



REF: 812/02/02/1/743

DATE: 11 January 2007

ATTENTION: LAB MANAGER

SUBJECT: 148th INTER-LABORATORY PROFICIENCY TESTING PROGRAM

We are pleased to present the results of the 148th Inter-laboratory Proficiency Testing Program involving the determination of liquid limit - plastic limit & plasticity index.

As in previous programs, we have assigned code numbers to participating laboratories in order to protect their identities. For this particular program please contact Dr. Yaser (Tel. No. 3027074) or Eng. Raniah (Tel. No. 3027069) to inform you which code number has been assigned to you.

You are also requested to pay to Dubai Accreditation Centre (DAC), an amount of (Dhs 418) in return for your participation in the Inter-laboratory Proficiency Testing Program (please note that the governmental laboratories are exempted from participation fees). We would like to draw your attention that payment can be made through DCLD counter- ground floor by credit card. Should you intend to pay by cheque please address the cheque to Dubai Municipality. After payment, please submit a copy of the invoice to the Accreditation Center (Eng. Raniah Ed Dili in the administration building on the second floor office no. 310).

You are kindly requested to pay the amount within one month from the date in which the result is posted on our website.

We thank you for your participation and we would welcome any comments or suggestions on this and on future programs. Please do not hesitate to contact us if you need any clarification on the report.

Kind Regards

A handwritten signature in black ink, appearing to be 'M. Badri'.

Eng. Mohammed Badri
Director of Dubai Accreditation Center

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



DUBAI ACCREDITATION CENTER

Report on 148th Inter-Laboratory Proficiency Testing Liquid Limit-Plastic Limit & Plasticity Index

14 January 2007

1. INTRODUCTION

This document presents the results of the 148th inter-laboratory proficiency-testing program conducted during the months of November - December 2006, involving the determination of the Liquid Limit-Plastic Limit & Plasticity Index of Clayey Soil samples according to BS 1377: 1990 Part 2 clause 4.5 / 4.3. Amd. 9027: 1996, Sample preparation shall be as per clause 4.2.4 for the determination of the liquid limit and BS 1377: 1990 Part 2 Cl. 5, Amd. 9027: 1996 for the determination of the plastic limit and plasticity index.

This program is part of the Interlaboratory Comparison Programs organized by Dubai Accreditation Center of DM for monitoring the validity of tests 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 Participants:

A total of fourteen laboratories participated in this program.

2.2 Samples tested:

The test items consist of two sets of clay soil. The sample specifications were such that the expected test results from one source is different than that of the other. The samples were thoroughly mixed using mechanical means in order to ensure homogeneity.

From one source, 28 samples were collected using standard sampling procedure for soil. Similarly from the other source, another 28 samples were also collected. The samples were randomly distributed to the fourteen participating laboratories with each participant receiving four samples, (two from each source). The samples were designated as Samples 1, 2, 3 and 4 with a unique identification number marked on each sample.

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:

1. BS 1377: 1990 Part 2 clause 4.5 / 4.3. Amd. 9027: 1996 and Sample preparation shall be as per clause 4.2.4 for the determination of the Liquid Limit.
2. BS 1377: 1990 Part 2 Cl. 5, AMD. 9027: 1996 for the determination of the plastic limit and plasticity index.

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

Please refer to document **DAC-G3-03** Robust Z-Score Analyses for the methodologies of analysis.

6.2 CALCULATIONS OF Z- SCORES

Appendix B gives the details of the calculation of the Z-Score from the raw data. The Z-Score analysis is based on an internationally accepted procedure being used by accreditation bodies implementing Interlaboratory comparison programs.

6.3 OUTLIERS RESULTE

After evaluating the z-scores, the following results were considered outliers:

| Test Parameter | Labs with outlier results | Type of Outlier |
|----------------|---------------------------|-----------------|
| Liquid Limit | Lab 1-1 Lab 1-2 | Between labs |

The test results provided by the above mentioned laboratories are outside the Z-score limits of ± 3 and identified as outliers. The above-mentioned laboratory is requested to investigate the root cause of the outlier results, implement corrective action and email a report within 2 weeks to Accreditation Decisions Section of Dubai Accreditation Center to the following address lmqudah@dm.gov.ae

7. APPENDICES

- 7.1 Appendix A: Raw Data
- 7.2 Appendix B: Calculation of z-scores and other statistics
- 7.3 Appendix C: Charts

