Chapter 2 Export Inspection System in Japan

An export inspection system has been implemented in Japan for the past 35 years and has contributed greatly to ensure quality of exported goods in Japan. The following a the brief history of the system.

After the defeat suffered in World War II, it was vital for Japan in its effort to achieve reconstruction to pursue promotion of exports and an increase in foreign exchange earnings. In order to achieve sound growth of exports, and in order to upgrade the reputation of Japanese export goods, the Export Control Law was enacted in 1948. This law, trusting in the sense of business ethics of exporters, expected such traders to correctly evaluate their own commodities and correctly indicate the grade levels of similar products even without national inspections to identify these.

However, it became evident that this law was not sufficient to prevent the export of inferior quality goods, being affected by the insufficient quality consciousness which prevailed at home and abroad at that time. This was partly a result of the working of the law itself which allowed the export of low quality goods provided that their low grade was clearly indicated.

The law was then reformed several times in order to improve and strengthen its application. In 1956, however, the incident of Japanese fountain pens exported to Peking which did not write, caused great damage to the international reputation of Japanese goods. This incident acted to focus and reinforce criticism of the Export Control Law and a fundamental reform in it was demanded in order to improve the reputation of Japanese goods.

It was against the above background that the Export Inspection Law was enacted in 1957, which stated that goods which did not pass the official inspections implemented by government bodies or by inspecting bodies designated by the government would not be allowed to be exported, listing 436 items which were to be covered by these export inspections. Subsequently, with the expansion in Japanese exports, the number of items designated increased and has exceeded 500 items at its highest point.

The main characteristics of these export inspections are 1) they are compulsory by law, 2) the inspection standards establish minimum levels for product quality and items must be above these levels, 3) if items do not pass the inspections, export will not be allowed. Since export is not permitted for items failing to pass inspections,

Japanese firms undertook the promotion of in-house product quality control activities, and directed efforts towards the development of products, production management and in-house inspections, etc. As a result the Exports Inspection Law contributed to upgrading the quality of Japanese exports and so in turn produced a considerable expansion of export performance.

By the late 1960's the quality of Japanese products was recognized throughout the world, and thereafter items were gradually released from the inspection obligation with the exception of a small number of export items. By the late 1980's the law had almost terminated its function.

The outline of the export inspection system executed in Japan is as follows (as of 1987).

(1) Aim

The aim of export inspections was to secure the desired quality level of exports, and to improve the reputation of Japanese products on international markets as part of the overall policy to promote Japanese exports.

(2) Legislation framework for the system

The Export Inspection Law is the core legislation for execution of the system. The Export Inspection Law has many derivative rules and regulations. Among them there is the Cabinet Order Specifying the Items Requiring Export Inspection. The designated commodities prescribed by the Order should not be exported unless they are found to be in conformity with the standards for the inspection of quality (including those of packaging conditions) laid down in the other derivative law of the Export Inspection Law – the Ministerial Ordinance Specifying Export Inspection Standards. Other relevant orders and ordinances are shown in Table A5-2-1.

(3) Products concerned

Items for inspection were chosen from among those meeting the following conditions.

1) Items having a large export volume or export value.
2) Items for which complaints from the importing countries were frequent, and items for which a minimum quality level was important for the promotion of exports.

3) Items whose quality levels needed to be coordinated and for which a policy of promotion of future exports was to be established.

Items for inspection and ratio of designated commodities to the total export amount are shown in Table A5-2-2. The export sum of those designated commodities accounts for 5.7% of the total sum of exports in 1985. In contrast with the figure of 45% in 1965 indicating the same proportion.

The designation is canceled when the item reaches a certain level to be recognized as high in quality. In other words, in cases where there is very little probability of failure, that is, when 100% of the items have passed the inspection for three years continuously, the said items are excluded from the designated commodities list. Or, the designation is canceled when the number of said items becomes too small to be exported.

(4) Type of inspection system

Export inspection is inspection compulsory by law carried out by government bodies or other inspection agencies which are designated. Products to be exported must pass these inspections. The basic method of inspection is lot inspection.

There are four types of inspection in export inspection which are as follows:

1) Inspection of Quality
2) Inspection of Materials (mainly for textiles)
3) Inspection on the Design and on the Process (for sea vessels)
4) Inspection on Packaging Conditions (silk fabrics, bolting cloth, rayon fabrics, etc.)

(5) Export inspectors

The inspecting personnel carrying out the export inspections are required to meet specified qualifications and are civil servants or accorded the same treatment. The qualifications as an inspector are precisely provided by the Regulations Specifying Standards for Designated Testing Organizations for each item.

The export inspectors are required to register their names and other required matters in the Registration Book of the Ministry concerned. Besides possessing knowledge of inspection, the inspectors should have enough experience. In this respect, inspectors in private institutes were used to be trained by the government

inspection organization, and used to have a joint meeting among the institutes to exchange information and techniques on export inspection. Presently they are undertaking inspections on an on-the-job training basis.

(6) Indications

Labels, etc., are attached to products which have passed the export inspections as proof of approval.

(7) Inspection standards

The level of standards for each item is set with detailed and careful consideration of commercial practices overseas, living standards overseas, safety and sanitary factors overseas and industrial technical standards in Japan based on the purpose of the Export Inspection Law. To this extent the standards for export inspection have a close conformity with the Japanese Industrial Standards (JIS) and Japanese Agricultural Standards (JAS).

Inspection standards as a rule should be the same for all items regardless of to where the items are being exported. However, when it is deemed to be especially necessary to maintain good reputation of the designated commodities in certain areas, the competent Minister can establish standards higher to only such specified items and areas.

(8) Inspection organizations

The export inspections are executed by both government and private authorized institutes. The government organizations are,

1) International Trade and Industry Inspection Institute,
2) Agricultural Standard Inspection Office, and
3) Transportation Bureau,

each with many branch offices all over Japan. These branch offices are usually located near export ports and have qualified inspectors who are ready to undertake inspection for the proposed items either at the offices or at the manufacturing or collecting places for the said products. In accordance with the policy of the government to let export inspection be conducted under private sectors, by 1974 almost all the designated commodities were arranged to be inspected by the authorized private institutions.

Thus government organizations undertake export inspection only which:

1) concerns silk products, which have had a long history of inspection by the government;
2) concerns commodities for which inspection costs are high, such as machines, instruments, and other equipment; or is considered to be too much of a burden for small manufacturers (textiles);
3) is not executed frequently (agricultural products);
4) concerns products for which the inspection needs to be done at locations spread over the country (agricultural products, vessels, etc.).

The agencies carrying out the export inspection works are chosen for each item concerned in accordance with the conditions laid down by the supervisory authorities. Except the above cases, all export inspection is undertaken by private inspection institutes. The number of authorized private institutes by the field is as follows:

1) Machinery & metals	5
2) Light industries	10
3) Textiles	14
4) Agriculture and fisheries	3
Total	32

Each private inspection institute is required to be completely independent of private industries. In this regard each institute is required to report the following to the competent Minister.

1) Operating rules
2) Operating plans, receipts and expenditure budget
3) Assignment and dismissal of officials and inspectors

A manufacturer must request an export inspection 48 hours before he wants the export inspection to be undertaken. The inspection institutes, upon the request, must perform and finish the export inspection on the requested date, except when there is justifiable reason for the delay.

(9) Inspection fees

The expenses incurred in carrying out of export inspections are borne by the applicant.

The amount of the fee (in case there are two or more inspections to one designated commodity, the sum of the fees required for two or more inspections) to be fixed by cabinet order, shall not be more than one hundredth (1/100) of the export value (FOB) of the designated commodity. The actual average fee rate in 1986 was 0.36% of export value as shown in Table A5-2-3.

(10) Government support for operation of inspection agencies

To assist the financial status and to strengthen the technical capability of the inspecting institutes the government assigned subsidies of purchasing and installing the inspecting instruments from 1957 to 1975.

Figures A5-2-1 through A5-2-6 show the export volumes and failure rates for a number of representative items among those subject to the export inspections in Japan.

Chapter 3 Rationalization and Acceleration of Standards Formulation making use of OA Equipment

The following is the formulation procedure of the Japanese Industrial Standards (JIS):

(1) Research and study

Research and study work as to the subject and the procedure for standardization of certain items is commissioned to private sector organizations from the Government along with the Industrial Standards Commission program.

(2) Drawing-up of JIS drafts

The Government annually commissions some 200 requests to relevant organizations in the private sector, such as the Japanese Standards Association (JSA), industrial associations, academic associations, etc. to draw-up drafts for JIS standards. These private organizations hold committees five to ten times a year to deliberate the drafts. The committees consist of representatives of manufacturers, users and academic experts. In the past, most draw-up drafts were described in hard-copies. However, in the last few years, more drafts have been presented in form of floppy disks being in-putted by word processors along with development and diffusion of OA equipment.

(3) Deliberation of JIS

The drafts of JIS drawn-up by the relevant private organizations are deliberated by a specialized committee set-up in respective committees-in-charge in the Japanese Industrial Standards Committee (JISC). After passing the specialized committee, the drafts are further deliberated comprehensively by the committee-in-charge.

Both the results of deliberation by the specialized committee and the committee-in-charge are added, deleted or amended in the floppy disks presented by the private organizations.

(4) Formulation of JIS

After passing the deliberation by the committee-in-charge, the drafts are usually reported from JISC to the Minister who publishes official gazettes defining the title and number of JIS as well as whether such JIS is formulated, amended, confirmed

or withdrawn together with its date.

(5) Publication of JIS standards cards

Since contents of JIS are not mentioned in the official gazettes, JSA prints and publishes the JIS Standards Cards by commission of the Government. In this case also, the same floppy disks prepared at the drafting stage are used with conversion by MS-DOS, if necessary, before the printing procedure.

Thus the use of floppy disks contributes greatly to the rationalization and acceleration of the standards formulation procedures. It is expected to have word processors and floppy disks used 100% in the future.

Chapter 4 JIS MARK PERMITTED FACTORIES BY MAIN PRODUCTS (AS OF THE END OF MARCH, 1992)

Name of Product	
Ready-mixed concrete	4,202
Centrifugal reinforced concrete pipes	1,276
Concrete blocks for retaining wall and revetment	798
Hollow concrete blocks	301
Reinforced concrete manhole blocks for sewerage work	220
Reinforced concrete gutters for roadside	184
Corrugated shipping containers	148
Corrugated fireboards for shipping containers	138
Reinforced concrete pipes	127
Pretensioned spun high strength concrete piles	118
Pressed cement roof tiles	108
Reinforced concrete flames	107
Clay roof tiles	101
Crushed stone for concrete	86
Low carbon steel wires and barbed wires	85
Zinc hot dip galvanizing	85
Polyvinyl chloride insulated flexible cords	72
Steel pipes for structural purpose	72
Wall coatings for textured finishes	70
Prestressed concrete beams for bridges	69
Rolled steel for general structure	68
Reinforced span concrete piles	67
Steel bars for concrete reinforcement	57
Sub-total	8,559
Others(Total of 870 kinds of products	7,834
Total	16,393

Source:JSA

Table A5-2-1 LEGAL FRAMEWORK OF EXPORT INSPECTION SYSTEM IN JAPAN

The Law	Cabinet Orders	Ministerial Ordinances
Export Inspection Law	1) Execution Order for the Export Inspection Law	1) Execution Regulations for the Export Inspection Law
	2) Cabinet Order Specifying the Items Requiring Export Inspection	2) Ministerial Ordinance Specifying
	3) Cabinet Order Specifying Export Inspection Fees	a) Export Inspection Standards, etc.
	4) Cabinet Order Specifying the Date of Execution for the Export Inspection Law	b) Product Areas
	5) Cabinet Order Concerning the Export Inspection and Design Promotion Council	c) Export Inspection Standards, etc. for Category 1 Agricultural, Fishery, and Forestry Products
		d) Product Areas for Category 1 Agricultural, Fishery, and Forestry Products
		e) Product Areas for Category 2 Agricultural, Fishery, and Forestry Products
		f) Export Inspection Standards, etc. for Medical and Pharmaceutical Products
		g) Export Inspection Standards, etc. for Ships, etc.
		h) Product Areas for Ships, etc.
		3) Regulations Specifying Standards for:
		a) Designated Testing Organizations
		b) Designated Testing Organizations for Standards for Grades of Plywood, etc.
		c) Designated Testing Organizations for Frozen Fishery Products, etc.

