generation and for cement manufacture-- for developing petrochemical industries and for producing chemical fertilizer. The project for developing the Eastern Seaboard has already reached the stage of seeing completion of the natural gas fractionating plant to separate the components to constitute LPG and LNG. Current plans are for producing annually 300 thousand tons of ethylene and 100 thousand tons of propylene, from which to derive polyvinyl chloride, polyethylene, polypropylene. Urea and compound fertilizer are also to be produced. All these projects are currently nearing their final phases. The joint ASEAN regional project for producing soda ash from the rock salt occurring in the northern region has been abandoned on account of difficulties foreseen in staple supply of raw material and in economic soundness.

2.2.3.10 Petroleum Refining

The country relies for 60 percent of its energy needs on petrol (1982 statistics). Petroleum refining is undertaken by 3 firms totalling a daily capacity said to amount to 175 thousand barrels. The products include gasoline, diesel oil, heavy oil, jet fuel, kerosene, liquified petroleum gas, asphalt, and lubricant. The emphasis is on gasoline and diesel oil production, to cover the needs of road transport, which bears the bulk of inland transportation.

The demand amounted to ca. 190 thousand barrels per day in 1982, which had thus to be covered partly by importation of petroleum products. The tightening of petroleum supply since the second round of oil price lowering, and the domestic shortage of diesel oil has induced an expansion of refining capacity, but with the supply of natural gas coming to be realized since September 1983, actual increase of production is not expected to reach a high level.

2.2.3.11 Pulp and paper

The pulp and paper industry was set on foot in 1962 with the establishment of a national enterprise. Today, more than 40 enterprises operate this product line, to manufacture paper for postage stamps, printing, wrapping, as well as cardboard, to provide in 1982 a total supply of ca. 400 thousand tons.

Newsprint and high quality art paper is imported.

Thailand is depleted in lumber supply to serve the pulp industry. The ecological conditions are not suited to growth of conifers --required for pulp manufacture-- and, most pulp is imported. For this reason, high reliance is placed on waste paper as source of pulp, and as much as 33 percent of the paper delivered to the market was recovered for re-utilization in 1980. This handicap of the scarce domestic pulp material resources makes it difficult to produce high quality paper.

2.2.3.12 Ceramics

The Thai ceramics industry almost completely covers the domestic demand for cement, glass, tiling, sanitary ware, porcelain and bricks, thanks to abundant availability of the materials required for their manufacture --limestone, kaolin, silica sand, gypsum. Among these products, tiling, sanitary ware and porcelain have come to count among promising items for export.

The cement demand has been fully covered by domestic supply since 1973, and already in 1974 - 75, 20 percent of the product was exported. Government regulation of cement prices dulled the incentive for expanding production, and imports came to exceed exports again during a certain period. Taking note of this serious situation, the Government subsequently took such measures as qualification of this industry for assistance under the Promotion of Investment Act, accompanied by revision of cement prices. These measures produced the desired effect of inciting enterprises to

increase their production capacity, and exportation of cement was resumed in 1982. Production attained 8.27 million tons in 1984, of which 30 thousand tons were exported. There are currently operating 3 Portland cement manufacturers and 1 producing white cement.

Flat glass is manufactured by 1 enterprise, which in 1984 completed expansion of production capacity, to reach 4.52 million cases* per year. The domestic demand was 1.84 million cases in 1985, that for 1986 is estimated to have been 1.86 million cases. After fully covering this demand, the surplus is being exported, amounting to 41 percent of total production in 1985, and expected to have exceeded 30 percent in 1986. The countries served by these exports include Singapore and Hong Kong, with increasing shipments seen these years also to China and Japan.

Tiling production developed rapidly during the early 1970's, and currently 9 major enterprises total an annual capacity of roughly 110 thousand tons. Exports have accounted for 40 percent of production in average during these several years. Sanitary ware is manufactured by 2 major enterprises totalling 3 thousand tons annual capacity; other porcelain ware is produced by 3 enterprises totalling 12 thousand tons. Exports of porcelain ware --kitchen ware, washing stands, sanitary ware, mainly to Hong Kong-- earned ₿ 68 million in 1985; those of tableware --mainly to U.S. and Singapore-- similarly ₿ 16.8 million; tiling --mainly to West Germany, Netherlands, U.S.-- similarly ₿ 583 million. Exports are gaining impetus with appreciable improvement seen in product quality.

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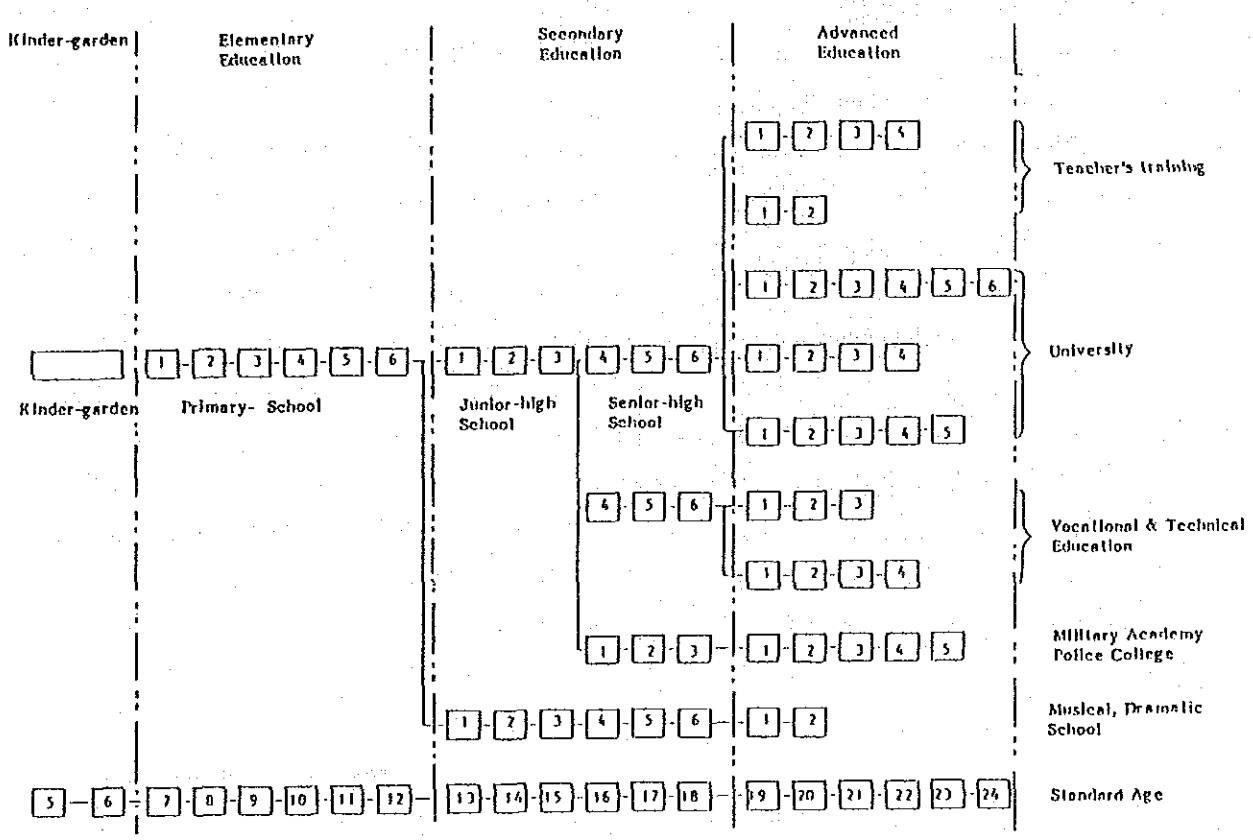
*1) 1 case is equivalent to 9.29 square metres of 2mm thick glass.

2.2.4 Technological Level of Industry

The level of industry, considered in terms of technological level, is as presented in what follows.

What physically supports the technological capability of a nation's labour force is education. The Thai educational system is presented diagrammatically in Fig. 2.2.4-1. The system is similar to that adopted in Japan, except for the limitation of compulsory education to the 6 years of primary school.



Source: Ministry of Education

Fig. 2.2.4-1 School System

The progress seen in education during the 10 years between 1970 and 80 is compared in Table 2.2.4-1 between the ASEAN countries and Korea, in terms of:-

- Number of schools
- Number of teachers
- Number of students.

The system of education is seen to be well established in Thailand for the 1st (primary) and 2nd (secondary) levels, but to leave room for development in the higher (advanced) levels.

The numbers of students graduating from Thai schools specializing in the different branches of engineering are indicated in Table 2.2.4-2. It is seen that 1,428 Bachelors in Engineering were created in 1980, representing 32 per million population, which --even without comparing with the corresponding Japanese figure-- is too low to fill the increasing need for qualified technical staff demanded by the rapidly growing industries. The shortage of educational facilities and teaching staff is said to be particularly acute for vocational and technical training in the electrical, mechanical and chemical branches.

Table 2.2.4-1 Education in ASEAN Countries

Number of School Teaching Staff Student Enrolled	INDONESIA		PHILIPPINES		THAILAND		MALAYSIA		SINGAPORE		KOREA	
	1970	1980 g)	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
Population (Thousands)	116 786 e)	147 490	36 684	48 098	35 550	46 961	10 400	13 550	2 250	2 391	31 435	38 723
Number of School												
1st Level	64 040	98 026	22 872 *1	31 494 *1	30 534 a)	34 758 g)	4 443	4 341	427	342	5 961	6 450
2nd Level	9 599	12 982 e)					887	1 023 b)	131 *7	161 *7	2 671	3 470
General	5 940	10 982	3 051	5 144	...	...	882	943 b)	112	144	2 085	3 133
Vocational/Technical	2 756	1 892 e)			204	180 d)	94	66 b)	19	17	586	337
Teacher Training	903	586	-	-	33	45 d)	11	14 b)	-	-	-	-
3rd Level	-	-	621 *2	1 098 *2	15	14 d)	-	-	5	5	232	334
Special	-	-	-	-	-	-	-	-	-	-	32	51
Teaching Staff												
1st Level	514 007	676 236	234 461 *1	235 911 *3	162 512	330 965 d)	45 307	52 492 f)	12 248	11 267	101 095	117 290
2nd Level	146 235	251 269 e)			44 756	55 180 d)	20 952	30 464 b)	6 990 *7	8 931 *7	52 232	103 149 d)
General	87 810	206 504	49 276	48 223 *3	35 641	42 290 d)	19 775	32 149 f)	5 835	8 019	41 052	73 342 d)
Vocational/Technical	48 780	44 765 e)			6 010	8 100 d)	870	1 043 d)	1 155	912	11 180	18 761 d)
Teacher Training	9 645	13 657			3 105 *5	4 790 *5	307	522 b)	-	-	-	-
3rd Level	20 018	46 668 c)	25 133 *2	38 226 g)	7 193	18 302 f)	1 213	4 506 d)	1 158	1 947	10 435	21 863
Special	670	...	-	-	410	...	-	-	43	...	394	824
Student Enrolled (Thousands)												
1st Level	14 870.2	21 123.5	6 855 *1	8 227 *1	5 635	7 272 g)	1 429.6	f) 1 637.1	363.518	296.608	5 749	5 640
2nd Level	1 930.6	4 071.1			710	1 376 d)	536.5	...	150.467 *7	182.859 *7	1 935	4 046 d)
General	260.9	3 517.3	1 591	2 767	512	1 530 g)	510.5	f) 877.8	136.782	146.769	1 634	2 991 d)
Vocational/Technical	544.8	553.7			170	148 d)	23.0	f) 15.5	13.685	36.090	301	581 d)
Teacher Training	124.9	216.5 c)	-	-	28	115 d)	2.9	b) 6.2	-	-	-	-
3rd Level	248.2	296.3	621 *2	1 182 *2	55	398 g)	17.0	d) 56.5	13.683	22.511	201	442
Special	3.9	-	-	-	7	8 b)					4	8

Source: UN Statistical Year Book
Asia and Pacific

Note: *1 - including intermediate
*2 - including collegiate and graduate school
*3 - Public school only
*4 - Public school only
*5 - Including teacher training at the third level
*6 - Government maintained and aided school only
*7 - Including junior college

a) 1971
b) 1975
c) 1976
d) 1977
e) Estimated
f) 1978
g) 1979

Table 2.2.4-2 Annual Manpower Output of Engineering Educational Institutions

Year / Level	1978					1979					1980				
	Total Engineering	Electrical Engineering	Industrial Engineering	Mechanical Engineering	Metallurgical Engineering	Total Engineering	Electrical Engineering	Industrial Engineering	Mechanical Engineering	Metallurgical Engineering	Total Engineering	Electrical Engineering	Industrial Engineering	Mechanical Engineering	Metallurgical Engineering
Master's Degree	69	6	7	3	-	83	20	-	10	-	86	17	6	10	-
Bachelor's Degree	1,376	373	142	254	6	1,369	327	127	222	13	1,428	363	116	219	4
Diploma Technician	6,483	1,566	389	1,975	567	6,832	1,478	467	2,015	581	7,276	1,787	494	1,874	880
Certificate Technician	18,482	4,044	4,029	5,796	-	22,206	5,236	4,657	7,212	-	24,895	5,880	3,828	9,638	-

Source: Ministry of Education

The composition of the labour force supporting industrial activity for the different product lines is indicated in Table 2.2.4-3, where the corresponding figures for Singapore are also given for comparison; Table 2.2.4-4 gives the figures for different sectors of industry and separately for different categories of occupation, derived from statistics published by the International Labour Organization. For comparison, corresponding figures for Japan are given in Table 2.2.4-5.

Comparison with Japan brings out the high percentage of work force engaged in agriculture (72 as against 10 percent), and the converse low percentage of those in manufacturing (6 against 24), together with the extremely small percentage (0.82%) of specialists and technical staff in the manufacturing branch.

Another criterion for measuring the technological level of a nation is the intensity of technical transfer taking place between patron and subcontractor enterprises. A recent survey of Thai manufacturing enterprises by the Ministry of Industry has revealed that more than 70 percent of the responding enterprises indicated their undertaking this form of work frequently and constantly. Among the reasons given by these enterprises of undertaking such work, "to ensure a stable source of work" was cited by more than half of the responding enterprises, and very few gave "to seek transfer of technology". This circumstance, together with the fact that very many of them replied "no particular consequence" to the question of what would ensue if their patron enterprise ceased to provide them support, is indicative of the relatively weak ties that prevail between patron and subcontractor. This is further confirmed by the responses obtained from the patron enterprises, who rarely cited "investment", "loan" or "supply of raw materials" among the forms of assistance they provided to their subcontractors, their aid being limited in most cases to little more than supply of drawings. The reasons given by the patron enterprises for subcontracting out work also were mostly "to supplement their technical capability" and "reduce manufacturing cost". Moreover, 40 percent of the patron enterprises indicated their having no department or personnel exclusively charged with administering their subcontractors.

A further index often utilized for measuring the technological level of a nation's industry is the proportion to GDP presented by the total expenditures of industrial enterprises in research and development. The case of Thailand is reproduced in Table 2.2.4-6, for the different sectors of economic and social activity. The overall research and development expenditure is seen to have amounted in 1980 to 0.22 percent of GDP, which still compares unfavourably with the industrialized nations, mostly exceeding 2 percent for this index (Japan: 2.58%). The endeavours by Thai industry to fill the gap in technological level, however, are evidenced by the number of enterprises that had contracted with foreign enterprises for licenced manufacture under the Promotion of Investment Act: The number of such enterprises amounted to 215 according to statistics published by the Bank of Thailand, which reveal the licence fees annually paid to have increased from ฿ 142 million to ฿ 1,993 million between 1972 and 84. The line of industry most actively seeking foreign licences is that of motor car assembly, having paid ฿ 278 million, followed by manufacturers of foodstuff and beverages with ฿ 245 million, of electrical equipment with ฿ 201 million, of cosmetics with ฿ 155 million, and of textiles with ฿ 124 million.

Table 2.2.4-3 Composition of Labour Force by Different Industries

(Unit: %)

Trade	Thailand (1979)	Singapore (1980)
Foodstuff	17.78	3.50
Beverages	0.00	0.92
Tobacco	0.15	0.45
Textile	38.48	3.38
Clothing	2.99	9.46
Leather goods	0.00	0.43
Footwear	0.00	0.53
Wooden products	6.25	3.61
Furniture	0.97	2.14
Pulp, paper	1.98	1.49
Printing, publishing	2.70	4.21
Chemistry	1.68	0.74
Miscellanous chemicals	4.65	1.50
Petroleum refining	0.00	1.18
Petroleum/coal products	0.00	0.00
Rubber products	2.67	1.41
Plastic	0.00	3.21
Ceramics	0.80	0.33
Glass	0.01	0.00
Nonmetallic materials	6.80	1.29
Iron, steel	3.35	0.65
Nonferrous metals	0.00	0.16
Metal products	2.54	6.15
General machinery	1.05	7.06
Electric machinery	1.09	30.54
Transport machinery	1.99	9.54
Precision machinery	0.10	3.64
Other manufactures	1.97	2.48
Total	100.0	100.0

Sources: United Nations, Yearbook of Industrial Statistics 1980 (for Singapore).

National Statistical Office, Report of the 1980 Industrial Census (for Thailand)

Table 2.2.4-4 Composition of Labour Force by Different Industries and Trades Thailand (1980)

Units: Upper lines - Persons
Lower lines - Percent

	Specialized/ Technical and Equivalent	Administrative/Supervisory	Clerical and Equivalent	Sales	Agriculture/ Stock Raising/ Forestry/ Fishing/ Hunting	Mining/ Quarrying/ Wellsinking and Equivalent	Transport Vehicle Driving and Equivalent	Craftsmanship/ Industrial Production/ Unskilled Labor	Service Industries	Unclassifiable Trades	Total	
Agriculture	1,212 0.01	1,798 0.01	1,053 0.01	1,198 0.01	16,623,993 99.89	134 0.00	2,926 0.02	7,843 0.05	2,742 0.02	54 0.00	16,642,953 100.00	71.92
Mining	289 0.31	2,541 2.76	1,311 1.42	336 0.36	361 0.39	56,917 61.73	1,958 21.2	27,506 29.83	967 1.05	14 0.02	922,200 100.00	0.40
Manufacturing	10,861 0.82	30,893 2.34	32,913 2.49	16,446 1.25	4,132 0.31	386 0.03	16,315 1.24	1,189,459 90.09	16,949 1.28	2,014 0.15	1,320,368 100.0	5.71
Construction	2,499 0.71	13,826 3.94	3,241 0.92	506 0.14	131 0.04	71 0.02	3,954 1.13	325,112 92.74	1,119 0.32	117 0.03	350,576 100.00	1.51
Commerce	4,143 0.26	11,763 0.73	25,487 1.59	1,526,883 95.04	899 0.06	231 0.01	6,578 0.41	23,484 1.46	6,518 0.41	573 0.04	1,606,559 100.00	6.94
Transport/ Communication	5,307 1.26	12,372 2.93	65,780 15.56	3,856 0.91	426 0.10	34 0.01	291,553 68.99	34,117 8.07	7,879 1.86	1,300 0.31	422,624 100.00	1.83
Service	639,324 33.30	325,076 16.93	166,299 8.66	6,349 3.31	19,049 0.99	315 0.02	37.751 1.97	105,048 5.47	614,104 31.99	6,581 0.34	1,919,896 100.00	8.30
Finance	19,539 17.72	18,505 16.78	49,790 45.15	10,118 9.18	198 0.18	43 0.04	2,172 1.97	2,163 1.96	6,918 6.27	827 0.75	110,273 100.00	0.48
Unclassifiable	9,611 1.56	14,104 2.29	34,949 5.68	32,108 5.22	12,484 2.03	148 0.02	8,185 1.33	472,460 76.82	13,334 2.17	17,638 2.87	615,021 100.00	2.66
Total	696,361 3.01	437,695 1.89	394,209 1.70	1,598,221 6.91	16,662,051 72.00	58,416 0.25	374,471 1.62	2,217,212 9.58	674,242 2.91	29,616 0.13	23,142,494 100.00	100.00

Source: National Statistical Office, 1980 Population and Housing Census - Whole Kingdom

Table 2.2.4-5 Composition of Labour Force by Different Industries and Trades Japan (1980)

Units: Upper lines - Persons
Lower lines - Percent

	Specialized/ Technical and Equivalent	Administrative/ Supervisory	Clerical and Equivalent	Sales	Agriculture/ Stock Raising/ Forestry/ Fishing/Hunting	Industrial Production/ Transport Vehicle Driving/Unskilled Labor	Service Industries	Unclassified Trades	Total	
Agriculture/Hunting/ Forestry/Fishery	10,000 0.18	10,000 0.18	50,000 0.91	10,000 0.18	5,350,000 97.63	50,000 0.91	0 0.00	0 0.00	5,480,000 100.00	9.72
Mining/Quarrying	0 0.00	10,000 10.00	10,000 10.00	0 0.00	0 0.00	80,000 80.00	0 0.00	0 0.00	100,000 100.00	0.17
Manufacturing	300,000 2.17	570,000 4.13	1,770,000 12.82	680,000 4.92	10,000 0.07	10,400,000 75.31	80,000 0.58	0 0.00	13,810,000 100.00	24.49
Construction	80,000 1.48	290,000 5.37	690,000 12.78	140,000 2.59	0 0.00	4,180,000 77.41	20,000 0.37	0 0.00	5,400,000 100.00	9.58
Utilities	20,000 6.06	20,000 6.06	150,000 45.45	10,000 3.03	0 0.00	130,000 39.39	0 0.00	0 0.00	330,000 100.00	0.59
Wholesale/Retail/ Restaurants/Hotels	110,000 0.85	570,000 4.40	1,930,000 14.90	6,480,000 50.04	0 0.00	1,780,000 13.75	2.080,000 16.06	0 0.00	12,950,000 100.00	22.97
Transport/Ware-housing/Communication	20,000 0.57	160,000 4.58	930,000 26.65	90,000 2.58	0 0.00	2,240,000 64.18	50,000 1.43	0 0.00	3,490,000 100.00	6.19
Communal/Social/ Personal services	4,010,000 35.84	330,000 2.95	2,620,000 23.41	170,000 1.52	40,000 0.36	1,640,000 14.66	2,380,000 21.27	0 0.00	11,190,000 100.00	19.85
Finsncial, Health, Real estate/Office services	150,000 4.31	250,000 7.18	1,590,000 46.69	800,000 22.99	20,000 0.57	490,000 14.08	180,000 5.17	0 0.00	3,480,000 100.00	6.17
Unclassifiable	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	150,000 100.00	150,000 100.00	0.27
Total	4,700,000 8.34	2,210,000 3.92	9,740,000 17.28	8,380,000 14.86	5,420,000 9.61	20,990,000 37.23	4,790,000 8.50	150,000 0.27	56,380,000 100.00	100.0

Source: ILO

Table 2.2.4-6 Progress of Expenditures for Research and Development in Different Fields

Unit: A: ฿ million; B: Percent

Field	1978		1979		1980	
	A	B	A	B	A	B
Agriculture/Irrigation	797.2	54.4	558.4	41.9	661.6	43.9
Mining/Manufacture	82.2	5.6	97.0	7.3	106.8	7.1
Distribution/Services	-	-	27.4	2.1	27.2	1.8
Transport/Communication	47.9	3.3	63.6	4.8	106.7	7.1
Energy generation	26.5	1.8	34.2	2.6	34.4	2.3
Social development	43.0	2.9	37.2	2.8	43.5	2.9
Public works	-	-	-	-	14.4	1.0
Health	78.4	5.3	121.0	9.1	86.7	5.7
Education	20.5	1.4	23.4	1.7	8.9	0.6
Natural resources/ Environmental protection	14.9	1.0	24.8	1.9	22.2	1.5
Domestic resources/ Development	2.1	0.1	2.0	0.1	2.6	0.2
Science/Technology	101.2	6.9	97.0	7.3	82.1	5.4
Defense	-	-	164.1	12.3	199.8	13.2
Related to all fields	253.5	17.3	81.0	6.1	110.5	7.3
Total	1,467.4	100.0	1,331.8	100.0	1,507.0	100.0
Percentage of GDP		0.31		0.24		0.22
Percentage in Government budget		1.18		1.45		1.38

Source: NESDB, The Fifth National Economic and Social Development Plan (1982 - 1986).

