

Table 3-11 Mass-Balance of Verification (Initial and Reverification)

Mass-Balance

No.	Branch Name	90				91				92			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	3	10,527	10,530	11,141	11,142	1	3	3,942	3,959	11,577	11,581
2	Langsa	1	1	2,775	2,775	3,181	3,183	0	0	3,183	3,183	3,127	3,130
3	Medan	11,458	44	34,484	45,986	34,209	42,994	46	98	8,258	35,501	43,857	43,857
4	P.Siamar	2,986	2	10,313	13,301	9,613	12,752	6	1	2,884	9,489	12,374	12,374
5	Padang	2	4	20,361	20,367	18,957	18,948	11	6	0	17,636	17,642	17,642
6	Pekabaru	1	11	18,303	18,315	20,902	20,912	10	14	0	20,389	20,403	20,403
7	Jambi	0	2	7,175	7,177	7,060	7,064	2	1	0	6,738	6,737	6,738
8	Pakembang	0	20	10,488	10,508	9,249	9,261	10	10	5	9,056	9,071	9,071
9	Lampung	0	28	12,910	12,938	13,321	13,341	20	17	0	13,778	13,778	13,778
10	Bengkulu	0	2	3,476	3,478	3,478	3,478	1	3	0	3,556	3,559	3,559
11	Jakarta	3,422	3,204	25,041	31,667	23,830	29,776	3,131	3,959	3,942	24,667	32,568	32,568
12	Bandung	942	329	47,380	48,651	47,347	48,523	324	233	1,729	48,523	50,485	50,485
13	Serang	0	50	10,218	10,268	10,655	10,825	170	97	0	11,210	11,307	11,307
14	Purwakarta	0	15	13,922	13,937	16,507	16,526	19	54	0	16,497	16,551	16,551
15	Bogor	311	36	19,894	20,241	24,665	25,225	52	204	540	28,184	28,928	28,928
16	Tasikmalaya	0	0	46,124	46,124	48,622	48,622	0	0	0	52,143	52,143	52,143
17	Cirebon	0	50	31,091	31,141	35,883	35,898	15	3	0	40,510	40,513	40,513
18	Semarang	97,955	57	35,171	133,183	44,590	159,710	73	151	111,330	41,568	153,049	153,049
19	Tegal	12,955	1	26,567	26,668	31,086	31,097	11	11	0	32,363	32,374	32,374
20	Pati	0	2	22,029	34,986	25,423	36,370	7	1	12,087	24,427	36,515	36,515
21	Purwokerto	27	6	29,890	29,923	26,188	26,193	5	17	0	27,730	27,747	27,747
22	Surakarta	70,881	261	42,140	113,282	41,004	111,194	311	312	80,335	43,095	123,742	123,742
23	Magelang	0	7	24,457	24,464	27,385	27,385	0	1	0	25,777	25,777	25,777
24	Yogyakarta	72,848	7	25,956	98,811	27,337	90,654	8	8	74,785	53,598	99,825	99,825
25	Surabaya	11,772	229	61,461	73,462	54,689	57,721	216	267	2,135	53,598	56,000	56,000
26	Jember	1,778	4	48,182	48,186	48,674	48,687	13	9	0	48,074	48,083	48,083
27	Malang	0	27	45,301	47,106	44,925	46,680	49	12	1,513	45,987	47,422	47,422
28	Madun	0	7	25,974	25,981	27,100	27,106	6	2	0	26,749	26,751	26,751
29	Kediri	0	6	31,186	31,192	31,501	31,511	10	3	0	31,270	31,273	31,273
30	Bojonegoro	0	1	10,661	10,662	16,945	16,970	5	6	2	17,058	17,066	17,066
31	Poniamak	0	6	14,837	14,843	14,735	14,737	4	1	0	15,705	15,706	15,706
32	Singkarang	0	0	5,968	5,968	7,003	7,003	0	1	0	7,451	7,452	7,452
33	Pilangkaraya	1	1	4,626	4,628	4,572	4,572	0	0	0	4,534	4,534	4,534
34	Benjarmasin	74	12	11,256	11,342	12,455	12,572	7	14	100	11,755	11,869	11,869
35	Samarinda	0	2	6,030	6,032	6,887	6,888	1	4	0	8,288	8,292	8,292
36	Manado	0	2	7,346	7,346	7,513	7,514	1	22	0	7,562	7,584	7,584
37	Pali	0	1	4,794	4,795	5,316	5,324	8	4	0	5,964	5,968	5,968
38	U.Pandang	1	23	13,492	13,516	12,578	12,590	11	9	6	12,120	12,135	12,135
39	Kendari	0	3	3,219	3,222	3,937	3,938	1	1	0	4,026	4,027	4,027
40	Depressur	0	12	19,267	19,279	20,602	20,647	45	25	0	19,958	19,983	19,983
41	Manaran	0	6	11,168	11,174	11,817	11,817	0	6	0	13,259	13,265	13,265
42	Kumpang	0	2	4,706	4,708	5,230	5,230	0	0	0	5,230	5,230	5,230
43	Ambon	0	0	2,267	2,267	2,670	2,670	0	0	4	2,396	2,400	2,400
44	Teratae	0	0	1,345	1,345	1,256	1,256	0	0	0	1,335	1,335	1,335
45	Jaya Pira	0	0	2,346	2,346	2,414	2,414	0	3	0	2,476	2,479	2,479
46	Sorong	0	0	1,634	1,634	1,943	1,949	6	0	0	1,928	1,928	1,928
47	Dili	1	0	767	768	1,054	1,055	0	1	0	1,262	1,263	1,263
Total		287,416	4,486	868,621	1,160,523	906,627	1,171,435	4,616	5,594	299,659	920,450	1,225,705	1,225,705

Table 3-12 Volume of Verification (Initial and Reverification)

Volume Total

No.	Branch Name	90				91				92			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	0	2,329	0	0	2,851	0	0	0	0	2,851	
2	Langsa	0	0	631	0	0	505	0	0	0	0	505	
3	Medan	5,381	0	3,428	0	0	3,317	0	0	0	0	7,631	
4	P.Siantar	35,473	0	1,500	0	0	27,752	0	0	0	0	29,291	
5	Padang	75	0	8,489	0	0	8,596	0	0	0	0	8,596	
6	Pekalongan	45	0	929	0	0	1,316	0	0	0	0	1,273	
7	Jambi	8	0	3,261	0	0	1,465	0	0	0	0	1,473	
8	Palembang	11,127	0	1,020	0	0	1,094	0	0	0	0	1,153	
9	Lampung	21,572	0	492	0	0	22,755	0	0	0	0	23,583	
10	Bengkulu	0	0	2,992	0	0	3,101	0	0	0	0	3,101	
11	Jakarta	189,474	0	6,538	0	7	184,904	0	0	0	0	188,350	
12	Bandung	30,961	0	5,264	0	0	36,225	0	0	0	0	32,197	
13	Serang	21,338	0	3,518	0	0	24,856	0	0	0	0	49,809	
14	Purwokerto	26,385	0	1,734	0	0	38,906	0	0	0	0	40,571	
15	Bogor	11,392	0	4,255	0	0	128	0	0	0	0	4,054	
16	Tasikmalaya	223,836	0	5,714	0	0	162,363	0	0	0	0	168,269	
17	Cirebon	24	0	3,366	0	0	3,390	0	0	0	0	2,576	
18	Semarang	14,228	0	3,951	0	0	18,179	0	0	0	0	80,423	
19	Tegal	19	0	3,491	0	0	3,510	0	0	0	0	3,379	
20	Pati	2	0	4,286	0	0	4,288	0	0	0	0	4,282	
21	Purwokerto	23,006	0	3,583	0	0	12,831	0	0	0	0	15,765	
22	Surakarta	331,627	0	22,948	0	0	209,820	0	0	0	0	234,381	
23	Magelang	0	0	3,171	0	0	4,044	0	0	0	0	4,044	
24	Yogyakarta	0	0	2,392	0	0	2,095	0	0	0	0	2,101	
25	Surabaya	811	0	29,047	0	0	30,758	0	0	0	0	25,545	
26	Jember	1	0	40,168	0	0	35,230	0	0	0	0	35,230	
27	Malang	2	0	20,562	0	0	19,590	0	0	0	0	19,590	
28	Madian	0	0	4,128	0	0	4,290	0	0	0	0	4,290	
29	Kediri	0	0	6,298	0	0	6,237	0	0	0	0	6,237	
30	Bojonegoro	2	0	3,988	0	0	5,123	0	0	0	0	5,124	
31	Pontianak	36	0	948	0	0	1,207	0	0	0	0	1,236	
32	Singkarang	0	0	236	0	0	691	0	0	0	0	859	
33	Palangkaraya	0	0	859	0	0	857	0	0	0	0	830	
34	Banjarmasin	69	2	6,250	0	0	6,083	0	0	0	0	5,962	
35	Samarinda	22	0	1,123	0	0	1,063	0	0	0	0	1,812	
36	Marado	10	0	7,335	0	0	11,684	0	0	0	0	8,376	
37	Palu	9	0	4,001	0	0	3,760	0	0	0	0	3,610	
38	UPandang	58	0	25,970	0	0	26,654	0	0	0	0	26,621	
39	Kendari	0	0	9,806	0	0	10,550	0	0	0	0	11,577	
40	Dempasar	1	0	1,648	0	0	1,831	0	0	0	0	1,476	
41	Maunram	0	0	568	0	0	571	0	0	0	0	751	
42	Kupang	0	0	828	0	0	922	0	0	0	0	828	
43	Ambon	0	0	200	0	0	214	0	0	0	0	220	
44	Ternate	0	0	1,982	0	0	1,911	0	0	0	0	2,371	
45	Jaya Pura	3	0	2,479	0	0	2,997	0	0	0	0	2,950	
46	Sorong	0	0	1,236	0	0	1,825	0	0	0	0	1,593	
47	DIY	2	0	782	0	0	1,139	0	0	0	0	1,300	
	Total	947,199	2	270,569	2	7	815,589	7	7	7	7	1,081,648	
				1,217,770			266,052			26	26	235,430	
												1,207,667	

Table 3-13 Can of Verification (Initial and Reverification)

Can (Volume)

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Benda Aceh	0	0	2,216	0	0	2,739	0	0	2,739	0	0	3,108
2	Langsa	0	0	628	0	0	505	0	0	505	0	0	668
3	Medan	5,274	0	7,950	4,195	0	2,729	0	0	6,924	0	0	5,614
4	P.Siantar	35,255	0	1,500	27,752	0	36,755	0	0	29,290	0	0	33,468
5	Padang	0	0	8,199	0	0	8,320	0	0	8,320	0	0	5,851
6	Pekbaru	0	0	730	0	0	1,076	0	0	1,076	0	0	1,002
7	Jambi	0	0	3,201	0	0	1,404	0	0	1,404	0	0	1,312
8	Palembang	11,068	0	660	1,968	0	676	0	0	2,644	0	0	677
9	Lampung	21,570	0	333	22,752	0	653	0	0	23,405	0	0	26,773
10	Bengkulu	0	0	2,958	0	0	3,048	0	0	3,048	0	0	3,290
11	Jakarta	189,119	0	5,406	184,447	0	1,965	0	0	186,412	0	0	182,640
12	Bandung	30,910	0	4,788	26,874	0	4,820	0	0	31,694	0	0	27,584
13	Sarang	21,319	0	3,267	24,686	0	3,266	0	0	49,608	0	0	2,885
14	Purwakarta	26,416	0	1,534	38,558	0	1,232	0	0	39,790	0	0	45,389
15	Bogor	11,304	0	3,959	100	0	3,581	0	0	1,681	0	0	4,519
16	Tasikmalaya	223,832	0	5,569	162,363	0	5,753	0	0	204,827	0	0	210,571
17	Cirebon	0	0	3,135	0	0	2,286	0	0	2,286	0	0	1,920
18	Semarang	14,228	0	3,762	75,163	0	5,027	0	0	80,190	0	0	3,863
19	Tegal	0	0	3,254	0	0	3,143	0	0	3,143	0	0	3,084
20	Pati	0	0	4,223	0	0	4,226	0	0	4,226	0	0	3,787
21	Purwokerto	22,997	0	3,388	12,827	0	2,718	0	0	15,545	0	0	1,961
22	Surakarta	331,424	0	22,760	209,662	0	24,340	0	0	234,002	0	0	11,668
23	Magelang	0	0	3,166	0	0	4,044	0	0	4,044	0	0	3,216
24	Yogyakarta	0	0	2,193	0	0	1,880	0	0	1,880	0	0	1,207
25	Surabaya	2	0	28,333	0	0	22,932	0	0	22,932	0	0	18,416
26	Jember	0	0	39,888	0	0	34,927	0	0	34,927	0	0	34,084
27	Malang	0	0	20,125	0	0	19,100	0	0	19,100	0	0	16,164
28	Madani	0	0	3,931	0	0	4,138	0	0	4,138	0	0	3,273
29	Kediri	0	0	6,285	0	0	6,146	0	0	6,146	0	0	5,673
30	Bojonegoro	0	0	3,962	0	0	5,055	0	0	5,055	0	0	4,612
31	Ponianak	0	0	813	0	0	1,056	0	0	1,056	0	0	1,198
32	Singawang	0	0	236	0	0	688	0	0	688	0	0	855
33	Palangkaraya	0	0	848	0	0	838	0	0	838	0	0	810
34	Banjarmasin	0	0	6,096	0	0	5,853	0	0	5,853	0	0	5,718
35	Samarinda	0	0	843	0	0	864	0	0	864	0	0	1,567
36	Manado	0	0	2,219	0	0	11,576	0	0	11,576	0	0	8,250
37	Pili	0	0	3,920	0	0	3,670	0	0	3,670	0	0	3,520
38	U.Pandang	0	0	25,591	0	0	26,241	0	0	26,241	0	0	26,234
39	Kendari	0	0	9,758	0	0	10,502	0	0	10,502	0	0	11,524
40	Dempasar	0	0	1,489	0	0	1,657	0	0	1,657	0	0	1,320
41	Mataram	0	0	490	0	0	486	0	0	486	0	0	652
42	Kupang	0	0	736	0	0	820	0	0	820	0	0	708
43	Arabon	0	0	150	0	0	150	0	0	150	0	0	178
44	Terate	0	0	1,968	0	0	1,881	0	0	1,881	0	0	2,341
45	Jaya Pura	0	0	2,446	0	0	2,964	0	0	2,964	0	0	2,909
46	Sorong	0	0	1,215	0	0	1,803	0	0	1,803	0	0	1,566
47	Dili	0	0	766	0	0	1,125	0	0	1,125	0	0	1,281
	Total	944,718	0	260,713	813,003	0	255,441	0	0	1,068,444	0	0	224,338
				1,205,431									1,193,871

Table 3-14 Tank of Verification (Initial and Reverification)

Tank (Volume)

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	0	97	0	0	103	0	0	103	0	0	112
2	Lampung	0	0	0	0	0	0	0	0	0	0	0	0
3	Medan	107	0	844	119	0	588	0	150	707	0	0	755
4	P.Siantar	218	0	218	0	0	0	0	0	0	0	0	8
5	Padang	45	0	209	64	0	205	0	76	269	0	0	261
6	Pekalongan	45	0	192	53	0	221	0	64	274	0	0	328
7	Jambi	8	0	56	3	0	58	0	3	66	0	0	77
8	Palembang	59	0	357	42	0	405	0	55	447	0	0	516
9	Lampung	2	0	159	3	0	175	0	31	178	0	0	195
10	Bengkulu	0	0	27	0	0	50	0	0	50	0	0	59
11	Jakarta	322	0	1,426	424	0	1,410	0	554	1,834	0	0	1,935
12	Bandung	17	0	461	11	0	450	0	8	461	0	0	495
13	Serang	18	0	128	38	0	133	0	19	171	0	0	181
14	Purwakarta	169	0	200	348	0	233	0	223	581	0	0	493
15	Bogor	88	0	284	28	0	329	0	14	357	0	0	319
16	Tasikmalaya	4	0	145	0	0	149	0	0	139	0	0	136
17	Cirebon	24	0	217	24	0	239	0	23	263	0	0	267
18	Semarang	0	0	189	2	0	231	0	63	233	0	0	319
19	Tegal	19	0	237	1	0	236	0	8	237	0	0	246
20	Pati	2	0	54	0	0	51	0	0	51	0	0	52
21	Purwokerto	9	0	188	4	0	199	0	8	203	0	0	224
22	Surakarta	203	0	178	158	0	220	0	213	378	0	0	425
23	Magelang	0	0	0	0	0	0	0	0	0	0	0	0
24	Yogyakarta	0	0	198	6	0	212	0	0	218	0	0	256
25	Surabaya	791	0	1,572	1,027	0	1,528	0	744	2,535	20	0	2,324
26	Jember	1	0	256	0	0	278	0	1	278	0	0	291
27	Malang	2	0	435	0	0	469	0	3	469	0	0	379
28	Madura	0	0	188	0	0	143	0	0	143	0	0	137
29	Kediri	0	0	0	0	0	73	0	0	73	0	0	244
30	Bojonegoro	0	0	21	1	0	61	0	2	62	0	0	63
31	Ponbana	36	0	122	28	0	143	0	27	171	0	0	155
32	Singawang	0	0	0	0	0	0	0	0	0	0	0	0
33	Palingkaya	0	0	11	0	0	17	0	10	17	0	0	30
34	Benjarasin	67	0	154	10	0	228	0	53	238	0	0	295
35	Samarinda	22	0	281	39	0	208	0	21	247	0	0	236
36	Manado	10	0	120	14	0	103	0	21	117	0	0	140
37	Pulu	9	0	88	6	0	88	0	10	94	0	0	100
38	U.Pandang	58	0	365	33	0	389	0	18	422	0	0	354
39	Kendari	0	0	41	0	0	43	0	0	53	0	0	49
40	Dempasar	1	0	138	5	0	149	0	1	154	0	0	144
41	Mataram	0	0	74	0	0	87	0	0	87	0	0	96
42	Kupang	0	0	81	0	0	92	0	0	92	0	0	101
43	Ambon	0	0	50	11	0	53	0	1	64	0	0	43
44	Terate	0	0	14	9	0	30	0	5	39	0	0	35
45	Jaya Pura	3	0	32	0	0	31	0	0	31	0	0	41
46	Sorong	0	0	21	0	0	22	0	0	22	0	0	23
47	Timor	2	0	14	0	0	14	0	0	14	0	0	18
	Total	2,391	0	9,454	2,526	0	10,136	0	2,429	12,662	20	0	10,947
	Total			11,845			10,136		2,429	12,662			12,947

Table 3-15 Flow Meter of Verification (Initial and Reverification)

Flow Meter

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	0	20	0	0	24	24	0	0	7	18	25
2	Langsa	0	0	0	1	0	0	0	0	0	0	0	0
3	Medan	0	1	55	4	4	66	66	4	4	4	58	62
4	P.Siamar	0	0	20	0	0	23	23	0	0	2	20	22
5	Padang	0	3	20	0	0	24	24	0	0	0	8	8
6	Pekanbaru	0	3	97	8	8	102	102	0	0	32	107	139
7	Jambi	0	2	2	0	0	24	24	1	1	1	24	24
8	Palembang	0	15	114	0	0	111	111	0	0	1	131	132
9	Lampung	0	0	13	0	0	13	13	0	0	0	0	0
10	Bengkulu	0	0	8	0	0	12	12	0	0	0	6	6
11	Jakarta	0	5	138	0	5	170	175	0	0	65	199	264
12	Bandung	0	4	49	0	0	58	58	0	0	0	70	70
13	Serang	0	0	51	0	0	25	25	0	0	0	25	25
14	Purwakarta	0	0	0	0	0	0	0	0	0	0	0	0
15	Rogor	0	0	0	0	0	5	5	0	0	0	0	0
16	Taskmalaya	0	0	15	0	0	16	16	0	0	0	16	16
17	Cirebon	0	0	23	0	0	19	19	0	0	0	12	20
18	Semarang	0	0	46	0	0	39	39	0	0	0	77	77
19	Tegal	0	0	6	0	0	13	13	0	0	0	7	7
20	Pati	0	1	8	0	1	11	12	0	0	0	11	11
21	Purwokerto	0	9	32	0	0	49	49	0	0	0	49	49
22	Surakarta	0	0	4	0	0	4	4	0	0	0	4	4
23	Magelang	0	0	0	0	0	0	0	0	0	0	0	0
24	Yogyakarta	0	0	66	0	1	69	70	0	0	0	51	51
25	Surabaya	0	15	122	0	7	137	149	0	0	3	153	156
26	Jember	0	0	40	0	3	43	43	0	0	0	43	43
27	Malang	0	0	0	0	0	15	15	0	0	1	16	16
28	Madiun	0	0	18	0	0	22	22	0	0	0	17	17
29	Kediri	0	0	7	0	0	13	13	0	0	0	22	22
30	Bojonegoro	0	0	0	0	0	0	0	0	0	0	7	7
31	Ponorok	0	0	43	0	0	36	36	0	0	3	58	61
32	Singawang	0	0	0	0	0	0	0	0	0	0	0	0
33	Palangkaraya	0	0	21	0	0	10	10	0	0	0	23	32
34	Banjarmasin	0	0	23	0	2	20	22	0	0	9	40	49
35	Samarinda	0	7	80	0	6	92	98	0	0	6	77	83
36	Manado	0	2	26	0	0	30	30	0	0	1	39	40
37	Palu	0	2	34	0	0	38	38	0	0	1	41	42
38	U.Pandang	0	3	67	0	0	64	64	0	0	0	71	71
39	Kendari	0	0	19	0	9	17	26	0	0	1	21	22
40	Dempasar	0	0	34	0	5	38	43	0	0	4	35	39
41	Mataran	0	0	18	0	2	15	17	0	0	0	19	19
42	Kupang	0	0	53	0	0	38	38	0	0	0	45	45
43	Ambon	0	0	44	0	0	35	35	0	0	0	36	36
44	Ternate	0	3	12	0	4	16	20	0	0	0	41	41
45	Jaya Pura	0	3	40	0	0	20	20	0	0	2	48	50
46	Sorong	0	3	25	0	2	16	18	0	0	8	19	27
47	Dili	0	0	8	0	0	7	7	0	0	0	7	7
	Total	0	81	1,540	0	60	1,472	1,532	8	160	1,753	1,921	1,921

Table 3-16 Water Meter of Verification (Initial and Reverification)

