As already shown by the actual inspection records, many instruments are related to mass measurement and the range of mass measuring instruments if fairly adequate.

The level of the available standards and inspection facilities varies from one laboratory to another and many are old or deteriorated. The maintenance of standards shows a particularly large discrepancy between laboratories, reflecting the conditions of the buildings, some of which are unsuitable to conduct accurate measurement. One example is that the present technical level of the laboratories, the environment of the standards room and the accuracy of the calibration equipment/instruments make it difficult to guarantee the original accuracy of 10^{-6} of Class E_2 and Class F_1 weights and high precision balances.

2) Type Approval Test Facilities

While test facilities for gas meters, water meters and watt-hour meters are available, none of the local inspection laboratories have the environmental test facilities required for the type approval test of measuring instruments and these facilities should be introduced in the near future. Other problems are the ambiguity of technical standards for measuring instruments, including the apparent absence of standards on durability and environmental performance, and the necessity to consolidate the inspection system through active research on the future introduction of electronic measuring instruments.

(6) Buildings and Environmental Conditions

The buildings of some of the local inspection laboratories are small and/or deteriorated to the point that the leakage of rain hampers inspection work. Such environmental arrangements as air-conditioning and the maintenance of standards is generally poor at most of the laboratories. It is necessary to check and rectify the problematic aspects of the buildings and to improve the environmental conditions, including temperature control, to ensure the proper maintenance of standards.

(7) Provision of Office Equipment

The provision of office equipment is rather poor at all the laboratories. A common register (large size) is used by all the laboratories to record the inspection results and to notify the date of the next re-inspection to measuring

instrument users. All types of work, including checks on inspection applicants and notification of approaching inspection dates, etc., are conducted manually and take up a large part of the working hours.

In addition to the introduction of such OA equipment as computers and facsimiles, user control software should be developed to rationalise the administrative work in order to increase the capacity of each laboratory to deal with the increasing demand for inspection.

(8) Training System

The staff members related to legal metrology are graded as inspectors, assistant inspectors and controllers. In order to qualify as an inspector, it is necessary to undergo a 3 tier training course with each tier consisting of one year's classroom study and one year's practical training and to pass an examination at the completion of each tier. This training system has succeeded in producing inspectors whose technical abilities little vary from one laboratory to another.

Controllers conduct on-the-spot inspection to detect those measuring instruments without the inspection or re-inspection mark and initiate the criminal prosecution process vis-a-vis offenders. These law enforcement activities are fairly strict and the amount of fines charged and collected is high.

3.4.2 Measuring Instruments Subject to Inspection

(1) Measuring Instrument Categories

Measuring instruments which are controlled by the Law on Legal Metrology in Indonesia are those used for commercial purposes regardless of their size. Consequently, those used for cooking or domestic purposes are not subject to inspection. Measuring instruments subject to inspection at present are roughly classified into the following categories.

- Length measuring instruments
- Mass measuring instruments
- Volume measuring instruments
- Flow measuring instruments
- Taxi meters

- Watt-hour meters, gas meters, water meters
- Petrol (pump) meters
- Pressure gauges
- Thermometers
- Aerometers, viscometers, liquefied gas meters, others

Of the above items, the inspection of gas meters is conducted by the Gas Board and not by local inspection laboratories and the total number of meters in use is still small. No inspection records are available for pressure gauges, thermometers, aerometers and viscometers, etc. although these are designated as being subject to inspection.

Measuring instruments currently subject to inspection in Indonesia mainly consist of instruments relating to weights and measures and those used for such utility services as power, gas and water. As measuring instruments for medical care and environment-related measurement are not as yet controlled by law, their inspection is not required. It is necessary, however, for the Government of Indonesia to expand the scope of inspection by establishing compatibility of Indonesia's metrology system with the systems of industrialised countries and also by revising the present metrology system.

(2) Implementation, Record and Validity of Inspection

As described earlier, the category of mass measuring instruments has the largest number of items subject to inspection among all categories and its initial inspection rate is almost 100%. Re-inspection is extensively conducted, underlining the DOM's positive commitment to promoting the wider application of the inspection system although problems do exist in terms of the number of inspectors and the level of inspection facilities.

The number of inspections is also fairly high in the case of such volume measuring instruments as various cans and tank lorries, taxi meters and water meters, suggesting active inspection in these categories.

Detailed inspection records by item and by type of inspection for the 3 year period from 1990 to 1992 are given in Table 3-4. The conditions of inspection implementation, inspection records and inspection result validity are described below for the main measuring instruments.

1) Length Measuring Instruments

The inspection of length measuring instruments, together with mass and volume measuring instruments, became compulsory in 1928, only a few years after the enactment of the Law on Legal Metrology in 1923. Following a transitional grace period of 10 years, official inspection commenced in 1938.

The subject items are mainly linear scales and tape measures. Scales and level gauges for wood processing are also inspected although the inspection volumes of these items are small.

Table 3-5 shows the inspection records for length measuring instruments for each local inspection laboratory for the 3 year period from 1990 to 1992 during which the inspection volume dropped from 52,000 pieces in 1990 to 44,000 pieces in 1991 and 1992. By geographical area, the inspection of length measuring instruments was mainly conducted in Jakarta and Bogor, implying a concentration of the relevant manufacturers in these two areas. The number of completed initial inspections and re-inspections is given below.

Year	Initial Inspection		Sub-Total	Re-Inspection	Total
	Domestic Products	Imported Products			
1990	32,424	111	32,535	19,469	52,004
1991	20,779	122	20,901	23,844	44,745
1992	23,216	118	23,334	20,224	43,558

The ratio of initial inspections and re-inspections was approximately 6:4 in 1990 and nearly fifty-fifty in 1991 and 1992. Most items were manufactured domestically.

All the local inspection laboratories are capable of inspecting linear scales. The inspection of tape measures is conducted by large-size laboratories in Jakarta and Medan and a medium-size laboratory in Palembang. The validity of inspection approval is one year.

2) Mass Measuring Instruments

Mass measuring instruments are largely classified into weights and balances. The inspection of mass measuring instruments became

compulsory into 1928 together with length measuring instruments and inspection commenced in 1938 after a transitional grace period of 10 years.

Most of the balances used for commercial purposes in Indonesia are manual balances, beam scales, and pendulum scales, and electronic scales which are used in Japan or the US are rare. Electronic scales for large supermarkets, truck scales for factories and automatic scales for conveyor belt lines are not yet widely used.

The survey on manufacturers of mechanical scales, truck scales and electronic scales in areas under the jurisdiction of the Surakarta and Medan Laboratories revealed a heavy dependence on the manual movement and installation of heavy items. The load cells used for truck scales and others requiring high efficiency are imported from Japan and other countries as the manual work to manufacture them cannot guarantee the required accuracy. At a state-run sugar factory located in an area under the jurisdiction of the Surakarta Laboratory, the scales in use are pendulum scales and automatic scales, i.e. conveyor scales, which are part of sugar refining lines in industrialised countries are not used.

Many types of weights are available, ranging from Class M3 and Class F1 weights which are relatively accurate and which are used for scales to measure precious metals and pharmaceutical products to Class M2 weights which are, used for ordinary scales.

Table 3-9 shows the total inspection records for mass measuring instruments of each local inspection laboratory in the 3 year period from 1990 to 1992 while Table 3-10 and Table 3-11 show similar records for weights and scales respectively in the same period.

The number of mass measuring instrument inspections showed an annual increase of several percent. The mass measuring instrument category was the largest category in terms of the number of inspections, accounting for roughly 70% of all inspections in 1992.

By geographical distribution, a large number of initial inspections was conducted by the Semerang, Pate, Surabaya and Yogyakarta Laboratories in Java, suggesting a concentration of manufacturers in this area.

The actual level of initial inspections and re-inspections of mass measuring instruments is given below.

Year	Item	Initial Inspection			Re-Inspection	Total
		Domestic Products	Imported Products	Sub-Total		
1990	Weights	937,705	2	937,707	2,909,490	3,847,197
	Scales	287,416	4,486	291,902	868,621	1,160,523
	Sub-Total	1,225,121	4,488	1,229,609	3,778,111	5,007,720
1991	Weights	860,437	4	860,441	3,028,794	3,889,235
	Scales	260,192	4,616	264,808	906,627	1,171,435
	Sub-Total	1,120,629	4,620	1,125,249	3,935,421	5,060,670
1992	Weights	954,197	0	954,197	3,063,216	4,017,413
	Scales	299,659	5,594	305,253	920,450	1,225,703
	Sub-Total	1,253,856	5,594	1,259,450	3,983,666	5,243,116

The actual number of scales inspected in 1992 was approximately 1.23 million, of which geometric scales accounted for 2.4%.

The number of weights inspected was approximately 4.02 million, of which the most common Class M2 weights accounted for 91.4%, followed by Class 3 weights for gold measurement at 5.7% and Class F2 weights for pharmaceutical measurement at 0.9%.

The ratio of initial inspections and re-inspections was 2 : 8, indicating a predominance of re-inspections. Most of the inspected products were domestically manufactured with imported products accounting for less than 1%.

There are several types of inspections, i.e. inspection at a local inspection laboratory of items taken to the laboratory, collective inspection which is conducted at a previously notified venue and the on-site inspection of truck scales which are fixed or high precision balances of which the accuracy will be damaged if moved.

In the case of collective inspection which plays an important part in re-inspection, the general capture rate of local inspection laboratories is 60-70% due to the overwhelmingly extensive geographical area which must be covered, the inclusion of many islands in the area of responsibility and the shortage of inspection vehicles, etc. This capture rate should be improved

by means of increasing the number of vehicles for collective inspection and the number of inspection teams (one team is usually composed of 2-3 inspectors/assistant inspectors, one administrative staff member and one driver, totalling 4-5 members).

The re-inspection rate can be greatly improved by preliminary work to check any movement of the owners of the subject measuring instruments using the inspection applicant register. It is, therefore, important to increase and improve not only the inspection facilities but also the number of inspection staff in general and controllers in particular.

The inspection fee is set at 2,900 Rp for a beam scale (50 kg), 875 Rp for a set of 5 weights and a 10 kg mechanical scale and 6,000 Rp for a scale for gold measurement.

If a scale is found to be unsatisfactory during the re-inspection process, the inspector instructs that on-the-spot readjustment be conducted and the re-inspection is repeated. In the case of the inspection of scales, the repairer attends the inspection so that those scales failing the re-inspection but which can be immediately re-adjusted are re-adjusted on the spot and then re-inspected to pass the inspection. Although this kind of practice is, in principle, prohibited in Japan, the Indonesian inspectors have the legal authority to order the re-adjustment of measuring instruments at the time of inspection. This arrangement is justified on the grounds that it is difficult to repair or replace failed instruments immediately afterwards because of both the cost and the physical difficulty given the geographical nature of Indonesia where a great many islands are scattered over a huge area. It is more practical and necessary to instruct that adjustment be conducted at the time of inspection to ensure the use of accurate instruments.

Each local inspection laboratory has 2-3 repair service providers who are present at inspections in the laboratory or at venues for collective inspection. The repair charge is 20,000 Rp for a beam scale (50 kg), 5,000 Rp for a 10 kg mechanical scale and 22,000 Rp for a scale for gold measurement. These repairers are registered with a laboratory and have been awarded a certificate by the laboratory at which they were trained.

The validity of inspection approval is one year for both scales and weights.

3) Volume Measuring Instruments

The inspection of volume measuring instruments commenced in 1938. The main small instruments relating to the measurement of volume include dry cans to measure rice and oil containers and wet cans while medium size and large instruments include automobiles, such as tank lorries, vehicle transporting containers used for rail or maritime transportation and oil storage tanks. Table 3-12 gives the number of volume-related inspections of each local inspection laboratory for the period from 1990 to 1992 while Table 3-13 and Table 3-14 gives the number of inspections of cans and tanks for the same period.

The total number of volume-related inspections in 1992 was approximately 1.21 million, accounting for some 16% of the total number of inspections conducted. This figure is second after the number of inspections of mass measuring instruments.

The inspection of small cans (approximately 1.1 million or 91%) was predominant, followed by some 13,000 inspections (1%) of tank lorries and 500 inspections of fixed storage tanks. By area, most initial inspections were conducted by the 3 laboratories in Jakarta, Tasikmalaya and Surakarta, all of which are located on Java Island, and re-inspections were conducted by all the laboratories in a more even manner.

The number of initial inspections and re-inspections from 1990 to 1992 is given below.

Year	Initial Inspection			Re-Inspection	Total
	Domestic Products	Imported Products	Sub-Total		
1990	947,199	2	947,201	270,569	1,217,770
1991	815,589	7	815,596	266,052	1,081,648
1992	972,211	26	972,237	235,430	1,207,667

In each year, initial inspections accounted for approximately 80% of all inspections and almost all the inspected products were manufactured domestically.

The inspection of small capacity cans and tank lorries was conducted in the laboratories while on-site inspection was conducted in the case of large capacity oil storage tanks, etc.

At the Palembang Laboratory which was visited during the second field survey, a DOM inspector visits the laboratory every month to inspect the oil storage tanks together with the Laboratory's own inspectors. The inspection data are taken back to the DOM for computing to obtain the final results. As this procedure is inefficient, the establishment of a computing system at the Palembang Laboratory is necessary as soon as possible. The validity of inspection approval is one year for all inspections.

In the case of the inspection of tank lorries, a standard tank of 500/1,000 litres in capacity is installed some 1.2m below the ground level in a special garage. The actual inspection is conducted by transferring water, which is pumped into the tank lorry to the reference level, to a standard tank for volmetric measurement. The largest standard tank is installed at the Jakarta Laboratory and is capable of inspecting a maximum tank capacity of 32 tons.

At most of the laboratories, the water used for measuring purposes is supplied from and drained to a water storage tank. However, the oil contained in this measuring water is not treated, leaving the question of environmental contamination by the finally discharged waste water wide open. In fact, at Ambon which was visited by the field survey team, untreated waste water containing oil from inspected was found in the well water in the vicinity, resulting in many complaints by local residents. It is desirable to install a measuring water circulation system and a waste water treatment system to remove as much oil as possible from the measuring water prior to its discharge after using the water several times. The installation of a waste water treatment system is particularly desirable in view of the fact that well water is often used for both drinking and domestic water in Indonesia.

Other standard volume measuring instruments include various standard glass flasks and graduated measuring cylinders.

4) Flow Meters

The main flow meters are those used to measure the volume of oil flow from a tanker to an oil refinery plant and to measure the volume of oil flow from a storage tank to a tank lorry. The inspection records of each laboratory for the period from 1990 to 1992 are given in Table 3-15. The number of initial inspections and re-inspections during the same period is given below.

Year	Initial Inspection			Re-Inspection	Total
	Domestic Products	Imported Products	Sub-Total		
1990	0	81	81	1,621	1,702
1991	0	60	60	1,472	1,532
1992	0	160	160	1,753	1,921

The annual number of inspections of approximately 1,500-2,000 was much lower than that of many other inspection items. In 1990 and 1991, all the inspected flow meters were imported products and 8 domestic products were inspected in 1992. The ratio of initial inspections of less than 10% means that flow meters are not frequently renewed. By geographical distribution, almost all of the laboratories inspected flow meters during this period. The validity of inspection approval is one year.

5) Water Meters

The inspection records of domestic water meters of each laboratory for the 3 year period from 1990 to 1992 are given in Table 3-16. The total number of inspections stood at approximately 221,000 in 1990, 266,000 in 1991 and 253,000 in 1992. With the growing water supply service, the number of water meters in use is also steadily increasing.

By geographical distribution, the Jakarta and Surabaya Laboratories conducted some 70% of the entire water meter inspections, reflecting the availability of the water service in large cities. The number of laboratories with a negligible number of water meter inspections gradually declined from 25 in 1990 to 20 in 1991 and further to 18 in 1992, indicating the steady development of the water service throughout Indonesia.

The number of initial inspections and re-inspections in the 3 year period is given below.

Year	Initial Inspection			Re-Inspection	Total
	Domestic Products	Imported Products	Sub-Total		
1990	155,143	61,907	217,050	3,712	220,762
1991	197,778	65,505	263,283	2,979	266,262
1992	193,584	55,651	249,235	3,447	252,682

The annual number of re-inspections of approximately 3,000 in these 3 years was extremely small compared to the number of initial inspections. Although this extremely low re-inspection level compared to that of initial inspections can be partly explained by the relatively long validity of inspection approval (5 years), it can only be reasonably explained by assuming that the shortage of inspection facilities results in a very low re-inspection enforcement rate. Domestically manufactured water meters accounted for some 80% of the total.

The actual inspections are conducted by laboratory inspectors and inspectors of the PDAM (Regional Water Supply Company run by the municipal government) using the latter's inspection facilities and no relevant facilities at the laboratories are used.

Using the Surakarta Laboratory as an example, it has a maximum water supply volume of 120-130ℓ /person/day compared to the required volume of 190ℓ /person/day, underlining the inadequate supply capacity. Some 30% of the water originally supplied is lost through leakage. Improvement of the infrastructure conditions is essential to ensure a stable water supply in the coming years.

The inspection fee is 250 Rp per meter.

6) Gasoline meters

The inspection records of gasoline meters of each laboratory for the 3 year period from 1990 to 1992 are given in Table 3-17. During this period, the annual number of inspections steadily increased by 11% in 1991 on 1990 and 20% in 1992 on 1991. Although the geographical distribution of inspections was not uniform, all 47 local inspection laboratories conducted gasoline meter inspections. Out of the some 11,000 meters inspected in 1992, some 2,000 (15%) were inspected at the Jakarta Laboratory. All

those laboratories which conducted more than 500 inspections were located on Java Island at Bandung, Bogor, Surakarta, Surabaya and Jakarta.

The number of initial inspections and re-inspections in the 3 year period is given below.

Year	Initial Inspection			Re-Inspection	Total
	Domestic Products	Imported Products	Sub-Total		
1990	0	841	841	7,444	8,285
1991	0	794	794	8,412	9,206
1992	0	885	885	10,231	11,116

All the gasoline meters were imported. The ratio of initial inspections of approximately just more than 10% of the total number of inspections remained at the same level throughout the period, indicating that an increase of the absolute number of meters is a key factor for an increase of the number of re-inspections. Given the one year validity of inspection approval, the re-inspection enforcement ratio appeared to be almost 100%.

Inspections are conducted using a standard 20 litre tank and the petrol volume indicated as 20 litres on the meter is checked by this standard tank.

7) Taxi Meters

The inspection records of taxi meters of each laboratory for the 3 year period from 1990 to 1992 are given in Table 3-18. A total of 19 laboratories (approximately 40%) of the 47 laboratories conducted taxi meter inspections during this period.

