Kansas Department of Transportation

TECHNICAL SUMMARY

Software for Load Distribution on Low-Fill Box Culverts: User's Manual

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Introduction

Reinforced concrete box culverts have mostly been installed at shallow depths under roadways for drainage. The effect of traffic loads on the shallowly buried culverts is more significant than that on culverts at greater depths. The distribution of traffic loads onto the culverts is used to determine the rating factors of these structures.

Project Description

The American Association of State Highway and Transportation Officials (AASHTO) provides three methods of load rating: 1. Allowable Stress Rating (ASR); 2. Load Factor Rating (LFR); and 3. Load and Resistance Factor Rating (LRFR). The Load Factor Design (LFD) method and the Load and Resistance Factor Design (LRFD) method have been mostly used by Departments of Transportation (DOTs) to load rate the buried culverts. The LFD method considers the wheel load acting as a point load on fill, which is distributed onto a square area on the culvert with a width of 1.75 times the fill depth above the culvert. The LRFD method suggests the wheel load be applied on a rectangular area as a tire footprint and distributed onto the culvert by increasing the tire footprint by 1.15 times the fill depth.

Project Results

The stress distribution program developed in this project used an improved load distribution method proposed by Han, Acharya, Parsons, and Khatri (2013). This method considers the effect of pavement type and pavement layers on the load distribution. This method was used to calculate the Equivalent Live Load Distribution Factor (ELLDF) based on the LFD and LRFD methods. This program considers the type of pavement, thicknesses, and elastic moduli of pavement layers, and 16 types of design trucks. This program computes the ELLDF for distributed loads, the distributed stress, and the distributed area on the buried box structure, which can be input into the current AASHTO design software and enable the software to consider the pavement effect on the live load distribution onto the buried box culvert.

Project Information

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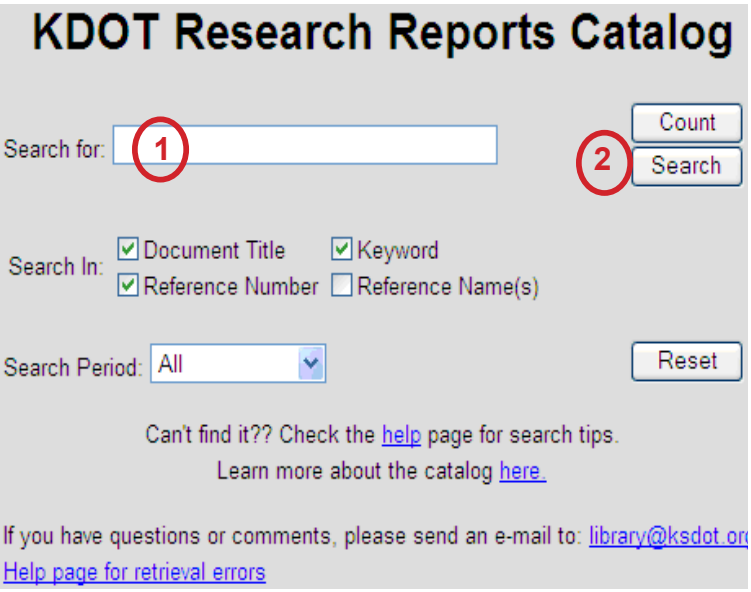

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