2.2.5 Future of Thai Industry

As mentioned earlier, the key policy of the Thai Government has been to retain agriculture as staple basis of national economy, while on the other hand according highest priority to the development of manufacturing industries, as symbolized in the Eastern Seaboard industrialization project. It has also been mentioned that the first step toward industrialization was directed to encouraging domestic production of articles to displace imported goods, to be followed by industries for producing export goods.

There exists, however, no intrinsic difference between industries for import displacement and for export: With progress of industrialization, what was initially an import displacement industry could well develop into an export industry, upon effectively satisfying and expanding the domestic market, and upon accumulation of efforts in enhancing technological and managerial capability, which will result in extending the circle of supporting industries and in strengthening the basic structure of industry. A representative instance is the textile industry: It was originally a typical import displacement industry: From about 10 years ago exports came to exceed imports; today this industry bears the largest share of export goods, even exceeding rice.

In envisioning the future path of Thai industrialization, the path taken by the newly industrialized countries like Korea and Taiwan, with contribution of Japanese assistance, might serve as guide. It would indicate that progress of Thai industries would first result in a rise of raw material consumption: This would signify that domestically produced raw materials are coming to be processed by industry into articles of higher value added. These articles will first satisfy the domestic market, and then the productive equipment and manpower will be extended and geared to the manufacture of articles for the international market. Typical products that can be expected to follow this path are those of the agro-industries --where products from relatively small-scale enterprises can be expected to find outlets in export-- and the more technology-oriented industries like machinery and electrical equipment manufacture, metalworking and electronics, as indicated in Table 2.2.5-1. This is the pattern of development to be followed by already existing industries.

Another promising line indicated in Table 2.2.5-1 is the transfer into Thailand of industries that come to be decreasingly tenable in the more industrialized countries on account of high labour cost. The attractive advantages offered by Thailand in the world market as a country for implanting bases for production --labour market not lacking in workers capable of flexibly adapting to new and higher skills, extensive land available for factory installation, abundant raw materials-- should not fail to draw many foreign enterprises seeking to establish factories abroad. This represents a line of industrial development that will bring out to best effect all the inherent advantages possessed by Thailand in this connection.

Envisioned in this light, the future of Thai industrialization should bring about extension in the range of exportable goods, from agricultural to agro-industrial products --to bring higher value added-- and further to more labour-intensive industrial products --to generate more employment opportunities. Signs of progress in this direction can already be discerned in the successful establishment by the Industrial Estate Authority of the industrial estates --including an export processing zone-- cited in Table 2.2.5-2, namely Bang Poo, Bang Phlee, Bang Chan, Lat Krabang and Northern Industrial Estate, as well as Laem Chabang and Map Ta Phut on the Eastern Seaboard.

Table 2.2.5-1 Promising Industrial Segments for Future Investments

1. Agro-industries

1.1 Aquaculture and marine products

- Aquaculture feed
- Hatchery operation to produce fry
- Aquarium fishes and freshwater plants for aquarium
- Tuna canning
- Canning of baby clams, squids, cuttlefish and mollusc

1.2 Fruits and vegetables based products

- Improved seeds for fruits and vegetables
- Integrated cultivation of papaya and production of papain and puree
- Canned: bamboo shoots, baby corns, water chestnut and white and all green asparagus
- Production of juice, nectars, puree and concentrate: guava, tomato, mango, orange and passion fruit
- Integrated mushroom farming and processing

1.3 Field crops based products

- Improved seeds and seedlings for major field crops
- Production of peanut butter

2. Machinery and electrical equipment manufacture, metalworking

2.1 Metal and machine works

- Precise machine component, molds and gears
- Food processing and storage equipment
- Industrial hand tools and machine tools
- Pump/Value for domestic water supply and special industries

2.2 Electronic products

- Computer peripherals (CRT monitors, keyboards printer, and floppy disk drives)
- Integrated circuit (IC)
- Printed circuit boards (PCB)
- Low voltage switchgear

2.3 Automotive

- Automotive aftermarket parts

3. Chemical products

3.1 The most attractive products

- Rare Earths: Specialized rare earths extraction and purification operation (e.g. yttrium)
- Surface Active Agents: Ethylene oxide and its derivatives
- Pesticides Active Ingredients: 2 - 4 D, Monocrotophos, Methyl bromide, Atrazine, Ametryne, Dalapon, etc.
- Rubber - Processing Chemicals: multipurpose organic synthesis plant and other products

3.2 The attractive products

- Titanium Dioxide (Ti O_2)
- Ethylene Oxide and Derivatives
- Fermentation Products of Chemicals and Drugs
- Stearates
- Fluorspar

Source: NESDB & SRI International

Table 2.2.5-2 Industrial Estates and Export Processing Zone Established by the Industrial Estate Authority of Thailand

	No. of Firms	Occupied Area (Rai)	Projected No. of Workers	Projected Investment (Million Baht)
a) Bang Chan	64	506.96	6,493	1,328.043
b) Lat Krabang				
General Industrial Area	36	726.31	3,457	3,298.860
Export Processing Zone	25	123.64	5,124	708.35
c) Bang Poo	60	712.48	6,457	3,455.429
d) Bang Phlee	46	321.17	5,305	841.524
e) Northern Industrial Estate	7	61.8	n.a.	n.a.
GRAND TOTAL	238	2,452.36	26,836	9,632.206

1 Rai = 1,600 m^2

Source: Informative Paper, May 1986, Industrial Estate Authority of Thailand

2.3 Future Prospects for Exports

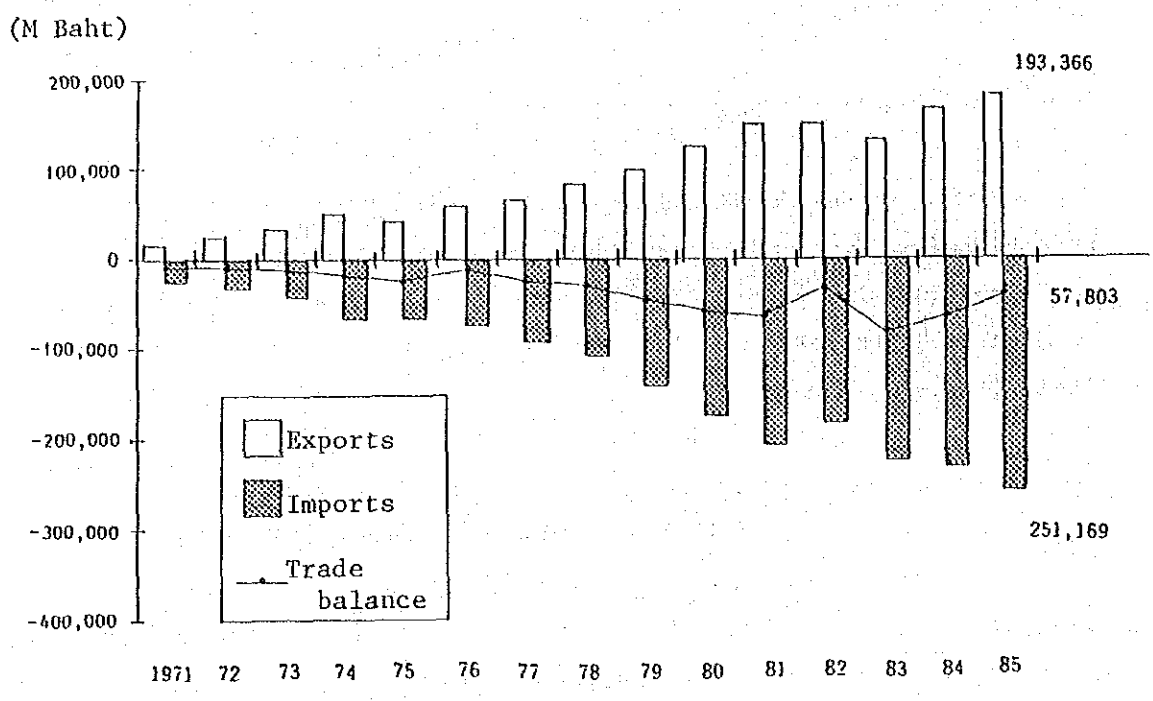
2.3.1 Balance of Trade

The balance of trade has progressed as indicated in Fig. 2.3.1-1. The traditional stable export articles are rice, tapioca, crude rubber, sugar, and other primary products; capital goods like machinery, iron and steel, chemicals, together with consumer goods, are being imported, as in the case of all developing countries.

The total external trade has steadily risen for both imports and exports, but the balance is chronically in the red, despite the notable improvement seen of recent years in exports of industrial products including textiles and integrated circuits. The increase in imports is due to the growing demands generated by consumers, and by the rapidly expanding domestic industry calling for imported equipment and materials. This is typical of an industrializing nation which has not yet completed transformation of economic structure from dependence on agriculture to reliance on manufacturing industry.

Current staple exports are agricultural products, whose prices are expected to follow a long-term falling trend. Against this, imports will have to cover materials and capital goods needed by the expanding manufacturing industries during some years. Also for some time, imported capital goods will further be required to equip the industries utilizing the Gulf of Siam natural gas. Moreover, continued increases will have to be expected in energy consumption, with the rising standard of living.

The road open to Thailand for improving the balance of trade problem is to follow for the time being the same path as Japan in pursuing the U.S., and as the newly industrialized in pursuing Japan --that of first manufacturing and exporting labour-intensive products of increasingly higher value added, with which to catch up and overtake the newly industrialized countries.



Source: Quarterly Bulletin, Bank of Thailand

Fig. 2.3.1-1 Progress of Trade Balance

2.3.2 Current status of foreign trade

Export trade has progressed as indicated in Table 2.3.2-1, which gives the data for staple export goods.

Six product lines --rice, rubber, maize, tapioca products, prawns, and sugar-- occupying 6 of the 10 leading positions in Table 2.3.2-1 attest to the continuing prominence of agricultural products in the export trade. In 1985, the above 6 product lines still represented in value 35 percent of the total exports.

It is notable, however, that rice --which has traditionally been the outstanding staple article of export-- is gradually decreasing its share, with the rising weight of manufactured products, to reflect the effect of

progressing industrialization. An illustrative instance is textile products --Line 9 in Table 2.3.2-1-- which is rapidly raising its share, to contribute 12.2 percent of total in 1985. During the same year, integrated circuits also reached 4.3 percent share, and is continuing its rise.

Table 2.3.2-1 Progress of Stable Exports: Product Lines Exported

Line			1980	1981	1982	1983	1984	1985
	a. Principal Exports							
1a	Rice	Metric tons	2,799,724	3,031,783	3,784,143	3,476,480	4,615,803	4,062,240
b		Millions of Baht	19,508	26,366	22,510	20,157	25,932	22,524
2a	Rubber	Metric tons	455,006	472,122	544,487	555,060	591,919	689,964
b		Millions of Baht	12,351	10,841	9,490	11,787	13,004	13,567
3a	Maize[1/]	Metric tons	2,202,510	2,574,608	2,830,701	2,658,679	3,144,605	2,781,994
b		Millions of Baht	7,299	8,349	8,330	8,486	10,147	7,700
4a	Tapioca products	Metric tons	5,217,702	6,265,833	7,815,455	5,196,751	6,569,728	7,088,394
b		Millions of Baht	14,887	16,446	19,752	15,387	16,600	14,969
5a	Prawns	Metric tons	17,915	18,761	20,138	20,150	19,428	24,041
b		Millions of Baht	1,961	2,136	2,764	3,164	2,799	3,439
6a	Tin	Metric tons	33,955	30,074	24,889	17,724	18,455	17,965
b		Millions of Baht	11,347	9,091	7,773	5,265	5,280	5,647
7a	Sugar	Metric tons	451,696	1,118,639	2,206,240	1,536,891	1,241,959	1,714,377
b		Millions of Baht	2,975	9,572	12,932	6,338	5,222	6,247
8a	Integrated circuits	Thousand units	621,186	599,100	448,005	453,879	747,902	576,736
b		Millions of Baht	6,156	6,193	5,930	5,829	7,352	8,248
9	Textile products	Millions of Baht	9,643	12,570	14,005	14,351	19,155	23,578
10	Precious stones	Millions of Baht	3,240	4,486	4,671	6,214	6,129	6,350
11	**Total principal exports**	Millions of Baht	**89,367**	**106,050**	**108,157**	**96,978**	**111,620**	**112,269**
12	Others	Millions of Baht	43,830	46,951	51,571	49,494	63,617	81,097
13	**Total**	Millions of Baht	**133,197**	**153,001**	**159,728**	**146,472**	**175,237**	**193,366**

1/ *Including maize groats and meal.*

Source: Bank of Thailand, Quarterly Bulletin

Table 2.3.2-2 gives in detail the item on Line 10 in Table 2.3.2-1, designated "Others". These miscellaneous product lines, which in 1980 represented 33 percent of total exports, rose to 42 percent in 1985, thus substantiating the differentiation of export items that has characterized the progress of industrialization.

Table 2.3.2-2 Progress of Other Exports: Product Lines Exported

Line			1980	1981	1982	1983	1984	1985
14a	Tobacco leaves	Metric tons	39,057	36,646	38,260	35,560	35,858	32,923
b		Millions of Baht	1,371	1,739	2,546	1,791	1,638	1,580
15a	Mung beans	Metric tons	179,350	172,176	190,230	156,859	172,426	233,523
b		Millions of Baht	1,448	1,693	1,915	1,552	1,778	2,284
16a	Frozen fowl	Metric tons	18,503	26,905	33,217	22,926	34,217	37,839
b		Millions of Baht	656	1,187	1,310	946	1,420	1,467
17a	Sorghum	Metric tons	180,592	220,618	288,755	228,279	219,232	316,887
b		Millions of Baht	661	904	928	790	809	1,048
18a	Fresh fruits	Metric tons	37,278	47,535	62,631	51,104	45,673	57,280
b		Millions of Baht	275	426	657	525	567	684
19a	Natural orchids	Metric tons	4,483	5,309	6,323	7,940	7,481	7,780
b		Millions of Baht	422	402	334	354	391	490
20a	Raw cotton	Metric tons	10,845	10,715	20,862	12,675	10,816	11,265
b		Millions of Baht	343	267	627	268	228	210
21a	Unworked leather	Metric tons	745	1,097	1,224	1,269	1,509	1,156
b		Millions of Baht	135	323	434	366	357	384
22a	Coffee	Metric tons	2,157	5,673	8,313	10,810	11,209	20,602
b		Millions of Baht	173	231	352	452	527	883
23a	Kapok fibre	Metric tons	14,771	12,447	10,123	11,558	9,427	9,775
b		Millions of Baht	255	285	229	250	220	230
24a	Fresh cuttlefish	Metric tons	38,641	39,804	42,656	39,322	42,823	46,290
b		Millions of Baht	1,301	1,336	1,784	1,637	1,693	2,120
25a	Fish meal	Metric tons	144,343	113,771	83,074	93,246	85,487	74,791
b		Millions of Baht	972	1,014	701	785	743	605
26a	Fresh fish	Metric tons	41,435	56,867	53,216	53,410	75,255	96,443
b		Millions of Baht	381	767	689	686	1,017	1,377
27a	Dried cuttlefish	Metric tons	2,456	2,912	3,565	3,441	3,919	4,385
b		Millions of Baht	378	488	607	630	800	1,046
28a	Tungsten	Metric tons	3,637	1,993	1,412	1,189	1,885	1,286
b		Millions of Baht	647	379	200	132	220	150
29a	Fluorite	Metric tons	226,305	221,838	182,388	183,002	230,137	199,640
b		Millions of Baht	314	332	320	289	368	363
30a	Canned pineapple	Metric tons	127,008	161,591	150,242	135,795	186,276	192,764
b		Millions of Baht	1,432	2,039	1,993	1,871	2,846	3,292
31a	Canned fish	Metric tons	14,159	28,371	43,706	49,947	81,419	102,944
b		Millions of Baht	603	1,109	1,665	2,116	3,696	5,204
32a	Canned crustanceans	Metric tons	17,038	15,250	20,722	19,580	29,048	29,542
b		Millions of Baht	987	1,009	1,479	1,664	2,162	2,143
33a	Molasses	Metric tons	245,846	443,325	927,422	726,839	774,504	751,656
b		Millions of Baht	364	696	851	609	863	758
34a	Iron or steel tubes and pipes	Metric tons	87,198	55,035	47,502	50,056	102,452	162,993
b		Millions of Baht	932	580	468	429	867	1,649
35a	Leather gloves	Thousand pairs	23,994	15,340	16,867	14,922	23,530	21,190
b		Millions of Baht	410	242	250	223	355	347
36a	Artificial flowers	Metric tons	4,795	5,793	5,110	4,430	4,617	4,121
b		Millions of Baht	286	383	372	481	756	913
37a	Wall and floor tiles	Metric tons	19,985	20,151	21,414	25,611	23,477	22,496
b		Millions of Baht	218	227	217	302	311	315
38	Wood products	Millions of Baht	1,363	1,367	1,332	1,336	1,646	1,901
39	Jute products	Millions of Baht	1,518	1,245	1,292	1,100	2,036	1,561
40	Footwear	Millions of Baht	358	956	1,340	1,743	2,052	2,368
41	Funiture and parts	Millions of Baht	576	707	793	981	1,017	1,317
42	Plastic products	Millions of Baht	610	689	713	938	1,297	1,262
43	Jewellery	Millions of Baht	533	526	578	1,028	1,254	2,168
44	Others	Millions of Baht	23,908	23,403	24,595	23,220	29,683	40,978
45	**Total**	Millions of Baht	**43,830**	**46,951**	**51,571**	**49,494**	**63,617**	**81,097**

Source: Bank of Thailand, Quarterly Bulletin

Imports have progressed as given in Table 2.3.2-3. With the rise of industrialization, consumer goods --which occupied the dominant position during the 1960's-- is seen to have steadily diminished its share, to be replaced by the increasing share of raw and intermediate materials to feed the rising industry, together with the capital goods to equip the production facilities. Crude oil --Line 65-- rapidly raised total import value following the first oil crisis until 1981, when there was the fall in oil price, and it was followed in the ensuing year by a slight decline in value imported; in the ensuing 1983, substitution of imported fuel with the Gulf of Siam natural gas came to take effect, to limit the volume of crude oil imports to a slight increase, and to a significantly reduced total value reflecting the sharply lowered oil price.

Examination of the 1985 import figures reveals the shares to have been ca. 14 percent for capital goods --Line 1-- ca. 26 percent for intermediate products and raw materials --Line 23-- and ca. 30 percent for capital goods --Line 41. All there product categories have increased in absolute value from the preceding 1984. This can be attributed, in respect of consumer goods, to the sharp upturn of domestic business and to a reduction in the tax imposed on electrical appliances, which induced a 9 percent increase of imports in this product category. The increase of intermediate products and raw materials was contributed by the active demand for chemicals by the expanding plastic industry, for scrap iron and iron/steel materials by the progressing construction activity, and for cotton fibre by the textile industry to satisfy the expanding export market. The total imports in this category marked a 7 percent increase over the preceding 1984.

Capital goods imports increased by 2.5 percent, with the trend toward inventory control coming to a close, with improving business, and with rising demand for machinery parts. Other factors included increases in the demand for production equipment by the textile and construction industries --notably elevators and equipment to cover the extension work in progress on the telecommunication network.

The foregoing trend of increasing imports has already been discussed in the preceding pages.