The geographical distribution of laboratories conducting taxi meter inspections was confined to 6 laboratories on Java Island, including those at Jakarta, Bandung and Surabaya, in 1990 but expanded to those laboratories in 3 regions, including Sumatera and Bali, in 1991 and further to those in Kalimantan in 1992, indicating a gradual spread of the taxi meter inspection capability throughout the nationwide laboratory network.

In the area supervised by the Ambon Laboratory which was visited by the First Field Survey Team, there are no metered taxis and the taxi fee is decided through negotiations. In 1992, 30 laboratories did not conduct any

taxi meter inspections. The Palembang Laboratory lacked the necessary inspection facilities and sent the subject meters to the Jakarta Laboratory for inspection that year.

The number of initial and re-inspections of taxi meters in the 3 year period from 1990 to 1992 is given below.

Year	Initial Inspection			Re-Inspection	Total
	Domestic Products	Imported Products	Sub-Total		
1990	0	6,648	6,648	15,068	21,716
1991	5	3,808	3,813	19,955	23,768
1992	21	2,935	2,956	16,825	19,781

Almost all of the taxi meters were imported. Given the one year validity of inspection approval, the number of taxi meters for re-inspection in a given year should be approximately equal to the total number of meters which were inspected in the previous year. In reality, however, the number of re-inspected taxi meters in 1991 represented only 92% of what it should have been. In 1992, the ratio dropped to approximately 71%, indicating a quite low re-inspection enforcement rate.

The inspection of taxi meters is conducted using either the stationary engine running method or the actual travelling test method. All of the laboratories visited in Bandung, Medan and Jakarta use the stationary engine running method.

The stationary engine running method involves the use of the front wheel driving force to rotate the roller to a distance of 3km and the meter fare must be between 1,600 Rp and 1,700 Rp. This method is rather antiquitated in Japan due to the large margin and possible error due to the different tilting position of the taxi and slipping between the roller and tyres. During the latest field survey, skidding due to improper contact between the roller and tyres and derailing of the wheels from the roller were observed, presenting problems in terms of achieving reliable inspection results.

It has been pointed out that the stationary running engine method is disadvantageous because of its adverse environmental and health implications in terms of NOx emission, bad odour and noise.

The most common taxi meter inspection method in industrialised countries uses the fixed two wheel, single axle type inspection wheel. The driving wheels rest on the inspection wheel, the revolution of which runs the former for meter measurement. Compared to the stationary engine running method, the inspection wheel method not only provides better accuracy but there is also no emission from the tested taxi itself and little noise apart from that generated by the roller revolution. The level position of the wheels on the ground means no tilting of the tested taxi, resulting in a more accurate reading. Adoption of this method by Indonesia is highly recommended to ensure inspection accuracy, to improve environmental conservation and to cope with the expected increase of the test demand in the future.

The building accommodating the testing facilities at the 3 places visited is rather old with only one entrance/exit, resulting in unnecessary delays in inspection as some time is required for a taxi completing the test to be replaced by the next taxi. Substantial rebuilding appears necessary if the new method is to be introduced as well as new arrangements for higher efficiency. Given the prospect of an increased inspection demand for taxi meters in urban areas, it is essential to secure a reasonably large site where the inspection building can have a separate entrance and exit. The new inspection facilities should be mainly located in urban areas where the number of taxis is expected to increase and need not be located at the present inspection sites.

Using the high likelihood of an increased demand based on past records and the minimum 500 inspections in 1992 as criteria, the following 7 cities have been selected as sites for facilities for the refurbishing and inspection of taxi meters.

① Medan

② Jakarta

③ Bandung

④ Serang

⑤ Bogor

⑥ Yogyakarta

⑦ Surabaya

Out of these candidate sites, it may be preferable for some 3 sites to be located in Jakarta to ensure inspection site convenience.

8) Watt-Hour Meters

The first initiative to make watt-hour meter inspection compulsory took place in 1949 but did not actually materialise for a long time. A project team was established with the cooperation of the PLN in 1982 to study and examine the feasibility of introducing a compulsory inspection system. A joint ministerial ordinance by the Department of Commerce and the Department of Mining and Energy was promulgated in 1988 and actual inspections commenced in fiscal 1991 by local inspection laboratories.

In 1993, 45 out of the 47 laboratories conducted watt-hour meter inspections using the facilities of the PLN branches. The inspection work of each laboratory was conducted by a PLN engineer and at least 2 laboratory inspectors.

The inspection records of each laboratory for the 3 year period from 1990 to 1992 are given in Table 3-19. Inspections were conducted at only 5 laboratories in 1991, increasing to 18 in 1992. The number of meters inspection sharply increased from some 13,000 in 1990 to 137,000 in 1991 and further to 611,000 in 1992. Since 1992, it appears that some 10% of the inspection watt-hour meters have been imported meters.

According to information provided by the SIGMABINA and others, 5 domestic manufacturers produce some 300,000 single phase, 2 wire watt-hour meters a year each, totalling 1.5 million meters a year. Consequently, the number of initial inspections of single phase watt-hour meters in Indonesia is 1.5 million. Assuming that imported meters are roughly equivalent to 10% of the number of domestically manufactured meters, the total number of new meters for inspection is estimated to be more than 1.7 million.

Those new meters which are not included in the inspection records of the laboratories and which are estimated to total more than 1.1 million are inspected in house at more than half of the PLN branches (30 on Java Island and 50 in other regions).

Table 3-20 shows the results of a questionnaire survey (consisting of some 20 questions) conducted at METBELOSA and LMK-PLN. The number of watt-hour meters requiring inspection manufactured by METBELOSA was approximately 220,000 in 1991 and 840,000 in 1992, showing a large fluctuation from one year to another. Given the facts that the PLN inspects an average of some 5 million meters, new and old, each year and that some PLN branches inspect meters which have been repaired at the end of their life expectancy, more than half of the inspections are re-inspections.

The procurement demand for watt-hour meters tends to fluctuate and the resulting fluctuation of the production volume is a headache for manufacturers. Hence, a request by manufacturers for the PLN to introduce a steady watt-hour meter procurement programme. The fluctuations of the production volume and sales volume, particularly in recent years, are vividly shown in Fig. 3-4 which traces the production and sales volumes of METBELOSA in the past 12 years. It is easy to see how difficult it is for Indonesian manufacturers of watt-hour meters to prepare a reliable production programme under these circumstances.

Table 3-21 shows what MELCOINDA, a local manufacturer of watt-hour meters, wants to see in regard to the business environment and meter inspection arrangements. Strong emphasis is given to levelling of the PLN order for watt-hour meters and appropriate pricing of watt-hour meters.

The electrification rate in some areas in which the visited laboratories are located is as high as 80 - 95%. In areas catered for by small laboratories and in Jakarta, however, the electrification rate is around 60%. Indonesia's electrification rate in 1993 was estimated to be 40% and is expected to improve to more than 70% in 10 years. The demand for watt-hour meters should, therefore, sharply increase in the immediate future.

Table 3-22 shows the rate of watt-hour meter installation by user type (the electrification rate in Table 2-22 is approximately 32%). By geographical distribution, 8.24 million meters (just above 66%) are installed on Java

Island while 4.16 million meters (just below 34%) are installed in other regions with a lower electrification rate, totalling 12.4 million meters. Assuming that the electrification rate in the year 2000 is more than 70%, the number of installed watt-hour meters will exceed 25 million.

The inspection of watt-hour meters is conducted in the following manner.

① Self-heating (10% of rated voltage and base current; power factor 1; 30 minutes)

② Creeping test (application of 110% of rated voltage)

③ Minimum running current test (with rated voltage and a power factor 1; application of 0.5% of base current; applicable to precision watt-hour meters)

④ Error test (with rated voltage and rated frequency)

i) 100% of rated current; power factor 1 and 0.5

ii) 50% of rated current; power factor 1 and 0.5

iii) 5% of rated current; power factor 1

* ii) above will not be applied in the case of single phase watt-hour meters.

⑤ Meter adjustment is conducted for the error test to improve the pass rate.

⑥ Watt-hour meter is conducted for a combination of a meter and current limiter.

Inspection is based on the SPLN standards which mainly conform to the IEC international standards There are 2 seals in use, i.e. that of the PLN and that of the DOM. There is no other system in the world which requires 2 seals for one product and this practice is a wasteful use of sealing equipment and unnecessary extra work.

The number of inspection test devices owned by the PLN is 89 single phase test devices (39 on Java Island and 50 in other regions) and 76 three phase test devices (47 on Java Island and 29 in other regions) as shown in Table 3-23. Some 61 single phase test devices and 33 three phase test devices are capable of simultaneously testing at least 15 meters as shown in Table 3-24. Thirty-five medium and large size laboratories of the DOM also have watt-hour meter testing devices, most of which are said to be currently used for

the training of laboratory inspectors. In short, the inspection of single phase meters which account for more than 80% of the 5 million meters inspected annually is predominantly conducted by the PLN's devices which are capable of simultaneously testing 15 or more meters. While the transfer of these testing devices to the DOM appears difficult, the inspection of 5 million meters a year can be conducting by assuming the use of 100 testing devices, each capable of testing 40 meters each time, 5 testing sessions per day and 250 workings days per year.

The branches of the PLN which were visited were found to be conducting the inspection of watt-hour meters with almost no air-conditioning. The inspection of those meters which are adjusted in the air-conditioned laboratory of the manufacturer under a different temperature is questionable in terms of the pass rate. A similar situation was found at the inspection laboratories, except at the Jakarta Laboratory where the Watt-Hour Meter Test Room is air-conditioned.

The validity of inspection approval for watt-hour meters is 20 years. While the validity is 10 years in many countries, Germany and South Korea have a longer validity than usual of 12 years and 15 years respectively. The validity of inspection approval in Japan is 10 years. It is desirable to shorten the current validity in Indonesia through discussions between the DOM and PLN when the metrology-related laws and regulations are reviewed some time in the future. (As described later, validity of 10 years in the case of SLI standards.)

The inspection fee is 300 Rp for single phase, two wire watt-hour meters and 1,500 Rp for three phase, four wire meters and is borne by the PLN. As in the case of other legal measuring instruments, 80% of the inspection fee goes to the Department of Finance while 20% is kept by the DOM. Part of this 20% is given back to the laboratories to supplement the facility improvement expenditure. The low inspection fee has been discussed for some time and a proposal to raise it is said to have already been submitted to the competent agency.

3.4.3 National Measurement Standards and Inspection Standards

(1) Standard Quantities

1) Length Measuring Instruments

The KIM-LIPI is responsible for the establishment of national length standards and has established the length standard with an interferometer using a He-Ne stabilised laser based on the definition of a "meter" to establish national traceability. The primary standard linear scale (1m in length) owned by the DOM in the line standard-based legal metrology field is calibrated by the length standard using an interferometer.

2) Mass Measuring Instruments

The DOM owns a one kg prototype and compares it with another prototype owned by the International Bureau of Weights and Measures every 10-15 years. In Indonesia, the primary national standard calibrated by the prototype is used to calibrate secondary one kg standards every 5 years which in turn are used to calibrate tertiary one kg standards owned by the laboratories every 5 years.

3) Volume Measuring Instruments

Volume standards are derived units. In the legal metrology field, the DOM uses standard weights to calibrate liquid volume standards and the standard bell prover for the air volume standard. In the case of large tanks, the volume standard is derived from length.

The standards for the following meters are maintained as derived units from volume, mass and time quantities.

4) Flow Meters

Volume or mass and time

5) Water Meters

Standard volmetric tube or mass

6) Gasoline meters

Volume or mass

7) Taxi Meters

Length and time

(2) Control of Standards

1) Length

With regard to the control conditions for standards at the local inspection laboratories, it must be pointed out that no air-conditioning is provided. The only visible control is that the 1m standard linear scale is kept in a specially designed wooden box, illustrating the generally poor control conditions.

With regard to the inspection of tape measures, the DOM has a 20m standard tape measure and the large laboratories have either a 10m or 20m standard tape measure.

2) Mass

The control conditions for standards depend on the laboratory size. Medium size and large laboratories have an independent storage room with some degree of air-conditioning to control the room temperature and humidity. Some small laboratories have an independent storage room while others use part of the high accuracy balance calibration room. In either case, there is no air-conditioning and the only noticeable control is to keep the standards in a specially designed wooden box.

While the size of the inspection space varies from one laboratory to another depending on the laboratory size, the balances to calibrate weights and the weights in use are more or less similar at all the laboratories. As all the inspection tools, including balances and weights, are deteriorated, their systematic renewal is necessary.

3) Volume

The 500 litre and 1,000 litre standard tanks used for inspection are calibration using the 20 litre volmetric standard which is calibrated by the DOM to maintain its accuracy.

4) Water Meters

The inspection facilities at the laboratories aim at supply water meters which can be used as standards. The 200 litre standard tank with a glass gauge is calibrated by the 20 litre volmetric standard every 3 years to maintain its accuracy. The present facility size appears to be adequate to supply standard water meters.

5) Gasoline meters

The work standard tank used for inspection is calibrated by the 20 litre standard tank which is in turn calibrated by the 20kg standard weight. As this traceability largely depends on the accuracy of the 20kg standard weight, the accuracy of the 20kg standard weight calibrated by the one kg secondary standard weight of the DOM plays a crucial role.

6) Watt-Hour Meters

The standards for basic electric quantities are maintained by the KIM-LIPI and are supplied to some 20 networked organizations, including the LMK-PLN. Each networked organization assembles the units for practical electric quantities and supplies them to related organizations and offices, etc. The electric standards traceability system at the LMK-PLN is shown in Fig. 3-5. The standard watt-hour meter (RCS: Rotating Sub-Standard Wha) used for the error test of ordinary watt-hour meters is calibrated by the secondary standard watt-hour meter (standard wha) which in turn is calibrated by an AC/DC comparator traceable to the national standard. The establishment of the watt-hour standard at the LMK-PLN is highly evaluated by the KIM-LIPI together with the high control level (repeatability: $\pm$ 0.03 μV) of the voltage standard.

(3) Traceability

The traceability of each type of quantity is given below.

1) Length Measuring Instruments

The traceability system for length measuring instruments is shown in Fig. 3-6 with legal metrology applicable to the standard linear scale and tape measure.

2) Mass Measuring Instruments

The traceability system for mass measuring instruments is shown in Fig. 3-7.

3) Volume Measuring Instruments

The traceability system for volume measuring instruments is shown in Fig. 3-8.

4) Flow Meters

The traceability system for flow meters is shown in Fig. 3-9.

5) Water Meters

The traceability system for water meters is the same as that for volume measuring instruments.

6) Gasoline meters

The traceability system for gasoline meters is shown in Fig. 3-10.

7) Taxi Meters

The taxi meter standard is a derived unit of length and time. The traceability system for time is shown in Fig. 3-11.

8) Watt-Hour Meters

The watt-hour standard is derived at the LMK-PLN from electric base quantities supplied by the KIM-LIPI. The supply system for the watt-hour standard to 5 watt-hour meter manufacturers and some 80 PLN branches where inspection is conducted is shown in Fig. 3-12.

(4) Calibration of Inspection Standards

1) Length Measuring Instruments

The DOM uses the primary standard linear scale and comparator to calibrate the 1m standard linear scales (some with a comparator) owned by the local inspection laboratories to an accuracy of 10^{-5}. In such areas as Medan, Jakarta and Surabaya with industrial cities, the local inspection laboratories have received many requests to extend the scope of inspection to include block gauges and others in addition to the current list of

inspection items under the legal metrology system but cannot meet these requests due to the absence of the relevant standards and testing devices. Although it is desirable to expand the calibration service network headed by the KIM-LIPI to supply industrial standards, it may be impractical to expect this type of service to cover such a vast country as Indonesia.

An alternative is to provide standard block gauges and comparison test devices at those large laboratories in areas where the calibration demand for block gauges is strong. As this alternative would permit the efficient use of the existing facilities and engineers, it is quite rational from an economic point of view. In short, it should prove very effective to make large laboratories play a part in industrial metrology. Given the required accuracy in the order of 10^{-8} for the calibration of block gauges, temperature control is essential, making the introduction of a length standard room necessary. A similar argument can be made for other quantities and, therefore, it is necessary to examine the possibility of giving large laboratories an industrial calibration capability.

2) Mass Measuring Equipment

The DOM has established the primary standard, which is the highest standard in the national legal metrology system, based on the one kg prototype and uses this primary standard to calibrate secondary standards every 5 years. These secondary standards are, in fact, distributed to the local inspection laboratories as master standards. The laboratories use these master standards to calibrate their own inspection standards every year in order to complete the traceability system for mass in the national legal metrology system. Each laboratory is responsible for calibrating its standard weights by dividing or multiplying the one kg master standard. However, as comparison of the weights calibrated by different laboratories is not conducted, it is quite possible that a reliable level of accuracy is not achieved due to differences between laboratories in terms of the technical level, control conditions of standards and control of the calibration environment.

Small laboratories in particular seem to find it difficult to maintain standards in an appropriate manner because of their technical weakness in relation to division and multiplication and because of their relatively poor

control of standards and the calibration environment compared to larger laboratories.

While one measure to improve the situation is for the DOM to confirm the accuracy of all calibration work on divided or multiplied standards conducted by the laboratories, this option is currently impossible because of the present manpower and facilities of the DOM.

It is possible for the DOM to work together with a certain number of large laboratories to measure the accuracy of divided and multiplied standard weights. These large laboratories will then supply divided and multiplied standard weights to the medium size and small laboratories nearby. It will, however, be necessary to expand the facilities and to upgrade the technical capabilities of the designed large laboratories in order to implement this measure.

Deterioration of the chemical balances used to inspect weights is noticeable at all the laboratories regardless of laboratory size. While the early renewal of these balances is required, this would be extremely costly. Therefore, it is essential to plan to complete this renewal in a systematic manner.

It may be necessary to consider the partial use of direct-reading balances instead of the current chemical balances for balances upto a capacity of 10 kg in a move designed to give priority to efficiency although direct-reading balances are inferior to chemical balances in terms of accuracy. At the same time, it may also be necessary to introduce different ranks for the laboratories in view of the systematic and steady implementation of calibration and inspection environment, including air-conditioning.

3) Volume Measuring Instruments

Each laboratory calibrates 5 litre, 10 litre and 20 litre standard tanks with a gauge glass vernier for liquid measurement using the weight method involving standard weights. Using these reference standard tanks, 500 litre and 1,000 litre standard tanks for the inspection of tank lorries and 200 litre standard tanks for the inspection of water meters are calibrated. The 5 litre, 10 litre and 20 litre standard tanks with a gauge glass vernier are calibrated using the weight method (the standard tank is filled with water and its

weight is compared with the standard weight) every 3 years at each laboratory.

