

Security Manual for Covered Bridges

Covered bridges are unique structural systems. Typically designed and constructed in the mid- to early 1800s, covered bridges were originally devised as a way of extending the service life of bridges. This need resulted from the fact that original timber bridges were constructed without the benefit of modern preservatives. Thus, when exposed to the environment they tended to deteriorate relatively quickly. By covering the primary structural components (heavy timber trusses and floor system) with a less expensive and sacrificial covering, a bridge owner could extend the life of a timber bridge.

Approximately 1,600 covered bridges remain worldwide, with over half of these located in the United States. Almost without exception, each of these covered bridges was designed for a specific location and to serve a very specific purpose in a unique location. As such, each bridge is essentially a one-of-a-kind work of art. Unfortunately, some of these irreplaceable structures have recently been vandalized and in some cases completely destroyed.

Background

Bridges have typically been built without much consideration of their security from vandalism, arson, or terrorist activities. Events of 2001 changed this to a certain extent. However, the majority of attention paid to securing our nation's bridges has focused on large, signature bridges because of their importance to the

public for transportation. The nation's covered bridges are not typically located on thoroughfares carrying large volumes of traffic, but they are extremely valuable historical landmarks. Much of the post-2001 information published with respect to securing bridges applies to large bridges in typically urban environments and is not directly applicable to covered timber bridges.

In 2004, Madison County, Iowa; the Iowa State University (ISU) Bridge Engineering Center (BEC); and the U.S. Forest Service, Forest Products Laboratory (FPL), initiated a collaborative agreement

to develop and demonstrate a remote, autonomous security system for protecting the covered bridges of Madison County. The goal is to develop a system that can reliably detect, and then alert authorities to, two types of threats to covered bridges: (1) a person's presence at the bridge site during "suspect" hours (late night and early morning) and (2) the ignition of a fire at the bridge site at any time of day. Detection of these events must be nearly instantaneous (to allow as much time for response as possible) and accomplished autonomously, without the need for human interpretation or interaction.

Objectives

This study will develop a manual that covered bridge owners can use to implement protection and security strategies and solutions.



Covered bridge infrared monitoring can prove to be very beneficial in night time applications.

Partners of the National Center for Wood Transportation Structures



Approach

- Review available bridge security literature and adopt and adapt those conventional techniques and approaches that are most applicable to covered timber bridges.
- In coordination with other on-going efforts, document state-of-the art approaches to securing covered timber bridges through the use of automated sensing technologies.
- Develop a step-by-step approach to designing and implementing security strategies.

Expected Outcomes

A comprehensive manual will document procedures for securing historic covered bridges. The manual will include documentation of conventional security measures and technology-based approaches. The manual will include a step-by-step guide for bridge owners.

Timeline

Review of available literature will begin in fall 2009. Documentation of the implementation of technology-based systems will begin in spring 2010 and conclude by fall 2010. Drafting of the manual will be completed by spring 2011.

Cooperators

Iowa State University, Bridge Engineering Center
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