

DUBAI ACCREDITATION DEPARTMENT

REPORT ON 176TH LABORATORY PROFICIENCY TESTING DETERMINATION OF COMPRESSIVE STRENGTH OF PAVING BLOCKS

Date: 30 May 2009

1. INTRODUCTION

This document presents the results of the 176th inter-laboratory proficiency-testing program conducted during the month of May involving the determination of **Compressive Strength of Paving Blocks** with twenty nine laboratories participating.

This program is part of the Inter-laboratory Comparison Programs organized by 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 had ensured the homogeneity of the samples prior to their distribution to the participating laboratories by taking the paving blocks from the same patch to ensure that all samples are from the same source and having similar conditions, although, this patch is tested and certified by Dubai Municipality, therefore, DAC conducted homogeneity test for this program, however, as per **ISO 13528:2005** the statistical calculations for determining the homogeneity need to have two portions (A & B) from each specimen which not applicable in the case of paving blocks, therefore, the evaluation of specimens which were distributed to participants is based on technical testing report issued by Dubai Central Laboratory for the same patch, also six samples (each sample consists ten specimens) were tested and the standard deviation of these samples is compared with standard deviation for set of data from pervious PTP program and found to be satisfactory.

2.2 Participants:

Twenty eight private laboratories and one governmental laboratory participated in this program. A total of twenty nine laboratories (seventeen of them are accredited by DAC for construction materials testing) participated in this program.

2.3 Samples Tested:

One (1) sample of Rectangular Shape Paving Block red color 200*100*60mm size consists of 10 specimens were 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.

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4. TEST METHOD

Instructions were given to the participants to test the samples as per: BS 6717:1993 Part 1 Annex A & B).

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
Compressive Strength of Paving Blocks	Labs : Lab 67 & Lab TQ

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 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 ----

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Determination of Compressive Strength of Paving Blocks

Appendix A: Raw Data

Compressive Strength of Paving Blocks

Lab #	1	2	3	4	5	6	7	8	9	10	Ave
Lab1	60.60	60.70	54.90	59.00	59.40	56.00	51.70	54.40	57.90	58.00	57
Lab3	53.00	61.00	59.70	53.80	58.50	55.80	55.50	51.00	56.60	59.00	56
Lab39	55.60	60.10	61.70	57.30	50.50	56.90	42.00	54.50	57.70	54.00	55
Lab4	56.80	47.10	50.90	52.20	59.30	52.80	54.30	56.30	50.40	52.60	53
Lab56	52.00	51.30	54.10	52.50	56.60	55.80	56.20	57.70	55.60	56.60	55
Lab21	51.80	57.70	50.40	59.50	53.40	54.90	55.50	51.10	56.50	52.40	54
Lab7	52.00	53.00	53.00	53.00	51.00	53.00	50.00	56.00	57.00	51.00	53
Lab9	54.50	54.60	57.50	53.40	55.20	55.80	52.10	56.90	53.10	54.70	55
Lab28	54.40	57.00	53.70	47.30	51.50	49.10	56.40	53.20	59.30	48.90	53
Lab23	56.40	48.40	51.60	51.60	52.20	60.40	54.10	55.30	54.60	57.10	54
Lab26	57.10	57.30	57.20	55.70	52.70	52.50	55.70	55.20	57.10	59.00	56
Lab88	50.70	50.20	57.00	50.30	59.00	52.70	57.40	53.50	54.60	55.10	54
Lab57	50.82	56.46	54.62	54.24	49.72	59.19	52.54	53.67	54.79	55.64	54
Lab58	56.20	56.50	54.60	53.80	50.10	52.40	53.40	50.70	54.30	50.30	53
Lab63	57.00	52.00	55.00	56.00	56.00	54.00	55.00	55.00	58.00	54.00	55
Lab64	49.00	50.00	52.00	53.00	49.00	52.00	53.00	53.00	53.00	53.00	52
Lab68	55.00	55.00	55.00	60.00	55.00	55.00	54.00	59.00	53.00	53.00	55
Lab66	51.00	57.00	56.00	44.00	49.00	56.00	50.00	51.00	52.00	51.00	52
Lab72	51.30	53.40	52.30	54.60	53.20	55.50	53.80	52.30	56.10	54.00	54
Lab67	25.56	33.54	29.19	36.65	36.38	32.11	26.67	27.19	27.75	36.38	31
Lab71	54.30	50.50	58.20	51.90	53.30	58.20	50.70	52.10	55.10	54.00	54
Lab74	54.00	52.50	56.30	56.30	53.90	48.10	54.10	55.80	55.70	55.40	54
Lab76	57.30	60.10	50.40	52.30	59.60	54.10	55.90	54.20	58.10	52.80	55
Lab79	52.60	52.50	51.60	53.70	52.10	53.70	51.10	55.50	51.90	54.40	53
Lab78	54.00	53.00	53.00	52.00	52.00	55.00	53.00	53.00	52.00	55.00	53
Lab84	46.90	55.60	50.30	53.80	51.20	56.00	54.60	55.20	55.60	45.70	52
Lab85	52.20	53.50	55.90	52.20	48.30	55.90	49.90	52.00	51.90	47.60	52
Lab89	55.00	51.00	46.20	52.00	49.20	50.50	58.80	46.70	50.90	48.40	51
LabTQ	51.00	43.00	50.00	47.00	41.00	45.00	51.00	46.00	50.00	46.00	47