4) Water Meters

The standard water meters used for the inspection of ordinary water meters are calibrated by a master meter. This calibration work is jointly conducted at the PDAM laboratories by a laboratory inspector and a PDAM inspector. The large and medium size laboratories have facilities to calibrate standard water meters.

5) Taxi Meters

The standards used for the inspection of taxi meters are calibrated in terms of distance and time in the case of the actual travelling test method and the drum circumference and number of revolutions in the case of the stationary engine running method. In other words, these standards are calibrated by the length standards, time and electric pulse signals.

6) Watt-Hour Meters

The calibration of the standards used for inspection purposes must achieve some kind of traceability to the national standards. The LMK-PLN meets this requirement to a large extent as described so far in this section. Regrading the standard watt-hour meters owned by the PLN's divisional offices as primary standards, those owned by owned by the PLN's section branches as secondary standards and those owned by manufacturers as tertiary standards, these standards are currently calibrated in the following manner. Tertiary standards and primary standards are calibrated every 9 months and 18 months respectively by the mobile LMK-PLN Calibration Group or at the LMK-PLN. These calibration intervals are rather long compared to the 6 months and 12 months in Japan. Secondary standards are calibrated by the standards owned by the divisional offices every 12 months.

3.4.4 Type Approval Test

The type approval test records are shown in Table 3-26. A relatively large number of tests are conducted in the case of such volume measuring instruments as dry/wet cans and tank lorries and also in the case of mass measuring instruments.

The type approval test facilities for gasoline meters at the DOM are of a fairly high standard but were only used once in 1990, indicating problems of the test implementation system.

The 4 tests for water meters and 5 tests for taxi meters do not appear to reflect the reality as the number of corresponding inspections is quite high.

The type approval test of watt-hour meters is conducted by the LMK-PLN and approved by the DOM. As this kind of arrangement is also observed in France and the UK, etc., the present arrangement will continue in the future. As Table 3-27 shows, type approval tests of watt-hour meters consist of 29 test items and the manufacturer is required to submit 7 watt-hour meters to the PLN for type approval purposes. The test data are compared with the SPLN standards and others. When the requirements of such standards are generally met, official type approval is given. The number of type approval tests for watt-hour meters and others conducted by the LMK-PLN in the past 5 years is shown in Fig. 3-10. The simple annual average is 9 tests and approximately 5 tests in the case of single phase watt-hour meters and three phase watt-hour meters respectively.

The DOM has expressed a desire to conduct its own type approval tests. A cautious approach is required in planning such a move in view of the small number of type approval tests currently undertaken, the type approval test system in foreign countries which does not necessarily encourage such a move and the cost of the test facilities as well as manpower development.

Areas for improvement of the current type approval test system include the partially ambiguous test methods and the absence of well-defined manuals, etc. These shortcomings should be rectified together with further consolidation of the test equipment to improve the overall type approval test system in Indonesia to meet the real demand for tests.

3.4.5 Examination of Improved Watt-Hour Meter Verification System

The issues to be examined here in relation to the future improvement of the watt-hour meter verification system include the introduction of new verification laboratories, type approval test laboratories and watt-hour standard supply centres and the further education/training of verification staff.

(1) Introduction of New Watt-Hour Meter Verification and Type Approval Test Laboratories

There is more than one option for the introduction of new watt-hour meter verification and type approval test laboratories. The employment of the best verification system for Indonesia, taking international trends into consideration, is desirable.

1) Types of Verification Systems

When considering the introduction of new verification and type approval test laboratories for legal measuring instruments, the 3 main options are as described below.

① Establishment of the Central Verification Laboratory (tentative name) to verify not only watt-hour meters but also gas and water meters for which the verification demand is expected to increase in the future.

② Designation of power, gas and water supply corporations as certified type approval test and verification organization s for the relevant meters.

③ Verification of watt-hour meters by the test laboratories of the Department of Trade and type approval testing by the DOM.

In regard to Option ①, the laboratory will be jointly capitalised by the PLN, watt-hour meter manufacturers, gas suppliers, gas meter manufacturers, the Water Board and water meter manufacturers based on the benefit principle.

In regard to Option ②, the DOM will inspect the relevant facilities of the corporations (test system, management conditions of standards and air-conditioning system, etc.) and the qualifications of the verification staff. The DOM will designate these corporations as verification and/or type approval test organizations if the latter satisfy the Designation Criteria Manual (tentative name) of the DOM, prepared in conformity with ISO/IEC standards. In the case of watt-hour meters for example, this approach simply envisages minor upgrading of the system in force prior to 1991 and is the least costly as it is only necessary for the subject organizations to bear some extra expense to consolidate the existing range of equipment.

Option ③ is currently being considered by the DOM. While the local verification laboratories will be responsible for the verification of watt-hour meters, the DOM will conduct type approval testing. In this case, it is desirable for the DOM to supply standards.

Option ① with the establishment of the Central Verification Laboratory as an independent verification organization is the most desirable option. As it will be necessary to establish one or more branch laboratories in each province, however, huge investment will be required. Moreover, the divided work responsibility between the new branch laboratories and existing verification laboratories means a fundamental review of the metrology administration, implying great problems in the adoption to this option. The rational choice appears to be a combination of Option ②, intending the utilisation of the vitality of the private sector through the introduction of designated verification and type approval test organizations, and Option ③, which intends consolidation of the functions of existing local verification organizations and modernisation of their facilities. This option should prove feasible.

2) Issues to be Examined for Option 3

If Option 3, under which the DOM and the local verification laboratories of the Department of Trade are responsible for the type approval testing and verification of watt-hour meters respectively, is selected for Indonesia, several issues require examination.

If the Department of Trade is to conduct verification testing, the present system, under which an inspector travels to a PLN branch located next to the local office of the Department, is undesirable in view of the testing principles and cost efficiency. The verification test system should instead by installed at each local office of the Department. In the case of the verification of watt-hour meters to be used in Jakarta, the field survey for the Study confirmed the feasibility of the necessary verification being conducted by staff of the local offices of the Department at the manufacturers' premises. The employment of this method should be encouraged as it will mark the first step towards realising a future system under which the verification test facilities and qualifications of the in-house inspectors of manufacturers are periodically examined and their in-house verification results are improved in lieu of official verification results as

requested by manufacturers (Table 3-21). In view of this likely development in the future, the DOM should examine possible criteria to certify manufacturers (introduction of the Designated Manufacturer system).

The METBELOSA is currently planning future verification laboratories at the 15 sites shown in Fig. 3-13. As induction type watt-hour meters are more liable to the adverse effects of vibration and impact in accordance with the transportation distance, the number of laboratories should at least be doubled to shorten the average travelling distance to the nearest laboratory. The limited testing facility size and likely increase of the verification demand for watt-hour meters further support the case for an increased number of laboratories. In the present Report, those sites indicated in Fig. 3-14 are suggested. The PLN is said to be currently conduct the verification and acceptance testing of watt-hour meters through the provision of the relevant testing facilities at 80 branches. Even if the verification work is solely conducted by the Department of Trade, it will still be necessary for the PLN to conduct its own acceptance testing. In addition, should the PLN be responsible for the verification of transformers for electrical meters, it will be desirable for the PLN and LMK-PLN to also be entrusted to conduct the verification and type approval testing respectively of electrical meters equipped with a transformer. Under these circumstances, it will be extremely difficult for the verification facilities of the PLN and the type approval test facilities of the LMK-PLN to be transferred to the Department of Trade and DOM respectively.

A list of improvement items is given below in the case of the DOM being made responsible for the verification of watt-hour meters.

a) Verification should be conducted by some 30 laboratories (Fig. 3-14) by selecting leading local offices of the Department of Trade, including those in special districts, and such large laboratories as Soro. In Jakarta, it is desirable for the Department of Trade to dispatch its inspectors to the manufacturers' premises for the time being while the DOM examines the required conditions and method to introduce the Designated Verification Organization system in the future.

b) Verification is the act of deciding whether or not a subject meter/instrument satisfies set criteria. Any adjustment of an instrument

at the hands of a verification organization may create suspicion on the part of consumers while a decision of disapproval following such adjustment could cause problems with the manufacturer involved. Such disapproval also means a lower verification work effectiveness. Consequently, it is desirable that the Department of Trade concentrate on passing a judgement of either the pass or failure of verified measuring instruments and avoid becoming involved in adjustment work.

c) There is no other country in the world which requires two seals, i.e. one from the PLN and one from the DOM, for the same meter which is both unnecessary and reduces the number of meters to be verified. The seal issued by the Department of Trade should be sufficient in the future.

d) Watt-hour meter adjustment and testing by manufacturers are not combined with a current limiter. In view of maximising the general work efficiency, the cut-off testing of current limiters should be entrusted to the PLN as an independent test from the watt-hour meter test. The number of meters to be verified should increase through this arrangement.

e) Several questionable practices currently exist, including (i) the order of testing whereby the creeping test is conducted after the self-heating process for the verification test, (ii) the non-existence of the starting current test for normal class watt-hour meters and the 50% load test for single phase, two wire watt-hour meters and (iii) the execution of the verification test involving meter adjustment by the verification authority. As the load characteristics of an induction type watt-hour meter are not flat, it is undesirable to omit the 50% load test. The following verification test items and order of testing are recommended. Those with an asterisk are additional items or alterations to current practices.

   i. Insulation test (with DC 500V) *

   ii. Creeping test

   iii. Starting current test

iv. Self-heating (with rated current and rated current under rated frequency *; power factor of 1; 20 minutes *)

v. Metering test during self-heating process *

vi. Error test under rated voltage and rated frequency (① 100% of rated current with power factor of 1 and 0.5 (lagging current); ② 50% of rated current with power factor of 1 and 0.5 (lagging current); ③ 5% of rated current with power factor of 1); 50% load test also to be applied for single phase watt-hour meters)

The watt-hour meter verification process in Japan is shown in Fig. 3-15.

The inspection of the transformers for electrical meters and the verification testing of watt-hour meters which are used in combination with a transformer should preferably be entrusted to the branches of the PLN.

f) At present, watt-hour meters are verified in many cases in a room without temperature control facilities despite the importance of such control due to the high susceptibility of watt-hour meters to temperature fluctuations. While the rate of failure given in Table 3-28 is the average figure, the rate of failure can be slightly less than 10% depending on the model or manufacturer. Any difference between the supply conditions of electrical standards and use conditions of standards significantly affects the rate of failure.

It is desirable for all watt-hour meter verification laboratories of the Department of Trade to be air-conditioned with a room temperature which is approximately the same temperature as a standard storage room of the DOM or testing and adjustment room of a manufacturer. A room temperature of 27°C is referred to as the standard temperature for a tropical region by the international standard (ISO 554-1976) and both Malaysia and Thailand adopt 27°C as the standard temperature.

Given the current power supply situation in Indonesia, the adoption of the common outside air temperature as the standard laboratory temperature should reduce power consumption. This is also beneficial in view of the proximity of the standard temperature to that at the place

of watt-hour meter installation and also in view of ensuring appropriate metering vis-a-vis most users. It may, therefore, be a good idea to adopt 27°C as the standard temperature for the testing, adjustment, verification and type approval testing of watt-hour meters as well as for the relevant supply of electrical standards. The temperature of a testing and adjustment room of a watt-hour meter manufacturer is currently set at 26°C ± 2°C, making the establishment of the Verification Council (tentative name) necessary, with members consisting of representatives of the Department of Trade and manufacturers, to examine the suitability of establishing 27°C as the standard verification temperature.

g) In general, the guarantee period for an induction type watt-hour meter is 10 years and the Indonesia Electric Standard (SLI) specifically states that the validity period for a watt-hour meter is 10 years. The current validity period of 20 years should, therefore, be shortened to 10 years if possible through consultations with the PLN and other related organizations. As Table 3-28 shows, many watt-hour meter complaints suggest the importance of trying to shorten the current validity period. Another useful idea is to introduce a user's tolerance as in the case of Japan.

h) As it appears virtually impossible to expect the PLN to transfer its testing facilities to the Department of Trade, it is desirable to prepare a plan to introduce new testing facilities from the medium to long-term perspective. The likely requirements vis-a-vis the number of testing units and inspectors and installation space are discussed next.

As already discussed in 3.4, 80 PLN branches currently verify and retrieve some 2 million watt-hour meters, including old meters and imported meters, using 100 units (each of which can simultaneously test and verify 20 meters at one time). More than 93% of the meters verified are independent watt-hour meters for household use. Assuming that some 50% of the watt-hour meters for public and commercial use are independent meters, more than 95% (approximately 4.75 million meters) of the watt-hour meters must be verified by the test laboratories of the Department of Trade.

Table 3-29 lists the verification equipment and system owned by the JEMIC which verifies more than 10 million meters a year (some 230 working days) using 134 testing units, each of which is capable of testing 40 - 80 meters simultaneously, with 7 testing cycles a day. It is worth noting that the JEMIC does not adjust meters. According to Table 3-23, the electrification rate in Indonesia will exceed the 70% level by the year 2000 and the number of independent watt-hour meters requiring verification will exceed 2.6 million a year.

Assuming 5 testing cycles a day and 250 working days a year, some 170 testing units capable of simultaneously testing 40 meters will be required in addition to 113 units capable of testing 60 meters a time and 85 units capable of testing 80 meters a time. The meter bench size will naturally increase with an increase of the number of simultaneously tested meters. The actual selection of testing units must take the available floor area at each branch office of the Department of Trade into consideration.

The price of testing units made in Japan ranges from 40 to 60 million yen, inclusive of the installation and operation guidance charges. If a trading house is involved in procurement, the trading house's commission is added to this figure. Given such a high price, careful planning will be required over a long period of time.

Any testing unit procurement plan must be based on the estimated verification volume for different types of watt-hour meters in a given catchment area. Because of the fair number of three phase, independent watt-hour meters in use, each verification laboratory should be provided with at least one three phase testing unit. Two inspectors will roughly be required to efficiently operate one testing unit and the personnel plan should also be prepared with great care together in addition to the testing unit procurement plan.

i) Table 3-30 shows the number of units to test independent watt-hour meters, the actual space requirement and annual work load vis-a-vis JEMIC's laboratory. A total of 103 testing units verify more than 8.3 million independent watt-hour meters a year and each unit requires some 80 m^2, inclusive of space for desk work. The number of inspectors is approximately 210 based on roughly 2 inspectors per unit.

j) With regard to the type approval testing of watt-hour meters, the US is an exceptional case because of the absence of such a system and self-regulation by manufacturers based on product standards (ANSI) is instead relied upon. In France and the UK, even though the actual testing is conducted by the respective central electrical research institute, formal type approval is issued by a non-profit state organization, i.e. the Department of Industrial Research in France and the Department of Energy in the UK. Indonesia could maintain the present system whereby the PLN conducts the testing while the DOM issues type approval. Further discussion is required to determine the best arrangement for the future.

k) In view of the fact that the DOM has expressed its desire to conduct type approval testing itself in the future, the required testing equipment, space requirement and test items, etc. are discussed next.

Table 3-31 and Table 3-32 show the type approval test items for watt-hour meters in Japan and the range of test equipment owned by the JEMIC to conduct such testing. Although the test items somewhat differ from those in Indonesia, most of the equipment listed is essential for type approval testing. Table 3-33 lists the equipment procured by the JEMIC some 15 years ago for type approval testing. The current prices are at least double the prices listed. Export to Indonesia will also incur transportation, installation, insurance and other costs. The total cost will, therefore, be around 300 million yen.

l) The laboratory space requirement to house the range of equipment listed in Table 3-31 and Table 3-32 is 330 m^2, consisting of 140 m^2 for the characteristic test room (to house 3 test units), 30 m^2 for the life test room, 40 m^2 for the vibration and impact test room, 70 m^2 for the environmental test room and 50 m^2 for the exposure test room. In short, enough land for a building containing the above rooms and common use facilities will be required at each site together with some 7 inspectors.

(2) Verification Laboratories to Supply Electrical Standards (Key Verification Laboratories)

The electrical standards which are essential for the verification of watt-hour meters are currently established by the LMK-PLN and supplied to the verification laboratories and manufacturers. When the Department of Trade becomes responsible for verification work, its dependence on the LMK-PLN for the supply of electrical standards to the verification laboratories may erode the authority of the Department. Accordingly, the responsibility of the DOM to establish and supply electrical standards to the verification laboratories in the future should be assumed as part of the overall arrangements for the future watt-hour meter verification system under the control of the Department of Trade. The key points of such arrangements are discussed below.

① As in the case of any other measurement standard, electrical standards must be traceable to national standards. Fig. 3-16 shows the calibration system for standard watt-hour meters at the JEMIC where an AC-DC comparator is used to establish electrical values. This comparator is operable with either AC or DC and can calibrate standard watt-hour meters with an accuracy of 100 ppm, including the case of a power factor of 0.5 (lagging current). In addition, the DC voltage and current (induced by voltage and resistance) are traceable to national standards.

② Following the establishment of standards, the standards owned by the verification laboratories must be calibrated. While these standards can be taken directly to the DOM at regular calibration intervals, this would flood the DOM with calibration work. Moreover, it is not particularly convenient to transport standards over a long distance. It is recommended that the DOM calibrate Class 1 standard watt-hour meters which will then be distributed to the main regions for use as local mobile standards to calibrate the standards owned by other laboratories. It may be an idea to officially approve the distribution of the Class 1 standards to some 9 key laboratories (3 in Java and Bali, 2 in Sumatera, one in Kalimantan, one in Sulawesi, one in Timor and one in Maluku).

③ The procurement of a small, air-conditioned vehicle for the transportation of the Class 1 standard for mobile calibration work will prove useful. In addition to the Class 1 standard, this vehicle could be reasonably equipped

with a standard voltmeter and ammeter. This type of special vehicle will cost some 30 million yen to procure in Japan, inclusive of all equipment.

④ The calibration intervals for electrical standards in Japan are given below.

Type of Standard	Calibration Interval
Ammeter; Voltmeter, Class 3 Watt-Hour Meter	6 months
Voltage Generator, Resistor, Class 1 and Class 2 Watt-Hour Meters	12 months

⑤ The equipment required to establish the electric energy standard is listed in Table 3-34. As some equipment is rather old, the current prices should be more than double those listed.

⑥ Table 3-35 lists the range of equipment that the JEMIC once recommended to a developing country under a technical cooperation project to establish electrical standards. As the equipment listed here is easy to handle and is relatively inexpensive, it should be included in Indonesia's future shopping list. Two engineers are likely to be required to establish and supply electrical standards.

(3) Education/Training Programme for Verification Staff

When the local branches of the Department of Trade and the DOM/local verification laboratories are made responsible for the verification of watt-hour meters and type approval testing and the supply of standards respectively, some 220 people will be required to conduct these assignments. Some 200 will be inspectors who are responsible for verification while the remaining 20 or so will be responsible for type approval testing and the establishment/supply of electrical standards. It must be noted here that these 220 people do not include such clerical staff as receptionists, typists and others.

