

# Analisis Penurunan Struktur Revetment Metode Cerucuk Matras Bambu Di Atas Tanah Lunak Dengan Metode Analitis, Elemen Hingga, Dan Instrumentasi = Settlement Analysis of Revetment Structures Using Bamboo Mattress Pile Method On Soft Soil with Analytical Method, Finite Element, And Instrumentation

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## Abstrak

Tanah lunak merupakan salah satu jenis tanah yang sering kali menimbulkan permasalahan jika tidak dilakukan perencanaan yang baik. Salah satu alternatif untuk meningkatkan daya dukung tanah lunak adalah dengan memanfaatkan material bambu sebagai cerucuk dan matras pada pondasi struktur bangunan. Material bambu memiliki keunggulan yaitu jumlah yang melimpah, murah, umur panen singkat, ramah lingkungan, gaya buoyancy yang dapat dioptimalkan. Pada penelitian ini dilakukan perbandingan penurunan tanah antara metode analitis, elemen hingga dengan pengamatan instrumentasi lapangan pada suatu bangunan dermaga di tepi sungai Kapuas, Pontianak yang memanfaatkan cerucuk matras bambu sebagai perkuatan struktur pondasinya. Deposit tanah pada lokasi tersebut didominasi oleh tanah lunak hingga ketebalan 28 m dengan muka air tanah yang dangkal. Analisis penurunan dilakukan menggunakan metode analitis dan metode elemen hingga. Konstruksi struktur revetment dibuat secara bertahap mengikuti hasil observasi alat instrumentasi lapangan. Pada metode analitis penurunan elastis tanah dimodelkan sebagai material elastik sedangkan pada perhitungan penurunan konsolidasi menggunakan teori konsolidasi 1 dimensi. Pada analisis elemen hingga, lapisan tanah dimodelkan sebagai Mohr-Coulomb. Cerucuk bambu dimodelkan sebagai elastic-plastic spring. Matras bambu dimodelkan elastic beams. Dari hasil observasi instrumentasi dan perhitungan metode analitis dan elemen hingga didapatkan bahwa bangunan revetment dengan struktur cerucuk matras bambu memberikan kestabilan dari kelongsoran dan kegagalan daya dukung. Sehingga dapat disimpulkan bahwa pemanfaatan bambu sebagai struktur cerucuk dan matras untuk perkuatan tanah lunak dapat dilakukan dan mampu memberikan tambahan daya dukung untuk tanah lunak.

.....Soft soil is one type of soil that often causes problems if proper planning is not carried out. An alternative method to improve the bearing capacity of soft soil is by utilizing bamboo materials as piles and mattress in the foundation of a building structure. Bamboo material is chosen because of its advantages such as abundance, affordability, short harvesting period, environmental friendly, and buoyancy optimization. In this study, a comparison of settlement was conducted between analytical method, finite element method, and field instrumentation observations on a wharf structure along the Kapuas River in Pontianak, which utilizes bamboo mattress piles as soil reinforcement. The soil deposit at the site is predominantly soft soil up to 28 m for the thickness with shallow groundwater levels. Settlement analyses were performed using analytical method and finite element method. The construction of the revetment structure was done gradually following observations from instrumentation. In the calculation of elastic settlement using analytical methods, the soil is modelled as an elastic material whereas in the calculation of consolidation settlement the soil is modelled using one dimensional consolidation theory. In the finite element method, the soil layers were modelled as Mohr-Coulomb materials. Bamboo piles were modelled as elastic-plastic springs, while bamboo mattress were modelled as elastic beams. From the instrumentation observations and analytical and

finite element method, it was found that the revetment structure with bamboo pile and mattress provided stability against sliding and failure of bearing capacity. Thus, it can be concluded that the use of bamboo as piles and mattresses for reinforcing soft soil can be carried out and provides additional support for soft soil.