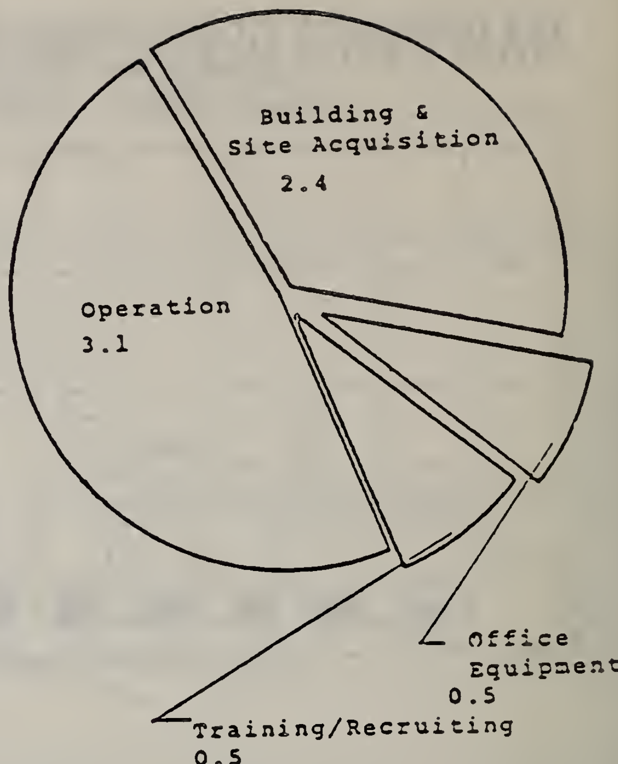
Besides increasing the total manpower quantities, the research staff upgrading will be conducted continuously through formal or nonformal education, for a degree or non-degree programme, in Indonesia or abroad. The training for research supporting personnel will also be considered.

CAPITAL INVESTMENT

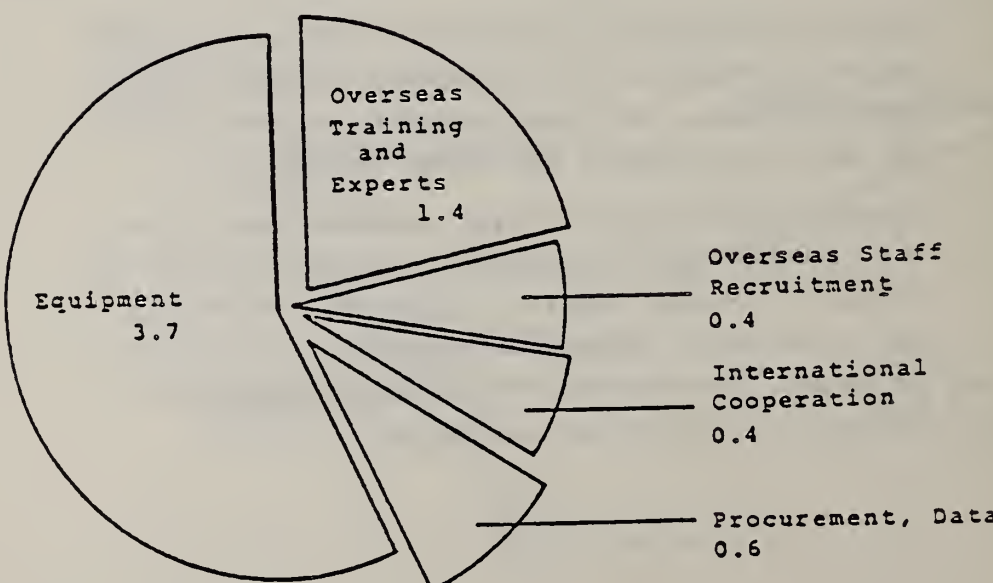
(1978 - 1984)

TOTAL INVESTMENT

- Indonesian Government Funding : Rp. 6,5 billion
- Foreign Aid : US $ 6,5 million
- Existing Investment on Equipment : US $ 1,0 million



DOMESTIC FUNDING



FOREIGN FUNDING

BUILDING FACILITIES

F A C I L I T I E S	PHASE I - 1981 (m^2)	PHASE II - 1986 (m^2)
1. LABORATORIES	4.000	5.700
2. SUPPORTING FACILITIES (SHOPS, LIBRARY ETC.)	5.800	6.000
3. ADMINISTRATION	1.960	1.960
4. O T H E R S	840	940
T O T A L :	12.600	14.600

- Building facilities area will be 20% of the total area.

