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APPENDICES

APPENDIX A

CONCRETE COMPRESSIVE STRENGTH OF INDONESIA

A.1. Combined data from several suppliers

Data of concrete compressive strength: 21.5 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	24.808	15.577	0.0217	2.7672	-2.0195
2	16.154	16.154	0.0435	2.5042	-1.7121
3	15.577	17.885	0.0652	2.3367	-1.5127
4	27.116	19.616	0.0870	2.2101	-1.3600
5	28.846	20.192	0.1087	2.1068	-1.2336
6	23.654	21.635	0.1304	2.0184	-1.1244
7	24.808	21.923	0.1522	1.9405	-1.0271
8	25.385	22.5	0.1739	1.8704	-0.9387
9	26.827	22.5	0.1957	1.8063	-0.8571
10	22.5	22.5	0.2174	1.7470	-0.7808
11	21.635	22.789	0.2391	1.6916	-0.7088
12	21.923	22.789	0.2609	1.6394	-0.6403
13	27.693	23.654	0.2826	1.5898	-0.5747
14	20.192	23.654	0.3043	1.5425	-0.5115
15	25.096	24.519	0.3261	1.4971	-0.4503
16	25.962	24.519	0.3478	1.4533	-0.3908
17	26.25	24.519	0.3696	1.4110	-0.3326
18	25.962	24.519	0.3913	1.3699	-0.2755
19	28.846	24.519	0.4130	1.3298	-0.2193
20	27.693	24.808	0.4348	1.2907	-0.1639
21	23.654	24.808	0.4565	1.2523	-0.1089
22	24.519	24.808	0.4783	1.2146	-0.0544
23	27.404	24.808	0.5000	1.1774	0.0000
24	22.5	24.808	0.5217	1.2146	0.0544
25	24.519	25.096	0.5435	1.2523	0.1089
26	24.519	25.096	0.5652	1.2907	0.1639
27	22.5	25.385	0.5870	1.3298	0.2193
28	24.808	25.673	0.6087	1.3699	0.2755
29	25.673	25.962	0.6304	1.4110	0.3326
30	24.519	25.962	0.6522	1.4533	0.3908
31	22.789	25.962	0.6739	1.4971	0.4503
32	17.885	26.25	0.6957	1.5425	0.5115
33	19.616	26.827	0.7174	1.5898	0.5747
34	24.519	27.116	0.7391	1.6394	0.6403
35	28.846	27.404	0.7609	1.6916	0.7088
36	28.558	27.693	0.7826	1.7470	0.7808
37	30	27.693	0.8043	1.8063	0.8571
38	29.423	28.269	0.8261	1.8704	0.9387
39	25.096	28.558	0.8478	1.9405	1.0271
40	22.789	28.846	0.8696	2.0184	1.1244
41	30.289	28.846	0.8913	2.1068	1.2336
42	28.269	28.846	0.9130	2.2101	1.3600
43	24.808	29.423	0.9348	2.3367	1.5127
44	25.962	30	0.9565	2.5042	1.7121
45	24.808	30.289	0.9783	2.7672	2.0195

mean	24.7822
bias factor, λ	1.15266
standard deviation	3.3550
coef. of variation, V	0.1354

Data of concrete compressive strength: 24 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	30.866	16.731	0.02632	2.69725	-1.93836
2	31.154	20.192	0.05263	2.42670	-1.62021
3	20.192	20.481	0.07895	2.25343	-1.41244
4	28.846	23.943	0.10526	2.12193	-1.25228
5	27.404	24.231	0.13158	2.01402	-1.11902
6	20.481	24.231	0.15789	1.92137	-1.00312
7	31.731	24.231	0.18421	1.83939	-0.89932
8	32.308	24.231	0.21053	1.76530	-0.80440
9	30.289	24.519	0.23684	1.69727	-0.71623
10	29.712	24.519	0.26316	1.63401	-0.63331
11	29.423	24.808	0.28947	1.57461	-0.55454
12	29.423	25.962	0.31579	1.51834	-0.47909
13	23.943	25.973	0.34211	1.46468	-0.40628
14	33.75	26.827	0.36842	1.41317	-0.33560
15	24.231	26.827	0.39474	1.36348	-0.26657
16	28.558	27.116	0.42105	1.31529	-0.19883
17	27.116	27.116	0.44737	1.26836	-0.13202
18	16.731	27.116	0.47368	1.22247	-0.06584
19	27.116	27.404	0.50000	1.17741	0.00000
20	27.693	27.693	0.52632	1.22247	0.06584
21	26.827	27.981	0.55263	1.26836	0.13202
22	29.423	28.558	0.57895	1.31529	0.19883
23	24.231	28.846	0.60526	1.36348	0.26657
24	30.577	29.423	0.63158	1.41317	0.33560
25	29.712	29.423	0.65789	1.46468	0.40628
26	25.962	29.423	0.68421	1.51834	0.47909
27	27.116	29.712	0.71053	1.57461	0.55454
28	30	29.712	0.73684	1.63401	0.63331
29	24.519	30	0.76316	1.69727	0.71623
30	24.231	30.289	0.78947	1.76530	0.80440
31	24.808	30.577	0.81579	1.83939	0.89932
32	25.973	30.866	0.84211	1.92137	1.00312
33	24.519	31.154	0.86842	2.01402	1.11902
34	31.731	31.731	0.89474	2.12193	1.25228
35	24.231	31.731	0.92105	2.25343	1.41244
36	26.827	32.308	0.94737	2.42670	1.62021
37	27.981	33.75	0.97368	2.69725	1.93836

mean	27.2874
bias factor, λ	1.1370
standard deviation	3.6274
coef. of variation, V	0.1329

Data of concrete compressive strength: 31 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	41.34	32.40	0.0244	2.7253	-1.9709
2	40.52	32.60	0.0488	2.4578	-1.6572
3	37.21	32.89	0.0732	2.2869	-1.4529
4	40.52	33.07	0.0976	2.1574	-1.2958
5	34.30	33.30	0.1220	2.0514	-1.1654
6	33.70	33.47	0.1463	1.9605	-1.0523
7	34.00	33.70	0.1707	1.8802	-0.9512
8	32.40	34.00	0.1951	1.8078	-0.8590
9	32.60	34.30	0.2195	1.7415	-0.7736
10	34.50	34.50	0.2439	1.6799	-0.6935
11	35.10	34.50	0.2683	1.6221	-0.6176
12	37.40	34.62	0.2927	1.5676	-0.5452
13	35.70	34.62	0.3171	1.5157	-0.4755
14	34.50	34.73	0.3415	1.4660	-0.4080
15	33.30	35.00	0.3659	1.4181	-0.3424
16	35.00	35.02	0.3902	1.3718	-0.2783
17	36.93	35.10	0.4146	1.3269	-0.2153
18	37.51	35.70	0.4390	1.2831	-0.1531
19	37.51	35.71	0.4634	1.2403	-0.0916
20	36.35	35.78	0.4878	1.1982	-0.0305
21	35.78	35.78	0.5122	1.1982	0.0305
22	34.62	36.35	0.5366	1.2403	0.0916
23	36.35	36.35	0.5610	1.2831	0.1531
24	36.93	36.62	0.5854	1.3269	0.2153
25	36.93	36.93	0.6098	1.3718	0.2783
26	34.62	36.93	0.6341	1.4181	0.3424
27	37.51	36.93	0.6585	1.4660	0.4080
28	35.78	37.12	0.6829	1.5157	0.4755
29	33.07	37.21	0.7073	1.5676	0.5452
30	33.47	37.21	0.7317	1.6221	0.6176
31	32.89	37.40	0.7561	1.6799	0.6935
32	43.82	37.51	0.7805	1.7415	0.7736
33	39.69	37.51	0.8049	1.8078	0.8590
34	40.52	37.51	0.8293	1.8802	0.9512
35	34.73	39.69	0.8537	1.9605	1.0523
36	37.21	40.52	0.8780	2.0514	1.1654
37	35.71	40.52	0.9024	2.1574	1.2958
38	35.02	40.52	0.9268	2.2869	1.4529
39	37.12	41.34	0.9512	2.4578	1.6572
40	36.62	43.82	0.9756	2.7253	1.9709

mean	36.22
bias factor, λ	1.1684
standard deviation	2.5836
coef. of variation, V	0.0713

Data of concrete compressive strength: 41.5 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	51.57	39.34	0.01961	2.80422	-2.06236
2	51.13	44.71	0.03922	2.54507	-1.76025
3	51.29	45.00	0.05882	2.38043	-1.56505
4	50.00	45.00	0.07843	2.25634	-1.41596
5	51.32	45.28	0.09804	2.15517	-1.29299
6	51.59	46.41	0.11765	2.06885	-1.18694
7	52.36	46.41	0.13725	1.99295	-1.09278
8	49.72	47.55	0.15686	1.92478	-1.00741
9	51.51	47.83	0.17647	1.86258	-0.92881
10	51.32	48.11	0.19608	1.80513	-0.85556
11	52.30	48.11	0.21569	1.75153	-0.78663
12	48.12	48.12	0.23529	1.70113	-0.72126
13	44.71	48.13	0.25490	1.65341	-0.65883
14	45.00	48.28	0.27451	1.60796	-0.59888
15	46.41	48.39	0.29412	1.56447	-0.54101
16	46.41	48.68	0.31373	1.52265	-0.48490
17	50.09	48.68	0.33333	1.48230	-0.43029
18	39.34	48.68	0.35294	1.44323	-0.37695
19	45.00	48.68	0.37255	1.40527	-0.32467
20	48.96	48.96	0.39216	1.36828	-0.27328
21	48.13	48.96	0.41176	1.33214	-0.22261
22	48.68	48.96	0.43137	1.29675	-0.17254
23	48.39	48.96	0.45098	1.26201	-0.12291
24	49.25	49.24	0.47059	1.22782	-0.07361
25	48.28	49.25	0.49020	1.19411	-0.02451
26	48.68	49.25	0.50980	1.19411	0.02451
27	50.37	49.25	0.52941	1.22782	0.07361
28	50.94	49.25	0.54902	1.26201	0.12291
29	48.11	49.52	0.56863	1.29675	0.17254
30	47.55	49.53	0.58824	1.33214	0.22261
31	49.25	49.72	0.60784	1.36828	0.27328
32	45.28	49.81	0.62745	1.40527	0.32467
33	47.83	49.81	0.64706	1.44323	0.37695
34	49.25	50.00	0.66667	1.48230	0.43029
35	48.68	50.09	0.68627	1.52265	0.48490
36	48.96	50.09	0.70588	1.56447	0.54101
37	50.37	50.37	0.72549	1.60796	0.59888
38	49.25	50.37	0.74510	1.65341	0.65883
39	48.68	50.37	0.76471	1.70113	0.72126
40	48.11	50.94	0.78431	1.75153	0.78663
41	49.53	51.13	0.80392	1.80513	0.85556
42	48.96	51.29	0.82353	1.86258	0.92881
43	48.96	51.32	0.84314	1.92478	1.00741
44	49.81	51.32	0.86275	1.99295	1.09278
45	50.37	51.51	0.88235	2.06885	1.18694
46	49.24	51.51	0.90196	2.15517	1.29299
47	49.52	51.57	0.92157	2.25634	1.41596
48	49.81	51.59	0.94118	2.38043	1.56505
49	50.09	52.30	0.96078	2.54507	1.76025
50	51.51	52.36	0.98039	2.80422	2.06236

mean	48.9994
bias factor, λ	1.1807
standard deviation	2.3164
coef. of variation, V	0.0473

Data of concrete compressive strength: 25 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	73.99	60.57	0.0323	2.6207	-1.8490
2	72.97	61.41	0.0645	2.3413	-1.5182
3	74.33	71.60	0.0968	2.1612	-1.3003
4	72.63	71.94	0.1290	2.0237	-1.1310
5	74.67	71.94	0.1613	1.9103	-0.9891
6	71.94	71.94	0.1935	1.8123	-0.8647
7	72.63	71.94	0.2258	1.7252	-0.7525
8	74.33	72.29	0.2581	1.6459	-0.6490
9	73.99	72.63	0.2903	1.5727	-0.5521
10	72.97	72.63	0.3226	1.5043	-0.4601
11	74.67	72.63	0.3548	1.4395	-0.3718
12	72.97	72.97	0.3871	1.3777	-0.2865
13	61.41	72.97	0.4194	1.3184	-0.2032
14	60.57	72.97	0.4516	1.2609	-0.1213
15	72.63	73.31	0.4839	1.2049	-0.0403
16	74.33	73.31	0.5161	1.2049	0.0403
17	73.31	73.31	0.5484	1.2609	0.1213
18	71.94	73.99	0.5806	1.3184	0.2032
19	72.29	73.99	0.6129	1.3777	0.2865
20	74.67	73.99	0.6452	1.4395	0.3718
21	73.99	73.99	0.6774	1.5043	0.4601
22	71.60	74.33	0.7097	1.5727	0.5521
23	73.31	74.33	0.7419	1.6459	0.6490
24	74.67	74.33	0.7742	1.7252	0.7525
25	71.94	74.33	0.8065	1.8123	0.8647
26	73.99	74.67	0.8387	1.9103	0.9891
27	73.31	74.67	0.8710	2.0237	1.1310
28	75.70	74.67	0.9032	2.1612	1.3003
29	71.94	74.67	0.9355	2.3413	1.5182
30	74.33	75.70	0.9677	2.6207	1.8490

mean	72.6024
bias factor, λ	1.32004
standard deviation	3.3286
coef. of variation, V	0.04585

A.2. Data from company A

Data of concrete compressive strength: 35 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	37.51	36.2	0.00730	3.13687	-2.44261
2	38.95	36.35	0.01460	2.90752	-2.18126
3	38.66	36.35	0.02190	2.76455	-2.01648
4	36.35	36.64	0.02920	2.65845	-1.89315
5	38.09	36.86	0.03650	2.57315	-1.79328
6	36.93	36.93	0.04380	2.50129	-1.70862
7	38.56	36.93	0.05109	2.43888	-1.63468
8	39.69	36.93	0.05839	2.38350	-1.56873
9	39.12	37.07	0.06569	2.33356	-1.50896
10	37.42	37.22	0.07299	2.28797	-1.45414
11	40.83	37.22	0.08029	2.24592	-1.40336
12	38.56	37.22	0.08759	2.20684	-1.35596
13	36.86	37.22	0.09489	2.17027	-1.31142
14	39.69	37.23	0.10219	2.13585	-1.26934
15	40.26	37.33	0.10949	2.10330	-1.22939
16	38.56	37.42	0.11679	2.07239	-1.19131
17	37.99	37.51	0.12409	2.04292	-1.15488
18	38.09	37.51	0.13139	2.01475	-1.11992
19	36.35	37.51	0.13869	1.98773	-1.08628
20	37.22	37.62	0.14599	1.96176	-1.05382
21	36.93	37.8	0.15328	1.93673	-1.02243
22	40.68	37.8	0.16058	1.91256	-0.99202
23	40.57	37.8	0.16788	1.88917	-0.96250
24	42.7	37.9	0.17518	1.86651	-0.93380
25	41.26	37.92	0.18248	1.84451	-0.90584
26	39.82	37.99	0.18978	1.82312	-0.87857
27	41.55	38.09	0.19708	1.80230	-0.85194
28	39.24	38.09	0.20438	1.78201	-0.82590
29	37.8	38.09	0.21168	1.76221	-0.80041
30	39.53	38.09	0.21898	1.74286	-0.77543
31	41.84	38.18	0.22628	1.72395	-0.75092
32	39.24	38.18	0.23358	1.70543	-0.72686
33	40.97	38.18	0.24088	1.68729	-0.70321
34	39.53	38.18	0.24818	1.66950	-0.67995
35	36.93	38.18	0.25547	1.65205	-0.65705
36	38.66	38.18	0.26277	1.63491	-0.63449
37	37.8	38.47	0.27007	1.61806	-0.61225
38	41.55	38.47	0.27737	1.60150	-0.59031
39	40.68	38.47	0.28467	1.58519	-0.56865
40	41.84	38.47	0.29197	1.56914	-0.54725
41	38.96	38.47	0.29927	1.55332	-0.52610
42	39.82	38.55	0.30657	1.53773	-0.50519
43	37.51	38.56	0.31387	1.52235	-0.48450
44	37.22	38.56	0.32117	1.50718	-0.46401
45	40.39	38.56	0.32847	1.49219	-0.44372
46	38.09	38.65	0.33577	1.47739	-0.42361
47	37.22	38.66	0.34307	1.46276	-0.40367
48	38.55	38.66	0.35036	1.44830	-0.38389
49	38.66	38.66	0.35766	1.43399	-0.36426
50	39.82	38.66	0.36496	1.41983	-0.34478
51	37.51	38.66	0.37226	1.40581	-0.32543
52	36.64	38.75	0.37956	1.39193	-0.30619
53	38.65	38.75	0.38686	1.37818	-0.28708
54	37.22	38.75	0.39416	1.36455	-0.26807
55	39.24	38.93	0.40146	1.35103	-0.24916
56	40.11	38.95	0.40876	1.33763	-0.23034
57	41.55	38.95	0.41606	1.32433	-0.21160
58	40.68	38.96	0.42336	1.31114	-0.19294
59	40.39	39.03	0.43066	1.29803	-0.17436
60	41.01	39.03	0.43796	1.28502	-0.15583
61	38.47	39.03	0.44526	1.27209	-0.13736
62	39.6	39.03	0.45255	1.25924	-0.11894
63	39.24	39.03	0.45985	1.24647	-0.10056
64	37.8	39.03	0.46715	1.23377	-0.08222
65	38.66	39.05	0.47445	1.22114	-0.06392
66	40.58	39.12	0.48175	1.20857	-0.04563
67	40.39	39.24	0.48905	1.19607	-0.02737
68	37.23	39.24	0.49635	1.18362	-0.00912
69	39.53	39.24	0.50365	1.18362	0.00912
70	38.93	39.24	0.51095	1.19607	0.02737
71	38.66	39.24	0.51825	1.20857	0.04563
72	38.09	39.31	0.52555	1.22114	0.06392
73	42.12	39.31	0.53285	1.23377	0.08222

Data of concrete compressive strength: 35 MPa (continue)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
74	39.24	39.31	0.54015	1.24647	0.10056
75	39.82	39.31	0.54745	1.25924	0.11894
76	38.95	39.53	0.55474	1.27209	0.13736
77	40.45	39.53	0.56204	1.28502	0.15583
78	38.18	39.53	0.56934	1.29803	0.17436
79	39.31	39.6	0.57664	1.31114	0.19294
80	39.6	39.6	0.58394	1.32433	0.21160
81	38.75	39.6	0.59124	1.33763	0.23034
82	39.88	39.6	0.59854	1.35103	0.24916
83	41.29	39.6	0.60584	1.36455	0.26807
84	38.18	39.6	0.61314	1.37818	0.28708
85	40.16	39.6	0.62044	1.39193	0.30619
86	38.47	39.69	0.62774	1.40581	0.32543
87	39.03	39.69	0.63504	1.41983	0.34478
88	39.6	39.82	0.64234	1.43399	0.36426
89	38.75	39.82	0.64964	1.44830	0.38389
90	39.88	39.82	0.65693	1.46276	0.40367
91	39.6	39.82	0.66423	1.47739	0.42361
92	41.86	39.83	0.67153	1.49219	0.44372
93	41.29	39.88	0.67883	1.50718	0.46401
94	41.01	39.88	0.68613	1.52235	0.48450
95	39.88	39.88	0.69343	1.53773	0.50519
96	38.75	39.88	0.70073	1.55332	0.52610
97	41.86	40.01	0.70803	1.56914	0.54725
98	39.03	40.11	0.71533	1.58519	0.56865
99	40.16	40.16	0.72263	1.60150	0.59031
100	37.07	40.16	0.72993	1.61806	0.61225
101	39.05	40.16	0.73723	1.63491	0.63449
102	37.92	40.26	0.74453	1.65205	0.65705
103	41.31	40.39	0.75182	1.66950	0.67995
104	41.88	40.39	0.75912	1.68729	0.70321
105	41.59	40.39	0.76642	1.70543	0.72686
106	40.74	40.45	0.77372	1.72395	0.75092
107	36.2	40.45	0.78102	1.74286	0.77543
108	37.62	40.45	0.78832	1.76221	0.80041
109	39.31	40.57	0.79562	1.78201	0.82590
110	41.58	40.58	0.80292	1.80230	0.85194
111	38.18	40.68	0.81022	1.82312	0.87857
112	39.6	40.68	0.81752	1.84451	0.90584
113	39.88	40.68	0.82482	1.86651	0.93380
114	38.47	40.74	0.83212	1.88917	0.96250
115	41.86	40.83	0.83942	1.91256	0.99202
116	39.03	40.97	0.84672	1.93673	1.02243
117	38.18	41.01	0.85401	1.96176	1.05382
118	41.01	41.01	0.86131	1.98773	1.08628
119	39.6	41.01	0.86861	2.01475	1.11992
120	39.31	41.26	0.87591	2.04292	1.15488
121	38.47	41.29	0.88321	2.07239	1.19131
122	39.03	41.29	0.89051	2.10330	1.22939
123	40.45	41.31	0.89781	2.13585	1.26934
124	39.6	41.55	0.90511	2.17027	1.31142
125	37.9	41.55	0.91241	2.20684	1.35596
126	39.31	41.55	0.91971	2.24592	1.40336
127	38.18	41.58	0.92701	2.28797	1.45414
128	39.83	41.59	0.93431	2.33356	1.50896
129	40.01	41.84	0.94161	2.38350	1.56873
130	37.33	41.84	0.94891	2.43888	1.63468
131	39.03	41.86	0.95620	2.50129	1.70862
132	38.18	41.86	0.96350	2.57315	1.79328
133	40.16	41.86	0.97080	2.65845	1.89315
134	38.47	41.88	0.97810	2.76455	2.01648
135	39.03	42.12	0.98540	2.90752	2.18126
136	40.45	42.7	0.99270	3.13687	2.44261

mean	39.27316
bias factor, λ	1.43949
standard deviation	1.12209
coef. of variation, V	0.036653

