International Journal of Natural Science Studies and Development (IJOSS)
Volume 01 Issue 01 2024, pp 14-18
Homepage: https://ipi-limited.com/index.php/ijoss/index
Doi: https://doi.org/10.55299/ijoss.v1i1.6

Impact of CBR Value of Soil in Soaked and Unsoaked Conditions Based on 2018 Division 3 Bill Specifications

Muhammad Yusuf Parlagutan Lubis

Department Civil Engineering, Universitas Pembinaan Masyarakat Indonesia, Medan, Indonesia
**Corresponding author: parlagutan85@gmail.com*

Abstract

Soil is a construction material that is used as embankment to provide better soil bearing capacity and resilience to the soil itself. This research aims to determine the comparison of the CBR value of soil in soaked and unsoaked conditions based on the provisions of the 2018 Directoral of Highways Specifications Division 3.2 regarding embankments. In the research, the CBR results in the soaked condition were 6.15% and the unsoaked CBR was 9.64%. The CBR value requirement based on the 2018 Specifications is a minimum of 6% of the results obtained that meet the requirements for embankment CBR value, where the CBR value in the soaked condition is greater than the unsoaked condition. Based on these results, soaked embankment soil is suitable for use if the soil is compacted under conditions of continuous work, while unsoaked embankment soil can be used after the CBR value meets after the soaking process or a drying period of 4 days (96 hours).

Keywords: *CBR, Soaked, Unsoaked*

1. INTRODUCTION

Road and transportation infrastructure development is very important to improve connectivity between regions and support economic growth. In the construction process, the use of soil as a basic material for embankments is very common. Because the strength of road construction is determined by the quality of the bearing capacity of the original soil as the base material (subgrade). The way to determine the bearing capacity of the road base soil is with the CBR (California Bearing Ratio) test. Soil is a geological material located in the earth's crust which is used as a working medium or to build buildings on it (Hakam, 2008).

The definition of CBR is the comparison between the penetration stress of a soil or pavement layer/material to the penetration stress of a standard material with the same penetration depth and speed (expressed in percent) (SNI 1744: 2012). The test that will be carried out is the aggregate bearing capacity in terms of CBR data parameters which is carried out in the condition that the sample (heap) is submerged in water (soaked). And the sample condition (heap) is not submerged in water (unsoaked). (Ardiansyah, A., 2008)

2. METHOD

A research approach is a method or method used to design and carry out research with steps based on general assumptions as a basis for determining methods for collecting or analyzing data, and understanding and interpreting the results of a study. The location of

History:
Received : August 09, 2024
Revised : August 10, 2024
Accepted : August 11, 2024
Published : August 11, 2024

Publisher: Inovasi Pratama Int. Press

this research is at UPTD. Construction Materials Laboratory of the Public Works and Spatial Planning Service of North Sumatra Province. Based on the research title and problem formulation in this research, the research subjects are a population and a sample where the population is all the land in the city of South Gunungsitoli while the sample used is land from the village of Sisobahili II TAN, Nias Regency.
Sampling technique or sampling technique is a process and method of collecting samples to be studied. The aim is to obtain a sample (Sampling object). In this research, the method for collecting samples to be studied in the laboratory is determined based on the provisions of SNI 03-6889-2002, namely by sampling and also by $\sqrt[3]{}$ (Area of Test Sample taken)

3. RESULTS AND DISCUSSION

Result

1. Preparation of Material Properties

Proper preparation of test specimens greatly determines the quality of aggregate testing, so it is necessary to carry out procedures for preparing test specimens. Aggregate sampling should be as representative of the aggregate group as is the test itself. The number of aggregate samples taken must be appropriate to the type of test to be carried out.
Before testing the properties, it is necessary to prepare the materials in accordance with the provisions of SNI 13-6717-2002. There are 3 methods used in this provision, including:

a. Splitter Method
b. Quartering and placement methods
c. Mini Mound

2. Properties Testing

In property testing, there are several test stages that must be completed to ensure data completeness. The tests carried out are:

a. Sieve Analysis Testing
b. Soil Specific Gravity Testing
c. Atterberg Limit Testing
d. Liquid Limit (liqud limit)
e. Plastic Limit (plastic limit)
f. Plasticity Index (plasticity index)
g. Light Density Testing
h. Soil CBR testing in Soaked and Unsoaked conditions

Discussion

Based on soil testing in soaked and unsoaked conditions, the following test results were obtained

Table Soil CBR testing in unsoaked condition

No	Test type	Soaked test value	Unsoaked test value	Unit
1	Sieve analysis test passed No. 200	34,76	34,76	%
2	Liquid limit	30,75	30,75	%
3	Plastic limit	23,56	23,56	%
4	Plasticity index	7,19	7,19	%
5	Soil classification	A-4	A-4	-
6	Soil density	2.586	2.586	gram/cm^3
7	Maximum dry density	18,33	18,33	%
8	Maximum dry density	1.582	1.582	gram/cm^3
9	CBR Laboratory	6,15	9,64	%

Based on the test result data in the table above, the laboratory CBR value in the soaked condition was 6.15%, while the laboratory CBR value in the unsoaked condition was 9.64%. From this data, the CBR value is highest in the unsoaked CBR condition, but testing using the unsoaked method cannot be carried out completely because CBR testing using this method cannot provide 100% density due to the conditions abnormal compaction and also the pores of the CBR test specimens which are not completely filled with the cavities inside so that over time it will cause a decrease in the condition of the soil, whereas testing using the soaked method will give uniform density values because the cavities are completely filled. From this, the use of soil without soaking may be used if it is continued in sustainable work.