Table A5-2-2 CHANGES IN NUMBERS OF DESIGNATED COMMODITIES FOR EXPORT INSPECTION

Year	Machinery & Metals	Light Industry	Textile Products	Agriculture & Fishery Products	Chemical Products (Reagent)	Medical Products	Transports Products	Total	Export of Designated Commodities in Percent of Total Export Sum
1959	188	96	52	45	68	4		436	
1960	187	99	52	46	68	2		453	
1961	193	99	52	46	68	2		454	
1962	197	104	52	46	68	2		460	
1963	198	104	52	46	68	1		469	
1964	221	111	52	46	68	3		470	
1965	222	113	52	46	62	3		501	45
1966	225	113	53	46	62	2		498	
1967	225	114	53	46	61	2		501	
1968	218	114	53	46	61	2		499	30
1969	218	113	53	45	61	2		492	30
1970	202	113	53	45	61	2		492	30
1971	196	108	53	45	61	2		471	24
1972	196	81	46	40	61	2		426	21
1973	196	82	45	37	61	2		423	20
1974	192	76	43	34	61	2		408	17
1975	123	74	43	31	61	2		334	14
1976	120	73	43	29	61	2		328	14
1977	113	73	43	29	38	2		298	9.9
1978	105	73	43	29	38	2		290	10.3
1979	92	67	41	26	(1) 34	2		262	10.1
1980	75	60	41	26		2		204	10
1981	65	57	41	25		2	(2) 4	194	9
1982	59	56	41	25		2	4	187	9
1983	56	51	40	23		2	4	176	7
1984	51	37	40	21		1	4	254	7
1985	46	34	38	17		1	4	140	7
1986	40	32	36	16		1	4	129	6.2
1987	35	29	34	16		1	4	119	5.7

Notes: (1) Number of designated products were decreased as product quality graded up to satisfactory level.
(2) Transports products have been classified as one group separated from the group of machinery and metals since 1981.

Source: MITI White Paper, Japan

Table A5-2-3 EXPORT PERFORMANCE AND INSPECTION FEE RATES (1986)

(Unit: 1,000 yen)

Inspection by:	Government Inspection Organizations				Authorized Private Inspection Institutes				Average Free Rate		
	Name of Inspection Organization	Export (A)	Free Revenues (B)	Free Rate (%) (B)/(A)	Number of Institutes	Export (C)	Free Revenues (D)	Free Rate (%) (D)/(C)	Export (E)=(A)+(C)	Free Revenues (F)=(B)+(D)	Free Rate (%) (F)/(E)
Machinery & Metal Products	International Trade & Industry Inspection Institute	8,937	32	0.36							
		22,393,332	28,460	0.13							
	Bureaus Transportation				6	957,301,350	4,090,484	0.43			
									979,703,619	4,118,976	0.42
Light Industry Products	International Trade & Industry Inspection Institute	120,852	665	0.55	11	183,817,565	806,376	0.44	183,938,417	807,041	0.44
Textile Products	International Trade & Industry Inspection Institute	50,328,912	29,023	0.06	14	405,001,011	901,686	0.22	455,329,923	930,709	0.2
Agriculture & Fishery Products	Agricultural Standard Inspection Office	36,628,301	76,534	0.21	3	89,510,313	384,329	0.43	126,138,614	460,863	0.37
Total		**109,480,334**	**134,714**	**0.12**	**34**	**1,635,630,239**	**6,182,875**	**0.38**	**1,745,110,573**	**6,317,589**	**0.36**

Source: Export Inspection Handbook, MITI, 1988, Japan

Figure A5-1-1 STANDARDIZATION FOR PROCUREMENT BY THE GOVERNMENT AND PUBLIC AGENCIES (THE CASE OF SOUTH KOREA)