Table 2.3.2-3 Progress of Imports: Product Lines Imported

Unit: ฿ million

Line		1979	1980	1981	1982	1983	1984	1985
1	**I. CONSUMER GOODS**	**15,933**	**19,286**	**22,985**	**22,783**	**29,699**	**31,939**	**34,820**
2	**A. Non-durable :**	**9,343**	**12,257**	**13,616**	**12,991**	**16,045**	**17,663**	**19,955**
3	Food and beverages :	4,263	6,182	6,447	5,638	7,041	8,072	10,116
4	Dairy products	1,445	1,534	2,451	1,937	2,447	2,418	2,588
5	Fish and preparations	427	472	481	648	984	2,020	3,753
6	Cereals and preparations	686	717	1,101	730	947	782	880
7	Fruits and vegetables	473	669	716	715	896	991	794
8	Coffee, tea and spices	171	131	166	191	237	191	261
9	Others	1,061	2,659	1,532	1,417	1,530	1,670	1,840
10	Tobacco products	40	80	71	100	85	105	111
11	Toilet and cleaning articles	861	828	991	957	1,165	1,230	1,442
12	Clothing and footwear	2,245	3,037	3,730	3,800	4,968	5,523	5,213
13	Medicinal and pharmaceutical products	1,934	2,130	2,377	2,496	2,786	2,733	3,073
14	**B. Durable :**	**6,590**	**7,029**	**9,369**	**9,792**	**13,654**	**14,276**	**14,865**
15	Household goods	1,950	2,266	2,573	2,471	2,885	3,044	3,523
16	Electrical appliances	2,475	2,887	3,732	4,039	5,719	6,726	6,846
17	Wood and cork products	120	114	126	122	121	103	116
18	Leather and leather products	60	64	38	30	47	75	269
19	Furniture	60	59	70	81	105	131	130
20	Jewelry, including silver bars	867	452	1,352	1,772	3,141	2,591	2,540
21	Cycles, motorcycles, carts, etc	919	931	1,225	1,024	1,310	1,284	949
22	Small arms	139	256	253	253	326	322	492
	II. INTERMEDIATE PRODUCTS AND RAW							
23	**MATERIALS**	**43,500**	**45,312**	**53,575**	**48,596**	**59,539**	**61,542**	**66,080**
24	**A. Chiefly for consumer goods :**	**26,108**	**28,182**	**33,716**	**30,427**	**37,187**	**39,018**	**41,415**
25	Animal and vegetable crude materials	1,072	3,514	3,149	2,782	2,987	4,010	2,494
26	Tobacco unmanufactured	811	1,019	865	1,639	603	974	1,409
27	Tobacco leaves	811	1,019	865	1,639	603	974	1,409
28	Tobacco unmanufactured, n.i.e.	—	—	—	—	—	—	—
29	Wood, lumber, cork, pulp, waste paper	3,552	2,612	3,642	2,992	3,783	3,489	3,678
30	Textile fibers :	3,189	3,175	3,915	3,247	4,516	5,388	5,673
31	Natural	2,839	2,853	3,443	2,451	3,882	4,507	4,919
32	Synthetic	350	322	472	796	634	881	754
33	Textile yarn and thread	704	786	1,278	1,094	1,399	1,513	1,443
34	Paper and paperboard	1,924	2,114	2,856	2,535	3,109	2,914	3,656
35	Chemicals	14,856	14,962	18,011	16,138	20,790	20,730	23,062
36	**B. Chiefly for capital goods :**	**17,392**	**17,130**	**19,859**	**18,169**	**22,352**	**22,524**	**24,665**
37	Crude minerals	1,247	895	1,055	1,035	1,105	1,150	1,318
38	Base metals :	16,145	16,235	18,804	17,134	21,247	21,374	23,347
39	Iron and steel	10,035	10,335	12,039	11,323	13,860	14,035	15,942
40	Others	6,110	5,900	6,765	5,811	7,387	7,339	7,405

1/ *Excluding military aid.*

Source: Bank of Thailand, Quarterly Bulletin

Table 2.3.2-3 Continued

Unit: ฿ million

Line		1979	1980	1981	1982	1983	1984	1985
41	**III. CAPITAL GOODS**	**39,902**	**46,075**	**56,772**	**47,778**	**69,358**	**72,431**	**74,241**
42	Fertilizers and pesticides	3,972	4,225	5,180	4,723	6,232	6,162	6,749
43	Cement	1,434	1,325	175	8	27	19	16
44	Construction materials	298	287	412	242	292	298	317
45	Tubes and pipes	266	345	650	458	824	834	1,065
46	Glass and other mineral manufactures	1,394	1,399	1,443	1,183	1,527	1,256	1,456
47	Rubber manufactures	442	410	504	511	620	630	698
48	Metal manufactures	2,987	3,142	5,147	2,986	4,046	3,952	4,979
49	Non-electrical machinery and parts	18,648	20,402	25,842	21,172	33,061	34,992	34,718
50	For agricultural use	176	176	239	164	140	192	216
51	Tractors	1,808	2,238	3,051	1,679	1,841	1,821	1,422
52	For industrial use	16,664	17,988	22,552	19,329	31,080	32,979	33,080
53	Electrical machinery and parts	7,355	11,206	10,867	11,008	15,916	16,909	14,683
54	Scientific and optical instruments	1,667	2,290	2,991	3,256	4,598	4,088	4,355
55	Aircrafts and ships	1,425	628	3,222*	2,171	1,427	3,176	3,494
56	Locomotive and rolling stock	14	416	339	60	788	115	1,711
57	**IV. OTHER IMPORTS**	**46,826**	**78,013**	**83,414**	**77,459**	**78,013**	**79,243**	**76,028**
58	Vehicles and parts	7,126	6,912	9,568	7,687	11,416	11,834	9,293
59	Passenger cars	162	41	29	47	71	174	114
60	Buses and trucks	2,671	2,190	2,588	2,485	3,406	3,688	2,786
61	Chassis and bodies	4,114	4,449	6,652	4,881	7,611	7,635	6,095
62	Tires	179	232	299	274	328	337	298
63	Fuel and lubricant :	32,647	58,733	65,100	60,765	57,065	57,353	56,718
64	Coke, briquettes, etc	138	175	208	408	356	385	570
65	Crude oil	23,425	39,304	47,241	45,052	39,975	35,035	38,526
66	Gasoline	659	2,164	1,713	89	4	337	202
67	Kerosene	46	43	300	528	753	462	95
68	Diesel oil and special fuels	6,993	14,833	12,494	10,763	11,018	16,089	14,085
69	Lubricants, asphalt, etc	1,386	2,214	3,144	3,925	4,959	5,045	3,240
70	Miscellaneous	6,582	12,368	8,746	8,987	9,497	10,024	9,976
71	Munition used in official services	4,340	6,474	5,226	5,641	6,152	6,101	6,139
72	Others	2,242	5,894	3,520	3,346	3,345	3,923	3,837
73	Gold bullion	471	—	—	20	35	32	41
74	**V. TOTAL IMPORTS**	**146,161**	**188,686***	**216,746***	**196,616**	**236,609**	**245,155**	**251,169**
75	Memo for merchandise imports in balance of payments coverage adjustment[2/]	-1,679	-5,264	-2,899	-3,276	-2,296	-2,839	-2,839
76	Gold imports	-471	—	—	-20	-35	-32	-41
77	Other imports[3/]	3,827	2,630	2,153	—	—	—	5,045
78	Thai military imports[3/]	5,625	3,973	—	—	—	—	—
79	Merchandise imports (c.i.f.)	153,463	190,025	216,000	193,320	234,278	242,284	253,334

1/ *Excluding military aid.*
2/ *Such as diplomatic shipments, personal effects, temporary imports, etc.*
3/ *Not included in customs return.*
* *Excluding imports of aircraft with have been taken account of in the balance of pagments statistics for the actual month of import.*

Source: Bank of Thailand, Quarterly Bulletin.

2.3.3 Forecast of Export Trend

2.3.3.1 Principal Countries Served

The past trend of staple exports is indicated in Table 2.3.3-1 for the different countries of destination.

Industrialization should advance from one of substituting imports with domestic products to a fully-fledged export industry furnishing the advanced as well as newly industrialized countries with manufactured products. Such a trend is already seen in the steady progress of exports in integrated circuits --Item h-- and textile products --Item i. The future of Thai exports should depend first on further extending the substitution of imported articles to cover products of higher grade, to be produced with imported equipment of ever higher performance; this shall be complemented by expanding exports of manufactured products to neighbouring and newly industrialized countries, which are rapidly raising their purchasing power.

Table 2.3.3-1 Progress of Exports --Classified by Country of Destination

Line			1981	1982	1983	1984	1985	1986 Jan.	Feb.	Mar.	Apr.	May	Jun.	Line
	a. Rice													
1a	China	Metric tons	215,247	337,579	28,999	104,703	73,723	-	43,962	57,260	94,921	32,833	28,584	1a
b		Millions of Baht	1,448	1,892	143	546	371	-	182	233	388	134	110	b
2a	Hong Kong	Metric tons	114,625	121,521	149,316	159,592	183,263	18,153	13,641	15,037	10,142	17,091	17,205	2a
b		Millions of Baht	1,172	952	1,196	1,161	1,294	126	96	105	67	114	121	b
3a	India	Metric tons	53,983	1,006	195,608	261,370	279	1	-	-	-	-	-	3a
b		Millions of Baht	469	8	997	1,329	1	-	-	-	-	-	-	b
4a	Indonesia	Metric tons	198,029	185,582	258,308	19,926	48,423	5,250	198	298	5,000	5,149	5,500	4a
b		Millions of Baht	1,719	1,256	1,402	105	216	19	1	2	23	26	29	b
5a	Iran	Metric tons	324,480	317,625	400,884	412,048	312,825	-	-	23,500	28,250	9,000	12,000	5a
b		Millions of Baht	3,490	2,128	2,361	2,583	1,731	-	-	119	145	46	61	b
6a	Malaysia	Metric tons	235,652	407,505	254,675	359,794	343,141	500	28,592	34,361	24,160	26,317	23,057	6a
b		Millions of Baht	2,150	2,777	1,595	2,182	2,090	3	167	203	141	152	136	b
7a	Saudi Arabia	Metric tons	87,649	94,856	72,995	92,175	156,366	19,308	44,124	33,892	19,529	12,985	4,316	7a
b		Millions of Baht	885	670	469	592	903	99	262	195	89	57	20	b
8a	Singapore	Metric tons	157,426	177,342	178,911	216,718	209,606	23,090	16,576	18,649	28,814	22,154	18,537	8a
b		Millions of Baht	1,728	1,431	1,325	1,438	1,299	145	100	116	165	128	109	b
9a	United Arab Emirates	Metric tons	46,089	16,112	29,027	54,693	78,414	10,416	6,191	3,057	8,967	7,262	15,615	9a
b		Millions of Baht	435	104	174	307	416	53	30	15	40	31	69	b
10a	U.S.S.R.	Metric tons	273,755	41,105	200	-	185,226	28,499	39,798	49,692	16,901	6,955	6,643	10a
b		Millions of Baht	2,619	174	1	-	768	74	103	128	55	25	27	b
11a	Brazil	Metric tons	43,017	-	106,002	55,745	165,969	-	48,976	154,431	500	-	-	11a
b		Millions of Baht	352	-	603	281	835	-	232	733	2	-	-	b
12a	Ivory Coast	Metric tons	157,167	134,639	88,267	52,650	5,249	420	36	-	-	-	27,665	12a
b		Millions of Baht	1,008	676	410	231	24	2	-	-	-	-	97	b
13a	Malagasy	Metric tons	19,546	262,752	119,259	223,410	81,723	-	-	-	-	-	-	13a
b		Millions of Baht	97	1,140	479	1,059	373	-	-	-	-	-	-	b
14a	Nigeria	Metric tons	190,685	195,316	471,191	189,177	292,424	-	-	6,500	10,500	-	23,500	14a
b		Millions of Baht	1,769	1,147	2,783	1,037	1,885	-	-	24	38	-	81	b
15a	Senegal	Metric tons	217,267	354,366	230,962	324,577	65,164	39,015	37,437	21,997	1,758	29,996	37,017	15a
b		Millions of Baht	1,171	1,378	933	1,425	269	142	125	57	5	82	104	b
16a	Others	Metric tons	697,166	1,137,121	891,602	2,089,225	1,860,445	176,067	211,743	177,655	223,500	268,385	210,482	16a
b		Millions of Baht	5,854	6,777	5,286	11,653	10,049	804	920	799	989	990	842	b
17a	Total	Metric tons	3,031,783	3,784,143	3,476,480	4,615,803	4,062,240	320,274	491,719	598,339	472,942	438,127	430,121	17a
b		Millions of Baht	26,386	22,510	20,157	25,932	22,524	1,469	2,218	2,729	2,147	1,786	1,806	b
	b. Rubber													
18a	China	Metric tons	10,200	29,924	38,910	41,036	60,296	9,270	4,420	680	5,867	7,515	1,851	18a
b		Millions of Baht	204	525	843	879	1,164	168	88	14	116	140	33	b
19a	Japan	Metric tons	329,038	320,259	319,940	322,072	348,854	32,823	48,004	14,611	38,412	25,267	26,771	19a
b		Millions of Baht	7,649	5,592	6,801	7,119	6,886	632	883	272	743	499	529	b
20a	S. Korea	Metric tons	5,952	16,563	11,183	16,447	23,328	2,649	2,671	3,780	2,131	1,161	1,177	20a
b		Millions of Baht	130	290	220	334	462	50	52	79	42	23	22	b
21a	Malaysia	Metric tons	16,463	17,899	17,111	15,350	15,490	2,570	1,266	1,624	1,136	1,556	1,118	21a
b		Millions of Baht	355	295	366	308	292	47	24	33	21	30	22	b
22a	Singapore	Metric tons	32,045	58,178	53,859	71,489	47,319	5,084	3,721	3,717	2,836	2,687	1,545	22a
b		Millions of Baht	717	990	1,049	1,596	916	92	70	73	51	49	29	b
23a	Taiwan	Metric tons	3,925	7,541	5,809	8,963	17,369	2,159	2,543	954	1,833	1,191	1,322	23a
b		Millions of Baht	84	126	122	192	350	41	48	19	35	23	27	b
24a	W. Germany	Metric tons	10,232	10,706	9,071	17,406	25,908	3,644	3,334	1,180	3,743	2,153	2,331	24a
b		Millions of Baht	233	187	187	389	504	67	63	24	77	42	46	b
25a	Romania	Metric tons	11,118	10,160	7,500	1,500	9,457	2,498	-	900	3,100	-	-	25a
b		Millions of Baht	269	189	170	36	185	45	-	18	64	-	-	b
26a	U.S.A.	Metric tons	42,040	48,451	69,052	65,701	81,630	11,832	8,679	3,081	7,776	5,401	5,289	26a
b		Millions of Baht	951	857	1,526	1,464	1,636	226	175	62	161	102	101	b
27a	Others	Metric tons	11,109	24,806	22,625	31,955	60,313	10,167	6,344	3,413	10,005	4,202	4,832	27a
b		Millions of Baht	249	439	503	687	1,172	187	122	71	200	81	94	b
28a	Total	Metric tons	472,122	544,487	555,060	591,919	689,964	84,696	80,982	33,940	76,839	51,133	46,236	28a
b		Millions of Baht	10,841	9,490	11,787	13,004	13,567	1,555	1,525	885	1,510	989	903	b

Source: Bank of Thailand, Quarterly Bulletin

Table 2.3.3-1 Continued - 1

Line			1981	1982	1983	1984	1985	1986 Jan.	Feb.	Mar.	Apr.	May	Jun.	Line
	c. Maize													
29a	China	Metric tons	143,340	96,610	162,014	33,663	66,300	8,000	75,500	118,600	26,500	10,500	40,750	29a
b		Millions of Baht	510	272	537	115	226	22	209	324	73	28	110	b
30a	Hong Kong	Metric tons	134,017	252,447	265,222	41,814	90,551	4,700	12,300	20,610	9,300	9,820	10,330	30a
b		Millions of Baht	431	746	845	140	215	12	32	52	25	26	27	b
31a	Indonesia	Metric tons	-	220,475	45,580	31,101	10,501	-	-	6,300	-	-	-	31a
b		Millions of Baht	-	683	145	104	43	-	-	29	-	-	-	b
32a	Iran	Metric tons	273,920	31,500	-	-	4,000	-	-	-	-	-	-	32a
b		Millions of Baht	806	85	-	-	15	-	-	-	-	-	-	b
33a	Iraq	Metric tons	5,996	1,488	25,468	6,428	38,445	-	-	-	-	-	-	33a
b		Millions of Baht	20	5	84	24	131	-	-	-	-	-	-	b
34a	Japan	Metric tons	20,619	185,617	10,580	5,856	26,065	6,848	12,779	31,951	6,887	200	323	34a
b		Millions of Baht	65	556	36	21	71	18	34	84	18	1	1	b
35a	Jordan	Metric tons	99,126	33,302	61,850	96,716	41,859	13,200	4,697	10,000	-	-	5,243	35a
b		Millions of Baht	320	107	193	321	108	33	12	25	-	-	14	b
36a	S. Korea	Metric tons	50,990	21,678	71,500	150,720	459,650	179,822	177,380	85,350	16,500	74,800	54,500	36a
b		Millions of Baht	149	56	216	472	1,098	439	432	213	37	186	136	b
37a	Kuwait	Metric tons	239,653	82,914	161,749	97,981	184,051	-	-	-	300	-	-	37a
b		Millions of Baht	874	258	519	331	567	-	-	-	1	-	-	b
38a	Malaysia	Metric tons	471,413	578,701	539,591	651,551	910,660	70,050	76,037	93,378	55,425	42,130	76,433	38a
b		Millions of Baht	1,506	1,732	1,746	2,105	2,533	175	189	235	141	108	195	b
39a	Philippines	Metric tons	49,109	126,310	178,400	39,650	141,703	-	3	-	-	-	-	39a
b		Millions of Baht	164	397	587	133	459	-	-	-	-	-	-	b
40a	Saudi Arabia	Metric tons	201,252	320,563	370,100	371,124	214,385	8,060	26,872	39,850	10,000	30,200	31,372	40a
b		Millions of Baht	663	984	1,175	1,242	626	21	64	93	25	72	76	b
41a	Singapore	Metric tons	365,070	464,984	382,500	406,601	368,811	38,900	22,865	30,105	24,300	24,100	15,405	41a
b		Millions of Baht	1,073	1,296	1,178	1,279	985	95	54	74	61	61	37	b
42a	Taiwan	Metric tons	99,908	190,958	7,263	50,658	4,622	1,485	1,260	4,052	216	216	94	42a
b		Millions of Baht	342	524	29	145	15	5	4	12	1	1	-	b
43a	U.S.S.R.	Metric tons	252,579	110,690	171,690	423,982	-	-	-	-	-	-	-	43a
b		Millions of Baht	850	308	523	1,294	-	-	-	-	-	-	-	b
44a	Others	Metric tons	167,616	104,464	205,172	736,760	220,191	19,375	52,549	67,124	25,782	11,275	43,569	44a
b		Millions of Baht	576	321	673	2,421	606	47	134	170	67	28	118	b
45a	Total	Metric tons	2,574,608	2,830,701	2,658,679	3,144,605	2,781,994	350,440	462,242	507,365	175,010	203,241	278,019	45a
b		Millions of Baht	8,349	8,330	8,486	10,147	7,700	867	1,164	1,312	449	511	714	b
	d. Tapioca Products													
46a	Indonesia	Metric tons	2	100,468	47,271	23	54	18	9,001	9,000	17	2,500	-	46a
b		Millions of Baht	-	451	253	-	-	-	39	39	-	15	-	b
47a	Japan	Metric tons	78,495	79,479	60,310	154,501	589,281	58,524	36,456	18,125	16,033	9,581	12,034	47a
b		Millions of Baht	355	401	323	590	1,192	138	109	62	66	51	63	b
48a	S. Korea	Metric tons	86,282	55,869	122,734	134,971	283,292	35,548	39,589	15,102	41,144	53,889	9,995	48a
b		Millions of Baht	227	134	363	367	481	59	69	29	90	134	27	b
49a	Taiwan	Metric tons	85,961	70,103	80,849	194,712	419,739	20,966	30,347	19,662	10,173	8,914	10,093	49a
b		Millions of Baht	370	324	426	660	897	55	89	75	52	47	52	b
50a	Belgium	Metric tons	209,932	369,482	130,992	75,518	136,297	20	-	752	37	151	19	50a
b		Millions of Baht	724	893	354	195	323	-	-	4	-	1	-	b
51a	France	Metric tons	101,633	166,061	89,593	131,429	68,919	557	19	536	549	291	505	51a
b		Millions of Baht	260	419	251	323	155	2	-	2	2	2	2	b
52a	W. Germany	Metric tons	243,808	279,697	97,705	53,069	284,738	36,364	388	25,076	51,864	82,566	48,283	52a
b		Millions of Baht	608	690	270	136	635	102	2	67	152	241	138	b
53a	Italy	Metric tons	76,493	124,128	27,025	152,293	62,265	-	-	37	-	150	-	53a
b		Millions of Baht	187	311	76	391	133	-	-	-	-	1	-	b
54a	Netherlands	Metric tons	4,907,321	6,379,568	4,362,394	5,393,860	4,069,569	406,029	131,007	491,699	353,080	570,037	214,705	54a
b		Millions of Baht	12,229	15,405	12,115	12,894	8,956	1,064	327	1,322	988	1,702	638	b
55a	U.S.S.R.	Metric tons	307,050	54,380	88,510	71,750	400,020	134,172	60,150	18,850	19,000	15,700	7,630	55a
b		Millions of Baht	876	235	484	323	671	166	71	92	92	91	45	b
56a	U.S.A.	Metric tons	40,627	25,209	35,983	39,952	49,954	1,065	584	9,303	831	4,517	676	56a
b		Millions of Baht	220	133	211	234	243	7	5	59	6	26	6	b
57a	Others	Metric tons	128,229	110,831	53,384	167,650	724,265	230,837	62,810	50,275	92,710	6,798	41,880	57a
b		Millions of Baht	390	356	261	487	1,283	433	115	128	261	35	141	b
58a	Total	Metric tons	6,265,833	7,815,455	5,196,751	6,569,728	7,088,393	922,100	388,350	858,417	585,438	755,094	354,820	58a
b		Millions of Baht	16,446	19,752	15,387	16,600	14,989	2,026	846	1,879	1,709	2,346	1,112	b

