Soil classification of the northwest region of the state of Rio Grande do Sul by the MCT methodology

Classification de la région nord-ouest de Rio Grande do Sul terres de l'État par le MCT méthodologie

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ABSTRACT: This work aims to present the characterization of several soil samples from the northwestern region of the southernmost state of Brazil and some mixtures of soil with small aggregates through the MCT methodology, classification system exclusively for the study of tropical soils, in order to create a database and consolidate the execution of the tests of said methodology in the Laboratory of Civil Engineering of UNIJUÍ (LEC). Based on the research methodology adopted, classifications were performed by systematic MCT Original and MCT Expeditious, also known as tablet method, composed of different sequences of tests that result in the same final classification of the sample studied. Several soils and mixtures of the northwest region of the state were classified, reaching the objective of this work. Following the natural sequence of the project and understanding the classification process, including methodology, equipment and tests, it will be possible to deepen research on the use of the MCT methodology applied to engineering works, mainly road. In addition, it is expected that over time this collection may be expanded.

1 INTRODUCTION

As an alternative to reduce the cost of road development and to accelerate the country's development, concepts have emerged of economic pavements, replacing materials traditionally used by other alternatives. According to Villibor and Nogami (2009), a pavement can be considered low cost when, among other possibilities, use bases consisting of in natura soils or in mixtures with costs substantially lower than the conventional bases, such as: graded gravel, cement soil, hydraulic macadam or bituminous macadam. Seeking to make feasible the construction of economic floors with bases of soils in natura or mixtures of soils, researches were started regarding the subject in 2012 at UNIJUÍ - Regional University of the Northwest of the State of Rio Grande do Sul.

To support research, soil classification and mixtures by the MCT methodology are fundamental, created specifically for tropical soils. From the classifications we intend to create a database with the description of the physical properties for each type of soil of the region, serving as an aid in the execution of engineering works, mainly road.

2 METHODOLOGY

Soil classification using the MCT Methodology was specially developed for the study of tropical soils based on mechanical and hydraulic properties obtained from compacted specimens of reduced dimensions. This classification does not use granulometry, liquidity limit and plasticity index, as in the case of traditional geotechnical classifications, separating the tropical soils into two large classes, those of lateritic behavior and those of non-lateritic behavior (FORTES et al. 2002).

According to Fortes (2002), lateritic and saprolithic soils, by MCT classification, belong to the following groups:

- Soils of lateritic behavior, designated by the letter L, being subdivided into 3 groups: LA - quartzite lateritic sand; LA '- lateritic sandy soil and LG' - lateritic clayey soil.

- Soils of non - lateritic (saprolithic) behavior, designated by the letter N, are subdivided into 4 groups: NA - sands, silts and mixtures of sands and silts with predominance of quartz grain and / or mica, not lateritic; NA '- mixtures of quartz sands with fine non-laterite behavior (sandy soil); NS '- non-lateritic silt and NG' - non-lateritic clay soil.

According to Villibor and Nogami (2009), the lateritic and saprolithic soils are classified using the original MCT methodology, using the graph of figure 1, where the dashed line separating the soils of lateritic behavior from those of non-lateritic behavior is perceived.

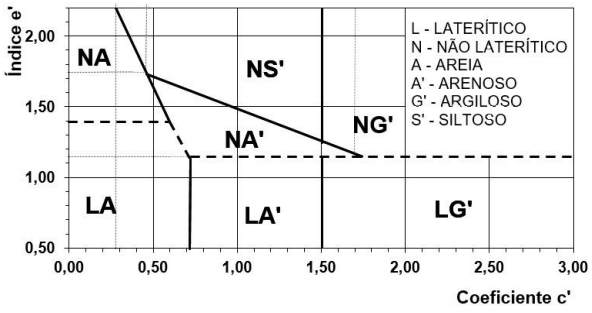

Figure 1. MCT Original Chart

The MCT Original classification is performed with the results of two tests: Mini-MCV, called M5, and the Immersion Mass Loss, called M8. The standards followed were DNER-ME 258-94 and 256-94 respectively, standards of the national road organ. The coefficient c' is an indicator of how sandy the soil is. With the Pi and d' it is calculated the coefficient e', which in turn indicates whether or not the soil has lateritic behavior. The obtaining of the coefficients is given by several graphs and calculations through the results of the M5 and M8.

The MCT Expeditious classification has the advantage of being a test carried out in a shorter period of time and a substantially lower quantity of material, making it more practical. It consists of the molding of pellets of 20 mm of internal diameter and 5 mm of height, which are subsequently submitted to drying, soaking and penetration, observing the phenomena of contraction, swelling and resistance to penetration. Figure 2 shows the MCT Expeditious classification chart, according to Villibor and Nogami (2009).