Water Meter

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	0	0	0	0	0	0	0	0	0	0	
2	Langsa	0	0	0	0	0	0	0	0	0	0	0	
3	Medan	689	849	0	1,538	3,238	1,014	4,252	0	5,109	0	5,109	
4	P.Siuntar	0	0	0	0	0	0	0	0	0	0	0	
5	Padang	0	0	0	0	0	0	0	0	0	0	0	
6	Pekanbaru	0	0	0	0	0	0	0	0	0	42	42	
7	Jambi	457	0	0	457	458	0	458	0	457	2,390	2,847	
8	Pelambang	0	0	0	0	0	0	0	0	0	0	0	
9	Lampung	0	0	0	0	0	0	0	0	0	40	40	
10	Bengkulu	0	0	0	0	0	0	0	0	0	0	0	
11	Bengkulu Jakarta	0	16,191	976	17,167	0	8,311	8,311	0	470	7,275	7,745	
12	Banding	75,880	0	0	75,880	103,350	0	103,350	0	117,276	0	117,276	
13	Sarang	410	214	0	624	20,300	0	20,300	0	28,880	26	28,906	
14	Purwakarta	0	0	0	0	0	0	0	0	0	0	0	
15	Rogor	0	0	0	0	0	0	0	0	0	0	0	
16	Tasikmalaya	0	0	0	0	0	0	0	0	0	0	0	
17	Cirebon	0	0	0	0	0	0	0	0	391	0	391	
18	Semarang	0	3,803	0	3,803	0	5,207	5,207	137	0	14,970	14,970	
19	Tegal	0	0	0	0	0	0	0	0	0	0	0	
20	Pati	0	0	0	0	0	76	76	0	0	0	0	
21	Purwokerto	0	8	0	8	0	0	0	0	690	328	1,018	
22	Surakarta	0	796	52	848	0	50	50	0	409	0	409	
23	Magelang	0	0	0	0	0	0	0	0	428	314	742	
24	Yogyakarta	117	896	0	1,013	66,750	5,530	5,530	0	37,480	3,191	3,193	
25	Surabaya	72,766	33,960	2,519	109,245	0	38,600	38,600	2,544	16,334	9	53,823	
26	Jember	0	587	0	587	584	724	724	0	498	0	498	
27	Malang	2,916	0	0	2,916	584	0	584	0	571	0	571	
28	Maduin	274	29	0	303	87	14	101	0	534	104	639	
29	Kediri	0	0	0	0	0	483	483	0	627	1	628	
30	Bojonegoro	0	0	0	0	62	0	62	0	0	0	0	
31	Pontianak	0	1,525	0	1,525	0	750	750	0	1,472	0	1,472	
32	Singkarang	451	0	0	451	440	0	440	0	300	0	300	
33	Palangkaraya	8	28	72	108	0	51	51	51	40	80	120	
34	Banjarnasin	0	1,878	0	1,878	0	3,814	3,814	0	5,928	110	6,038	
35	Sumarinda	0	0	61	61	0	0	0	214	0	731	731	
36	Manado	0	0	0	0	0	0	0	0	1,150	0	1,150	
37	Pala	500	100	29	629	282	0	282	18	285	99	384	
38	U.Pandang	587	0	0	587	2,191	0	2,191	6	120	0	120	
39	Kendari	0	0	0	0	36	201	237	0	0	0	0	
40	Depressar	30	889	0	919	0	141	141	0	87	715	802	
41	Mataram	0	0	0	0	0	590	590	1	8	2,695	2,703	
42	Kupang	0	0	0	0	0	0	0	0	0	0	0	
43	Ambon	0	0	0	0	0	0	0	1	1	0	0	
44	Maluku	58	154	3	215	0	0	0	7	7	15	15	
45	Terate	0	0	0	0	0	0	0	0	0	0	0	
46	Jaya Pura	0	0	0	0	0	0	0	0	0	0	0	
47	Sorog	0	0	0	0	0	0	0	0	0	0	0	
47	Dili	0	0	0	0	0	0	0	0	0	0	0	
Total		155,143	61,907	3,712	220,762	197,778	65,505	266,262	2,979	193,584	55,651	252,682	
												3,447	

Table 3-17 Gasolin Meter of Verification (Initial and Reverification)

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	19	97	116	0	2	93	95	0	0	118	
2	Langsa	0	4	29	33	0	0	37	37	0	2	29	
3	Medan	0	27	225	252	0	56	320	376	0	46	436	
4	P.Sianar	0	3	139	142	0	0	145	147	0	0	121	
5	Padang	0	18	122	140	0	1	146	144	0	10	134	
6	Pekanbaru	0	22	84	106	0	32	112	144	0	32	160	
7	Jambi	0	5	64	69	0	13	67	80	0	13	72	
8	Palembang	0	23	224	247	0	18	244	262	0	51	311	
9	Lampung	0	36	138	174	0	58	155	213	0	15	238	
10	Bengkabuh	0	2	52	54	0	0	74	74	0	7	51	
11	Jakarta	0	99	922	1,021	0	161	1,239	1,400	0	213	1,717	
12	Bandung	0	4	437	441	0	47	460	507	0	15	596	
13	Serang	0	40	157	197	0	6	201	236	0	14	239	
14	Purwakarta	0	19	154	173	0	18	218	236	0	21	437	
15	Bogor	0	33	348	381	0	47	391	338	0	45	795	
16	Tasikmalaya	0	0	137	137	0	4	156	160	0	0	178	
17	Cirebon	0	24	116	140	0	8	178	186	0	24	208	
18	Semarang	0	46	289	335	0	49	353	402	0	33	478	
19	Tegal	0	20	203	223	0	26	164	190	0	7	163	
20	Pati	0	23	103	126	0	9	160	169	0	27	199	
21	Purwokerto	0	18	129	147	0	7	109	116	0	12	134	
22	Surakarta	0	68	235	303	0	13	465	508	0	28	528	
23	Magelang	0	26	152	178	0	23	215	238	0	15	248	
24	Yogyakarta	0	37	96	133	0	17	148	165	0	9	209	
25	Surabaya	0	22	804	826	0	29	563	592	0	48	798	
26	Jember	0	19	197	216	0	4	248	252	0	19	275	
27	Malang	0	10	288	298	0	11	267	278	0	17	301	
28	Madiun	0	1	140	141	0	8	127	135	0	11	219	
29	Kediri	0	18	261	279	0	8	320	328	0	24	374	
30	Bojonegoro	0	4	106	110	0	4	104	108	0	6	191	
31	Ponjaneak	0	5	33	38	0	13	64	77	0	9	71	
32	Singawang	0	0	26	26	0	3	13	16	0	4	20	
33	Palangkaraya	0	3	14	17	0	4	24	28	0	9	30	
34	Benjarasin	0	12	98	110	0	3	37	40	0	0	54	
35	Samarinda	0	38	69	107	0	26	119	145	0	6	97	
36	Manado	0	38	84	122	0	0	97	97	0	5	95	
37	Pahu	0	5	63	68	0	0	47	47	0	5	75	
38	UPandang	0	31	205	236	0	12	229	241	0	18	202	
39	Kendari	0	2	23	25	0	8	26	34	0	2	31	
40	Dempeser	0	13	215	228	0	40	231	271	0	11	306	
41	Mataran	0	0	58	58	0	1	65	66	0	31	74	
42	Kupang	0	0	34	34	0	2	41	43	0	14	57	
43	Ambon	0	0	33	33	0	2	30	32	0	1	35	
44	Ternate	0	2	7	9	0	0	7	7	0	0	0	
45	Jaya Pura	0	2	17	19	0	1	11	12	0	2	28	
46	Sorong	0	0	12	12	0	0	20	20	0	0	6	
47	Dili	0	0	5	5	0	0	2	2	0	4	7	
	Total	0	841	7,444	8,285	0	794	8,412	9,206	0	885	11,116	

Table 3-18 Taxi Meter of Verification (Initial and Reverification)

Taxi Meter

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	0	0	0	0	0	0	0	0	0	0	
2	Langsa	0	0	0	0	0	0	0	0	0	0	0	
3	Medan	0	0	0	0	0	158	158	0	0	600	600	
4	P.Siantar	0	0	0	0	0	0	0	0	0	0	0	
5	Padang	0	0	0	0	0	48	48	0	0	151	151	
6	Pekabaru	0	0	0	0	0	0	0	0	0	0	0	
7	Jambi	0	0	0	0	0	0	0	0	0	0	0	
8	Palembang	0	0	0	0	0	0	0	0	1	10	11	
9	Lampung	0	0	0	0	0	0	0	0	0	0	0	
10	Bengkulu	0	0	0	0	0	0	0	0	0	0	0	
11	Jakarta	0	5,245	13,033	18,278	0	2,067	15,956	18,023	0	1,647	13,125	
12	Bandung	0	388	0	388	5	533	508	1,046	4	942	946	
13	Sarang	0	0	0	0	20	0	0	20	421	542	963	
14	Purwakarta	0	0	0	0	0	0	0	0	0	0	0	
15	Bogor	0	0	0	0	0	0	0	0	11	326	587	
16	Tasikmalaya	0	0	0	0	0	0	0	0	0	0	0	
17	Cirebon	0	0	0	0	22	0	0	22	10	26	36	
18	Semarang	0	49	172	221	0	0	409	409	0	423	423	
19	Tegal	0	0	0	0	0	0	0	0	0	0	0	
20	Pati	0	0	0	0	0	0	0	0	0	0	0	
21	Purwokerto	0	0	0	0	0	0	0	0	0	0	0	
22	Surakarta	0	80	0	80	0	0	80	80	0	80	80	
23	Magelang	0	0	0	0	0	0	0	0	0	0	0	
24	Yogyakarta	0	171	0	171	0	132	404	536	0	386	511	
25	Surabaya	0	715	1,863	2,578	0	974	2,178	3,152	0	1,445	1,861	
26	Jember	0	0	0	0	0	0	0	0	0	0	0	
27	Malang	0	0	0	0	60	0	0	60	0	65	100	
28	Madun	0	0	0	0	0	0	0	0	0	0	0	
29	Kediri	0	0	0	0	0	0	0	0	0	0	0	
30	Bojonegoro	0	0	0	0	0	0	0	0	0	0	0	
31	Ponjolak	0	0	0	0	0	0	0	0	0	0	0	
32	Singkawang	0	0	0	0	0	0	0	0	0	0	0	
33	Palangkaraya	0	0	0	0	0	0	0	0	0	0	0	
34	Benjaruasain	0	0	0	0	0	0	0	0	0	0	0	
35	Samarinda	0	0	0	0	0	0	0	0	0	45	45	
36	Manado	0	0	0	0	0	0	0	0	0	107	107	
37	Palu	0	0	0	0	0	0	0	0	0	0	0	
38	UPandang	0	0	0	0	0	0	94	94	0	96	96	
39	Kendari	0	0	0	0	0	0	0	0	0	0	0	
40	Dempasar	0	0	0	0	0	0	120	120	36	103	139	
41	Maharam	0	0	0	0	0	0	0	0	0	0	0	
42	Kupang	0	0	0	0	0	0	0	0	0	0	0	
43	Ambon	0	0	0	0	0	0	0	0	0	0	0	
44	Terbate	0	0	0	0	0	0	0	0	0	0	0	
45	Jaya Pura	0	0	0	0	0	0	0	0	0	0	0	
46	Sorong	0	0	0	0	0	0	0	0	0	0	0	
47	Dili	0	0	0	0	0	0	0	0	0	0	0	
	Total	0	6,648	15,068	21,716	5	3,808	19,955	23,768	21	2,935	19,781	

Table 3-19 Watthour Meter of Verification (Initial and Revirification)

Watthour Meter

No.	Branch Name	1990				1991				1992			
		Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total	Initial Verification		Reverifi- cation	Total
		Domestic	Imported			Domestic	Imported			Domestic	Imported		
1	Banda Aceh	0	0	0	0	0	0	0	0	0	0	0	
2	Langsa	0	0	0	0	0	0	0	0	0	0	0	
3	Medan	0	0	0	0	0	0	0	0	0	0	30,691	
4	P.Siamar	0	0	0	0	0	0	0	0	0	0	11,781	
5	Padang	0	0	0	0	0	0	0	0	0	0	0	
6	Pekabaru	0	0	0	0	0	0	0	0	0	0	0	
7	Lambi	0	0	0	0	0	0	0	0	0	0	0	
8	Palembang	0	0	0	0	0	0	0	0	0	0	0	
9	Lampung	0	0	0	0	0	0	0	0	0	0	0	
10	Bengkulu	0	0	0	0	0	0	0	0	0	0	0	
11	Jakarta	0	0	0	0	657	0	657	0	0	0	57,737	
12	Bandung	12,621	0	0	12,621	96,508	0	96,508	0	0	0	123,143	
13	Serang	0	0	0	0	0	0	0	0	0	0	0	
14	Purwakarta	0	0	0	0	0	0	0	0	0	0	0	
15	Bogor	0	0	0	0	11,516	0	11,516	0	0	0	88,699	
16	Tasikmalaya	0	0	0	0	0	0	0	0	0	0	0	
17	Cirebon	0	0	0	0	17,434	0	17,434	0	0	0	76,351	
18	Semarang	0	0	0	0	2,946	0	2,946	0	7,915	0	29,278	
19	Tegal	0	0	0	0	0	0	0	0	0	0	16,357	
20	Pati	0	0	0	0	0	0	0	0	0	0	11,639	
21	Purwokerto	0	0	0	0	0	0	0	0	0	0	16,996	
22	Surakarta	0	0	0	0	0	0	0	0	28	0	21,615	
23	Magelang	0	0	0	0	0	0	0	0	0	0	6,108	
24	Yogyakarta	0	0	0	0	0	0	0	0	86	0	19,189	
25	Surabaya	0	0	0	0	4,467	346	4,813	0	19,189	0	903	
26	Jember	0	0	0	0	0	0	0	0	681	0	26,476	
27	Malang	0	0	0	0	0	0	0	0	0	0	12,340	
28	Madium	0	0	0	0	0	0	0	0	0	0	11,024	
29	Kediri	0	0	0	0	0	0	0	0	0	0	1,984	
30	Bojonegoro	0	0	0	0	0	0	0	0	33,680	0	33,680	
31	Pontrenak	0	0	0	0	0	0	0	0	0	0	0	
32	Singkawang	0	0	0	0	0	0	0	0	0	0	0	
33	Palangkaraya	0	0	0	0	0	0	0	0	0	0	0	
34	Banjarmasin	0	0	0	0	0	0	0	0	0	0	0	
35	Samarinda	0	0	0	0	0	0	0	0	0	0	0	
36	Manado	0	0	0	0	0	0	0	0	0	0	0	
37	Palu	0	0	0	0	0	0	0	0	0	0	0	
38	U.Pendang	0	0	0	0	0	0	0	0	0	0	0	
39	Kendari	0	0	0	0	3,281	0	3,281	0	0	0	31,766	
40	Depasur	0	0	0	0	0	0	0	0	0	0	4,116	
41	Mataran	0	0	0	0	0	0	0	0	0	0	0	
42	Kupang	0	0	0	0	0	0	0	0	0	0	0	
43	Ambon	0	0	0	0	0	0	0	0	0	0	0	
44	Ternate	0	0	0	0	0	0	0	0	0	0	0	
45	Jaya Pura	0	0	0	0	0	0	0	0	0	0	0	
46	Serong	0	0	0	0	0	0	0	0	0	0	0	
47	Dili	0	0	0	0	0	0	0	0	0	0	0	
	Total	12,621	0	0	12,621	133,206	3,949	137,155	0	65,341	39	610,970	

Table 3-20 ANSWER TO QUESTIONNAIRE ON ELECTRICITY METERS, ETC.

Questions Relating to Electricity Meters	(Organization)	
(Requested by JICA Survey Team)	METBELOSA (Watt-hour Meter Manufacturer)	LMK-PLN (Central Research Institute for Electricity)
1) Type approval test and inspection organizations other than PLN	DOM	None, other than PLN
2) Purchaser, owner of Watt-hour meter	DOM (Govt. ordinance No. 2-1981)	PLN, Koperasi Listrik, Private Apartment, etc.
3) Applicant for inspection (Bearer of charges)	DOM (PLN)	Manufacturers (as to the left)
4) Inspection charges	300 Rp (single phase), 1500Rp (three-phase)	Delivery test: 2,346,000 Rp/10,000 pcs. (large difference according to no. of units)
5) Type approval test charges		2,000,000 Rp (single-phase), 3,000,000 Rp (three-phase)
6) Receivers of inspection charges	DOM	PLN-LMK
7) Financial base of inspection organizations	Items addressed to DOM	Operated on part of the PLN budget
8) No. of inspections per year	More than 220,000 ('91), approximately 840,000 ('92)	5,000,000 units
9) Qualifications of inspectors	Those approved by DOM	Those approved by PLN-LMK
10) Technical standards of type approval tests and inspections	Indonesian Language Version (conforming to IEC)	Inspection : SPLN 57-1 ('91), Delivery test : SLI/SPLN, Type approval test (LMK Technical Standards : conforming to IEC)
11) Delivery test method	Carried out by PLN (SPLN Technical Standards No. 63-'91 ; IEC Pub. 514)	SPLN 63-'91, SLI 024-'85, IEC Pub. 514 (from manufacturers)
12) Total no. of meters installed	Single phase : 13,486, 556 units ('93)	No reply received
13) Types of imported meters	See PLN's reply	Landis & Gyr, Fuji Electric, Ganz, Krezik, etc.
14) Importers	See PLN's reply	No importers (single phase meters)
15) Repair businesses	No repair businesses	No repair businesses
16) No. of electrical accidents	See PLN's reply	No accidents have occurred regarding PLN's facilities
17) Electricity charges system	See "Electricity Charges Schedule" attached	See "Electricity Charges Schedule" attached
18) Method for collecting electricity charges	Door-to-door collection by inspectors, concentrated inspection performance centers (PLN) exist	Amount collected per month by door-to-door collections by PLN employees
19) Measures to prevent theft of electricity	See PLN's reply (items addressed to DIVBNUS)	Changes to design of meter covers, prevention of inversion of measuring device, etc.
20) Presence of penal regulations	See PLN's reply (items addressed to DIVKUMAS)	Penal regulations exist

Table 3-21 MELCOINDA's Demands Regarding the Production and Inspections of Watt-hour Meters

1. Averaging of number of PLN orders from the point of view of producers of Watt-hour meters.
2. Establishment of prices for Watt-hour meters in line with rises in prices and wages.
3. Establishment of measurement term of validity, and recommendations for repair and replacements.
4. Regarding factory inspections, rather than inspection by a third party authority stationed at the factory, inspection in the form of factory authorization (authorization that a manufacturer's facilities and inspection methods are of a certain level) as seen in amendments to the Japanese Measurements Law, may be more appropriate when viewed from overall and futuristic aspects.

Table 3-22 Number of Customers for Electricity by Type of customers

1991/92

PLN Operational Unit/Province	Residential	Industrial	Commercial	Bootal	Gov. Office Building	Publ. Street Lighting	Total	(%)
Region I (ID Ache)	177,008	531	16,142	5,874	1,953	129	201,637	1.63
Region II (North Sumatra)	726,595	2,825	25,350	12,251	3,811	386	771,318	5.22
Region III	388,025	787	23,051	10,018	3,578	346	425,316	3.43
- West Sumatra	252,238	414	9,282	7,254	2,179	289	271,660	2.19
- Riau	135,787	359	13,779	2,764	1,399	57	154,155	1.24
Region IV	532,371	1,153	28,359	10,033	4,476	280	576,687	4.65
- South Sumatra	278,378	496	13,018	4,557	1,953	151	293,563	2.41
- Jambi	64,650	253	5,017	1,282	742	29	71,953	0.58
- Lampung	121,686	292	7,681	2,630	1,017	57	133,263	1.07
- Bengkulu	67,657	107	2,753	1,589	784	33	72,903	0.59
Region V (West Kalimantan)	133,383	403	14,350	2,924	1,647	91	152,798	1.23
Region VI	386,555	1,080	19,587	9,545	4,269	665	421,701	3.40
- Central Kalimantan	52,457	221	4,059	1,503	1,093	65	59,409	0.48
- South Kalimantan	196,185	808	6,885	5,802	1,809	188	211,157	1.70
- East Kalimantan	137,913	351	8,653	2,440	1,367	411	151,135	1.22
Region VII	293,403	594	10,255	5,708	2,705	290	313,985	2.54
- North Sulawesi	219,135	377	6,004	5,182	1,722	245	232,555	1.55
- Central Sulawesi	74,268	217	4,281	1,526	983	44	81,299	0.66
Region VIII	517,998	1,057	17,252	7,443	4,119	219	548,108	4.42
- South Sulawesi	470,807	954	14,942	5,525	3,332	198	496,866	4.01
- Southeast Sulawesi	47,191	103	2,320	818	787	23	51,242	0.41
Region IX (Maluku)	98,091	181	4,344	2,219	1,196	87	104,118	0.84
Region X (Irian Jaya)	54,541	158	5,994	1,963	1,719	191	64,888	0.52
Region XI	534,274	1,861	20,728	14,481	5,000	609	878,953	4.86
- Bali	291,165	1,335	12,247	8,251	1,651	359	315,008	2.54
- West Nusa Tenggara	157,482	250	3,468	4,094	1,293	153	166,740	1.35
- East Nusa Tenggara	71,320	247	3,543	1,557	1,309	44	78,235	0.63
- East Timor	14,307	29	1,385	489	747	53	15,970	0.14
Outelds Jaya	3,840,444	10,840	185,452	83,484	34,473	3,293	4,157,755	33.54
Dist of East Java	2,054,714	5,952	52,921	41,282	8,557	1,598	2,175,034	17.55
Dist of Central Java	2,011,998	4,158	60,199	47,608	11,842	2,087	2,137,892	17.25
- Central Java	1,730,823	3,587	52,701	41,013	10,309	1,733	1,840,156	14.84
- DI Yogyakarta	281,175	571	7,498	8,595	1,533	354	297,725	2.40
Dist of West Java	2,226,925	7,282	56,855	40,554	7,472	905	2,339,993	18.88
Dist. of Jaya & Tangerang	1,472,878	8,089	82,185	18,947	3,488	434	1,685,031	12.79
Java	7,775,515	25,501	252,160	148,391	31,359	5,024	8,238,950	66.47
Indonesia (%)	11,515,959 93.71	36,141 0.29	437,612 3.53	231,855 1.87	65,832 0.53	8,317 0.07	12,395,715 100.0	100.00

Table 3-23 Number of Watt-hour Testing Devices Owned by PLN (Total)

	No. of Areas	Meter-testing Device		Single Phase Use	Three-phase Use
		Single Phase Use	Three-phase Use		
Java	22	39	47	987	666
Outside Java	39	50	29	1677	484
Total	61	89	76	2664	1150

Table 3-24 Number of Watt-hour Testing Devices Owned by PLN (Approximate Figures for Those Devices with Processing Capacities of 15 Units or More at a Time)

Manufacturer	Java		Outside Java		Total
	Single Phase Use	Three-phase Use	Single Phase Use	Three-phase Use	
Enertec	5	7	5	5	22
Zera	0	5	8	0	13
Ganz	2	0	0	0	2
Siemens	2	0	1	0	3
L & G	2	2	0	1	5
Feranti	0	0	2	0	2
KDK	12	0	3	4	19
Sonoda	0	2	2	0	4
Multi Amp	3	0	0	0	3
Rakit Sendiri	4	1	0	0	5
Unknown	0	1	10	5	16
Total	30	18	31	15	94
Remarks	70 % or more of single phase devices, and 95 % or more of three-phase devices, have processing capacities of 20 units or more at a time. There are also several devices with processing capacities of more than 80 units at a time.				

