of amendment/modification, corresponding foreign standard

2) REGDAT (Regulations on quality)

History of amendment/modification

3) EXPODAT (Export)

Standard of export destination, regulations of export destination concerning the particular product, title, language

(3) Terminology

NCh are published in Spanish only. Catalogs are published in Spanish and English.

3.2.5 Preparation of Standards other than NCh

For those areas in which no NCh standards have been drawn up, the ministerial authorities will, in certain cases, prepare their own standards. This is the case, for example, with Department of National Road of MOP which drafts its own standards citing NCh, ASTM, and AASHTO to lay down its LNV standards for gravel, sand, soil quality, and construction methods. To a very small extent, MINVU has its own standards, citing international and foreign standards.

3.2.6 Problem Areas in the Establishment of Standards

(1) Establishing a policy on the drafting of standards

INN should make a thorough assessment of international trends and national economic policies as well as the developments which are taking place in the industrial domain. It must then build on this understanding to draw up its own policies and make proposals to the government, accordingly.

In detail, the following five fundamental areas will be essential for drawing up policies relating to the establishment of standards.

1) Clarification of the purpose(s) of standards

2) Assuring international alignment and compatibility

3) Appropriate Standardization to suit the needs of the time (Timely standardization)

4) Standardization from the viewpoint of the user and consumer

5) Proper maintenance

(2) NCh maintenance and updating programs

Measures to maintain and update the standards to state of the art in the technical domain are of the greatest importance to assure the reliability of the standards. This calls for urgent efforts to aim for a facility ensuring the regular revision and updating of standards.

1) Checking for changes of cited standards such as amendments, abolitions, unification, etc.

2) Checking relevant standards against modified standards (For example, testing and sampling methods, etc.)

3) Checking the overseas standards, including international standards, and investigating newly issued standards

(3) Establishment of explanatory statement on standards

Standards are made much easier to understand, if their background and purpose is explained in a "Statement Explaining the Standard". The explanatory statement should or may contain the following details.

1) Summary of the background leading to the drafting or amendment of the standard and comparison chart showing the amendments.

2) Name list of the Standards Technical Committee members

3) Clear identification of cited standards and reference standards

4) Main arguments and their voting results

5) Cautions with respect to related laws and regulations and the use of standards

(4) Measures to diffuse standards

The publication of the INN bulletin has been suspended, and in view of its importance in the diffusion of standardization and quality control, it is most strongly hoped that its publication will be revived. It is also worthwhile to examine propagation methods using the bulletins and journals published by other organizations.

(5) International standardization activities

At present, INN represents Chile at four of ISO's Technical Committees (TCs) in which it has P membership status. Under present conditions, however, there is no national committee and deliberations are conducted by consultation with those experts concerned or by taking INN's judgment into consideration even at the time of casting the vote for a draft international standard. It therefore appears most essential to set up a national committee.

3.3 Certification System

3.3.1 Outline of the Certification System as it Exists in the Republic of Chile

The problem in Chile are that the various definitions and implementation procedures included in the various types accreditation systems and certification systems belonging to the government, public, and private are not unified or aligned.

To deal with this problem, plans have already been made to see to it that an international level certification system is attempted on the basis of the ISO 9000 Series in the whole of Chile. This attempt is a strategical move to ensure positive results on the European market and to make ready for the integration of the EC market in 1992. These efforts are also turning into some fundamental plans with respect to quality control in Chile, Chile's certification system, and the nation's weights and measures system.

Some initial efforts have already been made. At present, the establishment of the national standards (NCh) corresponding to the ISO 9000 Series and ISO 10011 Series have been completed, and campaigns with the organization of seminars are held to ensure their penetration.

Table 3.3-1 Certification Principles and Practice ISO Publication 1980

No.	Third party certification system	Continuing surveillance of product exercised by certification body	Manufacturer's quality control investigated and audited by certification body
1	Type testing	-	-
2	Type testing followed by subsequent surveillance through audit testing of samples purchased on the open market	o	-
3	Type testing followed by subsequent surveillance through audit testing of factory samples	o	-
4	Type testing followed by subsequent surveillance through audit testing of samples from both the open market and the factory	o	-
5	Type testing and assessment of factory quality control and its acceptance followed by surveillance that takes into account the audit of factory quality control and the testing of samples from the factory and the open market	o	o
6	Factory quality control assessment and its acceptance only	-	o
7	Batch testing	-	-
8	100% testing	o	-

Recognition with regard to the types of certification in Chile is based on the Certification Principles and Practice Document issued by ISO in 1980. Table 3.3-1 sums up the situation. Used are types 1, 5 and 7 of this document. (The types will therefore be referred to hereinafter as ISO/1, ISO/5 and ISO/7). Type ISO/7 is by far the most predominant system. This is the lot certification system. ISO/1 certification is also conducted on a small scale. This certification relates to the initial production model and does not include the certification of products in the subsequent manufacturing process. ISO/5 type certification is practiced in the INN and CESMEC systems. The INN system, however, is not implemented. The CESMEC systems only extends to 12 companies.

In terms of the system as a compulsory and voluntary certification system, the compulsory certification concentrating on public health, hygiene, and safety is not liable to make a substantial contribution to the improvement of quality to promote exports and the use of alternatives to imports. The ISO/5 procedure, that is the method of certification based on an evaluation of quality systems and the assurance of product quality, is felt to have emerged as a major factor of the improvement of quality. In this sense, the ISO 9000 Series can be regarded as a base supporting the certification system and quality control.

The following entities may take over these functions in the certification system.

1) Accreditation body
2) Certification body
3) Inspection body

(1) Accreditation body

In the case of compulsory accreditation, the government bodies will undertake accreditation. For example MINVU has approved 44 certification bodies on the basis of the Urban Development Regulation to act as certification entities for building materials. The Bureau for Road Construction of MOP has accredited

certification bodies on a regional basis for the certification of construction materials.

However, some government ministries only register and use certification bodies accredited by INN. Registration is made upon request from accredited certification bodies. For example, MINECOM has registered 46 certification bodies accredited by INN for certification of agricultural and fishery products.

For voluntary certification, INN is currently considered as being an accreditation organization for certification bodies. INN accredits certification bodies on the basis of INN Rule 70 - 200. The types of certification to be maintained under these regulations are that Lot Certification, Permanent Production Certification and Certification Using the Mark of Conformity with NCh Standards. Fig. 3.3-1 gives the flowchart for INN's accreditation procedures relating to food products.

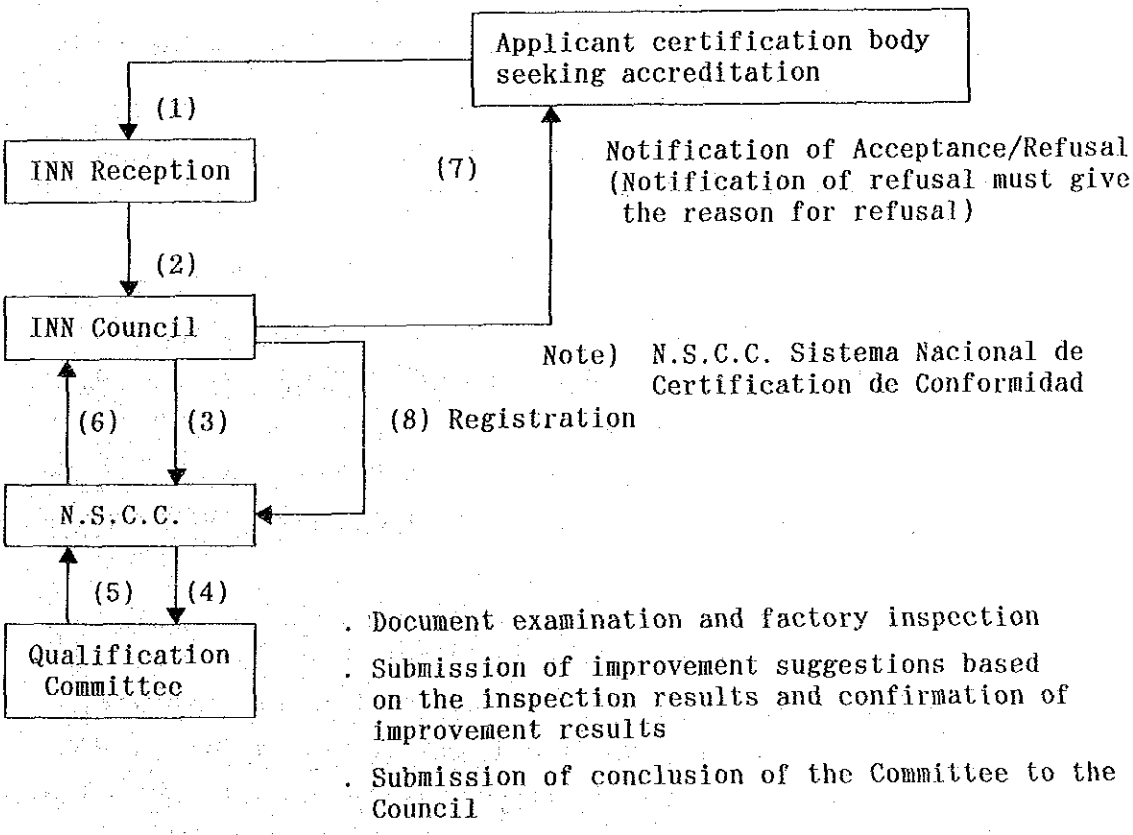


Fig. 3.3-1 INN Accreditation Flow (Source: INN)

Applicants seeking accreditation from INN will submit a written application document to INN. The entries on application forms are as follows. (INN-Doc-70-214)

1) Evidence that applicant is an organization established in compliance with the laws and regulations

2) Explanations about the organization and its functions

3) For applicants in the agricultural, pasture-farming, and fisheries sector, records of past certification results and consultancy service results.

4) Names of fields and products concerned

5) Qualification of engineering/technical staff and inspectors (engineering qualifications required)

6) Details of weighing and measuring equipment, methods for performing calibration

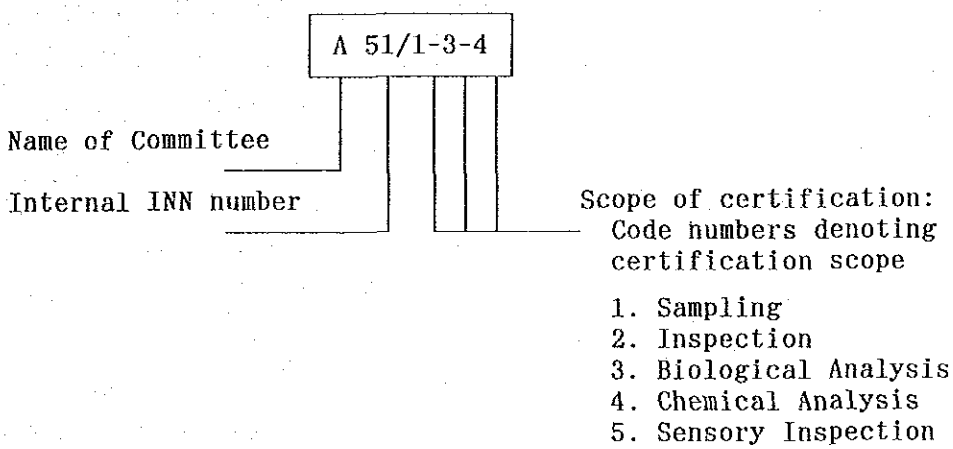
7) Standards used (NCh standard numbers, international standard numbers)

Accreditation authority at INN is vested in the Council of INN. The organization is structured so that instruction for inspection will be given through N.S.C.C. to the Qualification Committee. N.S.C.C. is a system within INN and its responsibility is to take charge and supervise of qualification and registration procedures.

The Qualification Committee scrutinizes the documentation submitted and assigns the auditors representing the committee on inspection duty to the applicant certification body. The appointed auditors will evaluate the details of quality control and standardization at the applicant's body. Based on the results, the auditors will give specific advice on areas requiring

improvement, and the applicant will act on this advice by making the appropriate improvements. The auditors will re-inspect the premises to confirm whether the improvements have been made as instructed.

The final report will be submitted by the Qualification Committee to the Council which will deliberate on the approval or refusal of accreditation in the final instance.



In the above example, registration is with the A (Food Products) Committee No. 51 and the scope of certification is given as sampling, biological analysis, and chemical analysis.

Accreditation is subject to renewal every two years. For renewal, INN will evaluate the results obtained during the period of validity of the accreditation and conduct inspections, including witnessed inspection visits to the applicant's premises if and when required. The certificate issued by the Accreditation Body will become null and void in the following circumstances.

1) When no application for renewal is made.

2) When business activities are suspended for a period of 30 days or longer, without reason

3) When business operations cannot be maintained due to changes in equipment and staff

4) When the certification system has been abused

5) When there has been a gross mistake committed in the execution of the certification duties

6) When the activities (certification) have been left to a third-party

7) When any other unlawful action has been taken.

Applicants having been granted INN inspection and accreditation (that is, applicants thereby enabled to acts as Certification Bodies) will be entitled to issue certificates themselves as certification bodies subject to the grant of permission by the government authorities concerned. In some cases of compulsory certification, these certification bodies may conduct certification procedures and tests under the instructions of the government authorities in charge.

Apart from the food and fishery product sector, INN also accredits six organization in the pipe installation material sector for the building industry. Since 1986, these organizations have been very active.

Features of the INN Accreditation System are as follows.

1) Apart from government and private sector organization, approval can also be obtained by private individuals

2) It is possible to obtain approval for sampling or inspection/ analysis, or for both (that is, certification organization exclusively for sampling are also approved).

It is clear that some order must be created in this connection. The first problem area is the fact that the various accreditation bodies (mostly the supervisory government authorities) carry out their own accreditation. The second major problem area is that the scope of the certification service activities are not properly

defined. In specific terms, this refers to the integration of sampling and testing/analysis under one category.

In connection with the first problem area, it has been pointed out that this leads to difficulties in maintaining objectivity and transparency in assessment procedures.

To achieve transparency as the pre-condition for mutual trust, it is necessary that the assessment criteria and accreditation procedures are simple and clear. For this purpose, it is conceivable to assign the accreditation to an independent or a very limited number of accreditation bodies.

The accreditation body must then maintain and handle the application and registration documents of the certification bodies and also assume responsibility for the laying down and upkeep of the qualification criteria.

The second problem involves the need to establish a comprehensive certification body with a great reputation for reliability. It is in the nature of a comprehensive certification body that it should be capable of certifying a whole range of operations, including sampling, inspection/analysis and ship loading.

(2) Certification bodies

In Chile, many certification bodies act as inspection bodies at the same time. According to the ISO guide, these two functions are broken down and regulated separately.

In Chile, the term "certification" is often used even though this implies only the certification of the test results for samples that have been brought to the testing. To ensure that Chile's certification will be accepted worldwide and that Chilean certification bodies will be recognized on an international level, it will be essential to create a system that strictly conform to the definitions laid down by the international bodies (ISO/IEC).

Table 3.3-2 sumps up their certification scopes. The data in parentheses ( ) refer to indirectly obtained data as the bodies concerned were not visited by the team.

By type of organization, these bodies can be divided as follows.