LIN

NATIONAL INSTITUTE FOR INSTRUMENTATION

1977

I. INTRODUCTION

National Institute for Instrumentation (LIN) is one of technological institute under Indonesian Institute of Sciences (LIPI) which was established by Presidential Decree no. 128 in 1967 and the work programme are coordinated by the Minister of State for Research as mentioned in the Presidential Decree no. 45 in 1974.

In 1965 the Government of the Netherland agreed to give a grant for duration of four years and later in 1970 an additional grant was given for some Calibration equipments.

In 1973 the United Nation Development Programme/UNESCO project aid was signed and a limited aid was given during the last - two years but it is not concluded according the agreement because of the UNDP financial difficulties.

LIN manpower consisting of 22 engineer, 22 Bachelor degree, 60 technicians, administration staff and others of total 130 employees. It is projected that LIN will have about 300 employees - in 1986 to meet the heavy demands on instrumentation support.

II. THE OBJECTIVES OF L.I.N.

The objective of LIN was determined after putting heavy consideration on the need of Indonesia and it's development in the field of general, scientific and industrial instrumentation.

1). to render services to other services institutes, research and development institutes within and outside LIPI, in terms of repair, maintenance, adaptation, fabrication and construction of general, scientific and industrial instruments and to provide facilities for testing and calibration.

2). to provide training courses for technicians and facilities for practical training for professional people in the field of instrumentation.

3). to provide consultation and reliable documentation in the instrumentation field as supporting agency for Governmental and Non-Governmental institutes.

4). to carry out engineering, development and research in the instrumentation field.

5). to promote the establishment of instrument industries in Indonesia.

The urgency of these activities are reflected in the Second Five Year Plan of Indonesia, REPELITA II, chapter XXIII para III.3.e. :

"Development of a national system for Calibration, Instrumentation and Metrology. In pace with the ever increasing research and development activities in the fields of communication, mining, agriculture, industry and other fields, which require the use of scientific equipments (instruments), it is necessary to have facilities for calibration, maintenance and quality improvement of scientific instruments. These activities are necessary to guarantee the quality of a product. Therefore, efforts to maintain, repair, to calibrate and to improve the quality of instruments, requires special attention. The same holds true for metrological equipments, and precision measurement can only be achieved by improving the quality of the equipments".

The programme have been designed as national priority and is being implemented as National Research Programme number 5.2. :

"Development of a national system for Calibration Instrumentation and Metrology, executed by LIPI which will act as a centre for systems management, in cooperation with other institutes concerned".

III. L.I.N. SUPPORTING ACTIVITIES.

The experience of LIN after the establishment in 1967 have shown its results in the last three years, evenso it is still felt some constraints in the technical capabilities, equipments, and other facilities including working floor space.

The development of LIN can be divided in five stages :

1961 - 1967	:	Institutional establishment preparation
1967 - 1969	:	Physical establishment, building.
1969 - 1971	:	Internal skill and technical training.
1971 - 1973	:	External technical training and outward looking trial.
1973 -	:	Move-out and development stage.

The move-out development stage is the crucial point which will reflect whether LIN could survive and develope further to fulfil the stated objectives.

The work done by LIN is directed to the short term needs of the country which will help to evercome instrumentation difficulties in the wide sense. Evenso intermediate and long-term needs can not be neglected looking at the development of Indonesia.

A. SUPPORTING ACTIVITIES IN THE MEDICAL SECTOR :

The Government medical care policy will not only stress to the city hospitals but also to the rural area (PUSKESMAS - Public Health Centre). The situation of the medical equipment, in most hospitals, are not very well kept and lack of services. But we can find also very sophisticated and modern instruments among the very old ones which still operating. Looking at this situation LIN take full attention to the problem.

Repair and Maintenance :

LIN has already done on repair and maintenance job at several hospitals mostly in major cities. This is done so, because LIN has lack of manpower and mobility.

The approach to solve this problem can divided in two parts :

- forminor repair and maintenance LIN is trying to train the hospital technicians the job training at the hospital itself.
- for major repair, maintenance and sophisticated instrument LIN will sent qualified technicians by coming down to the hospitals on requests or on regular basis.

Some activities that LIN has already done are making and designing medical apparatus on request, such as; cardio period counter, heart-rate meter, cassette recording heart-rate meter, and several accessory of medical instruments. Most of these instruments are made for Department of Health and Nutrition Research Institute.

