Appendix V – Tests in Laponite Test Bed

Introduction

As a precursor to the tests in the kaolin and sand-bentonite test beds, the model generic anchor was drag embedded into a laponite test bed. Laponite is a translucent gel (Figure V.1); thus, drag tests in laponite provides a quick, simple means of verifying that the model anchors would in fact self-embed during dragging. In addition to direct visual observation, video recordings were taken and divided into sequential images which were digitally processed to provide graphical outputs of anchor trajectory. Since laponite is not an actual soil, the results were considered to provide qualitative insights into the kinematic behavior of the anchors during drag embedment.

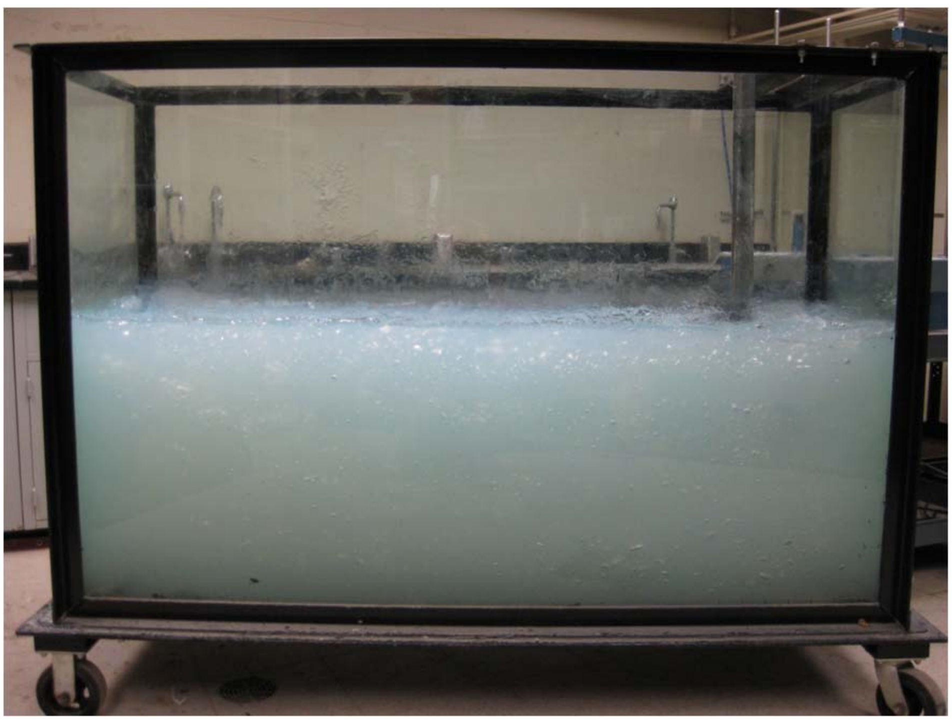

Figure V.1. Laponite Test Bed.

Testing

Two anchors were tested in the laponite test bed, having 30-degree and 50-degree fluke-shank angles, respectively. The 30-degree fluke-shank angle anchor did not successfully embed. By contrast, the 50-degree fluke-shank anchor shown in Figure V.2 successfully embedded.

Figure V.3 shows an example sequence of images of the 50-degree anchor as it traversed its trajectory. The anchor tests utilized a 1/16-inch diameter wire line.

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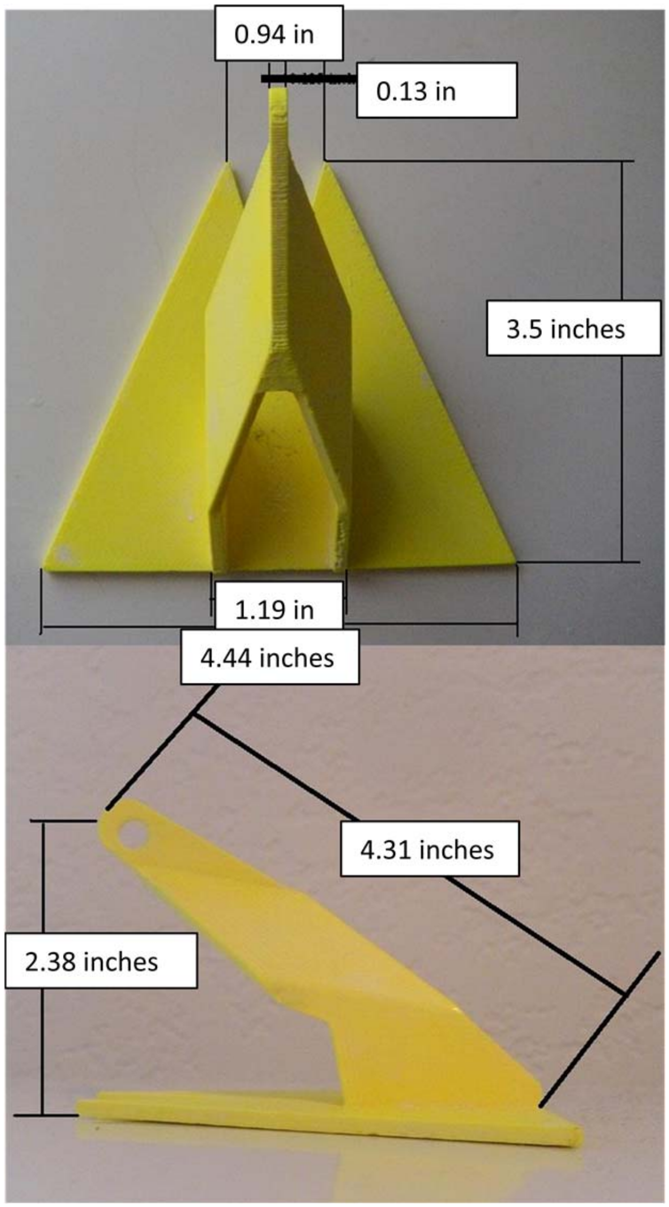

