Chapter 6

Comparison of Analysis with FLAC Analysis and Experimental Test

6.1 Introduction

This chapter compares the results formulated for the tube with an apron attached and constant cross-sectional area with a FLAC analysis performed by another graduate student, Meeok Kim, and with experimental data obtained by FitzPatrick et al. (2001).

FLAC (Fast Lagrangian Analysis of Continua) is a program that uses the Finite Difference Method in order to model the behavior of a system. It was developed to analyze geotechnical applications. In Meeok's analysis, the self-weight of the tube was neglected, but many other variables were introduced, which were neglected here. The fact that the material stretches was a variable that was considered. The modulus of elasticity used was 0.12 GPa. Other variables considered were the bending stiffness of the tube, the friction between the tube and the foundation, and deformation of the foundation. The analysis was carried out using Version 4.0 of FLAC.

Many tests were conducted by FitzPatrick et al. (2001) on a tube with an apron attached. Only one test is compared to the results of this study. The case of a 12 in. apron length is considered. Measurements of the tube's deformation were taken at external headwater heights of 3, 6, and 9 inches. The initial internal hydrostatic pressure was measured to be 0.47 m and the circumference of the tube was 1.4732 m. The present analysis and Meeok's analysis were performed using these parameters, and results are shown in the following sections.

6.2 Comparison of Data

Consider Figures 6-1 through 6-3, where the results of this study are plotted along with the results of the FLAC analysis and experimental data. The vertical tangent on the side opposite of the headwater was used as the reference point when plotting the results.

From the graphs, it is evident that the results of this study closely match the results of the analysis using FLAC and the experimental test. There is some variability when comparing the results of the experimental test with the present analysis. This may be mainly due to error present during the measurement process.

Since the results from this study are almost identical to the FLAC analysis results, neglecting friction and bending stiffness and assuming the tube was inextensible were valid assumptions made during the derivation process. Meook did consider a deformable foundation; however, its effect was almost negligible in her results.

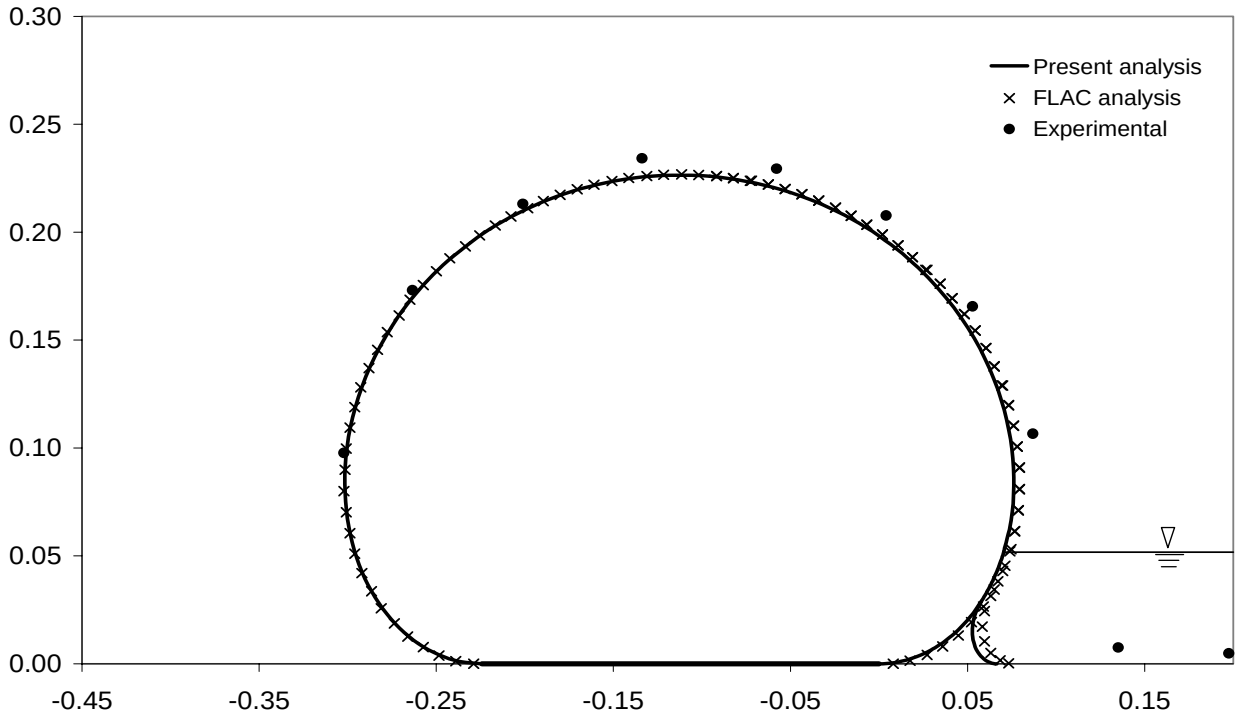

Figure 6-1: Tube with Apron Attached: initial hint = 0.31903, hext = 0.05172 (3 in.)

