



An Equipment to Measure the Freezing Point of Soils under Higher Pressure

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Soil freezing point is the highest temperature at which ice can be presented in the system and soil can be referred to as frozen. The freezing temperature of soil is an important parameter for solving many practical problems in civil engineering, such as evaluation of soil freezing depth, prediction of soil heaving, force of soil suction, etc. However, as the freezing temperature is always affected by many factors like soil particle size, mineral composition, water content and the external pressure endured by soils, to measure soil freezing point is a rather difficult task until now, not to mention the soil suffering higher pressure. But recently, with the artificial freezing technology widely used in the excavation of deep underground space, the frozen wall thickness is a key factor to impact the security and stability of deep frozen wall. To determine the freeze wall thickness, the location of the freezing front must be determined firstly, which will deal with the determination of the soil freezing temperature. So how to measure the freezing temperature of soil suffering higher pressure is an important problem to be solved. This paper will introduce an equipment which was developed lately by State Key Laboratory of Frozen Soil Engineering to measure the freezing-point of soils under higher pressure. The equipment is consisted of cooling and keeping temperature system, temperature sensor and data collection system. By cooling and keeping temperature system, not only can we make the higher pressure soil sample's temperature drop to a discretionary minus temperature, but also keep it and reduce the heat exchange of soil sample with the outside. The temperature sensor is the key part to our measurement, which is featured by high precision and high sensitivity, what is more important is that the temperature sensor can work in a higher pressure condition. Moreover, the major benefit of this equipment is that the soil specimen's loads can be loaded by any microcomputer control electron universal testing machines. All of above mentioned advantages of this equipment ensures one to catch up the moment soil turns from the thawed state into ice and enable one to determine the freezing point experimentally by recording the temperature-time history (cooling curve) at particular points within the sample used for analysis. Therefore, this equipment has excellent characteristics such as compact construction, convenient operation, high reliability and the measuring accuracy.

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