Medical glass apparatus for laboratory use are also made by LIN on their request.

Some of LIN's technicians have followed courses and even sent abroad for services training in the medical fields sponsored by Hospitals or Department of Health.

In calibration work;LIN are calibrating medical instruments such as blood pressure meter, thermometer etc. But we feel we could not meet all the demands because of LIN's limited cali bration facility and capability.

B. SUPPORTING ACTIVITIES IN THE AGRICULTURAL SECTOR :

More than 82% of the population are living in the rural area as farmers and most of them are in Java. Because rice is the main food, the Government policy having buffer stock as a system to stabilize the rice price will have Consequences, i.e. to increase to rice product and it will reflect that technology must support this policy.

LIN has taken part in design system and have made simple equipment, such as :

- rice moisture meter; it will be useful for transaction activities between producers (farmers) and the consumers (the Government),
- rice quality tester to measure the procentage of unfilled rice,
- instrument system design for rice bulk storage (3,5 ton storage) to monitor and to control temperature, moisture contents, relative humidity, etc.
- for other commodities LIN is active of making instruments for tea, rubber, wood, quinine product, etc.
- repair, maintenance and calibration of the above mentioned physical quantities,
- sugar factory instruments : there are more 56 sugar factory owned by private or the Government and there will be new factories built in the comming year. Most of these factories were built at the beginning of this century which means rehabilitation and services are needed. LIN also taking part in joining the installation and testing of instruments of the new factory.

C. SUPPORTING ACTIVITIES IN THE IRRIGATION SECTOR :

There are two kinds of irrigation system used in Indonesia, by using river water and the 'tidal system'. To increase the rice product, optimation of the irrigation must be done effectively and the Department of Public Works is responsible for this development. LIN takes part actively in this field by using up-to-date methods, which instruments as a tool have shown its superiority :

- river water level recording system. LIN takes part actively in three places in West Java in designing the system, making prototype, installation and testing of sensors, transmission, receiver station and the recording,

- 'tidal system', new area is opened along the coast in south and east Sumatra and also some part of Kalimantan. The task of collecting data's is done by LIN and ITB and LIN provides also repair, maintenance, and calibrati on of the measuring equipment,

- soil and ground water equipment is also made to support the Directorate for Water Research - Department of Public Works,

- flood warning system and centre monitoring system is one of LIN research activity which LIN hope could support Department of Publio Works in this matter.

D. <u>SUPPORTING ACTIVITIES IN THE TRANSPORTATION SECTOR</u> :

The rehabilitation of economic roads through out Indonesia is done by Department of Public Works. LIN take part in repair, maintenance and calibration of the instruments. Some instruments have been made for checking the road quality;

- road deflection tester. This instruments is needed to determined the quality of road.

E. <u>SUPPORTING ACTIVITIES IN THE EDUCATIONAL SECTOR</u> :

The Government education policy is stressed to overcome - the un-employment situation. Especially for the lower and intermediate skilled people. Supporting technical school is one of the main effort and for this, 'educational instruments' are needed. LIN has also done some training for the instructors and has made quite amount of educational equipment. A join project is being carried out with the Department of Education to solve this problem :

- modul system for electric and electronic training system including instruction book in 'Bahasa Indonesia';

- training equipment such as; low frequency oscillator, TV training set, power supply, etc.

- industrial process simulator for the University and technician training,

- glass apparatus for laboratory uses,

- lenses, prisms and mirrors for laboratory uses.

F. SUPPORTING ACTIVITIES IN THE SMALL AND HOME INDUSTRIES SECTOR :

In the rural area most people are still working in a very small industry to meet their own rural need bricks, pottery and woodworking, etc.

To increase the production and the quality, effort must be made to introduce simple instruments without neglecting their technical acceptance and their culture. It is not an easy approach and special attention must be considered in this matter.

This is one of LIN aim to introduce simple instrument - with full financial back-up by LIN (the Government or bilateral assistance). This kind of horizontal transfer of technology to rural area is very important and will directly boost the rural technology, for example : simple thermometer, pressure indicating instrument, etc.

G. SUPPORTING ACTIVITIES IN THE INDUSTRIAL SECTOR :

The industrial sector can be divided in three groups, looking from the instrumentation point of view :

1). the new factories (less than 5 years), foreign companies are still have reliance on their after sale services or to their mother organization,

2). small industries mostly owned by private have no backbone support for the system design, maintenance, repair and calibration,

3). old industry, established before Second World War, need rehabilitation and lack of instrument know-how from all aspects.