- Government/public bodies
  - CIMM
  - INTEC
  - SERNAP
  - IFOP
  - ISP
  - INFOR
  - IDIC

- Bodies belong to universities or their branch organizations
  - DICTUC
  - IDIEM
  - Facultad de Ciencias Fisicas y Matematicas - Universidad de Chile
  - Universidad de Concepcion
  - (Universidad de Austral)

- Non-profit bodies of the private sector
  - Fundacion Chile
  - (APSTC)

- Private-sector companies
  - CESMEC
  - SGS
  - BV

Table 3.3-2 Overview of Scope of Certification of the Certification Bodies Visited by the Team

Industrial sector for certification / Certification body	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Remarks (*)
CESMEC	o	o	o	o	o	o	o	o	o	o	o	o	o	o*	o	o	Marine service
IDIC			o				o	o	o	o	o	o	o	o*	o	o	Explosives/safety
DICTUC			o				o	o		o	o	o		o*	o	o	Geology
IDIEM								o	o			o			o		
CIMM						o						o				o	
INTEC	o	o	o			o					o	o		o*	o	o	Packaging
Fundacion Chile	o	o	o	o	o							o					
BV	o	o	o									o		o*			Ship certification
SERNAP		o	o														
IFOP		o	o														
(APSTC)		o	o														
(Austral University)		o	o	o	o							o*					Wood paints
Chile University											o					o	
SGS	o	o	o	o	o	o	o	o	o	o	o	o	o	o		o	
ISP	o	o	o									o	o*		o		Medical/ pharmaceutical, Health control
INFOR				o	o												
Concepcion University			o														

1. Agriculture - pasture-farming products
2. Fishery products
3. Agriculture - pasture-farming fishery processing-products
4. Forestry products
5. Processed wood products
6. Mining industry
7. Electricity - gas - water supply

(8. through 14. - Manufacturing industry)
8. Construction and construction materials
9. Metal processing
10. Mechanical engineering
11. Electric and electronic industry
12. Chemistry
13. Textiles and leather
14. Other sectors

15. Environment
16. Measuring equipment calibration

Table 3.3-3 Number of Engineers at the Certification Bodies Visited by the Team

	Name of certification body	No. of technical staff	University graduates	Non-university graduates	Remarks
1	CESMEC	450	300	150	
2	IDIC	80 - 100	40	40 - 60	
3	DICTUC	50	20	30	
4	IDIEM	130	-	-	
5	CIMM	140	-	-	
6	INTEC	140	70	70	
7	Fundacion Chile	113	-	-	
8	BV	25	-	-	No testing laboratory
9	SERNAP	40	-	-	No testing laboratory
10	IFOP	176	119	57	
11	INFOR	7	-	-	
12	SGS	40	-	-	
13	Chile University Department of Engineering	-	-	-	
14	ISP	580	-	-	Including office staff
15	Concepcion University	-	-	-	

Note 1: - symbolise not clear

Note 2: Chile University, Department of Engineering certifies only in the electrical field and space research center

Note 3: Exclusive certification bodies are CESMEC, BV, SGS and similar private bodies.

Note 4: Including research staff of public bodies and universities

1) Certification is provided for a wide range of fields by certification bodies with private company status. CESMEC, in particular, has a conspicuously large number of engineers and

the range it covers may be considered broad enough to cater for all of Chile's industries.

CESMEC, in particular, conducts mainly ISO/5 type certification but has not yet reached the ISO 9000 level.

2) The government authorities' certification bodies play a great role in Chile and there is a large number of them. These bodies perform certification services only in specific special areas.

SERNAP has a rather special status, in that it carries out compulsory certification services based on the agreements Chile has signed with its export destination countries for fish meal.

ISP is the central body in general control of all affairs subject to the compulsory regulations under MDS and Codigo Sanitario and its regulations. These activities include pharmaceutical and medical/dietary foods, etc.

As research institutes under CORFO, there are INTEC, INFOR and IFOP. All of these three entities conduct certification activities in their particular special fields.

3) The universities and university organizations conduct certification activities in conjunction with the public and private bodies. This may be considered as a particular feature of Chile's certification system.

IDIEM plays an important role as a certification body for construction materials, a critical area in a country located in the world's earthquake zone such as Chile. It has been accredited by MOP as Chile's only certification body for steel bars used for reinforced concrete.

Austral University has started a certification service for the voluntary certification corrosion-proof wood paints and has

just begun with the trial work.

4) Fundacion Chile and APSTC are all non-profit organizations of the private sector. These have the following characteristics.

Fundacion Chile covers agriculture/pasture-farming, fisheries, and forestry, providing certification and technical consultancy and advisory services for companies and services for the establishment of new companies based on technology introduced from abroad.

Salmon and trout export certification, developed by APSTC, is being provided as voluntary certification service by Fundacion Chile and CESMEC. This system came into being in 1987 and has taken root at a very fast rate.

(3) Present status of certification systems

1) Classification of certification systems in Chile

Certification systems can be divided into compulsory and voluntary certification system. Each of these two systems can be subdivided further into type certification (ISO/1 type), lot certification (ISO/7 type), and conformity mark certification (ISO/5 type). Practically all certification under the compulsory system comes under the regulations of the public or government authorities subject on regulations and enforcement orders. Compulsory certification is also performed on the basis of agreements signed by Chile with foreign governments.

On a macro-level most certification is of a compulsory nature, while voluntary certification accounts for a small minority of cases. Whether compulsory or voluntary, the main type of certification conducted in either system is that of lot certification. Conformity mark certification is not in widely spread use. Type certification is only conducted on an exceptional basis by outside (government authorities)

assignment.

2) Lot certification

Lot certification is the most widely used form certification. The products to be certified are submitted the certification body in the form of a lot. Th certification body will thereupon inspect the lot i accordance with the specifications in the contract, or suc standards as NCh. The certificate will be granted after th lot has been found to comply with the standards.

The first problem a typical certification body has i connection with lot certification is the lack of standards o specifications.

At present, lot certification can be seen as part of a process directed at Conformity mark certification in the future, and if lot certification is seen in those terms, it will become clear how important it may be to establish the ISO 9003 "Quality System - Model for quality assurance in final inspection and test" as a paradigm.

3) CONFORMITY mark certification

Certification under this system is administered by way of INN's ongoing production certification and by way of the certification procedure using a mark of conformity with NCh. At present, however, this system is not applied in practice.

APSTC operates an export certification system for fresh and frozen salmon. Though this system is not for industrial products, it is a good example of a Conformity mark certification system in which a certification body accredited by APSTC. The factory is entitled to affix the CONFORMITY mark to the inspected products (salmon). Fig. 3.3-2 shows a sample of a CONFORMITY seal.

Fig. 3.3-2 CONFORMITY seal by APSTC

The certification procedures are devised so that all standards and regulations in force in the U.S., Canada, New Zealand, Norway, and the United Kingdom are met.

CESMEC has developed a CONFORMITY mark certification procedure. The problem, however, is that a mere 12 firms have come to accept this system during the 15 years since it was started. This includes cases of voluntary application, and only a mere two companies have used the system permanently. The other ten companies use this system for items (products) subject to compulsory certification. CESMEC CONFORMITY mark certification system has remained at a low profile due to the following reasons:

(a) There are no applications for certification of products not subject to compulsory certification.

(b) Factories making application as a sales promotion exercise cannot be granted certification with the CONFORMITY mark because of their low level of technology.

The CESMEC CONFORMITY mark certification system operates as follows.

- Applicants seeking CONFORMITY mark certification will be subject to examination of their product quality and their quality system in the form of a document scrutiny and a factory assessment. If they pass the assessment, they will be granted permission to display the CONFORMITY mark. Under this system, CESMEC will examine the application documents

received and arranged for a factory assessment to be carried out by two auditors. The purpose of this assessment is to verify and confirm quality by checking the quality control status at the factory and taking samples from the process.

- For two or more months after the factory assessment, continuous checks are performed on the products leaving the factory. CESMEC also inspects measuring equipment. Within three months interval after receipt of permission, intermitten follow-up assessment are performed.

- The mark (seal) is made and monitored at the responsibility of the factory. No permit is issued. Validity is conferred by written notification. At the request of the user, a permit/certificate may be issued. There are no assessment criteria except for safety boots. For other products, specifications are established by specialists.

CESMEC
Certifica que este producto ha sido fabricado por PINTURAS STIERLING bajo un sistema de producción y control de calidad tal que asegura el cumplimiento de las especificaciones y de los niveles de calidad establecidos para él. La conformidad es controlada por CESMEC mediante auditorías periódicas.

Fig. 3.3-3 CONFORMITY Mark for Voluntary Certification (Paints)

The objectives of this CESMEC system are as follows:

(a) For the manufacturer

a) Conformity with standards is certified by a third party.

b) Gaining greater competitiveness against other manufacturers

c) Ability to eliminate excessive purchaser demands

d) Compared with lot certification, this is less costly and requires less time to complete.

e) Conveying an image of progressive quality control to outsiders

(b) For the purchaser

a) Certification by a third party offers confidence and reassurance (a feeling of being "safe")

b) For the purchaser (individual, small/medium company) without any means of checking the quality of the product it is a warranty service by the manufacturer.

c) Allows the purchases to cut acceptance inspection costs.

(c) For the domestic economy

a) Is a means of removing unnecessary duplication of effort by double control by the manufacturer and purchaser, thereby offering greater efficiency.

b) It means that the basic conditions for entering the international market are met.

Yet, despite these objectives, the questions remains as to why the system has not grown in the voluntary certification area. If the system is compared with that of APSTC, the following answers may be given to this question.

(a) The international certification level is not reached.

(b) Attention in quality control is shifted to inspection, notably product inspection.

(c) Low level of shipment quality

(4) The general climate of Chile's industry does not meet the conditions required for certification to become established.

As seen above, the CONFORMITY mark certification system has only a very poor record to show in the voluntary certification area. This contrast markedly with INN's NCh Conformity Mark System. INN NCh Conformity system and the CESMEC Conformity system pursue purposes which lie in different directions. A new idea is called for that will marry the two systems on which it should be based.

4) Summary of the Chilean certification system

Based on the findings of the study team, Table 3.3-4 gives an overview of the certification system as it stands in Chile.

The compulsory certification system is regulated by laws or regulations. Its scope covers product, human safety, health and environmental conditions. In Chile, the system is aimed at electric appliances, equipment using liquid and gaseous fuels, human protective implements, construction materials, pressure containers, etc.

The government authorities in charge accredit the certification bodies in pursuance of a ministerial regulations and prescribe the criteria for the execution of certification. The certification body carries out the certification activities in accordance with the criteria and it is the general practice for the certification bodies to issue certificate under their name.

(a) MOP has accredited IDIEM for the certification of structural concrete materials and steel bars for concrete reinforcement.

Table 3.3-4 Overview of the Certification System

	Compulsory voluntary	Products concerned	Accreditation bodies	Applicable law/ regulation	Applicable standard	Certification body	Certification method	Mark used/ not used
1	Compulsory	Steel bar, concrete	MOP	Decree	NCh	IDIEM	Lot	Not used
2		Road construction materials	MOP	Decree	LNV	Different for each construction section	Lot	Not used
3		Construction materials	MINVU	Urban Development Law	NCh and others	CESMEC, DICTUC, IDIEM and 44 other bodies	Lot	Not used
4		Construction materials	MOP	Decree		CESMEC	Conformity mark	Used
5		Waste gases Vehicle inspection	MINTRATEL	Decree	Technical specifi-cations	Waste gases: 176 companies Vehicle inspection: 62 companies	Single unit	Used
6		Electric applicances and fuel containers	MINECON	Decree	IEC/NCh	CESMEC, DICTUC, total of 6 companies	Lot	Used
7		Pipe installation materials	MOP & MINVU	Decree	NCh SENDOS	CESMEC, DICTUC, IDIC, IDIEM, UFTSM, Norte University	Lot	Used
8		Pharmaceutical Hygien	MDS	Decree		ISP (Certification and accreditation of testing laboratory)	Lot	Used
9		Fishery products for export	MINECON	Inter-Government Agreement	Contract specifica-tion	Various companies, including Fundacion Chile & IFOP	Lot	Used
10		Explosive	MDN	Decree	Technical specifica-tion	IDIC	Lot	Used
11	Voluntary	Fresh and frozen salmon	APSTC		APSTC certifica-tion rules	Fundacion Chile, CESMEC and others	Lot	Used
12		Shoes, paint, furniture			NCh	CESMEC	Conformity mark	Used
13		Export timber			NCh, JAS,	INFOR	Lot	Used
14		Wood protection paints			NCh, JAS, etc.	Austral University	Lot	Used
15		Fruit, Marine products	INN		Contract specifica-tion	46 companies with INN	Lot	Used

(b) MOP, Bureau of Road Construction accredits testing institutes charged with the checking of sections of roadworks at the time of carrying out road surfacing work.

(c) MINVU has accredited 44 certification bodies for certification in the construction field.

These bodies perform certification of the wood, cement, and metal materials. The main certification bodes are CESMEC, DICTUC, IDIEM, UTFSM and Norte University. These are also accredited by MOP. The compulsory certification system by way of Conformity Mark Certification includes a system operated by MOP aimed at construction materials. The condition is that it should be accredited by INN. Certification is executed by CESMEC. At present, there are seven companies coming under the system.

(d) MINTRATEL has instituted regulations for car exhaust gases and a bus inspection system for security. For the former, a total of 176 companies, for the latter, a total of 62 companies have been accredited.

(e) SEC of MINECOM carries out certification of electric appliances and town gas equipments for safety control of electricity and fuel. At present, the six certification bodies including CESMEC, DICTUC, IDIEM and UTFSM are accredited by the ministry. For export items, too, the regulation is being applied, but in this case, certification by UL and other selected certification bodies is accepted without further checking.

(f) SSSA of MOP has accredited six certification bodies (i.e., CESMEC, IDIC, IDIEM, DICTUC, UTFSM and Norte University) for certification of construction materials and sanitary installations (piping) in conjunction with MINVU on the basis of INN accreditation.

(g) ISP is responsible for products requiring compulsory sanitary inspection as well as pharmaceutical, health products, and the environment on the basis of Codigo Sanitario. It has accredited the certification bodies in this field and placed them under its supervision, and also conducts approval and certification of new drugs in its own testing and inspection laboratory. For import products, too, it assumes responsibility. There are 180 certification bodies accredited so far, including government, public and private bodies.

(h) SERNAP belongs to MINECOM and conducts certification for marine products for export. It is the certification body responsible for Chile's marine product exports (cans, fish meal, fish oil, etc.). It provides compulsory certification services, including certification based on an intergovernment agreement with the U.S. (FDA) and certification based on the requests of the governments of Europe, Central and South America.

(i) IDIC is the body supervising explosives, and 60% of the explosives handled by IDIC are used by companies in the private sector.

Some areas of the voluntary certification sector are outside government control. The voluntary system will be covered in this report only to the extent the study team was able to investigate during its mission.

(a) APSTC started, in 1986, the certification system for export salmon and trout. At present, the system has taken root. APSTC has accredited the certification bodies such as Fundacion Chile and CESMEC and issues Conformity mark certification seals.

(b) CESMEC operates a conformity Mark Certification service and has approved five companies (shoe, paint and interior decor manufacturers).

(c) INFOR belongs to CORFO. It provides lot certification services for export timber.

(d) Austral University intends to create a certification system for wood preserving paints and started a service which is now being operated on a trial basis for one year, according to schedule.

(e) MINECOM aiming at fruit and marine products set up a certification service with its own registration activities. The lot certification service system is operated by 46 certification bodies registered with MINECOM which have passed INN accreditation.

3.3.2 Problem Areas Concerning the Certification System

The results of this study have made it clear that the voluntary certification system, especially the voluntary certification system using quality system evaluation is an extremely weak one. This is the biggest problem in and for the certification system. The following itemizes the various problems areas.