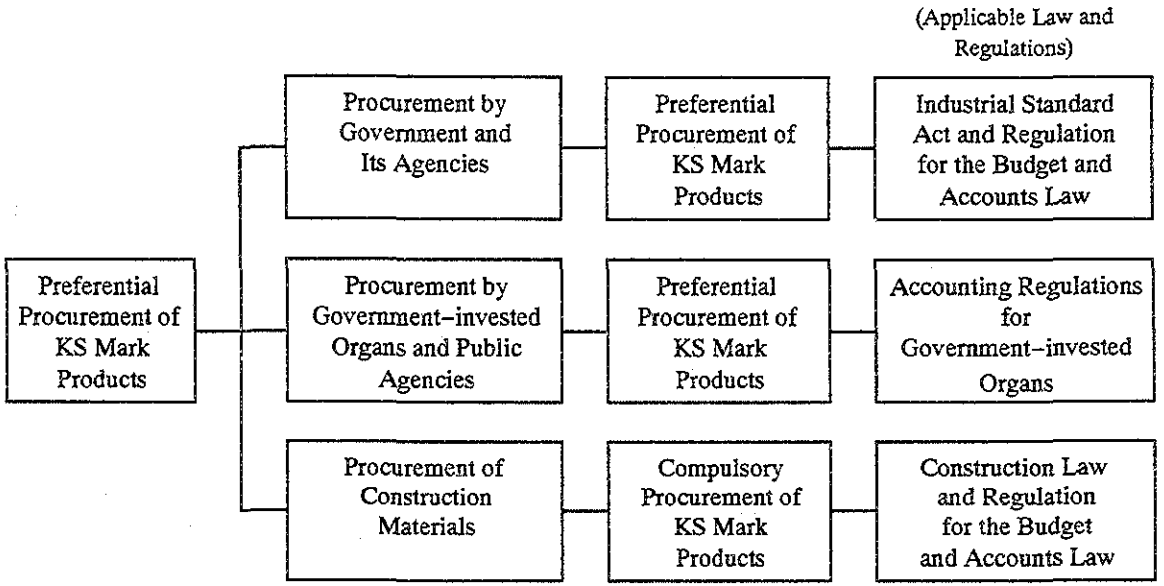


Figure A5-2-1 CHANGE IN REJECTION RATE AND NUMBER OF PRODUCTS INSPECTED IN JAPAN: CUTTING PLIERS

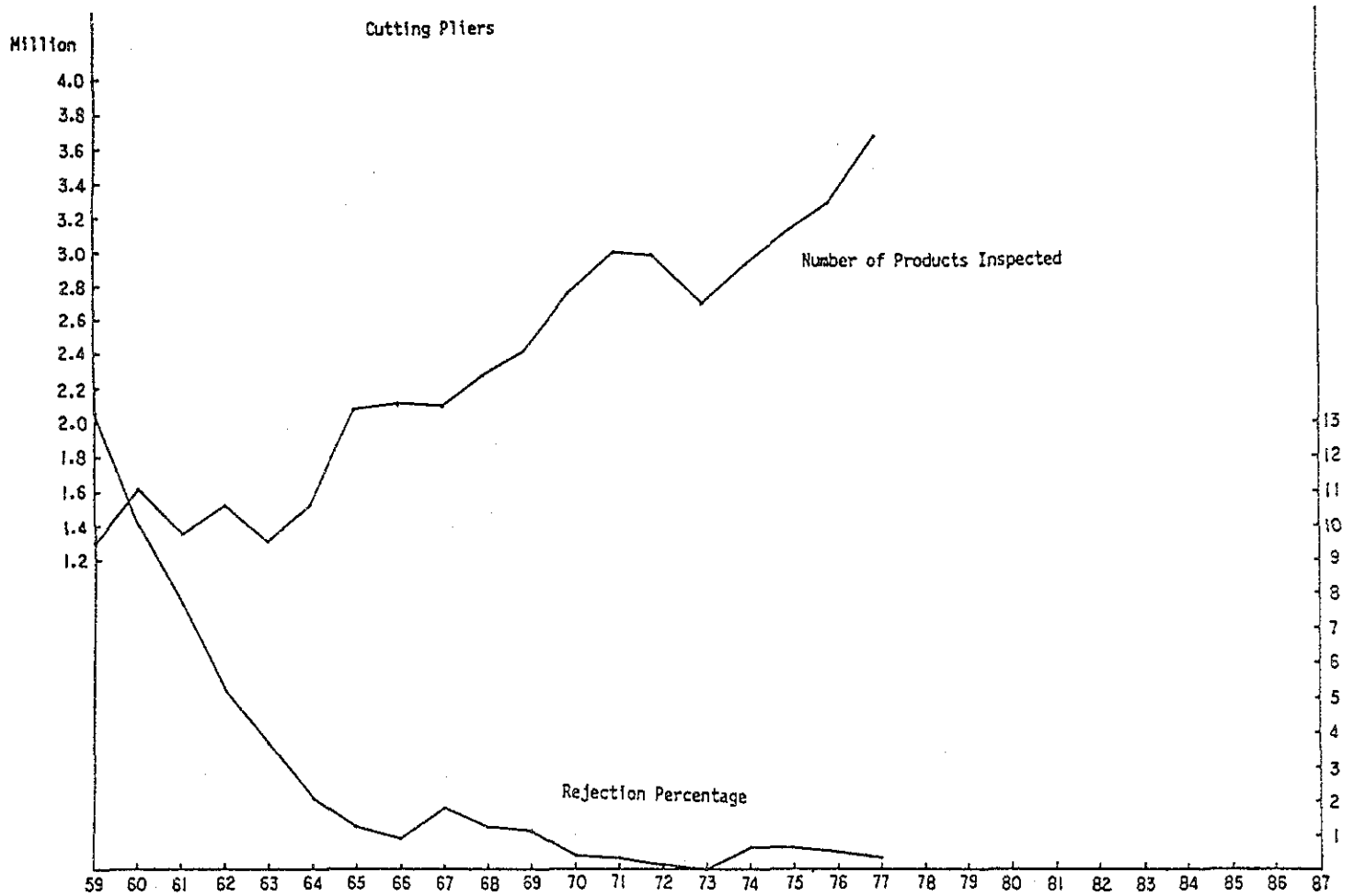


Figure A5-2-2 CHANGE IN REJECTION RATE AND NUMBER OF PRODUCTS INSPECTED IN JAPAN: CONE SPEAKER

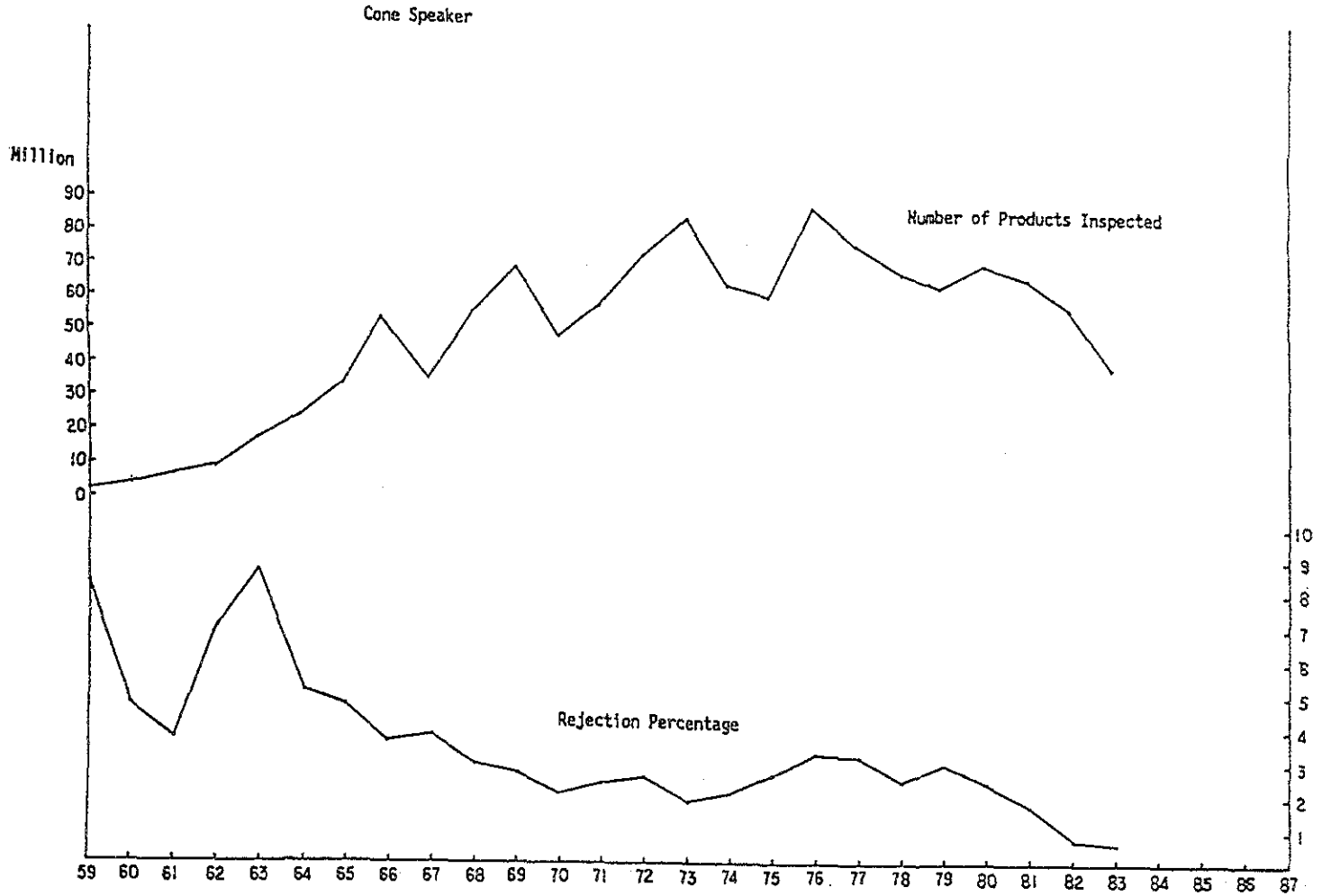


Figure A5-2-3 CHANGE IN REJECTION RATE AND NUMBER OF PRODUCTS INSPECTED IN JAPAN: LATHE

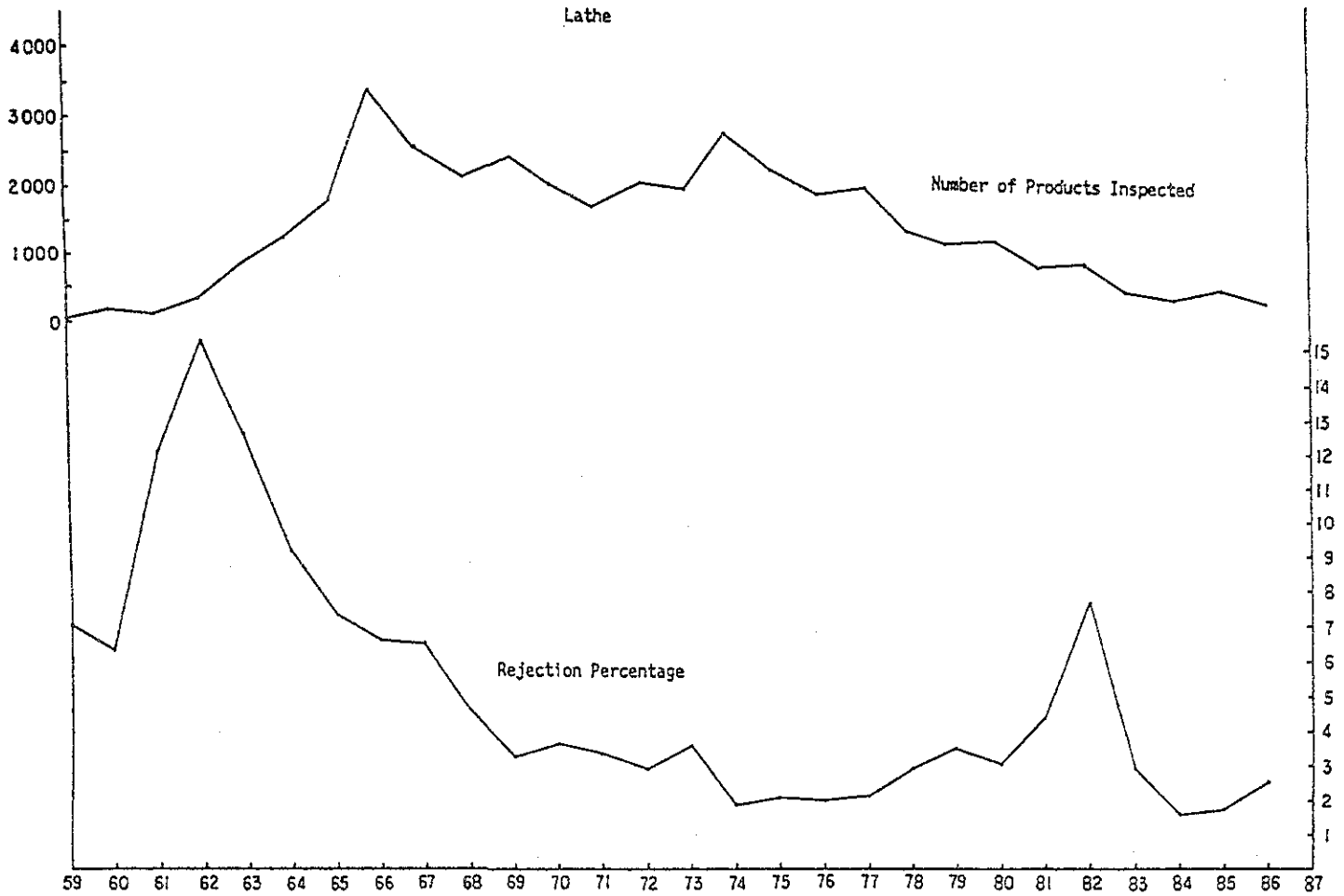


Figure A5-2-4 CHANGE IN REJECTION RATE AND NUMBER OF PRODUCTS INSPECTED IN JAPAN: TAPE RECORDER

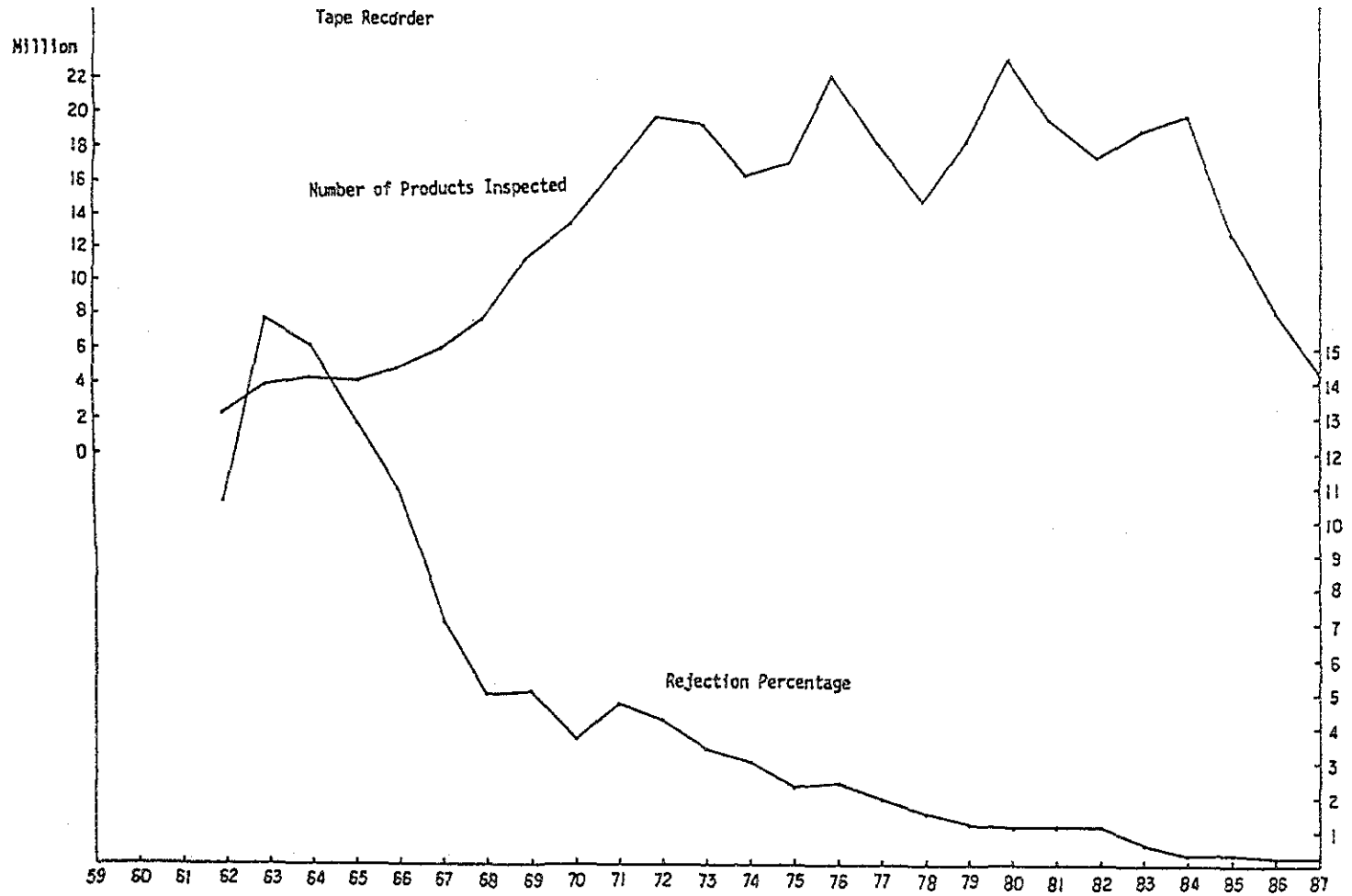


Figure A5-2-5 CHANGE IN REJECTION RATE AND NUMBER OF PRODUCTS INSPECTED IN JAPAN: TAPE PLAYER

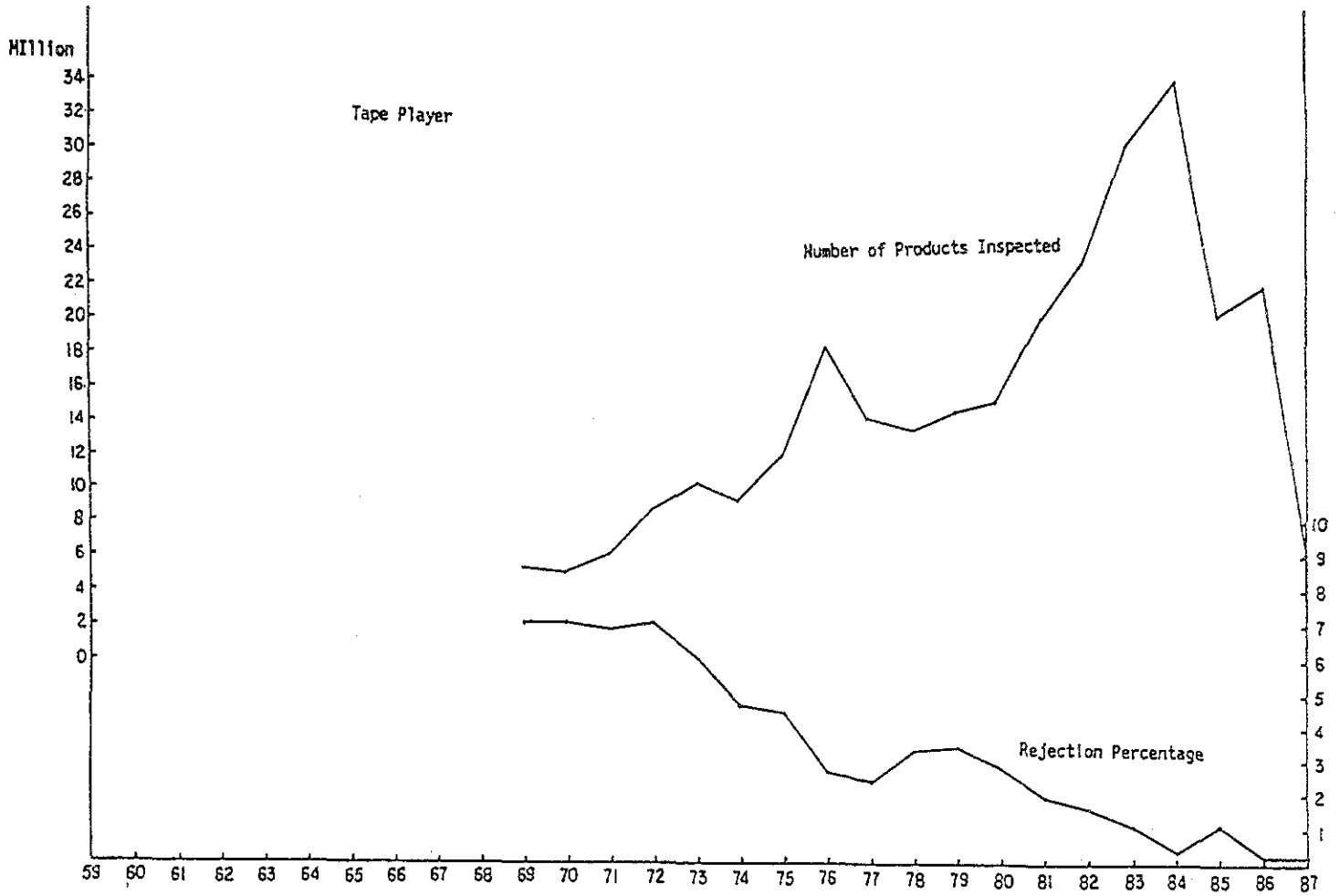
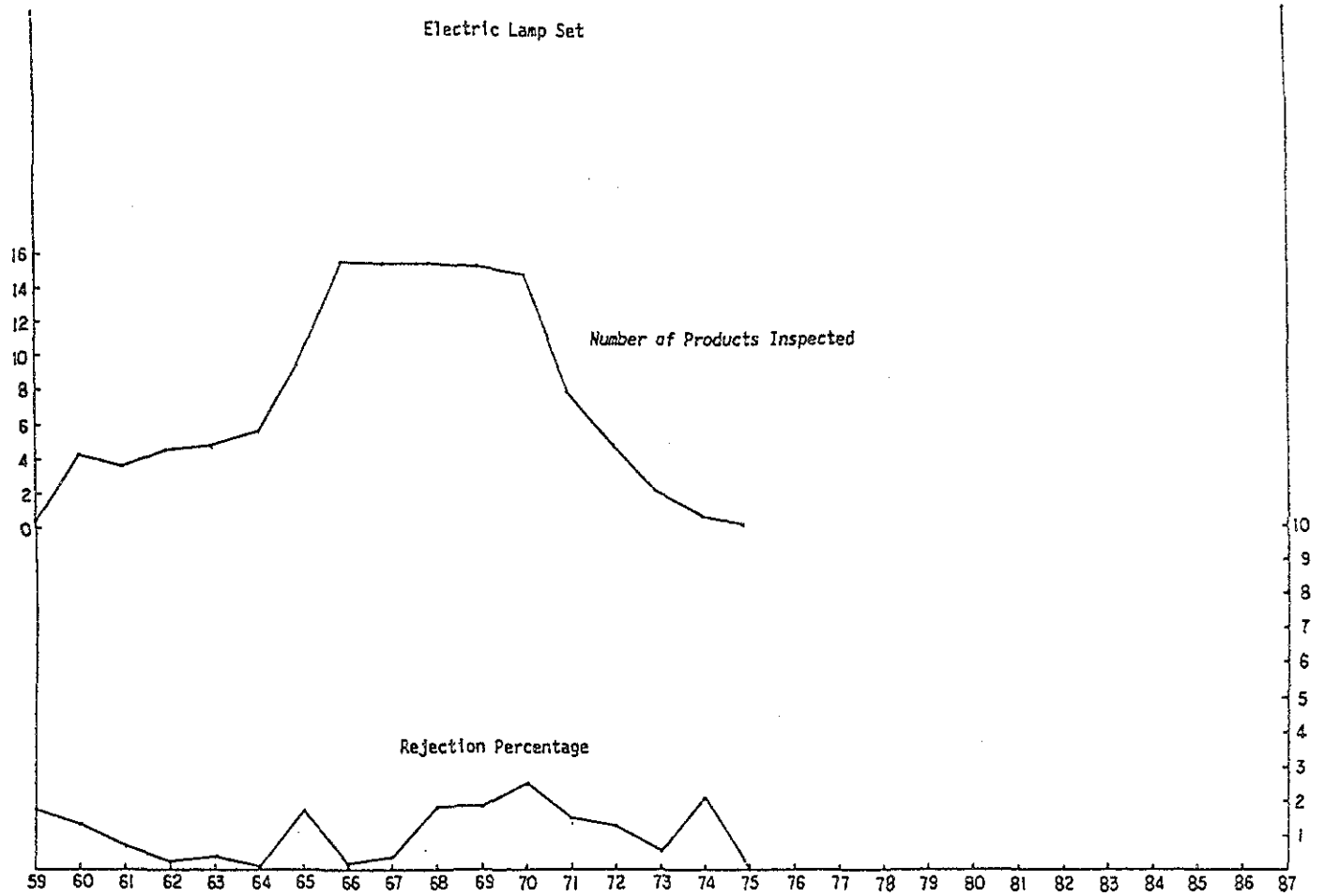


Figure A5-2-6 CHANGE IN REJECTION RATE AND NUMBER OF PRODUCTS INSPECTED IN JAPAN: ELECTRIC LAMP SET



Annex 6

SUMMARY OF

THE MANUFACTURER'S QUESTIONNAIRE SURVEY ON

INDUSTRIAL STANDARDIZATION

AND QUALITY CONTROL

CONTENTS

1. BACKGROUND

1.1 OBJECTIVES OF THE SURVEY

The primary objective of the survey was to identify the needs of manufacturing establishments on the promotion of industrial standardisation and quality control.

1.2 SCOPE OF THE STUDY

The questionnaire designed for the survey covered such areas as:-

- Business unit profile eg. location of business, year of establishment, number of employees, shareholders fund, annual sales, major industrial groups etc.

- Industrial standards eg. types of industrial standards used, technological level etc.

- Certification eg. MS Mark certification system, reasons not applied for Mark of Quality, ARQS, reasons for not applying for ARQS etc.

- Quality control eg. activities adopted for quality control, problems encountered in implementation etc.

- Testing facilities eg. usage of outside facilities, satisfaction of using outside facilities, expectations of setting up outside laboratories etc.

- Manpower and R & D eg. types of qualified staff, activities engaged in, likelihood of commissioning future R & D assistance from outside.

1.3 METHODOLOGY

The survey was conducted as a mail survey. Approximately 1,500 establishments were selected within certain specified industries to whom blank questionnaires were mailed. Questionnaires were multi-lingual in that they were translated into English, Bahasa Malaysia and Chinese.

1.4 FIELDWORK PERIOD

Two mailouts were conducted, the first in late May 1992 and the second in early July. The survey was closed on 21st September. Wherever possible telephone calls were made to remind respondents to send in the completed questionnaires.

1.5 INDUSTRIES SELECTED FOR THE SURVEY

The following industries were selected to be covered for the survey:-

Industry	Sub-Industry
- Textile and apparel	- Fiber and yarn - Woven and knitted fabrics - Tricot and lace fabrics, woven and non-woven, interlining and printing, dying and finishing - Garments - Accessories
- Plastic processing	-
- Rubber related products and processing	-
- Automotive	- Automotive assembles - Automotive parts manufactures
- Electrical and electronics	-
- Metal and engineering	- Foundry - Mould and die - Steel fabrication, metal and welding, machine shop, and machinery and parts manufacturing.
- Construction materials	- Cement and concrete products - Brick, ceramic and gypsum products - Wood and wood products - Steel bars

1.6 SOURCES OF NAMES OF MANUFACTURING ESTABLISHMENTS

The following sources were referred to in selecting the names of establishments to whom questionnaires were sent:-

Industry	Source
- Textile and apparel	- Malaysian Textile Manufacturers Association Directory (1992)
- Plastic processing	- Malaysian Plastic Manufacturers Association Directory (1992)
- Rubber related products	- Rubber Products Manufacturers Association
- Automotive	- Automotive Assemblers in Malaysia (MIDA) - List of Companies Producing Automotive Components in Malaysia (MIDA)
- Electrical and electronics	- Directory of Existing Electrical Product Manufacturers (MIDA)
- Metal and engineering	- Directory of Federation of Malaysian Founding and Engineering Industries Association (1992)
- Construction materials	- Federation of Malaysian Manufacturers' Directory - Cement Association of Malaysia - Malaysian Panel-products Manufacturer's Association.

1.7 NUMBER OF QUESTIONNAIRES MAILED OUT

Table 1 shows the distribution of the selected industries by state and the number of questionnaires mailed out to each industry.

TABLE 1 : NUMBER OF ESTABLISHMENTS SELECTED BY STATE

