Damage analysis of the characteristics and development process of thermosyphon embankment along the Qinghai-Tibet Highway

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Abstract: To analyse the damage characteristics of thermosyphon embankments in a permafrost region, the Qingshui River section along the Qinghai-Tibet Highway (QTH) was used as a case study in which a field investigation and drilling were performed. The field soils were sampled, and their water content, dry density and compaction degree were tested in the laboratory. Based on the measured temperature data of the thermosyphon embankment, damage characteristics and possible associated causes were analysed. The major damage found in thermosyphon embankments was a longitudinal crack, which developed 1.0 to 2.0m away from the thermosyphon. In partial sections, waves and other damage also occurred. The damage was primarily attributed to the non-uniform temperature distribution, which resulted in a non-uniform distribution of the mechanical properties of the embankment filling .Under a heavy traffic load, stress concentration phenomena occurred at the freezing-thawing interface that gradually developed into a longitudinal crack with increased highway operation. The embankment damage history, rainfall

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