

DUBAI ACCREDITATION DEPARTMENT

REPORT ON 172ND LABORATORY PROFICIENCY TESTING DETERMINATION OF CALIFORNIA BEARING RATIO

26 February. 2008

1. INTRODUCTION

This document presents the results of the 172nd Inter-Laboratory Proficiency Testing program conducted during the month of Feb. involving the **Determination of California Bearing Ratio** with nineteen laboratories participating.

This program is part of the Inter-Laboratory Comparison Programs organized by the Dubai Accreditation Department (DAC) of Dubai Municipality (DM) for monitoring the validity of test results of laboratories operating in Dubai as a requirement of the Local Order 52/1990 and ISO/IEC 17011: 2004.

2. EXPERIMENTAL DESIGN

2.1 Homogeneity:

DAC ensure the homogeneity of the samples prior to their distribution to the participating laboratories by conducting homogeneity test on six samples (randomly selected). Based on the test results the homogeneity is statistically evaluated as per *ISO 13528:2005 as explained in DAC-G3-03*.

2.2 Participants:

Seventeen private laboratories and three governmental laboratories (ten of them are accredited by DAC for construction materials testing) participated in this program.

2.3 Samples Tested:

One sample of Cemented Sand approximately 30 Kg was distributed to all participating laboratories.

3. CONFIDENTIALITY

Each laboratory is given a code number to maintain confidentiality of results and to protect their identities. Only the concerned laboratory knows its code number.

If you have doubt about your code number please don't hesitate to contact Dr. Yaser Saleh Rahag (Tel No.: 302 7074) to know your code number.

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4. TEST METHOD

Instructions were given to the participants to test the samples as per BS 1377 Part 4, T.7: 1990, Amd: 13925:2002.

5. TEST RESULTS

The test results submitted by the participating laboratories are presented in Appendix A. In order to protect the identity of the participating laboratories, each one was assigned a code number. The numbers in the column headings, Lab #, of the tables represents the code numbers for the participating laboratories.

6. EVALUATION OF RESULTS

6.1 Method of Analysis

The analysis of the participant's results is based on ISO 13528:2005 (*Statistical Methods for the Use in Proficiency Testing by Inter-laboratory Comparisons*).

6.2 Calculations of Z- scores

Appendix B gives the details of the calculation of the laboratories results and their Z-Scores which are obtained from the raw data. Also Z- Score and participant's results are represented in a bar chart and X-Y scattered plots C. The Z-Score analysis is based on an international Standard (*ISO 13528:2005*).

6.3 Outlier Results

Test	Labs outside the z-scores ± 3
California Bearing Ratio (Top)	Lab No. 7 & Lab No.164
California Bearing Ratio (Bottom)	Lab No. S3 & Lab No.164

After evaluating the Z-Score the test results provided by the above mentioned laboratories are outside the Z - score limits of ± 3 , the above mentioned laboratories are requested to investigate the root cause of the outlier results, implement corrective action and a report shall be available for checking by assessment team during the nearest assessment visit.

Also other participating laboratories have showed Z-score values higher than **two** which representing **not outlier** but a warning limit, these laboratories are advised to investigate the potential root cause of such results.

7. APPENDICES

7.1 Appendix A: Raw Data

7.2 Appendix B: Calculation of z-scores and other statistics

7.3 Appendix C: Charts

---- End of Report ---

رؤيتنا: بناء مدينة متميزة تتوفر فيها رفاهية العيش ومقومات النجاح.
Our Vision : To create an excellent city that provides the essence of success and comfort of living.

Appendix A - Raw Data

CBR @ 2.5 mm (Top)

Lab #	Results
Lab 4	40
Lab 9	37
Lab 74	35
Lab 3	39
Lab 58	34
Lab 21	39
Lab 56	39
Lab 23	36
Lab 79	37
Lab 57	38
Lab 7	43
Lab 2	36
Lab 28	37
Lab 64	42
Lab 39	36
Lab 62	40
Lab 1	37
Lab S3	39
Lab 124	39
Lab 164	7.3

CBR @ 2.5 mm (Bottom)

Lab #	Results
Lab 4	38
Lab 9	39
Lab 74	38
Lab 3	38
Lab 58	37
Lab 21	42
Lab 56	37
Lab 23	38
Lab 79	39
Lab 57	40
Lab 7	40
Lab 2	39
Lab 28	38
Lab 64	41
Lab 39	39
Lab 62	38
Lab 1	38
Lab S3	32
Lab 124	41
Lab 164	67.73