	Johore	Penang	Melaka	Perlis	KL/ Selangor	Perak	Sabah	Kedah	Panang Trengganu Kelantan	Negeri Sembilan	Total Questionnaires Mailed out
Textile and apparel	68	32	12	2	25	14	1	7	3	1	165
Plastics Processing	67	46	-	-	91	51	-	10	-	-	265
Rubber products	18	24	7	1	82	28	2	5	4	4	175
Automotive	15	12	-	-	130	8	-	4	-	-	169
Electrical and electronics	22	20	-	-	70	5	-	1	-	-	118
Metal and engineering	123	64	-	-	169	61	-	44	-	-	461
Construction materials	13	10	6	5	64	27	7	7	8	10	157
Total	326	208	25	8	631	194	10	78	15	15	1510

2. BUSINESS UNIT PROFILE

2.1 LOCATION OF FACTORY

Some of the manufacturing establishments covered for the survey had more than one factory, thereby, accounting for 308 factories. (Table 2)

TABLE 2 : LOCATION OF FACTORIES

State	Number	%
Selangor	127	41
Kuala Lumpur	43	14
Penang	34	11
Perak	53	17
Johore	35	11
Kedah	6	2
Negeri Sembilan	5	2
Malacca	5	2
TOTAL	**308**	**100**

Most of the establishments covered for the survey had their factories located within the Klang Valley region (comprising Kuala Lumpur and a large part of Selangor). Together they accounted for more than half (55%) of factories belonging to establishments survey.

The West Coast of Peninsular Malaysia being the main economic lists of Malaysia is further emphasised by the presence of factories in Perak (17%) Penang (11%) and Johore (12%).

2.2 YEAR OF ESTABLISHMENT

A large number of establishments were relatively new entrants into the industry (Table 3). Approximately 23% were established between 1986 and 1990, while 14% were established between 1981 and 1985. The decade from 1981 to 1990 alone, therefore, saw the establishment of 113 of the 303 manufacturers surveyed (37%).

Another 99 establishments commenced operations in the decade 1971 to 1980, representing 33% of those surveyed.

Therefore the two decades, from 1971 to 1990 saw the establishment of 212 manufacturers (70%), mainly as a result of the Governments emphasis towards industrialisation.

TABLE 3 : YEAR OF ESTABLISHMENT

Year	Number	%
1960 and before	27	9
1961 to 1965	14	5
1966 to 1970	23	8
1971 to 1975	49	16
1976 to 1980	50	17
1981 to 1985	42	14
1986 to 1990	71	23
1991 and later	10	3
Refuse	17	6
Total	**303**	**100**

2.3 NUMBER OF EMPLOYEES

A large number of the manufacturers surveyed had a fairly large work force. Approximately 44% were in the category of having 101 and more employees as at 31st December 1991. [Table 4]

A significant number also had various levels of employment below 50 workers. Approximately 36% (108 establishments) belonged to this category.

TABLE 4 : NUMBER OF EMPLOYEES

Employees	Number	%
10 and below	30	10
11 to 25	34	11
26 to 50	44	15
51 to 75	23	8
76 to 100	32	11
101 and above	133	44
Refused	7	2
Total	**303**	**100**

2.4 SHAREHOLDERS FUND

A significant number of firms were small-scale manufacturers having a shareholders fund of below M$500,000. As seen from Table 5, 87 such establishments (29%) fell into this category, while another 76 establishments (25%) had a shareholders fund of between M$500,000 to M$2.5 million.

Distribution of manufacturers indicates 53 manufacturer (18%) that were in the large scale sector, having a shareholders fund of above M$10 million.

TABLE 5 : SHAREHOLDERS FUND

Shareholders Fund	Number	%
Below M$500,000	87	29
M$500,000 to M$2.5 million	76	25
M$2.5 million to M$5 million	28	9
M$5 million to M$10 million	33	11
M$10 million to M$50 million	39	13
M$51 million and above	14	5
Refuse	26	9
Total	**303**	**100**

2.5 ANNUAL SALES

Table 6 gives the approximate sales in 1991 of the 303 establishments. As can be seen, being mostly small-scale establishments, about one-third (33%) had sales of below M$3 million in 1991, while about one-fifth (20%) had sales of between M$3 million and M$8 million.

The number of establishments slowly tapered off as the distribution of annual sales increased, although there were 8% of establishments that grossed more that M$101 million being the large-scale manufacturers.

TABLE 6 : ANNUAL SALES IN 1991

Sales	Number	%
Less than M$3 million	99	33
M$3 million to M$8 million	62	20
M$8 million to M$25 million	46	15
M$25 million to M$50 million	31	10
M$50 million to M$100 million	11	4
M$101 and above	24	8
Refused	30	10
Total	**303**	**100**

2.6 MAJOR INDUSTRIAL GROUP

Many of the 303 manufacturers responding to the survey displayed some diversity in their operations. As shown in Table 7, a total of 373 responses were recorded in relation to their activities.

Most of these activities were in the Metal and Engineering industry, where 115 responses (32%) were recorded. Establishments in this sector were engaged in more than one activity.