① Education and training for the technical staff must be constantly provided from the medium and long-term perspectives by means of expanding the training facilities of the Bandung Training Centre, strengthening of the current training system and the efficient use of the PLN-ITB Training Centre, etc.

② There is a strong demand for the training of technical staff in industrialised countries and also for the technical cooperation of donor countries involving the dispatch of experts. In regard to overseas training, it should

be sufficient to send some 3 technical staff members over a 3 year period from the DOM or key branches of the Department of Trade for approximately 2 months per person with a view to these people becoming instructors at the Bandung Training Centre on their return to Indonesia to train their successors. In regard to the acceptance of foreign experts, reasonably satisfactory technical cooperation arrangements can be made for experts to be dispatched to Indonesia for some 3 months for 2 successive years in accordance with the procurement and installation of the type approval test equipment and other equipment for verification and the establishment of electrical standards.

Table 3-1 State of Application of OIML Measurement Law to Indonesian and Japanese Measurement Laws

OIML Measurement Law	Indonesian Law on Legal Metrology	Japanese Measurement Law
Part I Legal Measurement Units Article 1 System of Units Article 2 Units Other than SI Those units which are outside the scope of SI but which are widely used at home and abroad can be approved as legal measurement units.	Chapter 2 Measurement Units o The international system of units (SI) is used to define the legal measurement units. o Base units are defined by the Law while derived units and auxiliary units are defined by government ordinances.	Chapter 2 Measurement Units o The international system of units (SI) is used as the basis for legal measurement units and their definitions are given in government ordinances. o Among those units outside the scope of SI, the Law approves widely used units at home and abroad (example, "decibel" for sound pressure and "percent" for density) and units of limited application (example, "carat" for precious stones and "mercurial column millimetre" for blood pressure) as legal measurement units. o Units used in the aviation industry based on the yard-pound system are considered legal measurement units for an indefinite period.
Part II Physical Representation of Units Article 3 Primary Standards The methods to establish and maintain a kilogramme standard and other national standards are decided in accordance with the domestic technical necessity and capabilityrelating to such standards.	Chapter 3 Measurement Standards o The measurement standards for base units are upheld as national standards and issues relating to their maintenance and use are stipulated by government ordinances. o National standards are controlled by anorganization especially established for this purpose and its structure and other details are stipulated by a presidential decree. o The kilogramme standard and other national standards are established by the DOM of the Ministry of Commerce and the LIPI-KIM respectively.	o The establishment, maintenance and control procedures and other details relating to the kilogramme standard and other national standards are stipulated by the Agency of Industrial Science and Technology Law andrelevant ordinances. o While the National Research Laboratory of Metrology (NRLM) of the Agency is responsible for the setting-up and establishment of the kilogramme standard and other national standards for general physical quantities in a manner and accuracy compatible with international standards, the Electrotechnical Laboratory (ETL) of the Agency has similar responsibility for electric quantities.

Part III *Application of Units* Article 4 General The legal measurement units are applied to all *measurements where the use of such units is required by* laws or regulations.	o The legal measurement units are applied to laws, *official documents* and commercial transactions, etc.	o The use of non-legal measurement units for trade and certification is prohibited.
Part IV Measuring Instruments Article 5 General The scales on measuring instruments must use the legal measurement units	Chapter 4 Measuring Instruments o The possession or use of *measuring instruments with* scales using non-legal measurement units is illegal. o The legal measuring instruments subject to inspection or re-inspection are stipulated by a ministerial ordinance.	o *Instruments, machines and devices for measurement are* defined as "measuring instruments" and the sale of those instruments using non-legal measurements is prohibited. o The legal measuring instruments subject to inspection are stipulated by a government ordinance.
Article 6 Quality of Measuring Instruments Those measuring instruments subject to compulsory inspection must satisfy the pre-determined functions and accuracy.	o The required conditions for measuring instruments subject to inspection or re-inspection are stipulated by a ministerial ordinance for each instrument.	o The structure and inspection allowance of each measuring instrument are stipulated by a ministerial ordinance as the conditions to pass inspection.
Part V Control of Measuring Instruments Article 7 Compulsory Control The measuring instruments used for legally stipulated purposes are subject to the control regime, including compulsory inspection.	o The use of measuring instruments which do not have an inspection approval mark for commercial trade, government services or wage calculation is illegal. o The use of measuring instruments which are currently used for the above purposes is illegal if they do not have *the approval mark of re-inspection* which is conducted at regular intervals.	o *The use of measuring instruments which have failed the* inspection is illegal for trade and certification purposes. o Manufacturers and importers of specific measuring instruments (example, thermometer and tonometer) are compulsorily required to have the products inspected prior to their sale. o Specific measuring instruments (example, massmeter and leather planimeter) have the compulsory obligation to undergo regular inspection.

Article 8 Types of Control o Type approval o Initial inspection o Inspection after repair or modification o Regular inspection	o Type approval o Inspectio o Re-inspection	o Type approval o Inspection - Inspection of new products - Inspection after repair or modification; inspection after completion of approved validity period o Regular inspection (for specific measuring instruments)
Article 9 Exemption Certain types of measuring instruments may be exempt from all or part of the control requirements.	o Details relating to exemption from the inspection and/or re-inspection requirements are stipulated by a government ordinance.	o Exemption from inspection: 1) Measuring instruments of which exemption is specially stipulated by a government ordinance. 2) Measuring instruments of manufacturers which are designated as being of exceptionally high quality control with a specific mark to show their status being attached. o Exemption from Regular Inspection 1) Registered measuring instruments with a certificate of inspection issued by a certified metrological engineer. 2) Measuring instruments used in a workplace or shop which is designated as an excellent workplace or shop for measurement control by the prefectural governor.
	Chapter 5 Inspection Mark	
Article 10 Inspection Mark and Legal Qualification for Measuring Instruments Measuring instruments which have passed inspection under the control regime described in Article 7 are awarded a special mark to indicate their status and qualify as "legal measuring instruments" to be used for legally stipulated purposes or applications.	o The Law stipulates the types of inspection marks and others while their shape, size and place of fixing, etc. are stipulated by a ministerial ordinance. 1) Inspection mark (pass mark) 2) Failure mark 3) Legal seal 4) Location mark (indicating the place of inspection or re-inspection) 5) Inspector mark (indicating inspector who conducted the inspection or re-inspection)	o The Law demands the attachment of an inspection mark and others to measuring instruments which have passed the inspection and the shape, size and place of fixing are stipulated by a ministerial ordinance. 1) Inspection mark 2) Regular inspection mark 3) Type approval indication

Part VI Article II Measurements Subject to Compulsory Control Measurements which are conducted pursuant to the law for certain types of trade are under the compulsory control of the government. The measurement types under compulsory control and the control methods may be stipulated by a government ordinance or regulations to enforce Article 11. Article 12 Measurement Method	o No specific provisions are given by the Law.	o No specific provisions are given by the Law. Note: For example, measurement of the quantity and alcohol content of liquor for taxation purposes is stipulated by the Liquor Tax Law. Similar legal arrangements exist for petrol and LPG, etc. The measuring instruments used for this type of measurement are subject to control under the Measurement Law.
Part VII Metrological Control of Quantities Relating to Products and Packed Commodities Article 13 Metrological Control of Quantity of Delivered Products or Packed Commodities on Display Article 14 Method of Control and Required Regulations Article 15 Violation Any seller of those commodities of which the weight or other measurement or number does not meet the required conditions described in Article 14 is in violation of the Law.	Chapter 6 Packed Commodities o For a packed commodity sold on the basis of length, volume, mass or number, the manufacture, filling or sale of a commodity of which the actual quantity is less than the quantity indicated on the package is prohibited. o The regulations on packed commodities are stipulated by a ministerial ordinance (preparatory work is currently in progress to issue such an ordinance in the future). o The penalty is either imprisonment for upto 6 months or a fine of half a million Rp.	Chapter 3 Implementation of Proper Measurement Section 2 Measurement for Commodity Sale o Traders who sell specific commodities based on measurement units or in packed form have the obligation to sell those commodities of which the quantities are accurately measured within the specific permissible error. o The subject commodities and permissible errors (quantity allowance applicable only to a shortage) are stipulated by a government ordinance. o The following measure(s) is taken by the prefectural governor or municipal mayor vis-a-vis the offender. 1) Improvement recommendation 2) Public announcement of an offender who defies the recommendation 3) Improvement order if the offender continues to defy the recommendation despite the measure described in 2) above. 4) Prosecution of the offender defying the improvement order with a fine of upto half a million yen.

Part VIII Manufacture, Repair and Sale of Measuring Instruments Article 16 Permission Any person or corporation who imports, manufactures, repairs, sells and/or leases certain types of measuring instruments specified by government ordinances as a business must be registered with the national inspection organization for legal metrology.	o Anyone intending to manufacture or repair measuring instruments must obtain permission to do so from the competent minister. o The import of measuring instruments must be permitted by the competent minister.	Chapter 4 Supply of Accurate Measuring Instruments o Anyone intending to manufacture measuring instruments as a business must notify the Minister of International Trade and Industry in advance. o Anyone intending to repair measuring instruments as a business must notify the prefectural governor (Minister of International Trade and Industry in the case of watt-hour meters) in advance. o Anyone intending to sell specific measuring instruments (massmeter, thermometer and tonometer) must notify the prefectural governor in advance.
Part IX Personal and Corporate Obligations Article 17 Obligation of Control Any person or company using and/or possessing measurement instruments for a purpose of work to which the domestic laws on measurement apply has the obligation to place the said measuring instruments under metrological control. Article 18 Form of Compulsory Obligation The administrative section of the legal metrological inspection laboratory shall define the form of the said obligation to place measuring instruments under metrological control in detail.	o No provision of equivalent control is available.	o Obligation to make the standards for legal inspection undergo inspection. o Obligation to make the measuring instruments for metrological certification undergo inspection. o The standards used by a designated manufacturer for the in-house inspection of measuring instruments with a view to obtaining exemption from inspection must have passed the inspection of standards. o The standards used for inspection by a designated inspection laboratory and the standards used for inspection in lieu of periodic testing conducted by a metrological engineer or for in-house inspection in lieu of periodic testing conducted by a business for appropriate measurement control must have passed the inspection of standards. o The measuring instruments used for a metrological certification business must undergo the metrological certification inspection by the prefectural governor at regular intervals. o The criteria to pass the above types of inspections are stipulated by a ministerial ordinance.

Part X Metrological Inspection Organization Article 19 A national metrological inspection organization shall be established to enforce the Law. Article 20 Structure and Assignment of National Metrological Inspection Organization Article 21 Staff of National Metrological Inspection Organization	o DOE, Ministry of Commerce 1) General administration and enforcement of legal metrology 2) Storage of the kilogramme standard; establishment and maintenance of primary standards for various legal metrology fields 3) Regular calibration of standards for local inspection offices 4) Type approval of measuring instruments and other work o Provincial Metrological Inspection Laboratories (47 Laboratories) 1) Inspection and re-inspection of measuring instruments 2) Control of metrological affairs	o Ministry of International Trade and Industry 1) Metrology Administration Office, Machinery and Information Industries Bureau - Administration work for the general enforcement of the Measurement Law 2) National Research Laboratory of Metrology, Agency of Industrial Science and Technology - Storage of the kilogramme standard and establishment of national standards for general physical quantities - Regular calibration of standards for local inspection - Type approval testing of measuring instruments 3) Electrotechnical Laboratory, AIST - Establishment of national standards for electric quantities - Regular calibration of the noise standard 4) Weights and Measures Training Institute - Training of legal metrology staff and metrological engineers o Prefecturai Metrological Inspection Laboratory (one each in all 47 prefectures) - Inspection and periodic testing of measuring instruments - On-the-spot inspection (of measuring instruments and measurements of commodities on sale) - Registration of businesses repairing or selling measuring instruments - Designation of businesses for appropriate measurement control o Designated Municipality (85 cities designated by a government ordinance) - Periodic testing of measuring instruments - On-the-spot inspection (of measuring instruments and measurements of commodities on sale) o Japan Electrical Instruments Inspection Laboratory (16 regional laboratories) - Type approval and inspection of electrical instruments - Testing of electric standards

		o Designated Inspection (Testing) Laboratories - Inspection and periodic testing of designated measuring instruments
Part XI Authority of Legal Metrological Organization Article 22 Authority to Enter Premises and Conduct Inspection The staff members of the legal metrological organization have the authority to enter premises where measuring instruments are owned or used and to conduct their assigned work on presentation of their identification cards. Article 23 Entry to Personal Premises The administrative section of the legal metrological organization can authorise entry to personal premises where measuring instruments are installed for the applications or purposes stipulated by the Law in accordance with the rules enforced with the consent of other administrative organizations.	Chapter 9 Supervision and Investigation o The officials of the government organization responsible for supervision and investigation relating to legal metrology have the obligation to investigate criminal acts violating the provisions of the Law. o Officials in charge of legal metrology have the authority to seal and confiscate evidence. o Officials in charge of legal metrology have the authority to freely enter premises designated by the Law.	o The Minister of International Trade and Industry, prefectural governors and mayors of designated municipalities can order their officials to enter premises manufacturing, repairing or using measuring instruments and premises manufacturing and/or selling packed commodities to check measuring instruments, packed commodities and trade books, etc. o Officials conducting on-the-spot inspection must carry identification cards and present them to the interested parties. o On-the-spot inspection can be conducted for measuring instruments installed in an ordinary household for trade measurement purposes (gasmeter, water meter and watt-hour meter, etc.) provided that the consent of the occupant is obtained.
Part XII Jurisdiction over Legal Metrological Organization Article 24 Jurisdiction of Competent Agency The legal metrological organization is under the jurisdiction of the	o The Ministry of Commerce has jurisdiction over legal metrology and the DOM is responsible for daily administration work. The administrative structure and other related items are stipulated by a presidential decree. o Provincial Measurement Inspection Laboratories The Law stipulates the establishment of provincial inspection laboratories which shall conduct, together with other organizations, such work assigned to provinces as inspection, re-inspection and enforcement of the Measurement Law.	o With regard to the jurisdiction of the Measurement Law, the scope of the assigned responsibilities of the Metrological Administration Office and Weights and Measures Training Institute are defined by the Law Concerning the Establishment of the MITI and related government and ministerial ordinances. o The scope of the assigned responsibilities of the NRLM and ETL are defined by the Law Concerning the Establishment of the Agency of Industrial Science and Technology and relevant government and ministerial ordinances.

		o The work relating to the implementation of the Measurement Law by prefectures and designated municipalities is defined by the Local Government Act as work entrusted by the central government to local governments.o The establishment and scope of work of the Japan Electrical Instruments Inspection Laboratory are stipulated by the Law to Set Up the Japan Electrical Instruments Inspection Laboratory. o The designated inspection (testing) organizations are established pursuant to the Law.
Part XIII Financial Arrangements Article 25 Commission The legal metrological organization may find it reasonable to charge a commission for the metrological services it provides.	o An inspection fee is charged for inspection and re-inspection services and the actual amount of the fee is stipulated by a government ordinance. o 80% and 20% of the inspection income go to the Ministry of Finance and the DOM respectively. The DOM distributes its income to the local measurement inspection laboratories to help them expand their facilities.	o Such chargeable items as inspection, registration and designation, etc. are stipulated by the Law and the respective commission amounts are stipulated by a government ordinance. o The commission is considered revenue for the organizations, such as the central government and local governments, etc., which provide the corresponding services. o When the financial expenses of prefectures or designated municipalities to conduct the entrusted work exceeds their revenue, any revenue shortage will be compensated for by the tax allocated to local governments.
Part XIV Violation Article 26 Violation Any violation of the Law or relevant enforcement regulations shall be prosecuted in accordance with the legal procedure applicable in the country concerned.	Chapter 7 Violation of the Law Chapter 8 Punishment o 7 items are listed as violation of the Law and are divided into 2 groups based on the possible punishment: (i) imprisonment upto one year or a fine of upto one million Rp and (ii) imprisonment upto 6 months or a fine of upto half a million Rp. o The ownership of that considered criminal evidence or items violating the Law and relevant regulations shall belong to the government. o The confiscation of items shall be conducted in accordance with the provisions of the Criminal Law. o Prosecution shall be conducted in accordance with the procedure stipulated by the Criminal Prosecution Law.	Chapter 10 Punishment o Punishable violations are listed by the Law with maximum imprisonment of one year and/or a fine of one million yen, followed by 6 lesser levels of criminal punishment of which the lightest is a fine of upto 200,000 yen. The 2 levels of administrative fines for lighter offences are also stipulated: (i) upto 200,000 yen and (ii) upto 100,000 yen. o Any loss resulting from on-the-spot inspection on the part of the owner of the subject premises shall be compensated. o No specific prosecution procedure is stipulated by the Law and the procedure stipulated by the Criminal Prosecution Act is applied.

Part XV Interim Arrangements	Chapter 10 Interim Measures	Chapter 11 Supplements
The administration section of the national metrological inspection organization shall decide the process for the gradual implementation of the provisions of the Law based on the agreement of related administrative organizations and opinions of the national metrological inspection organization.	o The Law stipulates provisional conditions for the approved items and regulations enforced prior to the revision of the Law.	o Various interim measures necessitated by the enforcement of the new Measurement law are stipulated in supplements.