Table 3-25 Metrology System in Some Countries

(1/3)

Item	Country	Indonesia	Germany	South Korea	Japan																																																																																																																												
Basic Law		Law on Legal Metrology (Law No. 2 of 1981)	Law Concerning Measurements and Inspection (1969)	Measurement Law (1970)	Measurement Law (promulgated in May, 1992)																																																																																																																												
Competent Government Organization		Ministry of Commerce (DOM)	Ministry of Economy	Industrial Advancement Administration (IAA) (Metrology Division, Standards Bureau)	MITI (Metrological Administration Office)																																																																																																																												
Regulations on Businesses Relating to Measuring Instruments		Authorisation required for manufacture, repair, sale and import	None	Authorisation required for manufacture	Notification required for manufacture, repair and sale (massmeter, thermometer and tonometer)																																																																																																																												
Type		Yes (clear legal provisions?)	Yes (EEC approval, automatic approval)	Yes	Yes (Validity: 5 years)																																																																																																																												
Approval		DOM (PLN tests wait-hour meters on behalf of DOM)	PTB (designated laboratories test gas, water and wait-hour meters on behalf of PTB)	National Industrial Technology Institute (NITI)	NRLM: ordinary measuring instruments JEMIC: wait-hour meters (JQA conducts type approval testing of environment-related measuring instruments)																																																																																																																												
Inspection		Measuring instruments used for commercial trade, public services and wage calculations (hoping to extend the scope to include those related to health, maritime navigation, life and the environment, etc.)	Measuring instruments used for commercial trade, public services, transport, medical care and pharmaceuticals	Measuring instruments used for trade and health care	Measuring instruments used for trade and certification																																																																																																																												
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		<ul style="list-style-type: none"> o 47 local inspection laboratories in 27 provinces o Approx. 1,400 employees 	<ul style="list-style-type: none"> o 80 local inspection laboratories in 11 states o Approx. 1,000 employees o Government designated inspection laboratories (some 400) Gas meter: 65 Water meter: 90 Wait-hour meter: 184 Hot water meter: 27 Integrating calorimeter: 30 	<ul style="list-style-type: none"> o NRI o 9 provincial industrial testing laboratories (PITL) 	<ul style="list-style-type: none"> o 47 prefectural metrological inspection laboratories (approx. 920 employees); inspection and re-inspection of ordinary measuring instruments o 84 designated municipalities (approx. 540 employees); re-inspection (periodic testing) of scales and weights o 16 local laboratories of JEMIC; inspection and re-inspection of wait-hour meters (approx. 1,000 employees) o local laboratories of JQA; inspection and re-inspection of environment-related measuring instruments 																																																																																																																												
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Country	Indonesia	Germany	South Korea	Japan
<p>Item</p> <p>On-the-Spot Inspection (Law Enforcement)</p>	<p>After the re-inspection of scales and weights in use, a controller conducts on-the-spot inspection of their users to detect those who have not completed the re-inspection</p>	<p>Yes</p>		<p>After the periodic testing of scales or at any suitable time, on-the-spot inspection is conducted by law enforcement staff. Hardly any prosecutions follow.</p>
<p>Organization Responsible for Maintenance and Control of National Standards</p>	<p>Mass: DOM Length, temperature, electric current and luminosity, etc. KIM-LPI Frequency: Telecommunication R & D Centre</p>	<p>PTB</p>	<p>Korean Standards Research Institute (KSRI)</p>	<ul style="list-style-type: none"> Such ordinary physical quantities as mass, length, time and temperature: NRLM Electric current, voltage, luminosity, intensity of illumination, sound and radiation quantity, etc: ETL Some items relating to direct current: JEMIC Some items relating to high frequency: IQA
<p>Traceability of Standards for Legal Metrology and Calibration Frequency</p>	<p>The DOM owns all primary standards (except electrical standards) for legal metrology and uses them to calibrate the master standards (secondary standards) owned by local laboratories every 5 years. Local laboratories use their master standards to calibrate inspection standards every year. Local laboratories use the master standards to calibrate reference standards which are then used for the calibration of the inspection standards.</p>	<ul style="list-style-type: none"> The PTB calibrates the state standards (secondary standards) owned by 11 State Metrology Bureaus every 10 years. The State Metrology Bureaus use the state standards to calibrate reference standards every 5 years. The State Metrology Bureaus use reference standards to calibrate the inspection standards owned by local laboratories every year, in principle. Exceptional calibration frequency of inspection standards <p>Steel linear scale 10 years Wooden linear scale 3 years Steel tape measure 5 years Gas Help Loop?? 5 years</p>		<ul style="list-style-type: none"> The NRLM calibrates locally-held inspection standards at regular intervals. The ETL calibrates the inspection standards owned by the JEMIC at regular intervals. In the case of graded inspection standards, the NRLM or ETL calibrates higher standards while local laboratories and the JEMIC can use the calibrated higher standards to calibrate lower standards. Validity (calibration interval) of main standards <p>Tax meter 3 years Tape measure 5 years Cast iron weights/Non-cast iron weights/Stainless steel water meter/inspection tank/Liquid tank/Gas meter/Class 1/2 watt-hour meter/Electrostatic microphone 5 years 2 years 6 months 2 years</p>
<p>Qualification and Training Scheme for Legal Metrology Staff</p>	<ul style="list-style-type: none"> Grading <ol style="list-style-type: none"> Inspector Assistant inspector Controller Technical assistant Training Scheme of Metrological Training Institute (MOC) <ol style="list-style-type: none"> Controller course: one year Assistant inspector course: one year Inspector course: one year The applicants of all courses must pass an enrollment examination and have minimum practical experience of one year. 	<ul style="list-style-type: none"> Grading <ol style="list-style-type: none"> Senior inspector Inspector Assistant inspector Training Scheme of Inspector Training School (MOE) <ol style="list-style-type: none"> Junior-level inspection technique course: 2.5 months Senior-level inspection technique course: 5 months Trainees must pass the course completion examination. Re-training <ul style="list-style-type: none"> The re-training of inspectors is conducted when deemed necessary on specific professional issues. 		<ul style="list-style-type: none"> Qualified inspector: those successfully completing the training courses of the WMTI Assistant inspector Training scheme of WMTI (MITI) <ol style="list-style-type: none"> General metrology training: 3 months Trainees must pass the entrance and course completion examinations to qualify as inspectors. Special training on general metrology: 2 months Only those passing the above course (1) are eligible. Those passing this special training course qualify as "general measurement engineers" without undergoing the national examination after 5 years of practical experience.

Item	Country	Indonesia	Germany	South Korea	Japan
Quantitative Control of Packed Commodities		<ul style="list-style-type: none"> Although there are legal provisions for the quantitative indication of the contents and for the accurate measurement of packed commodities, the enforcement regulations are not yet fully developed. It appears that such regulations are currently being prepared. 	<ul style="list-style-type: none"> Packed commodities are subject to quantitative control and local inspection laboratories are in charge of enforcing such control. 		<ul style="list-style-type: none"> The packed sale of certain commodities must indicate the quantitative contents which must be accurate within the allowable error. On-the-spot inspection at shops, department stores, supermarkets and food processing factories, etc. The measuring instruments made by those manufacturers whose quality control is approved above a certain level by the Minister (MITI) are exempt from initial inspection. The system will have been gradually applied to all instruments by 1998. The Minister (MITI) registers those with expert expertise and skills in metrology as Measurement Engineers. <ul style="list-style-type: none"> There are 3 types of MEs. <ul style="list-style-type: none"> - General ME - Environmental ME (density) - Environmental ME (noise and vibration) The qualification of ME can be obtained either through the national examination or training at the WMTI.
	Designated Manufacturer System				
	Metrological Engineer System				
Other Systems	Entrusted Test ME System				<ul style="list-style-type: none"> Scales which have passed the test conducted by a ME at the request of a user are exempt from the periodic testing by the prefecture. The scales used at a workplace of which the measurement control capability has been approved above a certain level by the prefectural governor are exempt from periodic testing provided that they are tested by a ME in-house. The laboratories approved by the Minister (MITI) certify that the accuracy of industrial measuring instruments is calibrated by national standards.
	Workplace with Appropriate Measurement Control System				
	Certified Measurement Standards System (Traceability System)	<ul style="list-style-type: none"> Nationwide Calibration Network (independent from the Law) Founded in 1984 Competent agency: Measurement Committee of the DSN Primary standards: KIM Certified calibration laboratories: 20 	<ul style="list-style-type: none"> German Calibration Service (DKD) (independent from the Law) Founded in 1977 Competent agency: Ministry of Economy Primary Standards: PTB Certified calibration centres: 72 	<ul style="list-style-type: none"> Calibration Network (independent from the Law) Founded in 1978 Competent agency: IAA Primary standards: KSRI Secondary standards laboratories: 7 Tertiary standards laboratories: 24 	

Table 3-26 Summary of Type Approval Test

Item to be Verify	Type Test Application	Type Test Fee	Time Limit of Test	Identification	Total from Beginning	Number			Test Item & Manual
						'90	'91	'92	
Gasoline Pump		Rp 600,-/h	200h	--	1	1	--	--	
Water Meter		ditto	100h	--	4	1	2	1	
Dry & Wet Can					37	12	13	12	
Tank Lorries					63	19	18	19	
Standard Volume					6	1	1	2	
Taxi Meters					5	3	1	1	
Length Stick					12	--	--	12	
Roll Tester					1	1	--	--	
Storage Tank					21	10	6	1	
Wood Rule					9	3	2	4	
Volumetric Filling Machine					1	--	--	1	
Wagon Tank					6	--	6	--	
Weights					40	7	5	3	
Equal Arm Balance					22	5	2	2	
Romance Balance					33	5	4	4	
Sliding Poise Balance					18	3	3	4	
Beranger Balance					50	10	5	6	
Precision Equal Arm Balance					1	1	--	--	
Centicimal Balance					47	10	5	5	
Electronic Balance					5	--	2	3	

Table 3-27 Test Items Carried Out by LMK-PLN

No.	Test Items
1.	Visual inspection
2.	Marking and mechanical construction
3.	Creeping
4.	Starting
5.	Variation of low load error
6.	Load characteristic
7.	Unbalanced-load characteristic
8.	Meter constant test
9.	Magnetic field influence of external origin
10.	Oblique suspension (3 degree)
11.	Voltage characteristic
12.	Frequency characteristic
13.	Temperature rise
14.	Insulation resistance test
15.	High voltage test
16.	Power losses
17.	Influence of self-heating
18.	Heavy current test
19.	Mechanical load register
20.	Temperature coefficient
21.	Vibration test
22.	Shock test
23.	Range of adjustment
24.	Humidity test
25.	Meter packaging test
26.	Rust protector
27.	Continuous load
28.	Flammability test
29.	Mechanical strength test for meter case

Table 3-28 Branch Offices of the Ministry of Commerce and Situations of Regions

	Solo	Bojonegoro	Ambon	Denpasar	Jakarta	Remarks
Number of staff (and inspectors)	44 (16)	19 (5)	17 (5)	22 (16)	60 (17)	(information from METBELOSA)
Number of testing equipment	2 (1)	Planning to adopt (2)	1 (2)	2 (2)	1	Number of manufactured watt-hour meters: 250 thousand per year and company
Number of tested meters (per year)	34,000	20,000	15,000	20,000 (140/day-unit)	132,000	Type test: Enforcement by DOM is expected.
Rejection ratio		1.4	0.5	1% or less		(Cooperation in facilities is intended.)
Provision of air conditioning	Not provided (Not provided)	Not provided	Not provided	Not provided	Provided	(PLN executes using seven meters.)
Provision of portable testing equipment	Provided (Provided)	(Provided)	Provided	(Provided)	Provided	Verification test: Facilities of manufacturers should be used.
Population	1.5 million (5.5 million)	800 thousand (3 million)	800 thousand (1.2 million)	600 thousand (2.78 million)	8 million	Electric power loss (including electricity robbery): 20-30%
Electrification ratio (%) (Number of meters used)	80 (550 thousand)	58 (135 thousand)	80	95 (450 thousand)	63	less than 20%
Number of complaints		5 to 20 complaints/month	1% or less			
Plan of replacing old meters	No	No	No	No	No	

Notes: 1) The values enclosed in parentheses for the item marked with (*1) are the numbers of meters tested by PLN.

2) The values for the item marked with (*2) are the numbers of meters tested in PLN's branch offices in cooperation with the staff of the branch offices of the Ministry of Commerce.

3) The values for the item marked with (*3) are estimated values obtained from the branch offices of the Ministry of Commerce, PLN's branch offices, etc. The values enclosed in parentheses are the all populations of the regions.

Table 3-29 Inspection Testing Equipment Owned by JEMIC

Testing Station	Single Phase Testing Units (30 A or below)						Three-phase Testing Units (30 A or below)						Large Current Testing Machines						Total			Proportion of Automation (%)							
	RC, SC		Automatic		Total		RC, SC		Automatic		Total		Shortage of Machines		Predicted Processing Capacity		Processing Capacity		Shortage of Machines		Predicted Processing Capacity		Processing Capacity		Automat-ic + SC + RC		Automat-ic + SC + RC		
	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines	Processing Capacity	Number of Machines
Sapporo	1	64	1	198	262	218	0	1	64	2	212	276	146	0	2	91	28	0	7	628	392	65.2	66.2	85.8					
Morioka	2	128	0	66	194	187	0	1	64	1	66	130	78	0	1	46	22	0	5	370	287	35.7	35.7	87.6					
Fukushima	2	128	1	132	260	197	0	1	64	1	146	210	110	0	2	91	29	0	7	561	336	49.6	49.6	83.8					
Niigata	1	64	0	66	130	144	0.1	2	128	1	66	194	76	0	1	46	19	0	5	370	239	35.7	35.7	87.6					
Tokyo	2	128	9	1,409	1,637	1,435	0	1	64	11	1,573	1,637	1,357	0	8	351	257	0	31	3,525	2,049	86.8	82.3	92.3					
Nagoya	2	128	2	254	392	249	0	2	128	5	666	794	644	0	4	182	88	0	15	1,368	991	83.0	72.7	86.7					
Kanazawa	1	64	0	66	130	83	0	1	64	1	66	130	92	0	1	46	29	0	4	306	204	43.1	43.1	85.0					
Kyoto	1	64	1	150	224	158	0	1	64	2	260	324	333	0.1	2	91	47	0	7	639	538	65.7	65.7	85.8					
Osaka	2	128	1	132	260	204	0	1	64	3	438	502	408	0	2	91	59	0	9	853	671	66.3	66.3	85.3					
Amagasaki	1	64	0	132	196	121	0	2	128	2	132	260	248	0	2	91	34	0	7	547	403	48.3	50.0	83.4					
Okayama	1	64	0	66	130	99	0	1	64	1	66	130	128	0	3	148	66	0	6	406	293	51.7	51.7	83.3					
Hiroshima	1	64	1	198	262	148	0	3	192	1	66	258	188	0	1	46	27	0	7	566	363	46.6	46.6	91.9					
Shikoku	1	64	0	66	130	82	0	1	64	2	212	276	145	0	2	91	60	0	6	497	277	55.9	55.9	81.7					
Fukuoka	1	64	2	368	422	214	0	2	128	2	212	340	171	0	2	91	26	0	9	853	411	66.8	66.8	85.3					
Kumamoto	1	64	1	226	290	187	0	1	64	1	66	130	98	0	2	68	17	0	6	488	302	59.8	59.8	86.1					
Okinawa	1	64	0	0	64	23	0	1	64	0	0	64	49	0	1	23	10	0	3	151	82	0.0	0.0	84.8					
Total	21	1,344	19	3,539	4,883	3,749	0.1	22	1,403	35	4,247	5,655	4,271	0.1	36	1,581	808	0	134	12,129	8,828	65.5	63.1	86.2					

Operation days: 228 days/year

PSA three-phase ratio: 0.5

1/19/93

Table 3-30 Number of Inspection Testing Machines (Single Meters), Floor Space, and Processing Capacity by Testing Station

Testing Station	Area (mm ²)				No. of Testing Machines	Processing Capacity (No. of Units/Yr.)	No of Units/Area (units/m ² -Yr.)
	Laboratories	Instrument Storage Rooms	Office Rooms	Total			
Sapporo	666			666	8	625	938
Morioka	185		65	250	5	370	1,480
Fukushima	284	74	44	402	7	561	1,396
Niigata	412			412	5	370	898
Nagoya	791	10	41	842	14	1,264	1,501
Kanazawa	421			421	4	306	727
Kyoto	359	89		448	7	639	1,426
Osaka	914	363		1,277	9	853	668
Amagasaki	346	173		519	7	547	1,054
Okayama	306	108		414	6	406	981
Hiroshima	367	147	26	540	7	566	1,048
Shikoku	457	95		552	6	497	900
Fukuoka	613	149	21	783	9	853	1,089
Kumamoto	462		29	491	6	488	994
Okinawa	99	33		132	3	150	1,136
Total	6,682	1,241	226	8,149	103	8,345	1,024
Average	445	124	38	543	7	556	1,024

As at 17 March 1994

Table 3-31 Testing Item and Equipment for Type Approval Test

No. Testing Item	Testing Equipment to be used
(1) Error test	1 or 2 or 3.5.6.7
(2) Current characteristics	Ditto
(3) Voltage characteristics	Ditto
(4) Frequency characteristics	Ditto
(5) Self-heating characteristics	Ditto
(6) Unbalanced-load characteristics	Ditto
(7) Temperature characteristics	Ditto and 8
(8) Creeping test	1 or 2 or 3.7
(9) Starting current test	Ditto
(10) Influence of reversed current	Ditto
(11) Insulation resistance test	9
(12) Withstanding voltage test	9.10
(13) Lightning-impulse voltage test	9.11
(14) Influence of over-current	1 or 2 or 3.5.6.7.12
(15) Influence of vibration	1 or 2 or 3.5.6.7.15
(16) Influence of shock	1 or 2 or 3.5.6.7.16
(17) Influence of tilt	1 or 2 or 3.5.6.7
(18) Influence of magnetic field	1 or 2 or 3.5.6.7.14.26
(19) Temperature-rise test of windings	1 or 2 or 3.5.6.7
(20) Influence of wave form	1 or 2 or 3.13
(21) Durability (life) test	1 or 2 or 3.5.6.7.27
(22) Error variation at low load	1 or 2 or 3.5.6.7
(23) Influence of register on/off	Ditto
(24) Water spray test	9.10.17.28
(25) Sunshine proof test	21.23.24.25.33
(26) Salt-water mist test	18.23.24.25.32
(27) Humid-sulfurous-acid gas test	19.20.23.24.25
(28) High-temperature rapid cooling test	22
(29) Impact test of painted film	29
(30) Bending test of painted film	30
(31) Thickness test of painted film	31
(32) Power loss of windings	1 or 2 or 3.34
(33) Mechanism-error test demand meters	1 or 2 or 3.5.6.7.35
(34) Heat-proof test of plastic case	36
(35) Impact test of plastic case	37
(36) Packing-aging test	8.22
(37) Driving torque test	1 or 2 or 3.36

Table 3-32 Testing Equipment for Testing Electricity Meters

No.	Testing Equipment to be Used
1	Testing equipment for single-phase meters
2	Testing equipment for three-phase meters
3	Testing equipment for single- and three-phase meters
4	Testing equipment for life test*
5	Precision standard watthour meters**
6	Automatic testing device
7	Meter disc rotating detecting device***
8	Constant temperature chamber
9	Insulation resistance tester
10	Withstanding high voltage testing device
11	Lightning-impulse voltage testing device
12	Over-current testing device
13	Temperature-rise recorder
14	Magnetic field generator
15	Vibration testing machine
16	Shock testing machine
17	Water spray testing equipment
18	Salt-water mist testing equipment
19	Humidity testing equipment****
20	Sulfurous acid gas testing equipment
21	Sunshine proof testing equipment
22	Packing-aging testing equipment
23	Pure-water supplying device
24	Pure-water creating device
25	Outdoor exposure testing equipment
26	Portable meter testing equipment
27	Oscillator
28	Power source for water spray test
29	Steel ball*****
30	Plate bending testing device
31	Universal film thickness testing device
32	pH measuring instrument
33	Light-beam integrator
34	AC power analyzer
35	Automatic testing equipment for demand meters
36	Glow-wire testing device
37	Impact testing hammer
38	Torque measuring

Remarks
* Operated continuously
** For single-phase or three-phase
*** Inclusive of pulse-frequency device
**** Inclusive of air compressor
***** Diameter: 2.54cm

Table 3 - 33 List of the Machines and Equipment for Type Tests and the JEMIC Purchase Prices

No.	Machine	Manufacturer	Model	Year Acquired	Acquisition Price (¥)	Remarks
1	DC Motor AC generator (2)	Showa Denki	E - V	1970	1,440,000	@ ¥720,000
2	Accessory (2)	Ditto	Ditto	1968	1,300,000	@ ¥650,000
3	Three-phase meter testing equipment (2)	Ditto	TE - 2115	1969	10,084,000	@ ¥5,042,000
4	Ditto	Soken Denki	DAC - 3015	1992	12,600,000	Electronic power supply (No generator is Needed)
5	Standard wait-hour meter (6)	Toshiba	KS4A	1986	7,200,000	@ ¥1,200,000
6	AC meter testing equipment	Keihin Densokuki	LF - 104A	1965	5,492,800	For continuous testing
7	Voltage withstand device	Tokyo Seiden	ITS - 10020	1986	350,000	
8	Over current testing equipment	Keihin Densokuki	TBS - 135	1987	3,050,000	
9	Impulse voltage testing equipment	VELONEX	515F	1980	2,515,000	
10	Impulse generator	SONY TECHTRO.	FC503	1983	429,000	
11	Constant temperature device	Tabai	TBL - 3W4YP2XP	1992	9,500,000	
12	Recording device	Yokokawa Electric	3081 - 11	1986	807,500	
13	Threshold generator	ETL		1965	18,680	Price is low due to hand making.
14	Vibration tester	Shin-nihon Sokuki	F - 300BM - E04	1983	10,886,800	
15	Impulse tester	Abco, U.S.A.	SM - 110 - 3p	1984	12,900,000	
16	Oscilloscope	SONY TECHTRO.	7633	1975	3,180,000	For setting reference on impulse wave.
17	Ditto (2)	Trio	CS - 2110	1983	700,000	@ ¥350,000
18	Other devices (some)	Yokokawa Electric, etc.	2041, etc.	The 1970 s	15,000,000	Indicators, Torque meters, Glow wire, Megger, etc.
19	Environment testers (6)	Suga Shikenki, etc.	GS - 3, etc.	The 1980 s	25,484,800	Tests at high tempera- tures and high humidi- ties, Pouring test, Neutral salt spray test.
					Total Amount = ¥ 122,938,580	

Table 3 - 34 List of the Watt-hour Standard Establishing Devices Possessed by JEMIC

(Unit : Yen)