(1) Accreditation (or designation) method for the compulsory certification system

In certain cases it may be unavoidable for government and public authorities to implement a compulsory certification system of their own in pursuance to or on the basis of laws and regulations. The accreditation methods, however, are not unified, nor are they related to each other in any form. For example, MOP and MINVU lay down the condition that an INN-accredited certification body shall be responsible for the certification of the pipe material used for construction projects. For other products, however, MINVU will accredit (or rather designate as is the case in practice) its own certification body. At the same time, it will exercise an indirect assessment by evaluating operation of the certification

body through on-site inspection. SERNAP will approve only such certification bodies as have passed INN accreditation.

In some cases, the approved range of activities is broken down. For example, the INN-accredited certification bodies include bodies whose activities are limited exclusively to sampling.

The following two observation will be made here as possible measures to overcome these problems.

The first measure to impart objectivity and transparency to the examination standards for accreditation may be to centralize the execution of accreditation procedure in the hands of a single entity such as INN, that is, a single or a very small number of accreditation bodies.

The second possibility is to regulate in a clear manner the range of certification activities. This may imply unification of sampling and testing/inspection.

As plans to upgrade the examination capabilities at INN, it will be of paramount importance to ensure the expansion and reinforcement of staff education and training and enlist the cooperation of specialists.

This may ensure the formation of a certification body with overall capabilities and permit the development of a unified certification system under the voluntary certification system in which INN plays a central role.

(2) Laying down of NCh Standards used for certification

The importance of the establishment of a comprehensive standards system has already been stressed in 3.2. as a major prerequisite for the success of the certification system.

The activities required for providing the standards are best covered by INN's organization and should be undertaken ahead of

the preparations for the broader system. Priority in the creation of the standards system should be given to standards for products designed for the domestic market and products considered to have a promoting export potential.

(3) Establishment of accreditation criteria

At present, none of the criteria applied for examining and assessing certification bodies by the accreditation bodies are documented. For conducting the examination procedures for accreditation, specific criteria will necessarily be required as these criteria vary according to product category with the certification procedures, the required equipment and staff.

This will be an indispensable requirement in case that mutual certification with foreign countries will be demanded.

(4) Differentiation between certification bodies and testing/ inspection bodies

In Chile, certification bodies and testing/inspection bodies are mostly viewed as one and the same. In view of the human resources, equipment, operating procedures for the service, and the accreditation assessment criteria, however, it must be recognized that these have different functions.

Current world trends agree that the accreditation bodies apply different assessment criteria for certification bodies and testing/inspection bodies, respectively.

(5) Product traceability

In Chile's certification system, both for compulsory and voluntary certification, most certification takes the form of lot (product) certification. In this case, it is absolutely vital that there should be a clear and unambiguous correspondence between the product lot in question and the certificate concerned. This correspondence must be obvious even to third parties. The

correspondence between shipment lots and production lots must be traceable within the quality system.

(6) Improvement in certification mark use

The certification marks currently in use have a different design for each certification body. This means that different marks may be attached to the same type of product (if certified by different certification bodies).

In view of the essential purpose and meaning of the certification system and also in terms of the future propagation of the certification system, however, it is more desirable that a mark showing the certification system itself (rather than the individual certification bodies) should be used, as is the case with the JIS mark, for example.

(7) Documentation of the certification procedures

Conformity mark certification and lot certification require the preparation of manuals for documenting the certification procedures. The main details should be indicated to the manufacturer and buyer. In some cases it may be necessary to take a stand between the manufacturer and buyer in preparing or agreeing the specifications. This makes it vital that the certification procedures should be laid down in written form (documented).

The auditors in charge of certification duties at present, are recruited at all certification bodies from the top ranks of graduated students academic record, but there is no training provided in accordance with organized training programs. This suggests the need for the inclusion of personnel training in the service programs within the certification system creating program. It will thus be necessary to prepare certification manuals to serve as textbooks for such training purposes.

(8) Provision of weights and measures system

This will form the subject of a more detailed discussion in a separate chapter. The weights and measures system is a major support on which the certification will rest. We will therefore only mention this as an improvement area and refer to the chapter dedicated to this topic.

(9) Use of international units for certification

NCh Standards are generally drawn up in SI units in accordance with ISO guidelines. For site certification, however, the previous units of weight and measure are used (for example, for tensile strength). INN has prepared such promotional materials as conversion measures and tables. In view of the difficulties of changing to the new unit system, more extensive efforts should be made so as not to lag behind the international trends.

(10) Speeding up the certification process

Applicants seeking certification will use an approved certification body, and the fact that the different certification bodies operate on a vastly different time scale to complete the certification process with the issue of the certificate is bound to be a major hindrance in the propagation of the certification system.

3.4 Quality Control

3.4.1 System and Legislation

Let us begin by summing up the most recent philosophy about quality control.

(1) Worldwide trends in Quality Control

In recent years, one of the worldwide trends in quality control has been to adopt quality control activities on a more global and universal level rather than in the narrow sense of simple production control. In this section, we will present the "quality system" concept of the ISO 9000 series as being one of the worldwide trends in recent quality control activities. Fig. 3.4-1 shows the system. As can be seen in the figure, TQC as a double aspect. One is the defensive-protective aspect designed to prevent the occurrence of nonconformities. The other is a more dynamic and positive aspect which tries to create more attractive quality. In quality activities, the latter, that is, the dynamic aspect of TQC is more important. However the defensive aspect of preventing the occurrence of nonconformities is essential as the foundation of TQC.

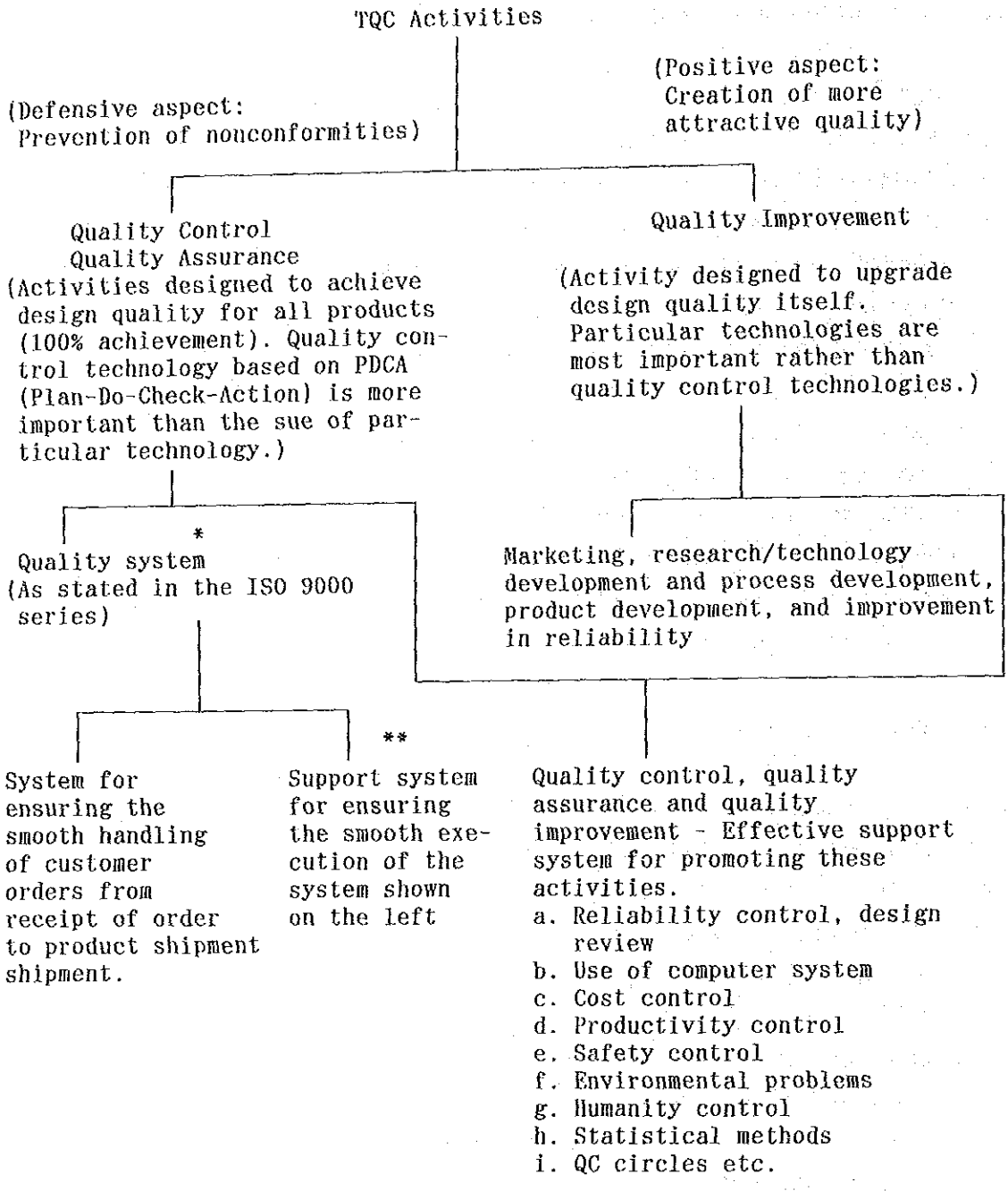
(2) Quality System

To prevent the occurrence of nonconformances, the minimum requirement is that the following two items should be implemented.

1) Products (including services) must meet the customer's specifications and must give customer satisfaction.

2) The system creating the product must be properly controlled and technology properly conveyed so that design quality will not give rise to "flaws" and lead to excellent reproducibility for quality.

Such a system is normally called a "quality system".



* : Quality system may, if necessary, be required official accreditation under the CERTIFICATION SYSTEM.

** : EQUIPMENT CALIBRATION is included herein as a sub-system.

Fig. 3.4-1 TQC Activity System

(3) Worldwide trends concerning current ideas about quality systems

The concept of "quality" used in a recent context, does not refer to any specific product but is taken in a more broader sense. It has a more global scope including environmental problems, safety issues and so forth. It has quite clearly emerged in the gradual evolution of the TQC philosophy. The recent swift sociological changes also be taken into account in the concept of "quality" above, such that towering urbanization, electronic systematization and increasing in size of socio-structure are rapidly emerging.

(4) Introduction of the quality series based on the international standards of the ISO 9000 Series in Quality Control System

Quality system approach is the basis of quality control and without it no real quality activity is possible and no technology transfer can be made. It is a social obligation to bring this about and ensure that all concerned with quality control follow it up. The ISO 9000 Series was established as an international standards as a general expression of this philosophy.

It is no longer just a matter of "good quality.". Rather "Good Control" is also regarded important in assessing the value of a product. But this "Good Quality" is not a matter of one person's opinions. It must be objective "Good Quality" that is accepted or recognized throughout the world on the basis of the international standards of the ISO 9000 Series.

(5) The positive aspect of TQC activities

In (2), (3), and (4) above reference was made to the "defensive-protective aspect of the TQC activities, which, as shown in the left part of Fig. 3.4-1, include "the prevention of occurrence of nonconformities and the achievement of design quality for all (100%) products."

It goes without saying that "the prevention of the occurrence of nonconformities" is part and parcel of the upgrading of quality

through improvement programs.

TQC activities the aspect given in the right half of Fig. 3.4-1 is of true importance. This is the positive aspect of creating an attractive quality.

The positive aspect of "creating an attractive quality" is a function that starts from the basis of "the prevention of the occurrence of nonconformities" and "the achievement of design quality for all (100%) products."

Fig. 3.4-2 shows "Stages in the Upgrading of Quality Control/TQC Activities".

This figure starts with stage 1 in the process of Upgrading Quality Control/TQC Activities and comes to completion in stage 4 which entails the positive quality activities.

Chilean Quality Control/TQC Activities are expected to reach the stage 2 as early as possible shown in Fig. 3.4-2. After that further move toward more positive quality control activities should be undertaken toward stages 3 and 4. It is important to realize that the configuration of the quality system under the ISO 9000 Series is thus not the "end" of quality control but rather the "beginning" of it.

3.4.2 Diffusion Body

(1) General outline

For the diffusion of quality control, it is essential that the following should be established:

1) Body capable of correctly assessing the real state of a company implementing quality control and trying to diffuse quality control in accordance with the needs of each company.

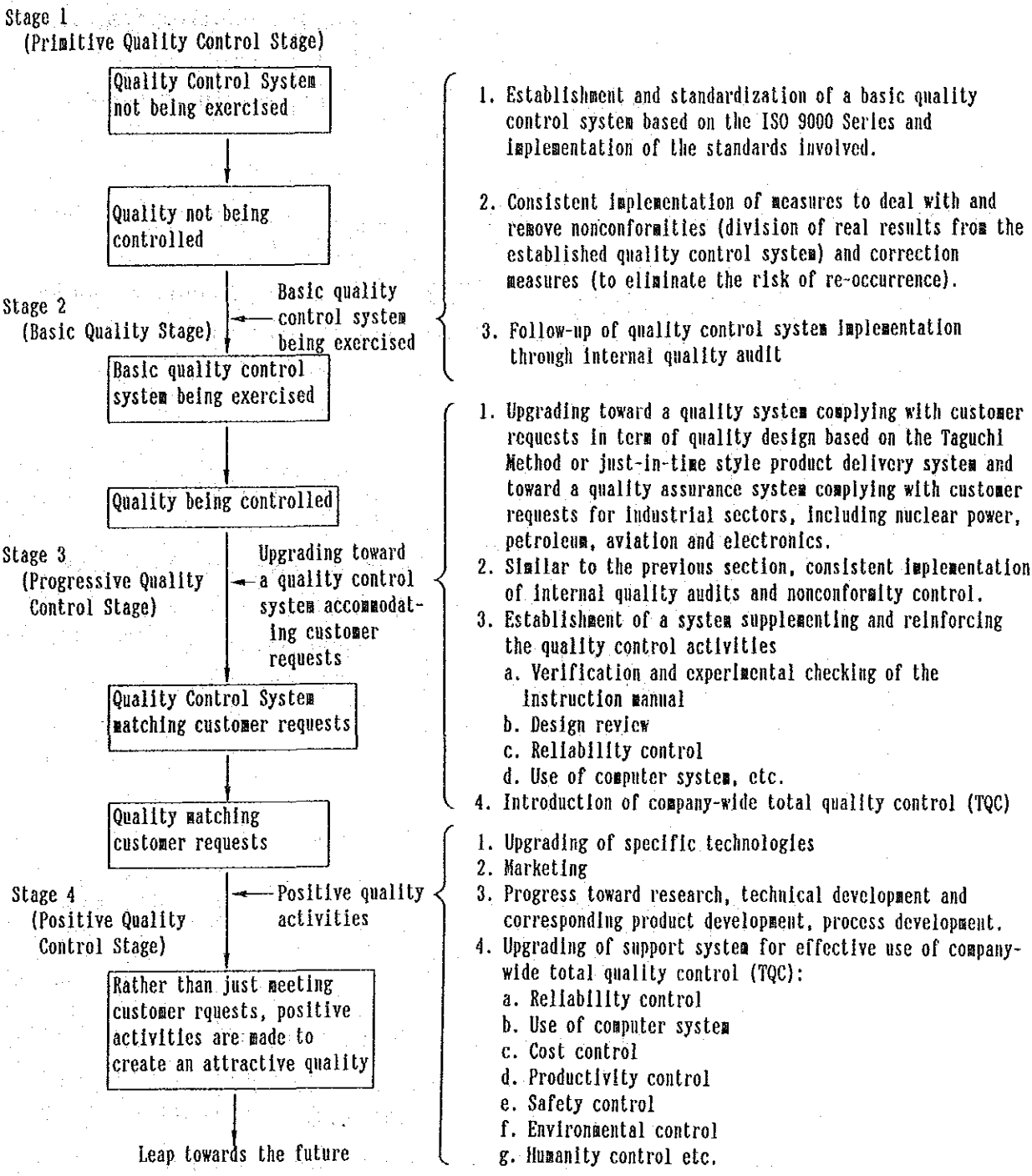


Fig. 3.4-2 Stages in the Upgrading of Quality Control/TQC Actitivies

2) Body accepting the above needs given in 1) and teaching quality control by establishing a teaching curriculum.