Data of concrete compressive strength: 25 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	29.25	27.51	0.02857	2.66659	-1.90264
2	30.65	27.51	0.05714	2.39257	-1.57955
3	30.40	27.80	0.08571	2.21664	-1.36786
4	28.91	27.94	0.11429	2.08281	-1.20417
5	28.38	28.07	0.14286	1.97277	-1.06759
6	31.27	28.09	0.17143	1.87808	-0.94846
7	28.07	28.09	0.20000	1.79412	-0.84146
8	30.70	28.33	0.22857	1.71808	-0.74331
9	31.56	28.33	0.25714	1.64810	-0.65186
10	27.51	28.37	0.28571	1.58289	-0.56557
11	29.86	28.38	0.31429	1.52148	-0.48332
12	29.25	28.66	0.34286	1.46318	-0.40424
13	27.94	28.91	0.37143	1.40741	-0.32763
14	28.96	28.96	0.40000	1.35373	-0.25293
15	27.80	28.96	0.42857	1.30177	-0.17966
16	28.33	28.96	0.45714	1.25121	-0.10738
17	27.51	29.25	0.48571	1.20178	-0.03572
18	29.54	29.25	0.51429	1.20178	0.03572
19	28.09	29.25	0.54286	1.25121	0.10738
20	28.96	29.25	0.57143	1.30177	0.17966
21	30.99	29.54	0.60000	1.35373	0.25293
22	31.27	29.54	0.62857	1.40741	0.32763
23	29.25	29.82	0.65714	1.46318	0.40424
24	28.09	29.86	0.68571	1.52148	0.48332
25	28.33	30.40	0.71429	1.58289	0.56557
26	29.54	30.40	0.74286	1.64810	0.65186
27	28.66	30.65	0.77143	1.71808	0.74331
28	30.70	30.70	0.80000	1.79412	0.84146
29	30.40	30.70	0.82857	1.87808	0.94846
30	28.96	30.70	0.85714	1.97277	1.06759
31	29.82	30.99	0.88571	2.08281	1.20417
32	30.70	31.27	0.91429	2.21664	1.36786
33	28.37	31.27	0.94286	2.39257	1.57955
34	29.25	31.56	0.97143	2.66659	1.90264

mean	29.33042
bias factor, λ	1.181113
standard deviation	1.173217
coef. of variation, V	0.040269

Data of concrete compressive strength: 37 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	42.41	39.53	0.02439	2.72528	-1.97094
2	42.70	39.82	0.04878	2.45781	-1.65716
3	41.55	39.82	0.07317	2.28690	-1.45285
4	41.84	39.82	0.09756	2.15744	-1.29576
5	39.82	39.82	0.12195	2.05141	-1.16539
6	40.97	40.10	0.14634	1.96052	-1.05226
7	39.53	40.10	0.17073	1.88025	-0.95121
8	39.82	40.10	0.19512	1.80783	-0.85903
9	40.68	40.39	0.21951	1.74146	-0.77362
10	42.70	40.39	0.24390	1.67987	-0.69352
11	41.26	40.39	0.26829	1.62214	-0.61764
12	41.55	40.68	0.29268	1.56759	-0.54518
13	40.39	40.68	0.31707	1.51567	-0.47548
14	43.28	40.97	0.34146	1.46596	-0.40803
15	42.70	41.26	0.36585	1.41811	-0.34241
16	39.82	41.26	0.39024	1.37185	-0.27826
17	42.41	41.26	0.41463	1.32692	-0.21525
18	40.10	41.55	0.43902	1.28312	-0.15312
19	42.12	41.55	0.46341	1.24027	-0.09161
20	40.68	41.55	0.48780	1.19820	-0.03049
21	42.12	41.55	0.51220	1.19820	0.03049
22	42.99	41.55	0.53659	1.24027	0.09161
23	41.55	41.55	0.56098	1.28312	0.15312
24	42.70	41.84	0.58537	1.32692	0.21525
25	40.10	42.12	0.60976	1.37185	0.27826
26	41.26	42.12	0.63415	1.41811	0.34241
27	41.55	42.41	0.65854	1.46596	0.40803
28	40.39	42.41	0.68293	1.51567	0.47548
29	42.41	42.41	0.70732	1.56759	0.54518
30	40.39	42.41	0.73171	1.62214	0.61764
31	40.10	42.41	0.75610	1.67987	0.69352
32	41.55	42.70	0.78049	1.74146	0.77362
33	43.28	42.70	0.80488	1.80783	0.85903
34	42.41	42.70	0.82927	1.88025	0.95121
35	41.26	42.70	0.85366	1.96052	1.05226
36	42.99	42.99	0.87805	2.05141	1.16539
37	43.57	42.99	0.90244	2.15744	1.29576
38	42.41	43.28	0.92683	2.28690	1.45285
39	39.82	43.28	0.95122	2.45781	1.65716
40	41.55	43.57	0.97561	2.72528	1.97094

mean	41.5189
bias factor, λ	1.1592
standard deviation	1.1221
coef. of variation, V	0.0279

Data of concrete compressive strength: 45 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	54.1	48.18	0.0313	2.6328	-1.8631
2	54.7	48.76	0.0625	2.3548	-1.5344
3	54.2	49.8	0.0938	2.1758	-1.3182
4	54.4	49.8	0.1250	2.0393	-1.1504
5	53.5	49.9	0.1563	1.9268	-1.0100
6	54.1	50.4	0.1875	1.8297	-0.8870
7	54.6	50.7	0.2188	1.7435	-0.7762
8	.54	50.78	0.2500	1.6651	-0.6742
9	53.6	51.2	0.2813	1.5928	-0.5788
10	54	51.8	0.3125	1.5252	-0.4884
11	54.5	52.9	0.3438	1.4614	-0.4018
12	54.2	52.9	0.3750	1.4006	-0.3182
13	54.4	53.5	0.4063	1.3422	-0.2368
14	54	53.6	0.4375	1.2858	-0.1570
15	53.7	53.7	0.4688	1.2310	-0.0782
16	54.2	53.7	0.5000	1.1774	0.0000
17	49.8	54	0.5313	1.2310	0.0782
18	52.9	54	0.5625	1.2858	0.1570
19	50.7	54	0.5938	1.3422	0.2368
20	52.9	54.1	0.6250	1.4006	0.3182
21	53.7	54.1	0.6563	1.4614	0.4018
22	54.1	54.1	0.6875	1.5252	0.4884
23	49.8	54.2	0.7188	1.5928	0.5788
24	50.78	54.2	0.7500	1.6651	0.6742
25	48.18	54.2	0.7813	1.7435	0.7762
26	48.76	54.4	0.8125	1.8297	0.8870
27	49.9	54.4	0.8438	1.9268	1.0100
28	51.2	54.4	0.8750	2.0393	1.1504
29	50.4	54.5	0.9063	2.1758	1.3182
30	51.8	54.6	0.9375	2.3548	1.5344
31	54.4	54.7	0.9688	2.6328	1.8631

mean	52.7587
bias factor, λ	1.9773
standard deviation	1.1724
coef. of variation, V	0.0375

A.3. Data from company B

Data of concrete compressive strength: 25 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	34	32.8	0.02439	2.72528	-1.97094
2	34.5	33.2	0.04878	2.45781	-1.65716
3	33.8	33.2	0.07317	2.28690	-1.45285
4	33.3	33.3	0.09756	2.15744	-1.29576
5	34.8	33.3	0.12195	2.05141	-1.16539
6	35.1	33.4	0.14634	1.96052	-1.05226
7	35.1	33.4	0.17073	1.88025	-0.95121
8	34.9	33.5	0.19512	1.80783	-0.85903
9	36.2	33.5	0.21951	1.74146	-0.77362
10	35.1	33.7	0.24390	1.67987	-0.69352
11	34.5	33.8	0.26829	1.62214	-0.61764
12	34	33.8	0.29268	1.56759	-0.54518
13	34.1	33.8	0.31707	1.51567	-0.47548
14	34.1	34	0.34146	1.46596	-0.40803
15	35.1	34	0.36585	1.41811	-0.34241
16	34.2	34	0.39024	1.37185	-0.27826
17	34.5	34	0.41463	1.32692	-0.21525
18	33.7	34	0.43902	1.28312	-0.15312
19	33.2	34	0.46341	1.24027	-0.09161
20	34	34.1	0.48780	1.19820	-0.03049
21	34.2	34.1	0.51220	1.19820	0.03049
22	34.5	34.1	0.53659	1.24027	0.09161
23	33.4	34.2	0.56098	1.28312	0.15312
24	33.8	34.2	0.58537	1.32692	0.21525
25	34	34.5	0.60976	1.37185	0.27826
26	33.3	34.5	0.63415	1.41811	0.34241
27	33.5	34.5	0.65854	1.46596	0.40803
28	33.5	34.5	0.68293	1.51567	0.47548
29	34.8	34.5	0.70732	1.56759	0.54518
30	34	34.8	0.73171	1.62214	0.61764
31	33.8	34.8	0.75610	1.67987	0.69352
32	35.1	34.8	0.78049	1.74146	0.77362
33	34.8	34.9	0.80488	1.80783	0.85903
34	34.1	35.1	0.82927	1.88025	0.95121
35	33.2	35.1	0.85366	1.96052	1.05226
36	33.4	35.1	0.87805	2.05141	1.16539
37	34	35.1	0.90244	2.15744	1.29576
38	32.8	35.1	0.92683	2.28690	1.45285
39	34.5	35.1	0.95122	2.45781	1.65716
40	35.1	36.2	0.97561	2.72528	1.97094

mean	34.2
bias factor, λ	0.7111
standard deviation	1.368
coef. of variation, V	0.0208

Data of concrete compressive strength: 30 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	38.5	37.3	0.01149	2.98861	-2.27407
2	38.1	37.4	0.02299	2.74691	-1.99604
3	37.6	37.4	0.03448	2.59511	-1.81905
4	37.8	37.5	0.04598	2.48178	-1.68555
5	37.9	37.5	0.05747	2.39018	-1.57669
6	38.6	37.6	0.06897	2.31264	-1.48383
7	37.6	37.6	0.08046	2.24499	-1.40223
8	37.7	37.6	0.09195	2.18470	-1.32902
9	37.9	37.6	0.10345	2.13011	-1.26231
10	38.6	37.6	0.11494	2.08006	-1.20078
11	39.3	37.6	0.12644	2.03372	-1.14348
12	39.6	37.7	0.13793	1.99048	-1.08970
13	39.6	37.8	0.14943	1.94985	-1.03890
14	40.1	37.8	0.16092	1.91147	-0.99065
15	39.2	37.8	0.17241	1.87502	-0.94459
16	37.9	37.8	0.18391	1.84028	-0.90046
17	38	37.8	0.19540	1.80704	-0.85801
18	38.5	37.8	0.20690	1.77513	-0.81705
19	39.9	37.8	0.21839	1.74440	-0.77742
20	37.6	37.9	0.22989	1.71475	-0.73898
21	39.1	37.9	0.24138	1.68605	-0.70159
22	39.1	37.9	0.25287	1.65823	-0.66517
23	41.3	37.9	0.26437	1.63120	-0.62960
24	38.2	37.9	0.27586	1.60490	-0.59482
25	39.6	37.9	0.28736	1.57926	-0.56075
26	39.9	37.9	0.29885	1.55423	-0.52731
27	37.9	37.9	0.31034	1.52975	-0.49446
28	37.4	37.9	0.32184	1.50579	-0.46214
29	37.9	37.9	0.33333	1.48230	-0.43029
30	38.4	37.9	0.34483	1.45925	-0.39888
31	37.9	37.9	0.35632	1.43661	-0.36786
32	40.2	37.9	0.36782	1.41434	-0.33720
33	38.1	38	0.37931	1.39241	-0.30686
34	38.8	38.1	0.39080	1.37080	-0.27680
35	38.9	38.1	0.40230	1.34949	-0.24699
36	37.6	38.1	0.41379	1.32845	-0.21741
37	37.4	38.1	0.42529	1.30766	-0.18802
38	39.6	38.2	0.43678	1.28711	-0.15881
39	37.9	38.2	0.44828	1.26676	-0.12973
40	38.5	38.4	0.45977	1.24662	-0.10077
41	39.6	38.4	0.47126	1.22665	-0.07191
42	38.5	38.4	0.48276	1.20685	-0.04311
43	39.8	38.4	0.49425	1.18719	-0.01436
44	37.9	38.5	0.50575	1.16766	0.01436
45	39.6	38.5	0.51724	1.14826	0.04309
46	37.9	38.5	0.52874	1.12895	0.07184
47	39.3	38.5	0.54023	1.24662	0.10077
48	39.6	38.5	0.55172	1.26676	0.12973
49	38.4	38.5	0.56322	1.28711	0.15881
50	38.5	38.5	0.57471	1.30766	0.18802
51	39.1	38.5	0.58621	1.32845	0.21741
52	37.9	38.5	0.59770	1.34949	0.24699
53	38.5	38.5	0.60920	1.37080	0.27680
54	38.6	38.5	0.62069	1.39241	0.30686
55	37.8	38.5	0.63218	1.41434	0.33720
56	37.9	38.6	0.64368	1.43661	0.36786
57	37.6	38.6	0.65517	1.45925	0.39888
58	37.6	38.6	0.66667	1.48230	0.43029
59	38.2	38.8	0.67816	1.50579	0.46214
60	39.6	38.9	0.68966	1.52975	0.49446
61	38.5	39	0.70115	1.55423	0.52731
62	39.5	39.1	0.71264	1.57926	0.56075
63	38.5	39.1	0.72414	1.60490	0.59482
64	37.5	39.1	0.73563	1.63120	0.62960
65	37.9	39.1	0.74713	1.65823	0.66517
66	38.4	39.2	0.75862	1.68605	0.70159
67	37.5	39.2	0.77011	1.71475	0.73898

Data of concrete compressive strength: 30 MPa (cont.)

No.	Recorded	Increase. order	pi = i/(N+1)	ti = $\sqrt{-\ln(p^2)}$	zi = Φ^{-1}(pi)
68	39.6	39.3	0.78161	1.74440	0.77742
69	39.2	39.3	0.79310	1.77513	0.81705
70	39	39.3	0.80460	1.80704	0.85801
71	37.8	39.5	0.81609	1.84028	0.90046
72	37.3	39.6	0.82759	1.87502	0.94459
73	37.8	39.6	0.83908	1.91147	0.99065
74	38.5	39.6	0.85057	1.94985	1.03890
75	37.8	39.6	0.86207	1.99048	1.08970
76	38.4	39.6	0.87356	2.03372	1.14348
77	38.5	39.6	0.88506	2.08006	1.20078
78	39.3	39.6	0.89655	2.13011	1.26231
79	37.9	39.6	0.90805	2.18470	1.32902
80	38.5	39.6	0.91954	2.24499	1.40223
81	39.1	39.8	0.93103	2.31264	1.48383
82	38.5	39.9	0.94253	2.39018	1.57669
83	37.8	39.9	0.95402	2.48178	1.68555
84	38.1	40.1	0.96552	2.59511	1.81905
85	37.8	40.2	0.97701	2.74691	1.99604
86	38.1	41.3	0.98851	2.98861	2.27407

mean	38.5163
bias factor, λ	0.8132
standard deviation	1.2839
coef. of variation, V	0.0211

Data of concrete compressive strength: 40 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	48.2	47.4	0.02083	2.78252	-2.03727
2	47.9	47.5	0.04167	2.52113	-1.73205
3	47.9	47.8	0.06250	2.35482	-1.53443
4	47.4	47.9	0.08333	2.22931	-1.38323
5	48.4	47.9	0.10417	2.12686	-1.25832
6	47.5	47.9	0.12500	2.03933	-1.15044
7	49.5	47.9	0.14583	1.96229	-1.05448
8	48.7	48.1	0.16667	1.89302	-0.96736
9	48.5	48.1	0.18750	1.82974	-0.88702
10	48.1	48.1	0.20833	1.77122	-0.81203
11	48.7	48.1	0.22917	1.71657	-0.74135
12	49.2	48.1	0.25000	1.66511	-0.67419
13	49.8	48.2	0.27083	1.61632	-0.60995
14	49.7	48.3	0.29167	1.56980	-0.54814
15	49.2	48.4	0.31250	1.52522	-0.48836
16	48.7	48.5	0.33333	1.48230	-0.43029
17	48.7	48.5	0.35417	1.44082	-0.37365
18	49.2	48.6	0.37500	1.40059	-0.31820
19	49.2	48.7	0.39583	1.36144	-0.26373
20	49.8	48.7	0.41667	1.32323	-0.21005
21	49.2	48.7	0.43750	1.28583	-0.15699
22	48.7	48.7	0.45833	1.24913	-0.10439
23	49.8	48.7	0.47917	1.21302	-0.05211
24	49.5	48.7	0.50000	1.17741	0.00000
25	48.7	48.7	0.52083	1.14221	0.05207
26	49.8	48.7	0.54167	1.10734	0.10424
27	49.5	48.7	0.56250	1.07272	0.15665
28	48.7	48.7	0.58333	1.03826	0.20945
29	48.6	48.7	0.60417	1.00390	0.26277
30	48.3	48.8	0.62500	0.96954	0.31679
31	47.9	49.2	0.64583	0.93511	0.37168
32	50.4	49.2	0.66667	0.90052	0.42762
33	52	49.2	0.68750	0.86567	0.48483
34	48.7	49.2	0.70833	0.83047	0.54357
35	48.1	49.2	0.72917	0.79480	0.60412
36	48.1	49.2	0.75000	0.75853	0.66681
37	47.8	49.2	0.77083	0.72150	0.73207
38	48.1	49.5	0.79167	0.68354	0.80040
39	49.2	49.5	0.81250	0.64442	0.87245
40	48.7	49.5	0.83333	0.60386	0.94904
41	48.1	49.7	0.85417	0.56148	1.03131
42	48.7	49.8	0.87500	0.51678	1.12080
43	47.9	49.8	0.89583	0.46904	1.21980
44	48.7	49.8	0.91667	0.41716	1.33189
45	49.2	49.8	0.93750	0.35927	1.46323
46	48.5	50.4	0.95833	0.29175	1.62618
47	48.8	52	0.97917	0.20520	1.85373

mean	48.8085
bias factor, λ	0.82931
standard deviation	1.2202
coef. of variation, V	0.01699

Data of concrete compressive strength: 55 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	60.4	57.4	0.03030	2.64443	-1.87678
2	59.7	58.7	0.06061	2.36785	-1.55003
3	60.4	59.7	0.09091	2.18993	-1.33539
4	60.8	59.7	0.12121	2.05437	-1.16905
5	60.8	60.1	0.15152	1.94271	-1.02995
6	61.1	60.2	0.18182	1.84648	-0.90835
7	60.7	60.3	0.21212	1.76102	-0.79888
8	61.5	60.3	0.24242	1.68349	-0.69824
9	61.2	60.4	0.27273	1.61201	-0.60423
10	60.1	60.4	0.30303	1.54527	-0.51530
11	61.5	60.7	0.33333	1.48230	-0.43029
12	61.1	60.8	0.36364	1.42239	-0.34831
13	57.4	60.8	0.39394	1.36496	-0.26864
14	58.7	60.9	0.42424	1.30954	-0.19069
15	61.2	61.1	0.45455	1.25575	-0.11392
16	59.7	61.1	0.48485	1.20326	-0.03788
17	60.2	61.2	0.51515	1.15178	0.03787
18	62	61.2	0.54545	1.10103	0.11375
19	61.2	61.2	0.57576	1.05078	0.19020
20	60.3	61.2	0.60606	1.00077	0.26765
21	61.4	61.2	0.63636	0.95077	0.34661
22	62	61.4	0.66667	0.90052	0.42762
23	61.2	61.5	0.69697	0.84972	0.51133
24	60.3	61.5	0.72727	0.79806	0.59853
25	62.9	61.5	0.75758	0.74516	0.69022
26	61.7	61.7	0.78788	0.69052	0.78772
27	61.5	62	0.81818	0.63352	0.89285
28	63.2	62	0.84848	0.57324	1.00823
29	61.2	62	0.87879	0.50835	1.13801
30	62	62	0.90909	0.43660	1.28930
31	60.9	62.9	0.93939	0.35361	1.47647
32	62	63.2	0.96970	0.24808	1.73809

mean	60.94688
bias factor, λ	1.120767
standard deviation	1.108125
coef. of variation, V	0.018389

APPENDIX B

DATA OF STEEL REINFORCEMENT IN INDONESIA

B.1 Data of reinforcing steel from Indonesia

Plain 12

No.	Diameter	fy
1	11.8	317.9
2	11.7	316.4
3	11.9	330.6
4	11.9	355.3
5	11.9	326.1
6	11.745	418.989
7	11.628	402.468
8	11.745	414.013
9	11.745	418.989
10	11.628	402.468
11	11.745	414.013

mean	11.76691	374.29455
st.dev	0.099611	44.567511
V	0.008465	0.1190707
λ	0.980576	1.2476485

Plain 8

No.	Diameter	fy
1	7.6	419
2	7.6	404.7
3	7.6	401.4
4	7.45	358
5	7.45	293.8
6	7.45	296.1
7	7.728	390.13
8	7.728	393.96
9	7.728	390.98
10	7.728	390.13
11	7.749	393.959
12	7.728	390.984

mean	7.62825	376.929
st.dev	0.121373	40.7494
V	0.015911	0.10811
λ	0.953531	1.25643

Plain 10

No.	Diameter	fy
1	9.885	398.69
2	9.744	410.032
3	9.868	413.018
4	9.885	398.686
5	9.744	410.032
6	9.868	413.018

mean	9.832333	407.246
st.dev	0.068844	6.762164
V	0.007002	0.016605
λ	0.983233	1.357487

Deform 13

No	Diameter	fy
1	12.93	590.5
2	12.74	602.4
3	12.68	568.1
4	12.68	566.5
5	12.68	564.5
6	12.7	590.4
7	12.7	596.3
8	12.7	600.3
9	12.72	487.261
10	12.625	471.736
11	12.515	490.247
12	12.72	487.261
13	12.625	471.736
14	12.515	490.247

mean	12.68071	541.2491
st.dev	0.100381	53.84714
V	0.97544	1.082498
λ	0.007916	0.099487

Deform 10

No	Diameter	fy
1	9.98	597.9
2	9.98	543.6
3	9.98	575.5
4	9.9	618.7
5	9.9	623.9
6	9.9	588.8
7	9.702	592.76
8	9.71	608.48
9	9.727	569.66
10	9.836	523.09
11	9.836	525.08
12	9.93	515.92
13	9.702	592.76
14	9.71	608.48
15	9.727	569.67

mean	9.834667	576.95
st.dev	0.111718	35.406
V	0.983467	1.1539
λ	0.01136	0.0614

Deform 19

No	Diameter	fy
1	18.78	456
2	18.78	431.6
3	18.78	439.5
4	18.78	329.5
5	18.78	320.5
6	18.78	321.1
7	18.935	477.31
8	18.711	452.23
9	18.711	468.55
10	18.803	337.18
11	18.851	317.68
12	18.921	352.71
13	18.755	296.55
14	18.721	326.11
15	18.818	329.11
16	18.95	477.31
17	18.711	452.23
18	18.711	468.55

mean	18.79322	391.87
st.dev	0.076629	69.864
V	0.989117	0.1783
λ	0.004077	0.1783

Data of reinforcing steel from Indonesia (cont.)