CBR @ 5 mm (Top)

Lab #	Results
Lab 4	37
Lab 9	38
Lab 74	39
Lab 3	40
Lab 58	38
Lab 21	36
Lab 56	40
Lab 23	38
Lab 79	39
Lab 57	39
Lab 7	40
Lab 2	38
Lab 28	39
Lab 64	40
Lab 39	38
Lab 62	38
Lab 1	33
Lab S3	36
Lab 124	40
Lab 164	13.5

CBR @ 5 mm (Bottom)

Lab #	Results
Lab 4	37
Lab 9	40
Lab 74	41
Lab 3	38
Lab 58	39
Lab 21	38
Lab 56	38
Lab 23	40
Lab 79	41
Lab 57	41
Lab 7	39
Lab 2	40
Lab 28	40
Lab 64	39
Lab 39	40
Lab 62	37
Lab 1	34
Lab S3	34
Lab 124	41
Lab 164	81.91

Appendix A - Raw Data

Computed Values for Z- Scores Calculations (CBR Top Values)

Lab #	Results
Lab 4	40
Lab 9	38
Lab 74	39
Lab 3	40
Lab 58	38
Lab 21	39
Lab 56	40
Lab 23	38
Lab 79	39
Lab 57	39
Lab 7	43
Lab 2	38
Lab 28	39
Lab 64	42
Lab 39	38
Lab 62	40
Lab 1	37
Lab S3	39
Lab 124	40
Lab 164	13.5

Computed Values for Z- Scores Calculations (CBR Bottom Values)

Lab #	Results
Lab 4	38
Lab 9	40
Lab 74	41
Lab 3	38
Lab 58	39
Lab 21	42
Lab 56	38
Lab 23	40
Lab 79	41
Lab 57	41
Lab 7	40
Lab 2	40
Lab 28	40
Lab 64	41
Lab 39	40
Lab 62	38
Lab 1	38
Lab S3	34
Lab 124	41
Lab 164	81.91

Appendix B: Calculation of z-scoree and other statistics

CBR @ Top

Iteration	0	\bar{x}	1	$(x_1 - \bar{x})^2$	2	$(x_2 - \bar{x})^2$	3	$(x_3 - \bar{x})^2$	4	$(x_4 - \bar{x})^2$	5	$(x_5 - \bar{x})^2$	6	$(x_6 - \bar{x})^2$	Z Score
$\delta = 1.5 s$	---		2.22		2.10		2.04		2.01		1.99		1.99		
$x^* - \delta$	---		36.78		36.92		36.97		37.00		37.01		37.01		
$x^* + \delta$	---		41.22		41.11		41.04		41.01		40.99		40.99		
Lab 4	40	1.00	40.00	0.98	40.00	0.99	40.00	0.99	40.00	1.00	40.00	1.00	40.00	1.00	0.76
Lab 9	38	1.00	38.00	1.02	38.00	1.01	38.00	1.01	38.00	1.00	38.00	1.00	38.00	1.00	-0.76
Lab 74	39	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	0.00
Lab 3	40	1.00	40.00	0.98	40.00	0.99	40.00	0.99	40.00	1.00	40.00	1.00	40.00	1.00	0.76
Lab 58	38	1.00	38.00	1.02	38.00	1.01	38.00	1.01	38.00	1.00	38.00	1.00	38.00	1.00	-0.76
Lab 21	39	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	0.00
Lab 56	40	1.00	40.00	0.98	40.00	0.99	40.00	0.99	40.00	1.00	40.00	1.00	40.00	1.00	0.76
Lab 23	38	1.00	38.00	1.02	38.00	1.01	38.00	1.01	38.00	1.00	38.00	1.00	38.00	1.00	-0.76
Lab 79	39	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	0.00
Lab 57	39	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	0.00
Lab 7	43	4.00	41.22	4.90	41.11	4.41	41.04	4.16	41.01	4.04	40.99	3.98	40.99	3.94	3.03
Lab 2	38	1.00	38.00	1.02	38.00	1.01	38.00	1.01	38.00	1.00	38.00	1.00	38.00	1.00	-0.76
Lab 28	39	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	0.00
Lab 64	42	3.00	41.22	4.90	41.11	4.41	41.04	4.16	41.01	4.04	40.99	3.98	40.99	3.94	2.27
Lab 39	38	1.00	38.00	1.02	38.00	1.01	38.00	1.01	38.00	1.00	38.00	1.00	38.00	1.00	-0.76
Lab 62	40	1.00	40.00	0.98	40.00	0.99	40.00	0.99	40.00	1.00	40.00	1.00	40.00	1.00	0.76
Lab 1	37	2.00	37.00	4.05	37.00	4.03	37.00	4.01	37.00	4.00	37.01	3.97	37.01	3.94	-1.51
Lab S3	39	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	39.00	0.00	0.00
Lab 124	40	1.00	40.00	0.98	40.00	0.99	40.00	0.99	40.00	1.00	40.00	1.00	40.00	1.00	0.76
Lab 164	13.5	25.50	36.78	5.00	36.92	4.37	36.97	4.13	37.00	4.02	37.01	3.97	37.01	3.94	-19.31
Average	37.98		39.01	28.84	39.01	27.22	39.00	26.46	39.00	26.10	39.00	25.90	39.00	25.78	
SD	5.93		1.23	1.52	1.20	1.43	1.18	1.39	1.17	1.37	1.17	1.36	1.16	1.36	
New x^*	39	1.00	39.011	1.23	39.006	1.20	39.003	1.18	39.001	1.17	39.00	1.17	39.00	1.16	
New s^*	1.48		1.397		1.357		1.338		1.329		1.32		1.32		