3) Body providing financial support for quality control training.

4) Body capable of balancing the above actions from the viewpoint of a national policy.

In Chile, the bodies given under 1) above correspond to the various industrial organizations or associations, 2) corresponds to INN or ASCAL or similar training organizations, 3) corresponds to SENCE as being a government body, and 4) corresponds to INN. However, there is no effective system in operation in Chile at present.

(2) Diffusion of quality control by the industrial associations

As stated in (1) above, there are various industry organizations in Chile such as ASIMET, C.CH.C, ASEXMA, SOFOFA, and ICARE, acting as bodies concerned with the correct assessment of the nature of the companies conducting quality control and with the diffusion of quality control in a manner suited to the needs of the companies concerned.

(3) Bodies for quality control training and curricula

There are 20 bodies providing training on quality control. These include INN, ASCAL, INACAP, and INTEC.

Also recognized as training organizations for quality control are the universities, notably the Santiago University, and the Technical Colleges. The most typical example of the above organizations are INN and Santiago University.

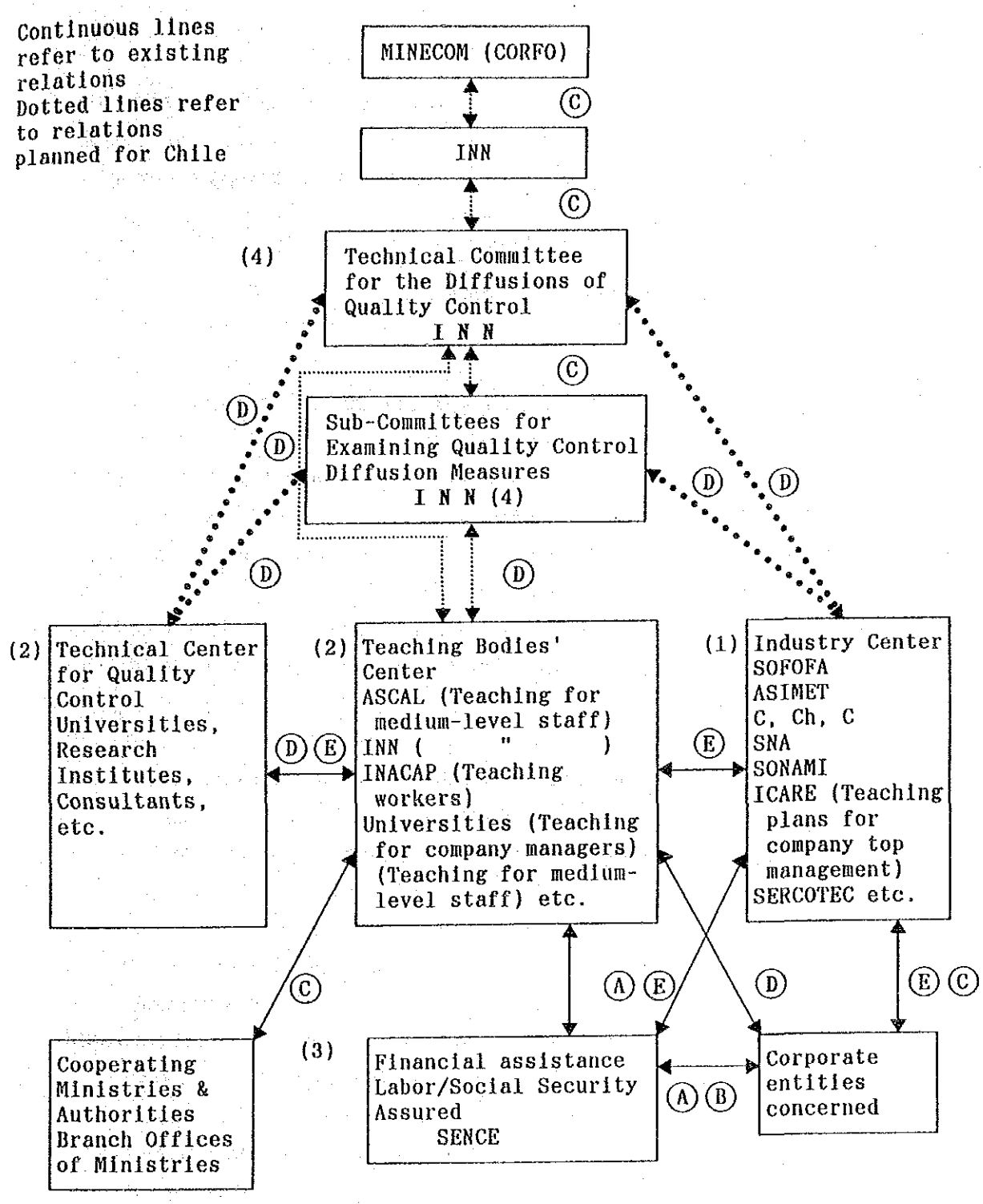


Fig. 3.4-3 Overview Chart of Quality Control Diffusion

Notes: Explanation of letters (A - E)
(1) - (4): Apply to above
A: Inspection and providing with Codigo SENCE mark for teaching bodies, equipment, curricula
B: Tax exemption amount associated with implementation of teaching
C: Control - Supervision
D: Sending out of lecturers, committee members etc.
E: Exchange of information
Activities of sections shown in (1) - (3) above are given in outline.

1) Teaching within INN goes back to the time of INN's predecessor, INDITECNOR, and was started in 1969. INN offers that five in-house quality control teaching courses covering the following detailed subjects:

(a) Basic quality control - SENCE
Code: 06-28- 0235-13

(b) Index (Attribute) - Based Quality Control
SENCE Code: 06-28-0236-13

(c) Quality Control by variables

(d) Total companywide Quality Control

(e) Causal analysis and solution of quality problems at the company level

2) Courses offered on quality control by the Santiago University

Santiago University offer special courses entitled "Quality Control and Management".

Quality control education at the university concentrates mainly on the techniques concerning "inspection" and "statistical methods." The courses are aimed at managers and control officers of a level above this.

- Module 1

Applied statistics, 48 hours, etc.

- Module 2

In-process Quality Control, etc.

- Module 3

  Quality Assurance, 16 hours, etc.

- Module 4

  Strategical Quality Control, 32 hours, etc.

3) Education and training achievements

Fig. 3.4-4 gives the data for INN by way of example.

(4) Bodies providing financial assistance for quality control teaching

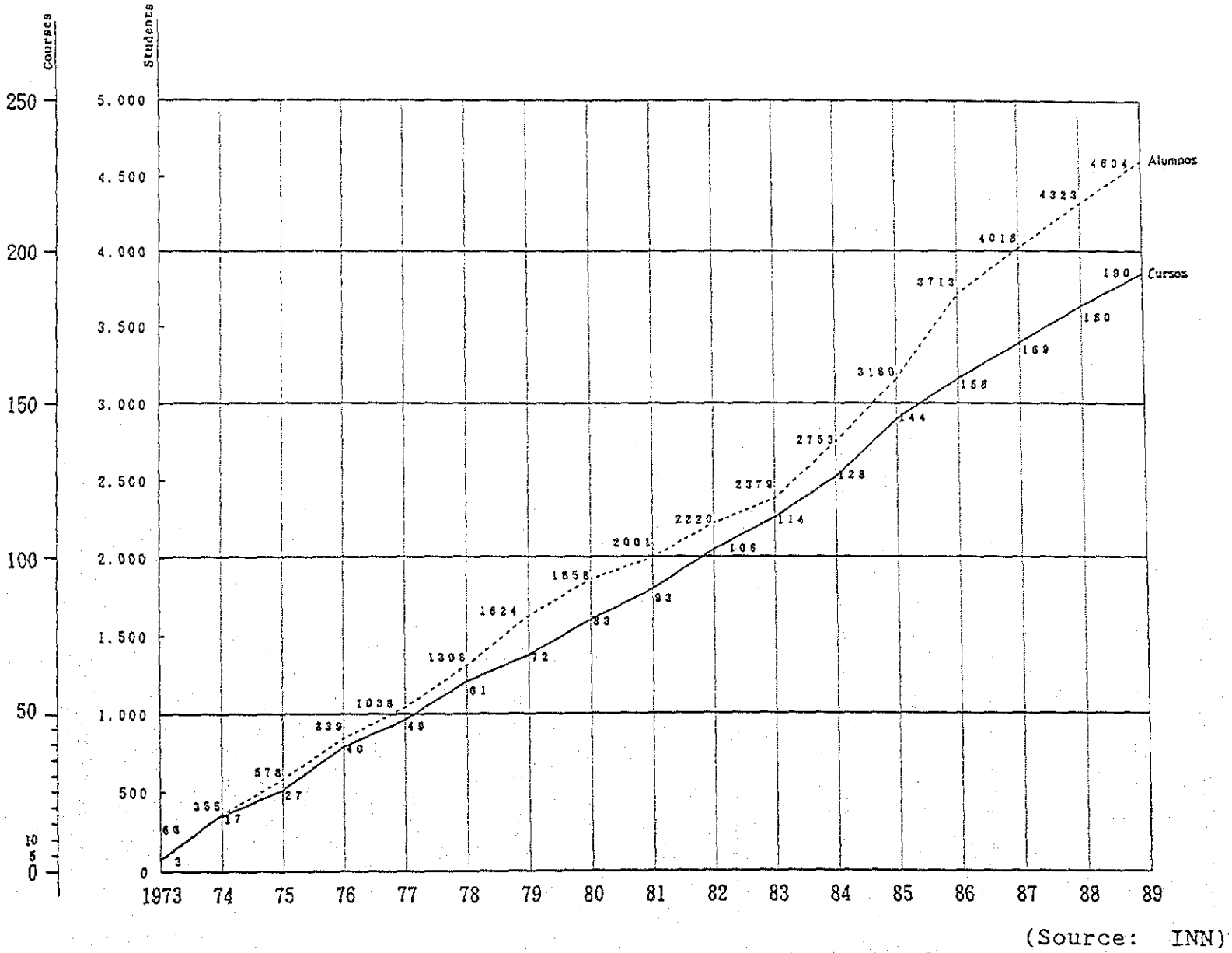
SENCE is an organization providing financial assistance for quality control teaching.

(5) Problem area s concerning the diffusion bodies

It can be seen from a study of the diffusion bodies that while there are no particular problems in connection with the number diffusion bodies, their facilities, their achievement record, and the financial support systems for the diffusion of quality control to the companies, there are problems concerning the curricular details.

Thus, the curricular shown in (3) lack any attempt to take up the world trends concerning quality control as conceived under the quality control/TQC system concept developed and based on the ISO 9000 Series.

There is also a problem with quality control education system that needs to be carried out from the standpoint of a national policy so as to respond to these current world trends.



(Source: INN)

Fig. 3.4-4 Courses and Seminars Held by INN and Participants in the Years 1973 - 1989

3.4.3 Current Status for Quality Control in Private-Sector Companies

(1) Questionnaire inquiry on the current status of industrial standardization/Quality Control

The responses to the questions on Quality Control/TQC of the questionnaire can be summed up as follows.

1) Recognition and awareness of Quality Control/TQC in Chile

In Chile's industry, the word Quality Control tends to be taken as meaning INSPECTION to a very large extent.

It must be noted, however, that in Chile's present-day industrial sector no clear distinction is made between Control de Calidad and Control Total de Calidad. This calls for the urgent need to teach and propagate the latest ideas about Quality Control, quality systems, and TQC in the light of the most recent worldwide trends.

2) Introduction of Quality Control/TQC

Many companies are contemplating the introduction of Quality Control/TQC (72% of all companies responding to the questionnaire).

Yet, it is also true that a substantial 28% of Chile's companies have not introduced Quality Control or Total Quality Control due to the lack of equipment and human resources. The situation shows that Chile's industry has not yet reached the perception of Quality Control/TQC activities as something that can be done leaving aside these shortcomings in terms of equipment and human resources.

There is also evidence of Chile's companies having some misgivings about the negative aspects that the effects in terms of saving materials, reducing manufacturing costs, achieving shorter delivery times, and reducing manpower were

not so significant as had been anticipated, and that may easily be associated with the introduction of Quality Control and Total Quality Control.

This is one of the factors that suggests the very substantial need for TQC teaching.

3) Quality Control and Total Quality Control Promoters

While 69% of all respondents stated that intermediate Quality Control officers and staff were promoters of Quality Control and Total Quality Control, only 12% felt so about the companies' top management.

4) Need for introducing a quality system philosophy

(a) Internal or in-house standardization

The inquiry showed that 70% of the respondents stated that external standards and specifications are used directly as internal (in-house) standards. This indicates that the basic principle of in-house standardization as an effort to translate the requirements given from outside into terms easily applicable to the inside organization of the company has not been generally endorsed yet.

(b) Quality system style control

The inquiry showed that a high proportion of 57% of all respondents felt that the areas in which Quality Control and Total Quality Control are being applied extend only to production control and the final products.

(c) Nonconformity control

The responses indicate that the most widespread statistical methods used in Quality Control and Total Quality Control are the check sheet and the control chart.

(43% and 36% of the respondents gave these methods, respectively.)

These two statistical methods are the most widely applied techniques for on-line control. For off-line control, however, the use of factorial analysis (histogram, distribution graphs, Paleto chart, Cause & Effect or Ishikawa diagram techniques) is still not adequately developed.

(d) Training and teaching

A substantial proportion of the respondents stated that teaching was conducted either by releasing personnel to take part of external seminars (48%) or by giving on-the-job or on-site instructions.

The above results indicate that many factors and aspects concerning Quality Control and Total Quality Control have not developed to maturity in Chile. In order to ensure the early establishment of a Quality Control and Total Quality Control System in Chile, however, it will be essential, in the first instance, to consolidate such Quality System factors as in-house standardization, process control, purchase control, defect control, and in-house training/instruction as these are vital prerequisites. For this purpose, it will be desirable that a Quality System be established on the basis of the ISO 9000 Series as the prerequisite for achieving these first-instance objectives.

5) Other items

The questionnaire inquiry showed that 47% of the respondents demanded the execution of Quality Control and Total Quality Control campaigns on a national level.

A further 31% saw that the low level of Quality Control and Total Quality Control seminars and technical standardization

in Chile presented a problem.

(2) Factory visiting

The ten companies specified by INN are mostly mass-production type of companies, and only one of the candidates was an assembly firm with small but diversified production runs.

The findings for their Quality Control endeavors may be summed up as follows, on an itemized basis.

1) Progress in quality system establishment (interest or commitment toward the introduction of the ISO 9000 Series)

Nearly all companies visited were establishing Quality Control systems not on a quality system philosophy and though their Quality Control systems were of a certain level, they did not appear to show a "very strong commitment" to Quality Control and were, for the most part, somewhere in the middle.

However, all those companies had appointed staff in charge of promoting quality activities.