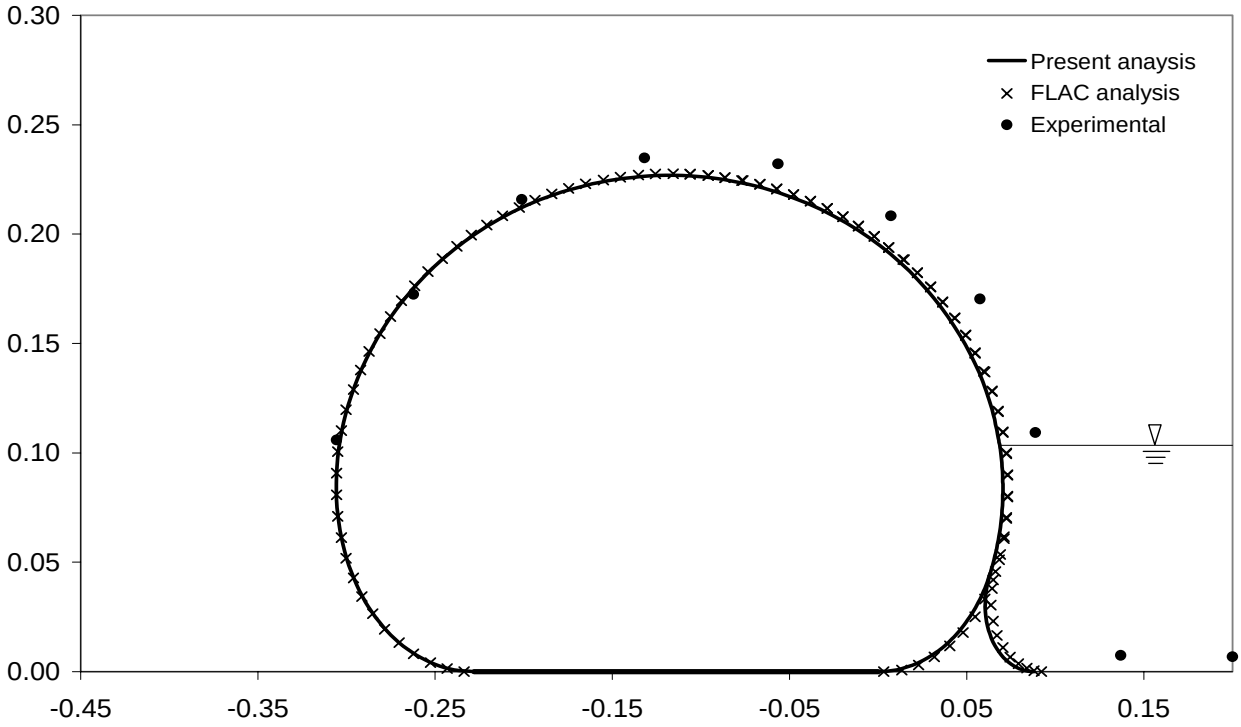

Figure 6-2: Tube with Apron Attached: initial hint = 0.31903, hext = 0.10345 (6 in.)

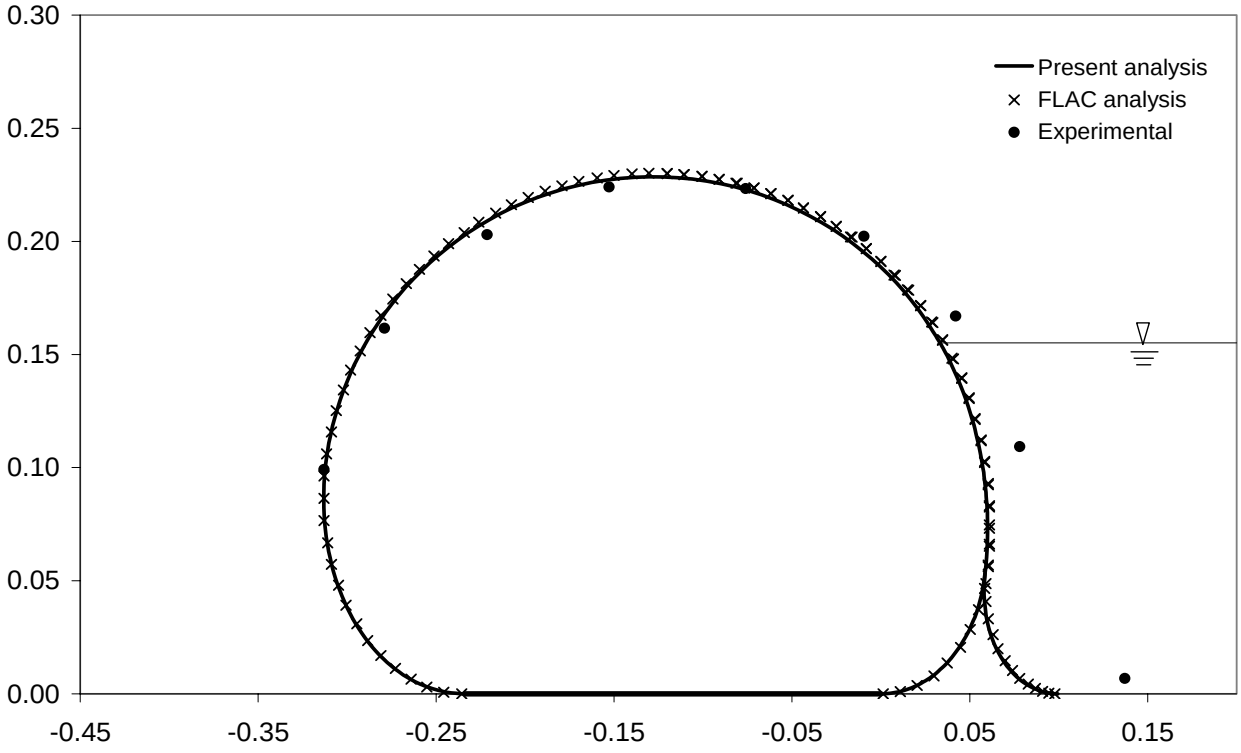

Figure 6-3: Tube with Apron Attached: initial hint = 0.31903, hext = 0.15517(9 in.)