N 20

Target value	39.00
Low Acceptable	35.04
High Acceptable	42.96
Acceptable Range	35.04-42.96

Appendix B: Calculation of z-score and other statistics

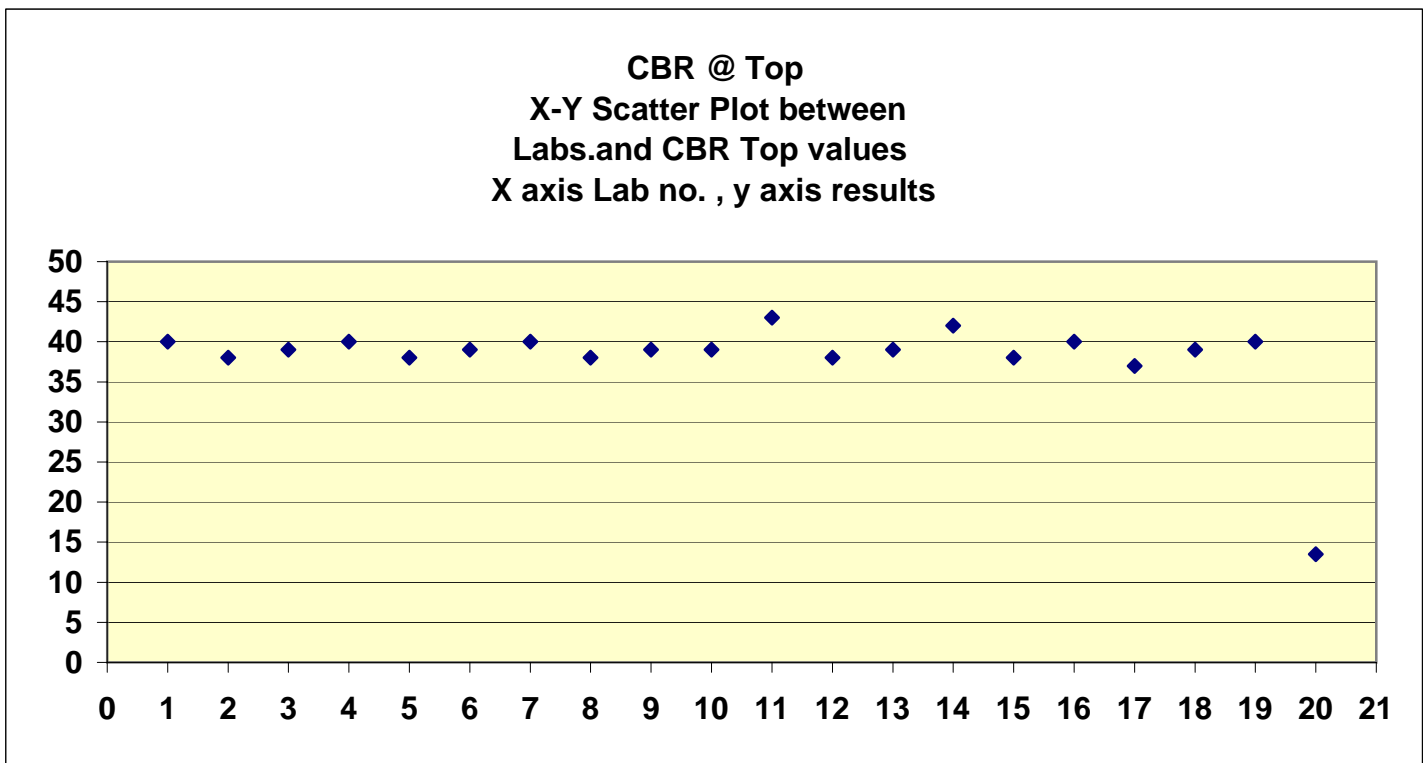
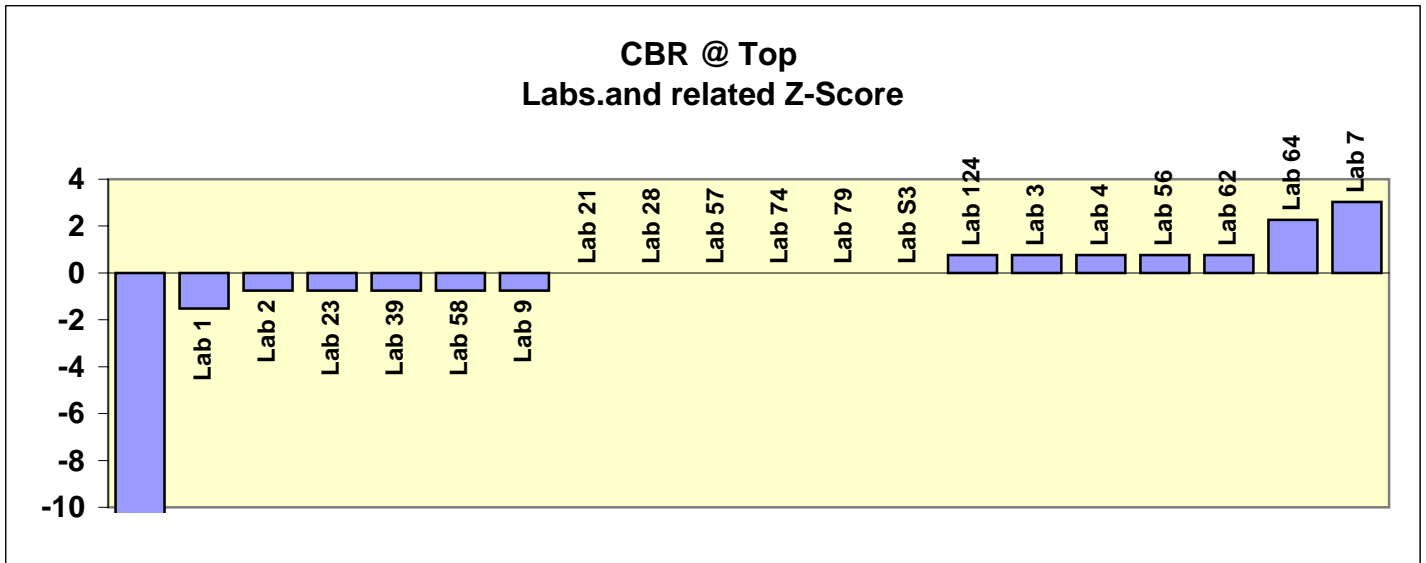
CBR @ Bottom