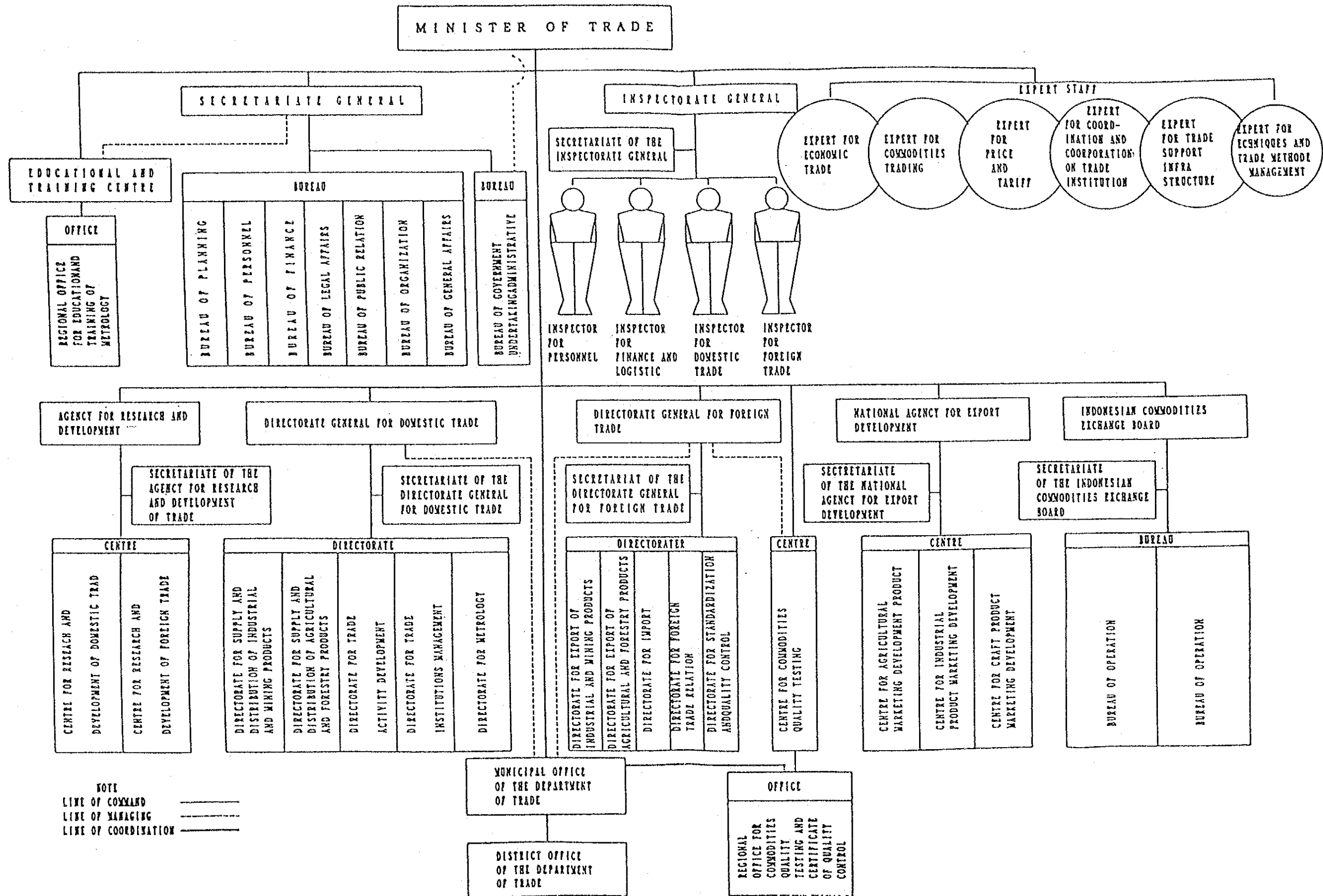
No.	Equipment	Pieces	Unit Price	Purchase Price
1	Digital Voltmeter (7081)	2	1,500,000	3,000,000
2	Standard Shunt (3947 - S4)	1	600,000	600,000
3	Voltage Standard (732A)	1	800,000	800,000
4	Ditto (CS - 206)	1	1,300,000	1,300,000
5	DC Voltage Calibrator (3330 B)	1	3,000,000	3,000,000
6	Transfer Polarity Switch	1	1,000,000	1,000,000
7	AC / DC Comparator (ADC - 11)	2	1,500,000	3,000,000
8	Three - phase Standard Watt-hour Meter (KS - 2A)	3	1,100,000	3,300,000
9	Three - phase AC testing Equipment	1	10,000,000	10,000,000
Total		13		26,000,000

Table 3 - 35 List of the Watt-hour Standard Establishing Devices in a Newly Industrialized Country

(Unit : Yen)

No.	Equipment	Pieces	Unit Price	Sub-Total
1	Multi Junction Thermal Converter (7200)	1	6,000,000	6,000,000
2	Calibrator (5700A)	2	5,700,000	11,400,000
3	Amplifier (5725A)	1	2,500,000	2,500,000
4	Synthesizer (Wavetek)	1	4,000,000	4,000,000
5	Watt - converter (2885)	1	1,000,000	1,000,000
6	Digital Phase Meter (DPF - 30N)	1	500,000	500,000
7	DMM (3458A)	1	1,000,000	1,000,000
8	Watt-hour Meter Testing System (Keihin)	1	17,000,000	17,000,000
9	Standard Watt-hour Meter (3 ϕ 4W)	2	2,500,000	5,000,000
Total		11		48,400,000

Figure 3-1



NOTE
 LINE OF COMMAND
 LINE OF MANAGING
 LINE OF COORDINATION

Figure 3-2

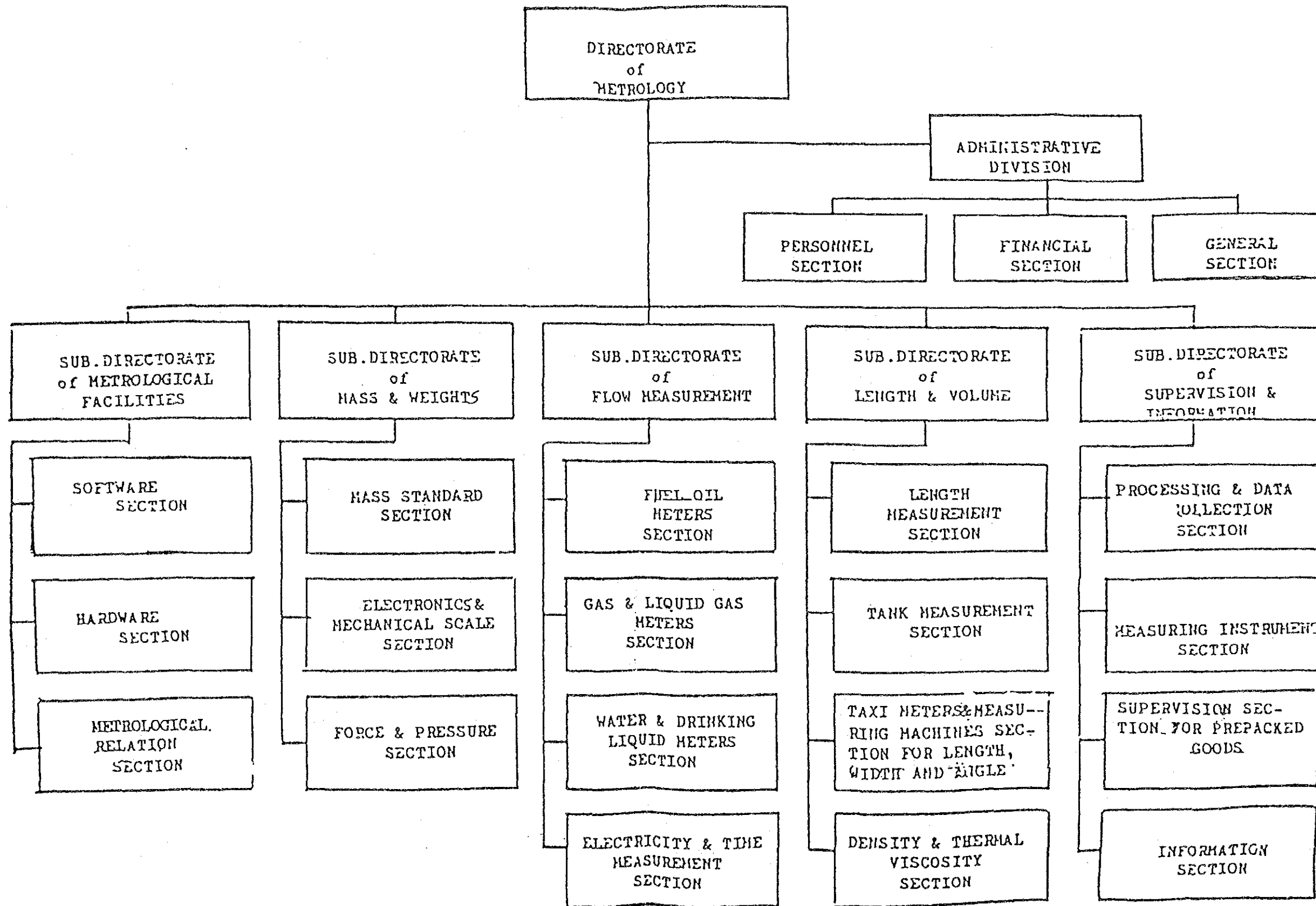
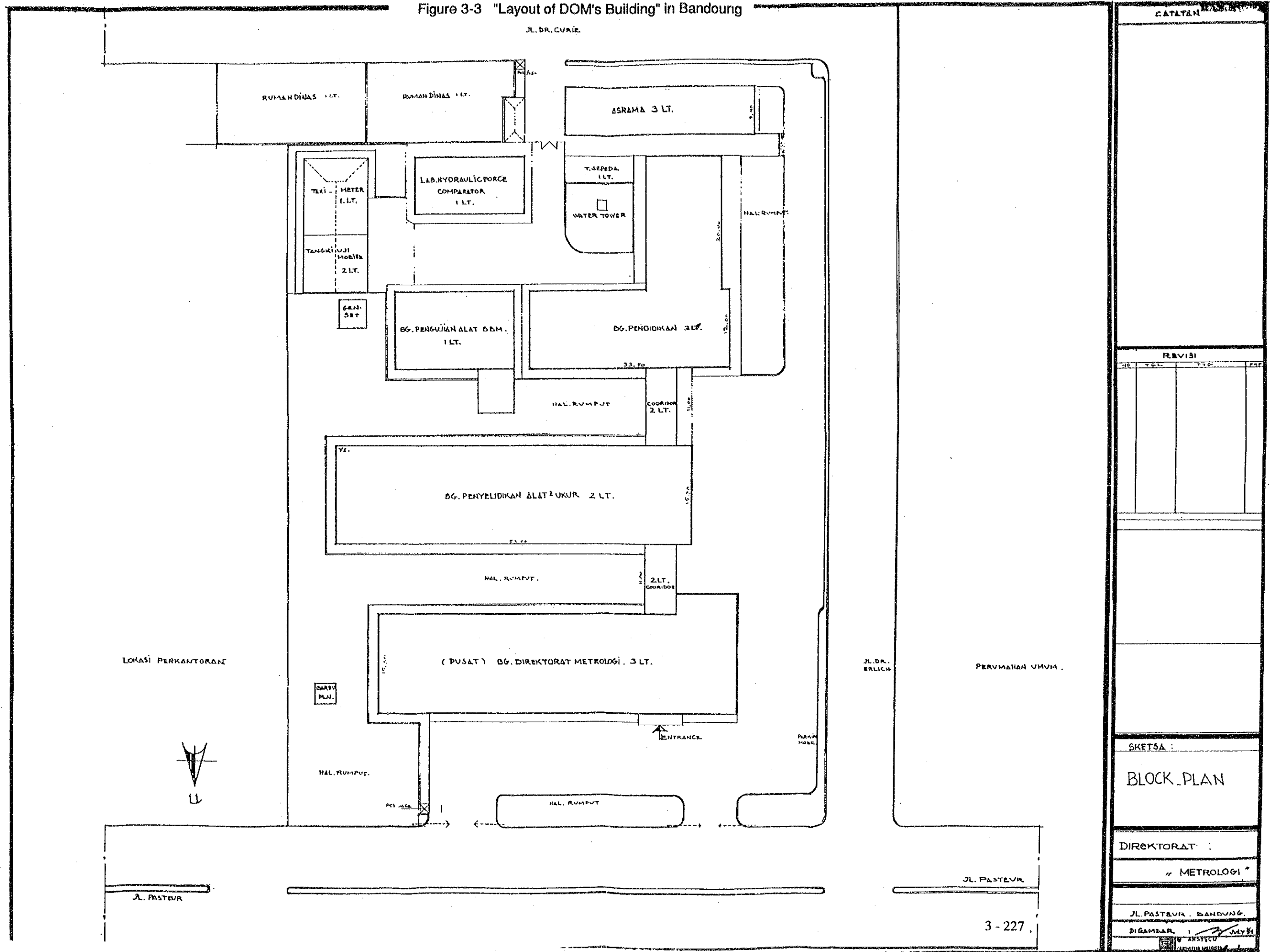


Figure 3-3 "Layout of DOM's Building" in Bandung



CATATAN			
REVISI			
NO	REVISI	REVISI	REVISI
SKETSA :			
BLOCK PLAN			
DIREKTORAT :			
" METROLOGI "			
JL. PASTEUR . BANDUNG.			
DIGAMBAR : 1 JULY 51			

No. of Machines Produced
 No. of machines delivered

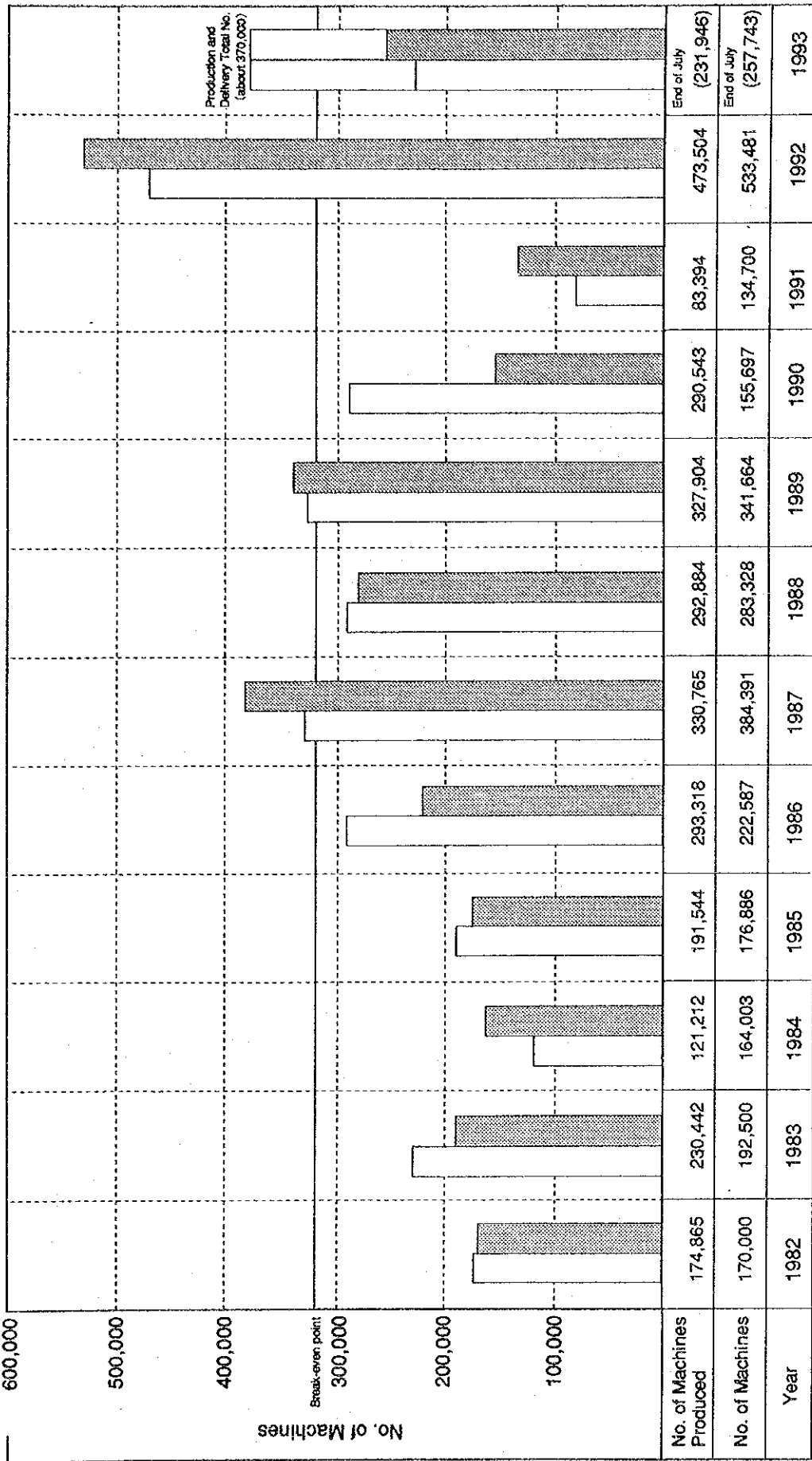


Fig. 3-4 No. of Machines Produced and Delivered (1982~1993)
 (Provided by METBELOSA)

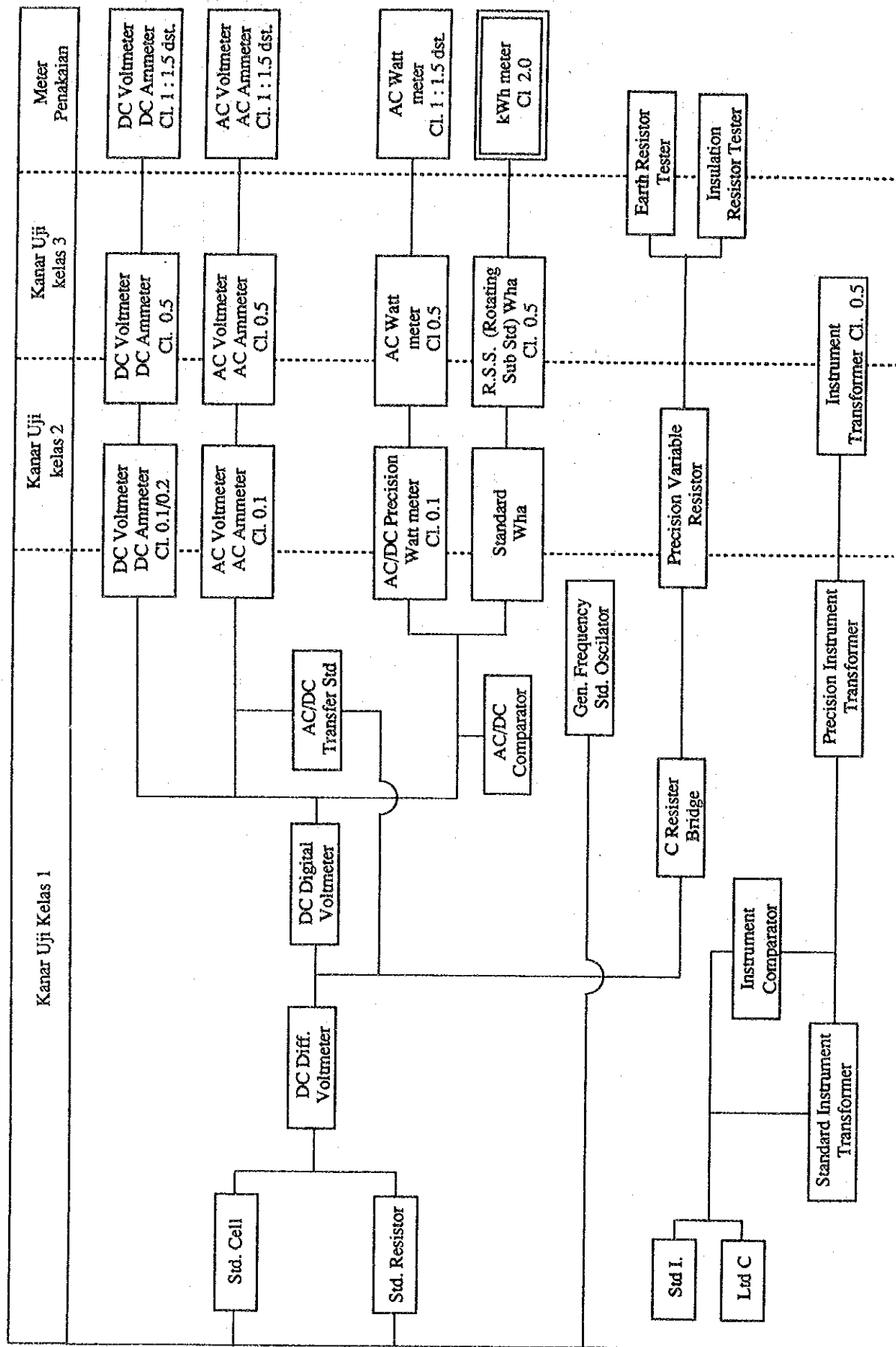


Fig. 3-5 Electric standard calibration system of PLN (Prepared by LMK)

