

CONCRETE BRIDGES DESIGN ASSESSMENTS AND ITS RELATIONSHIP WITH THE SURROUNDING SPACE

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Abstract:

The government of Arab republic of Egypt seeks to solve the traffic problems in the capital and other major cities through creating multiple solutions for the traffic. And with the end of the twentieth century and the beginning of the twenty first century many bridges & tunnels were constructed to solve the chronic traffic problem resulting from the population growth and the increasing number of vehicles in the streets. The traffic problems in Cairo & Giza cities can only be solved through the establishment of bridges at key intersections. Therefore many concrete bridges were constructed in addition to constructing extensions to some of the already existing bridges, especially the 6th of October Bridge. However, bridges are constructed without the preparation of complete engineering studies that include architectural & aesthetic studies to integrate the bridges with the general character of the surrounding space. This paper aims to assess the design of concrete bridges to employ the design to integrate with the surrounding space.

Keywords:

Concrete bridge; Egypt; 6th of October Bridge; Aesthetic architectural forms; Steel Bridge.

Introduction:

In order to solve the traffic problems in Egypt that have been caused by population growth and the increasing numbers of cars, the government of Egypt had constructed concrete bridges in most of the major areas in Cairo and Giza.

In spite of the presence of many structural systems most of the bridges in Egypt are constructed using one structural system due to the economic aspects and the project cost. Regardless of the surrounding spaces not much attention was paid to the aesthetic or environmental aspects.

Current concrete bridges affected negatively on most of the spaces surrounding them on all levels (economical – environmental – etc.) particularly in the general form of the surrounding space.

Reasons for building bridges:

The bridge is a way for over passing water streams and crossing perpendicular roads by providing a clear passage for vehicles with shortened duration for traffic lights in busy intersections. In order to determine the need for a bridge, a detailed study must be conducted according to the following considerations. (1)

Bridge design elements:

All bridge standards & provisions must be applied on all the elements of the bridge. The following should be considered: (2)

Elevations / Facades:

Bridge height & clearance under the bridge must be 5m at least plus 10cm clearance in anticipation of paving in the future.

Types of bridges:

Bridges can be categorized according to **usage**:

This research paper deals with vehicles & pedestrian bridges as many bridges of this type were constructed in Egypt in the late twentieth century and in the beginning of the twenty first century. These bridges lack the integration with the surrounding spaces. (3)

Bridges can be categorized according to **construction materials**:

- 1) Concrete bridges including:
- 2) Steel bridges including:
- 3) Concrete suspended bridges.
- 4) Steel & wooden bridges.
- 5) Stone bridges.

Also bridges can be categorized according to **shape**:

- ④ Straight dorsal bridges.
- ④ Curved dorsal bridges.
- ④ Straight tunnel bridges.
- ④ Curved tunnel bridges.

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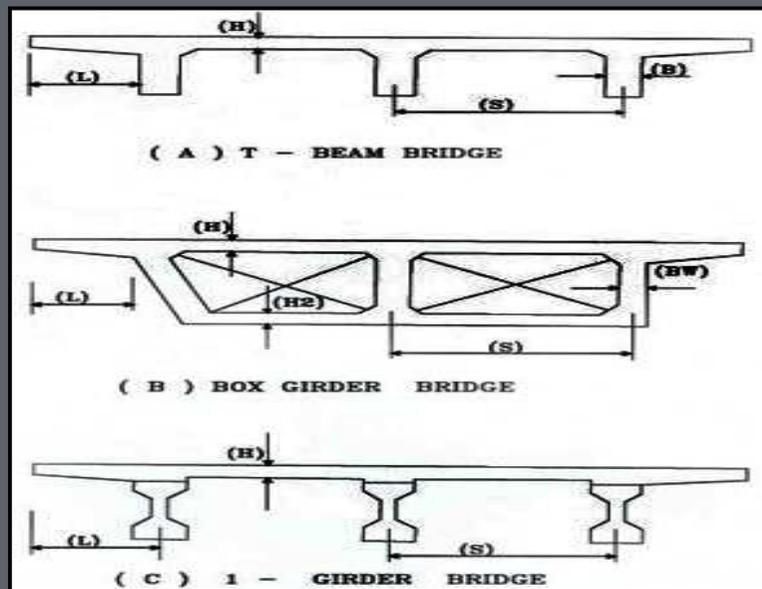


Fig. (2). shows different bridges slab shapes.