Iteration	0	$\bar{x} - x^*$	1	$(x_i - x^*)^2$	2	$(x_i - x^*)^2$	3	$(x_i - x^*)^2$	4	$(x_i - x^*)^2$	5	$(x_i - x^*)^2$	6	$(x_i - x^*)^2$	Z Score
$\delta = 1.5 s$	---		2.22		2.44		2.44		2.44		2.44		2.44		
$x^* - \delta$	---		37.78		37.36		37.36		37.36		37.36		37.36		
$x^* + \delta$	---		42.22		42.24		42.24		42.24		42.24		42.24		
Lab 4	38	2.00	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	-1.11
Lab 9	40	0.00	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	0.12
Lab 74	41	1.00	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	0.74
Lab 3	38	2.00	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	-1.11
Lab 58	39	1.00	39.00	0.64	39.00	0.64	39.00	0.64	39.00	0.64	39.00	0.64	39.00	0.64	-0.49
Lab 21	42	2.00	42.00	4.84	42.00	4.84	42.00	4.84	42.00	4.84	42.00	4.84	42.00	4.84	1.35
Lab 56	38	2.00	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	-1.11
Lab 23	40	0.00	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	0.12
Lab 79	41	1.00	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	0.74
Lab 57	41	1.00	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	0.74
Lab 7	40	0.00	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	0.12
Lab 2	40	0.00	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	0.12
Lab 28	40	0.00	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	0.12
Lab 64	41	1.00	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	0.74
Lab 39	40	0.00	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	40.00	0.04	0.12
Lab 62	38	2.00	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	-1.11
Lab 1	38	2.00	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	38.00	3.24	-1.11
Lab S3	34	6.00	37.78	4.10	37.78	4.10	37.78	4.10	37.78	4.10	37.78	4.10	37.78	4.10	-3.57
Lab 124	41	1.00	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	41.00	1.44	0.74
Lab 164	81.91	41.91	42.22	5.88	42.22	5.88	42.22	5.88	42.22	5.88	42.22	5.88	42.22	5.88	25.89
Average	41.60		39.80	39.10	39.80	39.10	39.80	39.10	39.80	39.10	39.80	39.10	39.80	39.10	
SD	9.66		1.43	2.06	1.43	2.06	1.43	2.06	1.43	2.06	1.43	2.06	1.43	2.06	
New x^*	40	1.00	39.800	1.43	39.800	1.43	39.800	1.43	39.800	1.43	39.80	1.43	39.80	1.43	
New s^*	1.48		1.627		1.627		1.627		1.627		1.63		1.63		

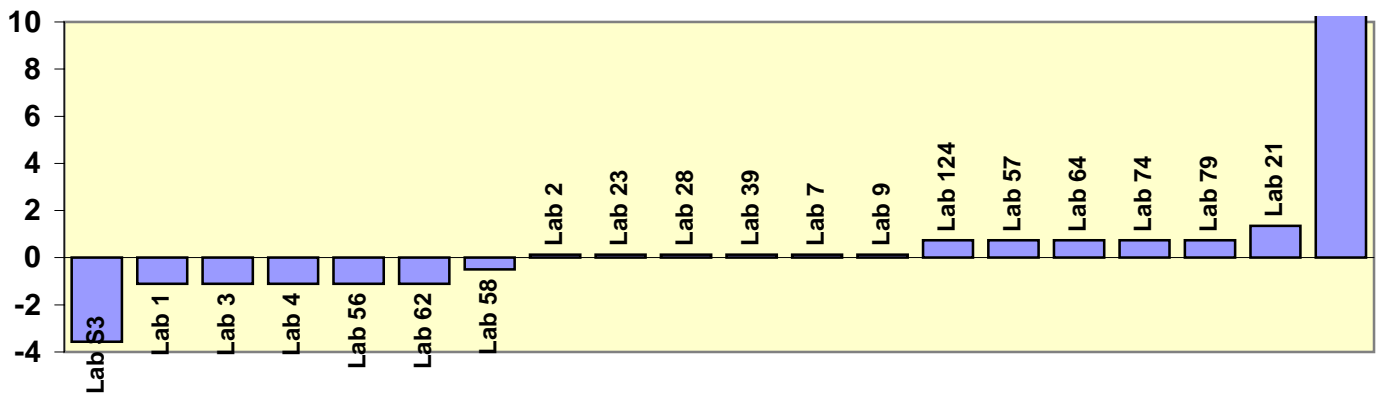
N 20

Target value	39.8
Low Acceptable	34.9
High Acceptable	44.7
Acceptable Range	34.9 - 44.7

Appendix C: Charts



**CBR @ Bottom
Between Labs.and related Z-Score**



**CBR @ Bottom
X-Y Scatter Plot between
Labs.and CBR Bottom values
X axis Lab no. , y axis results**