Deform 16

No	Diameter	fy
1	15.59	490
2	15.59	486
3	15.59	496.3
4	15.84	313.7
5	15.84	326.6
6	15.84	329.5
7	15.815	419.8
8	15.758	421.2
9	15.618	423.4
10	15.749	305.9
11	15.749	317.9
12	15.789	300.2
13	15.733	308.4
14	15.828	304.8
15	15.823	302.6
16	15.815	419.8
17	15.758	421.2
18	15.618	423.7

mean	15.74128	378.4
st.dev	0.095911	72.54
V	0.98383	0.192
λ	0.006093	0.192

Deform 22

No	Diameter	fy
1	21.97	475.3
2	21.97	475.1
3	21.97	409
4	21.88	415
5	21.88	388.4
6	21.88	379.5
7	21.882	385.947
8	21.874	412.42
9	21.856	376.194
10	21.885	498.806
11	21.996	495.024
12	21.874	487.261
13	21.96	493.4
14	21.96	457.5
15	21.96	442.2
16	21.758	431.867
17	21.773	391.981
18	21.623	424.99
19	21.74	516.378
20	21.882	385.947
21	21.874	412.42
22	21.856	376.194

mean	21.87741	433.2195
st.dev	0.089996	46.39147
V	0.994428	0.107085
λ	0.004114	0.107085

Deform 25

No	Diameter	fy
1	24.489	430.53
2	24.429	430.054
3	24.401	437.898
4	24.708	448.511
5	24.888	413.103
6	25.005	442.61
7	24.489	430.533
8	24.429	430.932
9	24.401	437.898

mean	24.5821	433.5632
st.dev	0.2286	9.994387
V	0.98328	0.023052
λ	0.0093	0.023052

APPENDIX C

CONCRETE COMPRESSIVE STRENGTH OF JAPAN

C.1 Combined data from several suppliers during 1992-1994 (Taken from PWRI data base)

Data of concrete compressive strength: 21 MPa (1992)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	18.4	18.4	0.015873	2.878588	-2.14804
2	25.1	18.8	0.031746	2.62678	-1.85614
3	22	22	0.047619	2.467599	-1.66876
4	22.4	22.2	0.063492	2.348123	-1.52641
5	22.4	22.4	0.079365	2.251087	-1.40961
6	24.9	22.4	0.095238	2.168583	-1.30937
7	27.1	22.5	0.111111	2.096294	-1.22078
8	26.4	22.9	0.126984	2.031597	-1.14084
9	25.7	22.9	0.142857	1.97277	-1.06759
10	24.7	23.2	0.15873	1.918619	-0.99966
11	29.1	23.4	0.174603	1.868282	-0.93605
12	29.1	23.9	0.190476	1.821114	-0.87601
13	25.3	23.9	0.206349	1.776618	-0.81897
14	23.4	24	0.222222	1.734403	-0.76448
15	18.8	24.2	0.238095	1.694157	-0.71217
16	24.2	24.4	0.253968	1.655624	-0.66174
17	29.3	24.7	0.269841	1.618593	-0.61295
18	28.1	24.9	0.285714	1.582885	-0.56557
19	27.3	25.1	0.301587	1.548351	-0.51944
20	28.5	25.1	0.31746	1.514861	-0.47439
21	28	25.3	0.333333	1.482304	-0.43029
22	25.8	25.3	0.349206	1.450581	-0.38702
23	28.2	25.5	0.365079	1.419606	-0.34447
24	22.9	25.5	0.380952	1.389303	-0.30254
25	31	25.6	0.396825	1.359602	-0.26115
26	29.2	25.7	0.412698	1.330442	-0.22022
27	23.2	25.8	0.428571	1.301766	-0.17966
28	24	26	0.444444	1.273523	-0.13941
29	25.5	26.2	0.460317	1.245664	-0.0994
30	30.2	26.2	0.47619	1.218144	-0.05956
31	25.6	26.2	0.492063	1.190922	-0.01984
32	25.1	26.3	0.507937	1.190922	0.019839
33	26.2	26.4	0.52381	1.218144	0.059562
34	29.3	26.7	0.539683	1.245664	0.099398
35	28.4	26.9	0.555556	1.273523	0.139409
36	22.9	27.1	0.571429	1.301766	0.17966
37	28.7	27.3	0.587302	1.330442	0.220218
38	23.9	27.3	0.603175	1.359602	0.261154
39	27.3	28	0.619048	1.389303	0.302545
40	26.2	28	0.634921	1.419606	0.344471
41	25.3	28	0.650794	1.450581	0.387021
42	29	28.1	0.666667	1.482304	0.430292
43	28	28.2	0.68254	1.514861	0.474391
44	22.5	28.4	0.698413	1.548351	0.51944
45	26.9	28.4	0.714286	1.582885	0.565574
46	25.5	28.5	0.730159	1.618593	0.612948
47	29.8	28.7	0.746032	1.655624	0.661744
48	34.4	29	0.761905	1.694157	0.712172
49	34.2	29	0.777778	1.734403	0.764481
50	26.2	29.1	0.793651	1.776618	0.818971

Data of concrete compressive strength: 21 MPa (1992)(cont.)

No.	Recorded	Increase. order	pi = i/(N+1)	ti = $\sqrt{-\ln(p^2)}$	zi = Φ-1(pi)
51	26.3	29.1	0.809524	1.821114	0.876008
52	23.9	29.2	0.825397	1.868282	0.936045
53	22.2	29.2	0.84127	1.918619	0.999659
54	24.4	29.3	0.857143	1.97277	1.067593
55	29	29.3	0.873016	2.031597	1.140843
56	28	29.8	0.888889	2.096294	1.220777
57	32.9	30.2	0.904762	2.168583	1.309366
58	31.4	31	0.920635	2.251087	1.409608
59	28.4	31.4	0.936508	2.348123	1.526414
60	29.2	32.9	0.952381	2.467599	1.668757
61	26.7	34.2	0.968254	2.62678	1.856145
62	26	34.4	0.984127	2.878588	2.148037

mean	26.5161
bias factor, λ	3.1987
standard deviation	1.2627
coef. of variation, V	0.1206

Data of concrete compressive strength: 24 MPa (1992)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	25	25	0.04	2.537272	-1.75108
2	25.2	23.5	0.08	2.247545	-1.40532
3	27.3	25.2	0.12	2.059254	-1.17509
4	28.2	25.3	0.16	1.914462	-0.99442
5	26.2	26	0.2	1.794123	-0.84146
6	27.5	26.2	0.24	1.689447	-0.70603
7	31.7	26.3	0.28	1.595597	-0.58248
8	30.7	26.3	0.32	1.509592	-0.46727
9	26.3	27	0.36	1.429441	-0.35801
10	31.9	27.3	0.4	1.353729	-0.25293
11	23.5	27.5	0.44	1.28139	-0.15065
12	29.9	28.1	0.48	1.211585	-0.05002
13	35.7	28.2	0.52	1.211585	0.05002
14	28.3	28.3	0.56	1.28139	0.150652
15	28.1	29.9	0.6	1.353729	0.252933
16	30.6	30.6	0.64	1.429441	0.358015
17	32.1	30.6	0.68	1.509592	0.467275
18	30.6	30.7	0.72	1.595597	0.582477
19	26.3	31.6	0.76	1.689447	0.706027
20	31.6	31.7	0.8	1.794123	0.841457
21	27	31.9	0.84	1.914462	0.994422
22	25.3	32.1	0.88	2.059254	1.175091
23	26	34	0.92	2.247545	1.405322
24	34	35.7	0.96	2.537272	1.751077

mean	28.70833
bias factor, λ	3.132011
standard deviation	1.196
coef. of variation, V	0.109

Data of concrete compressive strength: 21 MPa (1993)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	24.6	20	0.017544	2.843607	-2.10779
2	25	20.3	0.035088	2.588399	-1.81118
3	20.6	20.6	0.052632	2.426701	-1.62021
4	21.2	21	0.070175	2.305106	-1.47477
5	21.2	21.2	0.087719	2.206179	-1.35516
6	21.9	21.2	0.105263	2.121929	-1.25228
7	20.3	21.2	0.122807	2.047995	-1.16116
8	22.6	21.9	0.140351	1.981721	-1.07878
9	21	22.4	0.157895	1.921368	-1.00312
10	22.5	22.5	0.175439	1.865726	-0.9328
11	26	22.6	0.192982	1.813922	-0.86682
12	23.9	22.7	0.210526	1.765301	-0.8044
13	34.3	22.9	0.22807	1.719361	-0.74497
14	28.9	23	0.245614	1.675705	-0.68807
15	21.2	23.1	0.263158	1.634014	-0.63331
16	29.6	23.1	0.280702	1.594028	-0.58039
17	31.8	23.6	0.298246	1.555531	-0.52906
18	25.8	23.7	0.315789	1.518341	-0.47909
19	27.2	23.9	0.333333	1.482304	-0.43029
20	29.4	24.3	0.350877	1.447286	-0.38251
21	26.6	24.6	0.368421	1.413173	-0.3356
22	27.8	24.9	0.385965	1.379861	-0.28942
23	23.6	25	0.403509	1.347262	-0.24387
24	22.4	25.4	0.421053	1.315293	-0.19883
25	20	25.4	0.438596	1.283881	-0.15421
26	37	25.8	0.45614	1.25296	-0.10991
27	32	26	0.473684	1.222468	-0.06584
28	27.1	26.3	0.491228	1.192348	-0.02193
29	27	26.3	0.508772	1.192348	0.021927
30	24.9	26.5	0.526316	1.222468	0.065843
31	25.4	26.6	0.54386	1.25296	0.109907
32	28.1	26.7	0.561404	1.283881	0.154207
33	28.9	27	0.578947	1.315293	0.198829
34	30.3	27.1	0.596491	1.347262	0.243867
35	24.3	27.2	0.614035	1.379861	0.28942
36	30.8	27.2	0.631579	1.413173	0.335596
37	31	27.7	0.649123	1.447286	0.38251
38	22.7	27.8	0.666667	1.482304	0.430292
39	23	28.1	0.684211	1.518341	0.479086
40	34.2	28.9	0.701754	1.555531	0.529057
41	29.4	28.9	0.719298	1.594028	0.580392
42	23.1	29.4	0.736842	1.634014	0.633309
43	25.4	29.4	0.754386	1.675705	0.688067
44	23.1	29.6	0.77193	1.719361	0.744972
45	27.7	30.3	0.789474	1.765301	0.804401
46	27.2	30.8	0.807018	1.813922	0.866815
47	26.7	31	0.824561	1.865726	0.932802
48	26.3	31.8	0.842105	1.921368	1.003119
49	26.6	31.9	0.859649	1.981721	1.078776
50	33.3	32	0.877193	2.047995	1.161163
51	22.9	33.3	0.894737	2.121929	1.252277
52	26.3	34.2	0.912281	2.206179	1.355156
53	23.7	34.3	0.929825	2.305106	1.474772
54	26.5	35.2	0.947368	2.426701	1.620205
55	35.3	35.3	0.964912	2.588399	1.811182
56	35.2	37	0.982456	2.843607	2.107787

mean	26.6089
bias factor, λ	4.2991
standard deviation	1.2671
coef. of variation, V	0.1616

Data of concrete compressive strength: 21 MPa (1994)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	29.1	21.2	0.017544	2.843607	-2.10779
2	22	21.6	0.035088	2.588399	-1.81118
3	26.2	21.8	0.052632	2.426701	-1.62021
4	25.4	22	0.070175	2.305106	-1.47477
5	33.3	22.1	0.087719	2.206179	-1.35516
6	23	22.4	0.105263	2.121929	-1.25228
7	25.7	22.9	0.122807	2.047995	-1.16116
8	21.2	23	0.140351	1.981721	-1.07878
9	21.8	23.2	0.157895	1.921368	-1.00312
10	26.9	23.5	0.175439	1.865726	-0.9328
11	22.4	24.3	0.192982	1.813922	-0.86682
12	23.5	24.6	0.210526	1.765301	-0.8044
13	26.7	24.6	0.22807	1.719361	-0.74497
14	25.9	24.7	0.245614	1.675705	-0.68807
15	30.5	25.4	0.263158	1.634014	-0.63331
16	28.3	25.5	0.280702	1.594028	-0.58039
17	27.4	25.6	0.298246	1.555531	-0.52906
18	30.9	25.7	0.315789	1.518341	-0.47909
19	23.2	25.8	0.333333	1.482304	-0.43029
20	24.6	25.9	0.350877	1.447286	-0.38251
21	27.8	26.2	0.368421	1.413173	-0.3356
22	29	26.2	0.385965	1.379861	-0.28942
23	26.7	26.2	0.403509	1.347262	-0.24387
24	25.8	26.5	0.421053	1.315293	-0.19883
25	24.7	26.5	0.438596	1.283881	-0.15421
26	29.2	26.7	0.45614	1.25296	-0.10991
27	21.6	26.7	0.473684	1.222468	-0.06584
28	37.2	26.8	0.491228	1.192348	-0.02193
29	36.2	26.9	0.508772	1.192348	0.021927
30	29.4	27.4	0.526316	1.222468	0.065843
31	26.5	27.5	0.54386	1.25296	0.109907
32	26.8	27.8	0.561404	1.283881	0.154207
33	26.2	27.8	0.578947	1.315293	0.198829
34	28.2	27.9	0.596491	1.347262	0.243867
35	25.6	28.2	0.614035	1.379861	0.28942
36	29.2	28.2	0.631579	1.413173	0.335596
37	27.5	28.3	0.649123	1.447286	0.38251
38	25.5	28.7	0.666667	1.482304	0.430292
39	30.9	29	0.684211	1.518341	0.479086
40	30.2	29.1	0.701754	1.555531	0.529057
41	28.7	29.2	0.719298	1.594028	0.580392
42	24.6	29.2	0.736842	1.634014	0.633309
43	26.2	29.4	0.754386	1.675705	0.688067
44	32	30.1	0.77193	1.719361	0.744972
45	26.5	30.2	0.789474	1.765301	0.804401
46	22.9	30.5	0.807018	1.813922	0.866815
47	32.2	30.7	0.824561	1.865726	0.932802
48	24.3	30.9	0.842105	1.921368	1.003119
49	32.4	30.9	0.859649	1.981721	1.078776
50	28.2	31.3	0.877193	2.047995	1.161163
51	27.8	32	0.894737	2.121929	1.252277
52	27.9	32.2	0.912281	2.206179	1.355156
53	30.7	32.4	0.929825	2.305106	1.474772
54	30.1	33.3	0.947368	2.426701	1.620205
55	22.1	36.2	0.964912	2.588399	1.811182
56	31.3	37.2	0.982456	2.843607	2.107787

mean	27.3232
bias factor, λ	3.5409
standard deviation	1.3011
coef. of variation, V	0.1296

C.2 Data from company in Hokkaido

Data of concrete compressive strength: 21 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	26.7	23.4	0.032258	2.620682	-1.84901
2	23.6	23.4	0.064516	2.341299	-1.51824
3	26.5	23.6	0.096774	2.161192	-1.30034
4	24.3	24.2	0.129032	2.023706	-1.13105
5	24.2	24.3	0.16129	1.910261	-0.98913
6	27	24.4	0.193548	1.812307	-0.86475
7	27.3	24.5	0.225806	1.725153	-0.75249
8	25.4	24.7	0.258065	1.645932	-0.649
9	25.3	24.7	0.290323	1.572744	-0.55206
10	24.5	24.8	0.322581	1.504262	-0.46007
11	23.4	25	0.354839	1.439508	-0.37185
12	24.8	25.3	0.387097	1.377738	-0.28646
13	25.8	25.3	0.419355	1.318361	-0.20317
14	23.4	25.4	0.451613	1.260896	-0.12131
15	24.7	25.6	0.483871	1.204937	-0.04033
16	25.8	25.8	0.516129	1.204937	0.040331
17	25.6	25.8	0.548387	1.260896	0.121314
18	27.3	25.9	0.580645	1.318361	0.203168
19	28.4	26.1	0.612903	1.377738	0.286464
20	25	26.5	0.645161	1.439508	0.371845
21	26.1	26.5	0.677419	1.504262	0.460068
22	24.7	26.7	0.709677	1.572744	0.552059
23	24.4	27	0.741935	1.645932	0.649005
24	25.3	27.3	0.774194	1.725153	0.75249
25	27.5	27.3	0.806452	1.812307	0.86475
26	28.2	27.5	0.83871	1.910261	0.989128
27	28.9	28.2	0.870968	2.023706	1.131049
28	25.9	28.4	0.903226	2.161192	1.300342
29	28.7	28.7	0.935484	2.341299	1.518236
30	26.5	28.9	0.967742	2.620682	1.849009

mean	25.84
bias factor, λ	1.562403
standard deviation	1.230476
coef. of variation, V	0.060465

Data of concrete compressive strength: 24 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	28.3	27.2	0.032258	2.620682	-1.84601
2	28.3	27.8	0.064516	2.341299	-1.51567
3	29.3	27.9	0.096774	2.161192	-1.29806
4	31.9	28	0.129032	2.023706	-1.12898
5	30.4	28.2	0.16129	1.910261	-0.98723
6	28.7	28.3	0.193548	1.812307	-0.863
7	27.2	28.3	0.225806	1.725153	-0.75087
8	30.2	28.4	0.258065	1.645932	-0.6475
9	32	28.7	0.290323	1.572744	-0.55066
10	33.2	28.8	0.322581	1.504262	-0.45877
11	31.7	28.8	0.354839	1.439508	-0.37064
12	28.8	28.9	0.387097	1.377738	-0.28534
13	27.8	29.3	0.419355	1.318361	-0.20213
14	29.5	29.3	0.451613	1.260896	-0.12035
15	28.9	29.5	0.483871	1.204937	-0.03944
16	31.4	29.7	0.516129	1.204937	0.039443
17	29.3	29.9	0.548387	1.260896	0.120352
18	28.2	30	0.580645	1.318361	0.202129
19	29.9	30.2	0.612903	1.377738	0.285344
20	28	30.4	0.645161	1.439508	0.370639
21	30.9	30.8	0.677419	1.504262	0.458771
22	30.8	30.9	0.709677	1.572744	0.550664
23	29.7	31.4	0.741935	1.645932	0.647503
24	27.9	31.7	0.774194	1.725153	0.750871
25	28.4	31.7	0.806452	1.812307	0.863001
26	30	31.9	0.83871	1.910261	0.987231
27	32.1	32	0.870968	2.023706	1.128979
28	33.1	32.1	0.903226	2.161192	1.29806
29	31.7	33.1	0.935484	2.341299	1.515674
30	28.8	33.2	0.967742	2.620682	1.846009

mean	29.88
bias factor, λ	1.667209
standard deviation	1.245
coef. of variation, V	0.055797

Data of concrete compressive strength: 27 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	31.3	30	0.032258	2.620682	-1.84601
2	31.9	30.5	0.064516	2.341299	-1.51567
3	34.8	30.7	0.096774	2.161192	-1.29806
4	30.7	30.7	0.129032	2.023706	-1.12898
5	34.3	30.9	0.16129	1.910261	-0.98723
6	32.5	31.1	0.193548	1.812307	-0.863
7	33.1	31.2	0.225806	1.725153	-0.75087
8	30.7	31.3	0.258065	1.645932	-0.6475
9	31.8	31.7	0.290323	1.572744	-0.55066
10	34	31.8	0.322581	1.504262	-0.45877
11	35.3	31.9	0.354839	1.439508	-0.37064
12	33.6	32	0.387097	1.377738	-0.28534
13	36.8	32.2	0.419355	1.318361	-0.20213
14	35.3	32.5	0.451613	1.260896	-0.12035
15	32.7	32.7	0.483871	1.204937	-0.03944
16	31.2	33.1	0.516129	1.204937	0.039443
17	33.9	33.1	0.548387	1.260896	0.120352
18	32	33.2	0.580645	1.318361	0.202129
19	30.9	33.5	0.612903	1.377738	0.285344
20	32.2	33.5	0.645161	1.439508	0.370639
21	30.5	33.6	0.677419	1.504262	0.458771
22	33.5	33.9	0.709677	1.572744	0.550664
23	31.7	34	0.741935	1.645932	0.647503
24	33.2	34.2	0.774194	1.725153	0.750871
25	30	34.3	0.806452	1.812307	0.863001
26	31.1	34.8	0.83871	1.910261	0.987231
27	34.2	35.3	0.870968	2.023706	1.128979
28	33.5	35.3	0.903226	2.161192	1.29806
29	35.4	35.4	0.935484	2.341299	1.515674
30	33.1	36.8	0.967742	2.620682	1.846009

mean	32.84
bias factor, λ	1.716171
standard deviation	1.216296
coef. of variation, V	0.052259

Data of concrete compressive strength: 30 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	36.4	33.6	0.032258	2.620682	-1.84601
2	37.6	34.5	0.064516	2.341299	-1.51567
3	36.7	34.9	0.096774	2.161192	-1.29806
4	37.3	35.3	0.129032	2.023706	-1.12898
5	35.9	35.4	0.16129	1.910261	-0.98723
6	33.6	35.5	0.193548	1.812307	-0.863
7	35.7	35.5	0.225806	1.725153	-0.75087
8	36.7	35.7	0.258065	1.645932	-0.6475
9	37.6	35.9	0.290323	1.572744	-0.55066
10	35.9	35.9	0.322581	1.504262	-0.45877
11	37.4	36	0.354839	1.439508	-0.37064
12	37.4	36.2	0.387097	1.377738	-0.28534
13	38.7	36.2	0.419355	1.318361	-0.20213
14	36.2	36.4	0.451613	1.260896	-0.12035
15	38.1	36.7	0.483871	1.204937	-0.03944
16	35.5	36.7	0.516129	1.204937	0.039443
17	36.2	36.9	0.548387	1.260896	0.120352
18	35.4	37.1	0.580645	1.318361	0.202129
19	37.1	37.2	0.612903	1.377738	0.285344
20	36	37.3	0.645161	1.439508	0.370639
21	35.5	37.4	0.677419	1.504262	0.458771
22	38.6	37.4	0.709677	1.572744	0.550664
23	37.6	37.6	0.741935	1.645932	0.647503
24	36.9	37.6	0.774194	1.725153	0.750871
25	34.5	37.6	0.806452	1.812307	0.863001
26	35.3	38.1	0.83871	1.910261	0.987231
27	39.5	38.6	0.870968	2.023706	1.128979
28	34.9	38.7	0.903226	2.161192	1.29806
29	37.2	39.5	0.935484	2.341299	1.515674
30	41.3	41.3	0.967742	2.620682	1.846009

mean	36.75667
bias factor, λ	1.556673
standard deviation	1.225222
coef. of variation, V	0.042351