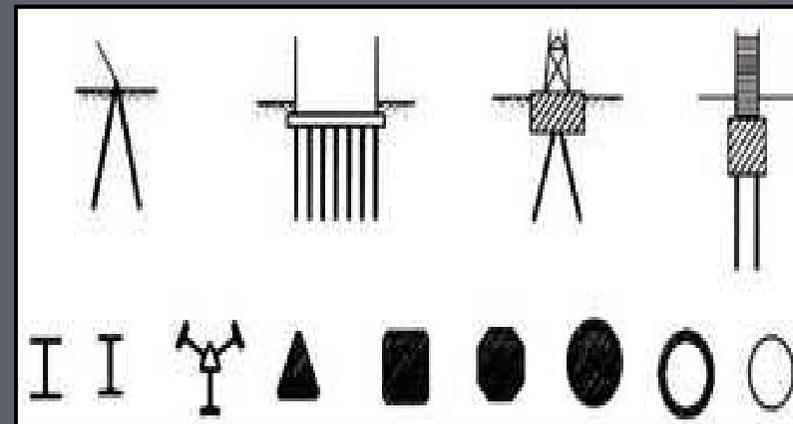


Fig.1(.shows different bridges column cross-sections.

Concrete bridge as a spatial element

Concrete bridges are considered a new important element added to the current spatial configuration, However concrete bridges are designed according to structural standards and calculations, neither architectural nor aesthetic aspects are considered in the design process.



Fig. (3). show some forms of bridges and their relationship with the surrounding space and the impact of aesthetic design on the general form.

Concrete bridges affect the surrounding space on all aspects either negatively or positively, as follows:

A. Positive effects

- On the aspect of planning
- On the aspect of economics:
- On the environmental aspect:

B. Negative effects

- On the aspect of planning
- On the aspect of economics:
- On the environmental aspect

Examples to show the relationship between the concrete bridges & the surrounding space:



Fig. (4). shows some forms of bridges and their relationship with the surrounding space and the impact of aesthetic design on the general form.

The 6th of October bridge:

It is considered one of the longest bridges in Egypt. Stretching from Dokki, in Giza governorate, to Nasr city in Cairo governorate. It was implemented on 10 stages until now. All the stages are made of reinforced concrete using the same architectural & structural design. The design did not regard the differences between the areas it's going through.



Fig. (5). Shows The 6th of October Bridge (Ramses st.).

Al-Azhar Bridge:

Al-Azhar Bridge was constructed to solve the problem of traffic jams in Al-Azhar area. It was an important bridge that made a traffic breakthrough in Al-Azhar area and (al-qahira al fatimia) but it had many negative impacts on the historical area which contains priceless historical buildings. Also it affected the commercial movement in the area



Fig.(6). Shows The 6th of October Bridge (Galaa st.).



Fig.(7). Shows the connection between the steel part & the concrete part of the bridge.



Fig. (8). Shows the relationship between the bridge & the surrounding buildings.

Some environmental solutions to the concrete bridges:

There are many architectural solutions that can be studied to make the concrete bridge with its elements a spatial object that makes it a good addition to the space.



Fig. (9). Shows the relationship between the bridge & the surrounding uses.

Study of the concrete bridge to serve the general form in space:



Fig. (10). Shows some of the aesthetic solutions to the concrete bridge elements.

Conclusions & recommendations

Through the review in this research paper, the concluded results & recommendations are as follows:

Recommendations regarding planning & architectural aspects:

- ③ Forming an engineering specialized committee to review and to approve the bridge design.
- ③ Setting provisions & engineering standards to control the proportions and the quality of the space that the bridge goes through.
- ③ The study of the general form of space to fit the bridge with.
- ③ Encourage the construction of tunnels to suit the current urban congestion.
- ③ Forming a specialized committee to study the attempt to create visual schematics for the areas around & under the bridges through specialized visual studies to solve the visual problems through a set of targets & policies that suit each region.
- ③ Preserving the remnants of the distinctive features of the character & the architecture of important historic areas especially the established activities without introducing any new activities to the urban context of these areas.
- ③ Setting standards & principles to ensure keeping a suitable passage for pedestrian traffic, and removing the random parking places for cars under the bridge.
- ③ Re-configuration of the space under the bridge to suit the uses of each area, in attempt to provide the needed services & aesthetic elements, pedestrian passages , and benefiting from bridge slabs as roofs for the spaces underneath it to be seating areas or flower shops in a specific form & system.
- ③ Creating future management schematics for the targeted future bridges.
- ③ Studying various commercial activities which the constructed bridges will pass by and the expected effect.
- ③ Using modern techniques in street lighting and guidance (Using retro-reflective cat's eyes in road marking) to assert the role of street in guidance especially in the night.
- ③ Taking into consideration areas & buildings of historical value and keeping away from them. Or to be taken into account when constructing these bridges while attempting to inflect the least possible degree of visual pollution and deal strictly with them.

Recommendations for administrative & regulatory aspects:

- ④ Setting standards and principles for the required maintenance and the necessary development to upgrade the bridges.
- ④ Forming specialized committees to maintain the overall condition of the bridge and its spaces to fit the nature of each bridge, and the development of spaces around the bridge.

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