Table 1: Liquid Limit, %

| Lab# | 1 | 2 | 3 | 4 |
|-------|-------|-------|-------|-------|
| Lab1 | 32.00 | 32.00 | 28.00 | 29.00 |
| Lab2 | 38.00 | 40.00 | 34.00 | 33.00 |
| Lab3 | 40.00 | 40.00 | 32.00 | 32.00 |
| Lab4 | 40.00 | 40.00 | 32.00 | 31.00 |
| Lab5 | 40.00 | 40.00 | 32.00 | 32.00 |
| Lab6 | 40.00 | 40.00 | 32.00 | 32.00 |
| Lab7 | 40.00 | 41.00 | 34.00 | 33.00 |
| Lab8 | 38.00 | 38.00 | 32.00 | 33.00 |
| Lab9 | 37.00 | 37.00 | 33.00 | 34.00 |
| Lab10 | 40.00 | 39.00 | 32.00 | 32.00 |
| Lab11 | 39.00 | 39.00 | 33.00 | 32.00 |
| Lab12 | 38.00 | 38.00 | 32.00 | 32.00 |
| Lab13 | 40.00 | 40.00 | 33.00 | 32.00 |
| Lab14 | 39.00 | 40.00 | 32.00 | 33.00 |

Table 2 : Plastic Limit, %

| Lab# | 1 | 2 | 3 | 4 |
|-------|-------|-------|-------|-------|
| Lab1 | 16.00 | 16.00 | 15.00 | 15.00 |
| Lab2 | 19.00 | 20.00 | 17.00 | 17.00 |
| Lab3 | 20.00 | 19.00 | 16.00 | 16.00 |
| Lab4 | 21.00 | 21.00 | 18.00 | 18.00 |
| Lab5 | 19.00 | 19.00 | 16.00 | 16.00 |
| Lab6 | 19.00 | 19.00 | 16.00 | 16.00 |
| Lab7 | 20.00 | 20.00 | 17.00 | 17.00 |
| Lab8 | 19.00 | 18.00 | 16.00 | 17.00 |
| Lab9 | 20.00 | 20.00 | 18.00 | 18.00 |
| Lab10 | 19.00 | 19.00 | 16.00 | 16.00 |
| Lab11 | 18.00 | 18.00 | 17.00 | 16.00 |
| Lab12 | 21.00 | 21.00 | 18.00 | 18.00 |
| Lab13 | 19.00 | 19.00 | 16.00 | 16.00 |
| Lab14 | 19.00 | 20.00 | 15.00 | 15.00 |

Table 3 : Plasticity Index, %

| Lab# | 1 | 2 | 3 | 4 |
|--------------|----------|----------|----------|----------|
| Lab1 | 16.00 | 16.00 | 13.00 | 14.00 |
| Lab2 | 19.00 | 20.00 | 17.00 | 16.00 |
| Lab3 | 20.00 | 21.00 | 16.00 | 16.00 |
| Lab4 | 19.00 | 19.00 | 14.00 | 13.00 |
| Lab5 | 21.00 | 21.00 | 16.00 | 16.00 |
| Lab6 | 21.00 | 21.00 | 16.00 | 16.00 |
| Lab7 | 20.00 | 21.00 | 17.00 | 16.00 |
| Lab8 | 19.00 | 20.00 | 16.00 | 16.00 |
| Lab9 | 17.00 | 17.00 | 15.00 | 16.00 |
| Lab10 | 21.00 | 20.00 | 16.00 | 16.00 |
| Lab11 | 21.00 | 21.00 | 16.00 | 16.00 |
| Lab12 | 17.00 | 17.00 | 14.00 | 14.00 |
| Lab13 | 21.00 | 21.00 | 17.00 | 16.00 |
| Lab14 | 20.00 | 20.00 | 17.00 | 18.00 |