Data of concrete compressive strength: 33 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	37.6	35.2	0.032258	2.620682	-1.84601
2	43.2	36.1	0.064516	2.341299	-1.51567
3	40.5	36.3	0.096774	2.161192	-1.29806
4	36.1	36.8	0.129032	2.023706	-1.12898
5	39	37	0.16129	1.910261	-0.98723
6	42.3	37.2	0.193548	1.812307	-0.863
7	42.6	37.6	0.225806	1.725153	-0.75087
8	39.3	37.6	0.258065	1.645932	-0.6475
9	37.6	37.7	0.290323	1.572744	-0.55066
10	38.2	37.9	0.322581	1.504262	-0.45877
11	37	38	0.354839	1.439508	-0.37064
12	39.3	38.2	0.387097	1.377738	-0.28534
13	41.7	38.3	0.419355	1.318361	-0.20213
14	39.7	38.5	0.451613	1.260896	-0.12035
15	36.3	38.5	0.483871	1.204937	-0.03944
16	36.8	39	0.516129	1.204937	0.039443
17	35.2	39	0.548387	1.260896	0.120352
18	38	39.3	0.580645	1.318361	0.202129
19	38.5	39.3	0.612903	1.377738	0.285344
20	39.9	39.7	0.645161	1.439508	0.370639
21	37.7	39.8	0.677419	1.504262	0.458771
22	38.5	39.9	0.709677	1.572744	0.550664
23	41.5	39.9	0.741935	1.645932	0.647503
24	39.9	40.5	0.774194	1.725153	0.750871
25	37.2	40.5	0.806452	1.812307	0.863001
26	38.3	41.5	0.83871	1.910261	0.987231
27	40.5	41.7	0.870968	2.023706	1.128979
28	39	42.3	0.903226	2.161192	1.29806
29	39.8	42.6	0.935484	2.341299	1.515674
30	37.9	43.2	0.967742	2.620682	1.846009

mean	38.97
bias factor, λ	1.983579
standard deviation	1.180909
coef. of variation, V	0.0509

Data of concrete compressive strength: 36 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	43.6	38.7	0.032258	2.620682	-1.84601
2	40.1	40.1	0.064516	2.341299	-1.51567
3	43.7	40.1	0.096774	2.161192	-1.29806
4	41.8	41.2	0.129032	2.023706	-1.12898
5	43	41.6	0.16129	1.910261	-0.98723
6	45.3	41.8	0.193548	1.812307	-0.863
7	46.5	41.9	0.225806	1.725153	-0.75087
8	43.5	42.1	0.258065	1.645932	-0.6475
9	42.4	42.2	0.290323	1.572744	-0.55066
10	40.1	42.4	0.322581	1.504262	-0.45877
11	38.7	42.4	0.354839	1.439508	-0.37064
12	41.6	43	0.387097	1.377738	-0.28534
13	43	43	0.419355	1.318361	-0.20213
14	46	43.2	0.451613	1.260896	-0.12035
15	46.9	43.3	0.483871	1.204937	-0.03944
16	45.5	43.3	0.516129	1.204937	0.039443
17	43.3	43.5	0.548387	1.260896	0.120352
18	42.4	43.5	0.580645	1.318361	0.202129
19	43.6	43.6	0.612903	1.377738	0.285344
20	43.2	43.6	0.645161	1.439508	0.370639
21	47.2	43.7	0.677419	1.504262	0.458771
22	44.5	43.9	0.709677	1.572744	0.550664
23	41.2	44.5	0.741935	1.645932	0.647503
24	42.2	45.3	0.774194	1.725153	0.750871
25	43.5	45.3	0.806452	1.812307	0.863001
26	43.3	45.5	0.83871	1.910261	0.987231
27	41.9	46	0.870968	2.023706	1.128979
28	45.3	46.5	0.903226	2.161192	1.29806
29	43.9	46.9	0.935484	2.341299	1.515674
30	42.1	47.2	0.967742	2.620682	1.846009

mean	43.31
bias factor, λ	2.020302
standard deviation	1.203056
coef. of variation, V	0.046647

Data of concrete compressive strength: 40 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	48.3	43.4	0.032258	2.620682	-1.84601
2	44.6	43.7	0.064516	2.341299	-1.51567
3	46.7	43.8	0.096774	2.161192	-1.29806
4	49.6	44.3	0.129032	2.023706	-1.12898
5	45.9	44.3	0.16129	1.910261	-0.98723
6	43.7	44.5	0.193548	1.812307	-0.863
7	43.4	44.6	0.225806	1.725153	-0.75087
8	47.8	45.3	0.258065	1.645932	-0.6475
9	49	45.4	0.290323	1.572744	-0.55066
10	51.3	45.5	0.322581	1.504262	-0.45877
11	46.4	45.7	0.354839	1.439508	-0.37064
12	44.3	45.9	0.387097	1.377738	-0.28534
13	47.2	46.1	0.419355	1.318361	-0.20213
14	49.2	46.4	0.451613	1.260896	-0.12035
15	45.4	46.7	0.483871	1.204937	-0.03944
16	50.2	47.2	0.516129	1.204937	0.039443
17	45.3	47.4	0.548387	1.260896	0.120352
18	47.4	47.8	0.580645	1.318361	0.202129
19	49.6	47.9	0.612903	1.377738	0.285344
20	50.2	48.3	0.645161	1.439508	0.370639
21	48.5	48.5	0.677419	1.504262	0.458771
22	45.7	49	0.709677	1.572744	0.550664
23	44.3	49.2	0.741935	1.645932	0.647503
24	43.8	49.5	0.774194	1.725153	0.750871
25	45.5	49.6	0.806452	1.812307	0.863001
26	49.5	49.6	0.83871	1.910261	0.987231
27	51.3	50.2	0.870968	2.023706	1.128979
28	47.9	50.2	0.903226	2.161192	1.29806
29	44.5	51.3	0.935484	2.341299	1.515674
30	46.1	51.3	0.967742	2.620682	1.846009

mean	47.08667
bias factor, λ	2.377877
standard deviation	1.177167
coef. of variation, V	0.0505

Data of concrete compressive strength: 48 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	58.3	53.5	0.032258	2.620682	-1.84601
2	56.4	53.9	0.064516	2.341299	-1.51567
3	53.5	54	0.096774	2.161192	-1.29806
4	57	54.8	0.129032	2.023706	-1.12898
5	59.3	55.1	0.16129	1.910261	-0.98723
6	61.1	55.2	0.193548	1.812307	-0.863
7	62.3	55.7	0.225806	1.725153	-0.75087
8	58.7	55.7	0.258065	1.645932	-0.6475
9	56.2	56.2	0.290323	1.572744	-0.55066
10	57.9	56.4	0.322581	1.504262	-0.45877
11	55.1	56.4	0.354839	1.439508	-0.37064
12	54	56.5	0.387097	1.377738	-0.28534
13	56.5	57	0.419355	1.318361	-0.20213
14	58.3	57.2	0.451613	1.260896	-0.12035
15	60.6	57.5	0.483871	1.204937	-0.03944
16	57.9	57.9	0.516129	1.204937	0.039443
17	55.2	57.9	0.548387	1.260896	0.120352
18	53.9	58.3	0.580645	1.318361	0.202129
19	55.7	58.3	0.612903	1.377738	0.285344
20	57.2	58.3	0.645161	1.439508	0.370639
21	58.5	58.5	0.677419	1.504262	0.458771
22	59.7	58.7	0.709677	1.572744	0.550664
23	62.2	59.2	0.741935	1.645932	0.647503
24	60.4	59.3	0.774194	1.725153	0.750871
25	57.5	59.7	0.806452	1.812307	0.863001
26	54.8	60.4	0.83871	1.910261	0.987231
27	55.7	60.6	0.870968	2.023706	1.128979
28	58.3	61.1	0.903226	2.161192	1.29806
29	56.4	62.2	0.935484	2.341299	1.515674
30	59.2	62.3	0.967742	2.620682	1.846009

mean	57.59333
bias factor, λ	2.370644
standard deviation	1.199861
coef. of variation, V	0.041162

C.3 Data from company in Fukuoka

Data of concrete compressive strength: 21 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	29.6	22.4	0.008929	3.07197	-2.369
2	28.1	22.9	0.017857	2.837376	-2.10061
3	26.2	22.9	0.026786	2.690683	-1.93071
4	29.4	22.9	0.035714	2.581552	-1.80315
5	24.2	23.1	0.044643	2.493616	-1.69955
6	26.6	23.3	0.053571	2.419396	-1.61151
7	28.2	23.4	0.0625	2.35482	-1.53443
8	23.3	23.6	0.071429	2.297415	-1.46552
9	25.7	23.8	0.080357	2.245562	-1.40292
10	27.2	24	0.089286	2.198142	-1.34538
11	26.3	24.1	0.098214	2.154346	-1.29198
12	25.1	24.2	0.107143	2.113571	-1.24202
13	24.5	24.3	0.116071	2.075355	-1.19498
14	25.7	24.3	0.125	2.039334	-1.15044
15	26.1	24.5	0.133929	2.005218	-1.10807
16	27.4	24.5	0.142857	1.97277	-1.06759
17	26.4	24.6	0.151786	1.941796	-1.0288
18	29.6	24.9	0.160714	1.912133	-0.99149
19	27.8	24.9	0.169643	1.883645	-0.95551
20	27.1	24.9	0.178571	1.856215	-0.92073
21	23.8	25	0.1875	1.829741	-0.88702
22	27.8	25	0.196429	1.804138	-0.85429
23	24.6	25	0.205357	1.779328	-0.82246
24	24.3	25.1	0.214286	1.755246	-0.79143
25	26.6	25.2	0.223214	1.731833	-0.76115
26	27.3	25.2	0.232143	1.709036	-0.73155
27	26.5	25.2	0.241071	1.686809	-0.70258
28	26.6	25.3	0.25	1.665109	-0.67419
29	22.9	25.3	0.258929	1.6439	-0.64633
30	26.7	25.5	0.267857	1.623146	-0.61897
31	27.6	25.5	0.276786	1.602817	-0.59206
32	29.5	25.6	0.285714	1.582885	-0.56557
33	27.9	25.6	0.294643	1.563324	-0.53948
34	25.2	25.7	0.303571	1.54411	-0.51375
35	26.7	25.7	0.3125	1.525222	-0.48836
36	22.9	25.8	0.321429	1.506639	-0.46328
37	25	25.9	0.330357	1.488342	-0.43849
38	28.9	26.1	0.339286	1.470315	-0.41397
39	28.9	26.1	0.348214	1.452541	-0.3897
40	26.5	26.1	0.357143	1.435005	-0.36566
41	25.6	26.2	0.366071	1.417693	-0.34183
42	26.1	26.2	0.375	1.400592	-0.3182
43	24.1	26.3	0.383929	1.38369	-0.29475
44	27	26.4	0.392857	1.366974	-0.27146
45	28.7	26.4	0.401786	1.350434	-0.24832
46	26.6	26.4	0.410714	1.33406	-0.22531
47	27.3	26.4	0.419643	1.31784	-0.20243
48	24.9	26.4	0.428571	1.301766	-0.17966
49	24	26.5	0.4375	1.285829	-0.15699
50	29.3	26.5	0.446429	1.27002	-0.1344
51	26.8	26.5	0.455357	1.254331	-0.11188
52	22.4	26.5	0.464286	1.238754	-0.08942
53	25.5	26.5	0.473214	1.22328	-0.06702
54	25.2	26.6	0.482143	1.207903	-0.04466
55	25	26.6	0.491071	1.192615	-0.02232
56	29.1	26.6	0.5	1.17741	1.01E-07
57	27.1	26.6	0.508929	1.192615	0.022319
58	27.1	26.7	0.517857	1.207903	0.044656
59	26.4	26.7	0.526786	1.22328	0.067021
60	23.4	26.8	0.535714	1.238754	0.089425
61	26.1	26.8	0.544643	1.254331	0.111879
62	25.3	26.9	0.553571	1.27002	0.134396

Data of concrete compressive strength: 21 MPa (continuous)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
63	27.8	27	0.5625	1.285829	0.156985
64	26.4	27.1	0.571429	1.301766	0.17966
65	24.9	27.1	0.580357	1.31784	0.202431
66	28.1	27.1	0.589286	1.33406	0.225313
67	27.5	27.2	0.598214	1.350434	0.248317
68	27.7	27.3	0.607143	1.366974	0.271456
69	28.6	27.3	0.616071	1.38369	0.294746
70	26.5	27.4	0.625	1.400592	0.3182
71	23.6	27.5	0.633929	1.417693	0.341833
72	25.8	27.5	0.642857	1.435005	0.365662
73	24.3	27.6	0.651786	1.452541	0.389703
74	23.1	27.7	0.660714	1.470315	0.413974
75	28.4	27.8	0.669643	1.488342	0.438494
76	22.9	27.8	0.678571	1.506639	0.463282
77	26.8	27.8	0.6875	1.525222	0.488361
78	28.3	27.9	0.696429	1.54411	0.513752
79	29.5	28	0.705357	1.563324	0.539481
80	31	28.1	0.714286	1.582885	0.565574
81	28.9	28.1	0.723214	1.602817	0.592058
82	25.6	28.1	0.732143	1.623146	0.618966
83	24.9	28.2	0.741071	1.6439	0.646331
84	30.7	28.3	0.75	1.665109	0.674189
85	26.4	28.3	0.758929	1.686809	0.702582
86	28.3	28.3	0.767857	1.709036	0.731552
87	26.5	28.3	0.776786	1.731833	0.761151
88	25.5	28.4	0.785714	1.755246	0.791432
89	30	28.5	0.794643	1.779328	0.822457
90	25.3	28.6	0.803571	1.804138	0.854294
91	29.5	28.7	0.8125	1.829741	0.887021
92	25.2	28.9	0.821429	1.856215	0.920725
93	28.3	28.9	0.830357	1.883645	0.955509
94	26.5	28.9	0.839286	1.912133	0.991488
95	26.9	29.1	0.848214	1.941796	1.028797
96	28.1	29.3	0.857143	1.97277	1.067593
97	28.5	29.4	0.866071	2.005218	1.108065
98	28.3	29.5	0.875	2.039334	1.150436
99	25	29.5	0.883929	2.075355	1.194976
100	29.8	29.5	0.892857	2.113571	1.242018
101	29.9	29.6	0.901786	2.154346	1.291978
102	27.5	29.6	0.910714	2.198142	1.345383
103	31.1	29.6	0.919643	2.245562	1.402923
104	32	29.8	0.928571	2.297415	1.465516
105	28	29.9	0.9375	2.35482	1.534435
106	25.9	30	0.946429	2.419396	1.611515
107	29.6	30.7	0.955357	2.493616	1.699553
108	24.5	31	0.964286	2.581552	1.803147
109	31.2	31.1	0.973214	2.690683	1.930713
110	26.4	31.2	0.982143	2.837376	2.100608
111	26.2	32	0.991071	3.07197	2.369001

mean	26.80541
bias factor, λ	2.051112
standard deviation	1.276448
coef. of variation, V	0.076519

Data of concrete compressive strength: 24 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	29.2	23.9	0.00625	3.185961	-2.49812
2	27.2	25.2	0.0125	2.960414	-2.24184
3	30.9	25.4	0.01875	2.820128	-2.08072
4	28.9	25.9	0.025	2.716203	-1.96039
5	34.4	26.2	0.03125	2.632769	-1.86315
6	32	26.4	0.0375	2.562582	-1.78086
7	29.6	26.8	0.04375	2.501705	-1.70911
8	31.6	26.8	0.05	2.447747	-1.64521
9	31	27.1	0.05625	2.399145	-1.58739
10	33.5	27.1	0.0625	2.35482	-1.53443
11	31.7	27.2	0.06875	2.313992	-1.48546
12	29.8	27.2	0.075	2.276079	-1.4398
13	33.6	27.2	0.08125	2.240636	-1.39696
14	32.3	27.3	0.0875	2.207314	-1.35653
15	29.2	27.3	0.09375	2.175833	-1.31821
16	31.1	27.4	0.1	2.145966	-1.28173
17	27.3	27.4	0.10625	2.117527	-1.24687
18	32	27.6	0.1125	2.09036	-1.21347
19	28.4	27.6	0.11875	2.064333	-1.18137
20	26.2	27.7	0.125	2.039334	-1.15044
21	31.1	27.7	0.13125	2.015267	-1.12057
22	28.9	27.7	0.1375	1.99205	-1.09166
23	30.7	27.8	0.14375	1.969609	-1.06364
24	30.3	27.8	0.15	1.947881	-1.03643
25	31.2	27.9	0.15625	1.92681	-1.00997
26	35.4	28	0.1625	1.906346	-0.98419
27	29.1	28.1	0.16875	1.886445	-0.95905
28	32.9	28.2	0.175	1.867067	-0.9345
29	30	28.4	0.18125	1.848176	-0.91051
30	29.3	28.4	0.1875	1.829741	-0.88702
31	32.2	28.5	0.19375	1.811732	-0.86401
32	27.6	28.5	0.2	1.794123	-0.84146
33	28.2	28.5	0.20625	1.776888	-0.81932
34	29.3	28.6	0.2125	1.760008	-0.79758
35	30.8	28.7	0.21875	1.74346	-0.7762
36	32.6	28.7	0.225	1.727226	-0.75518
37	29.5	28.7	0.23125	1.71129	-0.73448
38	33.6	28.9	0.2375	1.695634	-0.7141
39	31.7	28.9	0.24375	1.680245	-0.69401
40	33.7	28.9	0.25	1.665109	-0.67419
41	32	29	0.25625	1.650213	-0.65463
42	31.4	29.1	0.2625	1.635545	-0.63533
43	30.2	29.1	0.26875	1.621095	-0.61626
44	33.1	29.2	0.275	1.60685	-0.5974
45	34.5	29.2	0.28125	1.592803	-0.57876
46	32.3	29.2	0.2875	1.578944	-0.56032
47	29.7	29.2	0.29375	1.565264	-0.54207
48	31.3	29.3	0.3	1.551756	-0.524
49	27.8	29.3	0.30625	1.538411	-0.5061
50	30.4	29.3	0.3125	1.525222	-0.48836
51	27.3	29.3	0.31875	1.512183	-0.47077
52	28.5	29.4	0.325	1.499287	-0.45333
53	28.7	29.4	0.33125	1.486527	-0.43603
54	27.7	29.4	0.3375	1.473899	-0.41886
55	31.4	29.4	0.34375	1.461397	-0.40181
56	29.2	29.4	0.35	1.449015	-0.38488
57	28.9	29.5	0.35625	1.436748	-0.36806
58	32	29.6	0.3625	1.424592	-0.35134
59	26.8	29.6	0.36875	1.412541	-0.33472
60	29.4	29.7	0.375	1.400592	-0.3182
61	28.6	29.8	0.38125	1.38874	-0.30176
62	33.4	29.8	0.3875	1.376982	-0.28541
63	31.7	29.8	0.39375	1.365312	-0.26914
64	27.7	29.8	0.4	1.353729	-0.25293
65	30.4	29.9	0.40625	1.342227	-0.2368
66	30.9	29.9	0.4125	1.330804	-0.22073
67	27.4	30	0.41875	1.319455	-0.20471

Data of concrete compressive strength: 24 MPa (Cont.)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
68	30.5	30.2	0.425	1.308179	-0.18876
69	29.4	30.2	0.43125	1.296971	-0.17285
70	29.4	30.2	0.4375	1.285829	-0.15699
71	28	30.3	0.44375	1.27475	-0.14116
72	25.4	30.3	0.45	1.263731	-0.12538
73	30.2	30.3	0.45625	1.252768	-0.10963
74	29.9	30.4	0.4625	1.24186	-0.09391
75	27.7	30.4	0.46875	1.231004	-0.07822
76	28.5	30.4	0.475	1.220197	-0.06254
77	31.8	30.4	0.48125	1.209437	-0.04689
78	29.3	30.4	0.4875	1.19872	-0.03125
79	29.2	30.5	0.49375	1.188045	-0.01562
80	30.4	30.5	0.5	1.17741	1.01E-07
81	26.4	30.6	0.50625	1.188045	0.015622
82	29.8	30.7	0.5125	1.19872	0.031251
83	33.3	30.8	0.51875	1.209437	0.046891
84	32.1	30.9	0.525	1.220197	0.062545
85	35.1	30.9	0.53125	1.231004	0.078217
86	31	30.9	0.5375	1.24186	0.093911
87	29.1	30.9	0.54375	1.252768	0.109631
88	31.9	31	0.55	1.263731	0.125381
89	31.9	31	0.55625	1.27475	0.141164
90	25.2	31.1	0.5625	1.285829	0.156985
91	31.1	31.1	0.56875	1.296971	0.172848
92	31.6	31.1	0.575	1.308179	0.188756
93	35.6	31.1	0.58125	1.319455	0.204714
94	27.8	31.2	0.5875	1.330804	0.220727
95	33.6	31.2	0.59375	1.342227	0.236799
96	34.2	31.2	0.6	1.353729	0.252933
97	33.1	31.2	0.60625	1.365312	0.269136
98	32.6	31.2	0.6125	1.376982	0.285411
99	33.5	31.3	0.61875	1.38874	0.301764
100	31.2	31.4	0.625	1.400592	0.3182
101	30.4	31.4	0.63125	1.412541	0.334723
102	27.1	31.6	0.6375	1.424592	0.35134
103	30.4	31.6	0.64375	1.436748	0.368056
104	27.1	31.7	0.65	1.449015	0.384877
105	28.4	31.7	0.65625	1.461397	0.401809
106	30.5	31.7	0.6625	1.473899	0.418858
107	32.2	31.7	0.66875	1.486527	0.43603
108	33.1	31.8	0.675	1.499287	0.453333
109	30.9	31.8	0.68125	1.512183	0.470774
110	32.5	31.8	0.6875	1.525222	0.488361
111	31.2	31.8	0.69375	1.538411	0.506101
112	28.5	31.9	0.7	1.551756	0.524002
113	29.9	31.9	0.70625	1.565264	0.542073
114	31.7	31.9	0.7125	1.578944	0.560325
115	31.8	31.9	0.71875	1.592803	0.578765
116	34.4	32	0.725	1.60685	0.597405
117	32.8	32	0.73125	1.621095	0.616255
118	35.2	32	0.7375	1.635545	0.635328
119	30.2	32	0.74375	1.650213	0.654635
120	29.6	32.1	0.75	1.665109	0.674189
121	28.7	32.2	0.75625	1.680245	0.694005
122	23.9	32.2	0.7625	1.695634	0.714098
123	29.4	32.2	0.76875	1.71129	0.734483
124	32.3	32.3	0.775	1.727226	0.755178
125	32.2	32.3	0.78125	1.74346	0.776203
126	31.8	32.3	0.7875	1.760008	0.797575
127	30.6	32.5	0.79375	1.776888	0.819319
128	31.9	32.5	0.8	1.794123	0.841457
129	29.8	32.6	0.80625	1.811732	0.864015
130	31.2	32.6	0.8125	1.829741	0.887021
131	27.2	32.6	0.81875	1.848176	0.910506
132	32.8	32.8	0.825	1.867067	0.934503
133	28.7	32.8	0.83125	1.886445	0.959051
134	28.1	32.9	0.8375	1.906346	0.98419