Figure V.2. 50-degree Fluke-Shank Angle Model (Original) Anchor Used in Laponite Test Bed Studies.

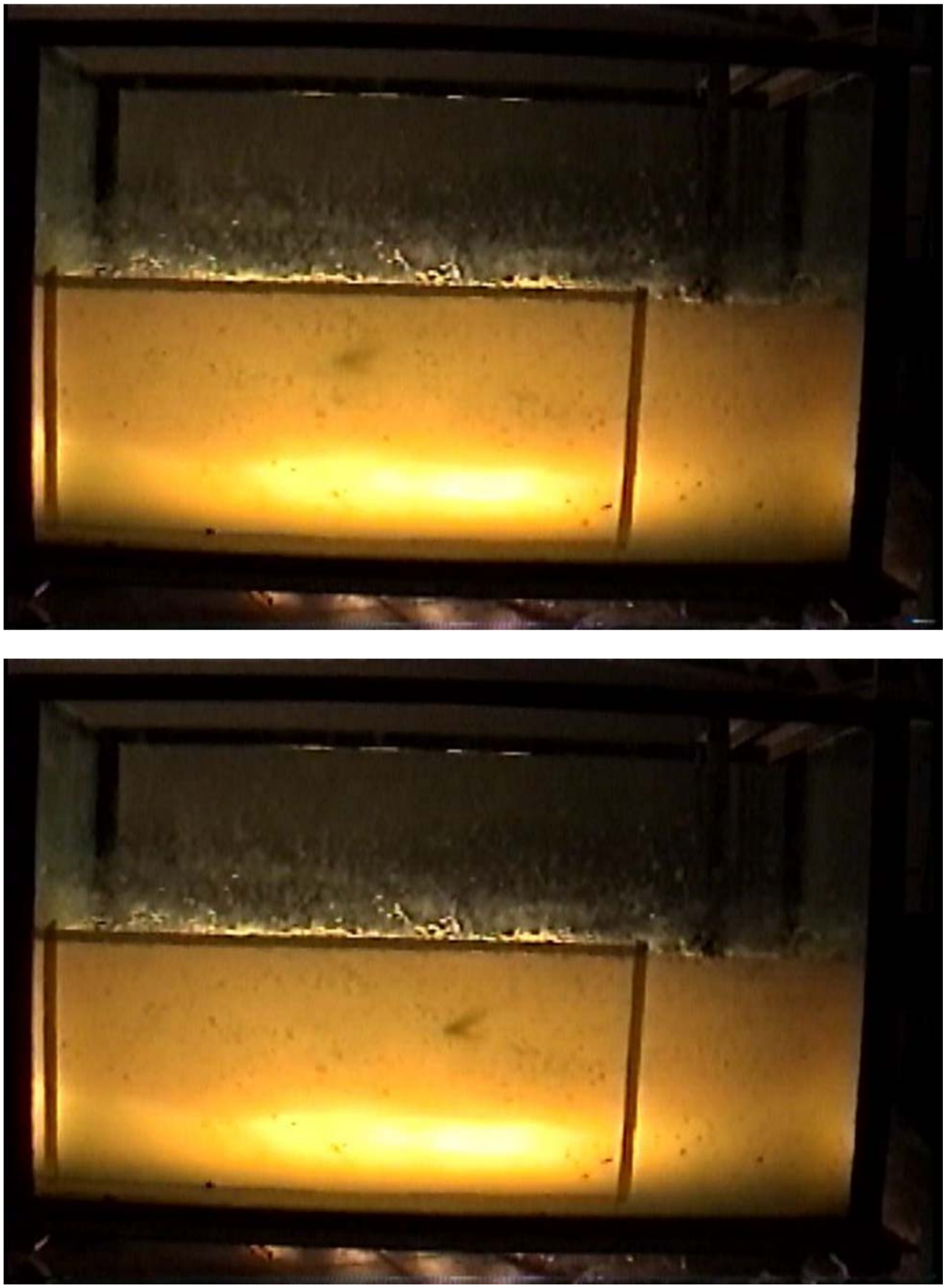

Figure V.3. Anchor Image in Trajectory Test 1.

