

DUBAI ACCREDITATION DEPARTMENT

REPORT ON PTP 167TH INTER-LABORATORY PROFICIENCY TESTING PROGRAM DETERMINATION OF FLAKINESS & ELONGATION INDEX IN COARSE CRUSHED ROCKS

Date: 11 November 2008

1. INTRODUCTION

This document presents the results of the 167th inter-laboratory proficiency-testing program conducted during the month of October involving the determination of flakiness & elongation index in coarse crushed rocks with twenty three 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 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 private laboratories and three governmental laboratories (ten of them are accredited by DAC for construction materials testing) participated in this program. A total of twenty three laboratories participated in this program.

2.3 Samples Tested:

One (1) Aggregate sample of approximately 1 kg consists of 10mm Coarse Crushed Rock specimen was distributed to all participating laboratories. With each participant being given one sample with a unique identification number provided during the time of distribution.

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 for Determination of Determination of flakiness & elongation index in coarse crushed rocks as per **BS 812: 1989 P105 S105.1, BS 812: 1990 P105 S105.2**.

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
Elongation Index	Lab No. 9 ; 16 & 23
Flakiness Index	Lab No. 16

7. CONCLUSION AND RECOMMENDATIONS

The test results provided by the above mentioned participating laboratories are found outside the Z - score limits of ± 3 .

8. APPENDICES

8.1 Appendix A: Raw Data,

8.2 Appendix B: Calculation of z-scores and other statistics,

8.3 Appendix C: Charts.

---- End of Report ---

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**Flakiness and Elongation
Index in Coarse Crushed Rocks****Elongation Index**

Analysis Code	Sample No.	Results
Lab 1	16701	30.00
Lab 2	16702	27.00
Lab 3	16703	28.00
Lab 4	16704	27.00
Lab 5	16705	28.00
Lab 6	16707	30.00
Lab 7	16708	30.00
Lab 8	16709	27.00
Lab 9	16710	19.00
Lab 10	16711	28.00
Lab 11	16713	28.00
Lab 12	16714	29.00
Lab 13	16718	29.00
Lab 14	16720	29.00
Lab 15	16721	29.00
Lab 16	16722	8.00
Lab 17	16723	29.00
Lab 18	16724	24.00
Lab 19	16725	27.00
Lab 20	16727	26.00
Lab 21	16728	26.00
Lab 22	16729	29.00
Lab 23	16730	17.87

**Flakiness and Elongation
Index in Coarse Crushed Rocks****Flakiness Index**

Analysis Code	Sample No.	Results
Lab 1	16701	23.00
Lab 2	16702	21.00
Lab 3	16703	21.00
Lab 4	16704	21.00
Lab 5	16705	22.00
Lab 6	16707	20.00
Lab 7	16708	20.00
Lab 8	16709	21.00
Lab 9	16710	21.00
Lab 10	16711	21.00
Lab 11	16713	22.00
Lab 12	16714	21.00
Lab 13	16718	21.00
Lab 14	16720	22.00
Lab 15	16721	22.00
Lab 16	16722	38.00
Lab 17	16723	22.00
Lab 18	16724	23.00
Lab 19	16725	22.00
Lab 20	16727	23.00
Lab 21	16728	22.00
Lab 22	16729	23.00
Lab 23	16730	23.67