Table 3-2 SUMMARY OF BUILDING

No.	Branch Name	Building				Area (m^2)								
		(Own/Rent)	Built Year	Construction	Air Condition (Full/Partial)	Mass	Length	Wait Boor Meter	Water Meter	Tank	Taxi Meter	Others	Administ -ration	Total
1	BANDA ACEH	Own	1969	Permanent	-	13.5	-	21.0	34.0	136.5	-	140.0	117.0	462.0
2	LANGSA	Own	1990	Permnanent	-	20.0	-	15.0	-	126.0	-	181.0	20.0	362.0
3	MEDAN	Own	1957	Permanent	Partial	29.19	52.64	33.67	27.65	42.67	27.26	817.84	59.08	1,090.0
4	PEMAJANGSIANTAR	Own	1982	Permanent	-	28.0	-	14.0	-	94.0	-	212.5	16.0	364.5
5	PADANG	Own**	1952	-	-	-	-	-	-	-	-	-	-	-
6	PEKANBARU	Own	1961	Permanent	-	95.0	75.0	18.0	-	77.0	-	68.0	165.0	498.0
7	JAMBI	Own	1982	Permanent	-	24.0	-	18.0	24.0	42.5	-	531.5	-	640.15
8	PALEMBANG	Own	1982	Permanent	-	30.0	30.0	30.0	-	55.0	-	143.0	187.0	475.0
9	LAMBUNG	Own	1980	-	Partial	32.0	-	21.0	-	200.0	-	208.0	65.0	526.0
10	BENGKULU	Own	1982	Permanent	Partial	138.0	48.0	32.0	315.0	165.5	-	50.4	74.4	539.8
11	JAKARTA	Own	1989	Permanent	Partial	331.0	59.4	40.8	27.7	880.0	300.0	782.4	135.7	2,557.0
12	BANDUNG	Rent	1917	Permanent	-	222.0	64.0	20.0	-	80.0	40.0	484.0	60.0	970.0
13	SERANG	Own	1983	Permanent	Partial	23.7	-	30.8	13.2	81.7	-	142.6	108.0	400.0
14	PURWAKARTA	Rent	-	Permanent	-	22.0	6.0	-	-	32.0	-	-	100.0	160.0
15	BOGOR	Own	1982	Permanent	-	108.0	-	40.0	-	160.0	-	29.0	63.0	400.0
16	TASIKMALAYA	Own	1982	Permanent	-	23.0	-	40.0	25.0	78.0	-	186.0	73.0	425.0
17	CIREBON	Own	1970	Permanent	Partial	20.0	-	42.0	21.0	133.25	-	230.98	42.0	489.23
18	SEMARANG	Own		-	-	40.0	52.0	-	85.0	125.0	45.5	740.5	-	1,088.0
19	TEGAL	Own	1982	-	-	16.0	-	-	-	200.0	-	154.0	30.0	400.0
20	PATI	Own		Permanent	-	17.5	17.5	-	-	-	-	314.0	12.0	361.0
21	PURWOKERTO	Own		-	-	24.0	12.0	-	11.3	133.6	-	208.5	148.0	538.0
22	SURAKARTA	Own	1980	Permanent	-	30.0	-	-	-	250.0	-	490.0	80.0	850.0
23	MAGELANG	Own	1989	Permanent	-	-	-	24.0	-	-	-	220.0	56.0	300.0
24	YOGYAKARTA	Own	1980	Permanent	-	36.0	108.0	18.0	24.0	120.0	60.0	858.0	81.0	1,125.0
25	SURABAYA	Own	1990	Permanent	-	48.0	43.0	24.0	24.0	200.0	200.0	1,144.52	75.6	1,759.12
26	JEMBER	Own	1972	Permanent	-	35.0	-	19.0	-	70.0	-	181.0	161.0	466.0
27	MALANG	Own	1985	Permanent	Partial	116.25	-	27.0	-	138.0	-	1,194.0	130.75	1,606.0
28	MADIUN	Own	1985	Permanent	Partial	80.0	-	24.0	26.0	125.0	-	12.0	100.0	367.0
29	KEDIRI	Rent	-	-	-	16.0	-	-	25.0	12.0	-	100.0	179.0	340.0
30	BOJONEGORO	Own	1992	Permanent	-	90.5	-	45.0	32.5	147.5	-	45.5	53.5	414.5
31	PONTLANAK	Own	1950	Permanent	-	12.96	-	20.4	18.0	144.0	18.0	-	45.12	258.48
32	SINGKAWANG	Own	1989	Permanent	-	20.0	-	-	-	-	-	128.0	62.0	210.0
33	PALANGKORAYA	Own	1982	Permanent	Partial	48.75	-	30.0	26.0	-	-	374.75	180.0	659.5
34	BANJARMASIN	Own		Permanent	Partial	28.0	28.0	28.0	28.0	49.0	-	209.0	16.0	386.0
35	SAMARINDA	Own	1982	Permanent	Partial	41.0	50.0	36.0	20.0	65.5	-	-	30.0	242.5
36	MANADO	Own	1949	Permanent	Partial	107.0	-	32.0	-	300.0	32.0	167.0	78.0	716.0
37	PALU	Own	1982	Permanent	Partial	24.0	-	30.0	20.0	200.0	-	399.0	27.0	700.0
38	UJUNGPANDANG	Own		Permanent	-	16.5	36.0	30.0	50.0	87.5	-	363.75	46.5	650.25
39	KENDARI	Own	1982	-	Partial	20.72	17.39	29.47	51.15	-	-	130.67	137.7	317.3
40	DENPASAR	Own	1979	Permanent	Partial	135.0	-	75.0	-	115.0	75.0	30.0	150.0	580.0
41	MATARAN	Own	1982	Permanent	-	20.0	32.5	50.0	30.0	180.0	-	330.0	60.0	650.0
42	KURANG	Own	1984	Permanent	Partial	25.0	-	30.0	-	200.0	-	245.0	200.0	700.0
43	AMBON	Own	1958	Permanent	Partial	16.0	-	93.0	-	200.0	-	152.0	32.0	493.0
44	TERNATE	Own	1982	-	Partial	16.0	-	24.0	-	-	-	120.0	40.0	200.0
45	JAYAPURA	Own	1979	Permanent	Partial	20.0	-	18.75	-	200.0	-	-	111.25	350.0
46	SORONG	Rent	-	-	-	-	-	-	-	-	-	-	-	160.0
47	PILI	Own	1989	Permanennt	Partial	20.5	-	-	36.0	-	17.0	136.5	70.0	280.0

* Included Length.

** The building is very old.

Table 3-3 Directorate of Metrology, Ministry of Commerce

DIRECTORATE OF METROLOGY, MINISTRY OF COMMERCE.
DIREKTORAT METROLOGI, DEPARTEMEN PERDAGANGAN

No.	ITEMS Nama Alat	Merk/type MARK/TYPE	RANGE Daerah Pengukuran	ACCURACY Ketelitian	REMARK Keterangan	LIAISON OFFICER Pejabat Penghubung
	LENGTH STANDARDS Alat Ukur Panjang					I Gde Mangku
					PRIMARY STANDARD	
1.	Meter Standard/X27	BIPM	1000 mm	0,5 μm	Standard ukuran panjang tk. I	M. Musta'ien Sudja'ie
2.	Meter Standard/Hmeter	SIP Geneve H AC.NI.EP-H131	1000 mm	1,0 μm	idem tk. II	
					SECONDARY STANDARD	
3.	Transversal Comparator	SIP Geneve C-4130 Swiss	0 – 1000 mm	0,1 μm	Alat pembanding standard ukuran panjang (ukuran garis)	
4.	Micro Indicator	SIP Geneve MI-6B Swiss	0 – 120 mm	0,1 μm	Alat pembanding — ukuran panjang (Ukuran ujung)	COMPARATOR
5.	Gauge Blocks	Mitutoyo 516 – 941	1,005 – 100 mm	Klas AA (00)		
					THIRD STANDARD	
6.	Comparator G.D. Koningh	G.D. Koningh	0 – 1000 mm	0,01 mm	Standard ukuran panjang tingkat III (dengan micros cope)	
7.	Comparator van Becker	van Becker	0 – 1000 mm	0,01 mm	idem tk. IV	
					WORKING STANDARD.	
8.	Meter Standard	DIN 865	1000 mm	0,1 mm	Standard kerja	
9.	Comparator 1 m	–	1000 mm	1,0 mm	idem	
10.	Comparator 20 m	–	20 m	0,01 mm	idem	
11.	Calibration Tester	Mitutoyo 170	0 – 25 mm	0,001 mm	Kalibrasi dial gauge	

P.T. BOMA BISMA INDRA, Unit Bisma

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
	PRESSURE/FORCE/MOISTURE METER Alat Ukur Tekanan/Gaya/ Kadar Air				PRESSURE GAUGE MEASUREMENT	
1.	Liquid Deadweight Tester	Ruhaak	50 kg/cm²	0,005 kg/cm²	Pengujian pressure gauge	S. Hadisusilo James Marpaung
2.	Pneumatic Calibrator	Nagano 3270679	0 – 2 kg/cm²	0,001 kg/cm²	Pengujian pressure gauge	
3.	Liquid Deadweight Tester	Nagano/P-100-55-2	0-1000 kg/cm²	0,01 kg/cm²	idem	
4.	Air Dead Weight Tester	Nagano P. 081	0 – 2 kg/cm²	0,001 kg/cm²	idem	
5.	Air Dead Weight Tester	Maihak / – AR		0,005 mm Hg	Pengujian blood – pressure	BLOOD PRESSURE MEASUREMENT
6.	Liquid Pressure Standard	Desgranges & Huot/Model 5306	1 – 500 bar 4 – 200 bar	2,5 mbar 10 mbar	Pengujian pressure gauge	
7.	Hydraulic Force Comparator	Inter Hydro / D 1620	10 – 100 kN 100 – 1000 kN	2 x 10⁻⁴ kN 2 x 10⁻⁴ kN	Pengujian dynamo meter	DYNAMOMETER MEASUREMENT
8.	Hardness Tester	Avary Denison 6407	0 – 100 HRC 0 – 130 HRB	0,1 HRC 0,1 HRB	Pengujian kekerasan pisau / bantalan	HARDNESS
9.	Hardness Tester	Ames model 2.10.107	0 – 90 HRC 0 – 120 HRB	0,5 HRC 0,5 HRB	idem	
10	Instrumen Uji Meter Kadar Air :	Memment Oven/ U 30	0 – 240° C	± 2° C	Pengujian meter kadar air	MOISTURE METER VERIFICATION
		Chyo Balance/ Jupiter CT 3.200 D	0 – 200 g	0,1 mg		
		Blinder Sanyo	–	–		

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
	MASS LABORATORY. Alat Ukur Massa					S. Hadisusilo Lepung Sulaeman
1.	Kilogram Standard (K46) – Standard Tingkat I	—	1 kg	1×10^{-9} kg	Untuk menguji Standar Massa Tingkat II milik Direktorat Metrologi dan Instansi lain.	
2.	Kilogram Standard (T4) Standard Tingkat II	—	1 kg	1×10^{-8} kg	Untuk menguji Standard Massa Tingkat III dan Standard Kerja milik Direktorat Metrologi, Unit Metrologi di Daerah dan Instansi lain.	
3.	Kilogram Standard (K4) – Standard Tingkat II	—	1 kg	1×10^{-8} kg	idem	
4.	Kilogram Standard (K25) – Standard Tingkat III	—	1 kg	1×10^{-8} kg	Untuk menguji Standard Massa Tingkat IV dan Standard Kerja milik Direktorat Metrologi dan Instansi lain.	
5.	Anak Timbangan Standard Kerja Klas : E_2	—	1 mg s/d 1000 mg 1 g s/d 1 kg	1×10^{-9} kg 1×10^{-8} kg	Untuk menguji Timbangan dengan keseksamaan special (khusus) dan keseksamaan halus (Klas I dan Klas II).	

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
6.	Anak Timbangan Standard Tingkat IV	—	1 mg s/d 1000 mg 1 g s/d 10 kg	1×10^{-9} kg 1×10^{-6} kg	Untuk menguji Standard Kerja milik Direktorat Metrologi dan Instansi lain.	
7.	Anak Timbangan Standard Kerja Klas : F_1 dan F_2	—	1 mg s/d 1000 mg 1 g s/d 20 kg	1×10^{-6} kg 1×10^{-7} kg	Untuk menguji Timbangan dengan keseksamaan sedang (KLas III).	
8.	Anak Timbangan Standard Kerja Klas : M	—	1 mg s/d 1000 mg 1 g s/d 50 kg	1×10^{-7} kg 1×10^{-6} kg	Untuk menguji Timbangan dengan keseksamaan biasa (Klas IV).	
9.	Neraca Parama C	Julian & Becker – Delf	1 kg	2×10^{-6} kg	Untuk membandingkan Standard Massa Tingkat II dengan Standard Tingkat I	
10.	Direct Reading Balance	Mettler – H 315	1 kg	1×10^{-7} kg	Untuk membandingkan Standard Massa Tingkat III dengan Standard Massa Tingkat II dan untuk menimbang anak timbangan dengan massa 200 g dan 500 g pada Standard Kerja Klas : E_2	

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
11.	Direct Reading Balance	Chyo Jupiter – CT_3.200	200 g	1 x 10^{-6} kg	Untuk penimbang an Anak Timbangan Standard Kerja Klas : E_2 dengan massa 100 g dan 50 g.	
12	Direct Reading Balance (Double Pan)	Chyo Jupiter – C_3.200	200 g	1 x 10^{-6} kg	idem.	
13.	Direct Reading Balance	Mettler – MS	20 g	5 x 10^{-9} kg	Untuk penimbang an Anak Timbangan Standard Kerja Klas : E_2 dengan massa 20 g, 10g, 5 g, 2 g dan 1 g.	
14.	Direct Reading Balance	Mettler – MS.SA	20 g	5 x 10^{-9} kg	idem.	
15.	Direct Reading Balance	Sartorius	1 g	1 x 10^{-6} kg	Untuk penimbang an Anak Timbangan Standard Kerja Klas : E_2 dengan massa 1 mg s/d 1000 mg.	
16.	Direct Reading Balance	Mettler – M22, Indic. : BA.25/BE.22	2 g	1 x 10^{-9} kg	idem.	
17.	Direct Reading Balance	Chyo – C_2.20 K	30 kg	1 x 10^{-5} kg	Untuk penimbang an Anak Timbangan Standard Kerja Klas : F_1, F_2 dan M dengan massa : 10 dan 20 kg.	

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
18.	Neraca Parama B Precision Balance Class B	Sauter/Karl Kolb	20 kg	2×10^{-6} kg	Untuk penimbangan Anak Timbangan Standard Tingkat IV dan Anak Timbang an Standard Kerja Klas F_1 dan F_2 dengan massa 2 dan 5 kg.	
19.	Neraca Parama C Precision Balance Class C	Julian & Becker – Delft	2 kg	2×10^{-6} kg	Untuk penimbangan Anak Timbangan Standard Tingkat IV dan Anak Timbangan Standard Kerja Klas : F_1 dan F_2 dengan massa 1 kg, 500 g, 200 g dan 100 g.	
20.	Neraca Parama D Precision Balance Class D	Julian & Becker – Delft	50 kg	1×10^{-6} kg	Untuk penimbangan Anak Timbangan Standard Tingkat IV dan Anak Timbangan Standard Kerja Klas: F_1 dan F_2 dengan massa : 50 g, 20 g, 10 g, 5 g, 2 g dan 1 g.	

DIREKTORAT METROLOGI, DEPARTEMEN PERDAGANGAN

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
21	Neraca Parama E Precision Balance Class E	Julian & Becker – Delft.	1 g	1×10^{-7} kg	Untuk penimbangan Anak Timbangan Standard Tingkat IV dan Anak Timbangan Standard Kerja Klas : F_1 dan F_2 dengan massa : 1000 mg s/d 1 mg.	
22.	Neraca Tera A Balance for Verification Class A	Julian & Becker – Delft	75 kg	1×10^{-5} kg	Untuk penimbangan Anak Timbangan Standard Kerja Klas : M dengan massa : 25 kg dan 50 kg.	
23.	Neraca Parama B Precision Balance Class B	Stanton	10 kg	5×10^{-6}kg	Idem, dengan massa : 2 kg, 5 kg dan 10 kg.	
24.	Neraca Parama C Precision Balance Class C	Stanton	1kg	2×10^{-6}kg	Idem, dengan massa : 1 kg, 500 g, 200 g dan 100 g.	
25.	Neraca Parama D Precision Balance Class D	Stanton	50 g	1×10^{-6}kg	Idem, dengan massa : 50 g, 20 g, 10 g, 5 g, 2 g dan 1 g.	
26.	Electric Vacuum Balance	Sartorius	2 g	5×10^{-7} kg	Idem, dengan massa : 1000 mg s/d 1 mg.	

DIREKTORAT METROLOGI, DEPARTEMEN PERDAGANGAN

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
	OIL METER LABORATORY Alat Ukur BBM					
1.	Instalasi uji meter hidrokarbon (MASTER METER)	Avery Hardoll	1400 l/min	0,05 l	Kalibrasi meter arus	M. Arifin Baso Atjeng
2.	Pipe Prover	Mestrole TE 150XD	660 l/min	± 0,02 %	Kalibrasi master meter	
	(INSTALLATION)					
3.	Instalasi uji meter hidrokarbon	1) A Gallier SA 2) Faure Herman	5000 l 250 m³/h	0,1 % 2 %	Kalibrasi meter arus Kalibrasi turbin meter	
4.	Master meter	SATAM	3000 l/min	0,01 l	Kalibrasi meter arus	
	GAS METER LABORATORY Alat Ukur Gas dan Gas Cair					
1.	Standard Piston gauge	Mestrole JP 330B	80 l/min	± 0,02 %	Kalibrasi pompa ukur BBG.	M. Arifin Baso I.G.N. Putra Sanjaya
2.	Instalasi uji meter gas industri – (INDUSTRIAL GAS METER LAB.)	I.G.A.	1). 4000 m³/h 2). 1200 m³/h 3). 400 m³/h 4). 200 m³/h	0,02 m³ 0,02 m³ 0,02 m³ 0,002 m³	Kalibrasi meter gas industri, turbin meter, CVM	
	(DOMESTIC GAS METER LAB.)					
3.	Instalasi uji meter gas tekanan rendah	Dordrecht	1). 15600 1/h 2). 500 l/h	0,1 l 0,01 l	Kalibrasi meter gas rumah tangga.	
	WATER METER LABORATORY. Alat Ukur Air dan Cairan Minum (TEST BENCH)					
1.	Instalasi uji meter air	Pont A Moussont	12 m³/h	0,25 l	Kalibrasi meter air	M. Arifin Baso
2.	Master meter ~~air~~	Avery Hardoll	1400 l/min	0,1 l	Kalibrasi meter air	Soemardi
3.	Master meter ~~air~~ (portable)	Kimmon	3 m³/h	0,1 l	Kalibrasi meter air	

PUSAT PENYELIDIKAN MASALAH KELISTRIKAN (PPMK/LMMK-PLN)

DIREKTORAT METROLOGI, DEPARTEMEN PERDAGANGAN

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
	ELECTRICITY METER LABS. Alat Ukur Listrik					
1.	Metrablock Three – Phase Test set	Landis & Gyr	367 V x 100 A	Klas 0,1	Kalibrasi : 1). kwh meter 2). KV Arh meter 3). Volt meter 4). Ampere meter 5). Sekring otomatis	M. Arifin Baso Hariyadi Suharso
2.	TEST BENCH - Alat uji meter listrik ETALOGYR 4001	Landis & Gyr	220/380 V x 100 A	0,05 %	Kalibrasi kwh meter 1 phasa dan 3 phasa energi aktif/reaktif	
3.	TEST BENCH Alat uji meter listrik (portable)	Metrotec	127/220 V x 10A	0,4 %	Kalibrasi kwh meter 1 phasa energi aktif	
4.	Alat uji meter listrik TEST BENCH.	Precitest PJUY	220/380 V x 100A	0,2 %	Kalibrasi kwh meter 1 phasa dan 3 phasa energi aktif/reaktif.	

