

Appendix A

Calibration of Soil Pressure Transducer

The pressure acts between soil particles and the transducer is quite different from the pressure that acts between liquid and transducer. It is necessary to calibrate the soil pressure transducer in an environment similar to that of the actual testing condition. A special system was designed for the calibration of the strain-gage type soil-pressure transducers. The system consists of the calibration device, the controlled air-pressure system, signal conditioner, and the sensor data acquisition system, as indicated in Fig.A.1.

The calibration device is a shallow cylindrical chamber with an inner diameter of 400 mm and a height of 30 mm. The chamber is made of a solid steel plate, which is the same material as the model retaining wall. The soil-pressure transducer was inserted through the bottom of the chamber. It is important that the surface of the sensor was installed flush with the upper face of the chamber. To simulate the interface between the sand particle and soil pressure transducer, 10 mm-thick sand layer was poured into the calibration device over the transducer. Then a 0.2 mm-thick rubber membrane was placed over the sandy layer. As indicated in Fig.A.1. A uniformly distributed air-pressure was applied on the membrane, over the soil particles, and transmitted to the transducer. The output voltage of the transducer was found to increase linearly with the increase of applied pressure.

A rubber O-ring was arranged to prevent air leakage between the chamber and the cap. It should be noted that the air pressure applied for the calibration of

transducer should be consistent with the operating pressure range for model wall experiments. For this study, the transducers were calibrated for the pressure range of 0 to 10 kPa. To reduce the effect of sidewall friction, the thickness of sand layer in the chamber should be limited, so that the side-friction between the sand the sidewall of the chamber could be minimized. Fig.A.2 to Fig.A.7 shows the test results of the soil pressure transducers calibrated without the compressible layer. Table A.1 is a summary of the calibration factors of each soil pressure transducer without the compressible layer.