Source: Bank of Thailand, Quarterly Bulletin

Line			1981	1982	1983	1984	1985	1986						Line
								Jan.	Feb.	Mar.	Apr.	May	Jun.	
	e. Prawns													
59a	Hong Kong	Metric tons	2,725	3,431	2,503	1,682	1,907	107	105	104	164	202	203	59a
b		Millions of Baht	129	188	139	109	117	6	6	6	10	11	16	b
60a	Japan	Metric tons	10,395	9,804	7,662	7,053	7,651	773	883	820	887	755	433	60a
b		Millions of Baht	1,450	1,853	1,536	1,212	1,456	182	176	190	195	150	96	b
61a	Singapore	Metric tons	344	375	459	1,011	3,363	228	364	330	374	296	298	61a
b		Millions of Baht	36	39	42	90	339	23	37	34	38	29	29	b
62a	France	Metric tons	247	384	378	301	322	32	14	30	27	16	78	62a
b		Millions of Baht	23	36	44	26	26	3	2	3	2	2	7	b
63a	W. Germany	Metric tons	280	394	479	267	273	15	12	31	29	38	28	63a
b		Millions of Baht	51	74	110	54	61	5	3	8	9	11	7	b
64a	Italy	Metric tons	584	740	157	57	116	31	18	59	64	44	45	64a
b		Millions of Baht	37	50	12	2	12	4	2	6	9	6	7	b
65a	United Kingdom	Metric tons	689	718	894	1,116	1,350	128	83	147	194	254	273	65a
b		Millions of Baht	70	86	115	99	114	13	6	12	26	28	33	b
66a	U.S.A.	Metric tons	2,475	3,458	6,149	5,941	7,097	524	385	639	703	849	1,170	66a
b		Millions of Baht	235	351	873	960	1,100	67	47	86	101	135	207	b
67a	Australia	Metric tons	417	418	1,002	1,062	851	18	11	789	40	23	30	67a
b		Millions of Baht	72	53	216	188	161	4	1	7	6	4	4	b
68a	Others	Metric tons	605	416	467	758	1,111	55	104	146	111	92	146	68a
b		Millions of Baht	33	34	77	59	53	-	3	9	8	6	10	b
69a	Total	Metric tons	18,761	20,138	20,150	19,428	24,041	1,911	1,979	3,094	2,593	2,569	2,704	69a
b		Millions of Baht	2,136	2,764	3,164	2,799	3,439	309	283	362	404	382	416	b
	f. Tin													
70a	Japan	Metric tons	4,496	4,324	3,941	3,251	4,018	291	315	546	614	269	450	70a
b		Millions of Baht	1,363	1,295	1,175	936	1,285	62	61	119	94	39	64	b
71a	Netherlands	Metric tons	13,666	10,379	5,935	6,827	6,327	630	810	360	-	-	-	71a
b		Millions of Baht	4,459	3,461	1,760	1,954	1,974	132	152	76	-	-	-	b
72a	U.S.A.	Metric tons	9,859	9,775	7,292	6,772	6,151	50	160	600	-	-	180	72a
b		Millions of Baht	2,956	2,904	2,171	1,933	1,934	11	30	128	-	-	26	b
73a	Others	Metric tons	1,053	411	556	1,605	1,469	360	855	940	718	571	1,100	73a
b		Millions of Baht	313	113	159	455	454	72	163	198	109	82	157	b
74a	Total	Metric tons	30,074	24,889	17,724	18,455	17,965	1,331	2,140	2,446	1,332	840	1,730	74a
b		Millions of Baht	9,091	7,773	5,265	5,280	5,647	277	406	521	203	121	247	b
	g. Sugar													
75a	China	Metric tons	109,798	518,437	83,599	268,056	857,861	1,583	-	37,635	-	-	11,527	75a
b		Millions of Baht	834	3,049	299	1,059	3,034	4	-	148	-	-	37	b
76a	Indonesia	Metric tons	18,813	64,460	45,905	2,968	-	-	-	-	-	-	-	76a
b		Millions of Baht	115	404	202	15	-	-	-	-	-	-	-	b
77a	Japan	Metric tons	104,474	401,602	632,982	439,964	282,784	-	11,476	12,266	7,600	101,220	31,472	77a
b		Millions of Baht	871	1,997	2,559	1,826	963	-	39	40	28	320	107	b
78a	S. Korea	Metric tons	113,833	93,810	165,159	184,438	218,956	16,208	29,779	12,018	34,289	65,102	5,281	78a
b		Millions of Baht	1,156	575	684	763	719	42	89	39	101	216	20	b
79a	Malaysia	Metric tons	42,975	98,500	78,906	114,813	77,312	-	-	24,055	10,950	19,489	29	79a
b		Millions of Baht	363	540	305	421	220	-	-	78	38	63	-	b
80a	Saudi Arabia	Metric tons	-	35,900	21,026	-	-	-	-	-	-	-	-	80a
b		Millions of Baht	-	253	110	-	-	-	-	-	-	-	-	b
81a	Singapore	Metric tons	15,340	681	1,907	12,560	1,979	1,331	42	176	272	718	60	81a
b		Millions of Baht	127	3	9	50	12	7	-	1	2	5	-	b
82a	Sri Lanka	Metric tons	-	6,841	66,729	-	28,317	4,728	-	1,308	-	-	11,469	82a
b		Millions of Baht	-	33	294	-	91	19	-	4	-	-	48	b
83a	U.S.S.R.	Metric tons	269,942	593,806	129,511	-	36,631	-	-	-	30,679	195,753	16,794	83a
b		Millions of Baht	2,122	3,374	444	-	124	-	-	-	93	632	55	b
84a	U.S.A.	Metric tons	275,116	290,948	29,683	39,550	29,875	-	21,184	-	-	192	-	84a
b		Millions of Baht	2,548	2,039	186	334	317	-	229	-	-	1	-	b
85a	Egypt	Metric tons	-	-	44,667	5,700	-	-	-	-	-	-	-	85a
b		Millions of Baht	-	-	226	12	-	-	-	-	-	-	-	b
86a	Morocco	Metric tons	132,792	65,196	71,426	24,144	-	-	-	-	-	-	-	86a
b		Millions of Baht	1,102	423	299	101	-	-	-	-	-	-	-	b
87a	Others	Metric tons	34,556	36,059	165,381	149,766	190,662	13,446	5,355	12,326	321	17,554	66,966	87a
b		Millions of Baht	334	242	721	641	767	48	19	61	3	61	259	b
88a	Total	Metric tons	1,118,639	2,206,240	1,536,891	1,241,959	1,724,377	37,296	67,836	99,784	84,111	400,028	143,598	88a
b		Millions of Baht	9,572	12,932	6,338	5,222	6,247	120	376	371	265	1,298	526	b

Source: Bank of Thailand, Quarterly Bulletin

Line			1981	1982	1983	1984	1985	1986 Jan.	Feb.	Mar.	Apr.	May	Jun.	Line
	h. Integrated Circuits													
89a	Hong Kong	Thousand units	35,552	39,916	17,893	12,617	8,151	847	623	586	474	574	785	89a
b		Millions of Baht	474	566	263	198	221	18	12	12	9	11	16	b
90a	S. Korea	Thousand units	21,069	11,130	13,989	37,566	35,629	851	1,113	1,185	2,795	707	-	90a
b		Millions of Baht	107	35	30	76	69	5	5	6	7	1	-	b
91a	Malaysia	Thousand units	83,882	24,602	7,620	5,526	70,407	9,515	6,827	5,795	7,070	8,260	7,630	91a
b		Millions of Baht	552	260	30	93	1,071	183	139	102	93	109	105	b
92a	Singapore	Thousand units	128,288	114,832	145,662	160,373	98,012	17,115	15,213	12,511	15,701	13,462	11,856	92a
b		Millions of Baht	2,609	2,294	2,999	2,804	2,223	404	343	256	301	308	288	b
93a	France	Thousand units	414	1,411	3,828	11,000	8,513	933	684	634	1,043	530	559	93a
b		Millions of Baht	5	28	159	392	377	42	21	21	32	19	25	b
94a	W. Germany	Thousand units	18,274	27,897	13,545	1,900	7,886	2,662	1,027	1,483	3,802	1,893	2,316	94a
b		Millions of Baht	85	182	78	19	103	27	10	13	39	24	28	b
95a	United Kingdom	Thousand units	3,036	7,911	1,035	3,093	11,431	2,214	1,360	1,050	1,369	1,063	859	95a
b		Millions of Baht	32	110	58	107	327	51	37	26	31	30	31	b
96a	U.S.A.	Thousand units	295,832	218,022	266,680	420,130	272,454	26,284	24,318	21,880	38,307	12,768	7,027	96a
b		Millions of Baht	2,295	2,416	2,116	3,208	3,401	535	499	398	450	394	281	b
97a	Others	Thousand units	12,753	10,284	23,667	95,697	64,253	5,171	5,844	5,457	10,795	1,091	130	97a
b		Millions of Baht	34	39	96	455	456	49	32	29	54	5	1	b
98a	Total	Thousand units	599,100	448,005	453,879	747,902	576,738	65,592	57,009	50,581	81,357	40,348	31,161	98a
b		Millions of Baht	6,193	5,930	5,829	7,352	4,248	1,314	1,098	863	1,016	901	775	b
	i. Textile Products													
99	Bangladesh	Millions of Baht	129	153	239	351	737	135	178	203	173	47	21	99
100	Hong Kong	Millions of Baht	848	835	657	565	690	62	58	82	91	104	99	100
101	Indonesia	Millions of Baht	180	176	34	81	50	3	8	12	2	2	5	101
102	Japan	Millions of Baht	577	618	494	563	453	37	55	77	69	46	50	102
103	Kuwait	Millions of Baht	348	273	225	284	418	56	83	67	75	55	37	103
104	Laos	Millions of Baht	104	136	200	53	107	12	5	9	8	-	9	104
105	Malaysia	Millions of Baht	165	278	213	218	182	19	15	18	28	34	11	105
106	Philippines	Millions of Baht	13	25	29	52	109	6	5	11	7	4	10	106
107	Saudi Arabia	Millions of Baht	529	719	663	645	1,106	76	101	185	223	206	191	107
108	Singapore	Millions of Baht	585	891	776	771	1,157	144	66	133	141	108	112	108
109	United Arab Emirates.	Millions of Baht	713	569	747	588	1,004	88	73	123	132	318	260	109
110	Denmark	Millions of Baht	215	231	218	301	302	23	30	23	38	18	37	110
111	France	Millions of Baht	513	524	431	460	596	65	63	84	93	103	108	111
112	W. Germany	Millions of Baht	1,075	1,342	1,295	1,720	1,987	195	206	172	145	179	240	112
113	Italy	Millions of Baht	768	871	682	931	1,154	68	66	85	96	103	173	113
114	Netherlands	Millions of Baht	348	459	431	523	508	34	49	63	46	37	66	114
115	Sweden	Millions of Baht	272	295	293	312	317	29	41	38	24	25	31	115
116	United Kingdom	Millions of Baht	709	829	600	696	791	100	97	150	93	100	170	116
117	Canada	Millions of Baht	174	165	382	788	745	76	86	75	57	64	101	117
118	U.S.A.	Millions of Baht	2,518	2,649	3,931	6,857	7,659	652	530	478	557	674	532	118
119	Australia	Millions of Baht	163	208	368	504	537	46	43	51	60	67	87	119
120	Others	Millions of Baht	1,624	1,759	1,443	1,892	2,969	262	274	344	321	362	357	120
121	Total	Millions of Baht	12,570	14,005	14,351	19,155	23,578	2,188	2,132	2,483	2,479	2,656	2,707	121
	j. Precious Stones													
122	Hong Kong	Millions of Baht	693	801	939	1,161	1,183	90	52	89	91	119	178	122
123	Japan	Millions of Baht	912	1,179	1,531	1,041	1,195	150	100	120	156	135	173	123
124	Singapore	Millions of Baht	27	44	83	74	132	8	10	10	4	9	8	124
125	Belgium	Millions of Baht	57	102	170	191	265	34	15	4	32	17	24	125
126	France	Millions of Baht	228	172	197	166	219	29	31	46	24	41	34	126
127	W. Germany	Millions of Baht	259	229	266	271	215	24	14	28	20	22	11	127
128	Italy	Millions of Baht	139	227	160	187	124	16	9	5	7	6	5	128
129	Spain	Millions of Baht	47	72	69	51	72	6	2	3	-	1	3	129
130	Switzerland	Millions of Baht	874	825	1,040	1,029	768	124	108	57	73	98	48	130
131	United Kingdom	Millions of Baht	139	133	180	213	164	20	59	28	15	8	9	131
132	U.S.A.	Millions of Baht	850	672	1,315	1,399	1,673	182	112	183	100	131	127	132
133	Australia	Millions of Baht	105	62	46	58	71	10	2	2	3	13	5	133
134	Others	Millions of Baht	156	153	218	288	269	19	17	33	33	24	15	134
136	Total	Millions of Baht	4,486	4,671	6,214	6,129	6,350	712	531	608	558	624	641	135

Source: Bank of Thailand, Quarterly Bulletin

2.3.3.2 Key Product Lines Selected for Encouragement by the Thai Government and Other Authorities Concerned

The export product lines currently selected --or considered-- for encouragement by the Government, determined from survey visits are as described below.

(a) Export targets for 1987 set by the Ministry of Commerce

The export targets for 1987 set by the Ministry of Commerce are as given in Table 2.3.3-2.

(b) Industrial products for export specified in the 6th NESDP

The 38 industrial products among the 199 products of all categories specified in the 6th NESDP for pursuing their possibilities with view to attaining the aim of increasing exports are given in Table 2.3.3-3.

(c) Product lines anticipated manufacture in the Export Processing Zone at Laem Chabang

The Laem Chabang Industrial Zone is planned to gather together light and labour-intensive industries, with land apportioned to different product lines as indicated in Table 2.3.3-4. It forms part of the national project for developing primary industry in the Eastern Seaboard, drawn up under the 5th NESDP, in parallel with the programme for heavy chemical industry development utilizing the Gulf of Siam natural gas. The project has been retained for continuation in the 6th NESDP.

It is seen from Table 2.3.3-4 that --as with other industrial zones-- the emphasis is laid on assembly work such as general machinery, electrical equipment, transport machinery and precision instruments.

Table 2.3.3-2 Progress of Exports Recorded by Industrial Products, 1985 - 87

Goods	1985		1986		1987 (target)	
	Quantity (MT)	Value (MB)	Quantity (MT)	Value (MB)	Quantity (MT)	Value (MB)
Industrial Products	--	53,880.3	--	71,598.0	--	86,223.0
1. Wearing apparel	--	14,984.0	--	20,695.2	--	23,190.0
1.1 Ready made Clothing (M. pieces)	234.4	14,603.2	303.3	20,178.6	340.0	22,600.0
1.2 Brassiere (M. pieces)	6.7	139.3	9.4	305.3	10.0	300.0
1.3 Socks (M. pieces)	8.7	84.4	15.5	136.8	20.0	170.0
1.4 Gloves (M. pieces)	9.6	157.1	8.5	74.5	13.0	120.0
2. Fabrics and fibres	--	8,138.2	--	9,806.7	--	12,400.0
2.1 Fabrics (M. pieces)	--	6,590.0	601.9	7,979.6	700.0	9,800.0
2.2 Fibres	507.8	1,457.3	26,280.0	1,827.1	36,000.0	2,600.0
3. Precious stones and jewelry	21,737.0	8,557.2	--	13,189.0	--	14,500.0
4. Imitation jewelry	--	137.8	--	319.8	--	370.0
5. Integrated circuits (M. pieces)	--	8,248.6	542.5	11,617.0	700.0	2,000.0
6. Bearings	576.7	1,695.5	385.0	864.7	700.0	2,000.0
7. Radio, television receivers and parts	417	94.2	--	81.6	--	200.0
8. Air conditioning and parts	--	189.2	--	167.2	--	200.0
9. Footwear	--	2,367.1	--	3,182.0	--	3,500.0
10. Furniture and parts	--	1,317.7	--	1,867.1	--	2,250.0
11. Plastic products	22,460	1,255.3	29,991	1,417.7	3,200	1,680.0
12. Steel pipes	167,181	1,791.0	167,188	1,743.6	15,000	1,450.0

Table 2.3.3-2 Continued

Goods	1985		1986		1987 (target)	
	Quantity (MT)	Value (MB)	Quantity (MT)	Value (MB)	Quantity (MT)	Value (MB)
13. Artificial flowers foliage and fruit	3,889	913.1	5,117	1,146.3	4,650	1,175.0
14. Household utensils of wood	--	543.9	--	618.2	--	780.0
15. Veneer sheets (M. metres)	7,023	491.2	5,779	433.6	7,500	585.0
16. Builder's carpentry and joinery	--	328.9	--	386.7	--	420.0
17. Floor and wall tiles	22,496	314.8	36,494	518.5	45,500	550.0
18. Travel goods	--	418.2	--	732.2	--	800.0
19. Pharmaceutical products	--	270.9	--	278.7	--	360.0
20. Leather gloves	23.17	352.0	27.28	426.0	28.13	450.0
21. Structures and parts of structures of aluminum	3,720	245.8	2,922	179.9	4,500	288.0
22. Corrective lenses for eyeglasses	7,977	224.7	7,662	254.6	8,500	285.0
23. Part and accessories of motor cars	6,892	303.7	6,551	336.7	7,000	400.0
24. Toys	--	483.0	--	649.2	--	1,000.0
25. Sweetened concentrated milk	3,029	55.2	8,677	158.8	10,000	190.0
26. Bronzeware	--	204.1	--	527.0	--	400.0

Source: Department of Business Economics, Ministry of Commerce

Table 2.3.3-3 Industrial Products among Those Specified in 6th NESDP for Pursuing Possibilities of Increasing Exports

Footwear, Leather, Toys, Precious Stones, Apparel, Frozen/ Canned Fish, Fresh/Canned Fruits, Furniture and Components, Electric Circuitry, Plastic Products, Rubber Products, Steel Tubes, Artificial Flowers, Wooden Products, Tiling, Aluminium Products, Lens, Bicycles and Components, Bullet Cups, Electronic Products, Noodles, Ethyl Alcohol, Wooden Tools for Carpentry, Air Conditioners and Components, Television Sets and Components, Imitation Precious Stones, Packaging Industry, Pulps, Pharmaceutical and Cosmetic Herbs, Souvenirs, Small Agricultural Machinery, Vegetable and Fruit Products, Sugar and Flour Products, Dairy Products, Fruit Juice, Industrial Engines, Agricultural Engines.

Table 2.3.3-4 Product Lines Represented in Laem Chabang Industrial Zone

Zone	Product Category	Land Apportioned	Product Line
Public Industrial Zone (336 ha)	Consumer goods	10%	Footstuff, textile, apparel, wood, wooden products, furniture, rubber, plastics, leather products, ...
	Raw materials	30%	Chemicals, ceramics, mansonry materials, iron/steel nonferrous materials
	Processing/ assembling	60%	General machinery, electrical equipment, transport machinery, precision equipment
Export Processing Zone (112 ha)	Consumer goods	40%	Foodstuff, textile, apparel, wood, wooden products, furniture, rubber, plastics, leather products, ...
	Raw materials	15%	Chemicals, ceramics, mansonry materials, iron/steel nonferrous materials
	Processing/ assembling	45%	General machinery, electrical equipment, transport machinery, precision equipment

Source: Industrial Location, July, 1985

(d) Product lines promoted by the Industrial Finance Corporation of Thailand

The Industrial Finance Corporation of Thailand has designated as industries qualified for obtaining loans from the Overseas Economic Cooperation Fund, small and medium enterprises manufacturing the 8 products listed in Table 2.3.3-5.

(e) Product lines selected for promoting export to Japan and other countries in a 3-year programme

Product lines selected for promoting export to Japan and other countries in a 3-year programme are as listed in Table 2.3.3-6.

(f) Product lines being exported by Japanese enterprises

Produce lines being exported by Japanese enterprises established in Thailand, as announced by the relevant sections of the Japanese Chamber of Commerce in Bangkok include, notably:-

- Motor car components
- Electrical household appliances
- Dry batteries and accumulators
- Processed agricultural products
- Flat glass.

Other notable product lines --exported to 100 percent-- include:-

- Ball bearings
- Computer keyboards
- Electric wiring and cabling
- Eyeglass lens
- Injection needles
- Stuffed dolls.

(g) Product lines considered promising by Japanese firms

Product lines considered promising by Japanese firms with affiliations in Thailand, determined from a survey conducted in Japan by Japan Federation of Economic Organizations are cited in Table 2.3.3-7, to serve as guidance.

Table 2.3.3-5 Products Promoted by the Industrial Finance Corporation of Thailand

No.	Product
1.	Foodstuff
2.	Clothing
3.	Rubber products
4.	Electric and electronic products
5.	Wooden products and furniture
6.	Metal products
7.	Footwear
8.	Toys

Source: IFCT

Table 2.3.3-6 Products Selected for Promoting Export to Japan and Other Countries

No.	Product
1.	Toys
2.	Plastics products
3.	Shoes
4.	Electronics parts
5.	Electric household
6.	Automobile parts
7.	Travelling product
8.	Sporting product
9.	Gloves
10.	Glasswares
11.	Artificial flowers
12.	Pharmaceutical products
13.	Garments
14.	Jewelries
15.	Electronic circuit
16.	Furniture
17.	Woodwares for household and decoration
18.	Veneer and Paquet
19.	Optical lens
20.	Ethyl Alcohl
21.	Ball bearings

Source: TISI

Table 2.3.3-7 Product Lines Considered Promising by Japanese Firms

Product line	Articles	Remarks
Foodstuff	Tuna, fish meal, kippered fish, canned pineapple, fish etc., frozen fowl, broiler, cultivated prawn, marine products, vegetables	Control of hygienic conditions; quality control; packing for export; cost of refrigerated transport; Japanese quarantine regulations; Japanese import quotas
Fresh fruit; fresh agricultural products	Mango, pineapple, durian, papaya, longan, orchid, rice	Control of hygienic conditions; packing for export; transportation
Textile	Fabric, sewn articles, fibre, synthetic fibre fabric, apparel, fish net, Thai silk	Designing to match market demand; channeling exportation; smallness of lots demanded by Japanese market
Electrical equipment and appliances	Household appliances and parts, black and white television sets and tuners, refrigerator compressors, accumulators, general industrial equipment, office equipment, computers, facsimile and reproduction equipment, optical fibre cable	Reducing production cost; enhancing product quality; procuring components of adequate specification and quality; overseas marketing; enhancement of technological level
Furniture	Wooden structural material for housing, rattan, teak, rosewood furniture	Supply capacity; cracking from humidity; improvement of finish; packing for export
Motor cars and parts	Engine parts, piston rings, metal dies, jigs, wheel hubs, exhaust piping and mufflers; rims/spokes/nipples for motor cycle wheels; electroplating; commercial vehicles; tyres and other rubber fittings	Improvement of product quality; reduction of production cost; enhancement of productive capacity; procurement of components in requisite specification and quality

Table 2.3.3-7 Continued

Product line	Articles	Remarks
Ships	Small water craft, including boats in fibre-reinforced plastic, shipbuilding	
General machinery	Agricultural machinery and components, machine assembly, castings and other parts	Establishment of supporting supply industry; transportation to assembly factory; reduction of production cost
Chemicals	Synthetic resin products, pharmaceutical products, caustic soda, chlorine	Raw material procurement; cost of transportation; enlargement of market, currently limited to basic pharmaceuticals
Other Products	Flat glass, safety glass, construction, services	Competition within country; enhancement of capital, of technological level

Source: Japan Federation of Economic Organizations

(h) Product lines subjected in past to export certification and specified for eventual future export certificate applications.

Product lines certified by TISTR for export and others specified by manufacturers for eventual future export certificate applications are listed in Table 2.3.3-8.

Table 2.3.3-8
Industrial Products Lines Certified in Past by TISTR for Export and Specified by Manufacturers for Eventual Future Applications

Product Lines Certified in the Past

Items	Destination	Ref. Standards	Amount
LPG Cylinders	Domestic (Compulsory Stds.)	TL5 27-2528	128,795 Cyl
	Australia	AS 2469-1981 AS 2470-1981	75,373 Cyl
	Papua New Guinea	AS 2469-1981 AS 2470-1981	16,413 Cyl
	Indonesia	Custom's Spec.	3,000 Cyl
	Fiji	DOT 4BA-270	1,176 Cyl
	Hong Kong	DOT 4BA-270 DOT 4BA-270	53,838 Cyl
	Israel	Custom's Spec.	12,840 Cyl
	Ireland	BS 5045	12,840 Cyl
	United Kingdom	BS 5045	171,424 Cyl
Steel pipe & Galvanized Steel pipes	Domestic	TIS 276 TIS 277 TIS 310 JIS, UL, ANSI, BS, A-1	20,000 ton
	USA	ASTM A 120	65,000 ton
	China	BS	8,000 ton
	Dubai	A-1	3,200 ton
	Singapore	BS	2,700 ton
	UNICEF (Bangladesh)	BS	520 ton

Table 2.3.3-8 Continued

Product Lines Specified by Manufacturers
for Eventual Future Applications

Items	Destination	Ref. Standards	Amount
Bicycles & parts (Certification in progress)	Domestic	TES	
	USA	Federal Spec. U.S.A.	3-5 x 10
Electrodes for Arc Welding (Certification in progress)	Domestic	TIS49 - 2528	
	Australia	Lloyd's register of shipping	
	Singapore		
	Taiwan		
	Middle East		
	South Africa		
IC Chips (Certification in progress)	USA	Custom's spec.	
Computer peripherals (Certification in progress)	USA	Custom's spec.	
Diesel Engines parts (Certification in progress)	Indonesia	Custom's spec.	

