

ECONOMICAL FALSEWORK SOLUTIONS FOR CONCRETE ARCH BRIDGES

**MASTER OF ENGINEERING IN STRUCTURAL
ENGINEERING DESIGN**



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ECONOMICAL FALSEWORK SOLUTIONS FOR CONCRETE ARCH BRIDGES

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The thesis submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfillment of the requirements for the Degree of Master of Engineering in Structural Engineering Design.



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Abstract

The arch bridge is very strong. It looks like half a circle. Arch bridges used to be made of stone. The problem was that until the last block was in place, these bridges were unstable and could fall down.

Construction field in Sri Lanka has lot of arch shape structures such as Buddhist Temples, Muslim mosque etc therefore aesthetic view of arch shape bridges are better than other shapes. Traditionally, arch bridges were constructed of stone, brick or mass concrete since these materials are very strong in compression and the arch could be configured so that tensile stresses did not develop.

Contractors are not motivated to construct arch bridges due to difficulties of construction. If there is a simple method to construct an arch bridge it is economical and quick because of flow of the stream or flood will not be disturbed to the construction. Heavy machineries or advanced technology does not matter and local labour force can be utilized. In the locations which are inaccessible to transport material or heavy machineries, concrete arch is a solution with a suitable falsework.

Most bridges in Sri Lanka are constructed over water ways therefore during the construction period finding a supporting base to construct an arch structure is very hard. Also river beds are located far below from the deck level of bridge and erection of stable falsework support will be another difficult task. These are the problems in arch bridge construction within the available technology of construction in Sri Lanka and tend to existing arch bridges are limited to short spans.

The objective of this research was to obtaining an economical solution for this problem.

In point form the scope of this research includes

- find the possible methods to construct concrete arch bridges.
- materials have to be used for falsework for construction of concrete Arch Bridges.
- Types of Trusses possible to use as falsework.

At the design stage of concrete arch bridge, suitable falsework truss also should be designed to get the support to construct the bridge. Similar to benefit of scaffoldings to building construction, falsework truss also will be benefited to arch bridge construction. It will facilitate to select different models of falsework truss for construction of various types of concrete arch bridges with higher spans or different curvatures.

Steel trusses design for falsework is ideal solution because mainly simplicity of its erection process. Another option is a timber falsework for the construction of concrete arch bridge. Cost of the timber falsework is obviously high where the locations of long span of arch bridges or high level difference between river and deck of bridge. Within the Types of steel trusses economical one also has to be identified because of their cost of material and cost of fabrication. The types of steel trusses commonly used are Howe truss, Modified Howe truss, Pratt Truss or Warren Truss. Structural analysis computer software SAP 2000 was used to analyse trusses to achieve the objectives of the research.

Based on the analysis of this research Modified Howe truss fabricated by steel angle iron is successful as economical falsework solution to the construction of concrete arch bridges in Sri Lanka.

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DECLARATION

I, J A V S Jayakody, hereby declare that the content of this thesis is the original work carried out by me. Whenever others' work is included in this thesis, it is appropriately acknowledged as a reference.

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