Data of concrete compressive strength: 24 MPa (Cont.)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
135	29.8	33.1	0.84375	1.92681	1.009967
136	26.8	33.1	0.85	1.947881	1.036431
137	35.9	33.1	0.85625	1.969609	1.063642
138	30.9	33.2	0.8625	1.99205	1.091662
139	31.2	33.3	0.86875	2.015267	1.120566
140	33.2	33.4	0.875	2.039334	1.150436
141	31.8	33.5	0.88125	2.064333	1.181367
142	30.3	33.5	0.8875	2.09036	1.213471
143	25.9	33.5	0.89375	2.117527	1.246875
144	35.9	33.6	0.9	2.145966	1.281729
145	33.5	33.6	0.90625	2.175833	1.318211
146	34.8	33.6	0.9125	2.207314	1.356535
147	29.3	33.7	0.91875	2.240636	1.396959
148	29	33.9	0.925	2.276079	1.4398
149	32.6	34.2	0.93125	2.313992	1.485457
150	27.9	34.4	0.9375	2.35482	1.534435
151	30.3	34.4	0.94375	2.399145	1.587392
152	29.4	34.5	0.95	2.447747	1.645211
153	31.1	34.8	0.95625	2.501705	1.709114
154	27.6	35.1	0.9625	2.562582	1.780862
155	31.9	35.2	0.96875	2.632769	1.863148
156	27.4	35.4	0.975	2.716203	1.960395
157	27.2	35.6	0.98125	2.820128	2.08072
158	32.5	35.9	0.9875	2.960414	2.241845
159	33.9	35.9	0.99375	3.185961	2.498124

mean	30.5478
bias factor, λ	2.357558
standard deviation	1.272825
coef. of variation, V	0.077176

Data of concrete compressive strength: 27 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	32.7	29	0.032258	2.620682	-1.84901
2	32	30	0.064516	2.341299	-1.51824
3	30.1	30.1	0.096774	2.161192	-1.30034
4	31.3	30.1	0.129032	2.023706	-1.13105
5	34.4	30.7	0.16129	1.910261	-0.98913
6	30	31.3	0.193548	1.812307	-0.86475
7	32.4	31.4	0.225806	1.725153	-0.75249
8	31.6	31.5	0.258065	1.645932	-0.649
9	32.7	31.6	0.290323	1.572744	-0.55206
10	34.5	31.9	0.322581	1.504262	-0.46007
11	32.9	32	0.354839	1.439508	-0.37185
12	33.2	32.1	0.387097	1.377738	-0.28646
13	35.6	32.3	0.419355	1.318361	-0.20317
14	35.2	32.4	0.451613	1.260896	-0.12131
15	30.7	32.7	0.483871	1.204937	-0.04033
16	32.1	32.7	0.516129	1.204937	0.040331
17	31.4	32.9	0.548387	1.260896	0.121314
18	34.8	32.9	0.580645	1.318361	0.203168
19	35.3	33.2	0.612903	1.377738	0.286464
20	31.9	33.6	0.645161	1.439508	0.371845
21	33.8	33.8	0.677419	1.504262	0.460068
22	32.9	34.2	0.709677	1.572744	0.552059
23	34.2	34.2	0.741935	1.645932	0.649005
24	34.2	34.4	0.774194	1.725153	0.75249
25	33.6	34.5	0.806452	1.812307	0.86475
26	30.1	34.8	0.83871	1.910261	0.989128
27	36	35.2	0.870968	2.023706	1.131049
28	32.3	35.3	0.903226	2.161192	1.300342
29	31.5	35.6	0.935484	2.341299	1.518236
30	29	36	0.967742	2.620682	1.849009

mean	32.74667
bias factor, λ	1.82109
standard deviation	1.21284
coef. of variation, V	0.055611

Data of concrete compressive strength: 30 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	37.1	31.5	0.00565	3.217499	-2.53371
2	38	31.9	0.011299	2.994329	-2.28059
3	34.3	32	0.016949	2.855709	-2.12172
4	33.4	32.6	0.022599	2.753127	-2.00325
5	38.6	32.6	0.028249	2.670847	-1.9076
6	37.3	32.9	0.033898	2.601688	-1.82676
7	41.3	32.9	0.039548	2.541747	-1.75635
8	36.7	32.9	0.045198	2.488658	-1.69369
9	36.7	33	0.050847	2.440871	-1.63705
10	34	33.2	0.056497	2.397317	-1.58521
11	37	33.3	0.062147	2.357225	-1.53731
12	37.7	33.4	0.067797	2.320019	-1.4927
13	40	33.6	0.073446	2.285257	-1.45087
14	38	33.7	0.079096	2.252595	-1.41143
15	40.7	33.8	0.084746	2.221756	-1.37407
16	37	33.8	0.090395	2.192515	-1.33854
17	39.8	33.9	0.096045	2.164688	-1.30461
18	38.4	33.9	0.101695	2.13812	-1.27212
19	39.9	34	0.107345	2.112681	-1.24092
20	36.8	34	0.112994	2.088261	-1.21089
21	39.2	34	0.118644	2.064765	-1.1819
22	38.5	34	0.124294	2.04211	-1.15388
23	34.7	34.3	0.129944	2.020225	-1.12673
24	36.3	34.3	0.135593	1.999048	-1.10038
25	33.7	34.3	0.141243	1.978522	-1.07478
26	33.8	34.3	0.146893	1.958598	-1.04986
27	40.4	34.3	0.152542	1.939233	-1.02558
28	38.7	34.3	0.158192	1.920388	-1.00189
29	35.5	34.5	0.163842	1.902027	-0.97874
30	35.8	34.6	0.169492	1.884119	-0.95611
31	37.7	34.6	0.175141	1.866635	-0.93396
32	35.6	34.6	0.180791	1.849548	-0.91225
33	38.9	34.7	0.186441	1.832835	-0.89097
34	39.5	34.7	0.19209	1.816474	-0.87008
35	34.3	34.7	0.19774	1.800445	-0.84956
36	36.9	34.7	0.20339	1.78473	-0.8294
37	36.2	34.9	0.20904	1.769312	-0.80957
38	41.7	35	0.214689	1.754174	-0.79005
39	38.3	35.1	0.220339	1.739303	-0.77083
40	35.7	35.1	0.225989	1.724686	-0.75188
41	35.8	35.1	0.231638	1.710309	-0.73321
42	39.1	35.2	0.237288	1.69616	-0.71478
43	35.8	35.2	0.242938	1.68223	-0.6966
44	33.9	35.3	0.248588	1.668508	-0.67864
45	32	35.5	0.254237	1.654985	-0.6609
46	34.7	35.5	0.259887	1.641651	-0.64337
47	38.6	35.6	0.265537	1.628498	-0.62603
48	33.6	35.6	0.271186	1.615518	-0.60888
49	36.5	35.7	0.276836	1.602704	-0.59191
50	36.6	35.8	0.282486	1.590048	-0.5751
51	32.9	35.8	0.288136	1.577545	-0.55846
52	32.6	35.8	0.293785	1.565188	-0.54197
53	34.3	35.8	0.299435	1.55297	-0.52563
54	40.1	35.9	0.305085	1.540887	-0.50943
55	36.5	36	0.310734	1.528932	-0.49336
56	36.6	36	0.316384	1.517101	-0.47741
57	32.9	36	0.322034	1.505389	-0.46159
58	32.6	36	0.327684	1.493792	-0.44589
59	34.3	36.1	0.333333	1.482304	-0.43029
60	40.1	36.2	0.338983	1.470922	-0.4148
61	36.5	36.2	0.344633	1.459641	-0.39941
62	33.8	36.2	0.350282	1.448458	-0.38411
63	34.3	36.3	0.355932	1.437369	-0.36891
64	37.2	36.4	0.361582	1.426371	-0.35379
65	35.1	36.4	0.367232	1.415459	-0.33875
66	36.9	36.5	0.372881	1.404632	-0.32379
67	36	36.5	0.378531	1.393885	-0.3089

Data of concrete compressive strength: 30 MPa (Cont.)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
68	35.2	36.5	0.384181	1.383215	-0.29409
69	36	36.5	0.389831	1.37262	-0.27933
70	34.6	36.5	0.39548	1.362097	-0.26464
71	37.5	36.6	0.40113	1.351643	-0.25001
72	31.9	36.6	0.40678	1.341256	-0.23543
73	41.6	36.7	0.412429	1.330932	-0.22091
74	33.3	36.7	0.418079	1.32067	-0.20643
75	38.9	36.7	0.423729	1.310467	-0.192
76	39.6	36.8	0.429379	1.30032	-0.17761
77	43.8	36.8	0.435028	1.290228	-0.16325
78	38.9	36.9	0.440678	1.280188	-0.14894
79	36.9	36.9	0.446328	1.270198	-0.13465
80	34.9	36.9	0.451977	1.260256	-0.12039
81	34.7	36.9	0.457627	1.25036	-0.10617
82	35.6	37	0.463277	1.240508	-0.09196
83	38.3	37	0.468927	1.230698	-0.07777
84	43.1	37.1	0.474576	1.220928	-0.06361
85	35.3	37.2	0.480226	1.211196	-0.04945
86	36.7	37.2	0.485876	1.201501	-0.03531
87	39.7	37.3	0.491525	1.19184	-0.02118
88	35.8	37.4	0.497175	1.182212	-0.00706
89	39.2	37.4	0.502825	1.182212	0.00706
90	36.5	37.5	0.508475	1.19184	0.021184
91	39.2	37.5	0.514124	1.201501	0.035314
92	37.5	37.6	0.519774	1.211196	0.049454
93	42.3	37.6	0.525424	1.220928	0.063607
94	42.4	37.6	0.531073	1.230698	0.077774
95	38	37.7	0.536723	1.240508	0.091959
96	35.1	37.7	0.542373	1.25036	0.106165
97	42.9	37.7	0.548023	1.260256	0.120395
98	36	37.7	0.553672	1.270198	0.13465
99	41.6	37.8	0.559322	1.280188	0.148936
100	34.6	37.8	0.564972	1.290228	0.163253
101	38.4	38	0.570621	1.30032	0.177606
102	35	38	0.576271	1.310467	0.191998
103	38	38	0.581921	1.32067	0.206431
104	37.8	38	0.587571	1.330932	0.220908
105	40.2	38.2	0.59322	1.341256	0.235434
106	39.8	38.2	0.59887	1.351643	0.250011
107	39.4	38.3	0.60452	1.362097	0.264643
108	38.7	38.3	0.610169	1.37262	0.279334
109	38.5	38.4	0.615819	1.383215	0.294086
110	38.7	38.4	0.621469	1.393885	0.308904
111	37.7	38.4	0.627119	1.404632	0.323791
112	39.9	38.4	0.632768	1.415459	0.338752
113	38.2	38.5	0.638418	1.426371	0.35379
114	36.2	38.5	0.644068	1.437369	0.368909
115	38.4	38.5	0.649718	1.448458	0.384114
116	38.5	38.6	0.655367	1.459641	0.39941
117	32.9	38.6	0.661017	1.470922	0.414801
118	34.7	38.6	0.666667	1.482304	0.430292
119	31.5	38.7	0.672316	1.493792	0.445887
120	33	38.7	0.677966	1.505389	0.461593
121	36.8	38.7	0.683616	1.517101	0.477414
122	35.9	38.8	0.689266	1.528932	0.493356
123	40.7	38.9	0.694915	1.540887	0.509426
124	33.2	38.9	0.700565	1.55297	0.525628
125	41.1	38.9	0.706215	1.565188	0.541971
126	36.1	38.9	0.711864	1.577545	0.55846
127	39.6	38.9	0.717514	1.590048	0.575103
128	39	39	0.723164	1.602704	0.591907
129	40.1	39.1	0.728814	1.615518	0.608881
130	43.1	39.2	0.734463	1.628498	0.626032
131	40.6	39.2	0.740113	1.641651	0.64337
132	37.6	39.2	0.745763	1.654985	0.660904

Data of concrete compressive strength: 30 MPa (Cont.)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
133	40.1	39.3	0.751412	1.668508	0.678644
134	36.9	39.3	0.757062	1.68223	0.6966
135	37.4	39.4	0.762712	1.69616	0.714784
136	35.5	39.5	0.768362	1.710309	0.733207
137	37.6	39.6	0.774011	1.724686	0.751883
138	34	39.6	0.779661	1.739303	0.770825
139	37.7	39.6	0.785311	1.754174	0.790048
140	40.7	39.6	0.79096	1.769312	0.809567
141	34.5	39.7	0.79661	1.78473	0.829399
142	39.3	39.8	0.80226	1.800445	0.849563
143	38.2	39.8	0.80791	1.816474	0.870079
144	42.6	39.9	0.813559	1.832835	0.890967
145	36	39.9	0.819209	1.849548	0.91225
146	38.9	40	0.824859	1.866635	0.933955
147	41.8	40	0.830508	1.884119	0.956109
148	37.6	40.1	0.836158	1.902027	0.978741
149	35.1	40.1	0.841808	1.920388	1.001886
150	43.4	40.1	0.847458	1.939233	1.02558
151	36.2	40.1	0.853107	1.958598	1.049863
152	37.8	40.2	0.858757	1.978522	1.07478
153	37.4	40.3	0.864407	1.999048	1.100383
154	38.6	40.4	0.870056	2.020225	1.126727
155	35.2	40.6	0.875706	2.04211	1.153876
156	39.6	40.7	0.881356	2.064765	1.181901
157	34	40.7	0.887006	2.088261	1.210886
158	34.3	40.7	0.892655	2.112681	1.240924
159	37.2	41.1	0.898305	2.13812	1.272124
160	42.6	41.3	0.903955	2.164688	1.304612
161	34.6	41.4	0.909605	2.192515	1.338536
162	36.4	41.6	0.915254	2.221756	1.374073
163	38.9	41.6	0.920904	2.252595	1.411432
164	38.4	41.7	0.926554	2.285257	1.45087
165	40.3	41.8	0.932203	2.320019	1.492699
166	34	41.9	0.937853	2.357225	1.537314
167	36.5	42.3	0.943503	2.397317	1.585212
168	39.6	42.4	0.949153	2.440871	1.637047
169	41.4	42.6	0.954802	2.488658	1.693689
170	40	42.6	0.960452	2.541747	1.756347
171	36.4	42.9	0.966102	2.601688	1.826765
172	41.9	43.1	0.971751	2.670847	1.907604
173	33.9	43.1	0.977401	2.753127	2.003245
174	39.3	43.3	0.983051	2.855709	2.121722
175	43.3	43.4	0.988701	2.994329	2.280589
176	38.8	43.8	0.99435	3.217499	2.533713

mean	37.41023
bias factor, λ	2.710384
standard deviation	1.247008
coef. of variation, V	0.07245

Data of concrete compressive strength: 33 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	38.8	34.2	0.008621	3.083372	-2.38195
2	40.7	35.3	0.017241	2.849717	-2.11482
3	38.7	35.5	0.025862	2.703693	-1.94585
4	40.2	35.8	0.034483	2.595109	-1.81905
5	39.7	35.8	0.043103	2.507649	-1.71614
6	41.4	36.2	0.051724	2.433857	-1.62871
7	36.5	36.5	0.060345	2.369675	-1.55221
8	40.2	36.6	0.068966	2.312639	-1.48383
9	37.8	36.6	0.077586	2.261135	-1.42176
10	42.1	36.7	0.086207	2.214048	-1.36472
11	40.4	36.8	0.094828	2.170574	-1.3118
12	39	36.8	0.103448	2.13011	-1.26231
13	39.8	36.9	0.112069	2.092195	-1.21573
14	39	36.9	0.12069	2.056469	-1.17165
15	43.1	36.9	0.12931	2.022642	-1.12973
16	41.4	37	0.137931	1.990478	-1.0897
17	39.8	37.1	0.146552	1.959784	-1.05135
18	40.3	37.1	0.155172	1.930398	-1.01448
19	36.7	37.1	0.163793	1.902184	-0.97894
20	38.9	37.1	0.172414	1.875024	-0.94459
21	39.6	37.1	0.181034	1.84882	-0.91132
22	40.2	37.1	0.189655	1.823484	-0.87904
23	38.7	37.6	0.198276	1.798942	-0.84764
24	42.2	37.7	0.206897	1.775126	-0.81705
25	41.6	37.7	0.215517	1.751979	-0.78721
26	36.8	37.8	0.224138	1.729447	-0.75806
27	37.7	38	0.232759	1.707485	-0.72953
28	41.8	38.1	0.241379	1.686052	-0.70159
29	42.4	38.5	0.25	1.665109	-0.67419
30	41.7	38.7	0.258621	1.644623	-0.64728
31	37.7	38.7	0.267241	1.624563	-0.62084
32	41.2	38.7	0.275862	1.604901	-0.59482
33	43.6	38.8	0.284483	1.585612	-0.5692
34	35.8	38.9	0.293103	1.566671	-0.54395
35	35.8	39	0.301724	1.548058	-0.51905
36	40.8	39	0.310345	1.529752	-0.49446
37	38.7	39.2	0.318966	1.511736	-0.47017
38	41.4	39.4	0.327586	1.493991	-0.44616
39	35.5	39.4	0.336207	1.476502	-0.4224
40	41.2	39.5	0.344828	1.459254	-0.39888
41	41.2	39.6	0.353448	1.442233	-0.37558
42	45.2	39.6	0.362069	1.425427	-0.35249
43	40.2	39.6	0.37069	1.408822	-0.32959
44	36.9	39.6	0.37931	1.392408	-0.30686
45	38	39.7	0.387931	1.376174	-0.28429
46	43	39.7	0.396552	1.360109	-0.26186
47	39.8	39.7	0.405172	1.344204	-0.23958
48	39.2	39.8	0.413793	1.32845	-0.21741
49	41.8	39.8	0.422414	1.312837	-0.19535
50	39.6	39.8	0.431034	1.297357	-0.1734
51	40.2	40.1	0.439655	1.282002	-0.15153
52	39.7	40.1	0.448276	1.266765	-0.12973
53	41.1	40.2	0.456897	1.251638	-0.108
54	41.6	40.2	0.465517	1.236613	-0.08633
55	45.9	40.2	0.474138	1.221685	-0.06471
56	42	40.2	0.482759	1.206846	-0.04311
57	41.1	40.2	0.491379	1.19209	-0.02155
58	39.4	40.3	0.5	1.17741	1.01E-07
59	46.8	40.4	0.508621	1.19209	0.021549
60	45.1	40.4	0.517241	1.206846	0.043114
61	41.8	40.5	0.525862	1.221685	0.064705
62	41.5	40.6	0.534483	1.236613	0.086332
63	40.8	40.7	0.543103	1.251638	0.108004
64	43.3	40.8	0.551724	1.266765	0.129731
65	40.1	40.8	0.560345	1.282002	0.151525
66	39.6	40.8	0.568966	1.297357	0.173395
67	37.1	40.8	0.577586	1.312837	0.195353

Data of concrete compressive strength: 33 MPa (Cont.)