Source: TISTR

2.3.3.3 Future Prospects for Export Product Lines

The substance of the foregoing survey is summarized in Table 2.3.3-9. Of the product lines cited in this Table, those considered promising for future exports are picked out in Table 2.3.3-10.

The future prospects for a nation's exports will evidently be largely governed not only by the policy of the particular nation but also by circumstances affecting the business of neighbouring countries; and in the case of Thailand, account must further be taken also of investments in Thailand of foreign capital. Be that as it may, the country's future exports should develop around the products currently being fostered to replace imports: These products should be steadily extended in range and supported by a widening circle of supporting industries, to constitute the backbone of Thailand's export activity.

As already mentioned earlier, future prospects are bright for the Thai industry. Exports of industrial --as well as agricultural-- products also can be considered equally bright, granted that further efforts are directed towards improvements in product quality and presentation, in packing and other factors, to ensure conformity with requirements of the countries of destination.

To this end also, the development of industrial standards and of the certification system for assuring product quality is strongly advised.

Table 2.3.3-9 Key Product Lines Selected or Considered Promising by Government Authorities for Promotion

Products included in Ministry of Commerce export target list	Industrial products for export specified in the 6th NESDP	Product lines anticipated manufacture in Laem Chabang Export Processing Zone	Product lines promoted by the Industrial Finance Corporation of Thailand	Product lines selected for export promotion in 3-year programme	Products being exported by Japanese enterprises	Product lines considered promising by Japanese firm
	Processed agricultural products	Processed agricultural products	Processed foodstuff		Processed agricultural products	Processed foodstuff
Textile products; clothing	Textile products	Textile products	Clothing	Textile products; clothing		Textile products; clothing
Electrical, electronic products	Electrical, electronic products	Electrical, electronic products	Electrical, electronic products	Electrical, electronic products	Household electric appliances	Electrical, electronic products
Furniture, components; wooden products	Furniture, components; wooden products		Furniture; wooden products	Furniture		Furniture
Motor car components	Motor cars, components; industrial/agricultural engines; agricultural machinery	Motor car components; containers; ship repair; agricultural machinery		Motor car components	Motor car components	Motor cars, components; ships
Copper tubing; aluminium and bronze products		Machinery components				General machinery
Ball bearings	Metal products	Metal products	Metal products	Ball bearings	Ball bearings	
Chemical products	Chemical, rubber products	Rubber-related products	Rubber products	Chemical products		Chemical products
Jewels; precious stones; imitation jewels	Jewels; imitation jewels	Jewels; ornaments		Jewels		
Other products:- Footwear; gloves; travelling cases; plastic products; pharmaceuticals; lens; toys; artificial flowers; tiling	Other products:- Footwear, other leather goods; lens; toys; artificial flowers; tiling; pulp	Other products:- Footwear; cameras; binoculars; toys; handicraft; sporting goods	Other products:- Footwear; cameras; binoculars; toys	Other products:- Footwear; travelling cases; pharmaceuticals; eyeglass lens; sporting goods toys; artificial flowers	Other products:- Flat glass	Other products:- Flat and safety glass; construction; engineering

Table 2.3.3-10 Key Product Lines Expected for Thai Exports in the Next 5 Years

Machinery:-	
(1) Motor components	Car engine components, including piston rings; disc wheels; exhaust pipes; for motor cycle spokes, nipples, rims; tooling, dies for motor manufacture; rubber parts
(2) Agricultural machinery, components	
(3) General machinery	Machinery assembly, including manufacture of cast/forged/machined components; bearings
Electrical machinery	Radio/television sets; refrigerators; air conditioning equipment; compressors; batteries/accumulators; wiring/cabling
Electronic equipment	Integrated circuits; electronic components/circuitry; office automation equipment; computers, computer keyboards; facsimile sets; copying machines; optical fibre
Chemicals	Synthetic resins; pharmaceuticals; caustic soda; chlorine

CHAPTER 3

CURRENT STATUS AND PROBLEMS OF INDUSTRIAL STANDARDIZATION, TESTING/INSPECTION AND METROLOGY IN THAILAND

3. CURRENT STATUS AND PROBLEMS OF INDUSTRIAL STANDARDIZATION, TESTING/INSPECTION AND METROLOGY IN THAILAND

3.1 Promotion Policies of the Thai Government

The importance of expanding and improving industrial standardization, and inspection and metrological systems in Thailand was particularly recognized by the 5th 5-Year Plan (1982 - 1986). This recognition is becoming more pronounced and specific in the on-going 6th 5-Year Plan (1987 - 1991). Namely, emphasis was placed on the fostering of export-oriented industries and relocation of industries to local areas in the 5th Plan. Furthermore, some emphasis was placed on the heavy chemical industry located in the eastern coastal industrial area, which utilizes the natural gas produced in the Gulf of Siam.

In succession to such industrialization policies, industrial and technological promotion policies have been established, in which the following 3 items are selected as specific targets of the said policies.

(1) Promotion of R & D activities for technologies to make effective use of natural resources, such as land and water resources, aiming at the improvement of agricultural productivity.

(2) Promotion of utilization of natural resources in Thailand and addition of high values to mining and manufactured products, promotion of studies on material science and treatment/processing technologies for mining products, and acquisition of independent technologies to foster export-oriented industries.

(3) Promotion of energy conservation technologies for the facilitation of energy saving.

The following specific measures are given, based on the belief that laying foundations is necessary to attain this objective.

(a) Establishment of "Technology Transfer Centre" to provide and evaluate information on science and technologies, and for the smooth introduction of foreign technologies.

(b) Strengthening of TISTR to allow its leading role in R & D activities. Namely, TISTR is expected to improve the introduced technologies and to ensure the adaptation of such technologies in order to solve technical problems and to make proposals on policies for R & D programmes.

(c) Establishment of "Institute of Material Science and Metallurgical Engineering" to cope with problems related to material science and engineering. This Institute is expected to be engaged in research and development activities for the effective use of metallic materials, minerals and other materials, development of their applications, processing technologies, etc.

(d) Establishment of "Energy Centre" to be engaged in development of energy conservation technologies.

(e) Enhancement of "standards, inspection and quality control" system to improve the quality of Thai products and to ensure their competitiveness as international merchandise. Reinforcement and upgrading of the TISI for that purpose so that Thai products can conform to "standards" of other nations.

(f) Increase of R & D investment.

The 6th 5-Year Plan (1987 - 1991) was prepared based on the achievements and shortcomings of the 5th 5 Year Plan and 3 approaches were introduced to achieve the economic and social targets, i.e. 1 reaping the benefits of the continuing economic development programmes, 2 restructuring of the production structure and improvement of the substance of the services and 3 realization of an equitable income distribution.

The present Study is expected to achieve the following in order to contribute to the realization of the above.

- Ensurance of the quality reliability of Thailand's industrial products in the international market.
- Promotion of industrial standardization.
- Consolidation and improvement of testing, inspection and metrological technologies.

3.2 Related Laws and Regulations

3.2.1 Industrial Product Standards Act

The Industrial Product Standards Act was originally enacted in 1968, revised in 1979, and has been in force since then. Objectives of the Act are not expressly stated in the said Act, but they are as follows according to targets set forth in the industrial promotion policies set by the Thai Government.

a. Enhancing the reliability of manufactured product quality

b. Promoting exports to the international market

c. Ensuring the equitability of commercial transactions

d. Protecting the safety and interests of consumers

e. Developing manufacturing industries

Major items set forth in the Act are as described below.

(1) Establishment of Standards for Mining and Manufactured Products

Subjects of Thai Industrial Standards are different from those of JIS in Japan and cover all products for which standardization is deemed necessary from the national viewpoint, including processed agricultural, forestry and marine products, pharmaceutical products and chemical fertilizers. Also included are shape, quality, functions, method of manufacture, test method, wrapping method, marking method, etc. of products for standardization and the introduction of standards within the framework of Thai Industrial Standards.

(2) Certification

All products for which industrial standards are determined will be subject to the certification scheme, if display of standards mark on the products is required. In the case where the standardization is required for the purpose of ensuring safety, or preventing harmful effects on the industry, economy of the country or the public, the minister in charge has the power to determine such standards as compulsory standards. Products that fall into this category may be sold in the domestic market after receiving the licence, with the certification mark showing that the products conform to the standards concerned.

(3) TISI (Thai Industrial Standards Institute)

The TISI was formed as a department of the Ministry of Industry (MOI) for the execution of the following powers and duties.

(a) To prepare and publish standards.
(b) To carry out the certification activities.
(c) To promote the implementation of standards.
(d) To represent Thailand in the International Organization for Standardization.
(e) To be responsible for international food standardization activities in Thailand and be in cooperation with the joint FAO/WHO food standards programmes.

Fig. 3.2.1-1 shows the structure of the TISI.

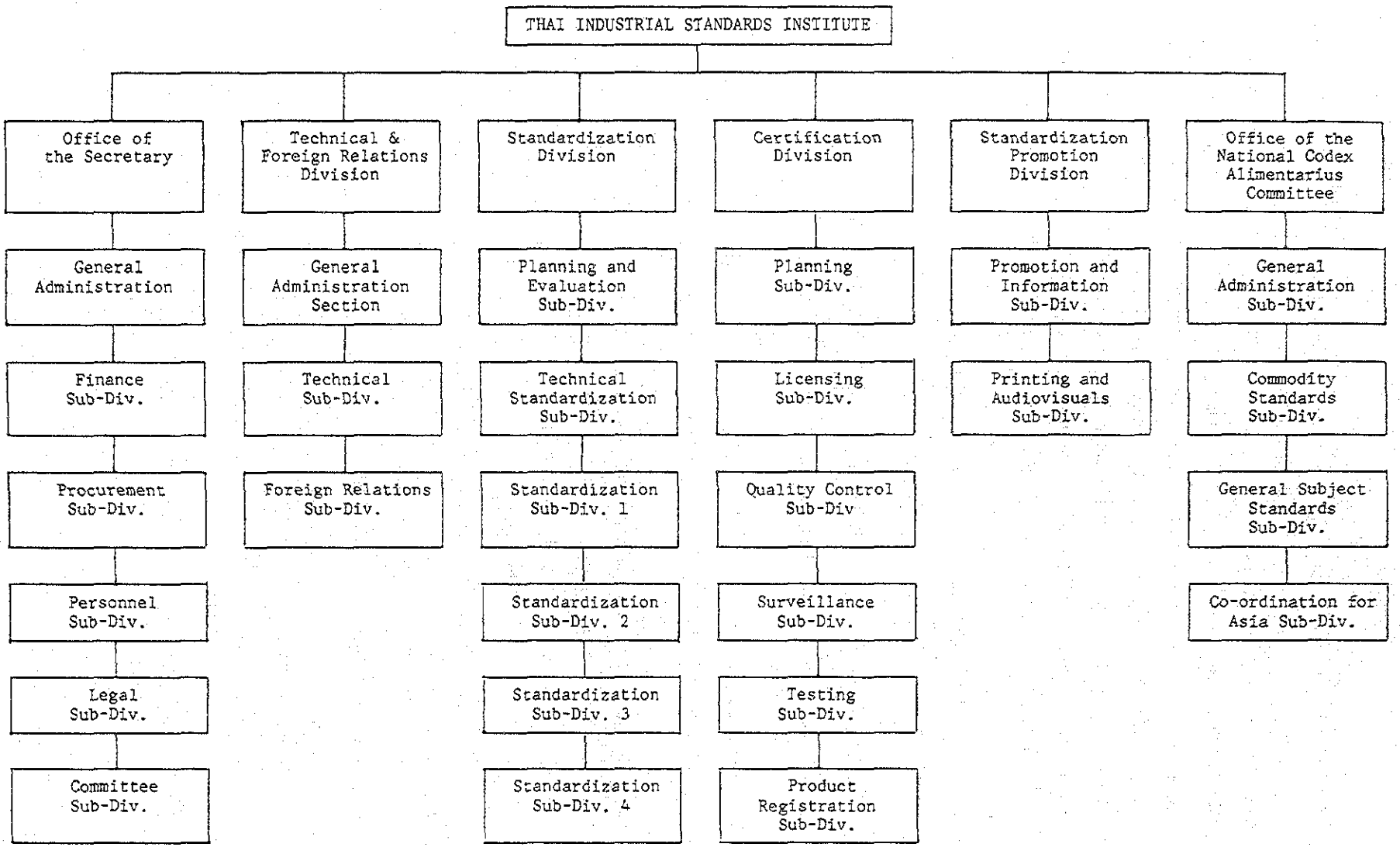


Fig. 3.2.1-1 Structure of TISI

(4) Industrial Product Standards Council

The Industrial Product Standards Council consists of 11 representatives from ministries concerned, the representative from the TISTR and 6 members appointed by the Minister of Industry - 18 members in total. Major power and duties of the Council are as follows.

a. To advice the Minister on the determination, amendment and revocation of standards
b. To permit the use of a standard mark
c. To permit the manufacture of industrial products subject to the compulsory certification (Royal Decree)
d. To permit the import for sale of products subject to compulsory certification
e. To advice the Minister on the determination of rules and conditions on the manufacture or import of industrial products to conform with the standard (including foreign or international standards equivalent to or better than the TIS standards)
f. To select and submit qualified persons to the Minister for appointment to the Technical Committees
g. To carry out other matters under this Act

Technical Committees are placed under the Industrial Product Standards Council, to prepare draft standards and to handle technical matters. Sub-committees are placed under the Technical Committees as called for.

3.2.2 Export Commodities Standards Act

The Export Commodities Standards Act was originally established as "Export Standards Act, 1960" in 1960 for the purpose of ensuring the quality of products to be exported from Thailand, and was amended into its present form on April 30, 1979.

(1) The Export Commodities Standards Act consists of the following articles.

Article 1 General Provisions
Article 2 Standards Committee
Article 3 Export Trade in Standardized Commodities
Article 4 Operation of Surveyor Business
Article 5 Licensed Standards Inspector
Article 6 Official Standards Inspection
Article 7 Standard Inspection and Issuing of Standards Certification
Article 8 Powers and Duties of Competent Officials
Article 9 Penalties

(2) Designation of Commodities and Establishment of Standards

With the recognition that the standardization of product quality is indispensable for the enhancement of quality of export commodities and for the promotion of export itself, the Minister in charge is empowered to designate commodities that should be standardized, establish commodity standards, designate the customs office to handle designated export products, issue quality (inspection) certificates, set the inspection fees, etc.

(3) Export Inspection/Testing

Exporters of designated export commodities must meet requirements specified under the Act, make registration at the Commodities Standards Division of the Ministry of Commerce (MOC), and receive certificates of registration. Further, exporters are required to receive inspection on designated commodities upon export, and to submit the commodities together with the quality certificate, to the designated customs office. The export inspection is done by the Commodity Standards Division of the Ministry of Commerce, its branch or designated inspection laboratory. The quality certificate is issued by the Commodity Standards Division.

(4) Commodity Standards Committee

The Commodity Standards Committee consists of 7 representatives from divisions of government agencies concerned and 6 or less scholars/ knowledgeable persons appointed by the Minister of Commerce, and has the following functions.

a. Examinations of proposals made by government agencies, and reporting of results to the Minister of Commerce
b. Providing recommendations on standards to the Minister of Commerce
c. Carrying out surveys and studies on appropriate steps to be taken for claims regarding the execution of the Act
d. Carrying out other matters entrusted by the Minister of Commerce

The Commodity Standards Committee also has the power to form subcommittees for examining technical and special matters as called for.

(5) Commodity Standards Division

The juridical agency of the Exports Standardization Act is the Ministry of Commerce, and the Commodity Standards Division of the Ministry executes the Act with following functions.

a. It acts as the secretariat of the Commodity Standards Committee and assists the standards preparation sub-committees and carries out tasks of collecting and analyzing information and data relating to the establishment, amendment and revocation of standards, preparing draft standards based on such data, etc. It also assists the Inspection Fee Calculation Sub-Committee, Inspection System Sub-Committee, etc. and carries out studies and surveys on various matters related to the inspection system, such as preparation of inspection fee drafts and test methods, determination of required qualifications of applicants and designated testing laboratories, etc.
b. Examination of exporters for designated products and designated testing laboratories, and registration thereof.
c. It actually carries out inspection together with its branch offices. Among the designated products, silver products and Thai silk are subject to inspection by the Commodity Standards Division and its branch offices but not by the designated testing laboratories in accordance with the law.
d. To receive claims directly from parties of export contracts, concerning inspection results submitted from inspection laboratories.

3.2.3 Other Laws and Regulations

In addition to the Industrial Product Standards Act and the Export Standardization Act, various laws and regulations are enforced for the protection of safety of the public in line with industrialization. Major laws and regulations are as follows. (Matters related to the Metrological Act are described in detail in 3.5)

(1) System under Food Act B.E. 2522

Purpose : Protection of the public health by controlling the quality of foods under the standards

Essence : Production, distribution, import and export controls by means of the following.

a. Designation of foods subject to control
b. Designation of food quality or its standard
c. Designation of container quality or standard and the method of use
d. Designation of production method, tool and equipment
e. Labelling requirement

Enforcement : The Ministry of Public Health has the authority to notify in a government gazette to the effect that those who wish to produce, distribute or import shall be licensed. Designated foods require the licence under the Food Preparation Act and must be prepared according to the Act.

Penalty : Those in violation of the provisions are subject to suspension or revocation of the licence.

(2) System under the Drug Act B.E. 2510: 2nd amendment B.E. 2516, 3rd amendment B.E. 2522

Purpose : Protection of the public welfare by controlling the production, sale or import of drugs

Essence : Those who wish to produce or import drugs shall be licensed by the Administrator or an authorized official of the Food and Drug Administration, the Ministry of Public Health.

The outline of regulatory requirements is as follows.

a. The sale of drugs in the metropolitan area must be licensed by the Administrator. The sale in areas other than the metropolitan area must be licensed by the Governor.
b. Those who are licensed to produce or import drugs must register prescriptions of the drugs prior to the actual production or importation. They also must hire pharmacists.
c. Production, sale or importation of drugs that may become harmful by deterioration is prohibited.
d. Announcements on drugs will be notified in the government gazette.
e. Advertisements of drugs are also subject to control by the Act.

Penalty : Those in violation of the provisions are subject to suspension or revocation of the license, revocation of the prescription of drugs registered and prohibition of advertisement.

(3) System under Poisonous Article Act B.E. 2510: 2nd amendment B.E. 2516

Purpose : Control on the sale in Thailand, importation, exportation and passage of poisonous articles. Poisonous articles referred to here include bacteria, harmful insects, animals and plants. Service industries for the prevention, destruction or extermination of insects, etc. are also subject to control.

Essence : The juridical ministry notifies names, manufacturing processes, usage and storing methods of poisonous articles in the government gazette. The juridical ministry is the Ministry of Agriculture and Cooperatives in cases where poisonous articles are for

agricultural use, the Ministry of Industry if they are for industrial use, and the Ministry of Public Health if they are for other use.

Enforcement : Those who manufacture or handle poisonous articles require of registration and licensing. Packages of poisonous articles must bear an illustration of a skull-and-cross-bones, in addition the wording "Poisonous Article".

Penalty : Those in violation of the provisions are subject to suspension or revocation of the licence.

(4) System under Fertilizer Act B.E. 2518

Purpose : The Thai Government is promoting agriculture, and controls the production, sale and import of fertilizers since the use of low quality fertilizers will have a negative effect on farming. Fertilizers referred to here include those that are absorbed by plants or those that change chemical properties of soil for the acceleration of growth of plants, regardless of whether they are organic, inorganic, natural or artificial.

Enforcement : The Ministry of Agriculture and Cooperatives notifies the quality of standard fertilizers, names of fertilizers, cautions on use, wrapping methods, weights, etc. in the government gazette. Those who wish to produce, sell or import fertilizers other than standard fertilizers must obtain registration licence and the certificate and required labelling if they are chemical fertilizers. In case of organic fertilizers, the licence is not required but relevant documents must be submitted to the competent ministry.

Penalty : Those in violation of the provisions are subject to suspension or revocation of the licence, or revocation of the certificate.

(5) System under Consumer Protection Act B.E. 2522

Purpose : Protection of the public interest by controlling trading companies and advertisement firms regarding labelling and matters related to the quality and price of the commodity concerned.

Essence : To control advertisement and labelling of trading and advertisement companies. This Act is applied particularly when there is suspicion that consumers are exposed to some risk.

Enforcement :
a. The Advertisement Board enforces re-writing or correction of misleading advertisements or prohibits such advertisements.
b. The Labelling Board controls the use of products that may be physically or mentally harmful for users.
c. If it is found that a certain product is a potential hazard, its sale will be prohibited and the prohibition will be notified in the government gazette.
d. Labelling on any specified product must be the same as that notified in the government gazette.
e. Advertisements must meet requirements of ministerial regulations.

Penalty : Those in violation of the provisions are subject to fines and imprisonment.

Foregoing descriptions are summarized in Tables 3.2.3-1 and 3.2.3-2.

Table 3.2.3-1 Laws and Regulations Related to Standardization

No.	Laws/Regulations	Organization empowered	Main responsibilities
1.	Industrial Product Standards Act	TISI, Ministry of Industry	Specifying the qualities, testing methods, labelling methods etc. of manufactured and mining products, processed agricultural/forestry/marine products, pharmaceuticals,chemical fertilizers and others.
2.	Food Act Drug Act Cosmetics Act	Food and Drug Administration, Ministry of Public Health	Specifying and controlling the composition including labelling of local made and imported food, drugs and cosmetics.
3.	Export Commodities Standards Act	Commodity Standards Division, Department of Foreign Trade, Ministry of Commerce	Specifying and controlling the quality of certain commodities mainly prime agricultural produces such as maize, beans,etc.
4.	Poisonous Article Act	Ministry of Industry, Ministry of Public Health, and Ministry of Agriculture and Cooperatives	Controlling the import, use, and sale of toxic substances.
5.	Fertilizer Act	Ministry of Agriculture and Cooperatives	Controlling the manufacture, import and sale of fertilizers.
6.	Consumer Protection Act	Consumer Protection Office, Office of the Prime Minister	Controlling the advertisement, sale and labelling of certain products for consumer protection purpose.
7.	Fuel Act	Department of Commercial Registration, Ministry of Commerce	Specifying and controlling the quality of fuel.