Appendix B: Calculation of z-scores and other statistics

Liquid Limit %

| Result# | S1 S2 | S3 S4 | S1+S3 S2+S4 | S1-S3 S2-S4 | Between Labs z- score | Within Labs z- score |
|---------|----------|----------|----------------|----------------|-----------------------------|----------------------------|
| Lab1-1 | 32.00 | 28.00 | 60.00 | 4.00 | -16.19 | -2.02 |
| Lab1-2 | 32.00 | 29.00 | 61.00 | 3.00 | -14.84 | -2.70 |
| Lab2-1 | 38.00 | 34.00 | 72.00 | 4.00 | 0.00 | -2.02 |
| Lab2-2 | 40.00 | 33.00 | 73.00 | 7.00 | 1.35 | 0.00 |
| Lab3-1 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab3-2 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab4-1 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab4-2 | 40.00 | 31.00 | 71.00 | 9.00 | -1.35 | 1.35 |
| Lab5-1 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab5-2 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab6-1 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab6-2 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab7-1 | 40.00 | 34.00 | 74.00 | 6.00 | 2.70 | -0.67 |
| Lab7-2 | 41.00 | 33.00 | 74.00 | 8.00 | 2.70 | 0.67 |
| Lab8-1 | 38.00 | 32.00 | 70.00 | 6.00 | -2.70 | -0.67 |
| Lab8-2 | 38.00 | 33.00 | 71.00 | 5.00 | -1.35 | -1.35 |
| Lab9-1 | 37.00 | 33.00 | 70.00 | 4.00 | -2.70 | -2.02 |
| Lab9-2 | 37.00 | 34.00 | 71.00 | 3.00 | -1.35 | -2.70 |
| Lab10-1 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| Lab10-2 | 39.00 | 32.00 | 71.00 | 7.00 | -1.35 | 0.00 |
| Lab11-1 | 39.00 | 33.00 | 72.00 | 6.00 | 0.00 | -0.67 |
| Lab11-2 | 39.00 | 32.00 | 71.00 | 7.00 | -1.35 | 0.00 |
| Lab12-1 | 38.00 | 32.00 | 70.00 | 6.00 | -2.70 | -0.67 |
| Lab12-2 | 38.00 | 32.00 | 70.00 | 6.00 | -2.70 | -0.67 |
| lab13-1 | 40.00 | 33.00 | 73.00 | 7.00 | 1.35 | 0.00 |
| lab13-2 | 40.00 | 32.00 | 72.00 | 8.00 | 0.00 | 0.67 |
| lab14-1 | 39.00 | 32.00 | 71.00 | 7.00 | -1.35 | 0.00 |
| lab14-2 | 40.00 | 33.00 | 73.00 | 7.00 | 1.35 | 0.00 |

| | | | | |
|----------------|-------|-------|-------|-------|
| No. of Results | 28 | 28 | 28 | 28 |
| Median | 40.00 | 32.00 | 72.00 | 7.00 |
| Q 1 | 38.00 | 32.00 | 71.00 | 6.00 |
| Q 3 | 40.00 | 33.00 | 72.00 | 8.00 |
| Inter Q Range | 2.00 | 1.00 | 1.00 | 2.00 |
| Normalzd IQR | 1.48 | 0.74 | 0.74 | 1.48 |
| Robust CV,% | 3.71 | 2.32 | 1.03 | 21.18 |
| Minimum | 32.00 | 28.00 | 60.00 | 3.00 |
| Maximum | 41.00 | 34.00 | 74.00 | 9.00 |
| Range | 9.00 | 6.00 | 14.00 | 6.00 |

