

# Chapter 1

## INTRODUCTION

In this study, the effects of adjacent inclined rock face on earth pressure at-rest is studied. In traditional, earth pressure at-rest behind a non-yielding retaining wall is estimated with Jaky's Formula. However, if the retaining wall is constructed adjacent to inclined rock face as shown in Fig. 1.1, the rock face intrudes the backfill. In this figure, the inclined rock face is excavated near the bridge abutment, and soil backfill is filled between the abutment and the rock face. Fig. 1.2 shows the basement walls near inclined rock faces. Fig. 1.3 shows the hopper of the storage silo with granular material. Under these conditions, Can Jaky's formula be used to evaluate the earth pressure at-rest on the abutment and basement walls? Would the distribution of earth pressure at-rest still be linear? The distribution of earth pressure at-rest on retaining structures adjacent to an inclined rock face will be discussed in this study.

### 1.1 Objective of Study

The NCTU model retaining wall was used to study the effects of adjacent inclined rock face on earth pressure at-rest. A steel interface plate was designed and constructed to the inclined rock face. Air-dry Ottawa sand was backfill material for a loose backfill, Ottawa sand was air-pluviation into the soil bin. To achieve a dense backfill, two vibratory compactors were used to densify the backfill. The parameters considered for this study are the following: (1) Relative density,  $D_r = 35\%$  for loose sand and  $D_r = 72\%$  for compacted sand; (2) The rock face inclination angles  $\alpha = 0^\circ$ ,

45°, 60°, 70° and 80° as shown in Fig.1.4. The height of the model wall  $H = 1.5\text{m}$ . The distribution of lateral earth pressure is measured with the soil pressure transducers on the model wall. Based on experimental results, the distribution of earth pressure adjacent inclined rock face will be obtained. For loose sand, the test results are compared with Jaky's theory. For compacted sand, the experimental data are compared with Jaky (1944), Peck and Mesri (1987), Chen (2002).

## 1.2 Research Outline

The subjects discussed in the thesis are summarized as follows. A review of theories and experimental findings associated with lateral pressures are introduced in Chapter 2. The Experimental apparatus for this study are discussed in Chapter 3. A steel interface plate was developed to simulate inclined rock face. The details of the steel interface plate and its supporting system are discussed in Chapter 4. Chapter 5 introduces the properties of backfill and the distribution of density in the soil bin. The interface characteristics between the backfill and sidewall, model wall, and interface plate are also described in Chapter 5. Chapter 6 reports the experimental results regarding on earth pressure at-rest for loose sand. The inclination angles for testing include 0°, 45°, 60°, 70°, and 80°. Chapter 7 discusses the distribution of lateral earth pressure at various inclination for dense sand.