

DUBAI ACCREDITATION DEPARTMENT

REPORT ON 186TH LABORATORY PROFICIENCY TESTING DETERMINATION OF CALIFORNIA BEARING RATIO

28 February 2010

1. INTRODUCTION

This document presents the results of the 186th Inter-Laboratory Proficiency Testing program conducted during the month of February involving the **Determination of California Bearing Ratio (CBR)** with twenty nine 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 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:

Twenty nine laboratories were participated in this program, the participants are registered and accredited laboratories who are operating in the emirate of Dubai. Also the program included one governmental laboratory and other laboratories participated from Abu Dhabi and Qatar.

2.3 Samples Tested:

One sample of Cemented Sand approximately 20 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.

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 which were 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.

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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 (Appendix A).

Z- Score of each participant and its code number are represented in a bar chart and also the result of each participant is reflected as X-Y scattered plots Appendix 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 G01; Lab 68; Lab 74; Lab EX1; Lab EX4; Lab EX7
California Bearing Ratio (Bottom)	Lab 68; Lab EX1; Lab EX4; Lab EX7

After evaluating the Z-Score values 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 is **not outlier** but, this is consider as a warring 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 ----

Appendix A - Raw Data

CBR @ 2.5 mm (Top)

Lab #	Results
Lab 4	38
Lab 9	37
Lab 74	45
Lab 58	38
Lab 21	36
Lab 56	38
Lab 23	37
Lab 79	38
Lab 57	39
Lab 7	39
Lab 28	36
Lab 64	36
Lab 39	38
Lab 82	37
Lab G01	28
Lab 72	37
Lab EX7	3.9
Lab 2	36
Lab EX9	38
Lab 78	37
Lab 89	35
Lab EX1	5
Lab EX6	37
Lab EX4	20
Lab 67	37
Lab EX5	40
Lab 84	37
Lab 66	34
Lab 68	9

CBR @ 2.5 mm (Bottom)

Lab #	Results
Lab 4	39
Lab 9	38
Lab 74	39
Lab 58	40
Lab 21	38
Lab 56	39
Lab 23	39
Lab 79	39
Lab 57	36
Lab 7	37
Lab 28	39
Lab 64	39
Lab 39	40
Lab 82	38
Lab G01	38
Lab 72	39
Lab EX7	18.9
Lab 2	38
Lab EX9	40
Lab 78	39
Lab 89	37
Lab EX1	26
Lab EX6	40
Lab EX4	23
Lab 67	39
Lab EX5	36
Lab 84	36
Lab 66	38
Lab 68	10

CBR @ 5 mm (Top)

Lab #	Results
Lab 4	40
Lab 9	40
Lab 74	46
Lab 58	39
Lab 21	34
Lab 56	39
Lab 23	38
Lab 79	41
Lab 57	40
Lab 7	42
Lab 28	38
Lab 64	38
Lab 39	39
Lab 82	39
Lab G01	26
Lab 72	38
Lab EX7	6
Lab 2	40
Lab EX9	40
Lab 78	39
Lab 89	37
Lab EX1	8
Lab EX6	36
Lab EX4	24
Lab 67	39
Lab EX5	42
Lab 84	36
Lab 66	37
Lab 68	10

CBR @ 5 mm (Bottom)

Lab #	Results
Lab 4	42
Lab 9	41
Lab 74	41
Lab 58	41
Lab 21	35
Lab 56	41
Lab 23	41
Lab 79	42
Lab 57	37
Lab 7	40
Lab 28	41
Lab 64	40
Lab 39	41
Lab 82	41
Lab G01	37
Lab 72	40
Lab EX7	17.9
Lab 2	41
Lab EX9	44
Lab 78	41
Lab 89	39
Lab EX1	20
Lab EX6	37
Lab EX4	23
Lab 67	40
Lab EX5	39
Lab 84	38
Lab 66	41
Lab 68	11