2) In-house standardization

Those companies which were technically influenced in some way or other by foreign companies presented a fairly good progress in in-house standardization. Chilean companies without foreign affiliations, however, are showing a rather poor state on companywide in-house standardization, except for the testing and inspection departments and those activities which require clearly specified Quality Control rules.

In most cases, however, the companies were found to have their own in-process control sheets and operation specification documents/product drawings, that is, standard formats directly connected with process operation.

3) Quality Control system - and its functions

Many companies have established Quality Control Departments and merge them with the Inspection Department. These activities are primarily concerned with in-process and product inspection. They are not TQC-style technical control organizations based on the wide philosophy that also include cost control, production control, Quality Control, quality improvement and modification.

4) Nonconformity control

Chile's companies have no clear systematic procedures for dealing with "corrective measures" to prevent the re-occurrence of nonconformities.

5) Calibration of measuring equipment

The companies under CESMEC certification and the Chilean companies with foreign affiliations, operate, in most cases, control systems on the basis of the "CESMEC-based Standard Calibration PLUS Practical Calibration by Voluntary In-House Quality Control" formula.

6) Purchase control

Many companies were seen to practice purchase control, including purchase and acceptance inspections based on the buying specifications and material storage control.

7) Production control

Many or most of the companies with mass-production factories use process sheets, process control charts, and operating instruction documents to implement process control.

In new factories, production instruction issuing and implementation control is accomplished under computer control, and some companies were found to have computerized even product history control.

Companies in the assembly type sector with small and diversified production runs presented a different picture. Control diagrams are in comparatively widespread use, but the manner in which they are used is not appropriate as it was found in many cases that the procedures for taking action were slow.

8) Equipment maintenance control

The petroleum industry with its strong influence by foreign industry and its concern for safety control, was seen to exercise equipment maintenance control by adopting preventive maintenance procedures. In the other sectors of industry, however, the approach to maintenance is based on repair after the event.

9) In-company training-staff qualification and QC circles activities

There were some companies with QC circle activities. Generally, however, management is opposed to handing down decision making and therefore also opposed to QC activities. Where such circle activities do take place, the member tend to have little "drive" for the want of encouragement, seeing that management is not likely to accept proposals from the circle.

To sum up the above, it can be observed that there is a certain difference in nuance between those of Chile's companies which are technically influenced by foreign companies or have foreign affiliations in some way or other and those of Chile's companies which do not have such foreign affiliations. The level of general quality control systems operated at the companies visited by the study team has still not progressed to the quality system stage

and to the establishment of Quality Control based on this philosophy.

Many companies have amalgamated their inspection functions with the appointment of the Quality Control Department. This testifies to a move toward the diffusion of Quality Control and the dissemination of the principle and philosophy of Quality Control on a wider scale by upgrading the Quality Control functions.

The most important requirement for the time being, however, is to aim at the introduction of the Quality Control system approach and the teaching and propagation of this approach so as to facilitate the "leap" from the present stage to the higher Quality Control system/TQC system level for Chile's companies and ensure the establishment of a new quality system.

3.5 Testing and Inspection System

The following briefly described the most typical of these testing organizations:

3.5.1 Present Status and Current Problems of the Testing and Inspection Organization

(1) Present status

1) CESMEC

(a) Testing and inspection performance record

CESMEC is an organization accredited by INN, and conducts standard conformity testing based on the NCh standards. The range of certification this organization is taking charge for is considerably wide, and conducts testing and inspection in all fields excluding those related to environment protection. Especially, in testing for

strength of steel materials for construction and cement, this organization has satisfied demands for testing and inspection in cooperation with other universities and laboratories in the country. Furthermore, this organization has an excellent record in testing of gas bombs by means of non-destructive testing including searching for flaws with gamma ray.

(b) Existing equipment and facilities

The testing equipment in the possession of CESMEC consists in the main of equipment relating to ore-mining and forestry/lumbering. In view of the large number of equipment which has broken down, uncalibrated equipment, and old type of equipment, it is possible to perform tests only for a limited number of test items among those required by the standards for standard conformity testing.

(c) Technical level of technical staff and education/training

No particular provisions are made for the education and training of technical staff, with no training courses being conducted. Generally, members of the staff will receive on-the-job-training (OJT) after joining the organization. For inspection officials in charge of quality control, however, participation in the seminars organized by INN is insisted upon.

The level of technical competence of the organization's technical staff members can be described as rather low in all areas except non-destructive testing. In this field, there are four engineers of a high standard.

2) IDIEM

(a) Test and inspection performance record

As most of the machines and equipment now being used are out of date, it takes a relatively long time to conduct testing with the available machines and equipment.

Furthermore, if any specific testing item cannot be carried out in standard conformity testing, this institute has no way but to ask other inspection organizations to do it.

(b) Equipment and facilities owned

The testing equipment in the possession of IDIEM consists in the main of equipment supplied by UNDP around 1960 and cannot necessarily be classed as new. All measuring equipment is however controlled to a high level of accuracy. Yet, calibration is performed only in-house so that there is no trace with external calibration organizations.

IDIEM functions as an inspection organization for steelreinforced concrete for the construction industry and in this respect it is unique in Chile. The testing and inspection equipment used for this purpose costs of a 50t class universal testing machine and a number of various other large-scale high-strength testing machines and facilities.

Standard conformity testing is carried out on the basis of NCh standards. IDIEM has the capability of performing mechanical strength tests and material analyses on building materials, including mainly cement and concrete apart from the steel-reinforced concrete.

(c) Technical level of technical staff and education/training

IDIEM has the status of being a organization attached to Universidad de Chile. It has 150 technical staff of Universidad de Chile and 50 post-graduates on its staff. Their technical level is high enough to carry out R&D activities.

3) SGS

(a) Test and inspection performance record

SGS, a certification body accredited by INN, conducts testing and inspection as business transactions upon requests from their clients, chiefly for products of the primary industry such as agricultural/stock farming products, marine products and processed agricultural/stock farming/marine products. Furthermore, this organization is capable of conducting and inspection for chemical products, and has an excellent performance record (350 inspection tests/year).

(b) Equipment and facilities owned

SGS CHILE has adequate analysis equipment for organic and inorganic analysis. Using bond analysis to determine the bonding arrangements of organic compounds, SGS CHILE has the capability to perform qualitative and structural analysis. Mass-spectrometry is used to perform qualitative and quantitative analyses. With these capabilities, SGS CHILE is in a position to carry out chemical analysis on sea products and measure pollution (in the atmosphere and water).

(c) Technical level of technical staff and education/training

SGS has testing locations in four South American countries and maintains technical interchange with all of these.

This is to assure a high level of technical expertise of its staff. It has a very high level of technology especially in the field of chemical analysis.

4) INTEC

(a) Test and inspection performance record

This organization has been conducting testing of materials especially for mining, but can satisfy only around 60% of the demands.

(b) Equipment and facilities owned

Most of the testing equipment at INTEC CHILE is set up for testing purposes in the mineral related fields and for conducting chemical analyses. Tests and analyses are also performed on (food-preserving) cans, packaging materials, agricultural produce, and bio-products. It has in particular equipment capable of analyzing the content of heavy metals which are poisonous to the human body.

(c) Technical level of technical staff and education/training

To ensure its capability of performing tests also on standardized products manufactured by smaller and medium scale companies, INTEC tries to enhance the level of technical competence of its technical staff by having a Japanese specialist on call.

5) Universidad de Chile, Centro de Estudios Espacias

(a) General

This institute closed a scientific cooperation agreement with NASA in the United States and became a satellite trace center for the latter. Now this institute provides not only NASA but also industrial, scientific and

technological organizations in Chile with information from satellites. This institute maintains and control a device for time standard, precision and accuracy of which are at the highest level in the country. The national time standard of Chile itself is, however, maintained and controlled by a Chilean navy's facility at Valparaiso.

(b) Testing and inspection performance record

This institute does not any specific testing or inspection service for organizations in the private sector, but if asked, it can provide clients with such information as voltage standard, time standard, and frequency standard.

6) IDIC

For military procurement, this research body provides the necessary services also within IDIC. It provides services for the private sector in the agricultura/forestry and mining areas.

This institute has introduced a granite table (150 x 100 x 30 cm) for inspection and measurement of firearms, but has not introduced any three-dimensional measruing equipment. They are now using a height gauge in place of a three-dimensional measuring equipment.

7) CIMM

(a) General

This body was established by Presidential Decree as a public body under the control of MDM. It provides an advisory service for domestic companies. It is competent mainly for the areas of environmental control in the mining sector and quality control for chemical analysis.

(b) Testing and inspection performance record

CIMM conducts testings and issues certificates for about 1,500 items a year.

8) Fundacion Chile

(a) General

Fundacion Chile is a private body for the promotion exports founded on a joint basis with the United States of America in 1967. It provides an advisory service on foreign standards and product inspection services for quality assurance. At present, it provides a range of consulting services and sells new technology to manufacturers and creates pilot plants/companies for sale to the private sector.

It acts as the certification body of INN and also has been appointed as a certification body by and for the FDA of the USA and SABS of the South African Republic.

(b) Testing an inspection performance record

This organization has testing facilities at 3 places, Santiago, Puerto Mont, and Concepcion, and conducts testing in these facilities mainly in the fields of chemistry and bio-chemistry. This organization take charge for testing of marine products and those related to forestry, and now can fully satisfy needs for testing and inspection.

(c) Equipment and facilities owned

This organization collects data using reference materials for calibration of analyzers, and the data is sent to calibrating organizations in the United States for comparative calibration. For this reason, reliability of

the data provided by this organization is relatively high.

9) DICTUC

(a) Testing an inspection performance record

This is one of the accredited bodies by INN, and is conducting testing for conformity to standards based on NCh. This organization is also performing testing based on international standards such as IEC, but when requested, this organization also performs testing not based on the standards. Object items for testing conducted by this organization are those mainly related to materials of machines and construction materials, and 7,000 to 8,000 items are tested by this organization annually in each field.

(b) Technical level of technical staff and education/training

This university is providing general education in technological fields, and has testing centers in each discipline, totally 9 testing centers. The faculty consists of 70 professors, and among them 59 people have a doctor degree. Each testing center has 3 or 4 specialist engineers and 5 technical assistants called "Technico".

10) Casa de Moneda de Chile

(a) General

Main job of this Bureau is to print bills and make coins used in Chile. Additionally, this Bureau prints public certificates such as passports, stamps and identity cards.

(b) Testing and inspection performance record

All of paper used for printing bills is imported from foreign countries, and this organization checks and

verifies data presented by paper manufacturers.

(c) Equipment and facilities owned

In this testing facility, the temperature is kept at 21° C and relative humidity at 65% strictly as peripheral conditions.

This organization can not be a certification organization for INN because of its specific position in Chile. The weights owned by this organization are at the highest level in Chile as standard weighs for measurement of weight.

(2) Current problems

It cannot be said that capability of each organization for testing and inspection is adequate in an assigned range because equipment and facilities owned are rather out of date and a number of engineers and their technical skill level are not enough. Generally, their capability of testing and inspection for products in the primary industry is at an acceptable level, but their capability of testing and inspection for industrial products is still inadequate.

Of the primary industry products, (1) for agricultural and stock farming products, BV can conduct standard conformity testing as a private testing organization, in addition to the above organization. (2) for marine products, such organizations as IFOP, and so on, which are under control by MINECOM have the capability, and (3) for processed agricultural/stock farming/ marine products, in addition to testing organizations for marine products, Universidad de Concepcion has the capability of testing. (4) For forestry industries and processed wood products, INFOR has many testing performance records, in addition to the above-described organizations.

Thus, it may be said that several testing organizations in addition to the main testing and inspection organizations described above are available for testing and inspection of products from the primary industry. For industrial products such as machines, metal or electricity, there is no private testing organization besides those described above, and the demands have not been satisfied. Of industrial products, however, for chemical products, BV, ISP and Universidad de Austral have capability for testing and can conduct standard conformity testing, so it may be said that the current needs are almost satisfied.

3.5.2 Equipment and Facilities for Testing and Inspection in Manufacturing Companies

(1) Present status

1) Sheet metal working company A

(a) Products manufactured and production output

This company is manufacturing enameled pans in a stamp system using such materials as aluminium, iron and stainless steel as the raw materials. 84% of the production is shipped to the domestic market, while the remaining portion is exported to 15 countries including the United States.

(b) Organization and the number of employees

Foundation	:	1939
Number of employees	:	350 people (1990)
Capital	:	$2,560,000 (1990)
Annual sales	:	$10,000,000 (1990)

(c) Used standards

NCh 2009/7, IEC 335 (Compatible with NCh 2008) etc.

(d) Equipment and facilities owned

Most of the equipment are available for standard conformity testing based on the IEC standards, but some of the NCh standards themselves have not been revised, so that the testing machines are based on the standards before revision.

(e) Technical level of technical staff responsible for testing and inspection

They can perform testing and inspection accurately for basic items in the IEC/NCh standards, but their experience is inadequate for items concerning abnormal testing.

(f) Current situation of and policy for education and training

From the viewpoint that they must produce products satisfying related standards, the company send employees to attend the Chilean Standard Technical Committee in INN and also give them many changes for studying.

2) Paint company B

(a) Products manufactured and production output

This is a medium-scale company producing 100,000 gallons of paint a month. 70% of total production is paint for industrial use, 25% for home use, and remaining 5% for use in ship building.

(b) Organization and number of employees

Foundation : 1969
Number of employees: 250 people (80 people in the production department) (1990)

(c) Standards used

ASTM 963, IDIC (Chilean Army Institute) Standards

(d) Technical level of technical staff responsible for testing and inspection

Adequate for testing and inspection of viscosity and hardness.

(e) Current situation of and policy for education and training

Education and training are not provided systematically, and necessary measures are taken case by case by OJT.

3) Steel material company C

(a) Products manufactured and production output

This company produces cement products, galvanized iron sheets, drainpipes, carpets, hoses, adhesive, lime and others.

(b) Organization and number of employees

Foundation	:	1930
Number of employees:		1532 people (1990)
Capital	:	$80,000,000 (1990)
Annual sales	:	$90,000,000 (1990)

(c) Standards used

According to requests from clients

(d) Technical level of technical staff responsible for testing and inspection

Testing and inspection are performed to products sampled from the production line according to the accurate procedure, and testing and inspection data are prepared in a good order.

(e) Current situation of and policy for education and training

Education and training are not provided systematically, and necessary measures are taken case by case by OJT.

4) Electric houseware manufacturing company D

(a) Products manufactured and production output

This company is producing the following items.

Electric washing machines, refrigerators, oil stove and gas stove and Gas stove for cooking.

(b) Organization and number of employees

Foundation	:	1905
Number of employees:		850 people
Capital	:	$33,000,000 (1990)

(c) Standards used

NCh 2008, IEC standards

(d) Equipment and facilities owned for testing and inspection

Final safety verification testing is performed with automated testing machines in the production line, and the data is recorded and stored in a good order.

(e) Technical level of technical staff responsible for testing and inspection

Their technics for testing and inspection as well as for production control are at a high level because of technological cooperation with foreign countries.

(f) Current situation of and policy for education and training

Education and training are not provided systematically, and necessary measures are taken case by case by OJT.

5) Balance production company E

(a) Products manufactured and production output

This company produces weight measuring equipment such as platform scales and plate balances, and gasoline flow meters. Although this company is producing measuring equipment with electronic circuits, the electronic circuit components are imported from foreign countries.

Products produced by this company share 60 to 65% of the domestic market.