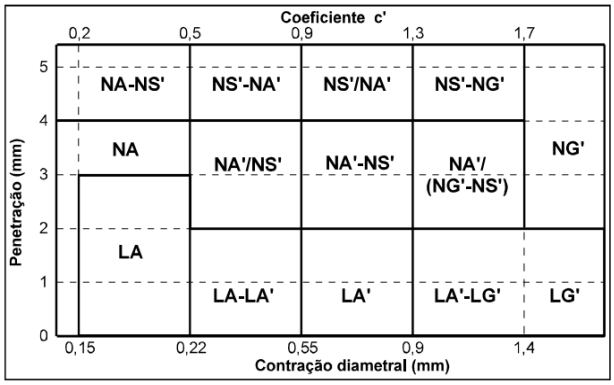

Figure 2. MCT Expeditious Chart

The methodology of the work is based on the following steps: removal of soil samples and performance of the MCT classification tests.

3. RESULTS

Three samples of different soils were classified by the methodology Original MCT, besides 9 mixtures that use the soil of the Campus of UNIJUÍ. Using the MCT Expeditious method – tablet method, 12 soil classifications and 6 mixtures were carried out for the research group. The results of the Original classification are shown in the graph of figure 3, and Expeditious's results are shown in the graph of figure 4.

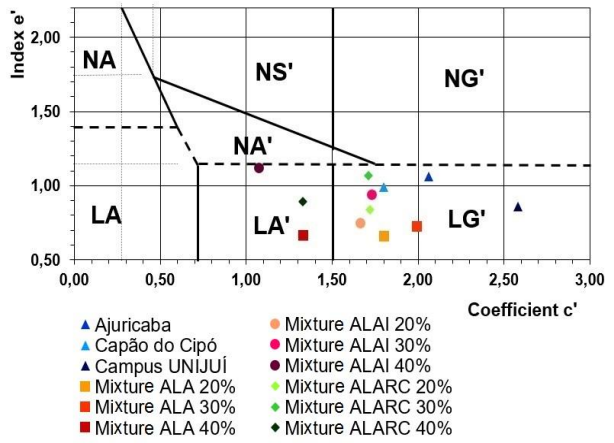

Figure 3. Results of the original MCT classification

The three soil samples presented LG 'behavior - Lateritic Clays, or Lateritic Sandy Clays. As expected, the UNIJUÍ Campus soil presented very clayey behavior, being located to the right on the classification chart. The soil of Capão do Cipó presented more sandy than the soil of Ajuricaba, due to its proximity to the group LA of the Lateran Sands, where most of the mixtures of 20 and 30% were located. It is thus perceived that both blends with natural sand, industrial sand or building waste require a replacement of 60% of the natural campus soil so that they fall within the group of lateritic sandy soils.

Figure 4 shows that of the 12 classified soils, 8 are LG ', the Ajuricaba NG', the point 2 of BR-377 LG 'but near the limit NG' and the soils of Tupanciretã and Jóia in the zone of transition LA "-LG".

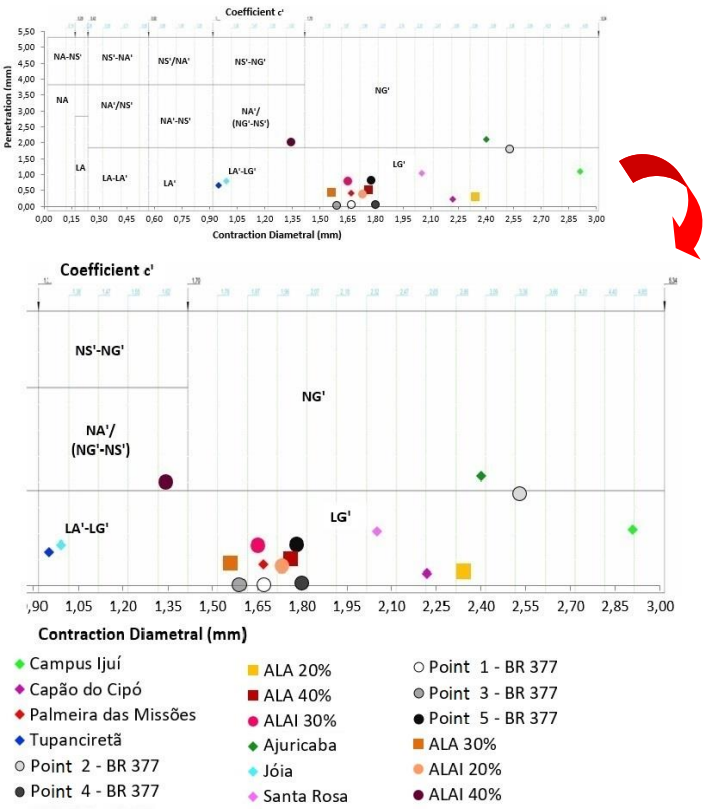

Figure 4. Results of the Expeditious MCT classification

4. CONCLUSION

Several tests were performed for the MCT classifications, whose results were consistent with those pointed out in the literature, specifically when compared with tests carried out at the University of Rio Grande Foundation (FURG) previously with the UNIJUÍ Campus of Ijuí soil, guaranteeing reliability in the results found.

All the mixtures studied proposed by the research group were classified by this methodology unpublished in our laboratory. MCT Classification tests are therefore consolidated and students, researchers and companies can use this important tool to qualify materials for use in paving and geotechnical works. Thus, a database is already formed, which will be in permanent expansion, Consolidating the execution of MCT Classification tests in the Civil Engineering Laboratory of UNIJUÍ (LEC).

5. REFERENCES

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