Appendix A - Raw Data

Maximum Computed Values for Z- Score Calculations

CBR Max.Top Values

Lab #	Results
Lab 4	40
Lab 9	40
Lab 74	46
Lab 58	39
Lab 21	36
Lab 56	39
Lab 23	38
Lab 79	41
Lab 57	40
Lab 7	42
Lab 28	38
Lab 64	38
Lab 39	39
Lab 82	39
Lab G01	28
Lab 72	38
Lab EX7	6
Lab 2	40
Lab EX9	40
Lab 78	39
Lab 89	37
Lab EX1	8
Lab EX6	37
Lab EX4	24
Lab 67	39
Lab EX5	42
Lab 84	37
Lab 66	37
Lab 68	10

CBR Max.Bottom Values

Lab #	Results
Lab 4	42
Lab 9	41
Lab 74	41
Lab 58	41
Lab 21	38
Lab 56	41
Lab 23	41
Lab 79	42
Lab 57	37
Lab 7	40
Lab 28	41
Lab 64	40
Lab 39	41
Lab 82	41
Lab G01	38
Lab 72	40
Lab EX7	19
Lab 2	41
Lab EX9	44
Lab 78	41
Lab 89	39
Lab EX1	26
Lab EX6	40
Lab EX4	23
Lab 67	40
Lab EX5	39
Lab 84	38
Lab 66	41
Lab 68	11

Appendix B: Calculation of z-scoree and other statistics

CBR @ Top

Iteration	0	$x_i - x^*$	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		2.67		2.67		2.67		2.67		2.67		
$x^* - \delta$	---		36.78		35.93		35.93		35.93		35.93		35.93		
$x^* + \delta$	---		41.22		41.26		41.26		41.26		41.26		41.26		
Lab EX7	6	33.00	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	-18.33
Lab EX1	8	31.00	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	-17.21
Lab 68	10	29.00	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	-16.08
Lab EX4	24	15.00	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	-8.21
Lab G01	28	11.00	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	-5.96
Lab 21	36	3.00	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	36.78	3.32	-1.46
Lab 66	37	2.00	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	-0.90
Lab 84	37	2.00	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	-0.90
Lab 89	37	2.00	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	-0.90
Lab EX6	37	2.00	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	37.00	2.55	-0.90
Lab 23	38	1.00	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	-0.34
Lab 28	38	1.00	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	-0.34
Lab 64	38	1.00	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	-0.34
Lab 72	38	1.00	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	38.00	0.36	-0.34
Lab 39	39	0.00	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	0.23
Lab 56	39	0.00	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	0.23
Lab 58	39	0.00	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	0.23
Lab 67	39	0.00	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	0.23
Lab 78	39	0.00	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	0.23
Lab 82	39	0.00	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	39.00	0.16	0.23
Lab 2	40	1.00	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	0.79
Lab 4	40	1.00	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	0.79
Lab 57	40	1.00	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	0.79
Lab 9	40	1.00	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	0.79
Lab EX9	40	1.00	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	40.00	1.97	0.79
Lab 79	41	2.00	41.00	5.77	41.00	5.77	41.00	5.77	41.00	5.77	41.00	5.77	41.00	5.77	1.35
Lab 7	42	3.00	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	1.91
Lab EX5	42	3.00	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	1.91
Lab 74	46	7.00	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	41.22	6.90	4.16
Average	35.07		38.60	68.84	38.60	68.84	38.60	68.84	38.60	68.84	38.60	68.84	38.60	68.84	
SD	10.17		1.57	2.46	1.57	2.46	1.57	2.46	1.57	2.46	1.57	2.46	1.57	2.46	
New x^*	39	1.00	38.60	1.57	38.60	1.57	38.60	1.57	38.60	1.57	38.60	1.57	38.60	1.57	
New s^*	1.48		1.78		1.78		1.78		1.78		1.78		1.78		

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Target value	38.6
Low Acceptable	33.3
High Acceptable	43.9
Acceptable Range	33.3 - 43.9

