

DUBAI ACCREDITATION DEPARTMENT

REPORT ON 191ST LABORATORY PROFICIENCY TESTING

DETERMINATION OF COMPRESSIVE STRENGTH OF PAVING BLOCKS

Date: 3 June 2010

1. INTRODUCTION

This document presents the results of the 191st inter-laboratory proficiency-testing program conducted during the month of May involving the determination of **Compressive Strength of Paving Blocks** with thirty 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 Reliability of Samples:

DAC had ensured the reliability of the samples prior to their distribution to the participating laboratories by taking the paving blocks from the same lot to ensure that all samples are from the same source and having similar conditions, moreover, the samples/specimens were taken from the lot number 10630028, this lot has been certified by Dubai Central Laboratory as per the report no.87662 and certificate no. 2010002676 dated 31/1/2010.

2.2 Participants:

Thirty laboratories were participated in this program; one is governmental laboratory and twenty two are private laboratories operating in the emirate of Dubai which are registered and/or accredited by DAC for construction materials testing, in addition, three participants from other emirates, three participants from Qatar and one from Oman.

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), also all participants were instructed to conduct the test in the same day to ensure that the conditions of the tested specimens are the same.

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 average of 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	Lab 3; Lab 68 & Lab G01

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



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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 ---

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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
Lab G01	49.10	52.30	57.00	61.60	54.50	56.00	53.30	61.70	59.80	56.00	56
Lab EX11	51.20	67.60	68.40	70.70	64.60	66.10	56.90	64.30	64.70	67.00	64
Lab 39	72.60	76.20	67.30	63.20	69.20	68.20	62.40	65.80	64.00	68.40	68
Lab 4	66.70	56.00	66.40	65.90	62.80	69.70	62.90	64.20	65.60	61.90	64
Lab 56	60.90	68.70	68.00	59.40	62.70	62.10	64.60	62.40	66.00	61.70	64
Lab 21	68.30	64.90	59.90	58.40	58.70	70.20	60.70	65.20	68.70	68.60	64
Lab 7	65.00	64.00	66.00	62.00	60.00	61.00	59.00	63.00	63.00	65.00	63
Lab EX5	64.60	66.50	63.10	61.70	61.70	55.70	60.40	61.80	58.60	65.60	62
Lab 9	59.70	64.60	63.70	60.10	58.10	68.80	66.30	64.90	65.40	64.70	64
Lab 28	67.00	64.20	67.00	64.40	65.10	67.10	66.40	65.00	63.90	66.70	66
Lab 23	68.20	62.90	61.20	65.50	61.50	65.50	62.50	57.50	67.80	63.60	64
Lab 57	61.12	62.52	59.92	62.41	69.73	62.32	67.17	67.20	67.52	66.73	65
Lab EX14	65.10	65.80	67.40	66.00	69.20	62.10	60.20	69.10	67.90	65.20	66
Lab 58	63.50	61.20	64.70	66.70	67.60	64.50	68.60	63.10	62.30	63.90	65
Lab 64	66.00	63.00	63.00	64.00	63.00	67.00	63.00	67.00	61.00	62.00	64
Lab 68	56.00	56.00	58.00	55.00	51.50	50.00	57.50	54.50	53.50	59.00	55
Lab 66	57.90	59.90	67.90	62.30	61.20	67.00	72.10	63.60	60.50	69.60	64
Lab 72	53.30	53.40	59.80	61.60	65.70	62.30	55.90	62.60	62.10	56.30	59
Lab 67	69.90	65.70	64.20	72.70	62.00	62.80	69.60	64.60	66.30	72.90	67
Lab 74	63.90	68.60	63.20	57.00	58.10	68.30	70.30	63.10	69.30	70.00	65
Lab 79	61.90	64.60	63.00	67.00	61.10	66.00	62.10	62.30	63.60	68.80	64
Lab 84	63.00	66.20	60.70	60.20	62.80	59.40	65.70	62.90	57.90	66.90	63
Lab 89	66.10	62.00	64.10	63.50	63.90	64.40	63.60	64.30	64.20	63.50	64
Lab 76	64.20	65.90	60.90	65.10	67.10	60.30	63.50	66.60	54.70	67.80	64
Lab 2	56.80	62.50	62.60	63.70	57.00	64.40	61.70	62.80	63.20	57.10	61
Lab 3	63.60	60.20	59.00	58.90	58.00	57.20	58.00	55.60	53.80	54.70	58
Lab EX10	53.50	61.70	61.80	60.00	62.50	52.20	57.70	68.70	62.80	57.00	60
Lab EX1	64.20	63.80	62.50	63.30	60.20	64.20	59.30	63.30	66.10	65.20	63
Lab EX4	66.70	65.50	63.40	67.50	52.30	61.10	69.80	67.80	56.50	0.00	63
Lab EX7	62.00	63.00	55.00	66.00	59.00	55.00	64.00	60.00	62.00	61.00	61