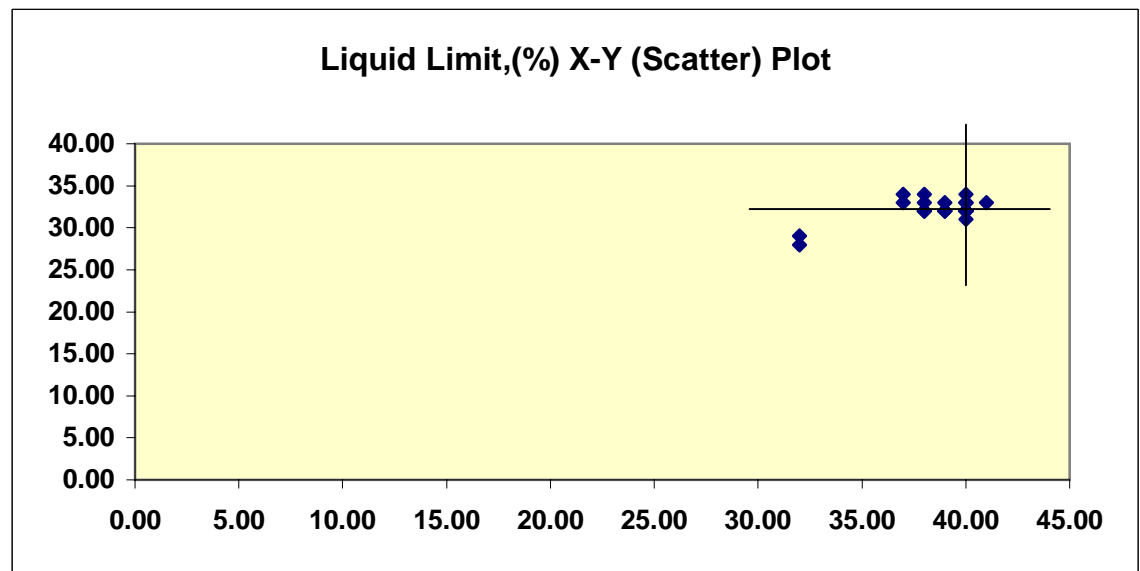
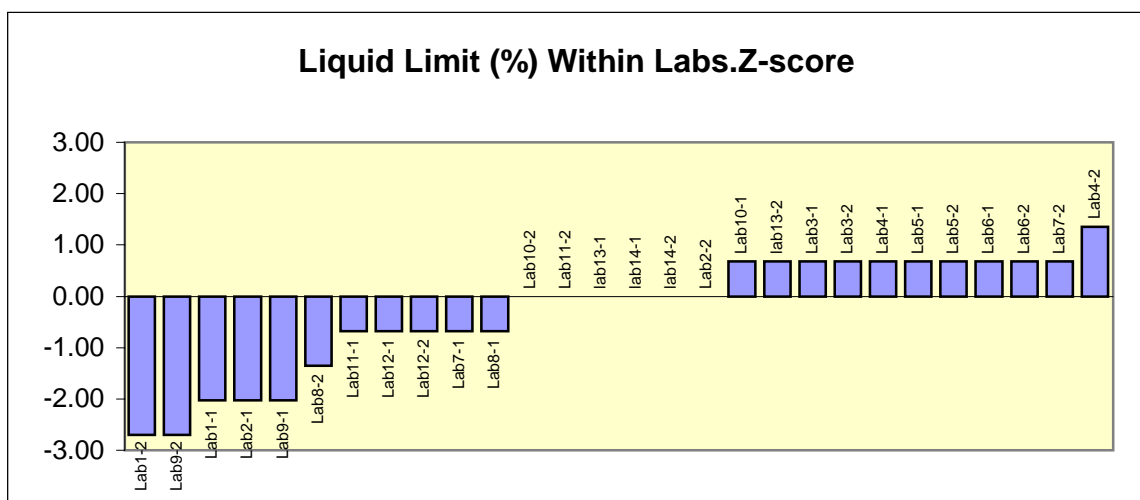
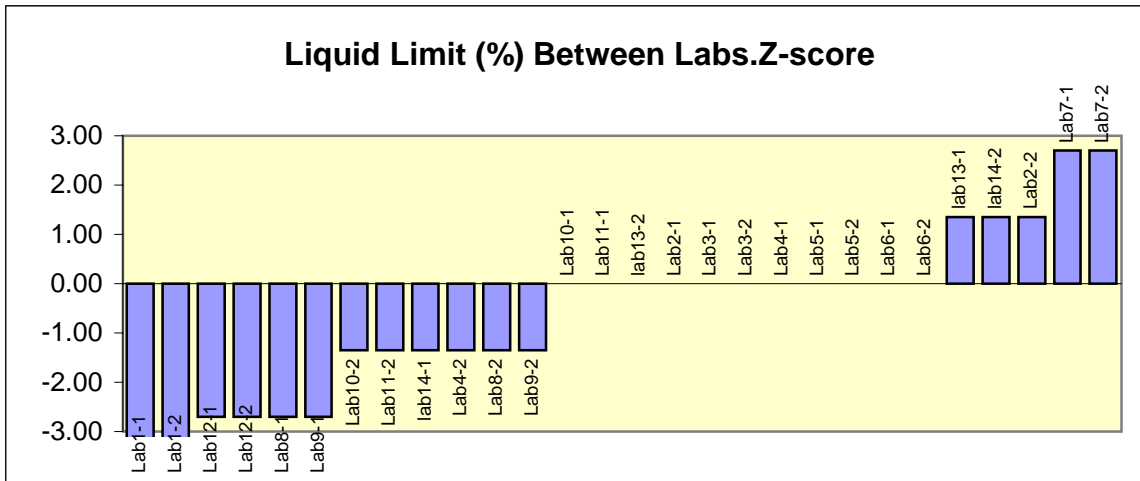
Appendix B: Calculation of z-scores and other statistics