Appendix B: Calculation of z-scoree and other statistics

CBR @ Bottom

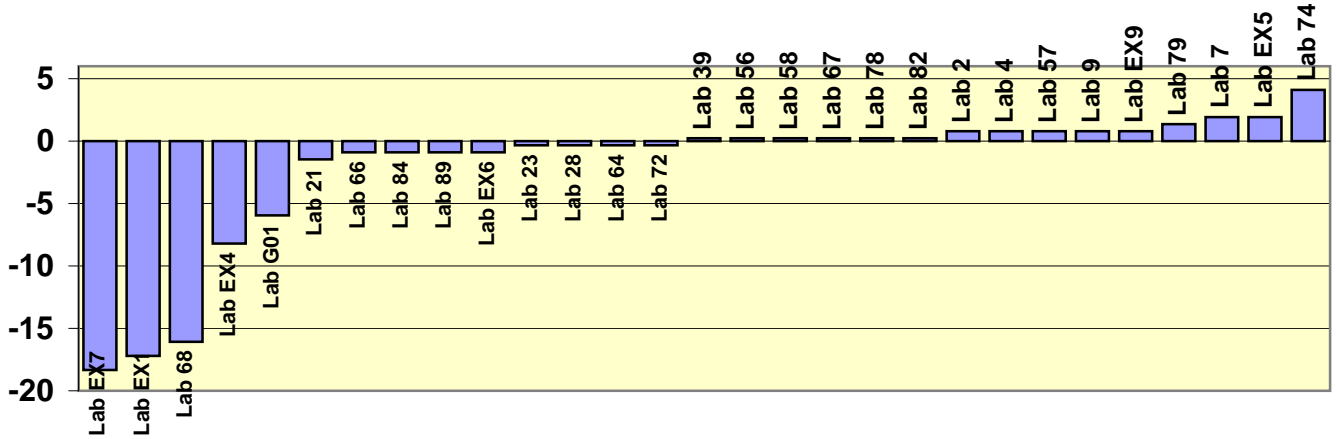
Iteration	0	$x_i - x^*$	1	$(x_i - x^*)^2$	2	$(x_i - x^*)^2$	3	$(x_i - x^*)^2$	4	$(x_i - x^*)^2$	5	$(x_i - x^*)^2$	6	$(x_i - x^*)^2$	Z Score	
$\delta = 1.5 s^*$	---		2.22		2.54		2.54		2.54		2.54		2.54			
$x^* - \delta$	---		37.78		37.39		37.39		37.39		37.39		37.39			
$x^* + \delta$	---		42.22		42.48		42.48		42.48		42.48		42.48			
Lab 68	11	29.00	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	-17.07	
Lab EX7	19	21.10	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	-12.41	
Lab EX4	23	17.00	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	-9.99	
Lab EX1	26	14.00	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	-8.22	
Lab 57	37	3.00	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	37.78	4.66	-1.73	
Lab 21	38	2.00	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	-1.14	
Lab 84	38	2.00	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	-1.14	
Lab G01	38	2.00	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	38.00	3.74	-1.14	
Lab 89	39	1.00	39.00	0.87	39.00	0.87	39.00	0.87	39.00	0.87	39.00	0.87	39.00	0.87	-0.55	
Lab EX5	39	1.00	39.00	0.87	39.00	0.87	39.00	0.87	39.00	0.87	39.00	0.87	39.00	0.87	-0.55	
Lab 64	40	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	0.04	
Lab 67	40	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	0.04	
Lab 7	40	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	0.04	
Lab 72	40	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	0.04	
Lab EX6	40	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	40.00	0.00	0.04	
Lab 2	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 23	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 28	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 39	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 56	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 58	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 66	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 74	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 78	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 82	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 9	41	1.00	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	41.00	1.14	0.63	
Lab 4	42	2.00	42.00	4.27	42.00	4.27	42.00	4.27	42.00	4.27	42.00	4.27	42.00	4.27	1.22	
Lab 79	42	2.00	42.00	4.27	42.00	4.27	42.00	4.27	42.00	4.27	42.00	4.27	42.00	4.27	1.22	
Lab EX9	44	4.00	42.22	5.24	42.22	5.24	42.22	5.24	42.22	5.24	42.22	5.24	42.22	5.24	2.40	
Average	37.48		39.93	62.57	39.93	62.57	39.93	62.57	39.93	62.57	39.93	62.57	39.93	62.57		
SD	7.66		1.49	2.23	1.49	2.23	1.49	2.23	1.49	2.23	1.49	2.23	1.49	2.23		
New x^*	40	1.00	39.93	1.49	39.93	1.49	39.93	1.49	39.93	1.49	39.93	1.49	39.93	1.49		
New s^*	1.48		1.70		1.70		1.70		1.70		1.70		1.70			