Source: TISI

Table 3.2.3-2 Organization Establishing the Technical Regulations

No.	Name	Foundation basis	Personnel 1987	Budget 1987 (MB)	Name of regulation	Share of regulation	Method of informing	Presence of testing facility	Method of certifying quality of product
1.	TISI, Ministry of Industry	Government	410	37.3	Industrial Product Standards Act	Manufactured and mining products, processed agricultural/ forestry/marine products, pharmaceuticals, chemical fertilizers	Notification in government gazette	Yes	Certification mark
2.	Food and Drug Administration	Government	493	39	Food/Drug Cosmetics Acts	Food, drugs and cosmetics	- ditto -	Yes	-- (Licence to make, sale, import)
3.	Office of Commodity Standards	Government	389	29.2	Export Standardiza-tion Act	Mainly prime agricultural products	- ditto -	Yes	Certificates
4.	(1) Ministry of Industry (2) Ministry of Agriculture (3) Ministry of Public Health	Government			Poisonous Article Act	Poisonous substances	- ditto -	Yes	-- (Licence to make, sale, import)
5.	Department of Agriculture	Government	272	18.5	Fertilizer Act	Fertilizers	- ditto -	Yes	--
6.	Consumer Protection Office	Government	45	4.8	Consumer Protection Act	Consumer Products (advertisement and labelling)	- ditto -	No	--
7.	Department of Commercial Registration	Government	272	18.7	Fuel Act	Fuel	- ditto -	Yes	--

Source: TISI

3.3 Current Status and Problems of Standards

3.3.1 Current Status of Industrial Standards

(1) Establishment of Industrial Standards

Industrial standards which constitute the basis of the industrial standard certification and inspection system are established, amended or revocated by the authority afforded to the Industrial Standards Council, while the actual work is done by the Technical Committees and the Standardization Division of the TISI.

Establishment of TIS standards is of industrial development and in the order of expected contribution of standardization to the improvement in product quality to strengthen export competitiveness. As stated in Article 17 of the Industrial Product Standards Act, standards which should be designated compulsory standards to protect the interest of consumers or to develop industry and economy of Thailand are covered by the compulsory certification system.

The establishment and revision of industrial standards are carried out in line with the following.

(a) To satisfy needs of organizations related to industry, economy and technologies in Thailand and other matters concerning living conditions of the Thai people
(b) To meet immediate needs of the economy of Thailand
(c) To obtain national consensus as much as possible
(d) To protect the interests of both manufacturers and consumers
(e) To ensure the optimum national economy
(f) To promote the progress of more effective economic activities. However, some room must be left for improvement of methods to carry out more efficient and effective economic activities
(g) To make periodic reviews and amendments of standards according to technological progress and changes in the national economy in

order to update them

(2) Established Standards

(a) 5-Year Economic and Social Development Plans and Established Standards

Establishment of industrial standards in Thailand was initiated in 1970, and has continued up to the present. The number of standards as of 1986 is 653.

During the initial stage from 1970 to 1971, only 13 standards were established. However, 187 standards were established during the subsequent 5 years (1972 - 1976) with the initiation of the 3rd 5-Year Plan, and 200 standards were established during the 4th Plan (1977 - 1981), followed by 253 standards during the 5th Plan (1982 - 1986), showing the tendency to rather rapid growth.

The increase in the number of standards established in Thailand is closely related to the 5-Year Plans, which indicates that industrial standardization has a vital position in the said plans.

It is also expected that more than 50 standards focussing mainly on automobile parts, household electrical appliances, etc. will be established in 1987 when the 6th Plan starts.

(b) Establishment Standards by Industrial Fields

The number of Thai Industrial Standards classified by fields is as listed in Table 3.3.1-1. It is found from the Table that standards related to the machine, chemical and food industries account for 13.5%, 11.6%, and 11.6% respectively. This is due to the facts that safety is one of objectives for the establish-

ment of industrial standards that food processing industries those of agricultural products in particular, are the major industries in Thailand.

The ratio of industrial standards related to electronics and communications is as low as 0.8%, but it is expected that standards in this field will be increased in accordance with the development of Thai industries.

Table 3.3.1-1 Established Industrial Standards by Fields

Field	'70-'71	'72-'76	'77-'81	'81-'86	Total (%)
Chemical	1	15	22	38	76 (11.6)
Mechanical engineering	-	14	42	32	88 (13.5)
Agricultural products	-	3	15	14	32 (4.9)
Plastic & plastic products	-	8	6	6	20 (3.1)
Electrical engineering	5	15	18	14	52 (8.0)
Consumer products	3	21	17	26	67 (10.3)
Pulp & paper	-	3	10	6	19 (2.9)
Metallurgical	-	18	21	19	58 (8.9)
Civil engineering & construction materials	-	18	10	22	50 (7.7)
Architectural	1	20	4	13	38 (5.8)
Textiles	1	13	2	9	25 (3.8)
Non-metallic products	-	3	9	23	35 (5.4)
Food	2	34	20	20	76 (11.6)
Electronics/ Communications	-	1	-	4	5 (0.8)
Others	-	1	4	7	12 (1.8)
Total	13	187	200	253	653 (100)

As described earlier, 653 TIS standards had been established by 1986, of which about 80% (approx. 540 standards) were product standards. In principle, all of them are supposed to become subjects of the certification (standard) mark system. However, 28 standards listed on Table 3.3.1-2 are actually subjected to the compulsory certification system as products for which inspection is made obligatory under Article 17 of the Industrial Product Standards Act.

In addition, 19 standards listed on Table 3.3.1-3 are scheduled to be covered by the compulsory certification system in 1987.

Table 3.3.1-2 Products Designated as Subjects of Compulsory Standards (28 Standards)

Chemical

TIS 30-1984	Nitrous oxide for medical purposes	Oct. 27 '85
TIS 78-1985	Laundry detergent powder	Nov. 1 '85
TIS 539-1984	Carbon dioxide for medical uses	Oct. 27 '85
TIS 540-1984	Oxygen for medical uses	Oct. 27 '85

Mechanical Engineering

TIS 27-1985	Liquified petroleum gas cylinders	Nov. 1 '85
TIS 196-1976	Automotive safety glass: laminated safety glass	Jun. 14 '79
TIS 197-1976	Automotive safety glass: tempered safety glass	Jun. 14 '79
TIS 198-1976	Automotive safety glass: zone tempered	Jun. 14 '79
TIS 369-1981	Protective helmets for road users	Mar. 25 '87
TIS 370-1982	Liquified petroleum gas cylinders for internal combustion engines	May 2 '83

Agricultural

TIS 52-1973	Tapioca products	Jun. 26 '74
TIS 330-1982	Hard tapioca pellets	Jun. 2 '84

Electrical Engineering

TIS 4-1979	Incandescent lamps	May 1 '87
TIS 11-1975	PVC-insulated cables and flexible cords	Aug. 14 '76
TIS 23-1978	Ballast for fluorescent lamps	Apr. 1 '79
TIS 183-1985	Starters for fluorescent lamps	Sep. 29 '86

TIS 293-1983	PVC-insulated aluminium cables	Dec. 1 '83
TIS 366-1985	Electric irons	Jun. 6 '86

Consumer Products

TIS 17-1980	Polyvinyl chloride pipes for drinking water services	Jun. 1 '84
TIS 53-1985	Safety matches	Dec. 1 '85
TIS 309-1982	Mosquito coils and sticks	May 15 '83
TIS 531-1984	Plastics containers for sterile pharmaceutical products	Jun. 18 '86

Metallurgical

TIS 20-1984	Steel bars for reinforced concrete: round bars	Mar. 1 '85
TIS 24-1984	Steel bars for reinforced concrete: deformed bars	Mar. 1 '85
TIS 211-1984	Steel bars for reinforced concrete: re-rolled round bars	Mar. 1 '85

Non-Metallic Products

TIS 496-1983	Lacquer thinner	Mar. 31 '85
TIS 520-1984	Automotive nitrocellulose lacquer thinner	Oct. 27 '85

Food

TIS 51-1973	Canned pineapple	Feb. 1 '77

Table 3.3.1-3 Standards Scheduled to be Covered by Compulsory Certification System

Chemical

TIS 322-1986	Dry chemical portable fire extinguishers

Mechanical Engineering

TIS 340-1985	Exhaust system for automobiles
TIS 341-1985	Exhaust system for motorcycles
TIS	Hydraulic set for trucks

Architectural

TIS 178-1976	Plywood

Electrical Engineering

TIS 10-1986	Low-voltage distribution link fuses
TIS 25-1973	Lampholders: bayonet types
TIS 92-1985	A.C. electric table type fans
TIS 127-1985	A.C. electric pedestal type fans
TIS 166-1976	Plugs and socket-outlets for general electrical use
TIS 191-1976	Capacitors for tubular fluorescent, high pressure mercury and low pressure sodium vapor discharge lamp circuits
TIS 205-1985	A.C. electric ceiling type fans
TIS 209-1977	Electric stove: open type heating elements
TIS 236-1977	Fluorescent lamps
TIS 344-1980	Lampholders and starter holders for fluorescent lamps

Consumer Products

TIS 90-1987	Metal cans for foods and drinks

Metallurgical

TIS 16-1981	Tinplate
TIS 348-1980	Low carbon steel wire rods
TIS 349-1980	High carbon steel wire rods

The following are subjects which are scheduled to be newly developed or to be shifted to compulsory basis in the field of electric appliances and automotives:

o Electrical Appliances

Subjects which are scheduled to be shifted to compulsory basis.

TIS 245-1977	Flashlights
TIS 385-1981	Room air conditioners
TIS 455-1983	Household refrigerators
TIS 572-1986	A.C. electrical double oscillating type fans
TC 72	A.C. electric ventilation fans
TC 266	Electric food freezers
TC 354	Small-size centrifugal pumps
TC 360	Luminaires
TC 402	Induction motors
TC 418	Generators
TC 532	Electric rice cookers
TC 539	Motor compressors

o Automotives

Subjects which are scheduled to be shifted to compulsory basis.

TIS 6-1981	Automotive lead-acid storage batteries
TIS 7-1970	Battery containers
TIS 93-1974	Leaf springs
TIS 97-1974	Brake linings for automobiles
TIS 117-1974	High voltage cables for automobiles
TIS 118-1980	Low voltage cables for automobiles
TIS 119-1974	High voltage resistance cables for automobiles
TIS 146-1975	V-belts for power transmissions
TIS 212-1977	Clutch facings for automobiles
TIS 231-1985	Spark plugs
TIS 291-1985	Separators for lead-acid batteries
TIS 367-1981	Automobile tyres, Part 1-1981 Performance and testing
TIS-367-1981	Automobile tyres, Part 2-1981 Dimensions and load capacity
TIS 370-1982	Liquified petroleum gas cylinders for internal combustion engines
TIS 388-1981	Automobile radiators
TIS 520-1984	Automotive nitrocellulose lacquer thinner
TIS 608-1986	Automotive nitrocellulose lacquer: top coat
TIS 609-1986	Automotive nitrocellulose lacquer: primer surface or surfacer
TIS 651-1986	Tubes of automobile tyres

Subjects which are scheduled to be developed.

Air filters
Alternators
Brake drums
Brake pipes
Bumpers
Clutch discs
Connecting rod bearings
Cooling fans
Crank shaft pullies
Distributors
Door weather strips
Electric horns
Engine mountings with brackets
Engine control cables
Engine gaskets
Fan pullies
Fuel filters (diesel)
Flywheels
Front and rear stabilizers
Front shock absorbers
Fuel and oil pipes
Fuel tanks
Fuel tank gauges
Gas filters
Gears
Hand brakes
Headrests
Hose radiators
Ignition coils
Intake and exhaust valves
Jack assemblies
License plate lamps

Oil filters
Oil lever gauges
Plain bearings
Radiator caps
Rear shock absorbers
Regulators
Reservoirs (brake fluid)
Road wheels
Room lamps
Safety seat belts
Seats
Starter motors
Suspension springs
Magnetic switch assemblies
Turn signal lamps
Valve springs
Wiper motors
Armrests
Battery cables
Battery holders
Battery trays
Body ground cables
Brackets & clamps
Brackets & supporters
Brake pedals
Brake systems: Brackets
Bumpers: Others
Carpets & floor mats
Carpets & rubber mats
Centre consoles
Chassis wiring harnesses
Cleaning tanks
Clutches: Brackets & connecting parts
Clutches: Hose vacuums
Clutch pedals
Cowl side trims

Doors: Hinges
Door assemblies
Door reinforcement inners
Door reinforcement outers
Door trims
Electrical components: Brackets
Engine assemblies
Engine Compartment assemblies
Engine under covers
Fan shrouds
Fender assemblies
Fender reinforcements
Finish trunks
Floor assemblies
Floor parts
Front hoods: Bonnet frames
Front hoods: Hinges
Front hoods: Hood assemblies
Front wheel brakes: Covers
Fuel pipes & tubes
Handle door window regulators
Headlining assemblies
Hood components: Sound proofing
Hoses: Vacuum
Instrument panel controls: Glove boxes
Luggage components: Sound proofing
Main clutch cylinder assemblies
Mufflers
Oil pipes
Other engine components: Other brackets
Parcel shelves
Pillar garments
Power brake boosters: Holders
Protection knobs
Protector fuel tanks
Radios

Rear hoods: Hinges
Rear hoods: Hood assemblies
Roofs: Front windows
Roofs: Rear window paneling
Roof assemblies
Roof side inners & garments
Scuff plates
Sound proofing
Spare wheel covers
Spark plug cables
Splash guards
Steering: Horn control covers
Subwiring harnesses
Sunvisors
Suspension: Front strut axles
Switch unit supports
Tail pipes
Tools and bags
Transmission: Boot rods
Transmission: Cups
Transmission: Knobs
Transmission: Pads
Transmission: Supports
Trim rear wheel houses
Trim room partitions
Trimming chain covers
Under body: Firewalls (dash panels)
Under body: Others
Under body: Rear panels
Washer nozzles & hoses
Water reserve tanks
Wheel caps

(3) Preparation of Industrial Standards

(a) Policies for Preparation of Industrial Standards

With regard to the preparation of industrial standards, while international conformity is basically adhered to, the following policies are adopted to take the actual conditions in Thailand into full consideration.

a. If ISO, IEC or other international standards are available for standards under planning, the TISI adopts them as they are, or revises or modifies them if necessary if they are deemed unsuitable for the actual conditions in Thailand.

b. If an appropriate international standard does not exist, study pertinent standards in other nations - particularly in nations having close economic/trade relations with Thailand. If a proper standard is found, adopt it as it is, or revise as necessary.

c. If neither a. or b. given above is possible, collect information from several nations and prepare a proper industrial standard based on such information.

d. An entirely original Thai standard could be prepared as an exception.

(b) Procedures for Establishment, Revision, etc. of Industrial Standards

Industrial standards are prepared by the following steps.

Step 1 - Receipt of the proposal

As the active participation of industrial organizations is crucial for the preparation of standards, any organization interested in the establishment of a new standard or the revision of an existing standard - for example, industrial associations, trade associations, consumers' organizations, users' unions, etc. - are allowed to submit their proposals to the TISI.

Step 2 - Preliminary scrutiny of proposed draft standards

The TISI examines whether the proposed draft standard conforms to the principles of establishment, revision, etc. of industrial standards in answering the following questions.

- Is there an ISO, IEC or some other international standard that can be used as the basis or reference for the preparation of the proposed standard?
- Is there a relevant Thai or foreign standard that can be used for the preparation, etc. of the standard concerned?
- Will an entirely original Thai standard have to be prepared?
- Is it necessary to carry out a survey/study for the preparation, etc. of the standard concerned?
- If the proposal is accepted, is there a technical committee to which the standardization work can be entrusted? Or is it necessary to establish a new technical committee?
- If a new technical committee is to be established, what kind of structure will be desirable?

Step - 3 Approval of a new project and appointment of the technical committee

The TISI submits findings of the preliminary examination and recommendations on the method to carry out the standardization work to the Industrial Product Standards Council. The Council decides on the approval, denial or postponement of examination of the proposal. If the proposal is approved, a new technical committee will be established, and representatives from the industries concerned, users' representative(s) and neutral qualified persons will be appointed by the Minister of Industry. There are about 600 technical committees at present.

Step 4 - Preparation of draft standard

Most of draft standards are prepared by the TISI.

Step 5 - Drafting panel

A draft standard prepared by the TISI is subject to examination in order to determine if its technical contents are sound and in conformity with the principles.

Step 6 - Circulation of draft standard

A draft standard that has passed Step 5 will be circulated extensively to those concerned in Thailand, so that the contents will be known and modifications may be done to make it more acceptable.

Step 7 - Editorial work on comments

Comments submitted to the TISI are examined systematically, and results of the examination are edited and filed in a proper order so that they may be recorded in an appropriate manner.

Step 8 - Completion of draft standard

Draft standards together with comments edited in Step 7 are considered by the Technical Committee concerned. When it is adopted by the Technical Committee, the secretariat edits the final draft and asks for the approval of the Industrial Product Standards Council.

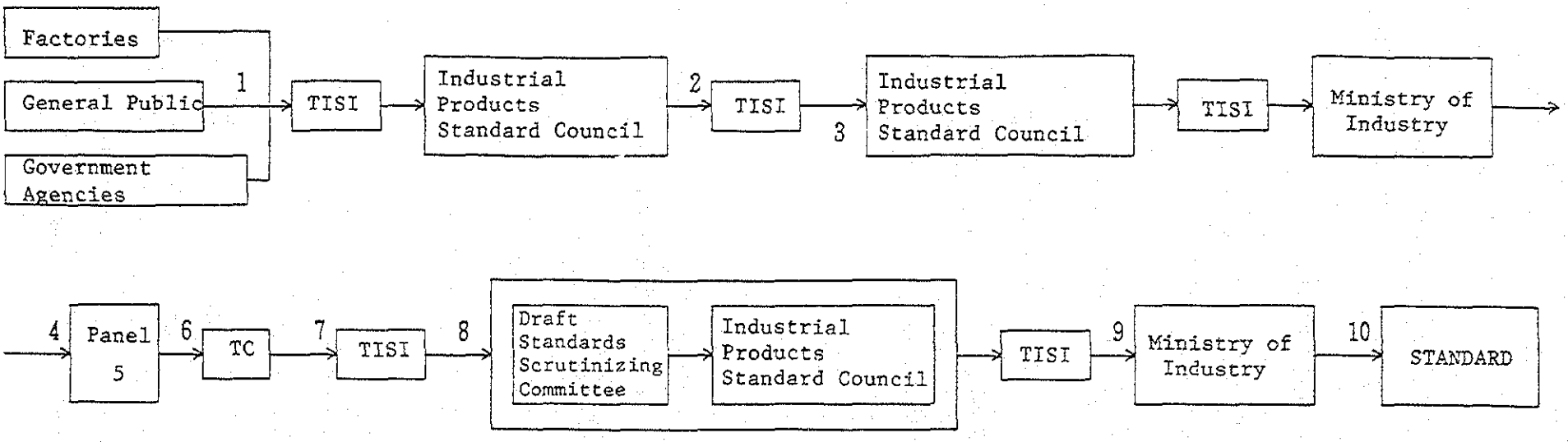
Step 9 - Approval of standard

The final draft standard edited in Step 8 is subject to a thorough review to determine if it is acceptable to the Draft Standards Scrutinizing Committee (TC425/TC525). The draft that has passed this thorough review will be presented to the Council and subject to final deliberation for approval. If any revisions are necessary, the draft will be returned to the Technical Committee for re-examination.

Step 10 - Publication and promulgation

The final draft standard is thus approved as a national standard. After it is approved and signed by the Minister of Industry, 7,000 copies will be distributed as an official gazette and an additional 2,500 copies will be prepared for general sale and complimentary use.

The process of the establishment, revision, etc. of industrial product standards described so far is shown in Fig. 3.3.1-1.



1. Receipt of the proposal (as requested by the sector concerned)
2. Preliminary scrutiny of proposals by Industrial Product Standards Council
3. Appointment of Technical Committee (TC) by Minister of Industry
4. Draft standards preparation by TISI staff
5. Drafting panel (composed of experts to consider first draft)
6. Circulation of the draft and compilation of comments
7. Study on the final draft by TC
8. Submission of the final draft to Draft Standards Scrutinizing Committee for consideration and approval of Industrial Product Standards Council
9. Promulgation by Minister of Industry and publication in government gazette
10. Publishing of 9,500 copies of standards

Source: TISI

Fig. 3.3.1-1 Progress of Standards Preparation

For reference purposes, Table 3.3.1-4 shows the annual transition of the number of established, revised or abolished Japanese Industrial Standards (JIS) for the 38 years since the enforcement of the Industrial Standardization Law on June 1, 1949. Table 3.3.1-5 shows the number of JIS standards by industries.

Table 3.3.1-4 Annual Trends of Japanese Industrial Standards

Year	Enforcement	Revision	Confirmation	Abolition	No. of Items Dealt With	No. of Effective Standards	Remarks
1949	187	1	0	0	188	187	
1950	867	11	0	2	880	1,052	
1951	698	42	0	4	744	1,746	Reconstruction Period after World War II
1952	778	71	117	15	981	2,509	
1953	690	476	365	51	1,582	3,148	
1954	450	418	351	34	1,253	3,564	
1955	416	547	567	32	1,562	3,948	
1956	406	763	833	86	2,088	4,268	
1957	352	624	656	59	1,691	4,561	
1958	375	634	890	111	2,010	4,825	
1959	337	680	1,140	88	2,245	5,074	High Growth Period of Japanese Economy (First Half)
1960	321	1,015	621	140	2,097	5,255	
1961	406	367	1,242	110	2,125	5,551	
1962	350	350	1,114	70	1,884	5,831	
1963	317	504	1,147	74	2,042	6,074	
1964	277	285	2,336	100	2,998	6,251	
1965	221	382	1,009	50	1,662	6,422	
1966	230	341	1,744	18	2,333	6,634	
1967	164	201	1,946	117	2,428	6,681	High Growth Period of Japanese Economy (Second Half)
1968	226	691	1,670	84	2,671	6,823	
1969	179	370	1,679	89	2,317	6,913	
1970	234	441	2,353	151	3,179	6,996	
1971	209	429	1,756	77	2,471	7,128	
1972	179	457	1,347	58	2,041	7,249	
1973	154	306	2,515	26	3,001	7,377	
1974	220	623	1,953	46	2,842	7,551	
1975	230	1,213	2,000	103	3,546	7,678	
1976	143	1,159	792	122	2,216	7,699	
1977	113	754	1,430	125	2,422	7,687	
1978	188	909	2,479	131	3,707	7,744	
1979	134	616	1,983	232	2,965	7,646	
1980	132	398	440	107	1,077	7,671	Later 10 years after the Oil Crisis
1981	137	404	53	55	649	7,753	
1982	156	399	767	57	1,379	7,852	
1983	130	394	2,022	87	2,633	7,895	
1984	160	370	1,387	124	2,041	7,931	
1985	124	349	1,020	77	1,570	7,978	
1986	193	344	766	61	1,364	8,110	

Note: The figures in the Enforcement column from 1949 to 1954 include 1,268 transfers from the JES (old Japanese standards in use prior to the introduction of the JIS system) to the JIS.

