Arun Prabmak 2009: Post-Surcharge Secondary Settlement of Soft Bangkok Clay: A Case Study of Bangkok-Chonburi Highway Construction. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Mr. Barames Vardhanabhuti, Ph.D. 229 pages.

The construction of Highway 7 (Bangkok–Chonburi) by using Prefabricated Vertical Drain (PVD) together with surcharge has accelerated the rate of primary settlement (S_P) during construction. But the efficiency of surcharge technique with PVD with soft clay in Thailand is still unclear. If σ'_{vf} has value that is closed to σ'_{vs}, may result in the continous settlement of clay because of high secondary settlement (S_S), therefore, further study on the long term settlement behavior and the parameter values are needed for suitable surcharge. The study of using surcharge technique with PVD has been studied in the field by SPT and field vane shear test. Piezometers were installed at kilometer 6+650 and elevated road surfaces were measured to determine the settlement value at kilometers 16+516 to 17+100. As for laboratory test, engineering index test and oedometer surcharging test were used to find the suitable effective surcharge ratio (R'_s) by performing at R'_s = 0, 0.2, 0.3, 0.4, 0.6, 0.8 and 1.0 with value of σ'_{vs} = 95 - 306 kPa and σ'_{vf} = 85 - 255 kPa.

The result of the research has unveiled that, for soft Bangkok clay, the value C_c = 0.4 - 2, C_α/C_c = 0.036, c_v = 0.3 - 2 m^2/year, c_{vs} = 2 - 30 m^2/year. Settlement observation after 12 years construction resulted at 0.65-0.80 m. Data from piezometers within 1 year found no change in pore water pressure in the soft clay layer. The settlement analysis after the highway has been opened for 25 years; in the first case where surcharge technique and PVD have not been used, has the highest settlement magnitude ($c_{v(field)} = 10c_{v(lab)}$) equals 1.20 m, resulted from S_P = 94 % (1.13 m) and S_S = 6 % (0.07 m), where as the lowest settlement magnitude ($c_{v(field)} = 26c_{v(lab)}$) is equals to 0.74 m, resulting from S_P = 78.4 % (0.58 m) and S_S = 21.6 % (0.16 m). The majority of the settlement resulted from S_P of the very soft clay and soft clay layer. In the second case, where PVD was used but without the surcharge technique (R'_s = 0), the highest settlement magnitude ($c_{v(field)} = c_{v(lab)}$) resulted from S_P = 75 % (0.45 m) and S_S = 25 % (0.15 m); the majority of settlement occurred from S_P of the clay layer underneath the PVD. The lowest settlement magnitude ($c_{v(field)} = 26c_{v(lab)}$) resulted from S_P = 26.4 % (0.10 m) and S_S = 73.6 % (0.28 m); the majority of settlement caused by S_S in every clay layers. In the third case, where PVD has been used with surcharge technique (R'_s = 0.2, 0.3, 0.4, 0.6, 0.8 and 1.0), the highest settlement magnitude ranges from 0.15 to 0.26 m ($c_{v(field)} = c_{v(lab)}$) resulting from S_P of the clay layer underneath the PVD, but in the case where at $c_{v(field)}$ = 10, 18 and $26c_{v(lab)}$, there is hardly no settlement of clay in every R'_s

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