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Development of a novel plane strain test apparatus for frozen soils

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Abstract:

In this paper, a novel apparatus enable of high controlling accuracy of temperature was developed for plane strain test of frozen soils. A cryostat was used to control test temperature. To improve temperature distribution uniformity of frozen soil specimens, two guiding plates were installed into the cryostat to force cooling air distribute uniformly surround specimen. According to test results, the temperature difference between different monitored points and average temperature can be controlled at ± 0.2 °C. By taking Chinese standard sand as study object, compression tests under different axial strain rates were conducted. The images on the surface with strain restrained were captured during loading process, and strain localization evolution was analyzed with PIV technique. It was indicated that, with decrease of strain rate, shear band inclination and width do not change notably, while the strain field distributes more uniformly and concentration of which was decreased.

Keywords:

Frozen soils; novel apparatus; plane strain test; strain localization.

1. Introduction

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