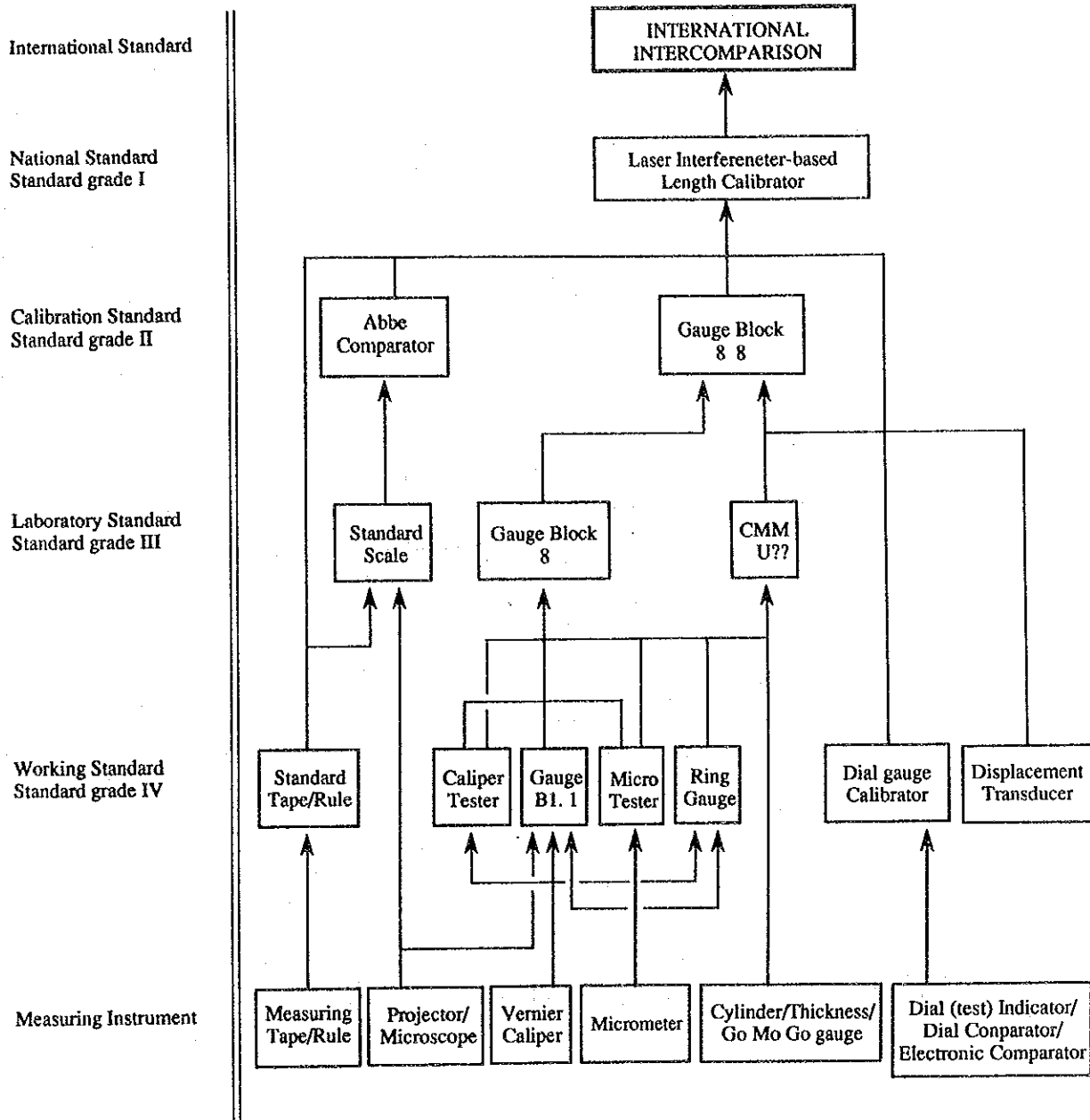


Fig. 3-6 Traceability Chart for Length

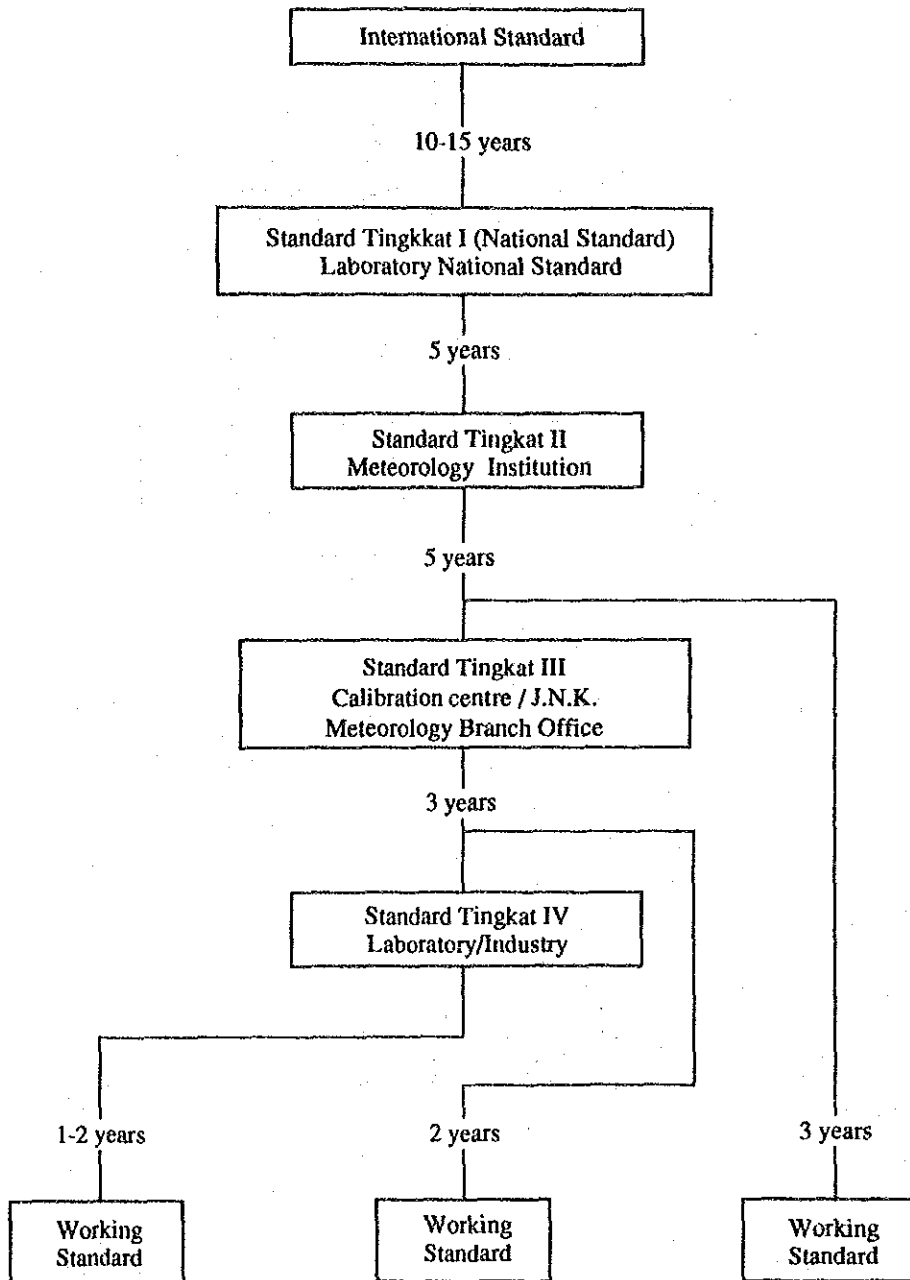


Fig. 3-7 Traceability Chart for MASS

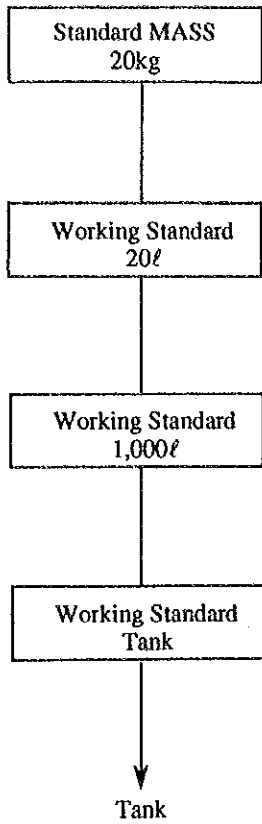


Fig. 3-8 Traceability Chart for Volume

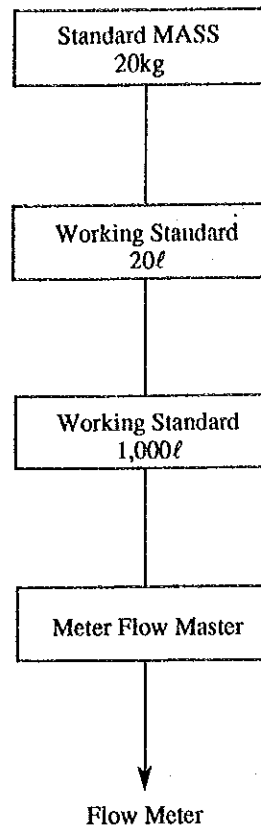


Fig. 3-9 Traceability Chart for Flow Meter

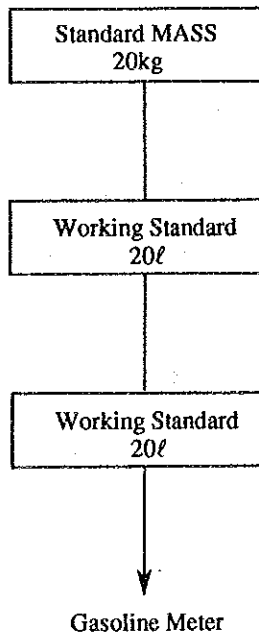


Fig. 3-10 Traceability Chart for Gasoline Meter

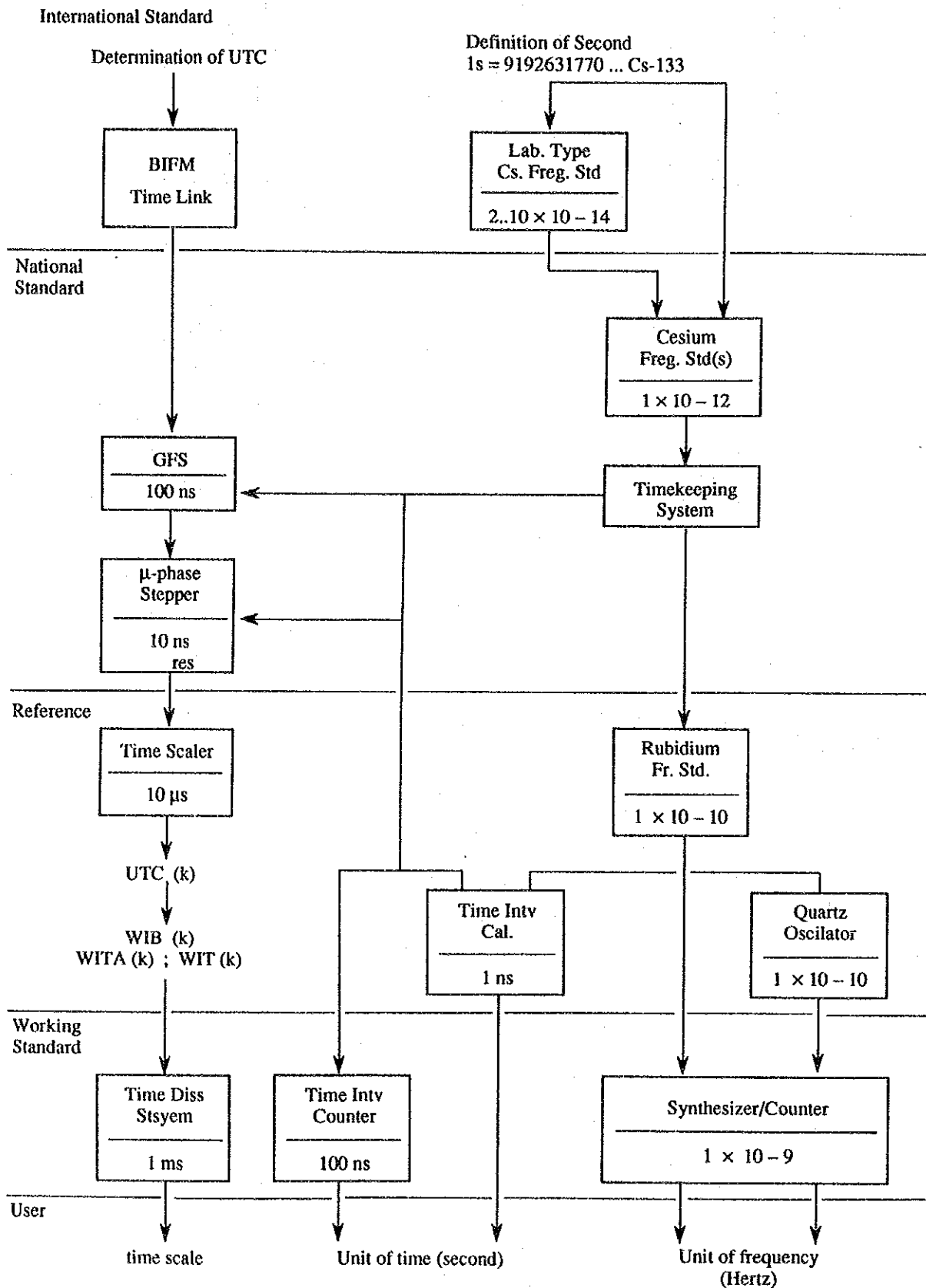


Fig. 3-11 Traceability Chart of Time & Frequency

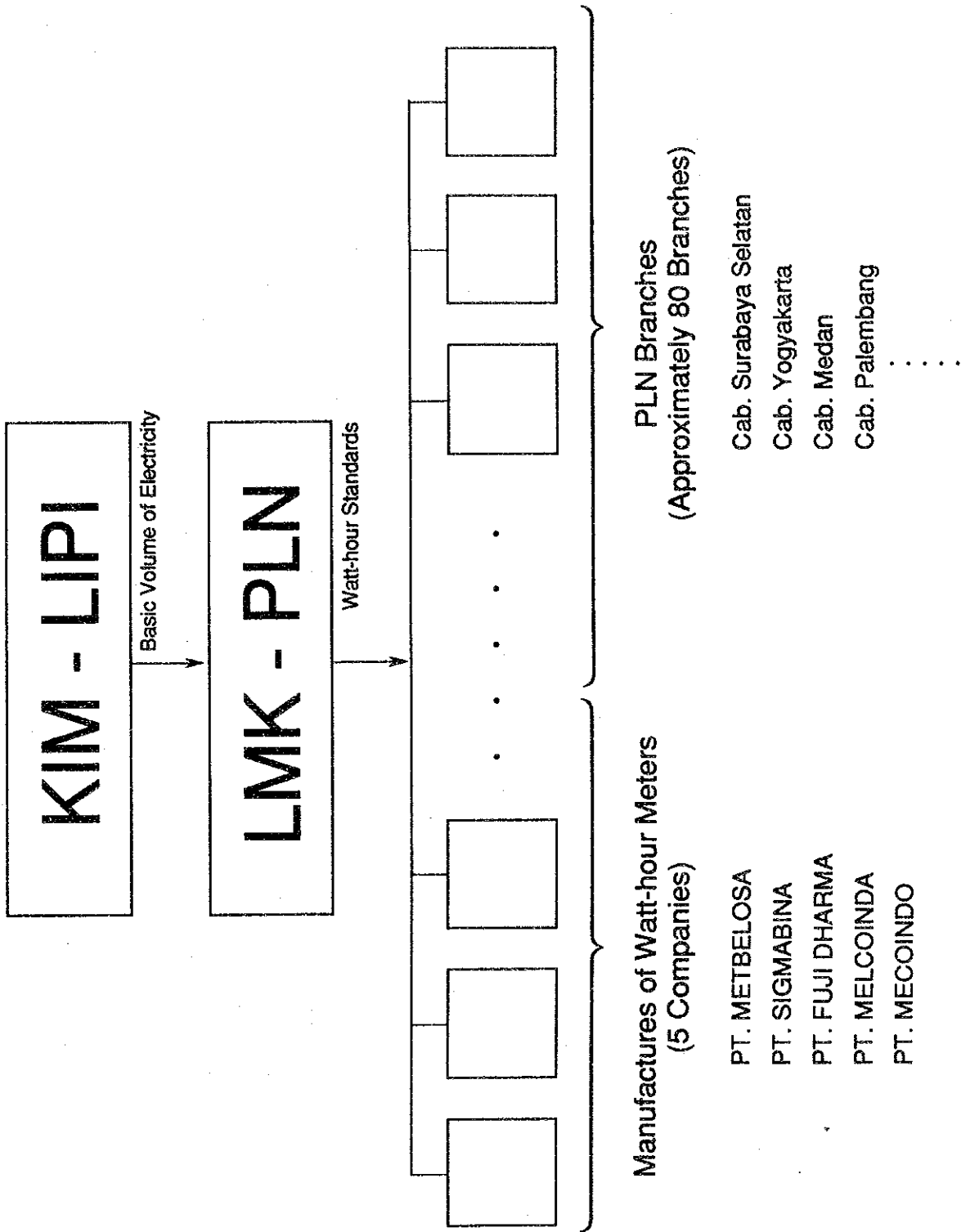
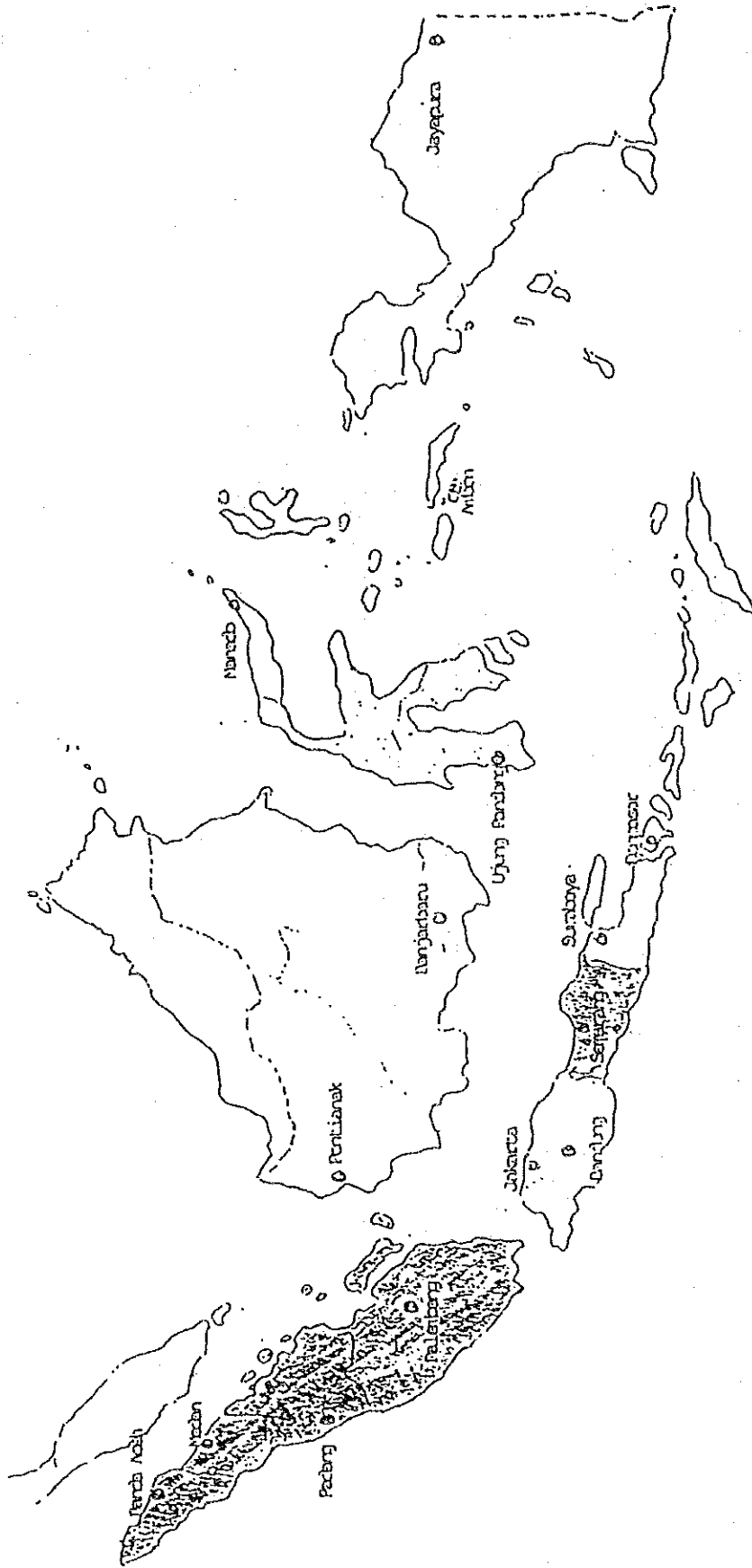


Fig. 3-12 Current Correction Structure for the Supply of Watt-hour Standards in Indonesia



PENGENDALIAN PROYEK JARINGAN I		PENGENDALIAN PROYEK JARINGAN II		PENGENDALIAN PROYEK JARINGAN III	
1. DANDA ACEH	PLN WIL. I DANDA ACEH	1. PONTIANAK	PLN WIL. V KALBAR	1. SURABAYA	PLN DISTRIBUSI JATIM
2. MEDAN	PLN WIL. II SUMUT	2. BANJARBARU	PLN WIL. VI KALSULTENG	2. MANADO	PLN WIL. VII SULUTENG
3. PADANG	PLN WIL. III SUMBAR RIAU	3. JAKARTA	PLN DISTRIBUSI JAWA-JANGRA	3. UJUNG PANDANG	PLN WIL. VIII SULSER
4. PALEMBANG	PLN WIL. IV SUMSEL	4. BANDUNG	PLN DISTRIBUSI JABAR	4. AMON	PLN WIL. IX MALUKU
5. SEMARANG	PLN DISTRIBUSI JATENG			5. JAYA PURA	PLN WIL. X IRIAN JAYA
				6. DENPASAR	PLN WIL. XI DALI MIT NTB

Figure 3-13 Metbelosa

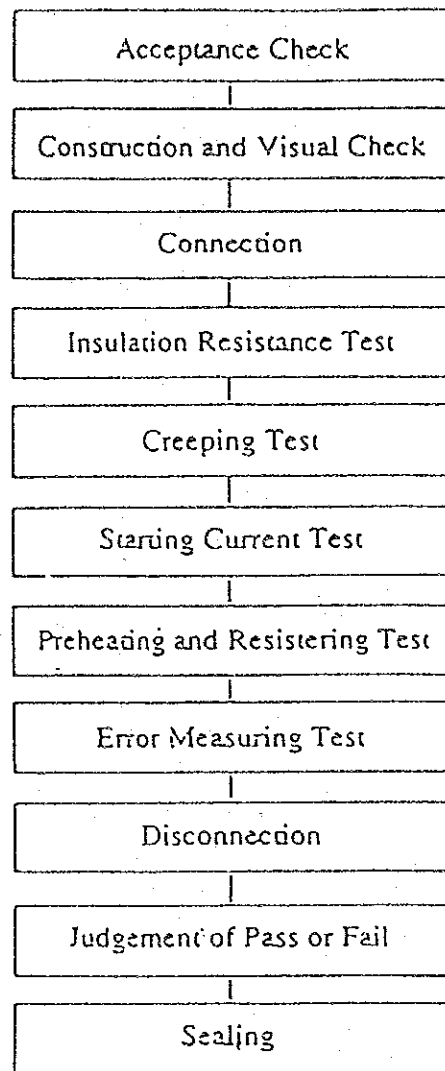


Figure 3-15 Verification Process of KWh Meter in JEMIC

ETL

JEMIC

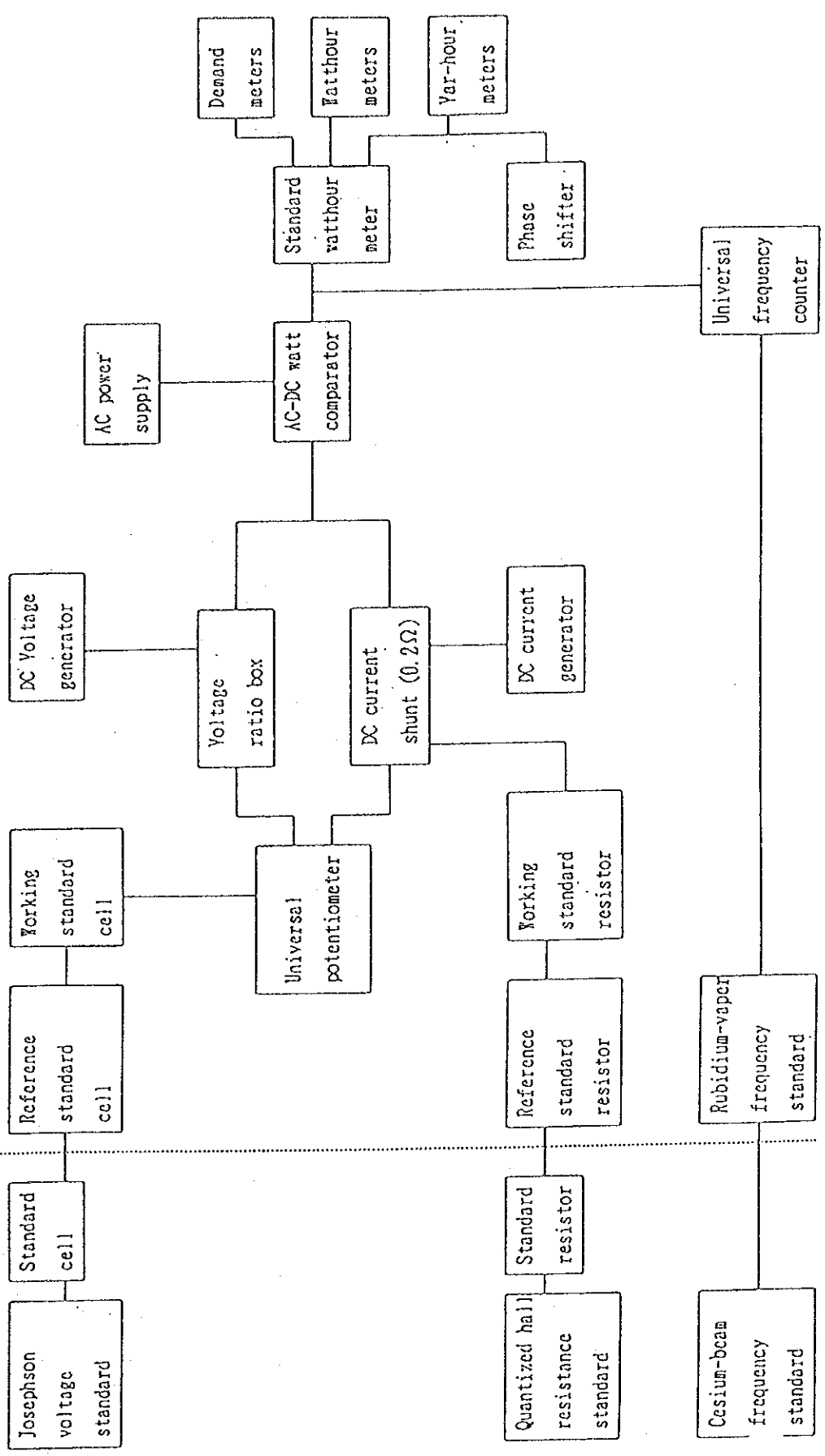


Figure 3-16 Traceability System of Watt-hour Standard

CHAPTER 4

CURRENT CONDITIONS AND PENDING PROBLEMS OF INDUSTRIAL METROLOGY

CHAPTER 4

CURRENT CONDITIONS AND PENDING PROBLEMS OF INDUSTRIAL METROLOGY

4.1 Current Conditions of Industrial Metrology

The establishment of measurement standards and the expansion/consolidation of the calibration service for standards and measuring instruments, both of which comprise the technical basis for qualitative improvement of industrial activities and products, are important. A metrology standard organization must have a traceable collection of standards, consisting of the primary standard at the top and secondary and working standards for each type of quantity. The current conditions of industrial metrology in Indonesia are described below, taking the above-described requirements into consideration.