Similarly in the Automotive industry 11% of the responses were recorded (3% for Automotive assembly and 8% for Automotive parts manufacturing). In the Textile industry, establishments were engaged in Fiber and yarn, Woven and knitted fabrics, and Tricot and lace activities accounting for a total of 4%.

Among the 'specialist' industries, Plastic processing was the most prominent with 81 establishments engaged in this activity (22%), followed by Rubber related products and processing (9%) and Electrical and Electronics (8%).

TABLE 7 : MAJOR INDUSTRIAL GROUP

Industrial Group	Number	%
Fiber and yarn	9	2
Woven and knitted fabrics	8	2
Tricot and lace	2	-
Garments	20	5
Plastic processing	81	22
Rubber related products and processing	34	9
Automotive assembling	10	3
Automotive parts manufacturing	29	8
Electric and electronics	28	8
Foundry	25	8
Mould and die	18	5
Steel fabrication	20	5
Metal and welding, machine shop	52	14
Cement and concrete products	16	4
Brick, ceramic and gypsum products	12	3
Wood and wood products	7	2
Steel bars	2	-
Total	**373**	**100**

2.7 MAJOR PRODUCTS MANUFACTURED

A wide variety of products were manufactured by the establishments. The more prominent products were from the plastics industry where 20% of responses were recorded (Table 8). The metal and engineering industry, producing metal products and machinery parts together accounted for 14%.

Another `specialist' industry, electrical and electronics represented 10% of the 351 respondents recorded. Other noticeable products manufactured were rubber products (9%) car accessories (8%) and garments and fabrics (8%).

TABLE 8 : MAJOR PRODUCTS MANUFACTURED

Major Products	Number	%
Pipes	13	4
Cement	6	2
Car accessories	30	8
Plastic products	71	20
Rubber products	33	9
Electrical and electronic items	35	10
Metal products	41	12
Motorcycle accessories and parts	3	1
Household items	16	5
Lighting	3	1
Wood products	6	2
Construction material	21	6
Garments and fabrics	27	8
Chemicals	2	1
Machinery parts	9	2
Others	22	6
Refused	13	4
Total	**351**	**100**

2.8 MAJOR MARKETS

Most of the 303 manufacturing concerns saw themselves as a source of exports for overseas market. Except for 33% of establishments which did not export any of their products to overseas market, most of the others had varying levels of export sales. On the one extreme 17% indicated that export sales accounted from between 1% to 10%, while 16% indicated exporting from between 91% to 100% (Table 9). Between these two ends of the scale other establishments had various levels of exports.

As domestic sales, the trend was generally towards final sales, rather than their products sold as an intermediate good for the domestic market or export market.

TABLE 9 : MAJOR MARKETS
(AS PERCENT OF ANNUAL SALES)

Percent of Export Market	Export Sales %	As final products %	As manu-facturing materials for domestic %	As manu-facturing sales for export %
1 to 10 percent	17	6	7	6
11 to 20 percent	7	4	2	3
21 to 30 percent	5	2	2	1
31 to 40 percent	5	4	1	2
41 to 50 percent	3	2	3	1
51 to 60 percent	2	3	1	–
61 to 70 percent	3	4	2	–
71 to 80 percent	3	7	1	–
81 to 90 percent	2	6	3	–
91 to 100 percent	16	30	6	2
None	33	30	70	82
Refuse	3	3	3	3
Total	**100**	**100**	**100**	**100**

2.9 MAJOR SOURCES OF RAW MATERIALS

On the procurement of raw materials, 36% of the firms indicated that they did not import them directly from abroad (Table 10). Apart from 8% of the firms that refused, the remaining indicated getting raw materials from abroad, but to varying degrees. Approximately 12% procured between 1% to 10% of raw materials directly from sources abroad.

Most of the establishments had a tendency to procure raw materials from domestic sources. Apart from 11% who did not get them locally and 8% who refused, the rest obtained their supplies from domestic sources.

The fact that very few firms indicated getting their overseas supply via domestic sources, seems to indicate that of those who obtain raw materials from abroad, did so directly.

TABLE 10 : MAJOR SOURCES OF RAW MATERIALS
(AS PERCENT PURCHASE OF RAW MATERIALS)

Percentage Purchase	Direct imports %	Domestic sources %	Imported Materials via domestic sources %
1 to 10 percent	12	8	11
11 to 20 percent	7	10	7
21 to 30 percent	6	5	7
31 to 40 percent	4	5	2
41 to 50 percent	6	8	4
51 to 60 percent	3	5	3
61 to 70 percent	4	7	2
71 to 80 percent	6	6	2
81 to 90 percent	4	7	1
91 to 100 percent	5	20	6
None	36	11	47
Refuse	8	8	8
Total	**100**	**100**	**100**

2.10 CAPITAL INVESTMENT TIE-UPS

A majority of the establishment did not have capital investment linkages with foreign firms (Table 11).

Among those that did have foreign partners, Japan was the more prominent, while Singapore and Europe were also quite significant.

By industries, Fiber and yarn and Woven and knitted fabrics had substantial Singapore interests, as well as Japanese.

Japanese interests were also quite significant in the Automotive assembly industry (20%), Electrical and Electronics (14%), Foundry (16%) and Wood products (Table 14).

TABLE 11 : CAPITAL INVESTMENT TIE-UPS

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Stee bar
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	12	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Singapore	5	22	38	15	11	6	-	-	-	8	6	-	2	-	-	14	-
Other ASEAN	1	-	-	-	-	3	-	3	7	-	-	-	-	-	-	-	-
Taiwan	2	-	-	15	2	3	-	10	-	4	6	-	-	-	-	-	-
Hong Kong	3	11	25	25	1	-	-	4	-	-	-	-	-	-	-	-	-
Republic of Korea	1	-	-	-	-	3	-	-	-	-	-	-	-	6	-	-	-
Japan	9	22	13	-	7	-	20	10	14	16	11	-	8	-	8	14	-
USA	2	-	-	-	1	9	10	-	7	-	-	5	-	-	-	-	-
Europe	5	-	-	5	1	9	-	7	18	-	-	-	-	13	-	14	-
Australia	1	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-
Others	2	11	13	-	1	-	-	3	4	-	6	-	2	-	8	-	-
None	73	56	38	40	75	71	70	72	54	80	78	95	88	81	83	57	100

2.11 TECHNICAL TIE-UPS

Like the financial tie-ups most of the firms indicated that they did not have technical affiliations with foreign firms (Table 12). Among those that did, the countries were most noticeably Japan (11%) followed by Europe (8%).

Common industries affiliated with Japan were Automotive assembly, Fiber and yarn, Cement and concrete products and automotive parts manufacturing.

TABLE 12 : TECHNICAL TIE-UPS

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	12	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Singapore	2	11	13	-	5	3	-	-	4	-	-	-	-	6	-	14	-
Other ASEAN	1	-	-	-	-	3	-	3	4	-	-	-	-	6	-	-	-
Taiwan	2	-	-	-	1	3	-	7	4	4	-	5	-	6	-	-	-
Hong Kong	1	11	13	5	-	-	-	-	4	-	-	-	-	-	-	-	-
Republic of Korea	1	-	-	-	1	3	-	-	-	4	6	-	-	-	-	-	-
Japan	11	22	13	-	7	15	60	31	7	4	11	-	4	19	8	14	-
USA	3	-	-	-	1	9	-	-	4	8	6	-	2	6	8	-	-
Europe	8	-	-	5	2	12	30	14	25	4	11	5	4	25	-	-	-
Australia	1	-	-	-	2	6	-	-	-	-	-	-	-	-	-	-	-
Others	2	-	-	-	1	-	-	7	7	-	6	-	2	-	8	-	-
None	75	56	63	90	79	59	40	45	61	88	78	90	88	69	83	71	100

3. INDUSTRY STANDARDS

3.1 RAW MATERIALS/INTERMEDIATES/COMPONENT PARTS/AUXILLARY MATERIALS PROCURED

Of the 303 firms surveyed, a surprisingly small number only were using MS Standard for raw materials purchased (Table 13). This was true for Product Standard (9%), Method Standard (8%) and Basic Standard (6%).

Most of these firms claimed using either their own company standard or international standard. Approximately 29% of firms claimed using their company standard and 23%, international standards for their product.

In terms of standards necessary, these establishments were quite equal in their opinions or foreign standards and company standards. Approximately 16% on firms indicated that foreign and company standard were necessary for their products. An almost equal number further felt that these same standards were necessary for methods as well term/vocabulary/nomenclature.

TABLE 13 : INDUSTRIAL STANDARDS FOR RAW MATERIALS/INTERMEDIATES/COMPONENT PARTS/AUXILLARY MATERIALS BOUGHT

	--Standards Used---			-------Standard Necessary--------			
	MS	Company Std.	Intern. Std.	Foreign Std.	As A New MS	As A Revised MS	As Company Std.
Base:	303	303	303	303	303	303	303
	%	%	%	%	%	%	%
Product Standard	9	29	23	16	4	2	16
Method Standard	8	25	17	13	6	3	13
Basic Standard	6	23	17	13	4	2	11

3.2 MACHINERY/EQUIPMENT/SPARE PARTS PROCURED

A similar scenario is noticed for establishments procuring machinery, equipment or spare parts. Only a small proportion of the 303 firms surveyed were using the MS Standard (Table 14) –4% for their products, 5% for method and 4% for basics.

However, approximately one in four firms (25%) were using their company standards for their products and 22% using international standards. A somewhat similar trend is seen for methods and basics.

In terms of standards necessary a trend similar to the firms that purchased raw materials is seen. The general concensus is that foreign standards and company standards were generally necessary.

TABLE 14 : INDUSTRIAL STANDARDS FOR MACHINERY/EQUIPMENT/ SPARE PARTS BOUGHT

	---Standards Used---			-------Standard Necessary---------			
	MS	Company Std.	Intern. Std.	Foreign Std.	As A New MS	As A Revised MS	As Company Std.
Base:	303	303	303	303	303	303	303
	%	%	%	%	%	%	%
Product Standard	4	25	22	15	4	2	15
Method Standard	5	20	17	11	4	3	12
Basic Standard	4	18	18	12	3	3	11

3.3 TECHNOLOGICAL LEVEL AIMED AT IN COMPANY STANDARD

Almost half of the companies survey (47%) indicated that they were striving for international technology standards, while another 26% indicated aiming for foreign standards. About a quarter of them (25%) either were not aiming for any sort of technology levels or did not answer (Table 15).

Of the 47% firms that were aiming for some international technological level, the most significant were from Fiber and Yarn (78%), Rubber processing and products (74%), Electrical and Electronics (71%) and Cement and Concrete products (69%) industries.

Among those that indicated aiming for some foreign standard industries that were prominent were Automotive assembling (48%), Foundry (52%), Cement and concerte products (44%) and steel bars (50%).

TABLE 15: TECHNOLOGICAL LEVEL AIMED AT IN COMPANY STANDARDS

	Total	Fiber And Yarn	Woven	Gar-ments	Plas-tic	Rub-ber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould And Die	Steel Fabr.	Metal Weld.	Ce-ment	Brick	Wood	Steel Bars
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	17	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
MS	18	22	13	-	16	21	-	-	21	32	11	15	10	56	42	14	50
Intern. Std.	47	78	63	25	40	74	50	55	71	44	39	50	37	69	33	29	50
Foreign Stds.	26	11	13	30	14	21	30	48	18	52	28	20	35	44	8	29	50
Others	7	11	13	15	7	12	10	7	-	8	11	10	8	13	-	14	-
None	25	-	25	40	36	15	20	10	11	8	28	30	29	6	25	43	-

4. POSSESSION OF CERTIFICATION

4.1 MS MARK CERTIFICATION SYSTEM

A vast majority of firms interviewed did not have any products that were applicable to the Mark of Quality (Table 16). Approximately 182 of the surveyed establishment indicated this (60%) while 78 had products that qualified (26%). Approximately 14% could not give an appropriate answer.

No one industry had a majority in claiming a Mark of Quality as the absence of this was noticed in all the industry groups except Steel bars. But then again, the base was too small as only two firms in this industry responded.

However, among those that did have products that qualified (78 firms), 60% (Table 14) were licensees who could use the Mark of Quality. Industries in which the majority of the firms who were licensees were Rubber and rubber products (57%), electrical and electronics (92%), Foundry, Mould and die, Steel fabrication, Cement and concrete products and Bricks, ceramic and gypsum products.