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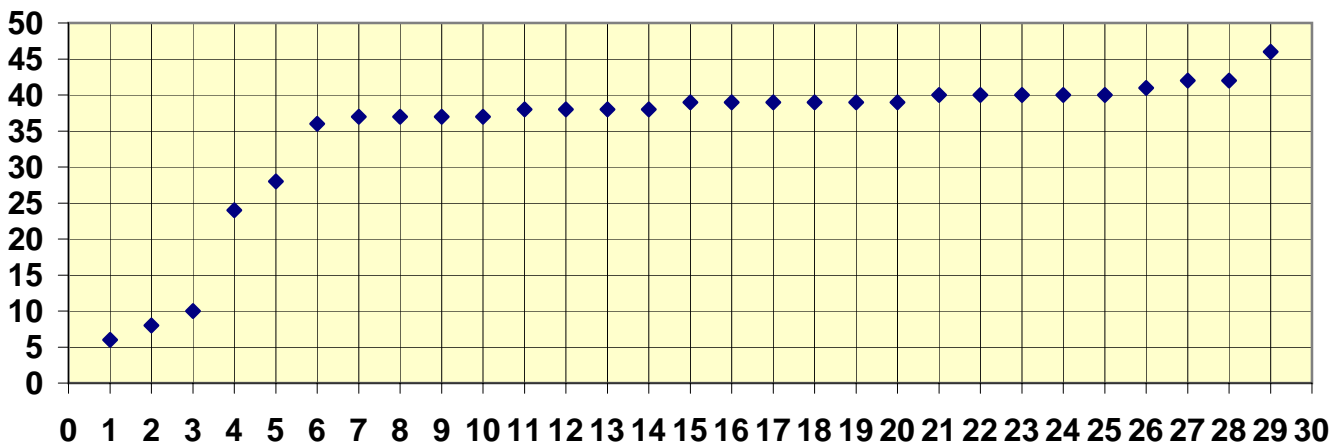
Target value	39.9
Low Acceptable	34.8
High Acceptable	45.0
Acceptable Range	34.8 - 45.0

Appendix C: Charts

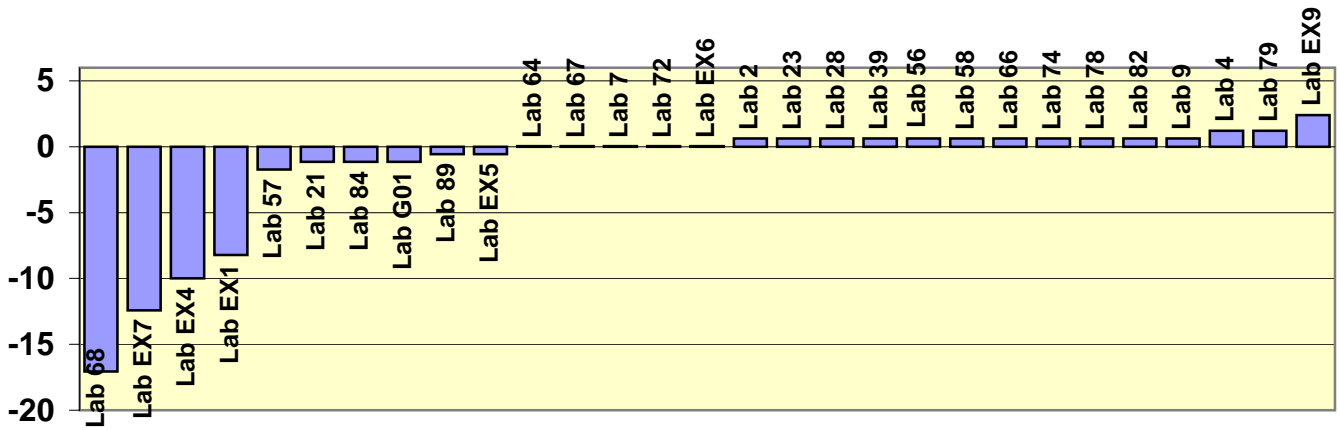
**CBR @ Top
Labs.and related Z-Score**



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



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