Flakiness and Elongation Index in Coarse Crushed Rocks

Appendix B: Calculation of Z-score and other statistics Elongation Index

Iteration	0		1		2		3		4		5		6		Z Score			
$\delta = 1.5 s$	---	xi-x*	2.22	(xi-x*) ²	2.53	(xi-x*) ²	2.53	(xi-x*) ²	2.53	(xi-x*) ²	2.53	(xi-x*) ²	2.53	(xi-x*) ²				
$x^* - \delta$	---		25.78		25.25		25.25		25.25		25.25		25.25			25.25	25.25	25.25
$x^* + \delta$	---		30.22		30.32		30.32		30.32		30.32		30.32			30.32	30.32	30.32
Lab 16	8.00	20.00	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	-11.72			
Lab 23	17.87	10.13	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	-5.87			
Lab 9	19.00	9.00	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	-5.21			
Lab 18	24.00	4.00	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	25.78	4.05	-2.24			
Lab 20	26.00	2.00	26.00	3.19	26.00	3.19	26.00	3.19	26.00	3.19	26.00	3.19	26.00	3.19	-1.06			
Lab 21	26.00	2.00	26.00	3.19	26.00	3.19	26.00	3.19	26.00	3.19	26.00	3.19	26.00	3.19	-1.06			
Lab 19	27.00	1.00	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	-0.47			
Lab 2	27.00	1.00	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	-0.47			
Lab 4	27.00	1.00	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	-0.47			
Lab 8	27.00	1.00	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	27.00	0.62	-0.47			
Lab 10	28.00	0.00	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	0.13			
Lab 11	28.00	0.00	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	0.13			
Lab 3	28.00	0.00	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	0.13			
Lab 5	28.00	0.00	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	28.00	0.05	0.13			
Lab 12	29.00	1.00	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	0.72			
Lab 13	29.00	1.00	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	0.72			
Lab 14	29.00	1.00	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	0.72			
Lab 15	29.00	1.00	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	0.72			
Lab 17	29.00	1.00	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	0.72			
Lab 22	29.00	1.00	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	29.00	1.47	0.72			
Lab 1	30.00	2.00	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	1.31			
Lab 6	30.00	2.00	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	1.31			
Lab 7	30.00	2.00	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	30.00	4.90	1.31			

Average	26.30		27.79	48.75	27.79	48.75	27.79	48.75	27.79	48.75	27.79	48.75	27.79	48.75
SD	5.06		1.49	2.22	1.49	2.22	1.49	2.22	1.49	2.22	1.49	2.22	1.49	2.22
New x*	28.0	1.00	27.79	1.49	27.79	1.49	27.79	1.49	27.79	1.49	27.79	1.49	27.79	1.49
New s*	1.48		1.69		1.69		1.69		1.69		1.69		1.69	

N 23

Target value	27.79
Low Acceptable	22.72
High Acceptable	32.85
Acceptable Range	22.72-32.85