4.1.1 National Metrology Standards

Indonesia has a certification system for measuring instruments calibration laboratories which form the National Measuring Instruments Calibration Network (JNK). While the Metrology Committee of the National Measuring Instruments Standardisation Council (DSN) acts as the Secretariat of the JNK, the KIM-LIPI conducts the essential activities. The KIM-LIPI is responsible for the supervision and coordination of the certification and measurement activities of the certified measuring instruments calibration laboratories and also for the supply of standards to members of the JNK. At present, the JNK has 22 organizations, ranging from private and public enterprises to government organizations.

(1) DSN

The DSN is the supreme organization which decides the development course for metrology standards in Indonesia and was established in 1984 by a relevant Presidential decree. The main roles of the DSN are to coordinate organizations engaged in standardisation activities and to provide the President with advice on policies relating to standardisation.

As shown in Fig. 4-1, the DSN is chaired by the Minister of Research and Technology with the Minister of Industry and the Minister of Trade acting as

Deputy Chairmen. The Deputy Director of the LIPI acts as the Secretary and the members represent the Departments of Industry, Trade, Health, Agriculture, Forestry, Manpower, Mining and Energy, Transportation and Public Works, the Technology Application Council and the National Atomic Council.

There are 6 subordinate committees, including the Calibration Committee which is chaired by a DSN appointee with members representing the Departments of Industry, Trade, Health, Agriculture and Manpower and the Technology Application Council. The actual management of the Metrology Committee is conducted by the LIPI as the Secretary of the DSN. The main fields of work of the DSN are described below and also shown in Fig. 4-2.

- 1) Issues relating to standardisation by the government and private enterprises, etc.
- 2) Issues relating to the provision of an information for the government and private enterprises, etc.
- 3) Issues relating to testing laboratories, calibration centres and the National Calibration Network.
- 4) Issues relating to the ISO, IEC, ASEAN standards and the national committee on Asia-Pacific standardisation.
- 5) Issues relating to coordination between the following committees.
 - National Standardisation Policy and Planning Committee
 - Official Indication of Standards Committee
 - Testing Certification Committee
 - International Cooperation and Information on Standardisation Committee
 - Safety Standards Evaluation Committee
 - Calibration Committee

Issues relating to metrology standards are handled by the Calibration Committee.

(2) KIM-LIPI

The KIM-LIPI was first established in 1967 by Presidential Decree No. 128 as the National Institute for Instrumentation - Indonesian Institute of Science. It was relocated in 1986 to the Science and Technology Development Centre in

Cirebon with the procurement of new buildings and equipment to facilitate calibration work as part of the Science and Technology Development Programme. In the same year, the name was changed to the KIM-LIPI (Research and Development Centre for Calibration, Instrumentation and Metrology - Indonesian Institute of Science) by Presidential Decree No. 1. Presidential Decree No. 7 of 1989 made the KIM-LIPI responsible for the technology control of national physical standards as it designated the KIM-LIPI as the national research institute for standards.

The KIM-LIPI controls the national standards for length (interferometer), voltage (standard cell), temperature (triple point of water, lead, silver and gold), luminosity (standard bulb), force upto 1 MN, capacitance, inductance and resistance.

All standards are regularly traced within the regional framework of the Asia-Pacific Metrology Programme as well as with standards controlled by the the PTB (Germany), NML (Australia) and CERLAB (France).

The main domestic work of the KIM-LIPI is research and development on metrology, calibration and instrumentation. Work in relation to metrology standards is conducted by the R & D Division for Calibration and Metrology Systems as shown in Fig. 4-3 which consists of the following 6 laboratories.

- Acoustical Metrology Laboratory
microphones; noise meters; vibration meters
- Mechanical Metrology Laboratory
force; pressure; mass; density; viscosity; volumeters
- Electrical Metrology Laboratory
voltage; radio waves; power; capacity; inductance; resistance; frequency; time
- Temperature Metrology Laboratory
temperature; relative humidity; moisture meters
- Dimensional Metrology Laboratory
length; angle; linearity; flatness; surface roughness; circularity
- Optical Metrology Laboratory
standard bulbs; illumination meters

(3) Metrology Standards Supply System

The metrology standards supply system is established by the 22 organizations belonging to the JNK. These organizations receive standards, mainly related to the 7 basic quantities of temperature, length, current, frequency, photometry and mass, and re-supply standards to private enterprises and others. The relevant traceability system is shown in Fig. 4-4.

4.1.2 Pending Problems

(1) Calibration Organizations

Although 22 organizations are certified by the JNK as metrology standards supply organizations, the domestic metrology standards supply system is still inadequate due to the concentration of most of these organizations on Java island. The establishment of new metrology standards supply organizations in local areas is necessary in response to the development of Indonesian industries in the coming years. At present, however, only university laboratories appear to be capable of metrology standards supply in local areas. A likely solution is the designation of key verification laboratories from among the existing 47 verification laboratories throughout Indonesia to act as metrology standards supply organizations.

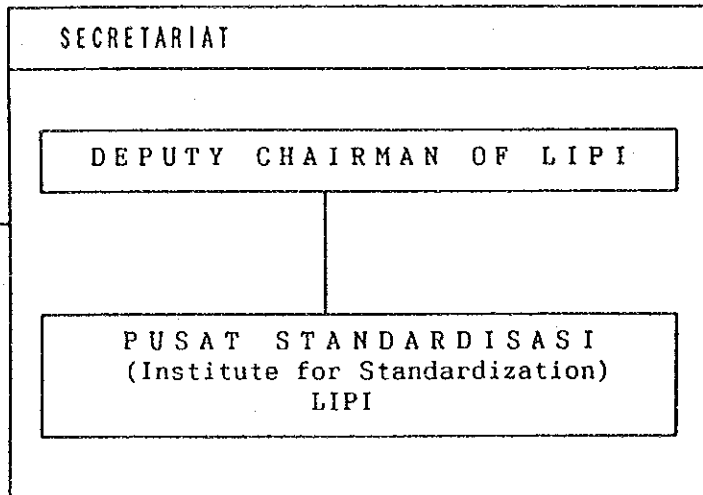
(2) Standard Quantities

The KIM-LIPI is currently supplying standards for mainly base units. In the future, it will be required to also supply standards for derived units to meet the growing industrial demand for such units, making the further expansion of the KIM-LIPI necessary.

In view of the increasing seriousness of the adverse impacts of industrial development on the environment, the supply of standards for measuring instruments used for environmental measurement is essential. While the KIM-LIPI has a research section for noise and vibration and supplies standards in these areas, no such system is currently available for chemical quantities. Environmental analysis equipment requires the supply of such chemical substances as standard gases (NO_x, SO₂ and CO, etc.) and standard pH liquid, etc. The metrology standards supply system in these areas must also be developed. More direct suggestions are not made here, however, as the present Study does not concern the desirable reform of the KIM-LIPI.

Figure 4-1

THE STANDARDIZATION COUNCIL OF INDONESIA - DSN	
Chairman	: Minister of State for Research and Technology
Vice Chairman I	: Minister of Industry
Vice Chairman II	: Minister of Trade
Secretary	: Deputy Chairman of LIPI
Members	: Representative of :
	1. Ministry of Industry
	2. Ministry of Trade
	3. Ministry of Health
	4. Ministry of Agriculture
	5. Ministry of Forestry
	6. Ministry of Manpower
	7. Ministry of Public Work
	8. Ministry of Mining and Energy
	9. Ministry of Communication
	10. Junior Minister for the Utilization of Domestic Products
	11. Agency for Application and Assessment of Technology
	12. National Atomic Energy Agency



EXECUTIVE COUNCIL	
Chairman	: Secretary of DSN
Vice Chairman I	: Member of DSN from Ministry of Industry
Vice Chairman II	: Member of DSN from Ministry of Trade
Members	: Member of DSN from Ministry of Health
	Member of DSN from Ministry of Agriculture
	Member of DSN from Ministry of Manpower
	Member of DSN from Agency for Application and Assessment of Technology

Figure 4-2

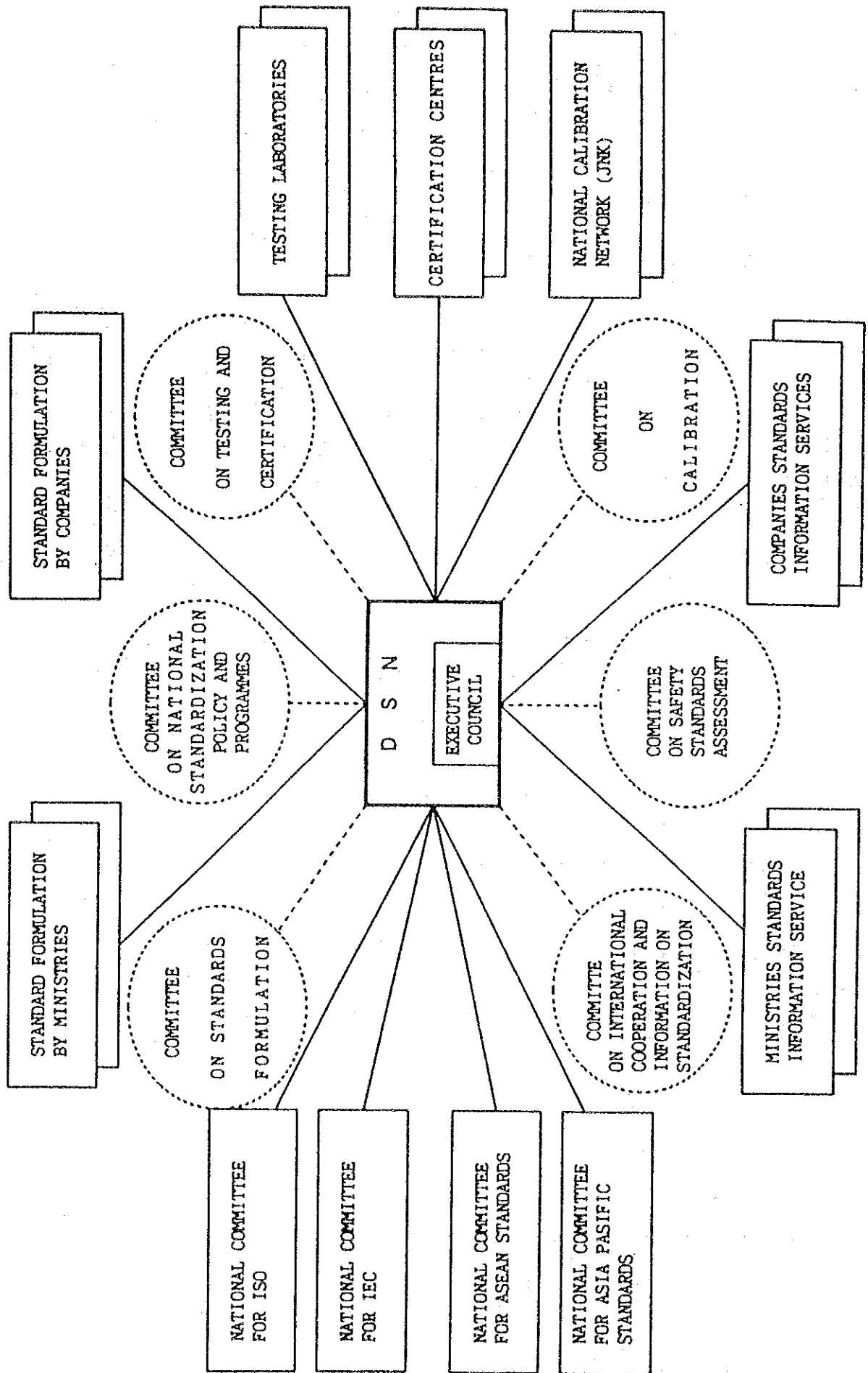


Figure 4-3

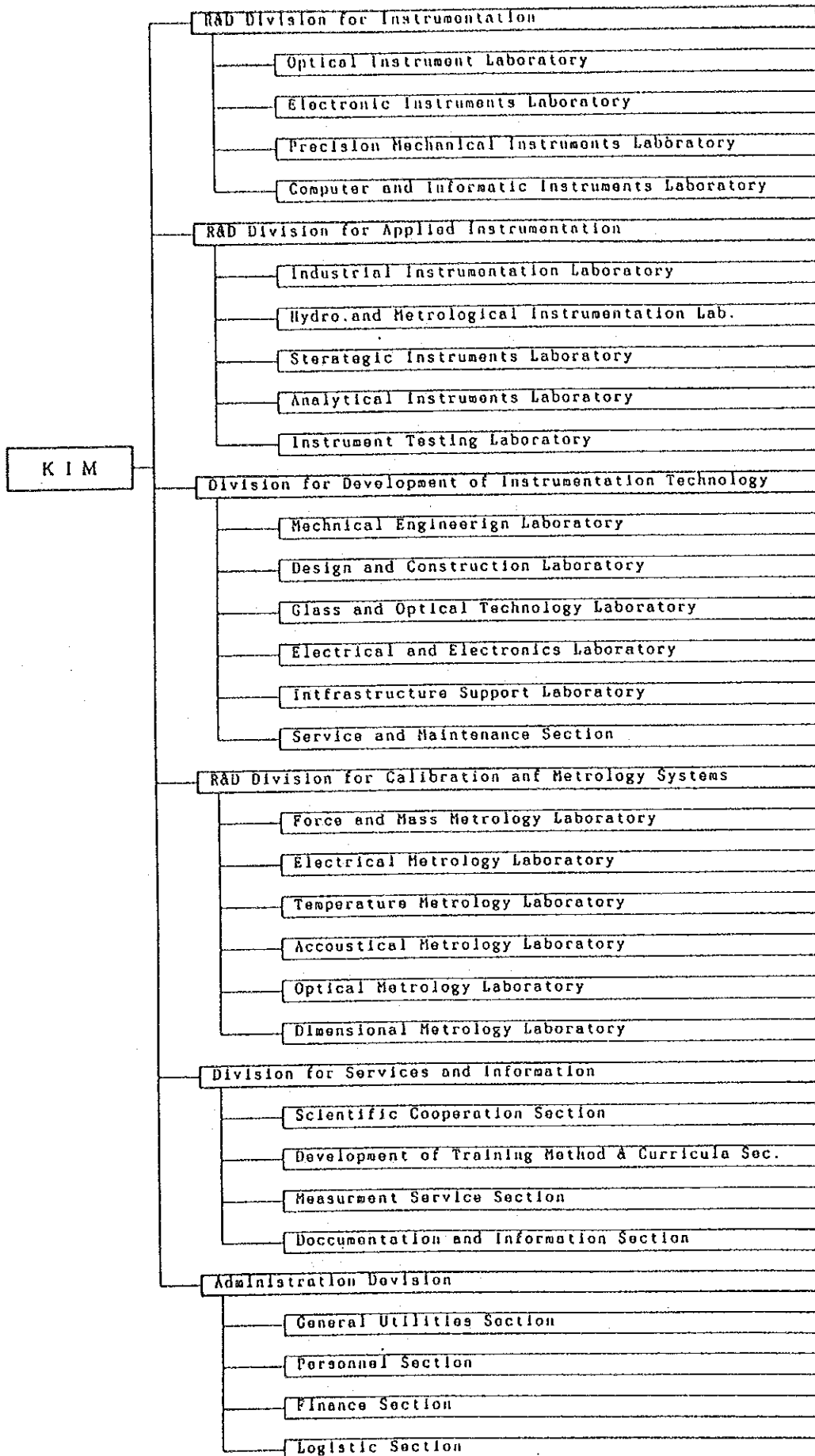
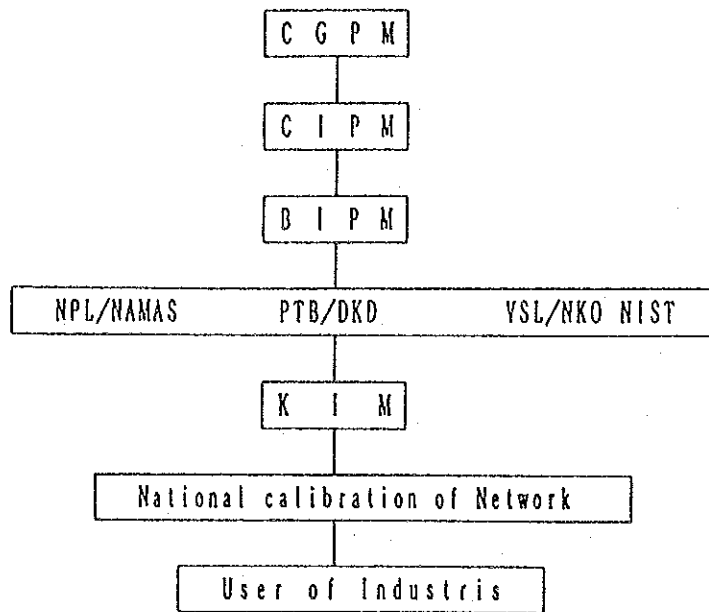


Figure 4-4



- CGPM : Conférenc Générale des Poids et Mesures
- CIPM : Comité International des Poids et Mesures
- BIPM : Bureau International des Poids et Mesures
- NPL : National Physical Laboratory
- BCS : British Calibration Service
- PTB : Physikalisch-Technische Bundesanstalt
- DKD : Laboratirien des Dentschen Kalibrier - Dienstes
- YSL : Van Swisedn Laboratory
- NKO : National Calibration Organization
- NIST : National Institute of Standerds and Technologys

CHAPTER 5

MASTER PLAN OF DEVELOPMENT ON LEGAL METROLOGY SYSTEM

CHAPTER 5

MASTER PLAN OF DEVELOPMENT ON LEGAL METROLOGY SYSTEM

5.1 Revisions of the Law, Government Ordinances and Ministerial Ordinances

Indonesia joined the Convention of Metre in 1890 and introduced the Law on Metrology in 1923 based on the metric system of units. The verification of legal measuring instruments relating to length, mass and volume commenced in 1938. The present Law on Legal Metrology (the Law) was enforced in 1975, incorporating the OIML recommendations after several revisions of the preceding Law on Metrology.

Although the Law and related government and ministerial ordinances at least cover all the items to be included in a national legal metrology system as recommended by the OIML, the subject items of legal metrology are not clearly defined. Moreover, the division between legal metrology (commercial metrology) and industrial metrology is unclear because of the lack of concrete descriptions of the measuring instruments to be controlled.

A review of the Law is, therefore, necessary from the viewpoints of fair trade, consumer protection and assistance for growing industrial activities. One important requirement of such a review is the clear division of industrial metrology and commercial metrology to establish appropriate methods of metrological control which reflect the actual conditions of use of measuring instruments.

The desirable revisions of the Law have already been discussed in Chapter 3 – Current Conditions and Pending Problems of Legal Metrology in Indonesia and can be summarised as follows.

- ① Extension and establishment of the subject units as national standards, including derived units. In general, more than 50 units, including base units, are stipulated by the measurement law of an industrialised country and are firmly established in the form of national standards.

- ② Clarification and extension of the measuring instruments subject to verification and clear indication of the limits of error for inspected measuring instruments.
- ③ Diversification and rationalisation of the verification method.
- ④ Establishment of a traceability system for measuring instruments in the field of industrial metrology.

5.1.1 Introduction of Designated Verification Organization System

Under the Law, the DOM has the central administrative authority for all matters pertaining to verification. Both the quantitative and qualitative inadequacy of the DOM in terms of facilities and manpower, however, means that the actual verification of watt-hour meters, water meters and gas meters relies on the local electricity, water and gas boards respectively.

From the viewpoint of environmental conservation, it is likely that the Law will be amended in the future to include provisions on the verification of such environment-related measuring instruments as air densitometers (NO_x, SO_x, CO and other meters), pH meters, noise meters and vibration meters, etc. in conjunction with environmental laws. The establishment of national measurement standards and verification facilities for these meters will require substantial investment and it will be uneconomical for these verifications to be functions of the present local verification laboratories.