DIREKTORAT METROLOGI – DEPARTEMEN PERDAGANGAN

No.	Nama Alat	Merk/Type	Daerah Pengukuran	Ketelitian	Keterangan	Pejabat Penghubung
1.	Psychrometer	Theis 1.0444,10.25	– 30° C ... – 50° C	0,2° C	Perlengkapan pemeriksaan standar	– S. Hadisusilo
2.	Thermometer	–	– 1 – 18° C	0,05	–	– I. Gde Mangku
		–	17 – 35° C	0,5	–	
		–	34 – 52° C	0,5	–	
		–	51 – 68° C	0,5	–	
		–	67 – 85° C	0,5	–	
		–	84 – 102° C	0,5	–	
		–	– 200 – 30° C	0,5	–	
		–	– 100 – 30° C	0,1	–	
		–	– 58 – 4° C	0,1	–	
		–	– 2 – 52° C	0,1	–	
		–	46 – 102° C	0,1	–	
		–	96 – 152° C	0,1	–	
		–	146 – 202° C	0,1	–	
		–	198 – 252° C	0,1	–	
		–	248 – 302° C	0,1	–	
		–	298 – 360° C	0,1	–	
		–	346 – 402° C	0,1	–	
		–	400 – 600° C	0,5	–	
		–	300 – 700° C	0,5	–	
		–	500 – 1000° C	5,0	–	

Table 3-4 Number of Verification (Initial and Reverification)

	No.	Branch Name	1990				1991					1992				
			Initial Verification		Reverifi-	Total	Initial Verification		Reverifi-	Total	91/90	Initial Verification		Reverifi-	Total	92/91
			Domestic	Imported	cation		Domestic	Imported	cation		%	Domestic	Imported	cation		%
	1	Banda Aceh	0	22	42,431	42,453	0	3	44,741	44,744	105.4	1	10	46,600	46,611	104.2
S	2	Langsa	1	5	9,362	9,368	2	1	9,642	9,645	103.0	3	2	10,102	10,107	104.8
U	3	Medan	21,031	921	112,561	134,513	17,561	1,123	113,044	131,728	97.9	49,508	152	120,128	169,788	128.9
M	4	P.Siantar	39,073	5	26,481	65,559	31,646	6	23,533	55,185	84.2	47,047	4	23,953	71,004	128.7
A	5	Padang	77	25	64,285	64,387	64	14	61,904	61,982	96.3	76	16	56,337	56,429	91.0
T	6	Pekanbaru	46	107	43,335	43,488	53	117	47,325	47,495	109.2	65	191	46,164	46,420	97.7
E	7	Jambi	465	9	19,318	19,792	468	15	17,992	18,475	93.3	460	15	20,397	20,872	113.0
R	8	Palembang	11,127	71	30,622	41,820	2,012	44	29,351	31,407	75.1	60	66	28,427	28,553	90.9
A	9	Lampung	21,572	77	57,185	78,834	22,755	85	60,541	83,381	105.8	26,431	40	61,279	87,750	105.2
	10	Bengkulu	0	4	14,065	14,069	0	1	14,304	14,305	101.7	0	10	14,812	14,822	103.6
	11	Jakarta	203,273	26,260	115,371	344,904	195,275	14,542	114,140	323,957	93.9	226,883	16,310	116,898	360,091	111.2
	12	Bandung	125,432	729	183,043	309,204	235,538	914	186,924	423,376	136.9	271,510	257	185,629	457,396	108.0
	13	Serang	21,748	304	43,096	65,148	66,680	196	44,157	111,033	170.4	77,019	532	45,945	123,496	111.2
	14	Purwakarta	26,585	34	52,195	78,814	38,906	43	51,929	90,878	115.3	44,392	89	52,973	97,454	107.2
	15	Bogor	35,694	75	80,710	116,479	27,542	128	102,669	130,339	111.9	109,575	508	107,499	217,582	166.9
J	16	Tasikmalaya	223,836	0	202,051	425,887	162,363	4	213,837	376,204	88.3	204,827	0	227,221	432,048	114.8
	17	Cirebon	24	83	129,010	129,117	17,458	47	144,093	161,598	125.2	68,868	7,942	146,309	223,119	138.1
	18	Semarang	125,380	3,959	140,121	269,460	185,146	8,277	170,978	364,401	135.2	287,740	15,159	178,833	481,732	132.2
A	19	Tegal	19	21	131,066	131,106	1	37	145,930	145,968	111.3	16,365	21	151,972	168,358	115.3
	20	Pati	717,685	26	125,648	843,359	597,111	93	148,190	745,394	88.4	756,332	28	150,578	906,938	121.7
	21	Purwokerto	23,057	41	146,822	169,920	12,831	12	128,002	140,845	82.9	17,668	395	133,210	151,273	107.4
	22	Surakarta	531,550	1,205	222,212	754,967	450,558	374	225,294	676,226	89.6	532,001	753	211,273	744,027	110.0
W	23	Magelang	0	33	132,560	132,593	0	23	145,387	145,410	109.7	6,450	416	146,335	153,201	105.4
	24	Yogyakarta	111,104	1,111	136,156	248,371	103,848	5,688	137,098	246,634	99.3	84,346	22,567	127,188	234,101	94.9
	25	Surabaya	126,524	35,001	350,418	511,943	111,200	40,230	324,065	475,495	92.9	96,062	18,479	304,389	418,930	88.1
A	26	Jember	1	610	312,819	313,430	0	745	311,654	312,399	99.7	12,158	715	302,649	315,522	101.0
	27	Malang	4,696	37	264,942	269,675	2,290	120	260,265	262,675	97.4	13,111	66	261,781	274,958	104.7
	28	Madiun	274	37	135,948	136,259	87	28	144,372	144,487	106.0	2,518	117	141,789	144,424	100.0
	29	Kediri	0	27	179,138	179,165	0	506	180,093	180,599	100.8	0	34,334	178,077	212,411	117.6
	30	Bojonegoro	2	5	64,595	64,602	83	9	97,454	97,546	151.0	4	12	97,953	97,969	100.4
	31	Pontianak	36	1,539	26,921	28,496	29	767	27,099	27,895	97.9	27	1,486	29,072	30,585	109.6
KALI-	32	Singkawang	451	0	14,017	14,468	440	3	17,219	17,662	122.1	300	5	18,515	18,820	106.6
MANT-	33	Palangkaraya	9	32	24,413	24,454	0	4	23,640	23,644	96.7	10	58	23,747	23,815	100.7
AN	34	Banjarmasin	456	1,904	68,275	70,635	120	3,826	72,733	76,679	108.6	174	5,998	69,999	76,171	99.3
	35	Samarinda	22	47	31,003	31,072	39	36	33,653	33,728	108.5	23	16	40,860	40,899	121.3
	36	Manado	10	43	31,487	31,540	14	1	36,107	36,122	114.5	21	1,180	33,541	34,742	96.2
SULA-	37	Palu	509	108	19,400	20,017	288	8	20,523	20,819	104.0	300	168	22,228	22,696	109.0
WESI	38	U.Pandang	646	61	76,279	76,986	5,506	28	75,045	80,579	104.7	32,207	31	74,606	106,844	132.6
	39	Kendari	0	5	20,856	20,861	47	219	23,496	23,762	113.9	4,116	12	24,906	29,034	122.2
BALI	40	Dempasar	31	914	111,053	111,998	5	231	115,981	116,217	103.8	88	818	114,964	115,870	99.7
TENG-	41	Mataram	0	6	47,688	47,694	0	593	50,507	51,100	107.1	8	2,714	58,021	60,743	118.9
GARA	42	Kupang	0	2	18,286	18,288	0	2	20,041	20,043	109.6	0	14	19,890	19,904	99.3
MALUKU	43	Ambon	0	0	7,615	7,615	11	2	8,920	8,933	117.3	30	1	8,471	8,502	95.2
	44	Ternate	58	159	7,129	7,346	9	4	7,215	7,228	98.4	5	0	7,854	7,859	108.7
IRIAN	45	Jaya Pura	3	5	12,105	12,113	0	1	13,128	13,129	108.4	0	7	13,405	13,412	102.2
JAYA	46	Sorong	0	3	9,196	9,199	0	8	11,195	11,203	121.8	0	8	10,570	10,578	94.4
TIMOR	47	Dili	3	0	4,339	4,342	1	0	5,960	5,961	137.3	0	5	6,775	6,780	113.7
		Total	2,372,510	75,672	4,097,628	6,545,810	2,287,987	79,158	4,261,370	6,628,515	101.3	2,988,789	131,727	4,274,124	7,394,640	111.6

Table 3-5 Number of Verification (Each Measuring Instruments)

1990 Total Number of Verification

	No.	Branch Name	Length (Meteran) (Graduated Scale)	Length (Bamukur) Level Gauge	Length (Bamukur) Tape Measure	Length Total	Mass Weights (Biaga) Class M2 (Ordinary)	Mass Weights (Emas) Class M3 (Gold)	Mass Weights (Obat) Class F2 (Drug)	Mass Weights (Miligram) Class M1	Weights Total	Mass (Simple Equal) Balance (Biaga) Balance (Ordinary)	Mass (Simple Equal) Balance (Emas) Weighting Gold	Mass (Simple Equal) Balance (Obat) Weighting Drug	Simple Balance Total
	1	Banda Aceh	203	0	0	203	25,411	3,510	4	268	29,193	2	316	0	318
S	2	Langsa	34	0	0	34	4,628	1,006	0	261	5,895	2	101	2	105
U	3	Medan	447	0	0	447	67,653	7,421	1,143	1,205	77,422	0	860	178	1,038
M	4	P.Siantar	58	0	0	58	11,810	2,956	78	216	15,060	42	371	13	426
A	5	Padang	599	0	0	599	27,495	6,741	0	522	34,758	166	888	0	1,054
T	6	Pekanbaru	515	0	65	580	15,140	5,887	127	2,215	23,369	7	615	26	648
E	7	Jambi	209	0	0	209	4,917	3,357	0	314	8,588	0	343	0	343
R	8	Palembang	487	0	0	487	12,821	4,188	815	472	18,296	6	390	96	492
A	9	Lampung	108	0	0	108	37,556	4,801	0	1,135	43,492	2	446	18	466
	10	Bengkulu	92	0	0	92	4,817	2,318	47	256	7,438	1	275	4	280
	11	Jakarta	10,537	0	0	10,537	42,061	12,371	6,128	6,811	67,371	0	1,440	982	2,422
	12	Bandung	1,522	0	0	1,522	118,336	5,411	3,321	6,320	133,388	1	500	296	797
	13	Serang	196	0	0	196	22,015	5,770	574	597	28,956	0	600	69	669
	14	Purwakarta	168	0	0	168	32,630	3,169	267	120	36,186	1	244	33	278
	15	Bogor	21,943	0	0	21,943	51,568	5,296	928	461	58,253	3	665	93	761
J	16	Tasikmalaya	525	0	0	525	145,120	3,844	212	360	149,536	6	358	30	394
	17	Cirebon	353	0	0	353	88,509	4,189	880	470	94,048	10	473	70	553
	18	Semarang	376	0	0	376	89,969	14,454	7,085	1,763	113,271	67	1,984	780	2,831
A	19	Tegal	402	0	0	402	93,739	5,730	0	828	100,297	13	553	13	579
	20	Pati	282	0	0	282	789,948	13,362	249	98	803,657	14	584	33	631
	21	Purwokerto	489	0	0	489	107,616	3,972	437	698	112,723	21	369	59	449
	22	Surakarta	183	0	0	183	267,181	6,592	635	11,284	285,692	11	957	0	968
W	23	Magelang	137	0	0	137	101,099	2,968	302	270	104,639	12	342	0	354
	24	Yogyakarta	272	0	0	272	140,893	3,544	0	1,076	145,513	6	423	0	429
	25	Surabaya	1,422	0	0	1,422	227,347	31,183	7,156	27,656	293,342	35	2,765	731	3,531
A	26	Jember	873	0	0	873	218,204	4,296	222	613	223,335	3	407	21	431
	27	Malang	630	0	0	630	190,208	5,955	1,275	723	198,161	40	670	118	828
	28	Madiun	225	0	0	225	101,794	3,299	0	370	105,463	19	275	38	332
	29	Kediri	556	0	0	556	132,438	7,216	339	817	140,810	2	727	39	768
	30	Bojonegoro	187	0	0	187	45,828	3,536	123	166	49,653	12	300	13	325
	31	Pontianak	739	0	0	739	6,461	2,942	350	559	10,312	2	288	43	333
KALI-	32	Singkawang	254	0	0	254	5,992	1,179	0	362	7,533	0	123	0	123
MANT-	33	Palangkaraya	107	0	0	107	16,482	2,078	19	135	18,714	0	195	2	197
AN	34	Banjarmasin	233	0	0	233	39,750	7,991	193	2,792	50,726	0	975	20	995
	35	Samarinda	261	0	0	261	18,120	4,702	255	301	23,378	0	504	33	537
	36	Manado	1,378	0	0	1,378	12,100	3,216	0	0	15,316	0	249	44	293
SULA-	37	Palu	687	0	0	687	7,604	2,057	0	128	9,789	0	236	0	236
WESI	38	U.Pandang	1,451	0	0	1,451	23,197	10,810	0	1,076	35,083	0	1,196	47	1,243
	39	Kendari	594	0	0	594	5,048	1,489	0	656	7,193	0	162	11	173
BALI	40	Dempasar	233	0	0	233	84,277	3,736	759	872	89,644	10	349	82	441
TENG-	41	Mataram	293	0	0	293	33,649	1,757	0	173	35,579	0	177	0	177
GARA	42	Kupang	546	0	0	546	11,300	670	0	149	12,319	0	55	9	64
MALUKU	43	Ambon	214	0	0	214	4,146	505	0	206	4,857	0	47	22	69
	44	Ternate	270	0	0	270	3,115	218	43	134	3,530	0	23	6	29
IRIAN	45	Jaya Pura	253	0	0	253	6,036	571	157	205	6,969	0	52	19	71
JAYA	46	Sorong	260	0	0	260	5,561	468	0	0	6,029	0	30	12	42
TIMOR	47	Dili	136	0	0	136	2,431	144	0	66	2,641	0	10	3	13
		Total	51,939	0	65	52,004	3,504,020	232,875	34,123	76,179	3,847,197	516	23,912	4,108	28,536

1990 Total Number of Verification

(1/3)

(Senti)	(Desi)	(Meja)	(Dacin)	(Kwadran)	(Cepat)	(Pegas)	(Boi)	(Jembatan)	(Elektoro)	(Curah)	(Banberjal)	(Badan)	(Tokok)	(Milisimal)	
Mass															
(Others) Balance and weighing Scal															
Centisimal Bal.	Dosimal Bal.	Potable Dial Scale	Steelyard	Non Linier Bal.	Dial Scale	Spring Bal.	Sliding Poise Bal.	Track Scale	Electric Weig. scale	(Wadah curah)	Conveyer Belt Scale	(Badan)	(Tokok)	Millisimal Bal.	Solution Balance
2,675	0	2,243	3,145	29	18	42	2,034	14	10	0	2	0	0	0	0
589	0	494	1,070	10	2	8	483	13	1	0	0	0	0	0	0
10,801	3	8,805	11,094	70	180	2,200	11,466	249	80	0	0	0	0	0	0
3,526	11	960	4,381	55	78	75	3,747	42	0	0	0	0	0	0	0
2,433	3	4,283	11,421	55	18	55	1,022	15	8	0	0	0	0	0	0
1,828	0	1,691	9,686	43	57	273	4,037	28	24	0	0	0	0	0	0
985	0	298	4,357	40	15	47	1,081	8	3	0	0	0	0	0	0
2,100	6	592	4,529	46	296	110	2,263	27	39	7	1	0	0	0	0
2,839	1	5,140	3,555	22	17	23	751	116	5	3	0	0	0	0	0
556	0	560	1,802	16	13	13	220	9	9	0	0	0	0	0	0
5,542	3	11,623	2,351	102	1,121	1,011	4,380	109	3,003	0	0	0	0	0	0
6,809	6	21,659	13,422	397	913	698	3,308	51	691	0	0	0	0	0	0
1,521	0	3,449	3,507	18	185	62	484	87	283	0	2	0	0	1	0
2,667	0	3,882	6,467	35	138	45	330	48	47	0	0	0	0	0	0
2,501	4	9,580	5,471	18	436	45	1,136	31	252	6	0	0	0	0	0
4,183	1	25,510	15,386	40	59	70	453	7	21	0	0	0	0	0	0
4,664	16	15,116	10,058	35	66	44	494	27	47	21	0	0	0	0	0
9,319	7	17,269	100,796	128	305	101	2,244	27	138	18	0	0	0	0	0
3,903	7	17,040	4,704	81	77	80	147	14	32	3	0	0	0	1	0
3,735	3	19,524	10,776	61	79	67	87	1	22	0	0	0	0	0	0
4,142	1	18,753	6,205	86	35	96	94	17	45	0	0	0	0	0	0
15,508	1	83,303	12,785	106	73	121	128	24	265	0	0	0	0	0	0
3,460	0	18,103	2,265	80	26	86	67	4	19	0	0	0	0	0	0
3,651	0	93,538	846	61	99	68	87	10	22	0	0	0	0	0	0
14,610	1	37,078	15,937	96	695	105	593	205	599	11	0	0	0	1	0
12,317	2	33,289	1,788	40	124	54	82	39	18	0	2	0	0	0	0
11,737	1	31,398	2,373	42	314	68	191	107	40	0	5	0	0	2	0
3,717	4	17,306	4,402	40	48	47	43	23	19	0	0	0	0	0	0
6,407	0	20,992	2,712	67	41	75	38	34	55	3	0	0	0	0	0
2,289	0	7,071	909	11	9	22	20	3	3	0	0	0	0	0	0
1,120	0	163	12,185	42	39	56	888	7	10	0	0	0	0	0	0
1,020	0	97	4,240	2	6	11	469	0	0	0	0	0	0	0	0
331	0	3,118	907	15	4	17	37	0	2	0	0	0	0	0	0
910	0	7,297	1,878	38	52	97	55	7	11	2	0	0	0	0	0
645	1	3,133	1,361	25	76	59	169	8	18	0	0	0	0	0	0
2,085	14	559	3,909	25	39	32	372	9	9	0	0	0	0	0	0
1,210	0	483	2,667	31	23	29	114	0	2	0	0	0	0	0	0
3,583	1	1,889	5,796	61	148	59	481	39	120	96	0	0	0	0	0
344	0	821	1,735	31	21	46	45	3	2	0	1	0	0	0	0
3,356	0	14,291	902	56	73	65	68	8	19	0	0	0	0	0	0
2,110	1	5,282	3,473	39	20	36	29	6	1	0	0	0	0	0	0
671	1	2,068	1,716	38	30	47	68	3	2	0	0	0	0	0	0
327	0	536	1,122	10	13	10	177	0	3	0	0	0	0	0	0
392	0	209	622	19	1	46	22	0	5	0	0	0	0	0	0
238	0	1,126	590	35	25	42	215	1	3	0	0	0	0	0	0
135	0	1,054	313	5	16	17	47	0	4	0	1	0	0	0	0
133	0	401	175	10	9	11	14	0	2	0	0	0	0	0	0
169,624	99	573,076	321,791	2,312	6,132	6,491	44,780	1,480	6,013	170	14	0	0	5	0