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Appendix B: Calculation of z-scores and other statistics

Iteration	0		1		2		3		4		5		6		Z Score
$\delta = 1.5 s$	---	xi-x*	2.22	(xi-x*) ²	2.35	(xi-x*) ²	2.33	(xi-x*) ²	2.33	(xi-x*) ²	2.33	(xi-x*) ²	2.33	(xi-x*) ²	
$x^* - \delta$	---		51.78		51.36		51.37		51.38		51.38		51.38		
$x^* + \delta$	---		56.22		56.06		56.03		56.03		56.03		56.03		
LAB 67	31	23.00	51.78	3.74	51.78	3.71	51.78	3.71	51.78	3.71	51.78	3.71	51.78	3.71	-14.64
LAB TQ	47	7.00	51.78	3.74	51.78	3.71	51.78	3.71	51.78	3.71	51.78	3.71	51.78	3.71	-4.32
LAB 89	51	3.00	51.78	3.74	51.78	3.71	51.78	3.71	51.78	3.71	51.78	3.71	51.78	3.71	-1.74
LAB 63	55	1.00	55.00	1.67	55.00	1.68	55.00	1.68	55.00	1.69	55.00	1.69	55.00	1.69	0.84
LAB 64	52	2.00	52.00	2.92	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	-1.10
LAB 66	52	2.00	52.00	2.92	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	-1.10
LAB 84	52	2.00	52.00	2.92	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	-1.10
LAB 85	52	2.00	52.00	2.92	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	52.00	2.90	-1.10
LAB 58	53	1.00	53.00	0.50	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	-0.45
LAB 79	53	1.00	53.00	0.50	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	-0.45
LAB 78	53	1.00	53.00	0.50	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	-0.45
LAB 4	53	1.00	53.00	0.50	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	-0.45
LAB 7	53	1.00	53.00	0.50	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	-0.45
LAB 9	55	1.00	55.00	1.67	55.00	1.68	55.00	1.68	55.00	1.69	55.00	1.69	55.00	1.69	0.84
LAB 28	53	1.00	53.00	0.50	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	53.00	0.49	-0.45
LAB 1	57	3.00	56.22	6.33	56.06	5.54	56.03	5.43	56.03	5.42	56.03	5.41	56.03	5.41	2.13
LAB 23	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 88	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 57	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 72	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 71	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 74	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 21	54	0.00	54.00	0.08	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	54.00	0.09	0.19
LAB 68	55	1.00	55.00	1.67	55.00	1.68	55.00	1.68	55.00	1.69	55.00	1.69	55.00	1.69	0.84
LAB 76	55	1.00	55.00	1.67	55.00	1.68	55.00	1.68	55.00	1.69	55.00	1.69	55.00	1.69	0.84
LAB 39	55	1.00	55.00	1.67	55.00	1.68	55.00	1.68	55.00	1.69	55.00	1.69	55.00	1.69	0.84
LAB 56	55	1.00	55.00	1.67	55.00	1.68	55.00	1.68	55.00	1.69	55.00	1.69	55.00	1.69	0.84
LAB 26	56	2.00	56.00	5.25	56.00	5.28	56.00	5.28	56.00	5.28	56.00	5.28	56.00	5.28	1.48
LAB 3	56	2.00	56.00	5.25	56.00	5.28	56.00	5.28	56.00	5.28	56.00	5.28	56.00	5.28	1.48
Average	52.83		53.71	53.33	53.70	52.51	53.70	52.40	53.70	52.39	53.70	52.38	53.70	52.38	
SD	4.60		1.38	1.90	1.37	1.88	1.37	1.87	1.37	1.87	1.37	1.87	1.37	1.87	
New x*	54	1.00	53.709	1.38	53.703	1.37	53.702	1.37	53.702	1.37	53.70	1.37	53.70	1.37	
New s*	1.48		1.565		1.553		1.551		1.551		1.55		1.55		

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Target value	53.70
Low Acceptable	49
High Acceptable	58
Acceptable Range	49 - 58

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Appendix C:Charts