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
68	41.5	40.9	0.586207	1.32845	0.217409
69	42.4	40.9	0.594828	1.344204	0.239576
70	39.6	41.1	0.603448	1.360109	0.261864
71	37.1	41.1	0.612069	1.376174	0.284286
72	44.2	41.1	0.62069	1.392408	0.306856
73	42.3	41.2	0.62931	1.408822	0.329586
74	39.4	41.2	0.637931	1.425427	0.35249
75	38.1	41.2	0.646552	1.442233	0.375583
76	44.3	41.3	0.655172	1.459254	0.398881
77	37.6	41.4	0.663793	1.476502	0.4224
78	44.5	41.4	0.672414	1.493991	0.446157
79	36.2	41.4	0.681034	1.511736	0.470171
80	36.6	41.5	0.689655	1.529752	0.49446
81	39.7	41.5	0.698276	1.548058	0.519047
82	41.3	41.6	0.706897	1.566671	0.543953
83	42.7	41.6	0.715517	1.585612	0.569203
84	37.1	41.7	0.724138	1.604901	0.594822
85	40.4	41.8	0.732759	1.624563	0.620838
86	46	41.8	0.741379	1.644623	0.647283
87	47.5	41.8	0.75	1.665109	0.674189
88	40.6	42	0.758621	1.686052	0.701593
89	37.1	42.1	0.767241	1.707485	0.729535
90	42.7	42.2	0.775862	1.729447	0.758058
91	40.8	42.2	0.784483	1.751979	0.787213
92	37	42.3	0.793103	1.775126	0.817052
93	42.8	42.4	0.801724	1.798942	0.847636
94	37.1	42.4	0.810345	1.823484	0.879035
95	40.9	42.7	0.818966	1.84882	0.911324
96	39.5	42.7	0.827586	1.875024	0.944592
97	36.8	42.8	0.836207	1.902184	0.978939
98	36.9	43	0.844828	1.930398	1.014479
99	40.8	43.1	0.853448	1.959784	1.051348
100	45.9	43.3	0.862069	1.990478	1.089702
101	45.1	43.6	0.87069	2.022642	1.129728
102	45.3	44.2	0.87931	2.056469	1.171648
103	41.1	44.3	0.887931	2.092195	1.215731
104	36.6	44.4	0.896552	2.13011	1.26231
105	40.5	44.4	0.905172	2.170574	1.311796
106	38.5	44.5	0.913793	2.214048	1.364717
107	34.2	45.1	0.922414	2.261135	1.421756
108	36.9	45.1	0.931034	2.312639	1.483831
109	40.9	45.2	0.939655	2.369675	1.552207
110	42.2	45.3	0.948276	2.433857	1.628713
111	35.3	45.9	0.956897	2.507649	1.716136
112	44.4	45.9	0.965517	2.595109	1.819053
113	40.1	46	0.974138	2.703693	1.945852
114	44.4	46.8	0.982759	2.849717	2.114823
115	37.1	47.5	0.991379	3.083372	2.381952

mean	40.35565
bias factor, λ	2.752007
standard deviation	1.222899
coef. of variation, V	0.068194

Data of concrete compressive strength: 36 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	45.3	37.2	0.026316	2.697253	-1.93836
2	41.8	37.7	0.052632	2.426701	-1.62021
3	42.4	38.5	0.078947	2.25343	-1.41244
4	40.1	38.7	0.105263	2.121929	-1.25228
5	42.8	39.8	0.131579	2.014025	-1.11902
6	44.1	39.9	0.157895	1.921368	-1.00312
7	40.8	40.1	0.184211	1.839389	-0.89932
8	43.5	40.1	0.210526	1.765301	-0.8044
9	42.7	40.8	0.236842	1.697269	-0.71623
10	46.7	40.9	0.263158	1.634014	-0.63331
11	37.7	41.8	0.289474	1.574605	-0.55454
12	38.5	42.1	0.315789	1.518341	-0.47909
13	43.9	42.1	0.342105	1.464675	-0.40628
14	42.1	42.2	0.368421	1.413173	-0.3356
15	38.7	42.3	0.394737	1.363478	-0.26657
16	39.9	42.4	0.421053	1.315293	-0.19883
17	43.7	42.6	0.447368	1.268363	-0.13202
18	45.9	42.7	0.473684	1.222468	-0.06584
19	44.4	42.8	0.5	1.17741	1.01E-07
20	45.9	43.2	0.526316	1.222468	0.065843
21	43.8	43.5	0.552632	1.268363	0.132022
22	44.3	43.7	0.578947	1.315293	0.198829
23	46	43.8	0.605263	1.363478	0.266573
24	40.1	43.8	0.631579	1.413173	0.335596
25	43.2	43.9	0.657895	1.464675	0.406284
26	37.2	44.1	0.684211	1.518341	0.479086
27	42.1	44.3	0.710526	1.574605	0.554541
28	42.2	44.4	0.736842	1.634014	0.633309
29	43.8	45.3	0.763158	1.697269	0.71623
30	47.9	45.6	0.789474	1.765301	0.804401
31	42.6	45.9	0.815789	1.839389	0.899319
32	39.8	45.9	0.842105	1.921368	1.003119
33	46.9	46	0.868421	2.014025	1.119021
34	49	46.7	0.894737	2.121929	1.252277
35	45.6	46.9	0.921053	2.25343	1.412442
36	42.3	47.9	0.947368	2.426701	1.620205
37	40.9	49	0.973684	2.697253	1.93836

mean	42.93514
bias factor, λ	2.81654
standard deviation	1.192643
coef. of variation, V	0.0656

Data of concrete compressive strength: 40 MPa

No.	Recorded	Increase. order	$p_i = i/(N+1)$	$t_i = \sqrt{-\ln(p^2)}$	$z_i = \Phi^{-1}(p_i)$
1	47.7	42.7	0.021277	2.774941	-2.02851
2	46.1	43.6	0.042553	2.512768	-1.72218
3	48	43.7	0.06383	2.345862	-1.52371
4	45.9	44.1	0.085106	2.219844	-1.37175
5	44.8	44.3	0.106383	2.116936	-1.24615
6	46	44.4	0.12766	2.028984	-1.1376
7	48.5	44.5	0.148936	1.951531	-1.04101
8	46.7	44.7	0.170213	1.881864	-0.95325
9	49	44.8	0.191489	1.818199	-0.87228
10	47.9	45.2	0.212766	1.759297	-0.79666
11	44.1	45.5	0.234043	1.704261	-0.72534
12	48	45.6	0.255319	1.652417	-0.65753
13	46.5	45.8	0.276596	1.603246	-0.59263
14	50.6	45.9	0.297872	1.556336	-0.53013
15	45.6	46	0.319149	1.511355	-0.46966
16	45.8	46.1	0.340426	1.468032	-0.41086
17	46.9	46.1	0.361702	1.426138	-0.35347
18	49.5	46.1	0.382979	1.385479	-0.29723
19	47.7	46.5	0.404255	1.345889	-0.24194
20	44.5	46.5	0.425532	1.307222	-0.1874
21	43.6	46.6	0.446809	1.26935	-0.13344
22	49.3	46.7	0.468085	1.232157	-0.07989
23	51.2	46.7	0.489362	1.195536	-0.02659
24	47.7	46.9	0.510638	1.195536	0.026595
25	46.1	47.3	0.531915	1.232157	0.079886
26	45.5	47.7	0.553191	1.26935	0.133436
27	46.6	47.7	0.574468	1.307222	0.1874
28	46.7	47.7	0.595745	1.345889	0.241941
29	48.3	47.7	0.617021	1.385479	0.297233
30	43.7	47.9	0.638298	1.426138	0.353469
31	44.7	48	0.659574	1.468032	0.410862
32	50.2	48	0.680851	1.511355	0.469657
33	45.2	48.3	0.702128	1.556336	0.530134
34	42.7	48.3	0.723404	1.603246	0.592626
35	47.3	48.5	0.744681	1.652417	0.657531
36	48.3	48.7	0.765957	1.704261	0.725338
37	48.7	49	0.787234	1.759297	0.796659
38	51	49.3	0.808511	1.818199	0.872283
39	51.9	49.5	0.829787	1.881864	0.953255
40	47.7	49.7	0.851064	1.951531	1.041009
41	44.3	50.2	0.87234	2.028984	1.137601
42	49.7	50.6	0.893617	2.116936	1.24615
43	46.1	51	0.914894	2.219844	1.371752
44	52.3	51.2	0.93617	2.345862	1.523706
45	44.4	51.9	0.957447	2.512768	1.722179
46	46.5	52.3	0.978723	2.774941	2.028507

mean	47.16304
bias factor, λ	2.30018
standard deviation	1.179076
coef. of variation, V	0.048771

APPENDIX D

DATA OF FABRICATION FROM INDONESIA

Dimension of columns (square)

Target 58

No.	Recorded
1	57.5
2	58
3	57.5
4	58.1
5	58
6	58
7	57.8
8	58
9	58.2
10	57.9
11	58.6
12	58.3
13	58.1
14	58
15	58
16	57.7
17	57.9
18	58.8
19	58.5
20	58.4
21	58.4
22	57.8
23	58.3
24	57.8
25	57.6
26	58.7
27	58.3
28	57.9
29	57.8
30	57.9
31	57.8
32	58.4
33	57.7
34	58.5
35	58.2
36	58.1
37	58.3
38	57.8
39	58.4
40	58

mean	58.075
bias	1.001293
std. dev.	0.320056
V	0.005511

Target 70

No.	Recorded
1	70.3
2	70.4
3	70.3
4	70
5	70.2
6	69.9
7	69.6
8	70.1
9	70
10	69.9
11	69.4
12	70
13	70
14	70.2
15	70
16	70.3
17	70
18	69.9
19	70
20	69.2
21	70.2
22	71
23	69.5
24	70
25	69.6
26	69.9
27	69
28	69.9
29	70.3
30	70
31	70
32	70
33	70.1
34	70.4
35	70
36	70.1
37	70.4
38	70.1
39	70
40	70
41	70
42	70

mean	70.005
bias	1.000071
std. dev.	0.344145
V	0.004916

Dimension of beams

width target 25 cm

No.	target	recorded
1	25	25.2
2		25.6
3		24.9
4		25
5		24.7
6		24.7
7		26.7
8		25.8
9		25
10		25
11		25.4
12		25.6
13		25.7
14		24.6
15		25
16		24
17		26.5
18		26
19		25.7
20		24
21		24
22		23

mean	25.09545
bias	1.003818
stdev	0.86821
V	0.034596

height target 50 cm

No.	target	recorded
1	50	48.2
2		47.5
3		47.5
4		48
5		49.7
6		50
7		49
8		50.1
9		49.5
10		50
11		50.5
12		52.5
13		48.5
14		50
15		51
16		51
17		48
18		49.5
19		51
20		51
21		50
22		49

mean	49.61364
bias	0.992273
stdev	1.305773
V	0.026319

Dimension of slabs

precast slab
target : 100 mm

No.	produced
1	10.4
2	10.3
3	10.5
4	10
5	9.9
6	10.4
7	10.6
8	10.3
9	10.3
10	9.1
11	10.4
12	10.3
13	10.4
14	10.1
15	10.5
16	10.6
17	10.4
18	10.3
19	10.3
20	10.3
21	10.2
22	10.4
23	10.3
24	10.3
25	10.4
26	10.2
27	10.4
28	10.5
29	10.3
30	10.4
31	10.3
32	10
33	10.3
34	10.4
35	10.6
36	10.5
37	10.3
38	10.5
39	10.3
40	10.6
41	10.6

slab cast in site
target =120 mm

No.	produced
1	12
2	10
3	14
4	11.5
5	12.4
6	10.8
7	10.5
8	11.8
9	14
10	12.5
11	12
12	13.1
13	13.2
14	11.4
15	12.2
16	14
17	10.8
18	12.7
19	11.8
20	14.5
21	13.7
22	12
23	11.8
24	13
25	11.6
26	12.4
27	12
28	12
29	11.7
30	14
31	14
32	11

slab precast

var	0.064256
stdev	0.253488
mean	10.32195
cov	0.024558
n	52
λ	1.032195

slab in situ

var	1.342581
stdev	1.158698
mean	12.325
cov	0.094012
n	32
λ	1.027083

Concrete cover of beams and column

concrete cover of beam

target cover = 30mm

No.	produced
1	29
2	30
3	25
4	29
5	25
6	26
7	27
8	25
9	28
10	23
11	29
12	27
13	32
14	27
15	30
16	30
17	24
18	27

stdev	2.428722
mean	27.38889
cov	0.088675
n	18
bias	0.912963

Conc. Cover of column

target cover = 40

No.	Produced
1	52
2	42
3	51
4	50
5	53
6	50
7	59
8	62
9	53
10	47
11	45
12	48
13	50
14	40
15	48
16	57
17	38
18	37

stdev	6.851363
mean	49
cov	0.139824
n	18
bias	1.225

APPENDIX E

DATA OF FABRICATION FROM JAPAN

Data of column dimension

Column dimension target 700

No.	Produced
1	670.75
2	701
3	703.25
4	703.3333
5	702
6	703.25
7	703
8	701.75
9	702.25
10	702
11	702
12	701.25
13	703
14	702
15	702.75
16	703.75
17	702.5
18	700
19	702.5
20	703.75
21	702.5
22	704
23	702
24	702.75
25	703.25
26	700

nominal	700
mean	701.1763
stdev	6.289909
bias	1.00168
V	0.008971

Column dimension target 800

No.	Produced
1	801.5
2	801
3	801.75
4	801.5
5	801.75
6	802.5
7	802.25
8	802.75
9	802.5
10	803
11	810.5
12	803.25
13	813.25
14	813
15	811.5
16	812
17	812
18	810.5
19	812.25
20	811
21	811
22	811.25
23	810.5
24	810.25
25	811.25
26	811.75
27	811.75
28	811.75
29	814.25
30	813.25
31	812
32	813.25
33	813.75
34	812.5
35	814
36	814.5
37	815
38	813.5
39	816
40	810
41	810
42	810.25
43	812
44	814.75
45	812
46	813.5
47	811
48	810
49	809.25
50	811.5
51	811
52	810.25
53	813
54	810.5
55	809
56	815.75

Column dimension target 900

No.	Produced
1	900.75
2	901.5
3	901
4	900.5
5	900.25
6	903.25
7	902
8	901.75
9	901.5
10	901.5
11	901
12	902
13	901.25
14	902.5
15	902.5
16	903.75
17	903.5
18	904.5
19	904.25
20	903
21	902.5
22	901.75
23	902
24	900.5
25	902
26	901.25
27	901
28	903
29	903.5
30	904
31	903.5
32	901.5
33	902.25
34	906.25
35	903.5
36	904.5
37	903.25
38	903.5
39	901.75
40	902.5
41	903.5
42	903.25
43	903.25
44	905
45	904.5
46	903
47	904.5
48	903.75
49	902.75
50	1009
51	1009.25
52	908
53	908
54	906
55	906.25
56	907

Data of column dimension (continue)

Column dimension target 700

Column dimension target 800

No.	Produced
57	813.75
58	812.75
59	813.5
60	812.5
61	814.25
62	818.25
63	815
64	815
65	814.75
66	816.25
67	817.25
68	815.25
69	803.75
70	804.5
71	805.75
72	802.75
73	805
74	804.75
75	806.75
76	805
77	803.25
78	804.25
79	804
80	805.25
81	806.25
82	805
83	804
84	804.75
85	804.25
86	803.75
87	805
88	804
89	806
90	805.25
91	805.75
92	805.25
93	806.5
94	805.5
95	806.25
96	806
97	805.5
98	805.75
99	805.25
100	804.25
101	804.5
102	805.25
103	803.75
104	805.25
105	806.5
106	802.75
107	807.25
108	805
109	805.5
110	803.25
111	804.75
112	805.25
113	806.25
114	805.5
115	804
116	804
117	802.5
118	803.25
119	803.75
120	805

Column dimension target 900

No.	Produced
57	907.75
58	907.75
59	908.5
60	907.5
61	906.75
62	907.25
63	907.75
64	906.25
65	905.75

nominal	900
mean	906.9
stdev	18.4907
bias	1.007667
V	0.020389

Data of column dimension (continue)

Column dimension (cont.)
target 800

No.	Produced
121	804
122	804
123	804
124	804
125	804.5
126	803.75
127	805.75
128	805
129	802
130	804.75
131	806.25
132	804.25
133	803.75
134	804
135	805
136	803
137	804.25
138	810.5
139	803.25

nominal	800
mean	807.7974
stdev	4.415491
bias	1.009747
V	0.005466

Data of beam dimension

Beam width
target 700

No.	Produced
1	704.4
2	711.8
3	710
4	713
5	711.4
6	705
7	714
8	717
9	702.6667
10	703
11	707.3333
12	714.3333
13	711.3333
14	711
15	702.3333
16	702.6667
17	714.6667
18	714.6667
19	715.3333
20	715.3333
21	702

mean	709.6794
stdev	5.205024
bias	1.013828
V	0.007334

Beam height
target 600

No.	Produced
1	605
2	604
3	618
4	617
5	610
6	620
7	610
8	623
9	613
10	615
11	600
12	614
13	600
14	600
15	600
16	600

mean	609.3125
stdev	8.105297
bias	1.015521
V	0.013302

Data concrete cover of column, target 40 mm

No.	Recorded	No.	Recorded	No.	Recorded	No.	Recorded	No.	Recorded	No.	Recorded
1	57.8	66	84.3	131	57.3	196	59.9	261	46.0	326	64.4
2	47.0	67	90.7	132	68.7	197	51.9	262	54.3	327	66.2
3	77.0	68	52.9	133	71.4	198	21.7	263	72.1	328	55.4
4	70.3	69	62.6	134	28.0	199	67.4	264	44.2	329	71.3
5	58.2	70	23.9	135	38.7	200	85.1	265	46.6	330	60.0
6	41.6	71	80.7	136	84.7	201	83.4	266	66.3	331	35.9
7	35.3	72	104.3	137	46.7	202	54.2	267	70.0	332	54.7
8	56.2	73	63.9	138	36.8	203	37.1	268	42.1	333	58.2
9	34.0	74	61.0	139	58.0	204	52.0	269	38.3	334	67.7
10	51.2	75	82.7	140	67.5	205	43.3	270	74.7	335	55.5
11	55.2	76	73.9	141	20.9	206	29.8	271	71.0	336	60.9
12	39.7	77	45.2	142	47.7	207	66.9	272	32.2	337	58.1
13	29.5	78	39.1	143	74.0	208	84.3	273	50.6	338	75.5
14	65.8	79	96.7	144	46.1	209	46.0	274	85.4	339	51.1
15	91.9	80	99.0	145	26.2	210	50.3	275	67.6	340	42.2
16	62.4	81	43.7	146	48.5	211	67.6	276	27.4	341	26.4
17	84.1	82	43.2	147	60.6	212	60.1	277	49.5	342	101.4
18	41.5	83	97.2	148	37.6	213	56.9	278	34.3	343	80.3
19	36.8	84	89.4	149	39.7	214	62.2	279	74.9	344	18.2
20	88.7	85	54.7	150	46.4	215	58.8	280	47.3	345	101.1
21	46.7	86	60.8	151	82.3	216	58.5	281	45.8	346	38.6
22	43.4	87	93.8	152	80.5	217	62.9	282	75.0	347	22.3
23	80.4	88	86.5	153	44.9	218	49.2	283	77.7	348	95.1
24	80.8	89	44.8	154	12.5	219	52.3	284	46.0	349	72.7
25	79.8	90	78.7	155	68.3	220	68.7	285	51.8	350	29.8
26	68.6	91	86.0	156	104.5	221	62.2	286	80.2	351	51.4
27	44.0	92	62.7	157	40.6	222	61.1	287	64.3	352	101.2
28	56.4	93	82.6	158	63.0	223	51.8	288	43.7	353	67.2
29	60.5	94	76.5	159	77.9	224	63.4	289	49.3	354	68.7
30	59.2	95	32.8	160	60.2	225	55.8	290	66.7	355	53.9
31	65.7	96	29.4	161	45.0	226	37.4	291	73.8	356	59.0
32	61.8	97	93.1	162	20.9	227	63.9	292	50.2	357	54.0
33	85.8	98	63.4	163	61.5	228	74.6	293	37.9	358	60.2
34	66.8	99	36.2	164	84.9	229	36.8	294	78.2	359	70.4
35	35.4	100	48.9	165	44.3	230	64.7	295	79.2	360	64.8
36	55.1	101	76.5	166	39.2	231	79.3	296	43.2	361	58.1
37	58.6	102	68.8	167	59.1	232	45.5	297	52.9	362	75.5
38	50.3	103	45.0	168	69.4	233	47.7	298	70.3	363	50.9
39	83.3	104	42.3	169	46.5	234	60.9	299	69.0	364	42.2
40	88.4	105	70.4	170	49.4	235	78.0	300	54.8	365	26.4
41	61.2	106	37.7	171	60.4	236	52.0	301	40.6	366	101.4
42	68.1	107	44.8	172	57.9	237	81.9	302	71.2	367	80.3
43	91.9	108	66.6	173	50.6	238	46.4	303	82.1	368	18.2
44	85.6	109	52.6	174	42.2	239	47.5	304	47.3	369	55.2
45	57.5	110	63.1	175	52.2	240	62.7	305	41.9	370	27.9
46	60.5	111	56.8	176	66.9	241	64.7	306	73.8	371	35.5
47	66.5	112	37.3	177	53.0	242	66.1	307	70.9	372	64.9
48	54.5	113	58.8	178	28.6	243	56.9	308	48.0	373	47.0
49	60.7	114	58.6	179	68.9	244	45.1	309	41.9	374	44.3
50	58.0	115	44.0	180	90.5	245	47.7	310	51.3	375	44.3
51	77.7	116	38.0	181	90.1	246	50.1	311	81.8	376	45.1
52	81.7	117	81.9	182	43.3	247	70.8	312	71.0	377	33.9
53	73.9	118	89.1	183	38.8	248	67.1	313	38.4	378	49.0
54	70.6	119	40.3	184	82.2	249	61.3	314	56.8	379	52.1
55	78.3	120	40.9	185	78.4	250	38.1	315	82.6	380	42.3
56	72.0	121	66.5	186	84.0	251	43.0	316	67.5	381	53.0
57	85.2	122	89.5	187	42.0	252	74.7	317	35.8	382	45.2
58	43.4	123	52.1	188	37.4	253	52.4	318	60.8	383	38.1
59	86.2	124	45.4	189	31.7	254	77.0	319	83.4	384	46.2
60	79.3	125	70.6	190	65.4	255	53.5	320	64.0	385	37.1
61	59.1	126	35.4	191	89.0	256	33.8	321	85.6	386	33.6
62	90.5	127	50.8	192	65.4	257	50.2	322	23.1	387	36.2
63	99.0	128	80.6	193	69.3	258	76.1	323	22.5	388	34.9
64	53.9	129	48.7	194	45.8	259	75.4	324	105.6		
65	64.8	130	38.3	195	50.4	260	26.0	325	45.6		

mean	56.906
stdev	18.629
bias	1.4227
V	0.3274

Data concrete cover of column, target 50 mm

No.	recorded	No.	recorded	No.	recorded	No.	recorded	No.	recorded
1	60.5	61	67.6	121	62.3	181	80.4	241	75.6
2	62.4	62	73.3	122	58.9	182	70.3	242	68.2
3	45.8	63	54.8	123	60.0	183	50.7	243	55.2
4	44.2	64	40.5	124	59.7	184	61.2	244	59.3
5	28.3	65	68.6	125	64.7	185	73.5	245	64.7
6	67.0	66	75.9	126	48.9	186	48.6	246	76.9
7	72.7	67	46.3	127	50.3	187	49.3	247	59.1
8	35.4	68	41.9	128	66.8	188	71.5	248	53.4
9	55.6	69	77.0	129	63.8	189	59.2	249	53.3
10	42.6	70	53.6	130	52.3	190	68.5	250	54.8
11	78.9	71	48.6	131	55.9	191	64.3	251	61.9
12	84.1	72	59.5	132	73.1	192	52.3	252	51.9
13	78.7	73	60.3	133	71.2	193	76.9	253	58.1
14	70.0	74	53.1	134	63.0	194	48.6	254	49.8
15	49.2	75	64.6	135	49.3	195	46.0	255	46.9
16	57.4	76	69.0	136	63.3	196	75.0	256	59.7
17	36.4	77	62.4	137	72.1	197	58.8	257	58.9
18	66.0	78	60.7	138	46.2	198	60.3	258	61.7
19	84.6	79	59.7	139	54.4	199	63.6	259	48.7
20	55.5	80	60.3	140	74.1	200	51.9	260	45.2
21	46.7	81	76.0	141	47.4	201	62.9	261	61.1
22	35.8	82	43.9	142	60.9	202	68.2	262	51.1
23	75.8	83	46.5	143	75.3	203	56.3	263	42.7
24	83.7	84	73.3	144	65.3	204	49.5	264	51.7
25	57.4	85	70.7	145	75.2	205	62.2	265	62.9
26	49.3	86	43.7	146	63.2	206	72.6	266	45.9
27	76.7	87	42.9	147	47.9	207	62.2	267	41.5
28	75.5	88	76.7	148	60.3	208	53.9	268	62.7
29	86.9	89	71.6	149	59.1	209	65.4	269	60.0
30	57.4	90	39.9	150	56.1	210	75.7	270	52.7
31	38.9	91	41.7	151	65.4	211	54.6	271	50.9
32	63.4	92	78.4	152	66.1	212	45.7	272	54.7
33	55.0	93	82.2	153	61.8	213	39.5	273	69.0
34	68.2	94	52.6	154	49.3	214	53.6	274	61.3
35	67.5	95	27.6	155	54.9	215	78.9	275	39.3
36	52.6	96	66.0	156	64.2	216	74.6	276	47.3
37	55.5	97	75.4	157	49.6	217	57.8	277	72.3
38	58.5	98	54.1	158	54.9	218	65.9	278	44.6
39	64.8	99	43.4	159	65.9	219	68.4	279	35.2
40	56.6	100	70.3	160	63.6	220	54.7	280	62.4
41	56.8	101	87.4	161	61.3	221	58.1	281	70.4
42	50.5	102	70.7	162	63.2	222	72.1	282	70.4
43	62.3	103	40.2	163	51.7	223	65.3	283	39.4
44	66.4	104	51.1	164	56.4	224	51.4	284	41.8
45	46.6	105	78.0	165	69.9	225	54.9	285	47.1
46	55.6	106	60.9	166	52.1	226	78.3	286	63.6
47	69.9	107	42.0	167	50.1	227	74.4	287	64.4
48	62.9	108	53.5	168	68.3	228	39.8	288	43.1
49	56.4	109	81.0	169	64.2	229	79.2	289	57.7
50	35.1	110	73.2	170	66.8	230	78.2	290	70.2
51	62.1	111	32.4	171	53.5	231	44.8	291	46.0
52	78.8	112	48.3	172	57.1	232	39.6	292	36.9
53	48.6	113	71.6	173	62.3	233	61.9	293	64.7
54	53.2	114	65.3	174	51.0	234	65.3	294	73.0
55	68.1	115	46.3	175	53.2	235	73.9	295	44.0
56	66.7	116	52.5	176	68.3	236	67.5	296	29.2
57	47.0	117	68.0	177	53.1	237	75.2	297	42.2
58	52.9	118	49.1	178	63.2	238	77.3	298	57.7
59	67.4	119	54.7	179	62.3	239	47.0	299	66.0
60	63.9	120	65.8	180	57.3	240	55.4	300	52.5

Data concrete cover of column, target 50 mm (Cont.)

