

**ANALISIS PERBANDINGAN PENGGUNAAN  
KAPUR *DOLOMITE*, KULIT TELUR PUYUH,  
NATRIUM HIDROKSIDA TERHADAP KARAKTERISTIK  
DAN KANDUNGAN MINERAL TANAH  
(STUDI KASUS LOKASI X KOTA SEMARANG)**

**TUGAS AKHIR**

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## ABSTRAK

# Analisis Perbandingan Penggunaan Kapur *Dolomite*, Kulit Telur Puyuh, Natrium Hidroksida Terhadap Karakteristik Dan Kandungan Mineral Tanah (Studi Kasus Lokasi X Kota Semarang)

Oleh:

Novi Ayu Setyaningtyas      18.B1.0070  
Indah Ayuliani                18.B1.0089

Tanah menjadi bagian penting dan menjadi dasar dalam suatu struktur atau konstruksi, baik konstruksi bangunan, jalan, maupun infrastruktur lain. Sifat-sifat dan jenis tanah di lapangan bervariasi, sebagai contoh adanya tanah ekspansif yang mempunyai sifat mudah mengalami pengembangan dan penyusutan. Sifat ini mampu merusak bangunan yang berdiri di atasnya. Sampel tanah yang diteliti adalah tanah di Lokasi X Kota Semarang dan dilakukan pengujian mineral *X-Ray Fluorescence (XRF)*, pengujian ukuran butiran tanah, *index properties*, *atterberg limit*, dan *swelling test*. Hasil uji XRF menunjukkan mineral dominan adalah Si (silikon) sebesar 54,6%. Hasil pengujian ukuran butiran tanah menghasilkan persentase dominan *sand* sebesar 54,78% serta nilai koefisien keseragaman ( $C_u$ ) = 20,0 dan koefisien gradasi ( $C_c$ ) = 0,8 sehingga dikategorikan tanah bergradasi buruk. Berdasarkan uji *index properties* didapatkan nilai kadar air alami 21,83%, berat jenis tanah ( $G_s$ ) sebesar 2,463 dan tergolong *halloysite*. Uji *atterberg limit* menghasilkan nilai *index plasticity (IP)* sebesar 18,46% sehingga termasuk kategori tanah dengan potensi pengembangan sedang dan agak ekspansif. Proses penelitian ini dilakukan upaya stabilisasi dengan penambahan kapur *dolomite* ( $\text{CaO} + \text{MgO}$ ), kulit telur puyuh ( $\text{CaCO}_3 + \text{MgCO}_3$ ), Natrium Hidroksida ( $\text{NaOH}$ ) dengan masing-masing kadar 5%, 10%, 15%. Berdasarkan penambahan kapur *dolomite* kadar 5%, 10%, dan 15% memberikan hasil *index plasticity* sebesar 20,18%; 19,10%; dan 16,95%, penambahan kulit telur puyuh memberikan hasil *index plasticity* 19,00%; 18,24%; dan 16,78%, dan berdasarkan penambahan  $\text{NaOH}$  didapatkan nilai *index plasticity* yaitu 18,67%; 17,32%; dan 16,45%. Berdasarkan ketiga bahan tersebut, hasil menunjukkan masing-masing bahan dengan penambahan kadar lebih besar mampu memperbaiki karakteristik dan sifat tanah. Hasil nilai berat jenis tanah ( $G_s$ ) kapur *dolomite* kadar 5%, 10%, 15% yaitu 2,79; 2,35; dan 2,16,  $G_s$  kulit telur puyuh kadar 5%, 10%, 15% adalah 2,71; 2,40; dan 2,31,  $G_s$   $\text{NaOH}$  kadar 5%, 10%, 15% didapatkan hasil 2,73; 2,52; dan 2,31. Berdasarkan pengujian potensi pengembangan menggunakan alat konsolidasi, didapatkan hasil *swelling test* tanah asli mengalami pengembangan 0,23 mm. Hasil *swelling* dengan penambahan bahan kapur *dolomite* kadar 5%, 10%, 15% yaitu 0,14 mm; 0,13 mm; dan 0,05 mm, nilai *swelling* kulit telur puyuh yaitu 0,13 mm; 0,06 mm; dan 0,01 mm. Hasil *swelling test*  $\text{NaOH}$  sebesar 0,10 mm; 0,02 mm; 0,01 mm. Berdasarkan data yang diperoleh maka bahan tambah yang dianggap baik dan efektif untuk memperbaiki dan mengurangi tingkat pengembangan adalah  $\text{NaOH}$  kadar 15%.

**Kata Kunci:** tanah, uji XRF, *index properties*, *atterberg limit*, *swelling test*

## ABSTRACT

### ***Comparative Analysis of the Use of Dolomite Lime, Quail Egg Shells, Sodium Hydroxide on the Characteristics and Mineral Content of Soil (Case Study Location X Semarang City)***

By:

**Novi Ayu Setyaningtyas      18.B1.0070**

**Indah Ayuliani                18.B1.0089**

*Soil is an important part and the basis of a structure or construction, whether it is the construction of buildings, roads, or other infrastructure. The properties and types of soil in the field vary, for example the existence of expansive soils that have properties that easily experience development and shrinkage. This property can damage the building that stands on it. The soil sample studied was soil at Location X Semarang City and X-Ray Fluorescence (XRF) mineral testing, sieve testing and hydrometer analysis, index properties, atterberg limit, and swelling test were conducted. XRF test results show the dominant mineral is Si (silicon) at 54.6%. The results of the soil grain size test resulted in a dominant percentage of sand of 54.78% and a uniformity coefficient ( $C_u$ ) = 20.0 and gradation coefficient ( $C_c$ ) = 0.8 so that it is categorized as poorly graded soil. Based on the index properties test, the natural moisture content value is 21.83%, the soil specific gravity ( $G_s$ ) is 2.463 and is classified as halloysite. The Atterberg limit test resulted in a plasticity index (IP) value of 18.46% so that it is categorized as a soil with moderate development potential and somewhat expansive. In this study, stabilization efforts were made by adding dolomite lime ( $\text{CaO} + \text{MgO}$ ), quail eggshell ( $\text{CaCO}_3 + \text{MgCO}_3$ ), sodium hydroxide (NaOH) with 5%, 10%, 15% levels respectively. Based on the addition of dolomite lime at 5%, 10%, and 15% levels, the plasticity index results are 20.18%; 19.10%; and 16.95%, the addition of quail eggshells gives plasticity index results of 19.00%; 18.24%; and 16.78%, and based on the addition of NaOH, the plasticity index values are 18.67%; 17.32%; and 16.45%. Based on these three materials, the results show that each material with the addition of greater levels is able to improve soil characteristics and properties. The results of the soil specific gravity ( $G_s$ ) value of dolomite lime levels of 5%, 10%, 15% are 2.79; 2.35; and 2.16,  $G_s$  quail eggshell levels of 5%, 10%, 15% are 2.71; 2.40; and 2.31,  $G_s$  NaOH levels of 5%, 10%, 15% obtained results 2.73; 2.52; and 2.31. Based on testing the development potential using a consolidation tool, the results of the original soil swelling test were 0.23 mm. The swelling results with the addition of dolomite lime 5%, 10%, 15% are 0.14 mm; 0.13 mm; and 0.05 mm, the swelling value of quail eggshell is 0.13 mm; 0.06 mm; and 0.01 mm. NaOH swelling test results are 0.10 mm; 0.02 mm; 0.01 mm. Based on the data obtained, the added material that is considered good and effective to improve and reduce the level of development is 15% NaOH.*

**Keywords:** soil, XRF test, index properties, atterberg limit, swelling test