TABLE 16 : PRODUCT APPLICABLE TO MARK OF QUALITY

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	12	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Yes	26	44	25	-	17	41	30	21	43	28	17	10	19	69	42	29	100
No	60	56	38	70	64	47	40	59	57	64	67	75	73	25	42	43	-
Don't know	14	-	38	30	19	12	30	21	-	8	17	15	8	6	17	29	-

TABLE 17 : LICENSEES OF MARK OF QUALITY

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	78	4	2	0	14	14	3	6	12	7	3	2	10	11	5	2	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Yes	60	-	-	-	43	57	33	33	92	57	67	100	40	82	80	50	-
No	40	100	100	-	57	43	67	67	8	43	33	-	60	18	20	50	100

4.2 REASONS FOR NOT APPLYING FOR MARK OF QUALITY

Table 18 gives the mean scores of eight reasons that were ranked from 1 to 8, with 1 being the most important and 8 being the least important.

As may be seen, the most important reasons for not applying for the Mark of Quality was that customers do not insist on it (means score of 2.0). This thus indicates that either manufacturers take the customers for granted, or that customers do not really see the benefits of insisting on quality. Awareness of customers is therefore lacking.

Costs involved in applying for the Mark of Quality is the second most important reasons (mean score of 2.4) thus giving rise to the need for making it less costly for small and medium scale industries to apply. This was particularly felt by firms in the Mould and die industry (1.0) and Rubber and related products and processing industries (1.7).

Other reasons cited by the manufacturers were:-

- Requirements are too complicated (3.0)
- Do not expect any good results (4.0)
- Applied before but found it not effective (5.5)
- Product quality does not conform with Mark of Quality (5.7)
- Applied once but could not maintain requirements (6.8)

TABLE 18 : REASONS FOR NOT APPLYING FOR MARK OF QUALITY (MEAN SCORE)

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Do not expect good results	4.0	4.5	4.5	-	5.3	7.5	-	2.3	-	5.0	6.0	-	3.0	5.0	-	7.0	-
Customer do not ask for it	2.0	1.3	1.0	-	2.0	2.8	-	2.3	-	1.0	5.0	-	1.0	2.0	-	1.0	-
Applied but found not effective	5.5	2.0	2.0	-	4.7	5.0	-	6.0	-	6.0	8.0	-	7.0	1.0	-	2.0	-
Preparation is costly	2.4	2.3	3.0	-	2.5	1.7	2.0	2.7	-	4.0	1.0	-	2.3	3.0	-	3.0	-
Requirements are complicated	3.0	3.0	4.0	-	3.0	4.0	1.0	3.5	-	3.0	3.0	-	2.0	4.0	-	4.0	-
Product quality does not conform with Mark of Quality	5.7	5.0	5.0	-	4.0	6.5	-	7.0	-	2.0	1.0	-	5.0	6.0	-	5.0	-
Applied once but could not maintain requirements	6.8	6.0	6.0	-	5.7	7.0	-	7.0	-	7.0	4.0	-	7.5	7.0	-	6.0	-

4.3 MATERIALS/INTERMEDIATES/COMPONENT PARTS/ AUXILLARY MATERIALS APPLICABLE TO MARK OF QUALITY

Among firms that did not have products applicable to the Mark of Quality, or were not licensees of the Mark of Quality were asked if they had raw materials or component parts that were applicable to the Mark of Quality. The results of this inquiry is given in Table 19.

Of the 260 firms, 26% indicated that their component parts were qualified to use the Mark of Quality, 64% did not and 10% were not sure. Significant industries among those that did not even have raw materials applicable to the Mark of Quality were Woven and knitted textiles, Garments, Automotive assembly, Automotive parts, Brick and Ceramics and Wood products.

4.4 REQUEST SUPPLIERS TO APPLY FOR MARK OF QUALITY

Of the 68 firms that claimed that their component materials were applicable to the Mark of Quality, the majority also required their suppliers to apply for the Mark of Quality as indicated by 56% of them (Table 20). Industries that were insistent on this requirement were Electrical and Electronics, Mould and Die, Steel fabrication and cement and concrete products.

Such firms, that had raw materials and component parts applicable to the Mark of Quality generally therefore expected a reciprocal requirement from their suppliers.

TABLE 19 : MATERIALS/INTERMEDIATES/COMPONENT PARTS /AUXILLARY MATERIALS APPLICABLE TO MARK OF QUALITY

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	260	9	5	14	66	30	7	23	28	23	15	17	48	15	10	5	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Yes	26	33	-	-	32	33	29	22	29	35	27	41	25	33	20	-	100
No	64	56	80	79	59	53	71	70	68	61	53	41	65	60	80	80	-
Don't Know	10	11	20	21	9	13	-	9	4	4	20	18	10	7	-	20	-

TABLE 20 : REQUEST SUPPLIERS TO APPLY FOR MARK OF QUALITY

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	68	3	-	-	21	10	2	5	8	8	4	7	12	5	2	-	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Yes	56	33	-	-	57	50	100	40	75	50	75	71	58	60	100	-	100
No	44	67	-	-	43	50	-	60	25	50	25	29	42	40	-	-	-

4.5 ASSESSMENT AND REGISTRATION OF QUALITY SYSTEM (ARQS)

Only 38 of the 303 respondening manufacturers (13%) were registered firms for the ARQS, while 211 (70%) were not. Almost one-fifth of these firms (18%) were quite ignorant of the ARQS.

Those firms that were not registered with the ARQS were asked to rank their reasons for not applying. The mean scores are shown in Table 21.

The fact that "customers do not require us to be a registered firm" again was the most important reasons, a fact that was reaffirmed by all the industries (mean score of 1.5).

In descending order of importance, these eight reasons were:-

Customers do not require us to register	(1.5)
Requirements are too complicated	(2.8)
Preparation for registration is too costly	(3.1)
Application procedures are too complicated	(3.8)
Do not expect good result by the ARQS	(4.0)
Our product does not conform with the standard	(4.8)
Applied once but quit after finding it not effective	(6.3)
Applied once but could not maintain requirements	(6.7)

Other reasons were given by responding firms but responses were too small to detect any meaningful scores. These were:-

In the process of applying
Follow standards set by clients
Not ready yet
Not aware of standard
Do not have facilities yet

TABLE 21 : REASONS FOR NOT APPLYING FOR ARQS (MEAN SCORE)

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Do not expect good results	4.0	-	3.0	2.0	4.2	5.0	-	4.3	4.3	5.0	3.3	3.7	4.6	2.7	3.0	-	-
Customer do not require us to resiter	1.5	1.0	1.0	1.2	1.5	2.3	1.0	1.6	1.6	2.0	1.3	1.4	1.2	2.0	3.0	1.0	1.0
Applied but found not effective	6.3	-	6.0	7.0	5.8	8.0	-	6.0	5.0	7.0	7.0	6.5	6.5	6.0	5.5	-	-
Registration is costly	3.1	-	5.0	5.0	2.9	3.9	3.0	2.7	2.3	2.2	2.0	2.0	2.7	2.8	4.0	-	-
Requirements too complicated	2.8	-	7.0	2.5	3.2	3.0	2.0	3.3	2.8	2.1	3.0	2.2	2.5	2.5	3.7	-	-
Application procedures too complicated	3.8	-	8.0	3.0	3.5	3.0	3.0	4.4	3.7	3.9	4.0	3.7	3.9	3.0	4.7	-	-
Products does not conform to standard	4.8	1.0	2.0	5.0	3.8	5.4	-	5.3	7.0	4.3	4.7	3.0	5.1	5.7	4.3	-	-
Applied once buy could not maintain requirements	6.7	-	4.0	6.0	7.2	7.2	-	7.4	8.0	6.3	6.3	5.5	7.2	6.0	5.5	-	-

4.6 REQUEST FOR SUPPLIERS OF RAW MATERIALS TO BE REGISTERED UNDER ARQS

Manufacturing firms that were themselves registered with the ARQS generally did not request the suppliers of raw materials, intermediates, and component parts to be registered under the ARQS (Table 22). As may be seen only 16% of these firms required their suppliers to be registered while 84% did not.

Among the firms that did not require registration with ARQS, this feeling was seen across the various industries, especially Fiber and Yarn, Woven and Knitted fabrics, Cement and Concrete products, Wood products and Steel bars.

TABLE 22 : REQUEST SUPPLIERS OF RAW MATERIALS/ INTERMEDIATES TO BE REGISTERED UNDER ARQS

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	249	5	3	14	65	30	8	26	26	20	16	15	40	15	10	4	1
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Yes	16	-	-	7	15	27	13	27	31	20	25	27	10	-	30	-	-
No	84	100	100	93	85	73	77	73	69	80	75	73	90	100	70	100	100

5. QUALITY CONTROL

5.1 ACTIVITIES ADOPTED/PLANNED TO BE ADOPTED

Most of the manufacturing firms had already initiated some form of quality control, as can be seen from Table 23. Among the more common activities already adopted were visual product inspection (83%), inspection in process (77%) and product inspection by testing equipment (62%).

Where quality control activities were not yet instituted, significant numbers of firms indicated that they were planning to implement them. Such activities are ARQS (43%), QC circles (35%), engagement of quality consultants (28%) and employee suggestion system (28%).

Firms were also quite ignorant of some of the quality control activities such as quality improvement practice (41%), ARQS (25%), seven tools for QC (36%) and Five S (36%).

TABLE 23 : ACTIVITIES FOR QUALITY CONTROL

	Adopted	Planned	Don't know
Base	303 %	303 %	303 %
Product inspection			
– visual	83	1	2
– by testing equipment	62	10	10
Inspection in process	77	4	5
Statistical Quality Control			
– for process	36	26	12
– for product	40	26	11
Establishment of QC Department	59	17	8
Documentation of quality practice	54	22	6
ARQS	10	43	25
Quality improvement practice	8	24	41
Engagement of quality consultant	15	28	27
Development of in–company standards	45	23	11
QC circles	22	35	16
Employee suggestion system	33	28	14
Seven tools for QC	18	18	36
Five S	19	17	36
Training on QC			
– in house training	63	15	8
– outside training	28	33	17

5.2 PROBLEMS ENCOUNTERED IN IMPLEMENTING QUALITY CONTROL

Among the various problems faced by manufacturing firms, the more common ones, as shows in Table 24, were:-

Lack of adequate staff to introduce QC	(48%)
Lack of knowledge of QC methods	(40%)
Job hopping	(40%)
Apathy of employees	(36%)

It is therefore clear that lack of expertise, lack of knowledge and job hopping by employees were the three most important reasons. These reasons were seen across the various industrial sectors especially in the Automotive parts manufacturing sector where at least six out of ten firms mentioned these problems.

TABLE 24 : PROBLEMS ENCOUNTERED IN IMPLEMENTING QUALITY CONTROL

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	12	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Ignorance by management	10	-	-	-	14	12	10	7	7	16	11	5	12	6	33	-	-
Apathy of employees	36	22	13	15	47	44	60	41	14	32	28	30	23	31	33	43	-
Lack of knowledge of QC methods	40	33	13	35	41	38	20	72	46	40	44	45	48	-	25	57	-
Lack of adequate staff to introduce QC	48	44	38	55	46	53	40	76	36	48	50	40	44	44	25	43	-
Lack of time to carry out QC activities	26	11	13	15	31	38	10	31	32	28	6	20	27	19	25	14	-
Unconcern of customers	7	-	-	-	4	6	-	7	7	16	6	30	15	6	8	14	-
Cost increases	27	11	-	30	32	35	-	28	21	36	33	40	38	19	33	14	50
Job hopping	40	33	38	60	40	53	50	72	25	40	50	35	38	19	17	14	-
Lack of commitment	1	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-
None	21	44	38	15	16	18	30	3	32	28	22	20	25	38	17	14	50

6. TESTING FACILITIES

6.1 INCIDENCE OF USEAGE OF OUTSIDE FACILITIES FOR TESTING/ CALIBRATION

Slightly more than half (52%) of firms surveyed indicated that they had used outside laboratories for testing and calibration (Table 25). Industries that had a significant number indicating this were Cement and Concrete products (81%), Automotive assembly (80%), Automobile parts manufacturing (79%). For these industries approximately eight out of ten industries indicated this.

Other industries that were quite significant were Rubber related products and processing (74%), Electrical and Electronics (71%) and Bricks, Ceramic and Gypsum products (67%).

6.2 USAGE OF OUTSIDE LABORATORIES FOR TESTING

The majority of firms indicating that they used outside laboratories for testing, did so for Calibration purposes with 58% indicated this (Table 26). Chemical testing (46%) and Physical testing (34%) were also common purposes.

Industries that tended to use outside laboratories significantly for Calibration purposes were Electrical and Electronics (75%), Cement and Concrete products (92%), Automotive assembly (75%) and Brick, Ceramic and Gypsum products (75%).

These same industries generally also tended to use these facilities for Chemical and Physical testing procedures.