No.	recorded	No.	recorded	No.	recorded	No.	recorded	No.	recorded
301	59.0	361	65.8	421	53.8	481	56.4	541	48.5
302	63.5	362	47.9	422	37.0	482	75.6	542	56.6
303	39.5	363	38.9	423	52.8	483	44.4	543	58.8
304	45.3	364	65.0	424	63.7	484	29.5	544	52.8
305	47.2	365	56.8	425	57.8	485	57.3	545	58.2
306	48.8	366	73.1	426	49.0	486	57.1	546	60.7
307	56.4	367	47.0	427	43.6	487	42.8	547	55.8
308	57.0	368	38.6	428	56.7	488	51.3	548	52.8
309	61.2	369	50.7	429	55.6	489	55.4	549	48.4
310	50.5	370	47.2	430	47.9	490	78.2	550	59.9
311	55.0	371	54.4	431	49.5	491	50.3	551	59.6
312	53.8	372	63.9	432	55.7	492	21.4	552	51.0
313	52.0	373	44.6	433	57.3	493	53.5	553	45.9
314	36.3	374	62.4	434	45.4	494	46.3	554	56.9
315	60.5	375	66.2	435	48.6	495	48.9	555	55.5
316	77.0	376	52.6	436	61.1	496	55.7	556	51.6
317	58.4	377	44.0	437	52.4	497	67.6	557	47.3
318	50.9	378	58.1	438	47.4	498	74.2	558	59.0
319	46.2	379	62.9	439	52.8	499	40.9	559	61.3
320	60.7	380	52.6	440	60.4	500	35.7	560	54.9
321	59.5	381	34.6	441	49.4	501	52.6	561	31.9
322	41.9	382	48.7	442	54.8	502	54.4	562	61.9
323	48.5	383	72.0	443	56.7	503	56.1	563	70.9
324	67.3	384	58.0	444	53.5	504	51.9	564	50.6
325	24.3	385	55.6	445	53.1	505	57.8	565	49.5
326	67.7	386	50.7	446	45.9	506	44.3	566	55.9
327	81.4	387	47.8	447	50.2	507	46.5	567	51.0
328	44.2	388	52.7	448	56.0	508	58.7	568	55.6
329	36.4	389	53.6	449	36.5	509	61.2	569	63.3
330	56.3	390	59.6	450	51.3	510	39.3	570	60.3
331	71.4	391	45.9	451	71.0	511	39.1	571	50.3
332	54.7	392	44.0	452	50.9	512	67.5	572	47.0
333	52.1	393	62.3	453	59.9	513	65.1	573	48.1
334	73.1	394	46.0	454	64.3	514	42.4	574	50.3
335	53.9	395	44.4	455	46.7	515	39.3	575	55.4
336	40.2	396	58.2	456	41.9	516	62.6	576	48.9
337	43.0	397	63.6	457	61.5	517	63.5	577	43.3
338	49.6	398	68.6	458	49.2	518	46.9	578	49.3
339	64.8	399	39.0	459	43.8	519	42.3	579	59.0
340	62.4	400	36.7	460	56.9	520	53.9	580	65.4
341	34.6	401	60.1	461	55.9	521	59.2	581	46.9
342	39.8	402	52.0	462	58.6	522	79.6	582	36.2
343	75.6	403	42.7	463	50.9	523	47.9	583	55.2
344	73.0	404	52.4	464	47.6	524	24.8	584	53.8
345	47.3	405	53.1	465	44.2	525	55.6	585	56.4
346	70.7	406	54.8	466	56.8	526	47.0	586	50.5
347	66.2	407	53.1	467	59.5	527	57.2	587	44.8
348	46.7	408	48.5	468	48.0	528	64.6		
349	63.7	409	49.2	469	35.5	529	59.3		
350	43.4	410	57.2	470	71.1	530	54.7		
351	44.4	411	61.3	471	73.4	531	40.8		
352	71.0	412	45.3	472	39.5	532	55.9		
353	51.7	413	65.7	473	30.9	533	37.5		
354	45.4	414	49.5	474	54.0	534	49.0		
355	56.8	415	40.4	475	80.6	535	64.5		
356	68.0	416	53.8	476	57.0	536	61.0		
357	59.6	417	62.0	477	72.4	537	48.8		
358	56.1	418	73.0	478	67.2	538	56.7		
359	46.2	419	42.9	479	37.2	539	54.8		
360	54.5	420	27.9	480	44.1	540	55.4		

mean	55.863
stdev	11.50745
bias	1.117255
V	0.205995

Data concrete cover of beam, target 40 mm

Concrete cover beam
Terget 40 mm

No.	Recorded	No.	Recorded
1	37.1087	36	24.4
2	34.94545	37	24.50746
3	36.38284	38	62.57143
4	41.37736	39	39
5	43.375	40	43.67419
6	36.92308	41	32.24138
7	32.14744	42	50.15385
8	42.425	43	24.23333
9	55.47059	44	39.01129
10	40.3	45	46.74074
11	38.00509	46	52.66667
12	38.8	47	45.32353
13	56.05882	48	34.58798
14	40.4	49	42.69841
15	34.04002	50	55.9375
16	34.15	51	50.70968
17	50.37838	52	34.11141
18	39.125	53	36.21212
19	30.97004	54	56.82353
20	37.61111	55	46.71875
21	57.8125	56	36.22158
22	35.28571	57	43.4375
23	38.94847	58	64.1875
24	43.54545	59	44.3125
25	51.28571	60	47.53001
26	38.80952	61	45.14925
27	32.9131	62	61
28	41.4	63	50.93548
29	57.82353	64	50.57326
30	35.69697	65	39.72727
31	29.68924	66	63.25
32	40.25758	67	48.63333
33	59.76471	68	46.27391
34	46.08065	69	44.47059
35	44.38532		

mean	41.791
stdev	9.481811
bias	1.04477
V	0.226888

Concrete cover beam
Terget 30 mm

No.	Recorded
1	28.9
2	47.9
3	36.4
4	30.1
5	49.8
6	32.0
7	29.0
8	41.1
9	41.5
10	59.4
11	52.5
12	45.7
13	
14	55.2
15	41.0
16	
17	50.6
18	52.6
19	30.5
20	37.2
21	35.3
22	36.8
23	35.6
24	15.6
25	31.2
26	48.5
27	36.0
28	20.1
29	29.5
30	51.6
31	34.3
32	24.6
33	24.3
34	37.4
35	23.3
36	30.6
37	37.0
38	26.6
39	24.3

mean	35.9766
stdev	10.75234
bias	1.199219
V	0.298871

APPENDIX F

CALCULATION OF GLOBAL PARTIAL SAFETY FACTOR FOR MATERIAL FROM INDONESIA

F.1 Ratio of variable and permanent load ν = 0.2

Determination of Partial factor

For concrete compresive strength

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4		0.285	3	1.123125
V_ζ =	0.2	20	0.292	3.5	1.227437
V_a =	0.0312		0.3	4	1.337599
V_η =	0.075				
V_f =	0.135				
λ_G =	1				
λ_Q =	1.824				
ν =	0.2				
μ_η =	0.9				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 20

Vf =	0.135	0.135	0.135
β =	3	3.5	4
VR =	0.254604	0.254604	0.254604
AQ =	0.285	0.292	0.3
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.1316	0.11824	0.104
R* =	1.03785	1.008865	0.979
ψ =	1.03785	1.008865	0.979
N =	0.280577	0.273638	0.266513
AQ =	0.285127	0.292357	0.300172
α_R =	0.941778	0.93869	0.935254
μ_R =	2.130793	2.328694	2.537694
Load(K) =	1.8972	1.8972	1.8972
γ_M =	1.123	1.227	1.338

For concrete compresive strength

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4		0.308	3	1.048069
V_ζ =	0.2	30	0.316	3.5	1.131406
V_a =	0.047		0.325	4	1.217492
V_η =	0.088				
V_f =	0.071				
λ_G =	1				
λ_Q =	1.824				
ν =	0.2				
μ_η =	0.9				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 30

Vf =	0.071	0.071	0.071
β =	3	3.5	4
VR =	0.234508	0.234508	0.234508
AQ =	0.308	0.316	0.325
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.12608	0.11152	0.096
R* =	1.03233	1.002145	0.971
ψ =	1.03233	1.002145	0.971
N =	0.259822	0.253239	0.246476
AQ =	0.307903	0.315907	0.324575
α_R =	0.931752	0.928019	0.92385
μ_R =	1.988397	2.146504	2.309826
Load(K) =	1.8972	1.8972	1.8972
γ_M =	1.048	1.131	1.217

For concrete compresive strength

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	40	0.312	3	1.036245
V_ζ =	0.2		0.32	3.5	1.116437
V_a =	0.0312		0.329	4	1.198974
V_η =	0.1				
V_f =	0.05				
λ_G =	1				
λ_Q =	1.824				
ν =	0.2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 40

Vf =	0.05	0.05	0.05
β =	3	3.5	4
VR =	0.231243	0.231243	0.231243
AQ =	0.312	0.32	0.329
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.12512	0.1104	0.09472
R* =	1.03137	1.001025	0.96972
ψ =	1.03137	1.001025	0.96972
N =	0.256478	0.249966	0.243278
AQ =	0.311918	0.320043	0.328842
α_R =	0.929894	0.926046	0.921749
μ_R =	1.965965	2.118104	2.274694
Load(K) =	1.8972	1.8972	1.8972
γ_M =	1.036	1.116	1.199

Partial Factor for concrete tension

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	20	0.261	3	1.220229
V_ζ =	0.2		0.268	3.5	1.352761
V_a =	0.0312		0.281	4	1.52886
V_η =	0.075				
V_f =	0.177				
λ_G =	1				
λ_Q =	1.824				
ν =	0.2				
μ_η =	0.9				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 20

Vf =	0.177	1.77	1.77
β =	3	3.5	4
VR =	0.279155	0.279155	0.279155
AQ =	0.261	0.268	0.281
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.13736	0.12496	0.11008
R* =	1.04361	1.015585	0.98508
ψ =	1.04361	1.015585	0.98508
N =	0.306223	0.29879	0.284331
AQ =	0.261248	0.267747	0.281362
α_R =	0.951362	0.948846	0.967146
μ_R =	2.315019	2.566459	2.900554
Load(K) =	1.8972	1.8972	1.8972
γ_M =	1.220	1.353	1.529

Partial Factor for concrete tension

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	30	0.269	3	1.184506
V_ζ =	0.2		0.276	3.5	1.306465
V_a =	0.047		0.291	4	1.467163
V_η =	0.088				
V_f =	0.152				
λ_G =	1				
λ_Q =	1.824				
ν =	0.2				
μ_η =	0.9				
γ_G =	1.35				
γ_Q =	1.5				

For fc'=30

Vf =	0.152	0.152	0.152
β =	3	3.5	4
VR =	0.270291	0.270291	0.270291
AQ =	0.269	0.276	0.291
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.13544	0.12272	0.10688
R* =	1.04169	1.013345	0.98188
ψ =	1.04169	1.013345	0.98188
N =	0.296944	0.289689	0.275369
AQ =	0.269411	0.276158	0.29052
α_R =	0.94819	0.945487	0.963774
μ_R =	2.247245	2.478625	2.783501
Load(K) =	1.8972	1.8972	1.8972
γ_M =	1.185	1.306	1.467

Partial Factor for concrete tension

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	40	0.271	3	1.179142
V_ζ =	0.2		0.274	3.5	1.315458
V_a =	0.0312		0.279	4	1.468323
V_η =	0.1				
	0.1				
λ_G =	1				
λ_Q =	1.824				
ν =	0.2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

For fc'=40

Vf =	0.154	0.154	0.154
β =	3	3.5	4
VR =	0.269	0.272	0.275
AQ =	0.271	0.274	0.279
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.13496	0.12328	0.11072
R* =	1.04121	1.013905	0.98572
ψ =	1.04121	1.013905	0.98572
N =	0.295547	0.291472	0.28702
AQ =	0.270685	0.274469	0.278726
α_R =	0.947686	0.946171	0.944439
μ_R =	2.237068	2.495687	2.785702
Load(K) =	1.8972	1.8972	1.8972
γ_M =	1.179	1.315	1.468

Partial Factor for reinforcing steel tension

V_G =	0.05
V_Q =	0.4
V_ζ =	0.1
V_a =	0.047
V_η =	0
	0.1
λ_G =	1
λ_Q =	1.824
ν =	0.2
μ_η =	0
γ_G =	1.35
γ_Q =	1.5

α_Q	β	γ_M
0.5	3	0.713566
0.514	3.5	0.718216
0.528	4	0.719135

Vf =	0.07	0.07	0.07
β =	3	3.5	4
VR =	0.130801	0.130801	0.130801
AQ =	0.5	0.514	0.528
AG =	0.625	0.625	0.625
G* =	0.90625	0.890625	0.875
Q* =	0.08	0.05608	0.03104
R* =	0.98625	0.946705	0.90604
ψ =	0.98625	0.946705	0.90604
N =	0.159818	0.155673	0.151476
AQ =	0.50057	0.513899	0.528137
α_R =	0.807187	0.795454	0.782378
μ_R =	1.353776	1.3626	1.364342
Load(K) =	1.8972	1.8972	1.8972
γ_M =	0.714	0.718	0.719

F.2 Ratio of variable and permanent load $\nu = 2.0$

Determination of Partial factor

For concrete compresive strength

V_G =	0.05
V_Q =	0.4
V_ζ =	0.1
V_a =	0.1
V_η =	0.075
V_f =	0.135
λ_G =	1
λ_Q =	1.824
ν =	2
μ_η =	0.9
γ_G =	1.35
γ_Q =	1.5

fc	α_Q	β	γ_M
20	-0.582	3	1.032481
	-0.566	3.5	1.176167
	-0.607	4	1.40041

For fc'= 20

Vf =	0.135	0.135	0.135
β =	3	3.5	4
VR =	0.209404	0.209404	0.209404
AQ =	-0.582	-0.566	-0.607
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.3968	3.5848	3.9424
R* =	4.387425	4.573863	4.9299
ψ =	4.387425	4.573863	4.9299
N =	1.219258	1.24894	1.306991
AQ =	0.656137	0.640543	0.612093
α_R =	0.753527	0.766878	0.78986
μ_R =	7.043583	8.02381	9.553598
Load(K) =	6.822	6.822	6.822
γ_M =	1.032	1.176	1.400

For concrete compresive strength

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	30	-0.608	3	1.139555
V_ζ =	0.2		-0.5915	3.5	1.318891
V_a =	0.047		-0.576	4	1.522832
V_η =	0.088				
V_f =	0.071				
λ_G =	1				
λ_Q =	1.824				
ν =	2				
μ_η =	0.9				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 30

Vf =	0.071	0.071	0.071
β =	3	3.5	4
VR =	0.234508	0.234508	0.234508
AQ =	-0.608	-0.5915	-0.576
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.4592	3.6562	3.8432
R* =	4.449825	4.645263	4.8307
ψ =	4.449825	4.645263	4.8307
N =	1.315839	1.352474	1.38774
AQ =	0.607977	0.591509	0.576477
α_R =	0.793045	0.805451	0.816319
μ_R =	7.774047	8.997476	10.38876
Load(K) =	6.822	6.822	6.822
γ_M =	1.140	1.319	1.523

For concrete compresive strength

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	40	-0.603	3	1.148502
V_ζ =	0.2		-0.587	3.5	1.331601
V_a =	0.0312		-0.572	4	1.54038
V_η =	0.1				
V_f =	0.05				
λ_G =	1				
λ_Q =	1.824				
ν =	2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 40

Vf =	0.1	0.1	0.1
β =	3	3.5	4
VR =	0.237904	0.237904	0.237904
AQ =	-0.603	-0.587	-0.572
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.4472	3.6436	3.8304
R* =	4.437825	4.632663	4.8179
ψ =	4.437825	4.632663	4.8179
N =	1.325581	1.362788	1.398668
AQ =	0.603509	0.587032	0.571973
α_R =	0.796464	0.808732	0.819493
μ_R =	7.835077	9.084181	10.50847
Load(K) =	6.822	6.822	6.822
γ_M =	1.149	1.332	1.540

Partial Factor for concrete tension

		fc	α_Q	β	γ_M
V_G =	0.05				
V_Q =	0.4		-0.553	3	1.27118
V_ζ =	0.2	20	-0.537	3.5	1.500132
V_a =	0.0312		-0.523	4	1.767918
V_η =	0.075				
V_f =	0.177				
λ_G =	1				
λ_Q =	1.824				
ν =	2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 20

Vf =	0.177	1.77	1.77
β =	3	3.5	4
VR =	0.279155	0.279155	0.279155
AQ =	-0.553	-0.537	-0.523
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.3272	3.5036	3.6736
R* =	4.317825	4.492663	4.6611
ψ =	4.317825	4.492663	4.6611
N =	1.447532	1.488418	1.528247
AQ =	0.552665	0.537483	0.523475
α_R =	0.832688	0.842605	0.851412
μ_R =	8.671989	10.2339	12.06073
Load(K) =	6.822	6.822	6.822
γ_M =	1.271	1.500	1.768

Partial Factor for concrete tension

		fc	α_Q	β	γ_M
V_G =	0.05				
V_Q =	0.4		-0.563	3	1.243254
V_ζ =	0.2	30	-0.547	3.5	1.461572
V_a =	0.047		-0.533	4	1.71587
V_η =	0.088				
V_f =	0.152				
λ_G =	1				
λ_Q =	1.824				
ν =	2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 30

Vf =	0.152	0.152	0.152
β =	3	3.5	4
VR =	0.270291	0.270291	0.270291
AQ =	-0.563	-0.547	-0.533
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.3512	3.5316	3.7056
R* =	4.341825	4.520663	4.6931
ψ =	4.341825	4.520663	4.6931
N =	1.421172	1.461342	1.500531
AQ =	0.562916	0.547442	0.533144
α_R =	0.825765	0.836144	0.845368
μ_R =	8.481476	9.970841	11.70567
Load(K) =	6.822	6.822	6.822
γ_M =	1.243	1.462	1.716

Partial Factor for concrete tension

V_G =	0.05	fc	α_Q	β	γ_M
V_Q =	0.4	40	-0.56	3	1.252979
V_ζ =	0.2		-0.603	3.5	1.541865
V_a =	0.0312		-0.588	4	1.820604
V_η =	0.1				
V_f =	0.1				
λ_G =	1				
λ_Q =	1.824				
v =	2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

For fc'= 40

Vf =	0.154	0.154	0.154
β =	3	3.5	4
VR =	0.273294	0.273294	0.273294
AQ =	-0.56	-0.603	-0.588
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.344	3.6884	3.8816
R* =	4.334625	4.677463	4.8691
ψ =	4.334625	4.677463	4.8691
N =	1.430328	1.508842	1.553463
AQ =	0.559312	0.530208	0.514978
α_R =	0.82822	0.84722	0.856599
μ_R =	8.547824	10.5186	12.42016
Load(K) =	6.822	6.822	6.822
γ_M =	1.253	1.542	1.821

Partial Factor for reinforcing steel tension

V_G =	0.05		α_Q	β	γ_M
V_Q =	0.4		-0.792	3	0.905181
V_ζ =	0.1		-0.776	3.5	1.002148
V_a =	0.05		-0.76	4	1.105528
V_η =	0				
V_f =	0.1				
λ_G =	1				
λ_Q =	1.824				
v =	2				
μ_η =	0.85				
γ_G =	1.35				
γ_Q =	1.5				

Vf =	0.06	0.06	0.06
β =	3	3.5	4
VR =	0.126886	0.126886	0.126886
AQ =	-0.792	-0.776	-0.76
AG =	0.0625	0.0625	0.0625
G* =	0.990625	0.989063	0.9875
Q* =	3.9008	4.1728	4.432
R* =	4.891425	5.161863	5.4195
ψ =	4.891425	5.161863	5.4195
N =	1.01376	1.035124	1.056112
AQ =	0.789141	0.772854	0.757495
α_R =	0.612228	0.632742	0.651122
μ_R =	6.175147	6.836655	7.541913
Load(K) =	6.822	6.822	6.822
γ_M =	0.905	1.002	1.106

APPENDIX G
SIMULATION FOR STRENGTH MEMBER (SAMPLE)

