

## 青藏高原典型冰碛土的物理力学特性研究

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## PHYSICAL AND MECHANICAL PROPERTIES OF TYPICAL MORaine SOIL ON THE QINGHAI-TIBET PLATEAU

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**摘要** 在被称为世界屋脊的青藏高原,更新世全球冰河期发生了多次冰川作用,留下了大量冰川遗迹。作为冰川遗迹之一的冰碛土,属于特殊的工程岩土,具有成分复杂、结构混杂、物理力学性质变化大的特点,容易和坡积物、残积物等第四系堆积物混淆。在建的亚丁机场位于稻城海子山,场地地基土为稻城冰帽消融所形成的冰碛土,具有青藏高原冰碛土的典型性。为了掌握冰碛土的特殊物理力学性质,揭示其与冰川演化之间的关系,通过对亚丁机场场道地基的勘察,完成了典型冰碛土粒度成分分析、现场及室内物理力学性质测试,以及冰碛土ESR测年。研究表明,亚丁机场场址的冰碛土形成于 $37 \pm 5$ ka B.P.; 由于大小混杂、颗粒级配良好( $C_u=8.05, C_c=1.09$ ),在后期多次冰川的压实作用下,表现出密度高、空隙比小、地基变形模量和承载力高的特性,平均前期固结压力达到290kPa,可作为高原重大工程的天然良好地基。

**关键词:** 青藏高原 冰碛土 物理特性 力学特性

**Abstract:** There were many times of glacial actions during the pleistocene global ice ages in the Qinghai-Tibet Plateau that is well-known as the roof of the world, leaved a lot of glacial traces. The moraine soil belongs to the special engineering soils, which has complicated composition, mixed structure and changeable physical and mechanical properties. The moraine soil is usually confused with diluvium and eluvium. The site of constructing Yading airport is located at Daocheng Haizi Mountain. Its foundation soil is a typical Qinghai-Tibet Plateau moraine soil, and stacked up after the Daocheng ice cap melt. In order to master the moraine's special physical and mechanical properties, and reveal the relationship between moraine's properties and the glacier evolution, the composition analysis, physical and mechanical properties testing, and ESR dating were carried out during the Yading airport foundation survey. Research shows that the moraine soil of Yading airport, stacked up during  $37 \pm 5$ ka BP and compacted by the glacier, has the characteristics of higher density, lower void ratio, higher foundation deformation modulus and bearing capacity. Moraine soil belongs to the over-consolidated soils (average preconsolidation pressure is about 290kPa) and can be used as a good natural foundation of major engineering in the Qinghai-Tibet Plateau.

**Key words:** Qinghai-Tibet Plateau Moraine soil Physical properties Mechanical properties

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