



Transportation Consortium of South Central States

Key Points

Project Number:
17STUNM03

Start Date:
05/08/2017

End Date:
11/08/2018

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Funds Requested to UTC:
\$94,000

Funding Source(s):
Tran-SET
University of New Mexico

Total Project Cost:
\$188,000

Cost-effective Methods to Retrofit Metal Culverts Using Composites

Brief Project Description

The proposed investigations include conducting a literature search of rehabilitation costs and materials for metal culverts, developing a culvert database with the help of New Mexico Department of Transportation (NMDOT) including the characteristics of existing metal culverts in New Mexico, and testing the use of GFRP for culvert rehabilitation.

Problem Statement

Metal culverts have served as a common structural element in highway design since the mid 1950's because of their low initial cost, ease of fabrication and simple construction method. There has been an epidemic of corrosion of metal culverts for the last decade. Such corrosion results in loss of cross-section and occasionally leads to structural failure of the culvert. Numerous failures have taken place imposing a high cost with the need to rebuild many culverts in addition to significant indirect costs associated with highway closure. While the expected life span of metal culverts is around 50 years, the literature reports that most metal culverts survived no longer than 30 years before the need for repair and retrofit specifically because of corrosion. Currently, corroded metal culverts are repaired using a corrugated steel liner with a grouting material or using shotcrete material. Both techniques are still prone to corrosion and degradation as steel liners would start to corrode after getting in touch with the corroding metal culverts and shotcrete will lose its roughness with water flow. Hence, there is an immediate need to develop a cost-effective corrosion-free technique to retrofit corroding metal culverts.

Objective

The objective of the proposed study is to develop and design a cost-effective technique for retrofitting corroded metal culverts using Glass fiber reinforced polymers (GFRP) materials. Furthermore, all tasks will be conducted in close collaboration with the New Mexico Department of Transportation (NMDOT) to ensure the design of the proposed retrofitting technique meets New Mexico's needs. A lifecycle cost-benefit analysis will also be conducted for selecting the most suitable retrofitting technique to be used in New Mexico.



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Intended Implementation of Research

The PIs will coordinate all the work with NMDOT. A culvert database will be developed with the help of NMDOT including the characteristics of existing metal culverts in New Mexico, and testing the use of GFRP for culvert rehabilitation. During the implementation phase, one corroded metal culvert from the database will be selected. The design of GFRP retrofit of this metal culvert will be conducted and communicated with NMDOT.

Anticipated Impacts/Benefits of Implementation

It is expected that the proposed technique will extend the service life of metal culverts to at least 75 years, thereby decreasing repair and maintenance costs significantly.

Weblinks:

<http://transet.lsu.edu/research/research-in-progress/>

<https://rip.trb.org/view/1467522>