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Others Balance Total	Balance Total	Mass Total	Volume (Kering) Can Dry	Volume (Basah) Can Wet	Volume (Pemaras) Supplement of Can	Can Total	Volume (Mobil) Tank Lorry	Volume (Tetap) Storage Tank	Volume (Tongkang) Ship's Tank	Volume (Wagon) Lail Tnaker	Tank Total	Volume (Gelas Takar)	Volume (Pengisioli)	Volume Vessele	Others Total
10,212	10,530	39,723	1,178	374	664	2,216	97	0	0	0	97	0	0	16	16
2,670	2,775	8,670	372	43	213	628	0	0	0	0	0	0	0	3	3
44,948	45,986	123,408	2,391	2,354	3,205	7,950	706	74	0	64	844	0	0	15	15
12,875	13,301	28,361	12,797	13,661	10,297	36,755	0	218	0	0	218	0	0	0	0
19,313	20,367	55,125	5,190	2,941	68	8,199	284	0	0	0	284	0	0	6	6
17,667	18,315	41,684	168	510	52	730	196	41	0	0	237	0	0	7	7
6,834	7,177	15,765	3,056	0	145	3,201	59	5	0	0	64	0	0	4	4
10,016	10,508	28,804	2,057	9,663	8	11,728	385	31	0	0	416	0	0	3	3
12,472	12,938	56,430	2,697	18,005	1,201	21,903	160	1	0	0	161	0	0	0	0
3,198	3,478	10,916	1,371	537	1,050	2,958	27	0	0	0	27	0	0	7	7
29,245	31,667	99,038	86,718	98,116	9,691	194,525	1,425	0	1	0	1,426	0	0	81	81
47,854	48,651	182,039	6,534	25,158	4,006	35,698	435	43	0	0	478	0	0	49	49
9,599	10,268	39,224	7,141	17,366	179	24,686	142	4	0	0	146	0	0	24	24
13,659	13,937	50,123	11,504	16,427	19	27,950	367	2	0	0	369	0	0	0	0
19,480	20,241	78,494	4,831	10,315	117	15,263	362	10	0	0	372	0	0	12	12
45,730	46,124	195,660	60,579	168,822	0	229,401	149	0	0	0	149	0	0	0	0
30,588	31,141	125,189	83	3,052	0	3,135	241	0	0	0	241	0	0	14	14
130,352	133,183	246,454	534	17,032	424	17,990	189	0	0	0	189	0	0	0	0
26,089	26,668	126,965	0	3,254	0	3,254	256	0	0	0	256	0	0	0	0
34,355	34,936	838,643	72	4,151	0	4,223	54	2	0	0	56	0	0	9	9
29,474	29,923	142,846	63	26,302	20	26,385	197	0	0	0	197	0	0	7	7
112,314	113,282	398,974	57,240	242,144	54,800	354,184	381	0	0	0	381	0	0	10	10
24,110	24,464	129,103	0	3,166	0	3,166	0	0	0	0	0	0	0	5	5
98,382	98,811	244,324	0	2,193	0	2,193	198	0	0	0	198	0	0	1	1
69,931	73,462	366,804	6,387	21,912	36	28,335	2,352	11	0	0	2,363	0	0	60	60
47,755	48,186	271,521	0	39,888	0	39,888	256	1	0	0	257	0	0	24	24
46,278	47,106	245,267	0	20,125	0	20,125	433	2	0	0	435	0	0	4	4
25,649	25,981	131,444	248	3,683	0	3,931	188	0	0	0	188	0	0	9	9
30,424	31,192	172,002	0	6,285	0	6,285	0	0	0	0	0	0	0	13	13
10,537	10,662	60,315	0	3,962	0	3,962	21	0	0	0	21	0	0	7	7
14,510	14,843	25,155	17	791	5	813	133	8	17	0	158	0	0	13	13
5,845	5,968	13,501	0	236	0	236	0	0	0	0	0	0	0	0	0
4,431	4,628	23,342	190	656	2	848	11	0	0	0	11	0	0	0	0
10,347	11,342	62,068	3,431	2,600	65	6,096	165	39	17	0	221	0	0	4	4
5,495	6,052	29,410	0	843	0	843	164	116	3	0	283	0	0	19	19
7,053	7,346	22,662	5,470	1,677	72	7,219	120	0	0	0	120	0	0	6	6
4,559	4,795	14,584	2,326	1,594	0	3,920	86	2	0	0	88	0	0	2	2
12,273	13,516	48,599	15,473	10,056	62	25,591	410	13	0	0	423	0	0	14	14
3,049	3,222	10,415	7,374	2,384	0	9,758	41	0	0	0	41	0	0	7	7
18,838	19,279	108,923	105	1,382	2	1,489	139	0	0	0	139	0	0	21	21
10,997	11,174	46,753	0	490	0	490	74	0	0	0	74	0	0	4	4
4,644	4,708	16,827	20	696	20	736	81	0	0	0	81	0	0	11	11
2,198	2,267	7,124	14	128	8	150	50	0	0	0	50	0	0	0	0
1,316	1,345	4,855	1,216	750	2	1,968	14	0	0	0	14	0	0	0	0
2,275	2,346	9,315	431	2,015	0	2,446	35	0	0	0	35	0	0	1	1
1,592	1,634	7,663	48	1,167	0	1,215	21	0	0	0	21	0	0	0	0
755	768	3,409	373	371	22	766	14	2	0	0	16	0	0	2	2
1,131,987	1,160,523	5,007,720	309,699	809,277	86,455	1,205,431	11,118	625	38	64	11,845	0	0	494	494

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(2/3)

Volume Total	(Kadar air) Meter: Standerd Water Met.	(Induk) Meter: Master Meter	(Air) Meter: Water Meter	(Prover) Meter: Prover Tank	(Arus) Meter: Flow Meter	(BBG) Pump: (BBG)	(BBG) Pump: Gasolin Pump	(Taksi) Taxi Meter	(Listrik) Watthour Meter	(ATG) Automatic Temperture and Gravity Selecto	(Cap Kartu) Automatic Card	(Cap Kartu) Non Automatic Card	(Lainlain) Others	Total
2,329	0	0	0	0	20	0	116	0	0	0	4	0	58	42,453
631	0	0	0	0	0	0	33	0	0	0	0	0	0	9,368
8,809	0	3	1,538	0	56	0	252	0	0	0	0	0	0	134,513
36,973	0	0	0	0	20	0	142	0	0	0	4	1	0	65,559
8,489	0	0	0	0	23	0	140	0	0	0	11	0	0	64,387
974	0	0	0	6	100	0	106	0	0	25	9	4	0	43,488
3,269	0	0	457	0	23	0	69	0	0	0	0	0	0	19,792
12,147	0	6	0	0	129	0	247	0	0	0	0	0	0	41,820
22,064	0	0	0	0	13	0	174	0	0	0	44	1	0	78,834
2,992	0	0	0	0	8	0	54	0	0	0	7	0	0	14,069
196,032	0	0	17,167	0	143	0	1,021	18,278	0	0	2,688	0	0	344,904
36,225	0	0	75,880	0	53	0	441	388	12,621	0	29	0	6	309,204
24,856	0	0	624	0	51	0	197	0	0	0	0	0	0	65,148
28,319	0	0	0	0	0	0	173	0	0	0	26	5	0	78,814
15,647	0	0	0	0	0	0	381	0	0	0	14	0	0	116,479
229,550	0	0	0	0	15	0	137	0	0	0	0	0	0	425,887
3,390	0	0	0	0	23	0	140	0	0	0	22	0	0	129,117
18,179	0	20	3,803	0	46	0	335	221	0	0	20	6	0	269,460
3,510	0	0	0	0	6	0	223	0	0	0	0	0	0	131,106
4,288	0	0	0	0	9	0	126	0	0	0	11	0	0	843,359
26,589	0	0	8	0	41	0	147	0	0	0	0	0	0	169,920
354,575	0	0	848	0	4	0	303	80	0	0	0	0	0	754,967
3,171	0	0	0	0	0	0	178	0	0	0	4	0	0	132,593
2,392	0	0	1,013	0	66	0	133	171	0	0	0	0	0	248,371
30,758	0	4	109,245	0	137	0	826	2,578	0	0	120	47	2	511,943
40,169	0	0	587	0	40	0	216	0	0	0	0	0	24	313,430
20,564	0	0	2,916	0	0	0	298	0	0	0	0	0	0	269,675
4,128	0	0	303	0	18	0	141	0	0	0	0	0	0	136,259
6,298	0	0	0	0	7	0	279	0	0	0	23	0	0	179,165
3,990	0	0	0	0	0	0	110	0	0	0	0	0	0	64,602
984	0	0	1,525	0	43	0	38	0	0	0	4	0	8	28,496
236	0	0	451	0	0	0	26	0	0	0	0	0	0	14,468
859	0	0	108	0	21	0	17	0	0	0	0	0	0	24,454
6,321	0	2	1,878	0	23	0	110	0	0	0	0	0	0	70,635
1,145	0	1	61	0	87	0	107	0	0	0	0	0	0	31,072
7,345	0	5	0	0	28	0	122	0	0	0	0	0	0	31,540
4,010	0	3	629	0	36	0	68	0	0	0	0	0	0	29,037
26,028	0	0	587	0	70	0	236	0	0	0	12	3	0	76,986
9,806	0	0	0	0	19	0	25	0	0	0	2	0	0	20,861
1,649	0	0	919	0	34	0	228	0	0	0	0	0	12	111,998
568	0	0	0	0	18	0	58	0	0	0	4	0	0	47,694
828	0	0	0	0	53	0	34	0	0	0	0	0	0	18,238
200	0	0	0	0	44	0	33	0	0	0	0	0	0	7,615
1,982	0	0	215	0	15	0	9	0	0	0	0	0	0	7,346
2,482	0	0	0	0	43	0	19	0	0	0	1	0	0	12,113
1,236	0	0	0	0	28	0	12	0	0	0	0	0	0	9,199
784	0	0	0	0	8	0	5	0	0	0	0	0	0	4,342
1,217,770	0	44	220,762	6	1,621	0	8,285	21,716	12,621	25	3,059	67	110	6,545,810

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	No.	Branch Name	Length (Meteran) (Graduated Scale)	Length (Banukur) Level Gauge	Length (Banukur) Tape Measure	Length Total	Mass (Biaga) (Emas) (Obat) (Miligram) Weights Class M2 (Ordinary)	Weights Class M3 (Gold)	Weights Class F2 (Drug)	Weights Class M1	Weights Total	Mass (Biaga) (Emas) (Obat) (Simple Equal) Balance Balance (Ordinary)	Weighting Gold	Weighting Drug	Simple Balance Total
	1	Banda Aceh	265	0	0	265	26,247	3,509	0	483	30,239	2	337	0	339
S	2	Langsa	82	0	0	82	4,573	1,124	0	140	5,837	6	110	2	118
U	3	Medan	709	0	0	709	65,490	7,348	1,186	1,510	75,534	0	801	152	953
M	4	P.Siantar	67	0	0	67	10,262	2,505	38	118	12,923	27	316	9	352
A	5	Padang	358	0	0	358	26,719	6,788	0	347	33,854	166	891	0	1,057
T	6	Pekanbaru	603	0	58	661	15,443	6,156	544	2,102	24,245	8	622	83	713
E	7	Jambi	205	0	0	205	5,123	3,787	0	261	9,171	0	337	17	354
R	8	Palembang	386	6	10	402	13,364	3,987	569	336	18,256	4	369	68	441
A	9	Lampung	77	0	0	77	39,639	5,492	0	993	46,124	0	458	29	487
	10	Bengkulu	101	0	2	103	4,944	2,184	98	307	7,533	1	248	7	256
	11	Jakarta	8,061	0	0	8,061	44,539	11,913	4,780	5,203	66,435	0	1,479	794	2,273
	12	Bandung	2,048	0	0	2,048	121,318	6,033	3,426	8,025	138,802	0	521	398	919
	13	Serang	151	0	0	151	22,788	5,846	521	528	29,683	0	590	62	652
	14	Purwakarta	204	0	0	204	29,805	2,724	635	342	33,506	2	278	48	328
	15	Bogor	13,573	0	0	13,573	67,488	6,474	1,109	551	75,622	0	885	205	1,090
J	16	Tasikmalaya	527	0	0	527	154,164	3,864	297	285	158,610	8	393	30	431
	17	Cirebon	385	0	0	385	99,190	4,407	637	825	105,059	15	412	86	513
	18	Semarang	882	0	0	882	110,149	13,433	9,269	1,364	134,215	14	1,784	968	2,766
A	19	Tegal	373	0	0	373	104,243	5,874	0	798	110,915	7	606	0	613
	20	Pati	396	0	0	396	691,716	11,896	305	165	704,082	17	587	32	636
	21	Purwokerto	404	0	0	404	93,522	3,463	435	893	98,313	13	325	54	392
	22	Surakarta	594	0	0	594	311,594	2,649	0	15,202	329,445	8	970	0	978
W	23	Magelang	261	0	0	261	108,467	3,896	388	725	113,476	16	400	46	462
	24	Yogyakarta	231	0	0	231	142,836	3,468	0	1,043	147,347	2	419	0	421
	25	Surabaya	3,123	0	0	3,123	210,951	24,456	9,269	27,729	272,405	33	2,217	980	3,230
A	26	Jember	783	0	0	783	191,676	33,450	904	644	226,674	4	419	31	454
	27	Malang	614	0	0	614	186,567	6,460	1,098	729	194,854	72	622	198	892
	28	Madiun	217	0	0	217	108,496	3,517	0	603	112,616	18	292	38	348
	29	Kediri	584	0	0	584	133,344	7,219	349	499	141,411	1	723	46	770
	30	Bojonegoro	270	0	0	270	68,392	6,228	138	254	75,012	16	574	19	609
	31	Pontianak	591	0	0	591	6,597	2,907	397	544	10,445	4	284	50	338
KALI-	32	Singkawang	435	0	0	435	7,236	1,358	48	435	9,077	0	132	6	138
MANT-	33	Palangkaraya	77	0	0	77	15,344	2,248	17	440	18,049	0	222	1	223
AN	34	Banjarmasin	273	0	0	273	41,047	9,693	255	2,868	53,863	3	1,079	26	1,108
	35	Samarinda	265	0	190	455	19,015	5,003	453	323	24,794	0	526	57	583
	36	Manado	968	0	0	968	12,274	3,536	0	0	15,810	0	320	28	348
SULA-	37	Palu	687	0	0	687	8,509	2,011	50	87	10,657	0	218	7	225
WESI	38	U.Pandang	1,874	0	0	1,874	22,327	10,449	25	928	33,729	0	1,148	36	1,184
	39	Kendari	569	0	0	569	5,953	1,694	0	748	8,395	0	184	11	195
BALI	40	Denpasar	291	0	0	291	88,416	3,487	752	812	93,467	4	327	79	410
TENG-	41	Mataram	244	0	0	244	35,642	1,775	116	250	37,783	3	183	9	195
GARA	42	Kupang	575	0	0	575	12,288	725	0	221	13,234	0	63	7	70
MALUKU	43	Ambon	191	0	0	191	4,570	894	0	323	5,787	0	87	16	103
	44	Ternate	264	0	0	264	3,144	386	0	224	3,754	0	31	9	40
IRIAN	45	Jaya Pura	234	0	0	234	6,387	595	316	153	7,451	0	59	22	81
JAYA	46	Sorong	246	0	0	246	6,604	541	0	0	7,145	0	32	11	43
TIMOR	47	Dili	161	0	0	161	3,356	159	0	82	3,597	0	12	5	17
		Total	44,479	6	260	44,745	3,511,758	257,611	38,424	81,442	3,889,235	474	23,892	4,782	29,142

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(1/3)