(b) Organization and number of employees

Foundation	:	1931
Number of employees:		160 people (1990)
Annual sales	:	$4,000,000 (1990)

(c) Standards used

According to requests from customers

(d) Technical level of technical staff responsible for testing and inspection

Accurate data is collected efficiently according to the test and inspection manuals, and testing and inspection are performed correctly.

(e) Current situation of and policy for education and training

Education and training are not provided systematically, and necessary measures are taken case by case by OJT.

6) Flow meter manufacturing company F

(a) Products manufactured and production output

Water supply meters

Accumulated watt meter

(b) Organization and number of employees

Foundation	:	1952
Number of employees:		200 people (1990)
Capital	:	$5,000,000 (1990)

(c) Standards used

According to requests from clients

(d) Technical level of technical staff responsible for testing and inspection

Data is collected according to testing and inspection manuals, and testing and inspection are performed correctly.

(e) Current situation of and policy for education and training

Education and training are not provided systematically, and necessary measures are taken case by case by OJT.

(2) Current Problems

Most of large enterprises have automated production lines, and their procedure for testing and inspection are clear. Also it can be said that their production facilities have been considerably modernized and the manufacturing efficiency is at a very high level. Measuring equipment used for testing and inspection are not only calibrated by private measuring organizations in the country, but also they are very active in approach to organizations in foreign countries. Also technical level of technical staff is fairly high. They dispatch engineers to advanced industrialized countries, and sometimes introduce necessary technologies from foreign countries.

In small and medium scale enterprises, production is made by human labour, and it can not be said that their production line has been modernized. Equipment and facilities used when the plants were built are still used, and most of works depend on individual skill. Some of technical staff are so-called amateur and some are professionals, which is reflected in non-unified product quality.

3.6 Metrological System

3.6.1 Metrological System and the Present Legal System

Chile adopted the metric system in 1848 after examining its legalization following the adoption of the metric system in France in 1840. This metrification law is still effective to-date.

After this, legislation was introduced in Chile making it compulsory to the kilogram as the official unit of weight, the meter as the official unit of length, and the liter as the official unit of

volume. In practice, however, a variety of units of measure exist and are still being used side by side, including units such as the CGS, MKS, MTS, MKFS, MKSA, and PSI systems.

This is the result of the lack, in Chile, of legislative law laying down a metrological system in all its practical aspects, including the national standards and the verification of metrological apparatus, as well as the absence of provisions for the practical enforcement of the legal metrology, and this despite the fact that Chile has formally adopted the metric system for its units of metrology.

3.6.2 Metrology Administration and Current Status of Policy-making

At present, metrology administration is not enforced by Chile's national and regional governments. The main reason lies in the structure of Chile's industry. As the primary product sector, including mining and agriculture/fisheries/forestry has traditionally been the leading area of the economy, there has been no substantially felt need for industrial weights and measures. This retardation in the nation's industrialization which generates technical progress, kept Chile at a level which did not necessitate the introduction of official industrial weights and measures.

In recent years, however, there has been a shift of emphasis from the primary product sector (mining and agriculture/fisheries/forestry) to the processed, value-added and the export areas. This change was prompted by the price stagnation seen in the recent past on the international primary product (raw materials) markets on the one hand, and the globalization of the market economy on the other. With this change of direction, there is now a greater recognition of the need for a metrological system shared by the government and the private sector. This is essential both in the interest of product quality and for improving productivity.

3.6.3 The Traceability System (National Primary Standards - Secondary Standards, Working Standards and Calibration Apparatus)

The Metrological Law, established in the middle of the 19th century, fixed the standard units for length, mass, and volume. As no infrastructural system has since then been created to administer the law, Chile does not now have any specialized metrology organizations for the maintaining and controlling of metrology. Nor does Chile have its own national metrological standards.

As a result, the metrological apparatus maintained and controlled by the universities as well as private and public testing organizations serve merely the practical calibration needs of industry, without forming a national traceability system.

All standards in the possession of Chile's universities as well as private and public testing organizations must therefore be considered as being secondary or below-secondary standards by international criteria. In the maintaining and controlling of these standards, it is now the general practice in Chile to have the standards calibrated by the suppliers, that is, the manufacturers of the standards, and the related overseas organizations. The lack of national standard organization in Chile creates a major problem in terms of reliability.

3.6.4 Verification of Standards and Calibration Organizations

(1) General

As the Republic of Chile has no measurement law including regulations for measurement administration, there is no compulsory authorization system for measuring instruments. However, such measuring instruments as a watt meter, a water supply meter, a gas meter, a taxi meter are objects for compulsory inspection under a decree by MINECOM, like electric homeware such as a television set and an electronic range, for fair transaction and protection of consumers. Such organizations as the Electric Power/Fuel Agency,

Water Supply Corporation, Gas Supply Corporation, and Car Check Center are responsible for authorization of models and display of authorization marks. Staff of these organizations sometimes make entrance inspection. But these organizations ask DICTUC to do actual jobs for testing for informal authorization, and such organizations as USAC, DICTUC, CESMEC, Facultad de Ciencias Fisicas y Matematicas - Universidad de Chile, ENDESA, and Universidad de Santiago to test meters for electricity according to types of each meter. Also, it is required that difference between units are adjusted in each manufacturing plant and the authorization mark should be adhered to all of the products which passed testing for conformity to standards, but a period of validity for the testing has not been legally established, and in many cases the authorization mark is removed at a site of installation. On the other hand, calibration of measuring instruments is performed by CESMEC LTDA in relation to a portion of physical quantities such as weight and volume to satisfy needs of private companies, and also Facultad de Ciencias Fisicas y Matematicas - Universidad de Chile, Facultad de Ciencia - Universidad de Santa Maria, and Armada de Chile and other organizations are providing calibration services in relation to a small number of physical quantities.

As upper national standards for a measurement system have not been established, scaling and calibration are requested to measurement standard organizations in overseas countries or manufacturers of measuring instruments, but a system of periodical calibration by the manufacturers or overseas organizations has not been established yet, and there are many problems in identification of precision and reliability.

(2) Performance result in calibration of measuring instruments which are objects for compulsory inspection

The number of water supply meters authorized a year is said to be around 150,000 units.

It can be estimated that the number of electricity meters authorized every year is in a range from 120,000 to 150,000 units.

The number of gas meter units authorized annually is estimated under several ten thousands units. As for taxi meters, there are many imported cars now in use, and restrictions for a compulsory car inspection system were just introduced in 1990, and there are few performance data on the restrictions, so that the actual situation is still unknown.

(3) Performance data for measurement calibration service

Such organizations as CESMEC, Facultad de Ciencias Fisicas y Matematicas - Universidad de Chile, Departamento de Ingenieria - Universidad de Concepcion, Departamento de Ciencia - Universidad de Santiago, Departamento de Ciencia - Universidad Tecnica Federio Santa Maria, and laboratories of Army are providing calibration services, but the number of clients who periodically request calibration of their equipment in CESMEC, which is the most active in this field, is only around 5 companies, so it can be considered that, corresponding to lack of the measurement administration, performance result in calibration of industrial equipment is very scare.

(4) Equipment and facilities owned

The standard equipment for measurement and those for calibration owned by CESMEC are as shown by double-line frames in each of the following measurement system drawings: Figs. 3.6-1, 3.6-2, 3.6-3, 3.6-4, 3.6-5 and 3.6-6.

Excluding CESMEC, there are the following organizations which own standards for each measurement system (physical quantities) and are providing calibration services.

Time

Universidad de Chile
Armada de Chile
Fuerza Aerea de Chile

Length

Cormecanica
Universidad de Chile
Universidad de Santiago

Mass

INN
Case de Moneda de Chile
Cientic Chile

Capacity

Refineria de Petroleo de Con-Con
Sociedad Chilena de Medidores
GASCO

Force

Universidad de Chile
Pontificia Universidad Catolica de Chile

Pressure

Fuerza Acrea de Chile

Temperature

Universidad de Chile
Pontificia Universidad Catolica de Chile
Universidad de Santiago
INTEC
Universidad Tecnica Federico Santa Maria