4. Conclusions and Suggestions

Conclusions

1. based on test results and observations of the CBR value of the soil in the unsoaked condition, it meets the CBR value requirement of 9.64%, however the density and bearing capacity of the soil is not good because the unsoaked condition does not provide 100% density, the compaction is not normal and there are still pores .

2. The use of soil in an unsoaked condition can only be used under conditions of continuous backfilling with different layers with the aim of providing better soil resilience and bearing capacity and compaction is carried out based on the provisions of the trial results with the Sandcone Test compaction test.

3. According to the test results, there is a difference in CBR values in soaked and unsoaked conditions, where the CBR value in soaked conditions is 6.15% and in unsoaked conditions is 9.64%.

Suggestions

1. The use of soil in an unsoaked condition can only be used in conditions of continuous work in the next layer
2. The use of soaked soil is suitable for use in construction both as embankment and as a support for the bearing capacity of the soil
3. Through this research, readers are able to increase their knowledge about soil compaction conditions in soaked and unsoaked conditions.

5. ACKNOWLEDGE

Thank you to the Faculty of Engineering, Universitas Pembinaan Masyarakat Indonesia for providing support in the implementation of this research.

6. REFERENCE

Ardiansyah, A. **(2008).** Tinjauan nilai CBR pada tanah lempung ekspansif yang distabilisasi menggunakan fly-ash. Retrieved from https://binamarga.pu.go.id/index.php/nspk/detail/sni-1742-2008-cara-uji-kepadatan-ringan-untuk-tanah

Boulevard, J., Sektor, B., Jaya, B., & Selatan, T. **(n.d.).** Mekanika tanah modul 3: Klasifikasi dari sifat tanah Universitas Pembangunan Jaya. Retrieved from https://adoc.pub/mekanika-tanah-sifat-indeks-propertis-tanah-modul-2-universi.html

Craig, R. F. **(2004).** *Soil mechanics* (7th ed.). CRC Press. https://doi.org/10.1201/9780203479240

Hakam, A. **(2008).** *Rekayasa pondasi*. CV. Bintang Grafika. Retrieved from https://www.researchgate.net/publication/292144569_Rekayasa_Pondasi

Hardiyatmo, H. C. **(1992).** *Mekanika tanah I*. PT Gramedia Pustaka Utama. Retrieved from https://ugmpress.ugm.ac.id/id/product/teknik-sipil/mekanika-tanah-i-edisi-ke-tujuh

Setyo Budi, G. **(2011).** *Pengujian tanah di laboratorium: Penjelasan dan panduan*. Retrieved from https://lib.ummetro.ac.id/index.php?p=show_detail&id=6742

Badan Standarisasi Nasional (BSN). **(2002).** SNI 03-6797-2002: Tata cara klasifikasi tanah dan campuran untuk konstruksi jalan. Retrieved from https://binamarga.pu.go.id/index.php/nspk/detail/sni-03-6797-2002-tata-cara-klasifikasi-tanah-dan-campuran-tanah-agregat-untuk-konstruksi-jalan

Sri, A., Fuji, Y., Feranie, S., & Tohari, A. **(2021).** Karakterisasi sifat fisik tanah residual lereng rawan longsor di ruas jalan kereta api Sukatani-Ciganea. In *Prosiding Seminar Nasional Fisika* (Vol. 7, Issue 0). Retrieved from http://proceedings.upi.edu/index.php/sinafi/article/view/1864/1673

Surendro, B. **(2015).** *Mekanika tanah*. Yogyakarta: Andi. Retrieved from https://balaiyanpus.jogjaprov.go.id/opac/detail-opac?id=291185

Badan Standarisasi Nasional (BSN). **(2012).** SNI 1744:2012: Metode uji CBR laboratorium. Retrieved from https://binamarga.pu.go.id/uploads/files/585/sni-1744-2012-metode-uji-cbr-laboratorium.pdf

Badan Standarisasi Nasional (BSN). **(2008).** SNI 1964:2008: Cara uji berat jenis tanah. Retrieved from https://binamarga.pu.go.id/index.php/nspk/detail/sni-1964-2008-cara-uji-berat-jenis-tanah

Badan Standarisasi Nasional (BSN). **(2008).** SNI 1966:2008: Cara uji penentuan batas plastis dan indeks plastisitas tanah. Retrieved from https://binamarga.pu.go.id/uploads/files/592/sni-1966-2008-cara-uji-penentuan-batas-plastis-dan-indeks-plastisitas-tanah.pdf

Badan Standarisasi Nasional (BSN). **(2008).** SNI 1967:2008: Cara uji penentuan batas cair tanah. Retrieved from https://binamarga.pu.go.id/uploads/files/593/sni-1967-2008-cara-uji-penentuan-batas-cair-tanah.pdf

Badan Standarisasi Nasional (BSN). **(2012).** SNI ASTM C 136-06 IDT: Metode uji untuk analisis saringan agregat halus dan agregat kasar. Retrieved from https://binamarga.pu.go.id/index.php/nspk/detail/sni-astm-c136-2012-metode-uji-untuk-analisis-saringan-agregat-halus-dan-agregat-kasar

Badan Standarisasi Nasional (BSN). **(2008).** SNI 1742:2008: Cara uji kepadatan ringan untuk tanah. Retrieved from https://binamarga.pu.go.id/index.php/nspk/detail/sni-1742-2008-cara-uji-kepadatan-ringan-untuk-tanah