IV. LIN RESPONSIBILITY AND ITS DEVELOPMENT.

Although LIN has a cross-sectoral function but as a research and development institute should have a capability and responsibility to develope the instrumentation know-how and skill as a national institutes. This institute is supposed to be a centre for vertical and horizontal of transfer technology in the field of instrumentation. This means a certain capabilities should be there to give a real meaning to support the development of this country.

A. LIN AS COORDINATOR AND CENTRE OF NATIONAL CALIBRATION NETWORK :

LIN is responsible to establish a national network for calibration with cooperation of the existing institution who have a capability for calibration. This approach is taken because the limited capability and mobility of LIN to meet the demand for calibration.

It is the aim of LIN that LIN will have the highest and complete physical standard in Indonesia so others could refer their working standard to LIN. And LIN standard will have the international traceability, but it does not mean that LIN will have the national primary standard for the time being, but as a country which a geographic situation like Indonesia someday it is a must.

In the network system LIN will be responsible for the daily running of the calibration network including administrative, having professionals staffs, to maintain relation among centres and to the users and to arrange inter-laboratory checking and international traceability.

B. TRAINING COURSES :

From the Unesco survey on the demand for Instrumentation technicians there still work to do to fulfil the need. Because of this reason LIN has already started giving training in the factories itself and also at LIN. The training is done for three level, for the staff member, for the repair and supervisor technicians and operators.

LIN have also done several courses on request based on special topics to their need.

C. REPAIR AND MAINTENANCE :

As seen above that LIN activity has cross-sectoral function there is no doubt, that this division should be the main activity and should be extended to fulfil the demand.

D. ENGINEERING, DEVELOPMENT AND RESEARCH :

Until right now most of the R & D activities is done on request for several Government Department and some industries which are usually shortterm engineering projects. Not only hard and software R & D work is done but also consultancy for instrumentation is already coming in to LIN which will increase in the coming years.

E. INSTRUMENTATION DOCUMENTATION CENTRE :

To support the consultancy activity LIN should have a reliable documentation and have strong relation to other institute abroad. This activity is just started few years ago and still progressing and need much aid and support.
For point 2 and 3 LIN will take part very active to overcome their difficulties. The manpower and mobility of LIN is one of the reason which LIN could not fulfil yet. For point 1 LIN is trying to do for minor repair to minimize the dependancy to foreign country, to support the Government ballance of payment policy.

H. SUPPORTING ACTIVITIES TO RESEARCH AND DEVELOPMENT INSTITUTES :

Most of the R & D institutes are located in Bandung and Bogor. And there are several R & D institutes in other area throughout Indonesia.

Because of the weaknesses in the instrumentation knowhow, maintenance and repair capabilities, the need for support was already felt many years back. LIN takes full effort to support them mostly in Bandung and Bogor.

Several special instrumentation on request are already made ;

- fuel rod control for the Atomic Reactor in Yogyakarta,
- periscope design for Atomic Reactor in Bandung,
- ground water pressure meter for the Department of Public Works,
- some electric testing apparatus for Power Research Institute in Jakarta.
- etc.

V . L.I.N. ORGANIZATION

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15. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

16. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

At the request of the Indonesian State Minister for Research and Technology, the National Bureau of Standards conducted a two-week survey of standardization and measurement systems in support of industrialization. Financial support was shared between the Agency for International Development and the Government of Indonesia. Coordination by the Lembaga Ilmu Pengetahuan Indonesia (Indonesian Institute of Sciences) and the U.S. National Research Council was provided. There were six topics of specialization: (1) Food and Food Safety, (2) Building and Construction, (3) Quality Control in Industry, (4) Safety Standards, (5) Calibration, Instrumentation, and Metrology, and (6) Industrial Measurement Techniques. In the executive summary the appraisal of the existing systems for standardization and measurement is coupled with recommendations. A background section is followed by one with the Indonesian specialists' assessments of needs and opportunities. The itinerary details about 80 visits and discussions of team members, and there is a concluding section with general remarks. Indonesia has immense human and natural resources. With a capable infrastructure in standardization and measurement (among other requirements), development could become rapid and very successful.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Calibration;development;Indonesia;industrialization;instrumentation;less developed country;metrology;standardization;third world.

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