

FECON
Listen to the Earth, Conquer the Height

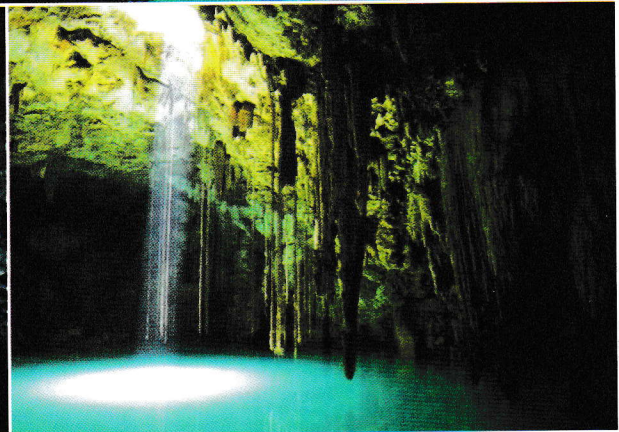
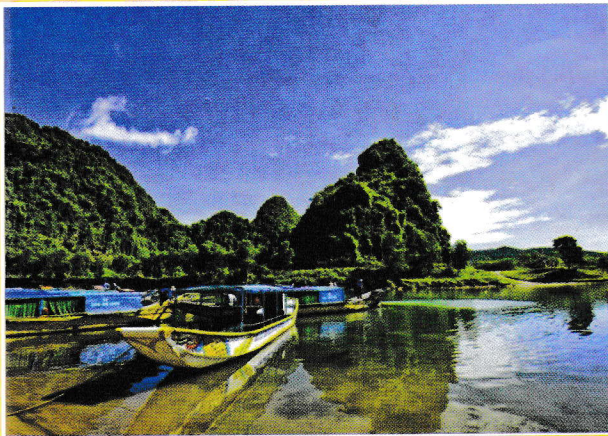


**TECHNICAL
WORLD**



**PROCEEDINGS OF THE 4th INTERNATIONAL CONFERENCE
VIETGEO 2018, QUANG BINH, 21-22 SEPTEMBER, 2018**

**GEOLOGICAL AND GEOTECHNICAL
ENGINEERING IN RESPONSE TO CLIMATE CHANGE
AND SUSTAINABLE DEVELOPMENT OF INFRASTRUCTURE**



SCIENCE AND TECHNICS PUBLISHING HOUSE

SESSION 2
**GEOTECHNICS FOR SUSTAINABLE DEVELOPMENT
 OF INFRASTRUCTURE**

Physical scale model of horizontal water collecting system for weirs in the Northwest Vietnam <i>Nguyen Huy Vuong, Nguyen Chi Thanh, Pham Tuan, Tran Van Quang, Le Vu Minh, Vu Ba Thao, Bui Truong Son</i>	101
Settlement of saturated clay layer subjected to cyclic loading with a wide range of loading periods <i>Hiroshi Matsuda, Tran Thanh Nhan, Hiroyuki Hara</i>	110
A case study on the determination of the excavated trench depth in unsaturated soil constructed by open trench method without supporting structures <i>Nguyen Xuan Man, Le Van Hung, Kenneydy Chibuzor ONYELOWE</i>	121
A method of evaluation of wave loads acting on vertical pier with non-prismatic section in the deep sea <i>Dang Xuan Truong, Dau Van Ngo, Le Van Nam</i>	130
Classifying the foundation structure for sustainable planning and development of Hanoi urban center <i>Tran Manh Lieu, Nguyen Huy Phuong, Duong Thi Toan, Tran Thi Luu, Nguyen Van Vu, Nguyen Van Thuong, Nguyen Ngoc Truc</i>	135
Establishing geology engineering map of the Hai Tinh area for planning of eco-social sustainable development <i>To Hoang Nam, To Xuan Vu</i>	142
Application of acoustic waves for assessment of excavation damaged zone for underground construction in rock mass <i>Hoang Dinh Phuc, Chu Viet Thuc</i>	149
Calculating the large two-way batter bearing pile foundation for pillar supported dam <i>Tran Van Thai, Nguyen Dinh Truong</i>	160
Influence of embankment height and soil parameters on piled embankments by 3D numerical simulation <i>Pham Van Hung, Vu Minh Ngan</i>	172
Application of transformation theory of engineering geological properties of soils to determine the distribution of Hai Hung formation in the Hanoi area <i>Ta Duc Thinh</i>	180
Analysis of metal pollution in groundwater of Pleistocene aquifer in Ho Chi Minh city, Vietnam <i>Tran Thi Phi Oanh, Nguyen Viet Ky, Dau Van Ngo, Ho Chi Thong, Mai Hoang Phuc , Nguyen Thi Ngoc Thuy</i>	184
Evaluation of the operating capacity of ports based on the analysis of hydrodynamics and the erosion - accretion regulation of the coastal areas in the North Vietnam <i>Nguyen Huy Phuong, Duong Van Binh, Nguyen Huy Quang</i>	195
Characteristics of cyclic deformation phases of soils distributed in the urban area of Hanoi for seismic design <i>Nguyen Van Phong</i>	201
The sand-cement-lime column method for soil improvement: A case study in Tay Thai Thuy High school, Thai Binh province <i>Ta Duc Thinh, Nguyen Duc Ly</i>	207