(Senti)	(Desi)	(Meja)	(Dacin)	(Kwadran)	(Cepat)	(Pegas)	(Boi)	(Jembatan)	(Elektoro)	(Curah)	(Banberjal)	(Badan)	(Tokok)	(Mllisimal)	
Mass															
(Others) Balance and weighing Scal															
Centisimal Bal.	Dosimal Bal.	Potable Dial Scale	Steelyard	Non Linier Bal.	Dial Scale	Spring Bal.	Sliding Poise Bal.	Track Scale	Electric Weig. scale	(Wadah curah)	Conveyer Belt Scale	(Badan)	(Tokok)	Millisimal Bal.	Solution Balance
2,924	1	2,266	3,286	39	30	58	2,170	12	17	0	0	0	0	0	0
650	0	453	1,389	12	2	9	532	18	0	0	0	0	0	0	0
10,822	2	9,021	10,636	67	176	72	10,839	269	137	0	0	0	0	0	0
3,102	5	723	4,356	47	52	67	3,991	49	8	0	0	0	0	0	0
2,390	5	4,078	10,252	41	10	44	1,050	15	6	0	0	0	0	0	0
1,912	0	1,717	11,582	36	86	371	4,427	36	32	0	0	0	0	0	0
1,005	0	315	4,094	37	14	43	1,191	9	2	0	0	0	0	0	0
2,037	7	535	3,413	34	367	117	2,253	34	16	6	1	0	0	0	0
2,749	0	5,253	3,950	26	23	14	701	114	19	5	0	0	0	0	0
576	0	597	1,787	17	13	21	204	5	3	0	0	0	0	0	0
4,938	4	11,208	1,756	105	1,149	1,390	3,950	122	2,795	86	0	0	0	0	0
7,004	4	20,936	13,442	304	995	953	3,344	44	885	3	0	0	0	0	0
1,678	0	3,615	3,580	19	190	81	493	111	405	0	0	0	0	1	0
2,893	0	4,361	8,107	45	141	56	428	51	116	0	0	0	0	0	0
3,010	3	12,282	6,504	24	428	53	1,544	25	262	0	0	0	0	0	0
4,454	2	26,798	16,187	47	57	79	515	9	43	0	0	0	0	0	0
5,091	13	18,406	11,030	41	67	53	566	31	87	0	0	0	0	0	0
9,928	5	21,995	102,030	93	306	95	2,234	41	217	0	0	0	0	0	0
4,208	7	19,293	6,483	77	85	83	168	25	52	3	0	0	0	0	0
4,149	3	21,397	9,796	60	92	69	121	5	41	0	0	0	0	1	0
3,701	3	16,538	5,199	77	40	87	81	20	55	0	0	0	0	0	0
14,399	4	81,675	13,256	113	88	148	160	29	344	0	0	0	0	0	0
3,982	0	19,921	2,709	86	33	99	68	7	18	0	0	0	0	0	0
3,577	0	85,436	865	61	98	66	93	9	28	0	0	0	0	0	0
11,859	2	33,205	6,779	80	697	167	735	225	734	6	0	0	0	2	0
12,479	1	33,752	1,535	44	132	58	86	43	101	0	2	0	0	0	0
11,789	1	31,033	2,182	25	242	51	259	117	83	0	5	0	0	1	0
3,947	1	18,548	4,012	49	38	55	56	23	29	0	0	0	0	0	0
6,766	0	21,027	2,588	69	46	74	42	54	73	2	0	0	0	0	0
3,618	0	10,519	2,100	20	9	56	20	11	8	0	0	0	0	0	0
1,199	0	174	11,958	50	36	65	887	9	21	0	0	0	0	0	0
1,251	0	131	4,940	11	5	12	514	0	1	0	0	0	0	0	0
263	0	2,888	1,118	12	7	24	33	0	3	0	0	0	0	1	0
971	1	7,644	2,559	35	36	129	69	9	9	2	0	0	0	0	0
619	0	3,477	1,643	34	95	106	225	36	44	24	1	0	1	0	0
2,156	14	525	4,020	24	29	18	360	8	12	0	0	0	0	0	0
1,424	0	554	2,904	34	17	41	121	0	4	0	0	0	0	0	0
3,523	1	1,812	4,790	53	134	80	453	41	148	170	1	0	0	0	0
412	0	910	2,232	35	24	58	64	3	4	0	1	0	0	0	0
3,574	0	14,970	798	45	53	63	67	7	60	0	0	0	0	0	0
2,160	0	5,873	3,432	47	14	52	35	6	3	0	0	0	0	0	0
765	1	2,202	1,972	53	10	68	86	2	1	0	0	0	0	0	0
334	0	593	1,396	4	14	5	212	0	9	0	0	0	0	0	0
417	0	192	557	10	0	19	20	1	0	0	0	0	0	0	0
255	0	1,183	595	30	11	30	222	1	6	0	0	0	0	0	0
147	4	1,223	419	10	17	27	51	3	3	0	2	0	0	0	0
190	0	534	253	12	13	13	22	0	1	0	0	0	0	0	0
171,297	94	581,788	320,471	2,294	6,221	5,399	45,762	1,689	6,945	307	13	0	1	6	0

1991 Total Number of Verification

Others Balance Total	Balance Total	Mass Total	Volume (Kering) Can Dry	Volume (Basah) Can Wet	Volume (Pemaras) Supplement of Can	Can Total	Volume (Mobil) Tank Lorry	Volume (Tetap) Storage Tank	Volume (Tongkang) Ship's Tank	Volume (Wagon) Lail Tnaker	Tank Total	Volume (Gelas Takar)	Volume (Pengisioli)	Volume Vessele	Others Total
10,803	11,142	41,381	1,367	616	756	2,739	103	0	0	0	103	0	0	9	9
3,065	3,183	9,020	279	68	158	505	0	0	0	0	0	0	0	0	0
42,041	42,994	118,528	673	2,244	4,007	6,924	592	78	0	37	707	0	0	0	0
12,400	12,752	25,675	9,192	12,650	7,448	29,290	0	0	0	0	0	0	0	1	1
17,891	18,948	52,802	4,646	3,638	36	8,320	269	0	0	0	269	0	0	7	7
20,199	20,912	45,157	284	719	73	1,076	233	41	0	0	274	0	0	19	19
6,710	7,064	16,235	815	451	138	1,404	59	7	0	0	66	0	0	3	3
8,820	9,261	27,517	1,200	1,443	1	2,644	370	77	0	0	447	0	0	13	13
12,854	13,341	59,465	1,788	21,149	468	23,405	174	4	0	0	178	0	0	0	0
3,223	3,479	11,012	1,172	713	1,163	3,048	49	1	0	0	50	0	0	3	3
27,503	29,776	96,211	89,403	93,315	3,694	186,412	1,834	0	0	0	1,834	0	0	84	84
47,914	48,833	187,635	6,006	20,944	4,744	31,694	449	12	0	0	461	0	0	42	42
10,173	10,825	40,508	13,325	36,205	78	49,608	171	0	0	0	171	0	0	30	30
16,198	16,526	50,032	12,528	27,241	21	39,790	581	0	0	0	581	0	0	0	0
24,135	25,225	100,847	1,688	1,889	104	3,681	357	0	0	0	357	0	0	16	16
48,191	48,622	207,232	38,555	127,468	2,093	168,116	139	0	0	0	139	0	0	14	14
35,385	35,898	140,957	50	2,236	0	2,286	256	7	0	0	263	0	0	27	27
136,944	139,710	273,925	15,151	53,606	11,433	80,190	233	0	0	0	233	0	0	0	0
30,484	31,097	142,012	0	3,143	0	3,143	237	0	0	0	237	0	0	0	0
35,734	36,370	740,452	74	4,152	0	4,226	49	2	0	0	51	0	0	5	5
25,801	26,193	124,506	1	15,544	0	15,545	203	0	0	0	203	0	0	17	17
110,216	111,194	440,639	46,646	144,080	43,276	234,002	378	0	0	0	378	0	0	1	1
26,923	27,385	140,861	101	3,943	0	4,044	0	0	0	0	0	0	0	0	0
90,233	90,654	238,001	0	1,880	0	1,880	218	0	0	0	218	0	0	3	3
54,491	57,721	330,126	3,669	19,234	29	22,932	2,482	13	0	60	2,555	0	0	58	58
48,233	48,687	275,361	0	34,927	0	34,927	278	0	0	0	278	0	0	25	25
45,788	46,680	241,534	0	19,100	0	19,100	469	0	0	0	469	0	0	21	21
26,758	27,106	139,722	197	3,941	0	4,138	143	0	0	0	143	0	0	9	9
30,741	31,511	172,922	0	6,146	0	6,146	73	0	0	0	73	0	0	18	18
16,361	16,970	91,982	504	4,550	1	5,055	62	0	0	0	62	0	0	7	7
14,599	14,737	25,182	19	1,033	4	1,056	164	1	6	0	171	0	0	9	9
6,865	7,008	16,080	0	688	0	688	0	0	0	0	0	0	0	3	3
4,349	4,572	22,621	194	633	11	838	16	1	0	0	17	0	0	2	2
11,464	12,572	66,435	3,474	2,303	76	5,853	224	5	9	0	238	0	0	2	2
6,305	6,888	31,682	0	864	0	864	196	51	0	0	247	0	0	21	21
7,166	7,514	25,324	9,511	2,020	45	11,576	115	2	0	0	117	0	0	5	5
5,099	5,324	15,981	2,205	1,463	2	3,670	93	1	0	0	94	0	0	2	2
11,206	12,390	46,119	15,820	10,381	40	26,241	419	3	0	0	422	0	0	24	24
3,743	3,938	12,333	7,734	2,768	0	10,502	46	7	0	0	53	0	0	6	6
19,637	20,047	113,514	121	1,536	0	1,657	150	4	0	0	154	0	0	20	20
11,622	11,817	49,600	15	471	0	486	87	0	0	0	87	0	0	4	4
5,160	5,290	18,464	5	812	3	820	92	0	0	0	92	0	0	10	10
2,567	2,670	8,457	6	139	5	150	55	9	0	0	64	0	0	0	0
1,216	1,256	5,010	1,241	640	0	1,881	30	9	0	0	39	0	0	0	0
2,333	2,414	9,865	880	2,078	6	2,964	31	0	0	0	31	0	0	2	2
1,906	1,949	9,094	46	1,757	0	1,803	22	0	0	0	22	0	0	0	0
1,038	1,055	4,552	16	1,068	41	1,125	14	0	0	0	14	0	0	0	0
1,142,287	1,171,435	5,060,670	290,601	697,889	79,954	1,068,444	12,215	335	15	97	12,662	0	0	542	542

1991 Total Number of Verification

(2/3)

Volume Total	(Kadar air) Meter: Standerd Water Met.	(Induk) Meter: Master Meter	(Air) Meter: Water Meter	(Prover) Meter: Prover Tank	(Arus) Meter: Flow Meter	(BBG) Pump: (BBG)	(BBG) Pump: Gasolin Pump	(Taksi) Taxi Meter	(Listrik) Watthour Meter	(ATG) Automatic Temperture and Gravity Selecto	(Cap Kartu) Automatic Card	(Cap Kartu) Non Automatic Card	(Lainlain) Others	Total
2,851	0	0	0	0	24	0	95	0	0	0	5	0	123	44,744
505	0	0	0	0	1	0	37	0	0	0	0	0	0	9,645
7,631	0	6	4,252	0	66	0	376	158	0	0	1	1	0	131,728
29,291	0	0	0	0	23	0	115	0	0	0	11	3	0	55,185
8,596	0	0	0	0	24	0	147	48	0	0	5	0	2	61,982
1,369	0	0	0	3	102	0	144	0	0	34	24	1		47,495
1,473	0	0	458	0	24	0	80	0	0	0	0	0	0	18,475
3,104	0	11	0	0	111	0	262	0	0	0	0	0	0	31,407
23,583	0	0	0	0	13	0	213	0	0	0	30	0	0	83,381
3,101	0	0	0	0	12	0	74	0	0	0	3	0	0	14,305
188,330	0	0	8,311	0	175	0	1,400	18,023	657	0	2,786	0	3	323,957
32,197	0	1	103,350	0	58	0	507	1,046	96,508	0	23	1	2	423,376
49,809	0	0	20,300	0	25	0	207	20	0	0	0	0	13	111,033
40,371	0	0	0	0	0	0	236	0	0	0	29	6	0	90,878
4,054	0	2	0	0	5	0	338	0	11,516	0	4	0	0	130,339
168,269	0	0	0	0	16	0	160	0	0	0	0	0	0	376,204
2,576	0	0	0	0	19	0	186	22	17,434	0	18	1	0	161,598
80,423	0	9	5,344	0	39	0	402	409	2,946	0	16	5	0	364,401
3,380	0	0	0	0	13	0	190	0	0	0	0	0	0	145,968
4,282	0	0	76	0	12	0	169	0	0	0	7	0	0	745,394
15,765	0	0	0	0	49	0	116	0	0	0	0	0	5	140,845
234,381	0	0	50	0	4	0	478	80	0	0	0	0	0	576,226
4,044	0	0	0	0	0	0	238	0	0	0	6	0	0	145,410
2,101	0	0	5,530	0	70	0	165	536	0	0	0	0	0	246,634
25,545	0	2	107,894	0	56	0	592	3,152	4,813	0	113	79	0	475,495
35,230	0	0	724	0	19	0	252	0	0	0	1	0	29	312,399
19,590	0	0	584	0	15	0	278	60	0	0	0	0	0	262,675
4,290	0	0	101	0	22	0	135	0	0	0	0	0	0	144,487
5,237	0	0	483	0	13	0	328	0	0	0	32	0	0	180,599
5,124	0	0	62	0	0	0	108	0	0	0	0	0	0	97,546
1,236	0	0	750	0	36	0	77	0	0	0	5	0	18	27,895
691	0	0	440	0	0	0	16	0	0	0	0	0	0	17,662
857	0	0	51	0	10	0	28	0	0	0	0	0	0	23,644
6,093	0	2	3,814	0	22	0	40	0	0	0	0	0	0	76,679
1,132	0	0	214	2	98	0	145	0	0	0	0	0	0	33,728
11,698	0	5	0	0	30	0	97	0	0	0	0	0	0	36,122
3,766	0	0	300	0	38	0	47	0	0	0	0	0	0	20,819
26,687	0	3	2,197	0	64	0	241	94	3,281	0	15	4	0	80,579
10,561	0	0	237	0	26	0	34	0	0	0	2	0	0	23,762
1,831	0	0	141	0	43	0	271	120	0	0	0	0	6	116,237
577	0	0	591	0	17	0	66	0	0	0	4	1	0	51,100
922	0	0	0	0	38	0	43	0	0	0	1	0	0	20,043
214	0	3	1	0	35	0	32	0	0	0	0	0	0	8,933
1,920	0	0	7	0	20	0	7	0	0	0	0	0	0	7,225
2,997	0	0	0	0	20	0	12	0	0	0	1	0	0	13,129
1,825	0	0	0	0	18	0	20	0	0	0	0	0	0	11,203
1,139	0	0	0	0	7	0	2	0	0	0	0	0	0	5,961
1,081,648	0	44	266,262	5	1,532	0	9,206	23,768	137,155	34	3,142	103	201	6,628,515

1992 Total Number of Verification

(Meteran) (Banukur) (Biaga) (Emas) (Obat) (Miligram) (Biaga) (Emas) (Obat)

	No.	Branch Name	Length			Length Total	Mass Weights				Weights Total	Mass (Simple Equal) Balance			Simple Balance Total
			(Graduated Scale)	Level Gauge	Tape Measure		Class M2 (Ordinary)	Class M3 (Gold)	Class F2 (Drug)	Class M1		Balance (Ordinary)	Weighting Gold	Weighting Drug	
	1	Banda Aceh	251	0	0	251	27,327	3,577	0	426	31,330	1	341	0	342
S	2	Langsa	63	0	0	63	4,876	1,122	0	219	6,217	2	121	1	124
U	3	Medan	951	0	0	951	70,139	8,732	980	1,854	81,705	0	877	121	998
M	4	P.Siantar	133	0	0	133	9,857	2,887	128	188	13,060	35	342	14	391
A	5	Padang	322	0	0	322	24,635	6,521	521	293	31,970	160	822	69	1,051
T	6	Pekanbaru	394	100	0	494	15,605	6,094	476	1,523	23,698	4	634	54	692
E	7	Jambi	162	0	0	162	5,382	3,831	0	372	9,585	0	316	17	333
R	8	Palembang	281	3	0	284	12,024	4,292	630	521	17,467	2	397	83	482
A	9	Lampung	125	0	0	125	40,577	5,126	44	803	46,550	0	456	22	478
	10	Bengkulu	85	0	0	85	4,875	2,323	211	379	7,788	0	270	25	295
	11	Jakarta	7,554	0	0	7,554	50,634	12,063	5,054	5,510	73,261	0	1,520	893	2,413
	12	Bandung	1,796	0	0	1,796	117,481	5,873	4,091	7,466	134,911	0	494	464	958
	13	Serang	157	0	0	157	22,954	6,372	728	611	30,665	0	638	85	723
	14	Purwakarta	153	0	0	153	30,451	3,192	270	444	34,357	1	316	36	353
	15	Bogor	15,588	0	0	15,588	68,111	7,850	1,482	676	78,119	0	980	140	1,120
J	16	Tasikmalaya	875	0	0	875	164,096	3,496	222	297	168,111	8	341	24	373
	17	Cirebon	331	0	0	331	97,251	4,598	698	489	103,036	18	445	73	536
	18	Semarang	938	0	0	938	122,018	12,332	7,505	1,689	143,544	65	1,632	855	2,552
A	19	Tegal	397	0	0	397	109,149	5,826	0	752	115,727	14	591	6	611
	20	Pati	322	0	0	322	842,105	11,864	325	101	854,395	17	563	33	613
	21	Purwokerto	345	2	4	351	98,501	3,264	606	413	102,784	16	308	74	398
	22	Surakarta	390	0	0	390	293,904	985	0	18,177	313,066	12	954	0	966
W	23	Magelang	223	0	0	223	112,170	3,645	359	705	116,879	13	370	44	427
	24	Yogyakarta	212	0	0	212	104,719	3,558	0	1,126	109,403	6	393	4	403
	25	Surabaya	1,525	0	0	1,525	201,299	23,426	8,028	23,928	256,681	27	2,043	893	2,963
A	26	Jember	816	0	0	816	214,057	4,185	275	509	219,026	0	413	28	441
	27	Malang	541	0	0	541	190,315	6,668	743	708	198,434	26	747	112	885
	28	Madium	199	0	0	199	107,225	3,440	0	535	111,200	14	290	35	339
	29	Kediri	516	0	0	516	131,946	6,902	446	676	139,970	2	711	50	763
	30	Bojonegoro	271	0	0	271	68,793	6,458	189	315	75,755	14	590	23	627
	31	Pontianak	635	0	0	635	6,900	3,180	520	657	11,257	4	313	62	379
KALI-	32	Singkawang	473	0	0	473	7,820	1,412	53	431	9,716	1	139	6	146
MANT-	33	Palangkaraya	52	0	0	52	15,401	2,540	0	257	18,198	0	219	0	219
AN	34	Banjarmasin	274	0	0	274	39,123	11,174	279	1,245	51,821	6	1,104	24	1,134
	35	Samarinda	313	0	2	315	23,570	5,441	182	286	29,479	0	592	19	611
	36	Manado	1,071	0	0	1,071	12,778	3,509	0	0	16,287	0	300	28	328
SULA-	37	Palu	554	0	0	554	9,609	2,212	12	155	11,988	0	224	4	228
WESI	38	U.Pandang	1,328	0	0	1,328	22,896	10,412	0	876	34,184	0	1,164	24	1,188
	39	Kendari	586	0	0	586	6,256	1,812	0	562	8,630	0	198	7	205
BALI	40	Denpasar	275	0	0	275	87,669	3,585	776	716	92,746	4	350	79	433
TENG-	41	Mataram	335	0	0	335	41,044	1,943	137	311	43,435	3	201	18	222
GARA	42	Kupang	490	0	0	490	12,214	749	37	177	13,177	0	56	12	68
MALUKU	43	Ambon	191	0	0	191	4,603	756	0	245	5,604	0	72	23	95
	44	Ternate	323	0	0	323	3,242	365	0	160	3,767	0	24	9	33
IRIAN	45	Jaya Pura	234	0	0	234	6,311	613	354	345	7,623	0	63	38	101
JAYA	46	Sorong	221	0	0	221	6,262	541	0	0	6,803	0	26	10	36
TIMOR	47	Dili	176	0	0	176	3,743	199	0	62	4,004	0	13	7	20
		Total	43,447	105	6	43,558	3,671,917	230,945	36,361	78,190	4,017,413	475	23,973	4,648	29,096