Digital Processing of Images

Strictly speaking, the intent of the testing in laponite was to provide a rapid means of qualitatively determining the adequacy of the model anchors. However, videos taken during the drag embedment tests could be processed to provide plots of the anchor trajectory. Figure V.4 shows the trajectories of the anchor fluke for three test repetitions of drag embedding a 50-degree anchor obtained by processing of the images extracted from the experimental footage. Firstly, the measured trajectories indicated that the generic model anchor proposed for subsequent testing in soils would properly self-embed during drag embedment. Secondly, the superimposed trajectories for the three tests were in reasonable agreement with one another. Accordingly, the anchor appeared sufficiently stable to ensure a reasonable degree of repeatability in the tests.

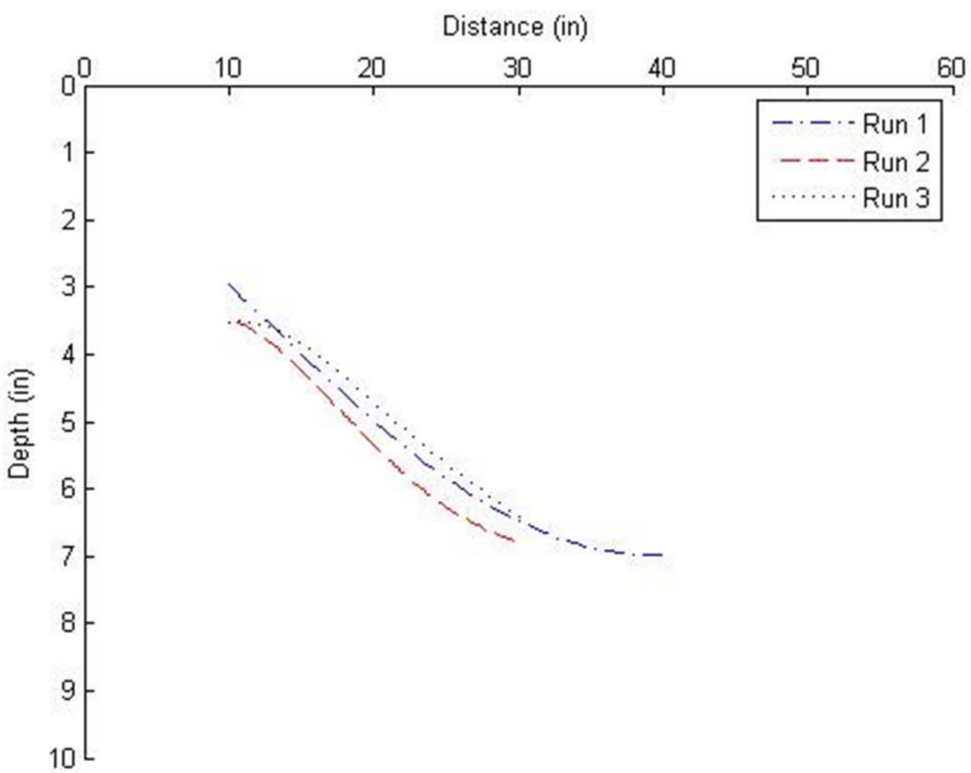

Figure V.4. Processed Anchor Trajectories from Three Drag Embedment Tests on a 50-Degree Fluke-Shank Angle Anchor.

Conclusions

The test results from the laponite test bed indicated the following:

1. This test approach provides a quick, simple means for qualitative evaluation of anchor kinematic performance.
2. Digital processing of images from video footage yield useful plots of anchor trajectory during drag embedment. These plots were useful in establishing that test repeatability could be insured, in addition to establishing that the model anchors would self-embed during dragging.
3. The tests suggested the 50-degree fluke-shank anchor model would perform adequately. By contrast, the laponite tests indicated that the 30-degree fluke-shank version of the anchor would experience minimal embedment. It is noted that the outcome of subsequent small-scale testing in kaolin and large-scale testing in sand-bentonite was generally consistent with the experience in the laponite test bed. Accordingly, testing in laponite can be considered as reasonably reliable screening tool to obtain a preliminary assessment of anchor performance.