INFLUENCE OF EMBANKMENT HEIGHT AND SOIL PARAMETERS ON PILED EMBANKMENTS BY 3D NUMERICAL SIMULATION

Pham Van Hung, Vu Minh Ngan

Hanoi University of Mining and Geology, Vietnam.

Corresponding author' Email: phamvanhung@khoaxaydung.edu.vn

Abstract: Piled embankment is a soil improvement method widely used in highway, railway and industrial storage tank projects all over the world. Although many soil mitigating methods have been applied recently in road projects in Vietnam, piled embankment still is a state-of-the-art soil improvement technique which can have a significant economic benefit. This paper investigates the behavior of the piled embankment based on a 3D numerical simulation with a typical geo-condition in Tan Vu - Lach Huyen highway in Hai Phong, Vietnam. The analyzed results in the reference case show the efficiency of the method in terms of load transfer and settlements. The influence of height embankment on both the arching effect and soft soil and embankment displacements is studied. Additionally, the change in soil properties, which are the friction angle of embankment and the pre-consolidation pressure of soft soil, are taken into consideration. The numerical results figure out that the pile efficacy increases with a rising embankment height as the ratio H/s is lower than 0.5, and it then declines with an increasing embankment height as the ratio H/s is larger than 0.5. While the friction angle of embankment fill affects the arching effect, the pre-consolidation pressure of soft soil influences the settlements.

Keywords: piled embankment; settlement; embankment height; friction angle.

1. Introduction

Piled embankments have been widely used in highway projects, railways, oil tanks, buildings, retaining walls and wind turbines in Chen et al., 2008. This system consists of a soft soil reinforced by rigid piles that is covered by an embankment fill, and a geosynthetic (optional). The surcharge and embankment loads are transferred to the piles and the soil foundation, as can be seen in Fig. 1. Due to either the significant larger stiffness of the pile than that of the ground or shearing effect inside the embankment, the shear stress increases the pressure acting on the pile heads and reduces the pressure on the soft soil layer. This load transfer mechanism is namely as 'arching effect'. The large part of load, therefore, is carried by the piles. The remaining part of load is applied to the subsoil, which leads to a reduction of the embankment and soft soil settlements. This method has some advantages compared to other methods,

such as a decrease in settlements, the reduced construction time (not necessary for waiting for the consolidation during the construction), and the reasonable cost by Magnan, 1994.

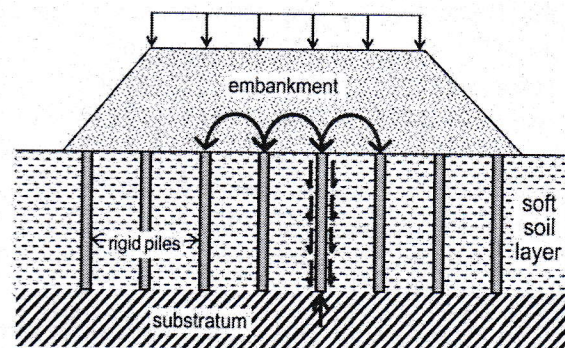


Fig. 1. Sketch of an embankment reinforced rigid piles and soil arches by Hassen et al., 2009

In order to assess the bearing capacity of the system (soil arching), an indicator of the efficacy of pile support (pile efficacy, E) is normally employed. It is defined as the proportion of the