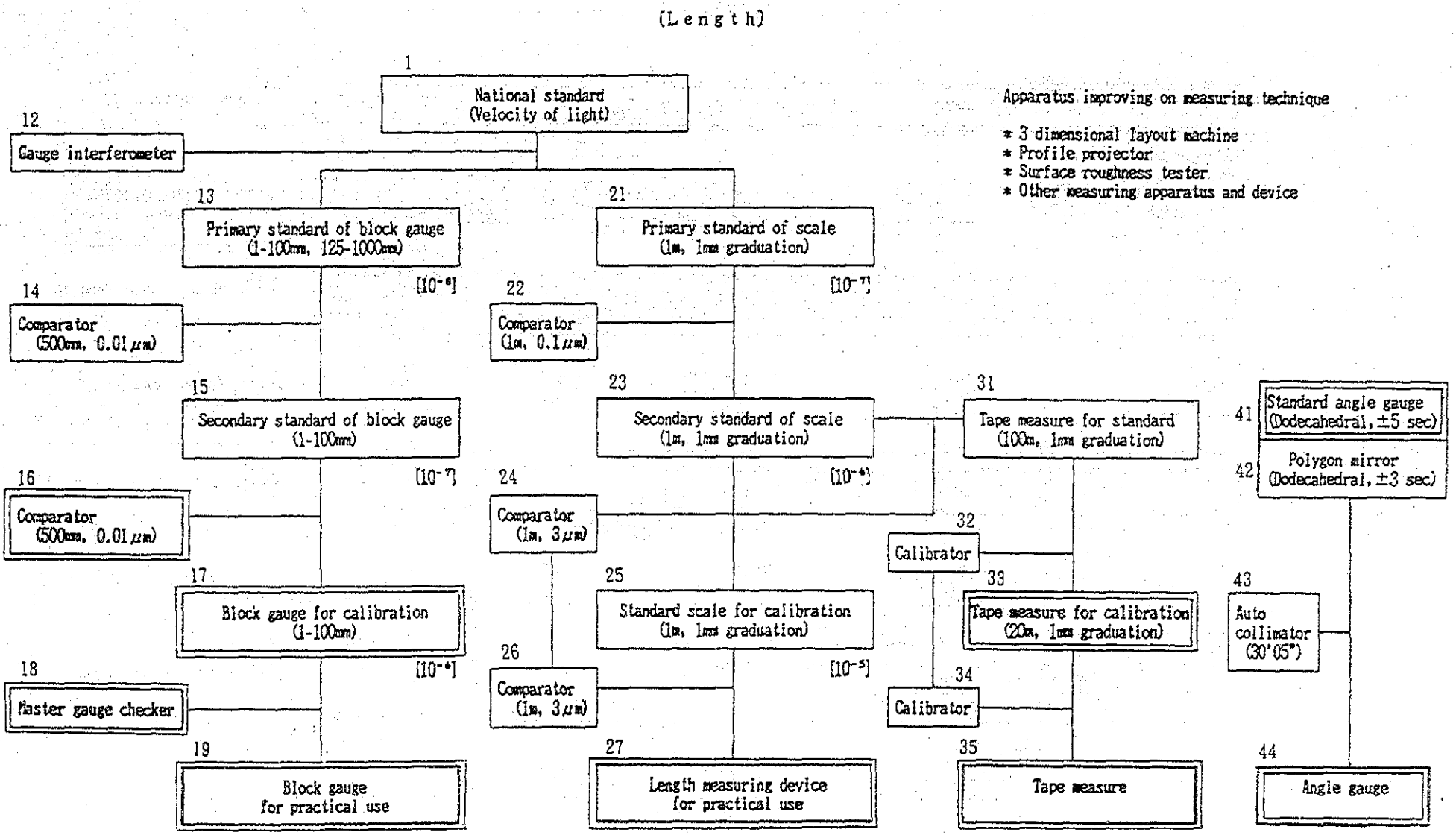


Fig. 3.6-1 Metrology/Calibration Equipment of CESMEC

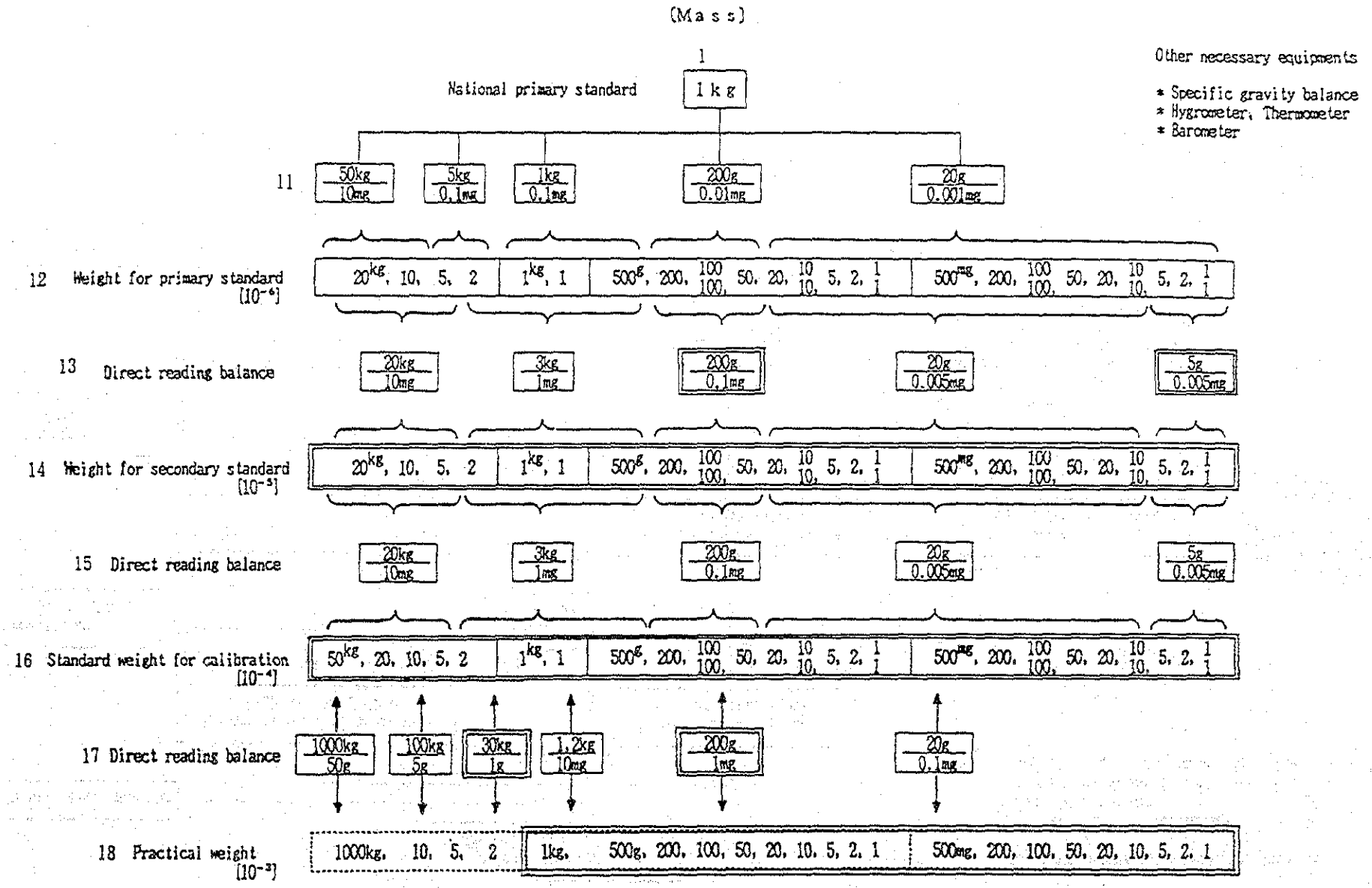


Fig. 3.6-2 Metrology/Calibration Equipment of CESMEC

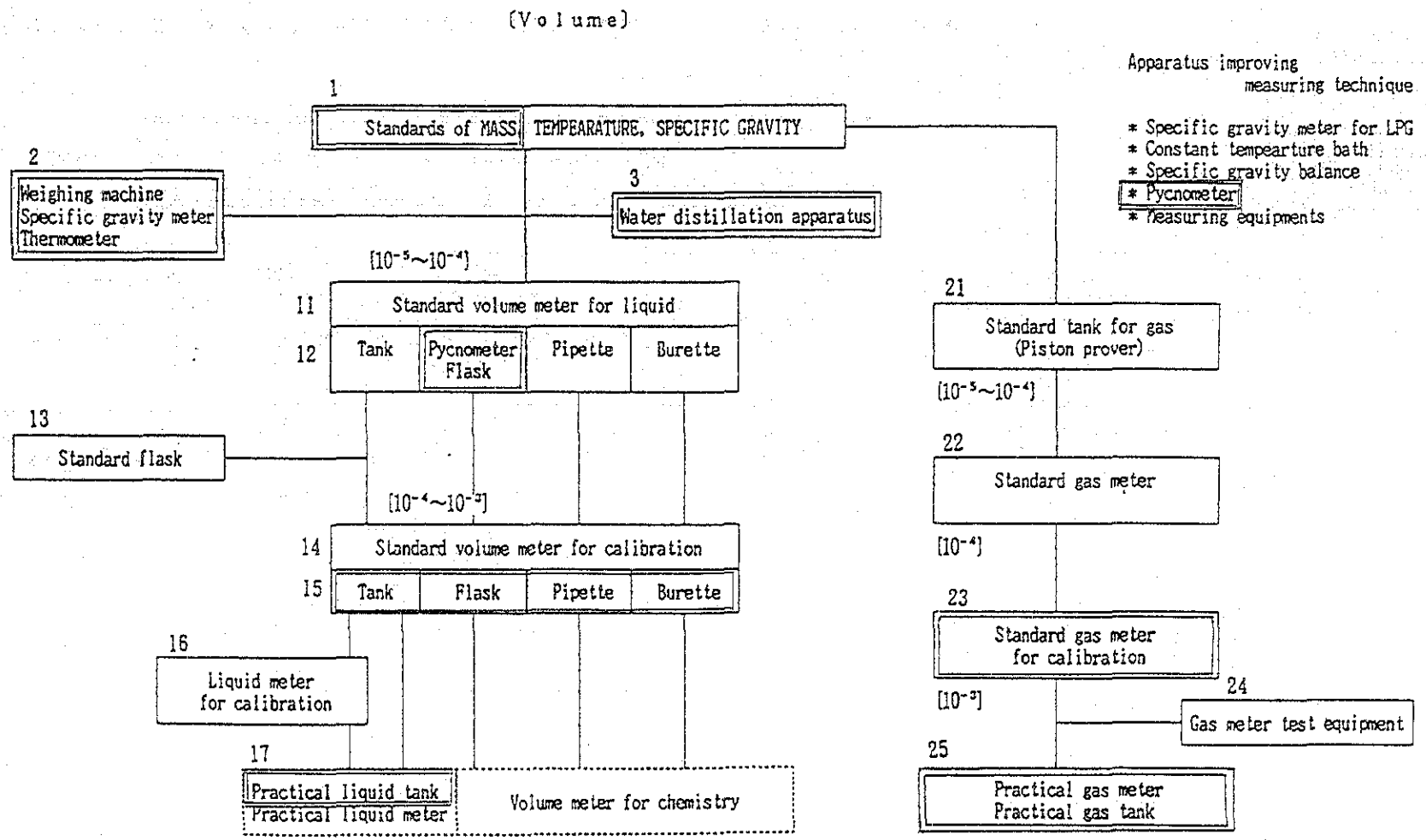


Fig. 3.6-3 Metrology/Calibration Equipment of CESMEC

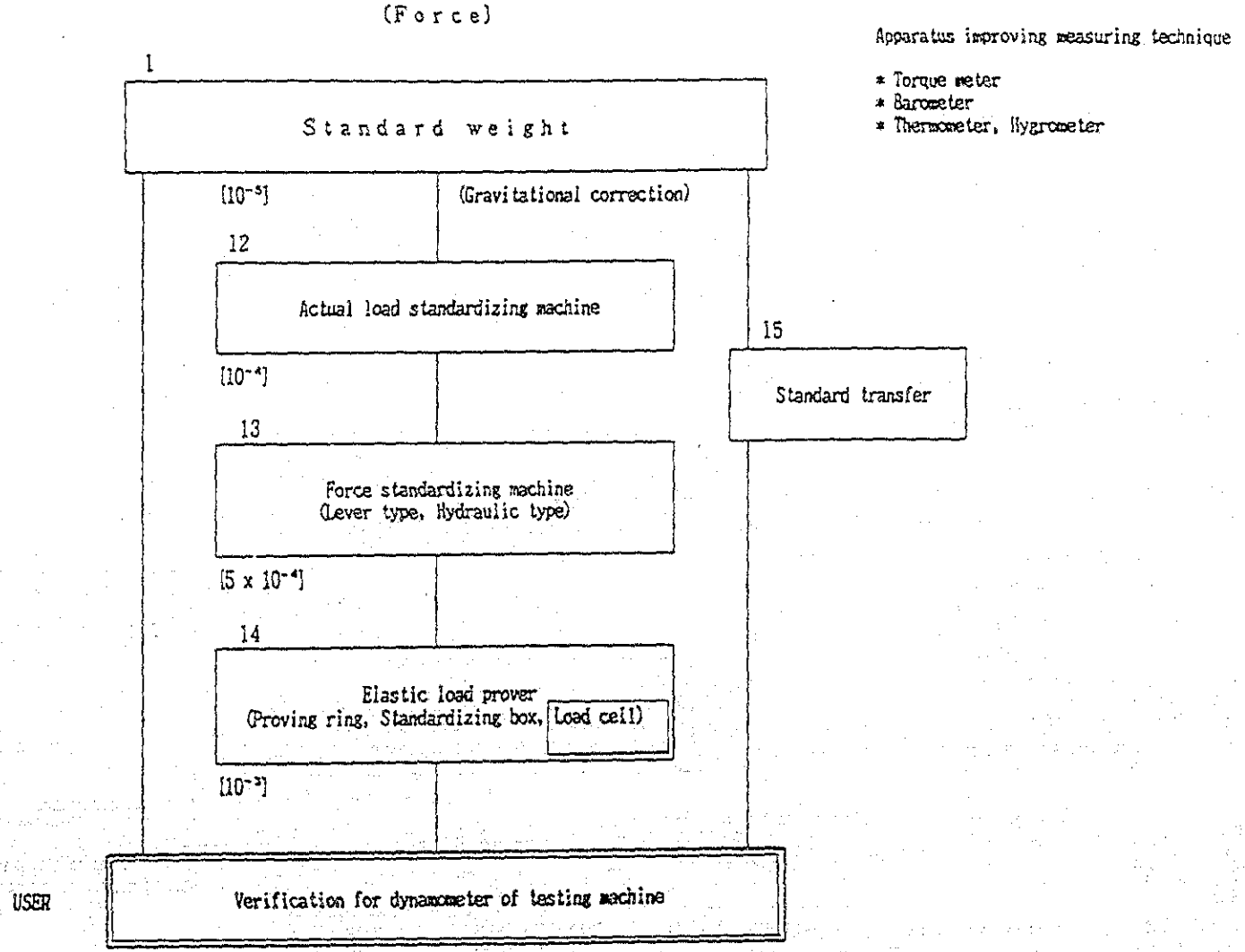


Fig. 3.6－4 Metrology/Calibration Equipment of CESMEC

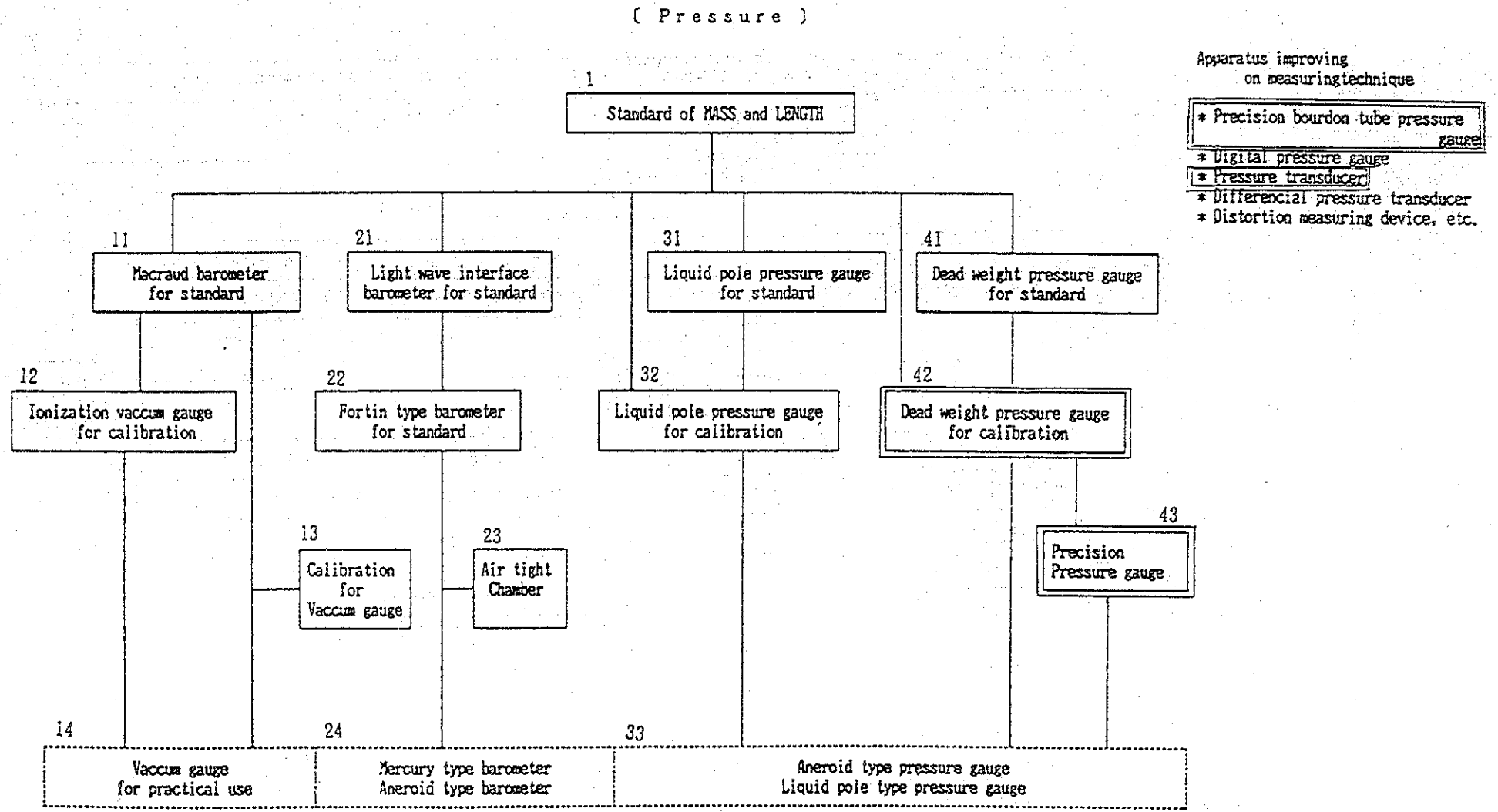


Fig. 3.6-5 Metrology/Calibration Equipment of CESMEC

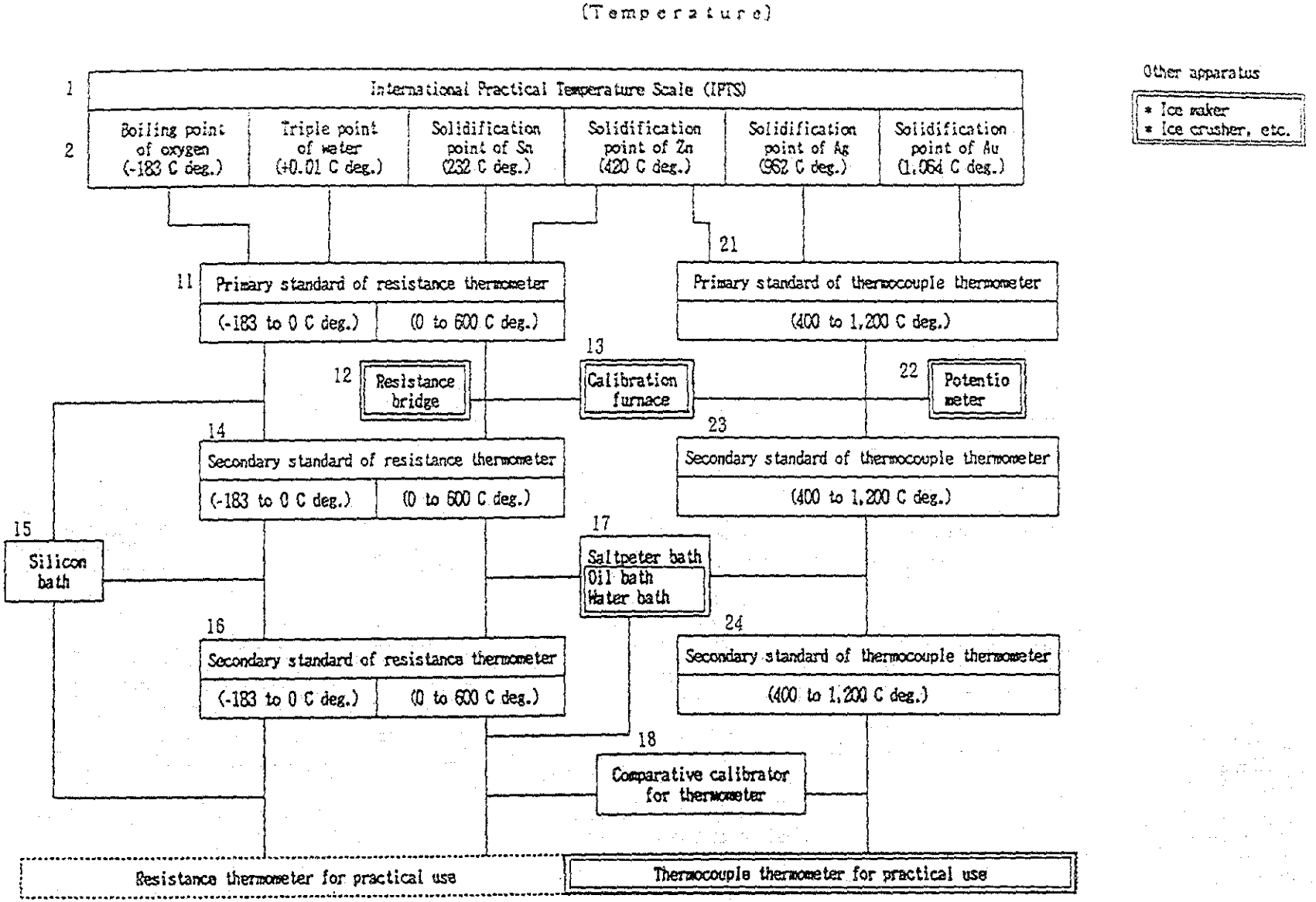


Fig. 3.6-6 Metrology/Calibration Equipment of CESMEC

3.6.5 Organizations Responsible for Maintenance of Measurement Standards

(1) General

There is no organization dedicated to maintenance and control of measurement standards. CESMEC is spontaneously making efforts to control and maintain the secondary standard for weight which was supplied from UNIDO in place of the government. For time, however, the Space Laboratory of Chile University own 3 units of time standards based on a cesium 133 watch system, and makes mutual calibration between the units, and at the same time compares the standard units to those in NASA in the United States. For this reason, it is possible that the standard units are national standard and the facilities are asked to take charge for control and maintenance of these time standard devices. Technological level of this laboratory is enough for that purpose.