Flakiness and Elongation Index in Coarse Crushed Rocks

Appendix B: Calculation of Z-score and other statistics Flakiness Index

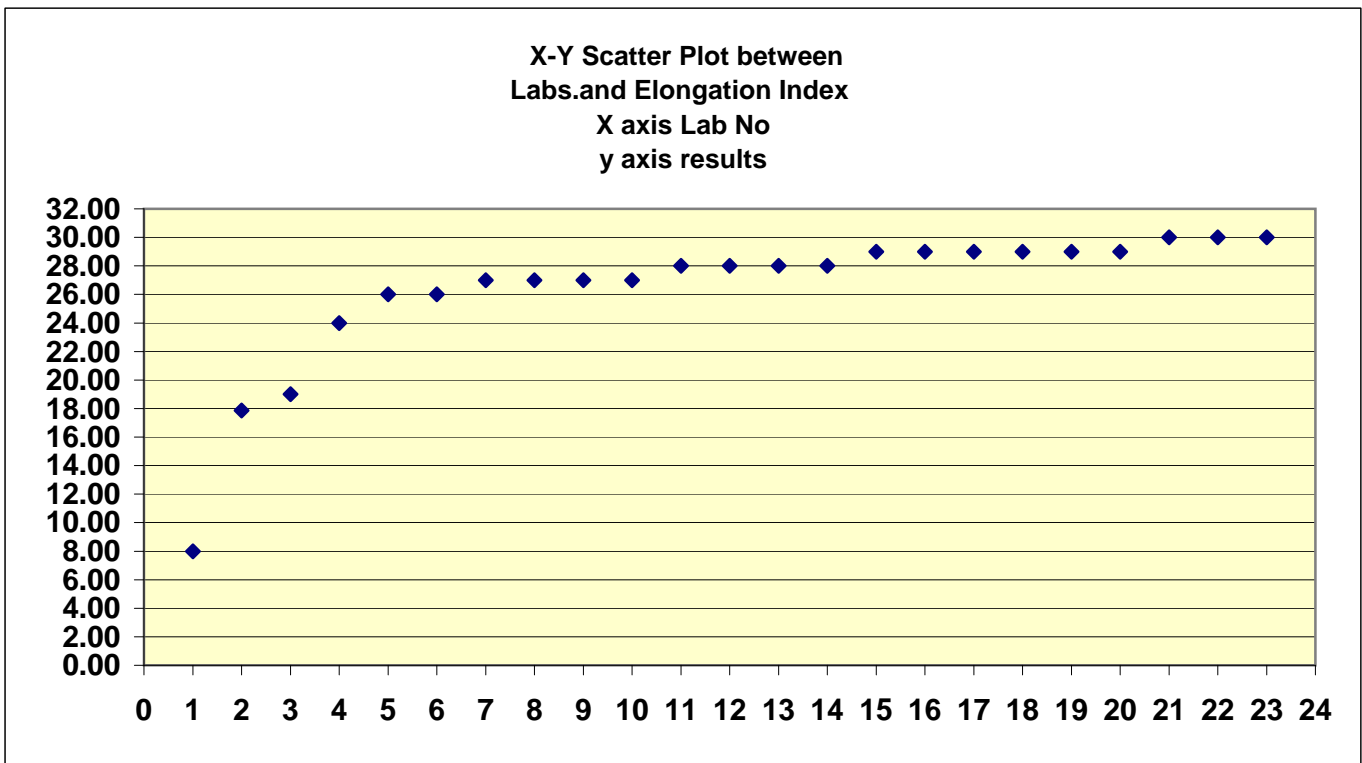
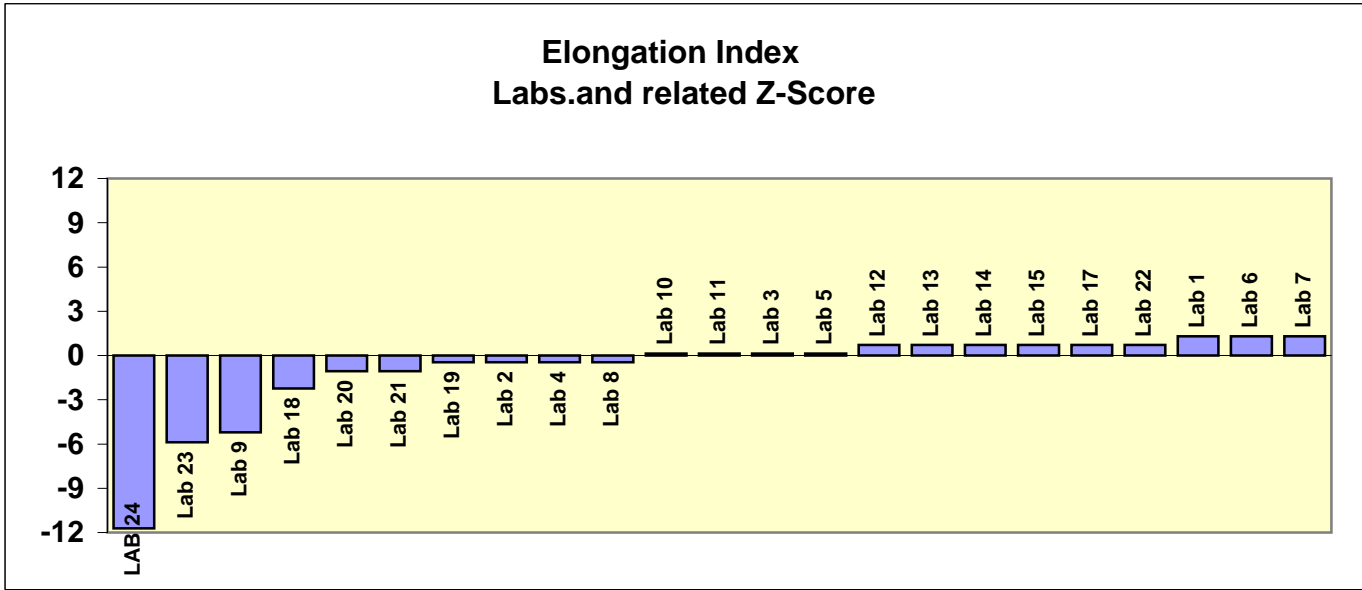
Iteration	0		1		2		3		4		5		6		Z Score
$\delta = 1.5 s$	---	xi-x*	2.22	(xi-x*) ²	1.88	(xi-x*) ²	1.80	(xi-x*) ²	1.78	(xi-x*) ²	1.77	(xi-x*) ²	1.77	(xi-x*) ²	
$x^* - \delta$	---		19.78		19.94		19.99		20.01		20.02		20.02		
$x^* + \delta$	---		24.22		23.71		23.60		23.57		23.56		23.56		
Lab 6	20.00		20.00	3.32	20.00	3.24	20.00	3.21	20.01	3.17	20.02	3.14	20.02	3.12	-1.52
Lab 7	20.00	2.00	20.00	3.32	20.00	3.24	20.00	3.21	20.01	3.17	20.02	3.14	20.02	3.12	-1.52
Lab 10	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 12	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 13	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 2	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 3	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 4	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 8	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 9	21.00	1.00	21.00	0.67	21.00	0.64	21.00	0.63	21.00	0.62	21.00	0.62	21.00	0.62	-0.67