Plastic Limit %

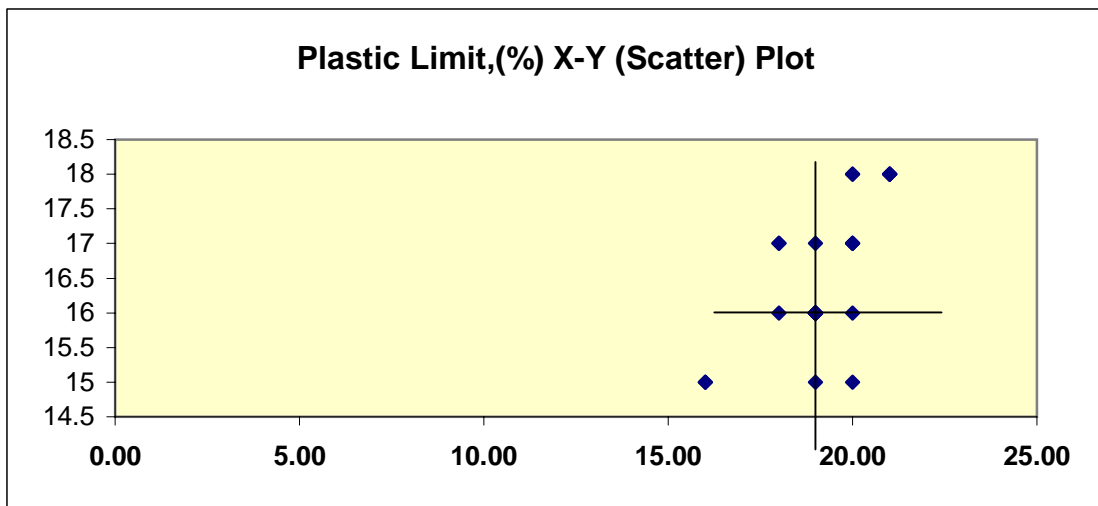
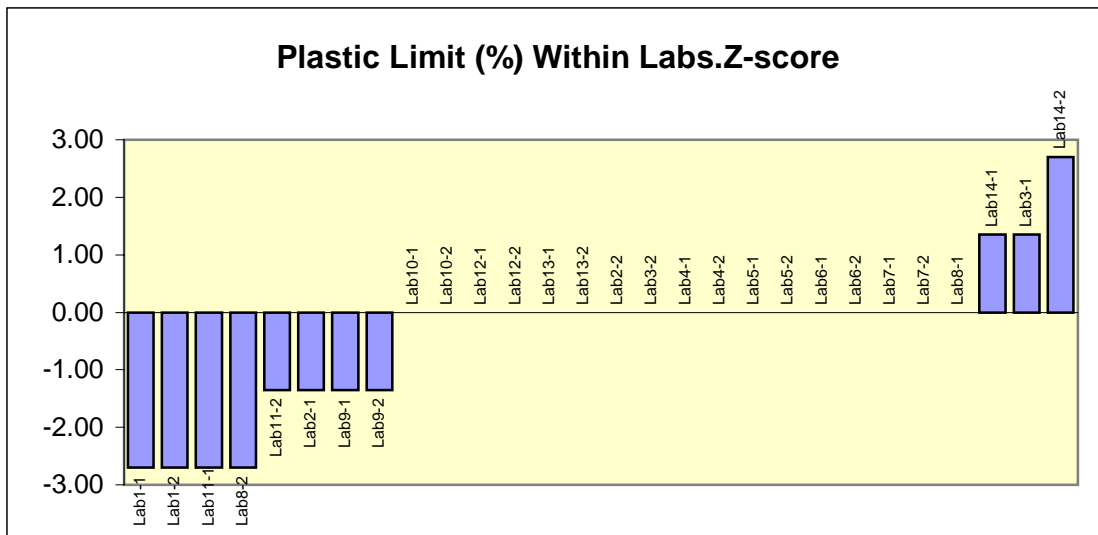
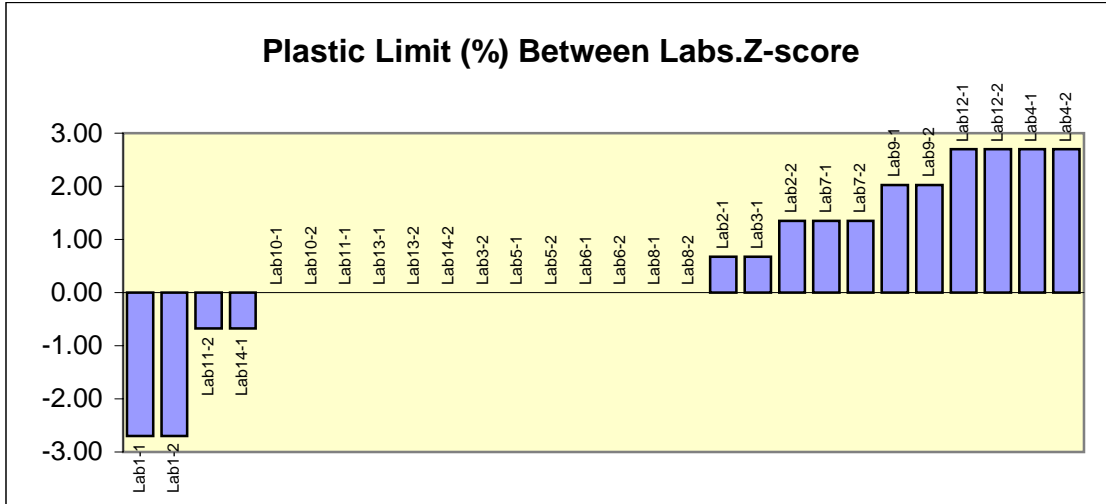
| Result# | S1 S2 | S3 S4 | S1+S3 S2+S4 | S1-S3 S2-S4 | Between Labs z- score | Within Labs z- score |
|---------|----------|----------|----------------|----------------|-----------------------------|----------------------------|
| Lab1-1 | 16.00 | 15 | 31.00 | 1.00 | -2.70 | -2.70 |
| Lab1-2 | 16.00 | 15 | 31.00 | 1.00 | -2.70 | -2.70 |
| Lab2-1 | 19.00 | 17 | 36.00 | 2.00 | 0.67 | -1.35 |
| Lab2-2 | 20.00 | 17 | 37.00 | 3.00 | 1.35 | 0.00 |
| Lab3-1 | 20.00 | 16 | 36.00 | 4.00 | 0.67 | 1.35 |
| Lab3-2 | 19.00 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab4-1 | 21.00 | 18 | 39.00 | 3.00 | 2.70 | 0.00 |
| Lab4-2 | 21.00 | 18 | 39.00 | 3.00 | 2.70 | 0.00 |
| Lab5-1 | 19.00 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab5-2 | 19.00 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab6-1 | 19.00 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab6-2 | 19.00 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab7-1 | 20.00 | 17 | 37.00 | 3.00 | 1.35 | 0.00 |
| Lab7-2 | 20.00 | 17 | 37.00 | 3.00 | 1.35 | 0.00 |
| Lab8-1 | 19.00 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab8-2 | 18.00 | 17 | 35.00 | 1.00 | 0.00 | -2.70 |
