CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From the data investigated through laboratory tests on both Cilangkap Bridge volcanic soils and Batang volcanic soils. Important conclusions can be determined as follows.

1. From the Casagrande plasticity chart investigated from the Batang and Cilangkap Bridge volcanic soil, it could be concluded that the soil classifies as MH.
2. From **Figure 4.3.11 and Figure 4.3.12** it could be seen that the cohesion increases more significantly in comparison to the internal friction angle of the soil when volcanic soil is mixed with cement. This result implies that cement affects cohesion more than internal friction angle in terms of increasing the volcanic soil shear strength parameter.
3. From the result investigated from the Cilangkap Bridge volcanic soil it could be seen that the shear strength parameter actually satisfies the requirements needed for embankment in construction projects. Thus, concluding that not all volcanic soils have poor shear strength and durability even after losing its chemical bond due to excavation process.
4. Investigation results shows that Batang volcanic soil is actually the problematic soil which requires soil cement mixing to be implemented to the soil to be used as embankment. This difference in characteristics is due to Batang volcanic soil having more silt content in comparison to the Cilangkap Bridge volcanic soil.
5. From the results investigated through the CBR test it could be seen that mixing 4% cement does not provide significant increase in the shear strength of the soil.
6. Mixing 8% cement to volcanic soil satisfies the minimum design requirement in construction projects which is a minimum of 10% CBR design value.

5.2 Recommendation

Some recommendation from experience after conducting the test in laboratory are as follows.

1. Electron microscopy test and geological map data of the surrounding location from where the soil sample is retrieved could be included to further provide veritification of the soil sample tested is actually volcanic soil.
2. Volcanic soil sample with high silt content such as the Batang volcanic soil is difficult to form such as forming it into cylinder shape for the UU triaxial test. As such, when forming volcanic soil sample with high silt content exercise extra caution as the soil tend to break very easily.
3. Wet sieve analysis or the alternative sieve analysis method could directly be used to investigate the soil grain size distribution. This is due to the dry sieve analysis unable to produce the 50 grams of soil sample in the pan needed to further conduct the hydrometer analysis.
4. From the result investigated it is shown that 8% cement actually satisfies the requirement for soil cement mixing in construction projects. However, actual construction projects might not produce as much energy. Thus, it is in best interest to add more cement mixture or increase the compaction energy for actual construction project to ensure safety of the project.

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