Table 3.3.1-5 Number of JIS Standards by Industries

	Total No. of Standards as of End of 1986	%
A: Civil Engineering/Architectural	528	6.5
B: Mechanical	1,190	14.7
C: Electrical	752	9.3
D: Automobile	353	4.4
E: Railway	223	2.7
F: Ship	541	6.7
G: Steel	312	3.8
H: Nonferrous Metal	351	4.3
K: Chemical	1,616	19.9
L: Textile	296	3.6
M: Mining	235	2.9
P: Pulp/Paper	102	1.3
R: Ceramic	231	2.8
S: Articles for Daily Use	268	3.3
T: Medical Safety Equipment	238	2.9
W: Aviation	97	1.2
X: Information	102	1.3
Z: Miscellaneous	675	8.3
Total	8,110	

(4) Outline of Industrial Standards

Industrial standards are established under the Industrial Product Standards Act by the Industrial Standards Council and may be roughly classified as follows in terms of their functions and contents.

(a)	Product standards	Those that specify shapes, dimensions, functions, etc. of products
(b)	Methodology standards ...	Those that specify methods for testing, analysis, inspection and measuring, and working standards
(c)	Basic standards	Those that specify terms, symbols, units, sequence of numbers, etc.

Contents of these standards are related to the following items as provided for under the Industrial Product Standards Act.

(a) Kind, type, shape, dimensions, manufacture, supply, grade, components, performance, durability and safety of industrial product
(b) Manufacturing process, design, drawing, usage, materials for industrial products and safety of manufacturer
(c) Packing method, wrapping method or binding method, materials thereof, kind, type, shape and dimensions of wrapping material and container
(d) Methods of experiment, analysis, evaluation and testing of industrial products and measuring methods for containers and dimensions
(e) Technical terms, abbreviations, symbols, codes, colours, numbers and units relating to industrial products
(f) Others, including definitions under Ministerial Regulations

Industrial standards basically consist of the following items, to which items inherent and particular to each product concerned are added as in the case of Japanese Industrial Standards.

(a) Scope
(b) Definitions
(c) Requirements
(d) Marking method and labelling
(e) Sampling method and conditions of conformity
(f) Testing

(5) Diffusion of Industrial Standards

The TISI established the Standardization Promotion Division and is striving for the diffusion and PR of Thai Industrial Standards. Targets of measures taken by the TISI are as follows.

- Wider recognition of TIS standards among the general public
- Encouragement of acquisition of arbitrary TIS mark
- Encouragement of procurement of products bearing the TIS mark by the Government and public organizations
- Expansion of scope of compulsory standards (limited to those with safety and economical reasons)

Specific diffusion activities currently employed for the attainment of the targets include the following.

(a) Publication (monthly) of TISI bulletins with information and articles on trends of standards and certification, etc.

(b) Education on standardization in schools

Education on standardization is given in many schools though it is not included in regular curricula. The TISI is preparing standard education programmes consisting of lectures, slides, exhibitions, etc. for primary schools, junior and senior high schools and special professional schools. Some colleges and universities provide lectures on standardization and the TISI staff often give lectures on the request of such colleges and universities. Lectures on SI units at colleges and universities

are also currently requested.

(c) Holding seminars and events

Seminars are held as called for, when a new standard is established or on other occasions, in order to enhance the recognition of the necessity of standardization among the public. Moreover, meetings on the effects of standardization are held. Seminars, etc. are often held under joint sponsorship with other organizations, such as the Thai Standardization Association and the Thai Quality Control Association.

Examples of seminars, etc. held in recent years are shown in Table 3.3.1-6.

Table 3.3.1-6 Examples of Seminars held by TISI

No.	Main subject	Date	No. of attendants	Objectives
1.	Seminar on household electric appliances and Standards	1 October 1982	68	To provide knowledge of standardization and its benefits for the economy and the electrical industry, presently possible solutions to problems of the manufacturer, consumer and the public in general.
2.	Body condition and national development (seminar)	25 November 1983		To publicise the research on body building to Thai Children.
3.	2nd Workshop on forms A series paper	25 July 1984	150	To exchange knowledge and views and to obtain solutions from experts on standardizing forms, in support of the cabinet resolution to adopt standard size paper.
4.	Seminar on improvement of slaughterhouse standard for consumer protection	12 October 1984	150	To find ways of improving the standards of the Thai slaughterhouse system so as to benefit the food processing industry.
5.	Incandescent lamp: bayonet cap and screw cap. Which is better?	14 December 1984	39	To enable exchange of views among the scholastics, the consumers, the manufacturer and all concerned and to obtain the view on whether or not only one cap type should be used in Thailand.
6.	Seminar on repeatability and reproducibility of test results	14 March 1985	120	To find solution to reliability of test results.
7.	Seminar on development and promotion of type	14 October 1985	100	To enable exchanges of views and recommendations on export promotion.
8.	Seminar on development of body structure and the industry	27 March 1986	40	To conduct research for industrial design.
9.	Seminar on modular coordination and making of building components	14 October 1986	150	To evaluate and follow-up the modular co-ordination completed in Thailand and to consider applying it in the construction industry, encouraging understanding of the concept.

Source: TISI

In addition, the TISI holds events twice a year. There is a "TISI Day" in April, for which timely events are planned and implemented.

(d) Diffusion and PR by mass media

The TISI is thus striving for the diffusion of standardization through providing press releases, broadcasting articles, interviews, discussions, spot advertisements, etc. for radio broadcasting and "Standards in News", interviews, films, slides, spot advertisements and others for TV stations. Industrial liaison officers are assigned for such promotion of standardization to manufacturers as explanation of standards, merits of standardization, effects of certification marks and others.

(e) Circulation of publications

The TISI prepares and circulates TISI bulletins and other publications as given below for the diffusion of TIS standards.

TIS catalogue
Buyers' Guide
Annual Report
Status of TISI Activities
Industrial Product Standards Act

Established standards are sorted in the order of establishment with their prices in the TISI catalogue and with the remarks that English versions are available for those translated into English. A list of standards re-sorted into alphabetical order is also attached to the catalogue.

The Buyers' Guide provides the list of certified products for the contribution to the sales promotion of products bearing the TIS mark and is issued once a year. It is particularly aimed at promoting the procurement of products with the TIS mark by government and public bodies, as will be described in the

following section.

(f) Encouragement to procure TIS marked products by Government and public bodies

The procurement of TIS marked products by government and public bodies is the most effective means for the diffusion of industrial standards. Japan and many other nations are taking this approach, and Thailand also makes it obligatory in principle for government and public agencies to procure only products with the TIS mark. It is admitted, however, that they may purchase other products if prices of TIS marked products are abnormally high compared with the listed prices in the budget of the purchasing body. The Buyers' Guide mentioned earlier is distributed to each government or public body for use in line with this objective.

(g) Expansion of Scope of Compulsory Standard Objects

As described earlier, 28 standards are compulsory standards and 19 more standards are scheduled to be made compulsory in the near future to contribute to the protection of public safety and the sound development of the national economy. The TISI intends to prepare and add more compulsory standards as called for in coming years.

(h) Survey on Consumers' Awareness of the TIS Mark

Owing to the diffusion and PR efforts, the knowledge of industrial standardization is diffused to a considerable extent among Thai consumers. The TISI carries out surveys on awareness of and reliance by consumers on the TIS mark once every two years in order to evaluate achievements of TISI operations. Results of surveys conducted in 1984 and 1986 are as follows.

a. Survey Area/Subjects: consumers in the metropolitan area

b. Survey Methods : questionnaires, interviews and statistical analyses

c. Survey Frequency : once every two years (1984 and 1986)

d. Survey Results

1) Background of those who answered questionnaires

1. Age

1984: 20 to 40 87%

1986: 31 to 50 70%

2. Education

1984: graduates of colleges/universities 70%

1986: graduates of colleges/universities 75%

3. Occupation

1984: government and private company employees 56%

1986: ditto 43%

4. Salary scale

	Less than 3,000 baht	3,000-9,000 baht	Over 9,000 baht
1984:	31%	64%	4%
1986:	29%	58%	14%

2) Ratio of those who know the TIS mark

1984: 79%

1986: 92%

3) How the TIS mark was known

	1984	1986
Through products :	55%	73%
radio :	25%	19%
television:	15%	6%
pamphlets :	5%	2%

A similar survey will be conducted on consumers of some area other than the metropolitan area in 1988. A survey on recognition of benefits of the TIS mark and standardization will be also carried out in 1988 subjecting manufacturers.

(6) Industrial Standardization Promotion Plans by TISI

The TISI has the following plans for the promotion of industrial standardization.

(a) Current Plans

- Preparation of more standards

The TISI intends to prepare more standards by increasing its staff and budget, promoting office automation for clerical work, strengthening the information collection system, and enhancing testing capability, etc. for standards development in particular.

- Promotion for standards certification

The promotion of the quality control system in factories is planned by encouraging the applications for the certification mark, making standards related to crucial safety into compulsory standards and accepting the "In-Series Product Certification" for factories implementing excellent quality control systems.

(b) Plans to be Implemented in the Future

The TISI intends the expansion and implementation of the current plans stated in (a) above. However, particular emphasis will be placed on the enhancement of the testing capability to prepare more standards and the expansion of the certification system to product certification (TIS mark system, product registration

system and product certification based on foreign standards, etc.), safety certification, certification of processing process and quality control, accreditation of testing laboratories and hygiene certification.

With regard to the testing capability, efforts will be made to strengthen it so that sufficient testing services for private manufacturers, consumers' unions and exporters may be ensured. For the promotion of QC, it is planned to form a QC consultancy group within the TISI so that consulting services can be provided to factories. Enhancement of public relations techniques to strengthen the effects of PR, expansion of educational activities from the level of factories to the level of academic societies and provision of regular training courses are included in the future plans for the promotion of industrial standardization. With regard to international standardization, active participation in preparing international standards and the promotion of mutual approval of test data with other nations through the introduction of an international testing laboratory accreditation system are intended.

3.3.2 Problems Relating to Industrial Standards

In order for the promotion of industrial product standardization to effectively assist the improvement of product quality, the subsequent industrial standards providing the basis for such improvement must be capable of coping with the diversification and sophistication of industrial products resulting from industrial progress in both the qualitative and quantitative aspects.

In view of the current status of Thai industry, the following problems may be pointed out for the industrial standards.

(1) Industrial standards for industrial products relating to basic daily life are established in a fair manner, with more standards on some

electrical appliances and automobile parts being in the preparation stage. In recent years, about 100 new standards have been established per year. However, the current speed of standard establishment cannot provide the timely establishment of standards in line with the significant progress of Thai industry in recent years, including the influence of advancement of foreign companies into Thailand. This standardization lag might cause a dissociation from to actual conditions of industries, creating confusion. The requirement for new standards is expected to particularly increase in the electric/electronic, machine and chemical industries.

(2) The current system appears inadequate for the development of appropriate standards reflecting the level of Thai industry. It will be necessary to encourage active participation of engineers from private companies from the drafting stage or to change the main drafting body from the TISI to some other public or private organization.

(3) On establishing industrial standards, thorough studies on relevant international standards and coordination of the domestic standards with the international standards are very effective to ensure the international competitiveness of industrial products. However, it should be noted that the introduction of international standards may cause confusion and economic losses in some cases depending on special factors, such as the process of industrial development, level of industrial strength, customs, conditions of use, etc. of a given country.

In this regard, it will be necessary to understand foreign standards and grasp the comparative level of industrial products of the country vis-a-vis foreign products. Even if joint efforts with other public or private testing laboratories are assumed, the TISI's own staff and testing equipment/facilities are insufficient.

(4) Standardization will contribute to the improvement of quality by ensuring interchangeability, safety and durability, etc. and by

specifying the minimum performance requirements. It must be noted, however, that the tight control of the quality of diverse industrial products and their parts at a uniform level many impede the further improvement of not only product quality but also industrialization.

(5) 653 industrial standards have been established so far, and are classified as shown in Table 3.3.1-1. However, direct and literal quotations of items from foreign or international standards are found in some TIS standards, making their use difficult.

(6) The present industrial standards are of a uniform nature and lack sufficient consideration to such different establishment objectives as safety assurance and product quality assurance, etc. (for example, in terms of the testing methods).

3.3.3 Commodity Standards

(1) Preparation of Commodity Standards

With regard the commodity standards related to export inspection, collection of information and analysis of the quality level of commodities and requirements placed by export customers are conducted by draft preparation sub-committees placed under the Commodity Standards Committee prior to the preparation of draft standards. These sub-committees consist of producers or manufacturers, importers, scholars and knowledgeable persons whose functions are to select/study commodities to be standardized for the promotion of exports, collect/analyze information on standard preparation and prepare draft standards. Draft standards are submitted to the Commodity Standards Committee for examination and subsequently become effective after the approval by the Minister of Commerce. The commodity standard is the minimum requirement which export commodities must satisfy. If quality above this standard is required as part of the export contract, the requirement will be applied to the export inspection and the commodity will be subject to the inspection judgment.

(2) Designated Commodities

Commodities currently subject to compulsory inspection include agricultural products that are exported in quantity as Thai specialities and other commodities, totalling the 12 items shown below.

Table 3.3.3-1 List of Designated Commodities

Bleached jute (fiber of yellow hemp)
Castor seeds
Fishmeal
Kapok cotton (silky cotton)
Maize (corn)
Mung beans
Salt
Silver
Sorghum
Tapioca products
Teak conversion
Thai silk

(3) Established Commodity Standards

Commodity standards have been established for 12 items which are also subject to export testing/inspection. At present, collection and analysis of information are in progress for the 7 items given below and early establishment of their standards is expected.

Products made of gold
Beans
Sea foods
Vegetables
Fruits
Raw rubber
Tapioca powder

Commodity standards are accompanied by the commodity performance or quality criteria, i.e. Class 1, 2, 3 etc., which is applied flexibly in relation to the requirements of export contracts depending on usage and export destination of the commodity in question.

Sampling methods, specific testing/analysis methods and durability requirements, taking conditions of transport such as packing methods, etc. into account are specified in commodity standards. Contents of the standards are aimed at immediate and effective response to market needs, together with the application of requirements specified in export contracts to the export inspection process.

For tapioca products for which industrial standards are also provided attention is paid to avoid double control by adopting the entire contents of the industrial standards as commodity standards.

3.4 Current Status and Problems of Certification and Inspection Systems

3.4.1 Certification Pursuant to Industrial Standards

(1) Certification Procedure - Marking Programme

(a) An applicant submits required documents to the TISI. The TISI officials examine the documents, then visit the factory of the applicant, inspect processes, quality control, product test equipment, etc. in accordance with the pertinent standard and the specified procedure and take samples for testing.

(b) The samples are sent to a designated testing laboratory for testing.

(c) The quality control staff evaluate the capability and the appropriateness of quality control in the factory concerned based on the report prepared by the testing staff.

(d) The TISI evaluates the reliability of test results submitted by the testing laboratory.

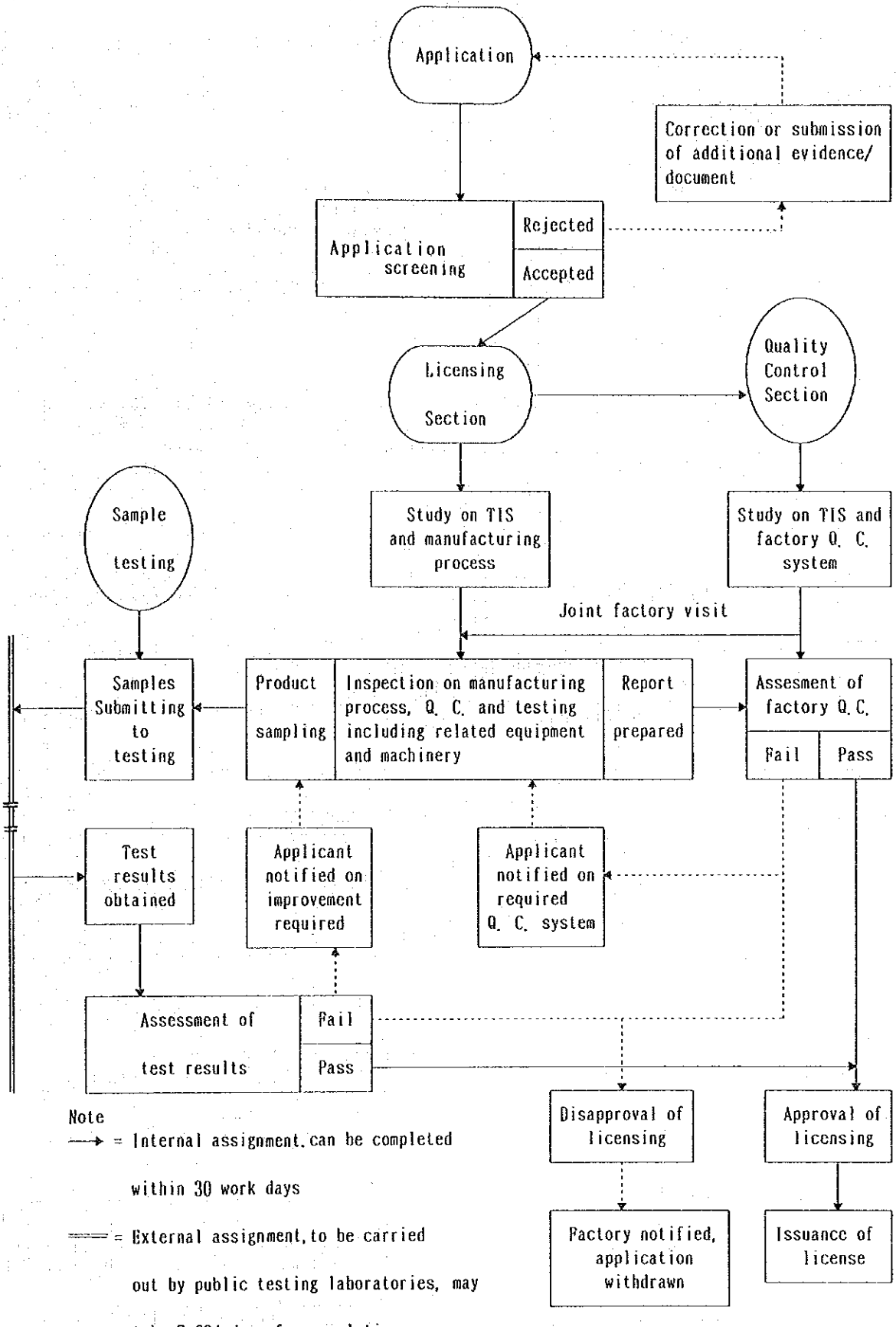
(e) If the test results, the factory's capability and the quality control system are judged to conform with the standard, the report will be submitted to the Industrial Product Standards Council and the certification (licence) will be granted to the applicant after the approval.

(f) Follow-up inspections are carried out 3 or 4 times in the first year of the factory having obtained certification in order to check on records of product quality and the quality control in the factory. Products bearing the TIS mark are sometimes sampled for testing. In the second and subsequent years, the frequency of factory inspections is determined based on the results of the inspections carried out in the first year.

(g) Once a year or so, the TISI buys products bearing the TIS mark sold on the market for inspection purposes.

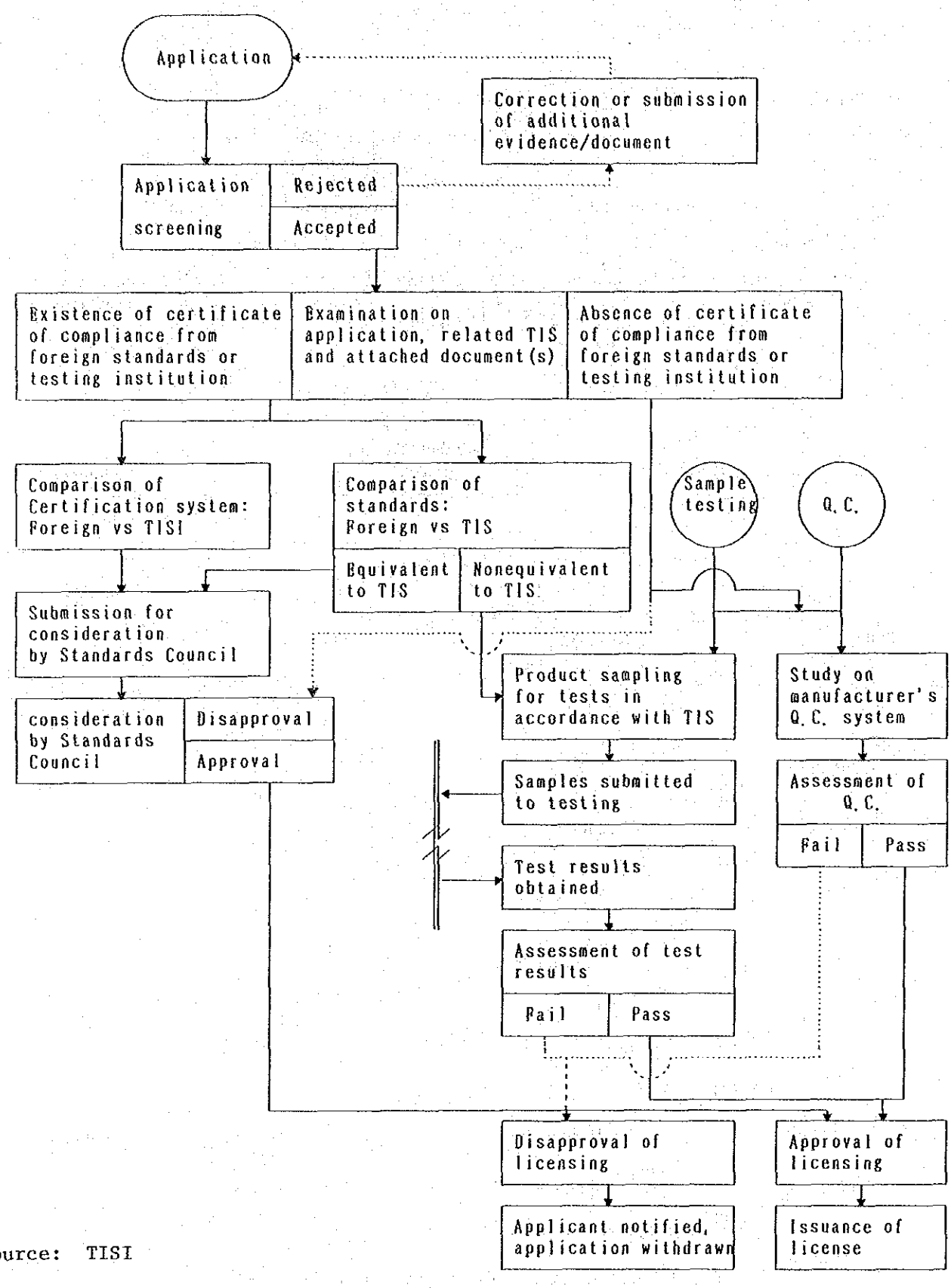
Apart from the scheme mentioned above, TISI also carries out Product Registration Programme which is used only when TISI product standards have not been published. Either relevant international or foreign national standards, or government specifications are used.

Flow charts of testing and certification procedures are shown in Figs. 3.4.1-1 through 3.4.1-4.