| Lab9-1 | 20.00 | 18 | 38.00 | 2.00 | 2.02 | -1.35 |
| Lab9-2 | 20.00 | 18 | 38.00 | 2.00 | 2.02 | -1.35 |
| Lab10-1 | 19 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab10-2 | 19 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab11-1 | 18 | 17 | 35.00 | 1.00 | 0.00 | -2.70 |
| Lab11-2 | 18 | 16 | 34.00 | 2.00 | -0.67 | -1.35 |
| Lab12-1 | 21 | 18 | 39.00 | 3.00 | 2.70 | 0.00 |
| Lab12-2 | 21 | 18 | 39.00 | 3.00 | 2.70 | 0.00 |
| Lab13-1 | 19 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab13-2 | 19 | 16 | 35.00 | 3.00 | 0.00 | 0.00 |
| Lab14-1 | 19.00 | 15.00 | 34.00 | 4.00 | -0.67 | 1.35 |
| Lab14-2 | 20.00 | 15.00 | 35.00 | 5.00 | 0.00 | 2.70 |

| | | | | |
|-----------------------|-------|-------|-------|-------|
| No. of Results | 28 | 28 | 28 | 28 |
| Median | 19.00 | 16.00 | 35.00 | 3.00 |
| Q 1 | 19.00 | 16.00 | 35.00 | 2.00 |
| Q 3 | 20.00 | 17.00 | 37.00 | 3.00 |
| Inter Q Range | 1.00 | 1.00 | 2.00 | 1.00 |
| Normalzd IQR | 0.74 | 0.74 | 1.48 | 0.74 |
| Robust CV,% | 3.90 | 4.63 | 4.24 | 24.71 |
| Minimum | 16.00 | 15.00 | 31.00 | 1.00 |
| Maximum | 21.00 | 18.00 | 39.00 | 5.00 |
| Range | 5.00 | 3.00 | 8.00 | 4.00 |

Appendix C: Charts



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