Lab 11	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 14	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 15	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 17	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 19	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 21	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 5	22.00	0.00	22.00	0.03	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	22.00	0.04	0.18
Lab 1	23.00	1.00	23.00	1.39	23.00	1.44	23.00	1.46	23.00	1.46	23.00	1.47	23.00	1.47	1.03
Lab 18	23.00	1.00	23.00	1.39	23.00	1.44	23.00	1.46	23.00	1.46	23.00	1.47	23.00	1.47	1.03
Lab 20	23.00	1.00	23.00	1.39	23.00	1.44	23.00	1.46	23.00	1.46	23.00	1.47	23.00	1.47	1.03
Lab 22	23.00	1.00	23.00	1.39	23.00	1.44	23.00	1.46	23.00	1.46	23.00	1.47	23.00	1.47	1.03
Lab 23	23.67	1.67	23.67	3.42	23.67	3.50	23.60	3.28	23.57	3.18	23.56	3.14	23.56	3.12	1.60
Lab 16	38.00	16.00	24.22	5.77	23.71	3.64	23.60	3.28	23.57	3.18	23.56	3.14	23.56	3.12	13.79

Average	22.42		21.82	27.00	21.80	24.77	21.79	24.15	21.79	23.86	21.79	23.71	21.79	23.63
SD	3.53		1.11	1.23	1.06	1.13	1.05	1.10	1.04	1.08	1.04	1.08	1.04	1.07
New x*	22.00	1.00	21.82	1.11	21.80	1.06	21.79	1.05	21.79	1.04	21.79	1.04	21.79	1.04
New s*	1.48		1.26		1.20		1.19		1.18		1.18		1.18	

N 23

Target value	21.79
Low Acceptable	18.26
High Acceptable	25.32
Acceptable Range	18.26-25.32

Flakiness Elongation Index in Coarse Crushed Rocks



Flakiness Elongation Index in Coarse Crushed Rocks