A rational choice appears to be the introduction of the designated verification organization system to reflect the realities of the current verification work vis-a-vis watt-hour meters, water meters and gas meters, etc. and also to ensure maximum economy vis-a-vis those environmental measuring instruments of which verification will be required in the near future.

5.1.2 Introduction of Designated Manufacturer System

With the increasing use of modern, mass-production manufacturing facilities reflecting rapidly advancing technologies, coupled with the wide spread of strict quality control practices, many products now meet the quality criteria set by the ISO 9000 series based on a reliable TQC system, posing a question regarding the necessity for the DOM or its local verification laboratories to conduct 100% initial verifications. It is now a standard practice for measuring instrument manufacturers

to conduct the adjustment of all instruments manufactured as the final test to uniformatise their measurement performance prior to official verification.

In the case of those manufacturers (factories) which have established a quality control system of a high level which is supported by modern facilities, it should prove rational from the socioeconomic point of view to introduce the designated manufacturer system under which compulsory 100% in-house verification is regarded as the official initial verification. Imported products should be omitted from this system due to the difficulty of verifying the status of factory verification while the designation criteria for exemption from the initial verification must be strict enough for international approval. Given the present conditions of the manufacture of measuring instruments, this designated manufacturer system can be applied to part of watt-hour meter production.

5.1.3 Introduction of Designated Measuring Instrument User System

The current verification system is quite fair in the sense that initial verification and re-verification are conducted regardless of the instrument users. However, it is physically quite difficult, if not impossible, to re-inspect all the measuring instruments used for commercial/trade purposes at department stores, large supermarkets and large enterprises, etc. because of the conditions of their actual use. It is more appropriate to make these organizations establish an adequate control system, the approval of which will remove the need to re-inspect all instruments.

Should such a system be introduced, it is necessary for the organizations to establish a rational in-house verification/calibration system for measuring instruments and to appoint measurement experts, certified as metrological engineers by the Department of Commerce after completing classroom and practical training courses on metrology and measurement, to be responsible for control, verification and calibration work. The successful introduction of an in-house verification/calibration system assumes the consolidation of metrological training centres with a view to training and certifying a large number of metrological engineers in the private sector. Some time will be required for the positive effects of the system to be visible even if the relevant training programmes are quickly consolidated.

5.1.4 Extension of Standard Units and Promotion of Measurement Standards Supply System

The clear indication of measurement units based on SI units is the basis of a measurement law. While the Law provides such indication for base units, it is inadequate in terms of indicating and establishing standard quantities for derived units.

There is a strong need for the extension of measurement units in Indonesia due to the further progress of industrialisation and this need must be fulfilled as soon as possible. In addition, increasing standardisation and quality control in the industrial sector in recent years now demand traceability between the measuring instruments and testing equipment used in the field of industrial metrology and national measurement standards. There is, in fact, a strong demand that the establishment of a traceability system in the field of industrial metrology be clearly demanded by the Law. For the establishment of such a traceability system, the introduction of the designated calibration organization system and certified calibrator system should prove useful.

(1) Designated Calibration Organizations

The development, establishment and maintenance of national measurement standards are assigned to the KIM-LIPI of the Department of Science and Technology (the DOM is responsible for weights). The system is reasonably established despite the inadequate number of standards. Designated calibration organizations are responsible for the calibration of the secondary standards owned by certified calibrators using sub-standards which are calibrated by national standards. While it is desirable to assign the responsibility for the maintenance of national standards to these organizations in order to maintain and improve the level of measurement technology of the organizations, it appears appropriate, in principle, to designate a single organization for each quantity. The designation of a single organization for multiple quantities, however, must be permitted for the convenience of certified calibrators provided that it has sub-standards equivalent to national standards and the relevant technical ability.

As Indonesia currently has no specialised calibration organizations with the relevant technical ability, the KIM-LIPI (the DOM for weights) can be assigned

this role. It may also be possible to designate universities with a metrological laboratory, such as the Bandung Institute of Technology, for certain quantities.

(2) Certified Calibrators

Certified calibrators calibrate the measuring instruments, including standards (tertiary standards, reference standards and working standards, etc.) owned by manufacturers, schools and research institutes, etc. using secondary standards which are calibrated by designated calibration organizations.

The certification of calibrators naturally requires the introduction of certification criteria. It is essential that certification be conducted on the basis of fair assessment of the calibration facilities and technical ability, etc. pursuant to these criteria and the scope and accuracy of calibration must be specified for each quantity.

In order to easily check the conformity of measuring instruments and testing equipment with the ISO 9000, it is necessary to widely publicise certified calibrators and the scope and accuracy of their calibration work for the convenience of prospective customers together with the introduction of a uniform certification mark for easy recognition of traceability.

Given the strong demand for both industrial metrology and legal metrology in industrial areas, the local verification laboratories located in such areas, particularly in Medan, Jakarta and Surabaya, etc., of the DOM's national network of verification laboratories are hoped to act as certified calibrators for physical quantities in the field of industrial metrology.

5.2 Review of Roles and Organizational Structure of DOM and Local Verification Laboratories and Consolidation of Their Facilities and Technical Expertise of Engineers

The DOM is currently expected to play the following roles.

(1) Metrological Administration

The DOM is authorised to issue Director's Decrees on administrative and technical issues relating to the execution of verification in view of the uniformity of verification at both the central and local levels. From the organizational point of view, local verification laboratories belong to the local offices of the Department of Commerce and the DOM cannot control the

budgetary appropriation for and work of these laboratories, resulting in problems of unbalanced manpower distribution and uncoordinated establishment of new facilities and their renewal.

Nevertheless, 20% of the verification fees collected by local laboratories are forwarded to the DOM which is redistributed to local laboratories for new facilities or facility renewal based on its assessment results of the relevant applications made by local laboratories. This feedback system is designed to supplement the independent budgeting system of each laboratory. The DOM is also authorised to give direct instructions on such technical issues as the distribution of inspectors and guidance on practical verification work.

The present administrative structure places local laboratories under the jurisdiction of the DOM and the centralisation of the authority and responsibility relating to legal metrology to the DOM should prove very effective in improving the uniform nature of verification and the verification achievement rate. Therefore, it is preferable to review the roles and organizational structure of the DOM.

(2) Type Approval Testing

While the DOM is supposed to conduct type approval testing, some tests are actually conducted by local verification laboratories. The type approval tests conducted by local laboratories are not fully satisfactory, however, because of the inadequate facilities and technical expertise of the testers.

The present situation calls for consolidation of the type approval facilities of the DOM and key local laboratories in areas in which measuring instrument manufacturers are consolidated and the proper execution of type approval testing to ensure the continuous accuracy of legal measuring instruments. In view of such necessity, a project will be proposed in the next chapter to consolidate the DOM and local laboratories.

(3) Calibration of Standards

Reference standards, which are the metrological standards currently in use by local verification laboratories, are calibrated by the DOM at regular intervals (every 5 years). The working standards used for verification by local laboratories are made by the multiplication or division of reference standards.

While the technical capability varies from one local laboratory to another, the graduation accuracy at all local laboratories is not fully reliable because of inadequate technical ability and inaccuracy of the media used for graduating working standards.

In general, the verification or graduation of working standards requires excellent skills and it is desirable for this work to be centralised to the DOM or key local laboratories in addition to the DOM so that ordinary local laboratories can concentrate on verification work.

(4) Diffusion of Measurement Techniques and Cooperation for Training of Metrological Engineers

The DOM gathers international information on metrology as the Indonesian representative in such international organizations as the OIML and APMP. It is also making efforts to diffuse measurement techniques through conferences for local laboratories and other channels while indirectly assisting the training of metrological engineers through its cooperation with the Metrological Training Centre which also belongs to the Department of Commerce but which is independent from the DOM.

From the viewpoint of diffusing measurement techniques in the private sector and the training of metrological engineers in the private sector, however, few systematic efforts have been made except for the diffusion of measurement techniques and the training of metrological engineers to a very limited degree through verification and calibration work involving the private sector. In the future, it may be necessary to assign the DOM the responsibility of training instructors at the Metrological Training Centre and senior metrological engineers together with the possible training of similar engineers working in the private sector.

5.3 Establishment of New Metrological Engineer Training Centre and Upgrading/Consolidation of Training Facilities

At present, the training of metrological engineers (inspectors, assistant inspectors and controllers) is conducted by the Metrological Training Centre which is located on the premises of the DOM and which is controlled by the Department of Commerce.

Each class consists of some 50-60 students who usually qualify as inspectors after 3 years of training. Hence, the total number of students at the Centre is approximately 150-180. Two courses are provided, i.e. continuous training for 3 years and training for 5 years with at least one year of practical work after the first year and second year.

The Centre has accommodation facilities for only 50 students (some 30% of the total number of students), making it necessary for other students to live in private accommodation or lodgings with the financial assistance of the government.

The relocation of the Centre is planned and the following points must be carefully examined prior to finalising the relocation plan. Concrete proposals are given in Chapter 6 of the present report.

- 1) Suitability of the training duration and training method.
- 2) Widening of the student background and increase of the training capacity. The acceptance of (fee-paying) trainees from the private sector is necessary to ensure the proper operation of the metrology system (creation of the metrological engineer certification system). It may be a good idea to establish an academy responsible for the current 3 year training course with a view to granting the graduates a different qualification from those granted by other training courses.
- 3) Training curriculum
- 4) Various conditions, including the environmental conditions, of the new site and transport access to the new site.
- 5) Size of the training building, auxiliary facilities and dormitory building.
- 6) Training facilities (equipment) in terms of general group training as well as practical verification training.

5.3.1 Upgrading of Training Instructors

At present, the instructors at the Metrological Training Centre are mainly external instructors, many of which are university lecturers. If an academy is founded at the Centre, full-time instructors will be required. The instructors in charge of practical verification and calibration must include metrological engineers with practical experience in addition to the relevant scientists.

It is essential for the DOM to try to upgrade its own metrological engineers and external instructors. One way of achieving such upgrading is to send appropriate persons abroad through technical cooperation with industrialised countries to undergo upgrading training in addition to domestic training at the KIM-LIPI, universities and the DOM, etc.

5.3.2 Development of Private Sector Metrological Engineer Training Programme, Implementation of Training and Creation of New Qualification

The need to train private sector metrological engineers in both legal metrology and industrial metrology has been clearly stated in 5.1. Any attempt to train metrological engineers from among engineers working for private enterprises is necessarily constrained by the limited amount of time that these engineers can afford to undergo such training. Therefore, it is necessary to restrict applications for training to those science/engineering graduates with the necessary basic knowledge and engineers with similar knowledge to graduates. An appropriate course duration is some 6 months and those successfully completing the course should be awarded a new qualification (certified metrological engineer). Needless to say, it is necessary to develop a training programme which has an appropriate curriculum. Moreover, an effective, efficient training method must also be developed.

The introduction of a national examination system should prove useful to upgrade the metrological engineers with a view to granting the qualification of certified metrological engineers to those with sufficient basic knowledge and rich practical experience in their work for private enterprises who successfully pass the said examination.

5.4 Establishment of Manufacturers' Association

The establishment of an association of manufacturers of measuring instruments should greatly contribute to the development of the measuring instrument industry. The main activities of such an association should be as follows.

- 1) Gathering, analysis and statistical processing of the latest data on measuring instruments and wide dissemination of the findings to not only those in the measuring instrument industry but also to everyone related to the industry.

- 2) Establishment of committees and/or working groups to solve the common problems of the industry.
- 3) Cooperation for government efforts to publicise the metrological administration and representation of the industry to reflect the industry's opinions on the metrological administration.

Government assistance will be required for the successful establishment of the said industrial association and for its continuing activities. Such assistance can be provided in the form of supplying the association with both administrative and technical information on metrology, financial assistance for efforts to improve public awareness of the importance of metrology and to educate consumers and commissioning of the association with appropriate funding to conduct national research to utilise the vitality of the private sector.

5.5 Establishment of Private Association for Certified Metrological Engineers

The training of private sector metrological engineers (certified metrological engineers) is essential to diffuse the principles of measurement throughout socioeconomic activities, for the flexible management of legal metrology (verification) and for widespread traceability in the field of industrial metrology.

When the number and quality of private sector metrological engineers reaches a certain level, it is necessary to establish an association of private sector metrological engineers with government assistance for its activities. The main areas of activity of the said association should be as follows.

- 1) Introduction of a scheme to use of understanding of the role of certified metrological engineers and also of the standardised operation of the scheme.
- 2) Provision of training relating to metrological technologies/measurement techniques and the provision of technical information.
- 3) Representation of certified metrological engineers to voice their opinions to the administration.

As certified metrological engineers are expected to play an important role in the metrological administration, the scheme referred to in 1) above should prove advantageous vis-a-vis enterprises ensuring the status of such engineers within them.

Self-employed certified metrological engineers can be entrusted to conduct re-verification in specified geographical areas to improve the re-verification rate.

5.6 Metrology Promotion Organization

It is desirable to establish a metrology promotion organization to form a federation with the manufacturers' association and certified metrological engineers' association in order to further diffuse the principles of metrology and the measurement system. This organization should invite metrology-related government agencies, the proposed designated calibration organizations and certified calibrators, etc. to participate in its activities. The main areas of activity of the said organization should be as follows.

- 1) *Diffusion of the principles of metrology throughout socioeconomic activities with government assistance.*
- 2) *Representation of all related parties to voice their opinions on national measurement standards for industrial circles and the designation of legal measuring instruments for consumer protection, etc. to the administration.*
- 3) *Gathering and analysis of both domestic and international information on metrology and the provision of the analysis findings to its members.*

5.7 Miscellaneous

Table 5-1 shows in detail the programmes proposed for the different levels as outlined below.

- **Government Level** - *Diffusion of Principles of Metrology and Consumer Education*
- **Enterprise Level** - *Upgrading and Promotion of Metrological Standards (Measurement Techniques) and Control Standards*
 - *Diffusion and Promotion of Industrial Metrology*
- **ASEAN Level** - *Promotion of Regional Cooperation for Metrology and Measurement*

As these programmes are very important for the future development of the metrology system in Indonesia, it is hoped that they will all be implemented in the near future.

Table 5-1

Present situations and problems		Countermeasures	Number	
Legal Regulations	1	Inconsistency between OILM recommendation and Measurement Law	Normalizations of regulations by revision of Measurement Law	Official : 1
	2	Inconsistency among regulations of Measurement Law, official orders, deparment orders and OILM recommendation	Systematization and unification of regulation of Measurement Law, official orders, department orders and OILM recommendation	Official : 2
	3	Identification of body of implementation and its authority	Introduction of institution designation system	Official : 3 Private
Legally Designated Measurement Equipments	1	Unclear legal basis of applicable measurement equipments	Specification of applicable measurement equipments through Measurement Law	Official : 4
	2	Unclear ranges of applicable measurement equipments	Addition / deletion of applicable measurement equipments	Official : 5 Private
	3	Inconsistency between the purposes of legal regulations		
	4	Unreasonable and uneconomic examination method	Normalization of examination method	Official : 6 Private

National Standards	1	Insufficient amount of measurement standards	Normalization of number of national standards through Measurement Law	Official	7
	2	Non-arrangement of measurement system	Development and maintenance of national standards, specification and expansion of authority for control institutions	Official	8
			Arrangement and expansion of measurement standard system	Official Private	9
Measurement Performance System	1	Non-identification of examination performance body and its unreasonableness	Identification of examination performance body	Official	10
	2	Discrepancy between the function and capacity of local examination institutions	Introduction of "designated institution" system	Official Private	11
	3	Incapacity and aging of examination institution buildings	Identification and specification (distinction) of functions for each examination institution	Official Private	12
	4	Insufficient accuracy control and aging of examination equipments	Reconstruction and air-conditioning of buildings for examination institutions	Official Private	13
	5	Insufficient amount of office work equipments	Streamlining of office work through provision of equipments	Official Private	14
	6	Insufficient quality and number of examiners	Normalization of quality and number of examiners	Official Private	15

	7	Insufficient number of training institutions and training facilities	Renewal of training facilities'	Official 16 Private
			Diversification in function and streamlining of training equipment and examination equipment (in actual use)	Official 17 Private
			Establishment and expansion of training institutions	Official 18
Industrial Measurement Calibration	1	Insufficient standard supply amount (Especially assembly amount)	Expansion of national standard assembly amount	Official 19
	2	Insufficient quality and number of calibration institutions	Arrangement of tracability system and streamlining of approval of calibration institutions	Official 20
	3	Non-arrangement of legal system	Arrangement of legal system for industrial measurement	Official 21
Promotion Measurement	1	Insufficient number of measurement engineers	Training of measurement engineers for private sectors	Official 22 Private
	2	Insufficient promotion of measurement idea	Establishment of various private measurement institution	Official 23 Private
	3	Insufficient number of promoters for measurement	Secureness of budget for promotion	Official 24

Promotion program	Applicable promotion program No.
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Government Level	1	Revision of Law Measurement, official order and ministry order	1 ~ 11
	2	Introduction of "designated examination institution" system and making of designation criteria	2,6,11,12
	3	Introduction of "designated manufacturer" system and making of designation criteria	1,6
	4	Introduction of "designated office for use of measurement equipment" system, and making of designation criteria	
	5	Expansion of amount of measurement standards and promotion for arrangement of measurement standard supply system (Introduction of "designated calibration institution" and "designated calibrator" system and making of designation criteria)	7,8,9,19
	6	Promotion for expansion of equipment at DOM and local examination institutions and expansion of capacities of measurement engineers	8 ~ 14,20,21
	7	Establishment of training institutions for measurement engineers and improvement and expansion of existing institution facilities	15,16,17,18
	8	Improvement of ability and training for trainers	15
	9	Development of training programs for measurement engineers for private sectors, performance of training and establishment of qualifications	
	10	Promotion and assistance for establishment of groups, per business, of measurement-related manufacturers	3,4,22,23,24

	11	Promotion and assistance for establishment of groups of measurement engineers in private sectors	
	12	Promotion of measurement idea and consumer enlightenment	22,23,24
Private Sector Level	13	Establishment of private groups for promotion of measurement	
	14	Promotion for establishment of groups, per business, of measurement-related manufacturers	
	15	Establishment of groups of measurement engineers in private sectors	3,4,22,23,24
Company Level	16	Promotion for improvement of measurement technique and control levels	16,17,18
	17	Promotion for industrial measurement	21,22,23,24
ASEAN Level	18	Promotion of ASEAN area co-operation in measurement	7,8,9,21,22

Projects to be promoted	Applicable promotion program No.
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PHASE 1	1	Revision of weights and Measurement Law and inovation of verification performance system		1,2,3,4,5
	2	Inovation of DOH	Improvement of R&D	6,7
			Type testing	
3	Inovation of training center	Calibration of reference standard	7,8,9,11,12	
		Arrangement of training apparatus		
		Construction of buildings of training center		
PHASE 2	1	Arrangement of equipments at the core verification for measurement & calibration at laboratories	Improvement in equipments at the core verification laboratories	5,16,17,18
	2	Introduction of officially "Designated verification organization" system	Establishment of official designated verification organization of electricity, gas and water supply meters	2,3
	3	Promotion of propaganda of law and regulations for metorology	Establishment of private measurement institutions	9 ~ 17
PHASE 3	1	Arrangement of equipments at local verification laboratories	Reform of local verification laboratories and improvement in equipments	6
	2	Introduction of qualification system for measurers	Introduction of qualification system for metorology engineer, for excellent factories and retail shops, and improvement of measurement system	3,4,7,8,11,12,15

.....Supplementary explanation of project promotion plan

1. The plan is divided into three phases.
(short term, middle term and long term)
2. Official verification work of electricity, gas and water supply is expected to expand hereafter, and all the existing examinations will not be able to cover it. Therefore, officially designated examination institutions of the three fields will be established. The funds for the establishment of institutions will be provided by the nation and related business sectors.
3. Until the official organizations are established examination will be done more frequently by using equipments at supply fields rather than improving equipments at each existing organization.
4. Each phase will cover five years of period.
 - (1) Utilization of private sectors.
 - (2) Assistance from the nation.
 - (3) Introduction of qualification system for meteorology engineer, for placement of qualified meteorology engineer at large companies.
 - (4) Role assignment for DOM.
 - (5) Improvement of training institutions.
Future plans of training institutions will be made.

CHAPTER 6

OUTLINE OF INDIVIDUAL PROJECTS

CHAPTER 6

OUTLINE OF INDIVIDUAL PROJECTS

The metrology system forms the basis for the various activities of modern society and its ultimate aim is to contribute to the economic development and cultural advancement of national life by means of establishing and managing standardised and rationalised bases for industrial technologies and economic activities.

The recent progress of borderless economic activities and active trade and cultural exchanges between different countries in the world have necessitated standardisation of the metrology system from the global point of view, leading to a series of international conferences by the OIML and other organizations. There is now strong willingness on the part of the world community to establish a uniform metrology system to create common bases for world development and to further stimulate economic development and cultural advancement. Against this background, the proposal of the several projects described next is made in view of the improvement and diffusion of the metrology system in Indonesia.

6.1 Project to Revise the Law on Legal Metrology (the Law)

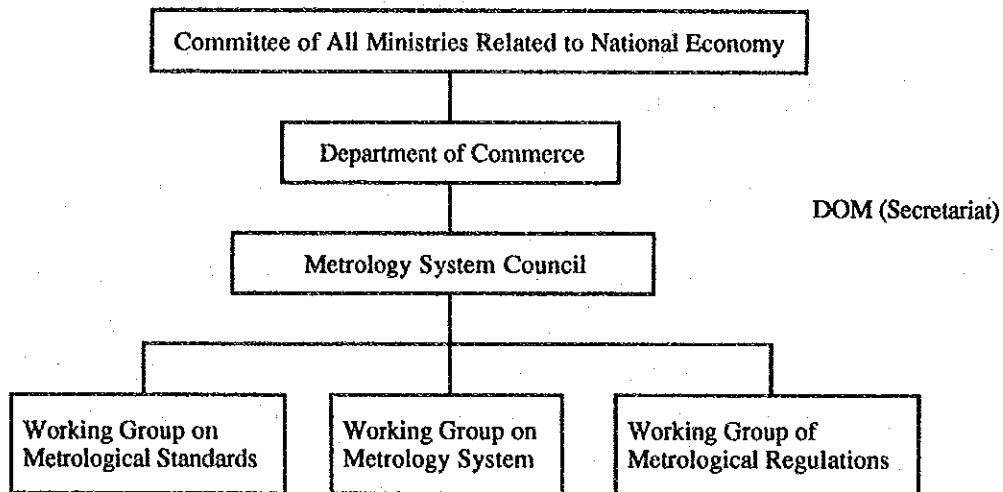
[Basic Principles of Metrology System]

Metrology is defined as measurement based on officially upheld standards and is different from simple measurement because of this involvement with such standards. From the metrological point of view, measurement must be conducted in accordance with standard measurement units which are stipulated by the Law or national standards. Each industrialised country today has its own legal metrology system which reflects its national character, history and culture. The basic concept of the metrology system from the macroscopic, legal point of view is typified by the German system which is a preventive system which presupposes the guarantee of measurement accuracy for a specific period of time. In comparison, such other countries as the UK and US have adopted a repressive system under which users are held responsible for the maintenance of metrological accuracy as part of their social responsibility. Although the main emphasis slightly varies from country to country, the legal regulations on metrology in most countries are a combination of the preventive and repressive systems. Regulations are generally classified as structural regulations on measuring instruments and regulations on their scope of use.

