Determination of the liquid limit, plastic limit and plasticity index of a cohesi...

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Results Sample 50% Clay 50% Sand Test location: Group: C 2/03/11 Liquid Limits Test No. LL1 LL2 LL3 LL4 Initial gauge reading (mm) 0 0 0 0 0 0 0 0 0 0 0 0 Final gauge reading (mm) 13. 4 14. 8 14. 2 18. 6 19. 5 18. 6 19. 0 19. 9 - 22. 1 22. 2 - Difference (mm) 13. 4 14. 8 14. 2 18. 6 19. 5 18. 6 19. 0 19. 9 - 22. 1 22. 2 - Average penetration (mm) 14. 13 18. 90 19. 45 22. 15 Container No. 1 2 3 4 m1 Mass of container (g) 14. 249 16. 300 15. 845 16. 442 m2 m1 + moist soil (g) 25. 105 28. 788 25. 962 28. 066 m3 m2 + dry soil (g) 20. 894 23. 811 21. 811 23. 262 w (%) 63. 37% 66. 26% 69. 58% 70. 44% The figure above shows a computerized plot of moisture content (%) versus penetration (mm.) rendered using Microsoft Excel. Data plot was taken from the results of the liquid limit test, where the x-coordinates or abscissas are the calculated moisture contents and the y-coordinates or ordinates are the penetration. The data points included in the plot are P1 (63. 37, 14. 13); P2 (66. 26, 18. 90); P3 (69. 58, 19. 45); and P4 (70. 44, 22. 15). The trend line or the best fit line was automatically fitted and the equation of the line was generated. From the figure, the equation of the best fit line is: $y= 0. 9613x – 46. 148$. From step (10) of the laboratory procedure for the determination of the liquid limit, the theoretical value of moisture content which would produce a penetration of 20 mm is the liquid limit of the soil. Hence, when y in the above equation is substituted with 20, the value of the liquid limit (x) may be calculated algebraically as; $y = 0. 9613x – 46. 148$. $20 = 0. 9163x – 46. 148$ $0. 9163 x = 20 + 46. 148$ $x = 68. 81 ? 69\%$ - the liquid limit of the soil The value of the liquid limit obtained above is verified below by manual

plotting. Manual Plot of Moisture Content vs. Penetration Plastic Limits Test No. 1 2 3 4 Container No. XPL YPL m1 Mass of container (g) 17. 858 14. 487 m2 m1 + moist soil (g) 22. 557 19. 559 m3 m2 + dry soil (g) 21. 400 18. 340 w (%) 32. 67 31. 64 Average moisture content (%) 32. 16 ? 32% A – Line Chart Conclusion: On the basis of the liquid limit and the plastic limit tests which yielded values of 69% and 32%, respectively, the plasticity index of the soil sample was computed to be 37%. Using the A-line classification chart shown above, the intersection of the plasticity index (37%) and the liquid limit (69%) is found just a little below the A-line. This indicates that the soil is most probably in the classification OH which is either organic clay of medium to high plasticity and / or organic silt as per the Unified Soil Classification System (Das, 2008; Virginia Department of Transportation, 2003). The conclusion is supported by the fact that the sample was originally described at the start of the experiment to be 50% clay and 50% sand. Moreover, the sample was located below the A-line chart when plotted and that its liquid limit is greater than 50%. References Das, B. (2008). Advanced soil mechanics (3rd ed.). Oxon, GBR: Taylor & Francis. Virginia Department of Transportation (2003). Unified soil classification system. Retrieved from http://www. geology. wmich. edu/fhydro/ HFC%20Docs/Unified%20Soil %20Classification. pdf Appendix 1 United Soil Classification System