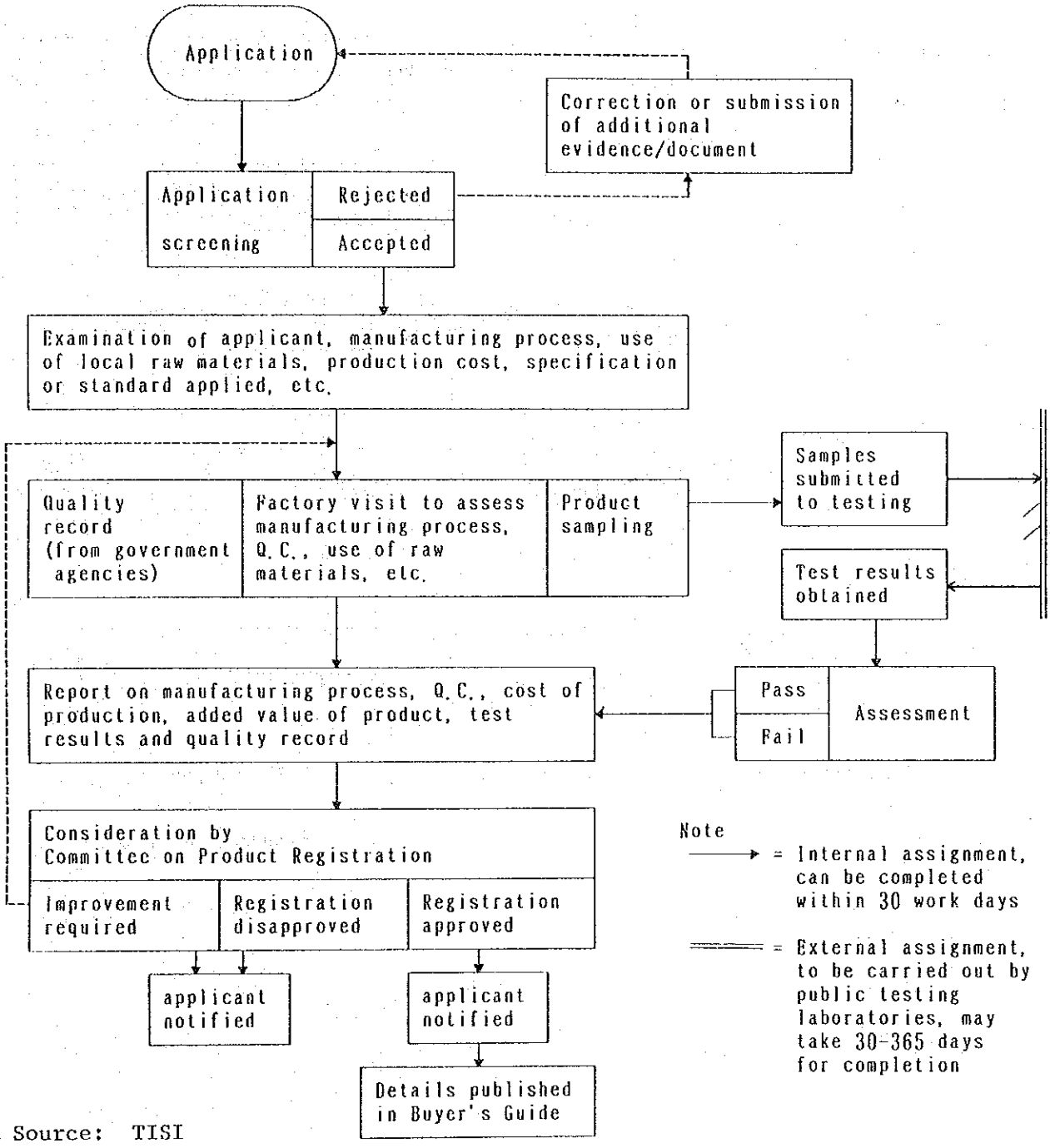
Source: TISI

Fig. 3.4.1-1 Certification Procedure
(Product Certification under IPS Act - voluntary & compulsory standards)



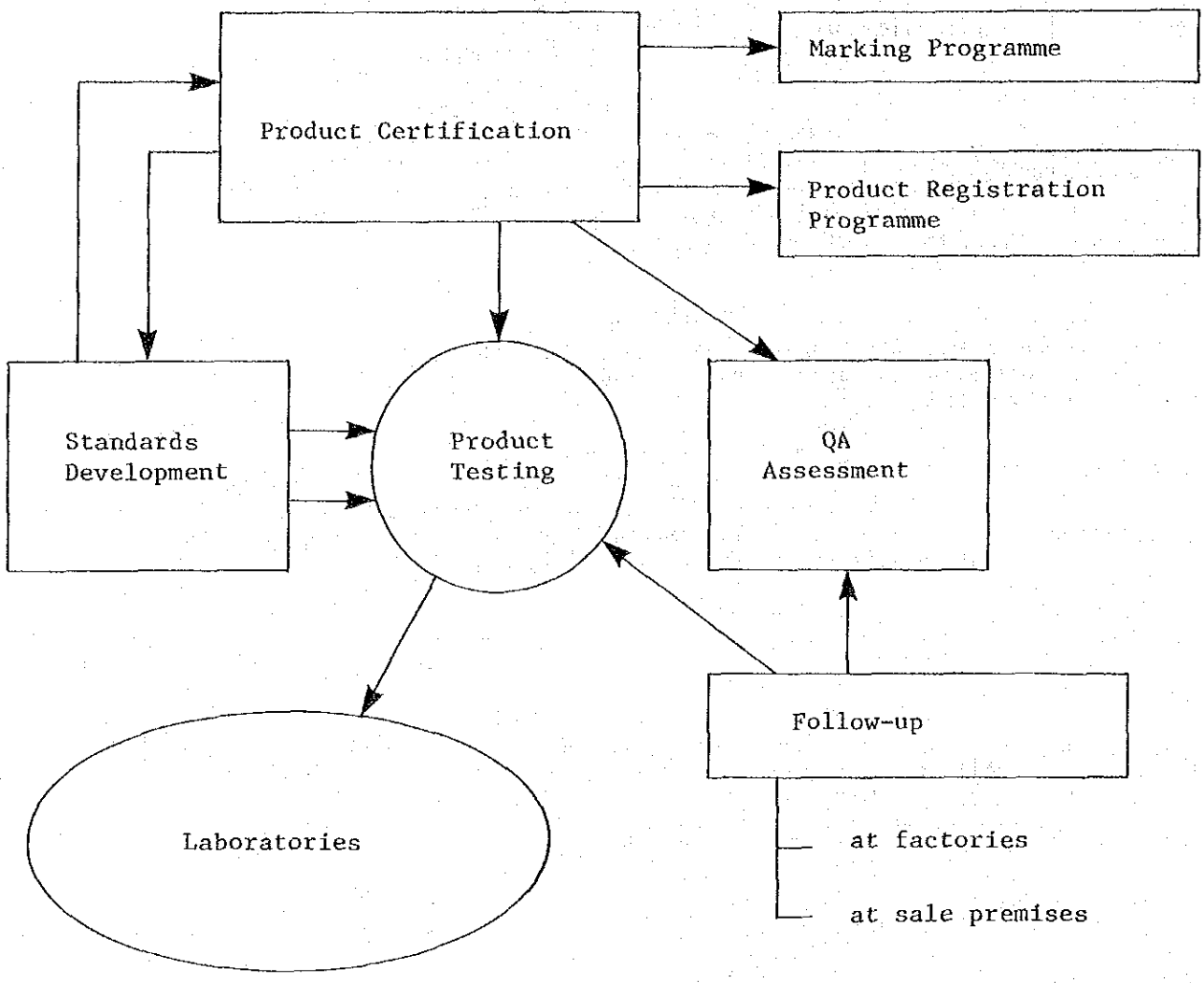
Source: TISI

Fig. 3.4.1-2 Licensing Procedure for the Import of Product under Compulsory Standard



Source: TISI

Fig. 3.4.1-3 Product Registration Procedure
(Certification under Cabinet's resolution
Products for which TIS standards have not been
issued yet)



Source: TISI

Fig. 3.4.1-4 Procedure of Product Testing

(2) Application Procedure

Applications for certification are submitted to the TISI in accordance with the relevant procedure regardless of compulsory or non-compulsory certification.

(3) Regulations Concerning Certification Pursuant to Industrial Standards

The following Ministerial Regulations have been issued in relation to the Industrial Product Standards Act.

No. 1 (1972)	Application for voluntary standard
No. 2 (1972) No.10 (1978)	Voluntary Standards Mark and marking
No. 4 (1972)	Inspector's I.D. card
No. 5 (1973)	Application for compulsory standard (manufacturing)
No. 6 (1973)	Application for compulsory standard (importing)
No. 7 (1973) No. 9 (1977)	Compulsory Standards Mark and marking
No. 8 (1973)	Re-issue of license
No.11 (1981)	Application and license fees

Specific requirements and procedures for the examination of factories, periodical factory inspections after the acquisition of license, procedure and method to sample products sold on the market, etc. are not specified.

(4) Industrial Product Standards Act and Export Commodities Standards Act

Since the objectives of the Industrial Product Standards Act and the Export Commodities Standards Act are clearly different, independent executions and operations should be possible for the two Acts.

Except for tapioca products, the scope of products under the Industrial Product Standards Act and that under the Export Commodities Standards Act do not currently overlap. Tapioca product standards, however, do not constitute any problem since nearly all provisions of corresponding industrial standards are incorporated in commodity standards. Should an overlap between industrial standards and commodity standards occur in the future due to the expansion of commodity standards, the problem of duplicated inspections pursuant to the two Acts may occur.

(5) Problems of the Certification System

The certification system, including the inspection system, consists of product inspection, quality control inspection, regular factory inspection after certification approval and market sampling inspection regardless of whether the product concerned is subject to either compulsory or non-compulsory (voluntary) certification.

In regard to the export inspection system, an inspection system has been established for each designated export inspection item pursuant to the relevant Act. Since the number of subject items is small, problems for duplicated inspection have not so far been encountered under the present system.

When the increase of the export inspection items is intended in the future, however, the industrial standards and commodity standards should be harmonized by incorporating the former to the latter in the case of those items where industrial standards already exist. In this way, attention should be paid to avoid the duplicated inspec-

tion system.

3.4.2 Export Inspection System

(1) Inspection System

Export inspections are carried out by the Commodity Standards Division of the Ministry of Commerce, testing laboratories acting as branch offices of the Division and designated testing laboratories that meet specified requirements.

Inspection is carried out in 2 stages. The first stage of inspection is conducted prior to the loading on ship - namely, samples taken following the method specified by the factory are measured and analyzed. The second stage is conducted after the loading on ship for the purpose of collation with test results of the first stage.

(2) Application Procedure and Requirements

Application for export inspection can only be made by approved exporters who have duly registered as exporters at the Ministry of Commerce.

Upon application, exporters are required to submit a copy of the export contract to confirm whether or not any requirement exceeding the commodity standard which must be considered as a criterion for export approval, is included in the contract.

(3) Requirements for Exporters of Designated Commodities

The applicant for export testing/inspection must be registered at the Ministry of commerce prior to the application for testing. Requirements of each applicant for registration are as follows.

(a) Member of exporters' Association.
(b) Corporation with a capital of 200,000 bahts or more
(c) No trouble in past as an exporter
(d) Corporation with an office, necessary test equipment and appropriate staff

(4) Designated Testing Laboratories

There are a total of 7 designated testing laboratories having met requirements and registered at the Ministry of Commerce, including 2 overseas testing laboratories. The registration is done independently for each designated commodity depending on the capability of the testing laboratory and requirements of such commodities. The effective period of registration is one year.

Requirements for a designated testing laboratory are as follows.

(a) Member of the Chamber of Commerce
(b) Corporation with a capital of 2 million baht or more (one million baht or more in certain cases)
(c) The location of the laboratory equipped with necessary testing equipment and analysis facilities must be within a 250km radius or less from the port of export.
(d) With 1 or more Grade-A testing/inspection staff (graduate of a science, engineering, medical or agricultural department of a college/university) and 6 or more Grade-B testing/inspection staff (graduates of senior high schools with special qualifications or experience of 5 or more years)

If the applicant for registration is a foreign testing laboratory, a certificate showing the capital of the corporation in its respective country is required.

(5) Problems of Export Inspection System

The export/inspection system is aimed at the promotion of exports and has been administrated flexibly with emphasis placed on product quality and performance as required by contract, using commodity standards as the minimum standards for testing and inspection.

Requirements of designated testing laboratories and qualifications of testing staff are also clearly specified and adequate testing staff are secured in line with the amount of work required. Therefore, export testing/inspection of an urgent nature can be handled adequately by the present system without causing particular problems.

3.5 Current Status and Problems of Testing

3.5.1 Current Status of Thai Industry Constituting Background of Testing

3.5.1.1 Current Status of Thai Industry Relating to Industrial Standard Testing

A description of the Thai industry has already been given in 2.2. Here the relation of the Thai industry to industrial standard testing is discussed.

(1) Classification by Type and Scale of Business

Further classification of the factories shown in Table 2.2.2-3 into each field of industrial standards is given in Table 3.5.1-1.

Table 3.5.1-1 Number of Factories Classified by Type and Scale of Business (Manufacturing Industry)

(1984)

Field \ Scale	Cottage	Small	Medium		Large
	(-9)	(10-49)	(50-99)	(100-199)	(200-)
Chemical	403	423	85	37	29
Chemical products	(393)	(414)	(80)	(36)	(25)
Petroleum and petroleum products	(10)	(9)	(5)	(1)	(4)
Machinery	5881	1267	120	52	50
General machines	(4206)	(776)	(58)	(17)	(9)
Transportation machines	(1644)	(463)	(58)	(31)	(37)
Precision/scientific machines	(31)	(28)	(4)	(3)	(4)
Agricultural products	64	173	36	22	36
Tobacco	(64)	(173)	(36)	(22)	(36)
Plastics	1331	711	85	58	34
Rubber products	(401)	(249)	(50)	(40)	(25)
Plastic products	(930)	(462)	(35)	(18)	(9)
Electric	524	283	49	26	23
Electric machines	(524)	(283)	(49)	(26)	(23)
Consumer Products	2464	1042	99	35	40
Foodware	(107)	(94)	(6)	(4)	(9)
Furniture	(695)	(399)	(39)	(9)	(9)
Printing/publication	(1604)	(420)	(24)	(12)	(12)
Ceramic products	(58)	(129)	(30)	(10)	(10)
Pulp/paper	279	118	23	16	16
Paper and paper products	(279)	(118)	(23)	(16)	(16)
Metals	3874	1110	113	63	43
Basic iron/steel products	(29)	(93)	(26)	(18)	(9)
Nonferrous metallic products	(194)	(102)	(7)	(5)	(4)
Metallic Products	(3651)	(915)	(80)	(40)	(30)
Textiles	552	1681	259	147	174
Apparel	(210)	(988)	(138)	(67)	(55)
Textiles	(342)	(693)	(121)	(80)	(119)
Non-metal	944	676	86	42	30
Leather and leather products	(161)	(97)	(7)	(6)	(7)
Glass products	(4)	(22)	(9)	(4)	(6)
Non-metallic mineral products	(779)	(557)	(70)	(32)	(17)
Foods	5348	2444	209	134	133
Foodstuffs	(5270)	(2382)	(200)	(110)	(114)
Beverages	(78)	(62)	(9)	(24)	(19)

Source: TISI

The Table shows the fact that the great majority of factories relating to industrial standard testing are small to medium factories with less than 50 workers.

(2) Classification by Area

The distribution of registered factories in 1986 in the metropolitan and local areas is shown below, based on TISI data.

Table 3.5.1-2 Regional Distribution of Registered Factories Classified by Type of Industry

	Bangkok	Provinces	Total
a. Chemical	439	373	812
b. Mechanical engineering	3,617	5,750	9,367
c. Agricultural products	717	51,817	52,534
d. Plastics	1,144	440	1,584
e. Electric	349	139	488
f. Consumer products	2,863	1,200	4,063
g. Pulp/paper	316	82	398
h. Metals	2,245	1,223	3,468
i. Civil engineering	617	2,829	3,446
j. Textiles	1,888	577	2,465
k. Non-metal	321	1,191	1,512
1. Foods	495	1,816	2,311
m. Others	201	277	478
Total	15,212	67,714	82,926

(1986)

Table 3.5.1-2 (a)

Chemical

Field	1986		
	Bangkok	Provinces	Total
Alcohol, ethyl	0	2	2
Alcoholic liquor	1	41	42
Alcoholic liquor blending	0	1	1
Chemical materials other than fertilizers	20	50	70
Chemical products	92	112	204
Drugs	207	84	291
Gas, non-natural	10	29	39
Petroleum products	9	16	25
Petroleum refining	1	2	3
Soap, cosmetics	99	36	135
Total	439	373	812

Source: TISI

Table 3.5.1-2 (b)

Mechanical engineering

Field	1986		
	Bangkok	Provinces	Total
Agricultural machinery, components and parts	0	0	0
Aircraft or hovercraft	2	0	2
Automobile tires	50	144	194
Automobiles, trailers	688	807	1,495
Engines, mill components and parts	390	2,325	2,715
Engine-drive vehicles, repairs	1,028	1,575	2,603
Locomotives	1	2	3
Machines: calculating, accounting, card-punch, etc.	56	10	66
Machinery for paper, chemical, food textile, industries	174	88	262
Other machinery	236	45	281
Motorcycles, tricycles or bicycles	152	280	432
Products as in 70's but which operate on electricity using electric engine generators and transformers, etc.	232	126	358
Pumps, air-conditioning units, water sprayers, refrigerators, etc.	483	138	621
Scientific or medical apparatus and equipment	22	13	35
Ships	79	195	274
Sleds	24	2	26
Total	3,617	5,750	9,367

Table 3.5.1-2 (c)

Agricultural products

Field	1986		
	Bangkok	Provinces	Total
Agricultural products	23	319	342
Animal food and feed	27	278	305
Fertilizers or pesticides	8	45	53
Flour and flour products	291	789	1,080
Grains and tubers	236	50,101	50,337
Sugar	9	143	152
Tea, coffee, cocoa, chocolate or sweets	117	55	172
Tobacco	6	14	20
Tobacco curing	0	73	73
Total	717	51,817	52,534

Table 3.5.1-2 (d)

Plastics

Field	1986		
	Bangkok	Provinces	Total
Plastics products	965	213	1,178
Rubber	173	212	385
Synthetic resins, etc.	6	15	21
Total	1,144	440	1,584

Table 3.5.1-2 (e)

Electric

Field	1986		
	Bangkok	Provinces	Total
Electrical appliances	196	81	277
Electrical household appliances	24	7	31
Electrical appliance repair	1	5	6
Electricity generation	1	14	15
Radios, televisions, tape recorders, records, etc.	127	32	159
Total	349	139	488

Table 3.5.1-2 (f)

Consumer products

Field	1986		
	Bangkok	Provinces	Total
Athletic and sporting goods	10	4	14
China	15	236	251
Furniture and accessories	594	617	1,211
Jewellery	141	8	149
Musical instruments	11	1	12
Optical instruments	13	2	15
Printing, engraving	1,320	108	1,428
Leather shoes and boots	105	25	130
Shoes and parts made of wood or plastic	202	19	221
Watch, clock and jewellery, etc. repair	2	0	2
Toys and games, etc.	138	20	158
Watches, clocks, etc. and parts	14	2	16
Purified water	5	9	14
Wood or cork products	188	125	313
Woodware or bamboo ware	105	24	129
Total	2,863	1,200	4,063

Table 3.5.1-2 (g)

Pulp and paper

Field	1986		
	Bangkok	Provinces	Total
Paper containers or fibre board	238	19	257
Pulp and hard board	71	32	103
Pulp and paper	7	31	38
Total	316	82	398

Table 3.5.1-2 (h)

Metal

Field	1986		
	Bangkok	Provinces	Total
Metal building components	815	710	1,525
Metal or mostly metal furniture	178	70	248
Basic iron and steel industries	61	131	192
Iron and steel machinery	46	35	81
Metal products	1,145	277	1,422
Total	2,245	1,223	3,468

Table 3.5.1-2 (i)

Civil engineering

Field	1986		
	Bangkok	Provinces	Total
Bricks, tiles and pipes, architectural terracotta, structural materials of chimney stop	5	485	490
Building materials, stone, sand and clay	0	598	598
Cement	5	107	112
Wood work	607	1,639	2,246
Total	617	2,829	3,446

Table 3.5.1-2 (j)

Textiles

Field	1986		
	Bangkok	Provinces	Total
Clothes and accessories, excluding shoes	1,148	90	1,238
Woven carpets	6	5	11
Knitted products	269	54	323
Ropes, nets, meshes	21	30	51
Textile products	85	48	133
Textiles, threads and fibres	359	350	709
Total	1,888	577	2,465

Table 3.5.1-2 (k)

Non-metal products

Field	1986		
	Bangkok	Provinces	Total
Accessories, carpets, furs or leather	2	1	3
Furs	2	4	6
Glass and glass products	24	20	44
Leather	4	141	145
Non-ferrous metal based industries	46	35	81
Non-metal products	160	894	1,054
Non-woven products	26	37	63
Paint, lacquer, shellac, etc.	57	59	116
Shoe and leather repair	0	0	0
Total	321	1,191	1,512

Table 3.5.1-2 (1)

Foods

Field	1986		
	Bangkok	Provinces	Total
Beer	2	0	2
Dairy products	43	170	213
Food seasonings and additives	106	251	357
Fruits and Vegetables	61	130	191
Ice	81	679	760
Meat and meat products	87	185	272
Non-alcoholic beverages	55	110	165
Seafood	22	150	172
Vegetable oils, animal oils and fats	38	141	179
Total	495	1,816	2,311

Of the local factories of agriculture products listed above, 50,101 factories are grain factories producing mainly tapioca products. Most of the civil engineering factories are producing raw materials. Of the local machine factories, 2,325 factories are producing milling materials. Taking the above into account and looking at Table 2.2.2-5 (Geographical Distribution on Registered Factories of Different Size Categories) again, it may be concluded that small to medium factories of major manufacturing industries are concentrated in the metropolitan area though some differences are found between individual industrial fields.

It is important to foster small to medium factories concentrated in the metropolitan area in order to promote industrial standardization and to improve the quality of industrial products to the international level. In this regard, manufacturers themselves should carry out testing under industrial standards and promote quality assurance and quality control. However, most of their equipment investments is for manufacturing equipment, and no investment for inspection/testing equipment is made. Given this present situation, it is difficult to expect each factory to have its own inspection/testing equipment/facilities and to carry out inspection/testing on its own accord.

On the other hand, the number of registered factories is increasing every year, as shown in Table 2.2.2-1, and new industrial standards are also established every year, as shown in Table 3.3.1-1. Taking this situation into account and considering the increasing necessity for testing/inspection, it may be said that not only the implementation of testing/inspection under the certification/testing system but also the enhancement of public testing laboratories to positively satisfy manufacturers' testing needs are urgent issues to be attended to.