(2) Relations with international measurement standard organizations

In 1875 when BIPM was established, also Chile participated in the international organization, but has not participated in any practical activity. INMETRO in Brazil is now a central organization for measurement in South America, and this organization has been authorized as a calibrating organization for measurement systems in Chile, so that CESMEC and universities in Chile ask INMETRO to calibrate their equipment and devices according to the necessity.

CHAPTER 4 MAIN PROBLEMS AND OBJECTIVES TO BE ACHIEVED FOR IMPROVEMENTS OF INDUSTRIAL STANDARDIZATION

4.1 General

As described in Chapter 2, Chilean economy, supported by traditional industries such as mining, agriculture, forestry and fishery, has recently been in exceptionally good shape compared to other South American nations. The reason why Chilean economy is heavily dependent on natural resources is that because the Government has been pursuing the open-market policy based on the market principle with minimum intervention in the market and has not adopted the policy to positively promote any specific industrial sectors or fields, naturally those industries which have a comparative advantage are of greater importance. Since the open-market policy has been so far effective and thus contributed to the good economic conditions, the Government is very likely to continue to adopt this policy with minor changes for the foreseeable future.

However, it is recommended that Chile make efforts to produce higher value-added products based on primary industry, in other words, highly processed primary products. In order to achieve this goal, to improve the product quality is quite important and so is to promote industrial standardization. With standardized high-quality products, Chile will be able to substitute them for currently imported products and even to export them after gaining enough international competitiveness in its products.

Development in high value-added industries will lead to not only an increase in national income but a decrease in external debts through obtaining foreign currency by export. Thus, as industrial standardization program could be one of keys for economic development, the program should be given a high priority for implementation.

4.2 Main Problems and Objectives to Be Achieved for Establishment and Improvement of Industrial Standards

As problems relating to preparation of standards were described in 3.2, only items are shown as follows;

(1) Establishment of policies for an industrial standard system
(2) Maintenance for NCh Standards
(3) Introduction of necessary Annexes to description of each standard
(4) Policies for diffusion for industrial standards
(5) Activities for international standardization

4.3 Main Objectives for Establishment of Unified Certification System and Objectives to be Achieved

4.3.1 Basic Concept for Unified Certification System

It should be noted that some certification systems, especially voluntary certification systems are not working now in Chile. The basic reason why of this is that there are few incentives for manufacturers. In other words, "even if a company gets a certification, consolidates a production system and produces products according to the conditions upon which the certification has been given, the company cannot feel or expect that they can obtain the merits and advantages as listed below".

(1) Improvement of product quality
(2) Reduction of rejection ratio
(3) Improvement of productivity
(4) Reduction of production cost
(5) Increase of sales
(6) Increase of profit

These merits and advantages would not be realized without introducing quality control and a unified certification system which are internationally accepted. For these reasons, the basic concept for the unified certification system would be as described below.

(1) In addition to maintenance and improvement of consumers' health and sound environment, the unified certification system must contribute to improvement of industrial technology in Chile, improvement of production efficiency, reduction of production cost, and improvement of quality of industrial products and

services.

(2) The unified certification system must be accepted not only in Chile, but internationally.

(3) The unified certification system must be consistent with trends in international certification systems.

(4) It is required that standards for quality assurance and various guideline employed in international organizations for standardization such as ISO/IEC can be used in the framework of the unified certification system as much as possible.

(5) The unified certification system will be a voluntary one in the initial stage, but it must be able to contribute to integration and improvement of other compulsory or voluntary certification systems being implemented at present in Chile.

(6) Certification made under the unified certification system must generally accompany a certificate of conformity to NCh standards.

4.3.2 Improvement of Current Certification System

Improvement of the current certification systems in Chile will be useful to smoothly introduce a unified certification system in the future. In order to improve them, the following should be settled.

(1) Consolidation of certifying organizations and definition of a scope of certification of which each organization take charge

(2) Arrangement and rationalization of NCh standards used for certification

(3) Setting up criteria for qualification

(4) Differentiation of certification bodies from testing and inspection bodies

(5) Traceability of products

(6) Improvement of conformity marks

(7) Documentation of procedure for certification

(8) Measurement system

(9) Units used for certification

(10) Quick processing for certification

As for the item (1), a government institution in control of each certification system independently specifies certification bodies and the scope of certification, so that it is difficult for outsiders to have correct understanding on this problem. To solve this problem, it is recommended to set up a single or a few accreditation bodies and prepare documents clearly stating a purpose, required procedures, criteria for qualification, criteria for maintenance and financial aspect of each body to establish transparency of each body.

Taking into considerations an international position of INN, it will be better to centralize the certifying organizations for both voluntary and compulsory certifications into INN.

International standards or ISO/IEC guidelines are available for reference in relation to any of (3) "Setting up criteria for qualification", (4) "Differentiation of certification bodies from testing and inspection bodies" and (7) "Documentation of procedure for certification".

As for (2) it is emphasized that improvement of NCh standards is a prerequisite for introduction of a unified certification system and the task for it should be started as soon as possible.

To carry out the item (5) "Traceability of products" and item (6) "Improvement of conformity marks", necessary measures should be taken

in plants (sites) where works for certification are made. It is necessary to clearly define a degree of demand for traceability of each product, taking into account such factors as weight, form and size of each product, and to standardize a practical method for recognition and criteria for processing. Additionally, a method of checking up a certificate with its actual products should clearly be defined as part of the procedure for certification.

A certification mark indicating the certification system itself should be used in place of that indicating the certification bodies, because the latter one is not desirable to defuse the certification system in the future.

The item (9) "Units used for certification" should be carried out in parallel with the item (2) "Arrangement and rationalization of NCh standards used for certification". As this problem is closely connected to designing and testing in fields, so that many problems such as introduction of design standards, modification of scale of modified testing units should be solved at the same time. For this reason, measures at a national level are required to wrestle with this problem.

As for the item (10) "Quick processing for certification", it should be noted that all of state-run companies, non-profit organizations and private companies are now working under the same certification system. It is recommended that this current situation should be reviewed from the viewpoint of whether it is desirable for quick processing of works for certification or not.

4.3.3 Objectives to be Achieved for Realization of Unified Certification System

The goal of the unified certification system is naturally to diffuse the certification system in Chile and improve quality of services and products in the country for the purpose to contribute to further development of industries, and the following conditions must be taken into considerations to establish a effective certification

system.

(1) Establishment of legal base

Even though a certification is either voluntary or compulsory, the system must be run fairly, consistently and systematically. For that purpose, it is necessary to consolidate comprehensive laws and restriction which will give a base for the unified certification system.

(2) The frame work of the unified certification system

Taking into consideration the recent trends in international certification systems and the current situation around INN which is a national organization responsible for introduction of a unified certification system, the following framework is recommended.

1) Accreditation body for certification bodies should be set up. INN should be the accreditation body. Also it is necessary to set up an organization to accredit testing and inspection bodies and measuring organizations which will participate in the unified certification system.

2) A certifying organization which hopes to do certification jobs based on the unified certification system presents an application to the accreditation body described above.

3) Certification bodies not having their own equipment and facilities for testing and inspection must request jobs for testing and inspection to testing and inspection bodies accredited according to conditions introduced separately.

4) Equipment in the accredited testing and inspection bodies must be calibrated periodically according to the conditions decided for each equipment by the accredited measurement body.

5) Industries hoping to get a certification that their products conform to a particular standard must present an application to the certification body and receive an examination. The same principle is applied also to certification of a quality system.

6) Only auditors registered in the registering organization can make an examination of an application for certification. The registering organization specifies various conditions required to become the auditor and introduces a qualification system in which only persons satisfying the conditions can be registered.

(3) Consolidation of administrative organizations

1) Accreditation organization

(a) The government must assist the organizations. Especially strong assistance will be required until the unified certification system becomes a permanent fixture with the society.

(b) An administrative structure must be established.

2) Certification body

(a) The financial base must be stable.

(b) The control system must have been established.

(4) National standard (NCh standard) enacting organization

As products and quality systems certified in a national certification system show quality level of the products of the country, so that standards used in the certification system must be national ones.

National standards must be prepared for all items required for certification jobs at least in important fields. The contents must be appropriate for purposes of the certification system.

(5) Clarification of a certification scheme (guideline for implementation and requirements for implementation)

It is extremely important to prepare documents clearly and concretely describing the guideline for implementation or requirements for implementation, so that the unified certification system in Chile will be transparent to both inside and outside of the country. A transparent certification system is indispensable for the unified certification system in Chile to be accepted internationally.

A certification scheme defined clearly and concretely is effective in the following points.

- The probability for auditors to make an uneven determination is reduced.

- The probability for auditors to overlook an important item or items related to examination is reduced.

- The documents are useful for an industry or a plant hoping to making an application for certification to prepare for it.

(6) Registration body and educational organization for auditor

Whether a certification system is successful or not depends on quality of human resources. In other words, it is necessary to obtain staff who have expertise in the field of managerial engineering including quality control. Furthermore, repeated education and training are indispensable so that the staff can catch up with the changes in and trends of international standards for certification.

Because of the reasons as described above, it will be necessary to introduce a special qualification system (for instance, official or registered auditor system).

(7) Testing and inspection body

Relations between certification bodies and testing/inspection bodies can be defined as described below.

- Certifying bodies have their own equipment and facilities for testing and inspection, and carry out testing and inspection for themselves.

- Certification bodies do not have their own equipment and facilities for testing and inspection, and jobs for testing and inspection are consigned to external organizations for testing and inspection. In this case, the external organization for testing and inspection may be either those officially accredited or those the organizations select for themselves.

(8) Measurement body

Consolidation of a measurement system is indispensable not only for implementation of a unified certification system, but also for maintenance of international trade and improvement of quality in products and services.

It is necessary to select standards to be introduced, taking into industrial policies of the government in Chile and the current situation of industries in the country, so that the standards introduced will be accepted by international community smoothly.

4.4 Main Objectives for Diffusion of TQC and In-house Standards and Goals

4.4.1 Main Objectives

(1) To diffuse correct understandings on quality control and TQC among industries in Chile, taking into account international trends in the field of quality control and TQC.

(2) To diffuse among industries in Chile the recognition that quality control/TQC activities are for optimization of quality elements taking into account all factors relating to quality control.

(3) To diffuse among top executives of industries in Chile the recognition that they should take initiatives in quality control/ TQC activities.

(4) To establish the quality system as shown in 3.4.1, which is a base for quality control/TQC activities in Chile.

(5) To radically improve curriculum of education for quality control/ TQC, which is an important means for achieving the above objectives.

(6) To practically carry out updating of systems for education on quality control and TQC in Chile, it is necessary to set up a technical committee consisting of representatives from industrial, academic and educational circles in Chile.

4.4.2 Main Goals in Achieving Main Objectives

The goals as described below should be set up to achieve the aforesaid main objectives.

(1) Innovation of educational systems for quality control and TQC in Chile

To train up staff who can deal with the main objectives (1), (2), (3) and (4) in 4.4.1, educational systems for quality control and TQC in Chile should be innovated. Contents of the innovation should be as follows.

1) Setting up a technical committee and sub-committees to innovate systems for education and diffusion of quality control and TQC

2) Preparation of a program for updating of systems for education and diffusion of quality control and TQC in Chile by the technical committee

3) Recruiting lectures for the new educational curriculum according to the program

4) Education for recruited lecturers based on the new educational curriculum.

(2) Start of education based on the new educational curriculum

(3) Establishment of a quality system in industries in Chile by graduators from courses based on the new educational curriculum

The goals for achievements in this plan are as follows.

(1) Large-scale industries should introduce a quality system based on ISO 9002 and establish the quality system within 2 years.

It is desirable that, after introduction of a quality system, large-scale industries make efforts to diffuse their quality system among their raw material suppliers and contractors utilizing their quality system functions to control supplies and contractors.

(2) Small and medium scale industries which are difficult to introduce a quality system based on ISO 9002 system into them from the initial stage should aim at establishing a system for

nonconformity control (including a related system for in-house standardization and so forth).

4.5 Main Objectives for Consolidation of Framework for Measurement Standards and Calibration Systems and Goals to be achieved

4.5.1 Main Objectives

The classical Measurement Law enacted in 1848 proclaimed employment of the metric system in the country, and then use of the metric system was made a duty of the country's citizens in 1869, but this Measurement Law include several problems to be a basis for correct administration for metrological systems in the country. For this reason, enactment of a modern measurement law is an origin for establishment of a modern metrological sytem, and it is necessary to urgently introduce a modern measurement law.

Generally in modern countries, registration systems for manufacturers, repair shops and marketers of measuring instruments related to measurable quantities, and compulsory legal restrictions based on legal metrology including a verification system for measuring instruments have been introduced for fair business transaction and protection of consumers. Also, in many countries, measurement calibration systems traceable to national measurement standards have been established as official services for industrial metrology.

The main objectives for that purpose are as described below.

1) Enactment of a modern measurement law

2) Establishment or accreditation of organizations responsible for legal metrology

3) Establishment of national standards, and setting up a national metrology laboratory for maintenance and control of the national standards

4) Establishment of a traceability system for industrial metrology and setting up or accreditation of organizations responsible for metrological calibration

5) Arrangement of measurement standards and equipment for calibration

4.5.2 Goal to be Achieved

It can be considered appropriate to achieve the goals, using the following methods, to solve the above problems and main objectives generated in relation to the problems.

1) Enactment of a measurement law

It is desired to set up a committee for enactment of a measurement law and a technical special committee under control by MINECOM, provide a forum to hear opinions from people in the industrial world and consumers, and make a full investigation on this problem. In this case, high capability is required to office staff responsible for preparation of the original plan, so it is recommended that CORFO or INN should take charge of it.

2) Organization responsible for implementation of legal metrology

The most important objectives to be carried out first is establishment of an organization accrediting bodies for implementation of legal metrology, and it can be considered that INN and the national metrological laboratory to be established anew should take charge of this task. When convenience for manufacturers of measuring instruments and consumers is taken into consideration, it is desired that an organization responsible for implementation of legal metrology should be established in each economical unit area.

3) Establishment of a national metrological laboratory

It is necessary to establish a national metrological laboratory, which take charge of establishment, maintenance and control of national standards and development and diffusion of metrological technologies. In this case, the laboratory may be established as a organization belonging to an appropriate public body, employing technicians and engineers from testing facilities of each university, CESMEC and INTEC-CHILE as staff of the laboratory.

4) Establishment or accreditation of an organizations for calibration

It will be practical to accredit testing facilities belonging each university, CESMEC and INTEC-CHILE and other organizations as calibrating organizations for each measurement unit according to capability of each facility.

5) Consolidation of hardware such as metrological standards and equipment for calibration

It is desirable to set up a committee consisting of engineers having technical knowledge concerning metrology and discuss the problem under guidance by related institutions under control by MINECOM because the national budget is related to this problem.