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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	2.45	(xi-x*) ²	2.43	(xi-x*) ²	2.42	(xi-x*) ²	2.42	(xi-x*) ²	2.42	(xi-x*) ²	Z Score
$x^* - \delta$	---		61.78		61.21		61.23		61.23		61.23		61.23		
$x^* + \delta$	---		66.22		66.11		66.08		66.07		66.07		66.07		
Lab 68	55	9.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-5.37
Lab G01	56	8.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-4.75
Lab 3	58	6.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-3.51
Lab 72	59	5.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-2.89
Lab EX10	60	4.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-2.27
Lab 2	61	3.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-1.65
Lab EX7	61	3.00	61.78	3.56	61.78	3.53	61.78	3.53	61.78	3.52	61.78	3.52	61.78	3.52	-1.65
Lab EX5	62	2.00	62.00	2.76	62.00	2.74	62.00	2.73	62.00	2.73	62.00	2.73	62.00	2.73	-1.03
Lab 7	63	1.00	63.00	0.44	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	-0.40
Lab 84	63	1.00	63.00	0.44	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	-0.40
Lab EX1	63	1.00	63.00	0.44	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	-0.40
Lab EX4	63	1.00	63.00	0.44	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	63.00	0.43	-0.40
Lab 21	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 23	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 4	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 56	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 64	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 66	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 76	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 79	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 89	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 9	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab 57	65	1.00	65.00	1.79	65.00	1.81	65.00	1.81	65.00	1.82	65.00	1.82	65.00	1.82	0.84
Lab 74	65	1.00	65.00	1.79	65.00	1.81	65.00	1.81	65.00	1.82	65.00	1.82	65.00	1.82	0.84
Lab EX11	64	0.00	64.00	0.11	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	64.00	0.12	0.22
Lab EX14	65	1.00	65.00	1.79	65.00	1.81	65.00	1.81	65.00	1.82	65.00	1.82	65.00	1.82	0.84
Lab 28	66	2.00	66.00	5.46	66.00	5.50	66.00	5.51	66.00	5.51	66.00	5.51	66.00	5.51	1.46
Lab 58	66	2.00	66.00	5.46	66.00	5.50	66.00	5.51	66.00	5.51	66.00	5.51	66.00	5.51	1.46
Lab 67	67	3.00	66.22	6.56	66.11	6.04	66.08	5.90	66.07	5.86	66.07	5.85	66.07	5.85	2.08
Lab 39	68	4.00	66.22	6.56	66.11	6.04	66.08	5.90	66.07	5.86	66.07	5.85	66.07	5.85	2.70
Average	63.00		63.66	60.12	63.66	58.99	63.65	58.69	63.65	58.61	63.65	58.59	63.65	58.58	
SD	2.96		1.44	2.07	1.43	2.03	1.42	2.02	1.42	2.02	1.42	2.02	1.42	2.02	
New x*	64	1.00	63.663	1.44	63.655	1.43	63.653	1.42	63.652	1.42	63.65	1.42	63.65	1.42	
New s*	1.48		1.633		1.617		1.613		1.612		1.61		1.61		

N 30

Target value 64

Low Acceptable 59

High Acceptable 68

Acceptable Range 59 - 68

Determination of Compressive Strength of Paving Blocks

Appendix C:Charts