6.3 FREQUENCY OF USING OUTSIDE LABORATORIES

Of those firms that used outside laboratories for the various areas of testing, most used them once a year (Table 27). Of those using these facilities once a year, 34% were for Calibration, 14% for Mechanical testing, 47% for Electrical testing, 15% for Chemical testing and 11% for Physical testing.

For Physical testing, however, larger establishments possibly used outside laboratories more frequently. Another 13% used them twice yearly, while 15% used them as much as eleven to fifteen times a year, indicative of a standard testing procedure.

6.4 INSTANCE WHERE OUTSIDE LABORATORIES USED

Apart from a significant number of firms that were not sure of the number of times they had used outside laboratories the majority of the others were not frequent users, mostly using only once (Table 28).

Among these infrequent users, the common test area was in the area of Calibration (42%), followed next by Chemical testing (30%) and Physical testing (28%).

6.5 AREAS IN WHICH NEW OUTSIDE LABORATORIES EXPECTED

Although approximately 27% of the firms were quite satisfied that no additional outside laboratories were needed, 19% indicated that new laboratories were needed for Calibration purposes, 16% for Chemical and 12% for Mechanical (Table 29). This general feeling was felt among the various industries.

Among those that felt that no additional outside laboratories were needed, Woven and Knitted fabric (75%) and garments (60%) were quite strong in this.

TABLE 25 : INCIDENCE OF USAGE OF OUTSIDE LABORATORIES

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	12	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Yes	52	44	38	10	38	74	80	79	71	64	50	40	37	81	67	57	50
No	48	56	63	90	62	26	20	21	29	36	50	60	63	19	33	43	50

TABLE 26 : USAGE OF OUTSIDE LABORATORIES FOR TESTING

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	158	4	3	2	31	25	8	23	20	16	9	8	19	13	8	4	1
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Calibration	58	25	-	-	48	68	75	57	75	44	33	50	42	92	75	25	-
Mechanical	27	-	-	-	29	16	63	35	20	69	33	50	32	15	-	25	100
Electrical	12	-	-	-	6	4	13	17	55	13	-	-	-	8	-	-	-
Chemical	46	100	100	50	52	60	75	52	15	56	11	38	26	46	63	-	100
Physical	34	75	67	100	32	72	25	48	15	19	-	13	16	31	25	25	-
Others	6	-	-	-	3	12	-	9	-	-	22	38	16	8	13	-	-
Don't know	9	-	-	-	16	8	-	4	10	13	22	-	21	-	-	50	-

TABLE 27: FREQUENCY OF USAGE OF OUTSIDE LABORATORIES

Frequency Of Usage	AREA OF TEST					
	Cali-bration	Mecha-nical	Elec-trical	Chemical	Physical	Others
Base:	90	44	19	72	53	9
	%	%	%	%	%	%
Once a year	34	14	47	15	11	33
Twice a year	11	11	5	11	13	11
Three times a year	3	2	–	11	6	–
Four times a year	3	2	5	6	6	22
Five to ten times a year	4	5	5	7	4	–
Eleven to Fifteen times a year	6	5	5	11	15	22
More than 15 times a year	–	–	–	6	–	–
As and when required	3	11	–	8	8	22
Don't know	38	52	32	33	40	11

TABLE 28: CASES WHERE OUTSIDE LABORATORIES USED

Area of Test	One Case	Two Cases	Three Cases	Not Sure
Base:	158	158	158	158
	%	%	%	%
Calibration	42	8	6	43
Mechanical	20	4	4	72
Electrical	7	3	2	88
Chemical	30	8	8	54
Physical	28	3	3	66
Others	4	2	-	94

TABLE 29 : AREAS IN WHICH NEW OUTSIDE LABORATORIES EXPECTED

	Total	Fiber	Woven	Gar-ments	Plas-tic	Rubber	Auto Assem.	Auto Parts	Elec.	Foun-dry	Mould die	Steel Fabr.	Wel-ing	Cem-ent	Brick	Wood	Steel bar
Base:	303	9	8	20	81	34	10	29	28	25	18	20	52	16	12	7	2
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Calibration	19	11	-	5	19	26	30	24	32	16	28	10	15	19	17	14	-
Mechanical	12	11	-	5	11	6	30	17	4	16	22	15	23	13	17	29	-
Electrical	6	-	-	-	5	6	10	-	29	-	-	-	2	13	8	-	-
Chemical	16	11	-	5	20	29	30	17	7	12	11	5	8	-	25	-	-
Physical	9	11	-	10	7	18	-	10	4	4	-	5	2	6	25	14	-
Others	2	-	-	-	1	-	-	7	7	-	6	5	4	6	-	-	-
Expect No Additional Laboratory	27	44	75	60	27	35	20	31	25	20	11	25	23	13	8	29	-
No comments	36	22	25	20	31	24	30	21	32	52	44	50	40	56	50	43	100

7. MANPOWER

7.1 QUALIFICATIONS OF STAFF

A general indication of the professional staff employed in the surveyed firms in given in Table 30. This represents a tally count of the questionnaires returned from the 303 manufacturers.

As would have been the trend, first degree holders (eg. Bachelor's degree) and diploma holder's) constituted the bulk of these professional staff. Of the 2105 professional staff, first degree holders made up 947 (or 44%) and diploma holders 951 (45%), therefore together accounting for almost 90% of the total.

Analysing by the different disciplines eg. science and engineering, for the former first degree holders outnumbered the latter. For engineering disciplines, however, diploma holders outnumbered first degree holders.

Within the science discipline, there were more chemistry graduates employed. Of the total of 506 in this group 230 (or 45%) were in this category. Within the engineering discipline, however, mechanical engineering graduates were the mode, comprising 537 of the 1599 (or 34%) under this category.

TABLE 30 : QUALIFICATION OF STAFF (NUMBERS)

	<----------TYPE OF DEGREE---------->				
Discipline	Phd.	Masters	First Degree	Diploma	Total
Science					
- Maths	5	5	42	20	72
- Physics	5	4	28	9	46
- Chemistry	10	9	164	47	230
- Life Sciences	4	7	46	15	72
- Materials	5	6	34	41	86
Sub-total	29	31	314	132	506
Engineering					
- Electrical	5	17	121	167	310
- Electronics	4	7	56	80	147
- Software	4	10	44	50	108
- Production	4	8	59	116	187
- Mechinical	8	14	251	264	537
- Design	5	5	24	55	89
- Civil	5	22	57	27	111
- Quality Assurance	5	24	21	60	110
Sub-total	40	107	633	819	1599
Total	**69**	**138**	**947**	**951**	**2105**

7.2 EMPLOYMENT OF STAFF IN VARIOUS FUNCTIONS

Of the degree and diploma holders involved in various specified functions (Table 31), the former outnumbered the latter (598 to 495).

Collectively, most of them were involved in New Product Development (23%), Product redesign/adaptation (20%) and Testing and analysis (19%). Another 13% were engaged in Machinery redesign/adaptation and 11% in Fundamental and applied research.

Individually, degree holders and diploma holders were observed to be engaged in the three main functions, similar to the general overall trend.

7.3 LIKELIHOOD OF COMMISSIONING FUTURE R&D ASSISTANCE

Among the various functions, most of the 303 firms surveyed appeared to be unlikely to commission future R&D assistance in the next one to two years, as seen from Table 32. Except for New product development, product redesign/adaptation and Testing and analysis where firms indicated a `possibility', the rest were quite unlikely to do seek R&D assistance in the coming two years.

However, in the next three to five years, firms were a bit positive in saying that they may possibly seek R&D assistance, perhaps indicative of their relative state of preparedness now. They may not be ready in the next one or two years but possibly in the next three to five years.

TABLE 31 : STAFF INVOLVED IN VARIOUS FUNCTIONS

Function	----------NUMBER OF STAFF---------- Degree Holders	%	Diploma Holders	%	Total	%
Fundamental and applied research	62	10	57	11	119	11
New product development	146	24	109	22	255	23
Product redesign/ adaptation	129	22	88	18	217	20
New machinery design	39	7	39	8	78	7
Machinery redesign/ adaptation	85	14	63	13	148	13
Software development	30	5	43	9	73	7
Testing and analysis	107	18	96	19	203	19
Total	598	100	495	100	1093	100

TOTAL 32: LIKELIHOOD ON COMMISSIONING FUTURE R&D ASSISTANCE

	-----IN NEXT 1-2 YEARS----			----IN NEXT 3-5 YEARS-----		
Functions	Unlikely	Possibly	Likely	Unlikely	Possibly	Likely
Base:	303	303	303	303	303	303
	%	%	%	%	%	%
Fundamental and applied research	28	17	9	17	21	9
New product development	22	24	15	11	24	12
Product redesign/ adaptation	21	25	13	11	22	13
New machinery design	24	16	9	14	19	9
Machinery redesign /adaptation	20	19	12	12	18	11
Software development	22	17	9	15	17	10
Testing and analysis	19	20	16	12	18	13

8. GOVERNMENT ASSISTANCE

8.1 SUGGESTION FOR GOVERNEMENT ASSISTANCE

Numerous suggestions were given by the 303 manufacturing establishments with regard to government assistance on promotion of industrial standardisation and quality control. The most prominent was 'More trainig and consultancy' as indicated by 11% of these firms, indicative of the general lack of information and know-how among most firms. The various suggestion put forward are shown in Table 32 below.

TABLE 33: SUGGESTIONS FOR GOVERNMENT ASSISTANCE

Suggestions	No. of Firms	%
Reduce tax for imported machinery	5	2
Malaysian Standards to be accepted internationally	12	4
More seminars/forums	9	3
More dissemination of information	20	7
More training and consultancy	34	11
Simplify procedure for application	6	2
Reasonable testing fees	8	3
Improved facilities at SIRIM	6	2
Greater assistance and promotion	12	4
Provide greater incentives	4	1
Set up R&D centre	4	1
Greater attention to small-scale industries	2	1
Others	12	4

Annex 7

REFERENCE INFORMATION ON

IMPROVEMENT OF INDUSTRIAL MEASUREMENT SYSTEM

AND CALIBRATION CAPACITY IN MALAYSIA

1. Introduction

The present situation of the industrial measurement system and calibration capacity in Malaysia was presented in 4.2 of the main text together with a basic proposal for its improvement. The following provides an improvement plan of measurement and calibration facilities, based on the above proposal, as reference information.

Development of plans in the field of measurements require a high degree of technical competence, and such planning is beyond the scope of this present study. The plan presented in this annex gives an outline only, and therefore, additional work will be necessary before implementation of a final plan, on the basis of a comprehensive study of all measurement, calibration and legal metrology systems.

2. Expansion of Metrology Centre Equipment

2.1 Required Equipment and Facilities

As discussed in 4.2.2 of the main text, the SIRIM is recommended to envisage its role as a measuring facility as being one of the bases in an Asian network, instead of attempting to realize and maintain its own independent measuring laboratory for primary standards. In line with the above thinking the most appropriate approach will be to entrust the maintenance and management of the various measuring standards to an international metrology center and to have the Metrology Centre of SIRIM maintain and administer the traceability interface needed to provide access to traceable standards kept by the above international center.

With the above plan in mind the following equipment and devices would be needed by the Metrology Centre in Malaysia.

(1) Length: Laser measurement system, standard gauge block sets, electronic micrometers, standard gauge blocks used for calibration, micrometers, height masters, profile projectors, three dimensional measuring machines, others
(2) Mass: Standard weight sets (2E class or below), balances, comparators, balance tables, others
(3) Force/pressure: Standard proving rings, load cells, precision voltmeters, standard manometers, hardness standards, pressure calibrators, standard pressure gauge, others
(4) Temperature: Vertical calibration unit, standard platinum resistance thermometers, temperature ovens for calibration
(5) Volume/flow: Electric platform scales, standard tanks, standard containers, others
(6) Electrical measurement: Standard cells, voltage standards, standard resistance, differen-

tial voltmeters, power amplifiers, multimeters, standard capacitance, others

(7) Photometry: Standard lamps, integrated spheres, spectrophotometers, standard light sources, acoustic, in-echoic chamber, standard microphone sets, standard sound level meters, others

(8) Vibration: Exticitors, signal separators, standard pickup, standard vibration level meters, others

(9) Standard material: 58 standard materials, analyzers, others

The measuring equipment and devices listed above include those already installed in the Measurements Unit of SIRIM but in view of the time which has elapsed since their purchase, these were also included in the list.

The total cost of the above measuring equipment and devices is estimated to be approximately 800 million Japanese yen.*1 It is estimated that in addition to the space currently available in the SIRIM Measurements Unit an area of approximately 3,500 square meters will be required for the installation of such measuring equipment and devices and for carrying out measurement tests.

The following points will need to be given careful attention when designing a Metrology Centre in Malaysia.