G.1. Variability on beam flexure

No.	pi(concrete)	fc'	No.	pi(steel)	fy	No.	pi(steel)	As	As (slab)	No.	pi(b)	b	No.	pi(d)	d	a	Mn (knm)	V (kN)
1	0.263856	34.65565	1	0.09816	416.958	1	0.946149	3519.488	822.3169	1	0.01035	289.721	1	0.608402	467.6195	103.1692	610.5224	1595.106
2	0.062143	32.40164	2	0.609276	459.524	2	0.925259	3503.413	814.7917	2	0.214656	301.0144	2	0.522174	458.7326	116.5139	644.7268	1572.028
3	0.257855	34.60968	3	0.144241	423.2132	3	0.465068	3356.448	745.9908	3	0.99276	325.0055	3	0.899886	508.3308	89.14217	658.7676	1943.864
4	0.309736	34.99145	4	0.334959	440.4398	4	0.401327	3340.854	738.6907	4	0.730842	311.4379	4	0.271567	431.8672	95.31101	565.3465	1591.229
5	0.869359	39.02379	5	0.078914	413.6954	5	0.487536	3361.872	748.5298	5	0.927284	317.6702	5	0.250067	429.1875	79.19326	541.8394	1703.406
6	0.430518	35.79182	6	0.212213	430.3375	6	0.991701	3595.12	857.7238	6	0.34461	303.9097	6	0.320912	437.6528	100.3984	599.4353	1591.461
7	0.242935	34.49288	7	0.287459	436.7905	7	0.618531	3393.866	763.5077	7	0.258086	302.0608	7	0.321565	437.7266	100.433	574.4482	1553.074
8	0.399469	35.59352	8	0.669563	463.8977	8	0.377308	3334.833	735.8718	8	0.807912	313.3277	8	0.223413	425.6887	97.91718	582.8095	1591.499
9	0.232443	34.40842	9	0.1946	428.6478	9	0.821416	3453.376	791.3671	9	0.836525	314.1437	9	0.217743	424.9147	96.6682	557.4454	1566.003
10	0.497786	36.21375	10	0.371239	443.0891	10	0.842681	3461.523	795.1811	10	0.263296	302.1797	10	0.547437	461.3061	98.93545	631.6626	1677.727
11	0.619593	36.98529	11	0.924201	490.8876	11	0.499736	3364.811	749.906	11	0.350714	304.0321	11	0.987422	547.1136	103.6875	818.059	2023.213
12	0.994644	42.57977	12	0.36886	442.9182	12	0.413453	3343.857	740.0964	12	0.596211	308.6809	12	0.238719	427.7242	79.54088	574.5809	1723.079
13	0.232312	34.40735	13	0.091126	415.8259	13	0.111686	3247.843	695.1481	13	0.418565	305.3507	13	0.334425	439.1676	90.73789	531.8399	1573.204
14	0.886114	39.22978	14	0.547973	455.2691	14	0.420897	3345.69	740.9546	14	0.375293	304.518	14	0.538547	460.3988	90.00307	632.7287	1756.245
15	0.109216	33.16414	15	0.193859	428.5747	15	0.541892	3374.987	754.6694	15	0.68337	310.413	15	0.155525	415.4756	99.17959	529.2297	1485.422
16	0.74179	37.84271	16	0.707994	466.8491	16	0.987534	3580.411	850.8379	16	0.975289	321.4449	16	0.930371	516.3315	96.99581	781.9894	2042.003
17	0.800971	38.33114	17	0.73224	468.8036	17	0.155507	3267.5	704.3503	17	0.952781	319.2761	17	0.74251	482.8373	88.35288	671.9477	1908.856
18	0.854808	38.8593	18	0.989917	515.0068	18	0.684718	3411.1	771.5759	18	0.968805	320.6929	18	0.794573	489.7709	99.50742	772.9957	1958.213
19	0.742454	37.84782	19	0.624704	460.6204	19	0.97011	3545.804	834.6368	19	0.098651	297.315	19	0.90177	508.768	102.4548	747.2872	1861.175
20	0.786918	38.20836	20	0.573438	457.0208	20	0.607094	3390.995	762.1637	20	0.611272	308.9707	20	0.917897	512.7899	92.66584	722.8942	1958.692
21	0.971122	40.95084	21	0.247595	433.5021	21	0.882584	3479.061	803.3915	21	0.62196	309.1783	21	0.162886	416.7044	84.08407	565.0585	1648.916
22	0.28796	34.83524	22	0.782636	473.1841	22	0.675026	3408.496	770.3566	22	0.46206	306.1688	22	0.621431	468.9992	106.7445	670.3423	1695.01
23	0.466191	36.01636	23	0.868261	482.3259	23	0.021696	3170.728	659.0471	23	0.236793	301.561	23	0.645551	471.5937	99.39326	645.2173	1706.959
24	0.041363	31.90867	24	0.167383	425.8412	24	0.221977	3291.295	715.4898	24	0.5673	308.1319	24	0.809216	491.9008	100.624	618.9172	1712.373
25	0.345319	35.2369	25	0.733987	468.9477	25	0.901191	3488.708	807.9075	25	0.486537	306.6247	25	0.565062	463.1125	106.8849	670.2291	1685.864
26	0.891695	39.30315	26	0.119895	420.1201	26	0.509727	3367.219	751.033	26	0.69956	310.7541	26	0.402286	446.4657	81.75851	573.7573	1739.597
27	0.669076	37.31623	27	0.459708	449.2563	27	0.418776	3345.169	740.7104	27	0.017927	291.3141	27	0.465842	453.0114	97.58548	607.4752	1612.314
28	0.508752	36.28217	28	0.346549	441.297	28	0.734739	3425.16	778.1579	28	0.772722	312.4202	28	0.893389	506.8675	94.12645	695	1907.701
29	0.366807	35.38044	29	0.675996	464.3811	29	0.901768	3489.027	808.057	29	0.550618	307.8183	29	0.734468	481.8366	105.0155	695.6152	1764.436
30	0.91524	39.64704	30	0.377829	443.5606	30	0.442624	3351.003	743.4419	30	0.861542	314.9371	30	0.413605	447.6458	84.02829	602.9199	1775.39
31	0.922907	39.77436	31	0.914843	489.1868	31	0.290994	3311.965	725.1662	31	0.210052	300.8967	31	0.392983	445.4894	95.55911	644.3574	1690.778
32	0.195722	34.09434	32	0.065991	411.1484	32	0.816413	3451.551	790.5124	32	0.754656	311.9855	32	0.070708	396.9562	94.17342	496.4995	1446.266
33	0.057752	32.30981	33	0.581965	457.6118	33	0.820961	3453.209	791.2887	33	0.098133	297.2929	33	0.040244	385.7303	116.1271	517.7884	1303.663
34	0.462944	35.99602	34	0.10624	418.1874	34	0.615221	3393.033	763.1176	34	0.078048	296.3581	34	0.307873	436.1657	93.89014	552.2743	1551.049
35	0.462162	35.99112	35	0.527415	453.8651	35	0.494484	3363.546	749.3137	35	0.734669	311.5242	35	0.363174	442.3144	96.11018	601.8748	1653.296
36	0.98129	41.4079	36	0.518154	453.2345	36	0.657901	3403.969	768.2376	36	0.947242	318.8775	36	0.958842	526.8093	82.47719	749.1368	2161.966
37	0.983057	41.50811	37	0.090031	415.644	37	0.716483	3419.894	775.6927	37	0.260167	302.1084	37	0.408466	447.111	80.01486	578.6807	1740.502
38	0.726442	37.72625	38	0.787473	473.6332	38	0.962891	3536.467	830.2657	38	0.825742	313.8263	38	0.047078	388.7252	99.86449	567.4742	1498.594
39	0.406572	35.63919	39	0.266904	435.1259	39	0.048175	3205.052	675.1156	39	0.449587	305.9355	39	0.06228	394.3099	90.28688	486.9479	1440.328
40	0.982682	41.4861	40	0.643156	461.9506	40	0.073561	3225.529	684.7016	40	0.205724	300.7847	40	0.489001	455.3653	84.2889	615.7135	1764.4
41	0.616796	36.96703	41	0.49811	451.8715	41	0.883493	3479.506	803.5996	41	0.03299	293.2421	41	0.936874	518.3756	102.3821	734.5494	1848.452
42	0.78046	38.15354	42	0.59974	456.8525	42	0.465978	3356.668	746.0938	42	0.975611	321.4865	42	0.555779	462.1597	88.63726	643.5653	1835.491
43	0.0644	32.4469	43	0.057939	409.359	43	0.596624	3388.387	760.9427	43	0.408857	305.166	43	0.581789	464.8392	98.88271	576.1845	1616.052
44	0.176648	33.91709	44	0.22706	431.6989	44	0.570031	3381.835	757.8755	44	0.428996	305.5482	44	0.762973	485.4602	99.44143	636.1511	1727.717
45	0.627484	37.03703	45	0.3423	440.984	45	0.861545	3469.381	798.8595	45	0.180712	300.1077	45	0.417323	448.0317	97.16142	611.1366	1636.567
46	0.721039	37.68603	46	0.942503	494.7449	46	0.757113	3431.872	781.3002	46	0.75599	312.017	46	0.022465	375.309	101.9263	550.7072	1437.763
47	0.4255	35.75999	47	0.502653	452.1804	47	0.504748	3366.019	750.4713	47	0.115035	297.9757	47	0.337948	439.5585	100.8283	592.2963	1566.485
48	0.601543	36.86813	48	0.007584	386.1438	48	0.444116	3351.367	743.6119	48	0.917832	317.1665	48	0.466371	453.0653	78.11554	535.771	1745.143
49	0.400054	35.59729	49	0.452163	448.7402	49	0.005361	3119.622	635.1218	49	0.435061	305.663	49	0.459059	452.3201	90.81748	569.6351	1649.784
50	0.63022	37.05505	50	0.462627	449.4557	50	0.881986	3478.77	803.2551	50	0.754372	311.9788	50	0.864269	500.996	95.47121	708.6967	1902.887
51	0.570359	36.66886	51	0.811635	475.9723	51	0.89874	3487.366	807.2792	51	0.253022	301.944	51	0.720459	480.1294	105.8249	709.133	1755.753
52	0.171748	33.86962	52	0.124507	420.7375	52	0.642836	3400.058	766.4066	52	0.73447	311.5197	52	0.168339	417.5916	95.70487	528.9237	1514.162
53	0.33724	35.1821	53	0.544484	455.0303	53	0.369289	3332.797	734.9189	53	0.056018	295.0918	53	0.803693	491.0862	103.1105	666.5592	1719.118
54	0.034535	31.70235	54	0.087995	415.3011	54	0.186982	3279.421	709.9309	54	0.406567	305.1222	54	0.614065	468.2175	99.38648	570.008	1608.782
55	0.876645	39.11339	55	0.222937	431.3261	55	0.845631	3462.709	795.7362	55	0.005245	287.8982	55	0.429917	449.3335	93.62453	601.1884	1618.082
56	0.781818	38.16499	56	0.265052	434.9728	56	0.889403	3482.46	804.9824	56	0.621654	309.1724	56	0.798195	490.289	90.61804	674.0445	1872.903
57	0.157166	33.72303	57	0.368424	442.8869	57	0.724532	3422.194	776.7696	57	0.397435	304.9472	57	0.061001	393.8843	104.0348	518.1489	1395.04
58	0.59335	36.81543	58	0.085108	414.8047	58	0.469404	3357.496	746.4816	58	0.55866	307.9693	58	0.737397	482.1993	86.70704	611.1828	1802.1
59	0.642736	37.13805	59	0.300216	437.7951	59	0.904778	3490.716	808.8477	59	0.197834	300.5768	59	0.045153	387.9192	96.63695	518.9841	1421.138
60	0.678921	37.38423	60	0.892379	485.6092	60	0.786856	3441.341	785.7329	60	0.329096	303.5945	60	0.259032	430.3189	103.9357	632.2801	1597.565

H.2. Slab flexure (sample)

No.	pi(d-slab)	d-slab	a	Mn(kNm)
1	0.790203	110.5018	11.63961	35.89248
2	0.931509	117.0677	13.59468	41.28705
3	0.123867	91.54745	10.73189	27.20864
4	0.191613	94.28878	10.93877	28.89728
5	0.459077	101.7161	9.335581	30.05231
6	0.718564	108.295	12.1326	37.73371
7	0.193551	94.35715	11.37465	29.57076
8	0.939499	117.6804	11.28326	38.2466
9	0.321448	98.23138	11.59832	31.35465
10	0.107684	90.74535	11.44629	29.95639
11	0.660397	106.7015	11.70957	37.12363
12	0.153583	92.84793	9.057108	28.95128
13	0.473653	102.0702	9.883679	28.07597
14	0.266805	96.69753	10.11638	30.91304
15	0.392788	100.0814	11.47349	30.5141
16	0.807488	111.0961	12.34873	41.67627
17	0.522415	103.2511	10.13466	32.42049
18	0.366572	99.41621	12.03034	37.11448
19	0.302735	97.72063	11.95036	35.2716
20	0.99299	126.4303	10.72524	42.17087
21	0.457599	101.6801	10.00545	33.67002
22	0.914928	115.9536	12.31074	40.02371
23	0.76609	109.7188	10.38337	33.22659
24	0.617628	105.5979	11.23372	30.46273
25	0.438336	101.2098	12.64938	35.94879
26	0.034245	85.11767	9.444658	25.36666
27	0.47355	102.0677	10.49122	32.21936
28	0.637128	106.0955	11.1349	34.52121
29	0.209842	94.91637	12.47769	33.27592
30	0.471282	102.0127	9.785214	32.02646
31	0.715374	108.204	10.49277	36.52335
32	0.229213	95.54912	11.21517	29.23261
33	0.763455	109.636	13.18496	37.31237
34	0.608561	105.3692	10.43011	31.96181
35	0.417658	100.701	11.11671	32.35681
36	0.644238	106.2791	9.892735	35.28324
37	0.987603	124.3817	9.138171	38.62901
38	0.800848	110.8642	12.263	41.18522
39	0.446721	101.4149	9.697199	28.36735
40	0.305375	97.79349	8.969646	29.51337
41	0.052313	87.0386	11.55636	29.50759
42	0.127353	91.71041	10.55633	29.58982
43	0.66436	106.8062	11.29443	31.51089
44	0.245558	96.05996	11.34858	29.57185
45	0.270606	96.8088	11.19021	32.13315
46	0.312531	97.98963	12.06702	35.54511
47	0.619178	105.6372	11.16425	33.95352
48	0.693033	107.5794	9.16274	29.57496
49	0.825547	111.7531	9.419247	30.50789
50	0.246932	96.10206	11.46236	32.62638
51	0.243356	95.99226	12.3279	34.51586
52	0.104468	90.57581	11.2006	27.40086
53	0.262305	96.56476	11.1825	30.42248
54	0.044287	86.26474	10.9413	23.82093
55	0.457125	101.6686	10.32358	33.12325
56	0.181276	93.91659	10.79355	30.9948
57	0.826892	111.8037	12.00161	36.39841
58	0.101492	90.41554	9.89496	26.46468
59	0.808509	111.1322	11.21759	37.36685
60	0.929071	116.8918	12.00755	42.31035

H.3. Axial Column (sample)

No.	p1	As		P(square)	P (circular)
1	0.859277	3410.925		8673.659	8583.81611
2	0.943173	3507.983		9500.551	8648.72706
3	0.344621	3127.004		9797.203	8935.38594
4	0.593377	3249.288		10493.19	10299.9194
5	0.215796	3052.69		11835.21	12015.4446
6	0.215935	3052.781		9891.319	10158.7167
7	0.324464	3116.361		11079.58	11379.8726
8	0.96421	3550.236		9288.927	9201.071
9	0.834232	3390.538		9891.145	9052.89418
10	0.214019	3051.52		10725.85	10168.4858
11	0.507618	3207.546		10476.95	8852.55007
12	0.328116	3118.308		13555.82	14077.9673
13	0.969132	3563.002		9986.394	9056.0327
14	0.243511	3070.263		10994.54	10055.7352
15	0.548465	3227.286		9914.823	9519.3737
16	0.60023	3252.691		10932.99	11299.8261
17	0.763004	3341.513		11094.19	10043.0973
18	0.359635	3134.78		10863.95	10685.5379
19	0.605873	3255.504		11138.17	10366.7036
20	0.502097	3204.886		10215.53	10199.9741
21	0.351903	3130.791		11689.4	10299.8738
22	0.998159	3762.172		10468.67	9535.65176
23	0.749915	3333.482		10435.72	10410.859
24	0.655887	3281.011		9095.21	8365.68295
25	0.005974	2720.663		9181.694	8711.72532
26	0.708861	3309.615		11735.31	10821.6591
27	0.37232	3141.262		9012.227	9542.44924
28	0.939813	3502.452		9829.651	9177.03954
29	0.250332	3074.417		11462.49	10139.9563
30	0.458126	3183.661		11176.43	9480.5029
31	0.115643	2973.763		11620.65	11001.0621
32	0.779717	3352.132		10251.95	10610.3534
33	0.100871	2958.47		9030.763	9198.17814
34	0.912738	3464.89		10761.69	10876.2448
35	0.715722	3313.482		11146.14	10729.6343
36	0.777619	3350.775		12216.75	10449.0417
37	0.570376	3237.964		12618.63	10519.4988
38	0.483037	3195.699		10884.79	10342.8594
39	0.896529	3446.476		10356	10020.2942
40	0.749687	3333.466		12566.87	11124.4019
41	0.03734	2861.236		10628.49	11199.3666
42	0.867447	3418.099		11619.69	11395.9058
43	0.913827	3466.215		10327.17	10239.6034
44	0.185318	3031.773		10497.46	8699.55731
45	0.997473	3742.807		12007.89	10615.0646
46	0.968359	3560.891		10543.44	9832.86248
47	0.910668	3462.405		11582.5	10684.5103
48	0.47592	3192.265		11266.79	11087.8217
49	0.886697	3436.313		10290.52	9273.38878
50	0.800536	3366.03		10364.93	10231.348
51	0.708725	3309.538		11798.96	10609.7546
52	0.663763	3285.142		9102.507	8354.91065
53	0.618176	3261.678		10184.7	10103.6567
54	0.547249	3226.695		8565.288	9021.79881
55	0.023125	2820.735		10825.05	10673.5668
56	0.831279	3388.271		11622.22	11099.258
57	0.700319	3304.858		10721.86	10916.9768
58	0.786395	3356.503		10634.44	10020.5714
59	0.779343	3351.89		11347.51	10327.4932
60	0.248489	3073.3		10800.66	10049.0214

APPENDIX H
DESCRIPTION OF THE METHOD OF CALCULATION FOR
γ- VALUES

(Based on FIB Bulletin No. 202 Reliability of concrete structures)

The design conditions is

$$\left.\begin{aligned}&\theta = R - mG - nQ \geq 0\\ &R = \varsigma a \eta f\end{aligned}\right\} \tag{1}$$

$$\nu = \frac{n\mu_Q}{m\mu_G} \tag{2}$$

The design value equation is

$$R^* - mG^* - nQ^* = 0 \tag{3}$$

where

$$G^* = \mu_G(1 - \alpha_G \beta V_G) \tag{4}$$

$$Q^* = \mu_Q(1 - \alpha_Q \beta VQ) \tag{5}$$

$$R^* = \mu_R \exp(1 - \alpha_R \beta V_R) \tag{6}$$

$$\mu_R = \mu_\varsigma \cdot \mu_a \cdot \mu_\eta \cdot \mu_f \tag{7}$$

$$V_R = \sqrt{V_\varsigma^2 + V_a^2 + V_\eta^2 + V_f^2} \tag{8}$$

The sensitivity factors α are determined in the following way (X^* and x^* mean all variables G, Q, and R)

$$K_G = \mu_G V_G \cdot \left.\frac{\partial\theta}{\partial G}\right|_{X=x^*} = -m\mu_G V_G \tag{9}$$

$$K_Q = \mu_Q V_Q \cdot \left.\frac{\partial\theta}{\partial Q}\right|_{X=x^*} = -n\mu_Q V_Q = -\nu\mu_G V_Q \tag{10}$$

$$K_R = R^* V_R \cdot \left.\frac{\partial\theta}{\partial R}\right|_{X=x^*} = R^* V_R \tag{11}$$

$$\alpha_G = \frac{K_G}{\sqrt{\Sigma K^2}}; \alpha_Q = \frac{K_Q}{\sqrt{\Sigma K^2}}; \alpha_R = \frac{K_R}{\sqrt{\Sigma K^2}}; \tag{12}$$

The α-values are determined by iteration

1. A value of α_Q is assumed
2. α_G is calculated: $\alpha_G = \frac{K_G}{K_Q} = \frac{V_G}{(\nu V_Q)}$
3. $\psi = \frac{R^*}{m\mu_G} = \frac{(mG^* + nQ^*)}{m\mu_G}$ is calculated from 1) and 2) and eqs. (3), (4) and (5)

4. $N = \frac{\sqrt{\Sigma K^2}}{m\mu_G} = \sqrt{V_G^2 + V_Q^2 + \psi^{@} + V_R^2}$ is calculated from 3) and eqs. (9), (10) and (11)

5. $\alpha_Q = \frac{-\nu V_Q}{N}$ is calculated from 3qs (10) and (12). If this value of α_Q does not agree with the assumed value a new value of α_Q is assumed and so on until the calculated and assumed value agree. With this value of α_Q the calculation proceeds.

6. $\alpha_R = \frac{\psi V_R}{N}$ is calculated from 3) and 4) and eqs (11) and (12)

7. $\frac{R^*}{m\mu_G} = \frac{\mu_R}{\mu_G} \exp(-\alpha_R \beta V_R)$ from eq (6)

8. With $\frac{R^*}{(m\mu_G)}$ from 3) and $\exp(-\alpha_R \beta V_R)$ from 7)

   $\xi = \frac{\mu_R}{\mu_G}$ is solved.

Symbols

G	= permanent action
Q	= variable action
m, n	= coefficient which transform action values to action effect values
V_S	= coeff. Which describes the variability of the calculation model for load effect
R	= resistance
V_R	= coeff. Which describes the variability of the calculation model for the resistance
α	= geometric quantity
h	= conversion factor which transform the strength of control test specimens to the strength in the structure
f	= strength of control test specimens or other strength valued derived from the strength of such specimens
μ	= mean values
V	= coefficient of variation
a	= sensitivity factors,
β	= reliability index
λ	= number of values describing the relation between the character value and the mean value
ν	= ratio between the effect of the mean values of the variable action and the permanent action
γ	= partial coefficients

BIOGRAPHY

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I was born in Banyumas, Central Java, Indonesia on the 16^{th} day of June 1977. I finished elementary school to senior high school in Banyumas, where the school place not too far from my parent's house. After which, I pursued my undergraduate and master study in Universitas Gadjah Mada, Special Region of Yogyakarta, where I earned bachelor in 2001 and master of engineering in civil engineering in 2003. Soon after, I started to join Department of Civil Engineering Universitas Gadjah Mada as junior teaching staff in 2004. At the end of 2004, I received the scholarship from AUN/SEED-Net JICA to pursue PhD in which this dissertation is a partial requirement in the fulfillment of the degree.