(1) Organization to Examine Possible Revisions of the Law

The DOM will be responsible for preparing the actual draft of the revised Law and draft enforcement rules while coordinating with all interested parties.

**Position of DOM in Proposed Structure
to Examine Possible Revisions of the Law**



(2) Project Components

1) Revisions of the Law

The Metrology System Council will be established within the Department of Commerce to examine possible revisions of the Law and to submit draft revisions to the Minister of Commerce. It is highly desirable that the members of the Council consist of representatives of the following organizations and academics in order to fairly reflect the opinions of those involved in metrology in Indonesia and to clarify the most appropriate metrology system for Indonesia in view of the recent international trends of metrology.

- ① Related government ministries and agencies
- ② Industrial associations
- ③ Consumer groups
- ④ Testing, verification and certification organizations and universities (particularly those which can function as metrological laboratories)

The DOM will assign at least 5 staff members with the appropriate expertise to form the secretariat for the council.

2) Points to Note in Revising the Law

The points to be noted in efforts to revise the Law are outlined below.

① Protection of Users of Measuring Instruments and General Consumers

One of the purposes of regulating measuring instruments is to provide users with high quality, inexpensive measuring instruments through the imposition of certain regulations as it is virtually impossible for general consumers to check the accuracy and performance of such instruments.

② Response to Technological Innovation

It is necessary to establish a metrology system which incorporates such results of technological innovation as the improved accuracy and performance of measuring instruments through the development of electronic instruments and the improved production and quality control ability of manufacturers and which will not hinder technological innovation in the future.

③ Response to Globalisation

The continuing development of the borderless economy is expected to demand the introduction of international standards and uniform certification/ verification procedures, etc. The regulations on measuring instruments must reflect such globalisation trends.

It should be recognised that any regulation has possible adverse side effects and efforts to determine the scope of the measuring instruments to be controlled and the control method is no exception. What must at least be taken into account in this context are the preservation of the life and health of the public, the stability of commercial trade and social fairness.

The selection of regulatory measures for measuring instruments is strongly related to the fundamental principles of the metrology system of a country and, therefore, public debate must be ensured to achieve a national consensus. Regulatory measures can be classified under the 2 systems described below.

① Preventive System

- a) Regulations on businesses which manufacture, repair and sell measuring instruments.
- b) Introduction of verification and regular inspection systems and enforcement of technical standards for measuring instruments for household use.
- c) Regulations on the use and transfer of measuring instruments and measuring methods.
- d) Use of the appropriate unit for each type of merchandise.

② Repressive System

- a) Introduction of certified workplaces for the use of measuring instruments.
- b) Introduction of the certified metrological engineer system.
- c) Introduction of the on-site inspection system.
- d) Introduction of the special container system.

The successful enforcement of regulations under the Law cannot be achieved without the establishment of national measurement standards and the consolidation of and capital investment in an organization to maintain and control such standards, an organization responsible for verification and calibration work within the framework of the legal metrology system, an organization responsible for calibration work in the field of industrial metrology and an organization responsible for the training of certified metrological engineers. As the enforcement body for the Law, the Government of Indonesia must be fully aware of its responsibility to both directly and indirectly ensure such consolidation and capital investment.

(3) Proposal of Items to be Controlled by the Law and Pending Issues

A draft proposal for the revised law is included here to stimulate discussions on the desirable revisions of the present Law.

**SUGGESTION ON PROVISIONS TO BE EMPLOYED IN THE MEASUREMENT
LAW AND PROBLEMS TO BE STUDIED**

Matters provided in the measurement law and decrees (by the government) and rules (by the ministries) for implementation of the law are suggested in each box, and problems to be solves are described outside the boxes. Note that numbers of article and clause are omitted in the suggestions.

Chapter I General Provisions

(Purpose)

Section 1 Purpose of the Measurement law

The purpose of this Law is to establish the standards of measurement and secure administration of proper measurements and thereby to contribute toward the development of economy and uplifting of culture.

"To establish the standards for measurement" means establishment of units for measurement as a basis for measurement. To achieve this purpose, it is necessary to set up standards for standards of quantities concerning 7 types of basic physical states. It is necessary to derivate and establish various measurement units depending on the standards."

Also, to "secure administration of proper measurement" is to secure implementation of accurate and rational measurement, and for that purpose efforts are required for introduction of various systems such as unification of measurement units, registration of manufacturers, repair shops and sellers of measuring instruments, accreditation of measuring instruments, and restrictions over measuring instruments used at home so that accurate instruments will be acquired by users. Also efforts are required for periodical check of measuring instruments, inspection, and control over measurement scale to prevent

illegal and unfair measurement as well as for introduction of official qualification for measurement engineer and specification of job site where measuring instruments are used.

It is necessary to correctly understand that the final purpose of the measurement law is to secure rationalization of and accuracy in measurement and contribute to development of economy and uplifting of culture standard by rationalizing various industrial activities and daily life of citizens through smooth and correct implementation of these systems.

Section 2 Definitions of Measurement and Measuring Units

The terms "measurement" as used in this Law shall mean to measure length, mass, time, electric current, temperature, amount of substance, luminous intensity, area, volume, speed, acceleration, force, pressure, work, power, amount of heat, angle, angular velocity, angular acceleration, solid angle, flow rate, mass flow rate, viscosity, kinematic viscosity, density, concentration, wave number, frequency, electric energy, electric power, electric charge, voltage, electromotive force, electric field strength, electric resistance, electric conductance, electrostatic capacity, inductance, magnetic flux, magnetic flux density, magnetomotive force, magnetic field strength, reactive electric power, reactive electric energy, apparent electric power, apparent electric energy, thermal conductivity, specific heat, entropy, radiant intensity, luminous flux, luminance, illuminance, radioactivity, neutron emission rate, exposure dose, absorbed dose, noise level and quantities should be decided in decrees (hereinafter referred to as "quantity of the state of physical phenomena", and the term "measuring units" shall mean the standards for measurement.

Of the 7 types of quantity and the measurement units for the quantities ranging from "length" to "light intensity defined in resolutions in the general conference of weights and measures and others, each derivated unit derivated from the basic unit, 51 types of

quantities from "area" to "noise level" must be defined in the measurement law. Other quantities having derivated units should be decided in decrees, but it is desired that the quantities are not limited to those for legal metrology and include those for industrial metrology and scientific metrology.

(Base Units and Representations)

The measuring units of length, mass, time, electric current, temperature, amount of substance and luminous intensity shall be as follows:

- (1) The measuring unit of length shall be the meter.

The meter is the length light travels in a vacuum in $1/299,792,458$ of a second and shall be represented by the method decided by Cabinet Order in conformity with the resolution of the General Conference of Weights and Measures.

- (2) The measuring unit of mass shall be the kilogram.

The kilogram shall be the mass of the International Prototype Kilogram and shall be represented by the Prototype Kilogram delivered to Indonesia in accordance with the Metric Convention.

- (3) The measuring unit of time shall be the second.

The second is represented as the time equivalent to $9,192,631,770$ times the period of radiation corresponding to the transition between the two hyperfine energy levels of the cesium-133 atom in the ground state.

- (4) The measuring unit of electric current shall be the ampere.

The ampere is represented by the Minister of International Trade

and Industry as constant electric current which flows through each of two straight linear conductors of infinite length and of negligible circular sectional area placed one meter apart in vacuum and exerts each other the force of $2/10,000,000$ newton per one meter of the length of these conductors.

The ampere in alternating current shall mean the electric current equal to the root mean square of instantaneous values throughout one period, in terms of the ampere as indicated in the preceding Paragraph.

- (5) The measuring unit of temperature shall be the kelvin.

The kelvin shall be $1/273.16$ of the thermodynamic temperature at the triple point of water and shall be represented by the method provided for by Cabinet Order in conformity with the resolution of the General Conference of Weights and Measures.

- (6) The measuring unit of amount of substance shall be the mole.

The mole shall be the amount of substance of a system composed of elementary particles or of a set of elementary particles (limited to that of a definite composition), the number of which equals to that of atoms contained in 0.012kg of carbon-12, and it shall be used by specifying the elementary particle or the set of elementary particles.

- (7) The measuring unit of luminous intensity shall be the candela.

The measuring unit of luminous intensity shall be the candela.

The candela shall be the luminous intensity in the perpendicular direction, of a plane surface of $1/600,000$ meter of a black body at the freezing temperature of platinum under a pressure of $101,325$ newton per square meter.

The luminous intensity of the light source whose colour is different from that of the black body at the freezing

temperature of platinum provided in the preceding Paragraph shall be decided by Cabinet Order in conformity with the resolution of the General Conference of Weights and Measures.

The candela shall be represented by the standard kept in custody by the Minister of MINECOM.

(Custody of the Prototype and Auxiliary Prototype)

The prototype Kilogram in Item (2) of the preceding Article and the Auxiliary Prototype Kilograms manufactured therefrom shall be kept in custody by the Minister of MINECOM.

(Derived Measuring Units and Presentations)

The measuring units of area, volume, speed, acceleration, force, pressure, work, power, amount of heat, angle, angular velocity, angular acceleration, solid angle, flow rate, mass flow rate, viscosity, kinematic viscosity, density, concentration, wave number, frequency, electric energy, electric power, electric charge, voltage, electromotive force, electric field strength, electric resistance, electric conductance, electrostatic capacity, inductance, magnetic flux, magnetic flux density, magnetomotive force, magnetic field strength, reactive electric power, reactive electric energy, apparent electric power, apparent electric energy, thermal conductivity, specific heat, entropy, radiant intensity, luminous flux, luminance, illuminance, radioactivity, neutron emission rate, exposure dose, absorbed dose and noise level shall be as follows:

- (1) The measuring unit of area shall be the square meter.

The square meter shall mean the area of a square whose sides are one meter in length.

(Auxiliary Measuring Units)

The auxiliary measuring unit of the measuring units (Base Units and Representations) and the preceding Article shall be as follows.

- (1) The auxiliary measuring unit of the meter in Article 3 Item (1) shall be the micron. The micron shall mean 1/1,00,000 of the meter.
2. Besides the auxiliary measuring units prescribed in the preceding Paragraph, the auxiliary measuring units composed by multiplying 10^n (n being an integer) to the measuring units as well as the auxiliary measuring units shall be provided for by Cabinet Order.

(Symbol)

The symbols of the measuring units (Base Units and Derived Units and Auxiliary Measuring Units) (Above mentioned measuring units and auxiliary measuring units shall hereinafter be referred to as "legal measuring units") shall be provided for by the MINECOM Ordinance.

(Prohibition to Use of Non-Legal Measuring Units)

As to the quantities of the state of physical phenomena as provided for (Base Units and Representations) and (Derived Units and Representations), measuring units other than the legal measuring units shall not be used in measurements (including indications of the quantity of the state of physical phenomena) for transaction or certification, provided, however, that this shall not apply to measurements of export goods and measurements concerning import goods.

It should be clarified that the metric system is employed as units for legal metrology and other units for measurement must not be used for business transactions or for certification, and that units for measurement will be unified under the metric system. However, as for goods exported from or imported into Chile, it is necessary to allow use of units other than legal metrology units because of the circumstances in partner countries, but it is needless to say that legal units for measurement must be used when the imported goods are sold in the country.

(Definition of Transaction and Certification)

The term "transaction" as used in this Law shall mean any act in business, with or without compensation, the object of which is either the delivery of goods or the performance of services.

2. The term "certification" as used in this Law shall mean the act of certifying to the public or to other persons that a certain fact is true in the course of business.
3. The measurements, conducted by using measuring instruments prescribed by Cabinet Order, for the prevention of impairments to human lives or properties with respect to driving carriages or ships or to handling explosives, gases and other dangerous materials, shall be deemed to be certification in the application of this Law.

"Other party on jobs" means other legal bodies, and "to express that a certain fact is true" is typically a various types of certifications issued by certifying bodies.

The measuring instruments used for safety of people or prevention of danger to property include speed meters for running vessels and ships, pressure gauges, thermometers and pressure gauges for vessels for storing high pressure gas, precision balances for producing poisons

and others, volume gauges for scientific research, density meters and others.

(Definition of Measuring Instruments)

The term "measuring instruments" as used in this Law shall mean appliances, machines or equipments used for measurements, which are decided in decrees (excluding the Prototype Kilogram, the Auxiliary Prototype Kilogram and the standards).

Under the measurement laws, measuring instruments, which should become objects for verification, type approval and control, must be specified in a decree. Provisions should naturally be given in the measurement law for watt hour meters, flow rate meters (water supply meters, gas meters), and speed meters (taxi meter), which are now under control by other laws or decrees, and also the possibility to put measuring instruments to secure fair business transaction (such as length meters, mass meters, measures, volume meters, calorie meters, and illumination meters etc.) and measuring devices for health care (such as thermometer and aneroid type of pressure gauges) under control by the measurement law.

When selecting measuring instruments to be put under control by measurement law, those widely used for business transaction and certification and not satisfying the condition (1) or (2) should be selected.

- 1) Measuring instruments used by specialists and which are not required to be put under control by the measurement law because of advance in technology for production of the measuring instruments (such as precision measurement instruments, and machines for testing etc.)
- 2) Measuring instruments having rough precision, which are not required to be guaranteed by verification (household measuring cup, etc.)

Chapter II. Enterprises Relating to Measuring Instruments

Section 1. Manufacture

(Registration for Enterprise of Manufacture)

Any person who intends to engage in an enterprise of manufacture of measuring instruments (including remodelling) shall obtain the registration of Minister of MINECOM accordance with the classification of enterprises provided for by the MINECOM Ordinance. Provided, however, that this shall not apply in case that he intends to engage in the enterprise of manufacture of measuring instruments to be used for the mere purpose of his own other than transaction or certification.

(Application for Registration)

Any person who intends to obtain the registration by the preceding Article shall submit a written application stating the following matters, in the case of the measuring instruments (hereinafter referred to as "electric meter") mentioned in Item (11) through Item (13) of Article 12 (Definition of Measuring Instruments) to the Minister of MINECOM and, in case of the other measuring instruments, as stipulated by the MINECOM Ordinance, to the same Minister through the governor of prefecture:

The first requirement to secure implementation of correct measurement is to provide accurate measuring instruments. If manufacturing of measuring instruments is left free and even manufacturers not having appropriate equipment and facilities are allowed to manufacture measuring instruments, the public interest of implementation of correct and fair measurement is spoiled, and registration of the manufacturers is made so that only manufacturers

satisfying certain conditions will be allowed to manufacture measuring instruments.

The (criteria for registration) means making it a duty for registered manufacturers to own equipment and facilities for inspection of measuring instruments to be manufactured, and concrete provisions should be defined for each measuring instrument.

Decision and filing of provisions for inspection are required to secure high quality measuring instruments by diffusing spontaneous inspection, and the provisions for inspection should be as follows.

- (1) Organizations for performing inspection of the measuring instruments (including important parts)
- (2) Equipment and facilities for inspection and method for consolidation
- (3) Method and timing for implementation of inspection of the measuring instruments
- (4) Method for disposing defected measuring instruments
- (5) Method for storing records of results of inspection
- (6) Other items required for implementation of inspection

(Term of validity of registration) should generally be for 10 years, and re-registration should naturally be allowed.

Section 2. Repair

(Registration for Business of Repair)

Any person who intends to engage in the business of repairing measuring instruments shall obtain, in accordance with the classification of business provided for by the MINECOM Ordinance, the registration of the Minister of MINECOM and the registration of the respective governor of Province who has the jurisdiction over the area including the place wherein the person intends to carry out the business in case that it is related to the other measuring instruments. Provided, however, that this shall not apply in case that he intends to engage in the business of repairing measuring instruments to be used for the mere purpose of his own other than transaction or certification.

(Procedure of and requirements for registration) relates to application for registration and criteria for registration, and different requirements are necessary for each manufacturer, but it may be considered that other items for manufacturers can be covered by application of a decree by a ministry.

Purpose of enactment of this decree is the same as that of registration of manufacturers.

Section 3. Sales and Brokerage of Sale

(Registration of Business of Sale, Etc.)

Any person who intends to engage in the business of sale or brokerage of sale of measuring instruments (hereinafter being referred to as "sale, etc.") provided for by Cabinet Order (excluding the sale or brokerage of sale for export) shall obtain, in accordance with the classification provided for by the MINECOM Ordinance, the registration of the respective governor of Province who has the

jurisdiction over the area including the place wherein the person intends to carry out the business.

Measuring instruments specified in the decree will be selected from those under control by the measurement law, and the criteria for the selection includes the following items.

- (1) Measuring instruments which are sold to general consumers and users who cannot be expected to have knowledge concerning measuring instruments.
- (2) Measuring instruments widely used for fair and correct business transaction
- (3) Measuring instruments for health care

For this reason, it can be considered that the measuring instruments as described below will become objects for restriction by the decree.

- (1) Hand-held balance and indicator balance with the limit weight of 150 Kg or below, and weighs used in these types of balance
- (2) Clinical thermometer made of glass
- (3) Aneroid ashygmanometers

Most of what was described about registration of repair shops can be applied to (procedure of and requirement for registration), but as for (criteria for registration), it can be considered that the following conditions should be satisfied.

- (1) The applicant must have a shop required to perform business such as sales.

- (2) The applicant must have knowledge concerning verification marks, type approval number and structure and allowance of the measuring instruments and required in the business.

Chapter III Preservation of Security of Measurement

(Duty for Conforming to Provisions in Manufacturing, Etc.)

The manufacturer of the measuring instruments which are considered as to serve mainly for the use of the daily life of general consumers and are provided for by Cabinet Order shall, in case that he intends to manufacture the relevant measuring instrument, make them conform to the technical provisions provided for by the MINECOM Ordinance. Provided, however, that this shall not apply in the case of manufacturing the relevant measuring instrument for export and in the case of making trial manufacture of the said measuring instrument.

2. Any person who intends to engage in the business of importing the measuring instrument provided for by Cabinet Order mentioned in the preceding Paragraph shall, in the case of sale of the relevant measuring instrument, sell those which conform to the technical provisions provided for by the MINECOM Ordinance. provided, however, that this provision shall not apply, in case that he intends to sell the relevant measuring instrument for export.

(Indications)

The manufacturer provided for by the preceding Article Paragraph 1 or the person who is provided for by the same Article Paragraph 2 shall, beforehand he sells the relevant measuring instrument, affix the indications thereto by the form provided for by the MINECOM Ordinance. Provided, however, that this shall not apply to the measuring instruments which are manufactured or sold under the provision of Proviso of Paragraph 1 or Proviso of Paragraph 2 of the said Article respectively and

to the measuring instruments which have passed the verification.

2. Nobody shall, except for the case of affixing the indications under the provision of the preceding Paragraph, affix to a measuring instrument the indication mentioned in the same Paragraph or an indication liable to be confounded with the said indication.

(Restrictions on Use)

Those which are not equipment, machinery or apparatus for measurements and the measuring instrument coming under any one of the following items shall not be used or possessed for making use thereof, for the purpose of measurements by legal measuring units for transaction or certification ...

- (1) Measuring instruments which are neither stamped with a verification mark nor a calibration mark;
- (2) Measuring instruments provided for (Term of Validity of Verification), which have passed the verification but the term of validity of verification has expired.

Of the measuring instruments which can be regarded as those used in daily life of consumers and are specified in the section concerning "duty of conforming to standards in manufacturing", measuring instruments specified in the decree are those used at home, so it is better to limit the instruments to a very few instruments such as a length meter (a scale, a tape measure), a balance, and a measuring cup. Verification of these types of measuring instrument is not necessary, and technical standards should be decided, and a duty to follow the standards should be introduced. It may be considered, however, that, of the measuring instruments used at home, clinical thermometers and aphygmomanometers are directly related to health of users and should be objects for verification.

In a decree for (restriction of use)....

For this reason, it would be better to employ a negative system where object measuring instruments for authorization are decided and other measuring instruments are specified.

(Sales by Legal Measuring Units)

Any person who sells commodities which are suitable for sale by measuring length, mass or volume shall make effort to sell such commodities by length, mass or volume in the legal measuring units.

(Indication of Length, Etc. to Commodity)

Any person who sells the commodities in the legal measuring units, after measuring length, mass or volume of the commodities in terms of the legal measuring units, shall make an effort to indicate length, mass or volume of the commodities in the relevant legal measuring units.

(Duty to Measure Accurately)

Any person who makes transaction or certification in the legal measuring units as to the quantity of the state of a physical phenomenon provided for by Cabinet Order with respect to the commodities provided for by Cabinet Order shall measure the quantity so as not to exceed the error provided for by Cabinet Order.

2. In addition to the above cases provided for by the preceding Paragraph, the person who makes transaction or certification as to the quantity of the state of a physical phenomenon in the legal measuring units shall make an effort to measure the quantity accurately.

It is necessary for a decree for (a duty to accurately measure) to include as many measuring instruments used in general business

transaction as possible for protection of consumers. The same principle can be applied to the allowable error of the measuring instruments.

(Indication of Net Content, Etc.)

When the person who sells the commodity prescribed by Cabinet Order prepares the commodity, in a container or package, in such a way that one can neither increase nor decrease the length, mass or volume thereof without breaking the container, package or seal attached thereto, he shall indicate, on the container or package, the length, mass or volume (hereinafter referred to as "net content") of the commodity in the legal measuring units as prescribed by Cabinet Order.

2. When the person who sells the commodity prescribed by Cabinet Order of the preceding Paragraph by length, mass or volume, in the legal measuring units indicates the net content of the commodity under the provision of the said Paragraph, he shall measure the net content in such a way that the error shall not exceed the limit prescribed by Cabinet Order provided that the indication is in either the length, mass or volume prescribed by Cabinet Order.

(Indication of a net content) In general business transaction, fairly many goods will be put under control by this provision. In the decree, provisions reflecting trends in the market of refrigerated foods and instant foods and based on considerations to form of sales of each food will be required.

Chapter IV Verification, Pattern Approval, Calibration
and Inspection of Verification Standards

Section 1. Verification

(Subject of Verification)

The verification of the measuring instruments shall be performed by Ministry of MINECOM, the respective governor of Province or the body designated by Ministry of MINECOM (hereinafter referred to as "designated verification body") according to the classification as determined by Cabinet Order.

(Place of Performing Verification)

The place of performing verification shall be the verification offices established in the MINECOM or government of Province or the designated verification bodies. Provided, however, that the case mentioned in either of the following items shall be subject to the provision of respective items:

- (1) The place where the measuring instrument is located when the verification cannot be performed at the verification office due to calamities or some other reasons beyond control;
- (2) The place where the land, building or another structures are located in the case of the measuring instrument which must be used by fixing to a land, building or another structures and which are provided for by the Ministry of International Trade and Industry Ordinance.

(Conditions for Qualification of verification, Etc.)

When a measuring instrument, which has been verified, conforms to Item (1) through Item (3), it shall be regarded as qualified: