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水泥稳定碎石强度特性及设计标准

The Strength Properties and Design Criteria of Cement Stabilized Crushed Rock

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关键词:

路面工程; 水泥稳定碎石; 强度特性; 强度设计标准; 疲劳断裂; 垂直振动试验方法; Pavement Engineering; Cement Stabilized Crushed Rock; Strength Properties; Strength Criteria; Fatigue Cracking; Vertical Vibration Compaction Method

摘要:

开裂破坏是水泥稳定碎石基层工程实践中最大问题, 而强度特性及强度标准是影响水泥稳定碎石基层开裂关键因素之一。为了缓解水泥稳定碎石开裂破坏, 振动(VVCM)成型试件研究了水泥剂量、级配类型和密度等对水泥稳定碎石强度影响规律, 分析了施工期和运营期基层荷载响应和疲劳累积损伤, 提出了控制开裂破坏的水泥稳定碎石强度设计标准。结果表明: VVCM试件强度测试精度高达93%; 当水泥剂量 ≥ 5%时, 增加水泥剂量对提高水泥稳定碎石强度效果有限, 且不利于材料抗裂性能; 与悬浮密实级配相比, 采用骨架密实级配可提高强度10%; 压实度提高1%, 水泥稳定碎石强度提高约11%; 为防止设计年限内基层在施工车辆和运营车辆反复作用下产生疲劳断裂, 建议水泥稳定石灰岩碎石7 d无侧限抗压强度不低于7.0 MPa。实体工程应用表明, 本成果能较好地解决水泥稳定碎石基层开裂问题。

Cracking has proven to be the major failure in cement stabilized crushed rock (CSCR) base. The lack of strength and insufficient anti-cracking, which are related to the strength properties and design criteria of CSCR, are two main causes for cracking in CSCR. In order to reduce cracking in CSCR base, the objective of this study is to investigate the influence of cement content, gradation and compaction degree on the strength properties of CSCR with vertical vibration compaction method (VVCM) in Laboratory and the load response and fatigue cumulative damage of CSCR base, and then provide a design criterion to control the cracking of CSCR. The results from this study indicate that: 1) the strength of VVCM specimens is 0.93 times of core samples strength; 2) when cement content is more than 5%, the strength of CSCR will not increase significantly with cement content, but anti-cracking performance will decrease significantly; 3) with compaction degree rise of 1%, the ultimate strength of CSCR can be increased by 11% ;4) compared with CSCR of suspended-dense type, the ultimate strength of CSCR of dense framework type can be increased by 10%; 5) in order to prevent fatigue cracking of CSCR base under repeated vehicles load during design period, the recommended minimum 7-day unconfined compressive strength of stabilization of crushed limestone is 7.0 MPa. Actual engineering

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