1) The entire building must be air conditioned and temperature and humidity levels be individually controllable in each research room. In particular, the temperature level in the standards room for length, time and temperature, etc. must be set and maintained to international standards of 20°±0.5°C.
2) Humidity control must be carried out throughout the entire building. Malaysia has a very humid, hot climate and condensation arises on the surface of measuring devices when these are cooled rapidly. Such water impairs the precision of equipment and has a detrimental effect on use life, so the removal of excess humidity must be possible in each laboratory and room of the Centre.

Note: *1 The estimates are based on prices indicated in catalogs (or estimates in the case of special orders), and exclude transportation costs, installation fees, operation costs, and the cost of dispatching engineers for operational supervision.

3) Careful attention must be given to the general layout and placing of equipment so that equipment which causes vibrations and equipment sensitive to vibration, equipment which produces dust or particles and equipment sensitive to such particles or dust are kept mutually isolated, and to ensure that layout takes account of equipment and devices which use water, and other utilities, etc.
4) Measures to prevent direct sunlight from entering into laboratories and research rooms.
5) Sufficient care to ensure that water used is passed through filters and adequately filtered.
6) To ensure as far as possible that the frequency pattern of electrical power supplies do not contain high frequency waves. Stabilized power sources should be used as required. Further it must be ensured that a sufficient volume of power source is available to laboratories, etc.
7) To respond to the eventuality of power failures an auxiliary back up power supply which can be switched on in emergencies must be available so that data is not lost.
8) Care must be given to avoid excessive lighting in rooms.

It is advisable to undertake thorough discussions of design aspects in designing stages and if necessary to call in the advice of design experts in this field. The construction costs required for the above are estimated to be 500 million Japanese yen.*2

2.2 Program for Expansion of Centre Equipment

(1) Implementing body: SIRIM

(2) Period

The Weights and Measures Unit of SIRIM currently located in the Standards Division should be made into an independent Metrology Centre, and then a program for the expansion of its measuring equipment be undertaken. It is estimated that 3 years would be required to make expanded building space available to the new Metrology Centre and to install equipment and devices.

Note: *2 The Metrology Centre is assumed to be built by local construction companies.

(3) Activity program

1) Survey and preparation stage

a) Definition of precision targets by measure

The SIRIM has already defined the precision targets for the various weights and measures. When drawing up the present program it is necessary to clarify the targets for integration of the system into international networks for each given weight and measure.

b) Selection of equipment and devices

Equipment and devices can be selected in view of the precision targets once these have been set as in a) above.

c) Design of the Centre

The area which will be required for the installation of the newly selected equipment and devices, for the existing equipment and devices to be transferred from the present Weights and Measures Unit, for the test benches and equipment needed for carrying out measurement calibration services, is to be calculated. Moreover, the area indirectly needed to support implementation of calibration services (for research personnel rooms, storage, corridors, toilets, etc.) is to be calculated and the design of the Metrology Centre to be carried out on the basis of these results. When designing the centre careful attention should be accorded to those points of note already outlined in the foregoing part.

The layout of measuring equipment and devices, of electric wiring and water piping is to be carefully decided.

d) Cost estimates

Estimates of the costs to be incurred for purchase of measuring equipment and devices and for construction of buildings are to be made and the necessary budgetary funding prepared.

e) Construction of the Centre

The construction of buildings, purchase, reception and installation of equipment are to be carried out in accordance with the design plans.

f) Establishment of training program

A training and instruction program for the Centre personnel concerned in measurement is to be set up for each measure concerned.

g) Recruiting of new personnel

A recruitment plan is to be drawn up and regular recruiting of new personnel to be carried out in accordance with this.

2) Implementation stages

a) Securing access to international traceability networks

SIRIM should have an international metrology center evaluate SIRIM's standards. Then SIRIM should carry out an evaluation of its in-house weights and measures standards on the basis of those which were evaluated by the international metrology center.

b) Maintenance and management of standards

Research should be initiated in the maintenance and management of the available standards.

c) Implementation of calibration services

Calibration services are to be carried out on commissions received from other organizations and from industry, etc. The calibration of equipment and devices used by the divisions and sections of SIRIM itself is to be carried out on the basis of the calibration procedures established within SIRIM.

d) Implementation of training

Training and instruction of personnel are to be carried out in line with the training program drawn up for this purpose.

e) Participation in international comparisons

International comparison of measures carried out by the APMP and other organizations are to be taken part in and a general upgrading of levels aimed for.

3) Expansion stages

a) Review of precision targets to be reached

Reviews are to be carried out when redefinition of precision targets becomes necessary in view of industrial development and technological progress.

b) Provision of measuring equipment and devices

The purchase and installation of new measuring equipment and devices is to be carried out when this is necessitated by the above review of precision targets.

c) Training of personnel

Engineers and research personnel must be trained continually in order to upgrade calibration technology, and the technology of maintenance and management of standards.

4) Technical guidance and advises of experts

The technical support and advice of qualified and experienced experts are necessary in the design stages of the Metrology Centre. Also, after construction of the Centre, the hosting of overseas experts together with the dispatch of trainees abroad are considered effective ways to promote the acquisition and upgrading of the technology for maintenance and management of standards and for calibration technology

The short, mid, and long-term programs are shown in Table A7-1.

3. Expansion of Calibration Capacity in the Provinces

3.1 Required Equipment and Facilities

The following shows the measuring equipment and devices required for calibration in each of the branch offices of SIRIM.

(1) Length: Standard gauge block sets, electronic micrometers, each type of standard gauge block used for calibration, each type of micrometer, height masters, profile projectors, etc.
(2) Mass: Each set of standard weights (for FI class or below), precision balances of each type, each type of comparator, each type of balance tables, etc.
(3) Force/pressure: Each type of standard proving ring, each type of load cells, precision voltmeters, standard manometers, each type of hardness standard, each type of pressure adjustor, each type of standard pressure gauge, etc.
(4) Temperature: Standard mercury resistance thermometer, thermometer, isothermal vat, etc.
(5) Volume/flow: Electric platform scales, each type of standard tank, etc.
(6) Electrical measurements: Standard cells, voltage standards, each type of standard resistance, differential voltmeter, power amplifier, multimeter, standard electric capacity, etc.

The Northern Branch Office is already equipped with an Electric Measurements Room.

The total cost of the above measuring equipment and devices is estimated to be approximately 300 million Japanese yen.*3 The space required for the installation of the above equipment and devices and for implementation of testing will be approximately 1,500 square meters. The points listed for the design of Metrology Centre are also applicable to this case. There may be special regional conditions or factors which will additionally need to be taken into account. The required cost for construction would be in region of 150 million Japanese yen.*4

Notes: *3 Estimated using prices indicated in catalogs (or estimates in the case of special orders), and does not include transportation costs, installation fees or the cost of dispatching engineers for operational supervision.
*4 Assuming the construction to be carried out by local construction companies.

3.2 Program for Upgrading the Capacity for Calibration in the Provinces

(1) Implementing body: SIRIM

(2) Period

This program aims to realize the implementation of measurement calibration services in the branch offices of SIRIM. Since the program involves the construction of buildings to house new Metrology Centres, and the installation of equipment and devices it is estimated that 3 years would be required for completion of stages from preparation to implementation.

(3) Activity program

1) Survey and preparation stage

a) Determining the measurement calibration needs and setting calibration ranges

The exact nature of the required measurement calibration services are to be determined taking account of the particular nature of industry in each region of Penang, Johor Bahru and Sarawak. On the basis of this analysis the range of corrections to be covered in each region is to be determined.

b) Selection of equipment and devices

Equipment and devices can be selected in view of the needs identified by area once these have been set as in a) above. Selection of equipment and devices is also to be made so as to include the basic weights and measures.

c) Design of the Centre

The area which will be required for the installation of the equipment and devices selected according to b) above and for the test benches and equipment needed for carrying out measurement calibration services, is to be calculated. Moreover, the area indirectly needed to support implementation of calibration services (for research personnel rooms, storage, corridors, toilets, etc.) is to be calculated and the design of the Metrology Centre to be carried out on the basis of these results. When designing the Centre careful attention should be accorded to those points of note already outlined in 2.1 regarding design.

The layout of measuring equipment and devices, of electric wiring and water piping is to be carefully decided.

d) Cost estimates

Estimates of the costs to be incurred for purchase of measuring equipment and devices and for construction of buildings are to be made and the necessary budgetary funding prepared.

e) Construction of the Centre

The construction of buildings, purchase, reception and installation of equipment is to be carried out in accordance with the design plans.

f) Establishment of training program

A training and instruction program for the Centre personnel concerned in measurement is to be set up for each measure concerned.

2) Implementation stages

a) Securing access to traceability networks

The standards of the branch office metrology centers are to be evaluated in line with the national standards held by SIRIM.

b) Implementation of calibration services

Calibration services are to be carried out on commissions received from other organizations and from industry, etc.

c) Implementation of training

Training and instruction of personnel are to be carried out in line with the training program drawn up for this purpose.

3) Expansion stages

a) Review of the range of calibration covered

Reviews are to be carried out when a redefinition of the range of areas for which calibration services are available becomes necessary in view of industrial development and technological progress.

b) Provision of measuring equipment and devices

The purchase and installation of new measuring equipment and devices are to be carried out when this is necessitated by the above review of the range of calibration services.

c) Training of personnel

Engineers and research personnel must be trained continually in order to upgrade calibration technology, and the technology of maintenance and management of standards.

4) Technical guidance and advises from experts

The hosting of overseas experts together with the dispatch of trainees abroad are considered effective ways to promote the acquisition and upgrading of the measurement calibration technology.

The short, mid, and long-term programs are shown in Table A7-2.

Table A7-1 PROPOSED ACTION PROGRAM FOR EXPANSION OF METROLOGY CENTER EQUIPMENT

	Short-term	Mid-term	Long-term
Implementation Body	SIRIM	SIRIM	SIRIM
Implementation Policies	1. Decide on the accuracy targets 2. Draw up list of equipment and devices 3. Design the Metrology Center 4. Budgetary measures (costs for equipment procurement and building construction) 5. Construction of center 6. Draw up training program 7. Recruit personnel 8. PR activities to Industry	1. Evaluation of standards 2. Maintenance and management of standards 3. Implementation of calibration services 4. Implementation of international comparisons 5. Training of research personnel	1. Review of the accuracy targets 2. Procurement and installation of measuring equipment and devices 3. Training of research personnel
Supporting Bodies and Activities	None in particular	None in particular	None in particular
Location for Implementation	SIRIM	SIRIM	SIRIM
Main Points for Implementation	1. Define the accuracy targets 2. Design and construction of center 3. Listing, procurement and installation of measuring devices and equipment 4. Recruitment of personnel 5. Draw up a training program proposal 6. Carry out PR activities through SIRIM seminars, etc.	1. Development of the technology for maintenenace and management of standards 2. Implement calibration services 3. Implement the instruction and training of personnel 4. Participate in international comparisons as the representative of Malaysia	1. Review and adjust the accuracy targets 2. List up, procurement and install measuring equipment and devices required 3. Carry out the instruction and training of personnel
Overseas Technical Cooperation	1. Technical information for center designing	1. Maintenance and management technology for standards 2. Calibration technology	

Table A7-2 PROPOSED ACTION PROGRAM FOR UPGRADING THE CAPACITY FOR IMPLEMENTING MEASUREMENT CALIBRATION IN THE PROVINCES

	Short-term	Mid-term	Long-term
Implementation Body	SIRIM	SIRIM	SIRIM
Implementation Policies	1. Decide on range of calibration 2. Draw up list of equipment and devices 3. Design the Metrology Center 4. Budgetary measures (costs for equipment procurement and building construction) 5. Construction of center 6. Draw up training program 7. Inter-nation PR activities	1. Evaluation of standards 2. Implementation of calibration services 3. Training of research personnel	1. Review of the range of calibration 2. Procurement and installation of measuring equipment and devices 3. Training of research personnel
Supporting Bodies and Activities	None in particular	None in particular	None in particular
Location for Implementation	SIRIM brance offices	SIRIM branch offices	SIRIM brance offices
Main Points for Implementation	1. Define needs and determine the range of calibration services accordingly 2. Design and carrying out of center construction 3. Listing, procurement and installation of measuring devices and equipment 4. Draw up a training program proposal 5. Carry out PR activities through SIRIM seminars, etc.	1. Have standards evaluated 2. Implement calibration services 3. Implement the instruction and training of personnel	1. Review and adjust the range of calibration covered 2. List up, procurement and install measuring equipment and devices required 3. Carry out the instruction and training of personnel
Overseas Technical Cooperation		1. Calibration technology