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Professional paper

BRIDGES AS STRUCTURES

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Abstract

Purpose: Bridges are objects that serve to cross an obstacle. Man has felt the need for bridge structures since his existence. The construction of bridge structures has always been, but even today it is a special field in construction. Bridges are quite impressive objects that create unforgettable impressions on passers-by. Since ancient times, the fate of bridges has been intertwined with the fate of man. Many important events are connected with bridges, their construction, existence and destruction. The events surrounding bridges and the bridges themselves have inspired many people with interesting stories. The construction of bridge structures has not developed without problems. There have been many misfortunes of bridges and their builders. The construction of bridges over the centuries has flowed as a time-consuming development, especially on the basis of those objects that were already only just completed. In the first period, the construction of bridges was based on that for the needs of pedestrians. The emergence of railways and the rapid development of road transport became an indispensable need for the construction of bridges with fairly large spans and lengths.
Method: Analysis of different types of bridges, whose function is to ensure the passage of natural or artificial obstacles, analysis of general methods on bridge constructions and their types, methods for determining which types of bridges are for what purpose, development of numerical calculation methods, especially those of finite elements using different software, enabling reliable achievements in static and dynamic aspects, as well as those of linear and nonlinear analysis of structures.
Results: From the study of bridges as structures, the expected results are that students and young engineers will have preliminary knowledge of these engineering objects, to gain knowledge about the types of bridges that they can design in their careers, since the current trend in the country is with the construction of international corridors that also pass here and that are arteries for international cooperation, transport of people, goods, etc. As is the case with corridors VIII and X, where a considerable number of bridges will be built on the body of these roads, some types of which are mentioned in this paper, as well as the implementation of European norms/EN/for bridges, for which principles, standards we have given an example, a task on how to calculate a bridge construction.
Conclusions: In conclusion, bridge systems as structures are imperatives of the time since there are no urban places where these types of structures do not participate in connecting roads in cities, in the suburbs in various mountainous areas, crossing barriers such as rivers, dry gorges and other needs that the human factor needs, for free movement, movement of goods, etc. Since there is an expression of form if you want the development of a country, the state must first regulate the infrastructure and with this, human well-being, economy, etc. are directly related. In this paper, data are given on how to use European norms, for loads, for the dimensioning of the constructive elements of these structures, calculation methods are given and knowledge is given on which software programs can be used in the calculation of the same.

***Keywords**: Bridges, Structures, types of bridges, construction materials, standards.*

1. History of bridges

Bridges are objects that serve to cross an obstacle. Man has felt the need for bridge structures since his existence. The construction of bridge structures has always been, but even today it is a special field in construction. Bridges are quite impressive objects that create unforgettable impressions on passers-by. Since ancient times, the fate of bridges has been intertwined with the fate of man. Many important events are connected with bridges, their construction, existence and destruction. Events around bridges and the bridges themselves have become an inspiration for many people with interesting stories. The construction of bridge structures has not developed

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without problems. There have been many misfortunes of bridges as well as their builders. The construction of bridges over the centuries has flowed as a timeless development, especially on the basis of those objects that were already only just realized. In the first period, bridge construction was based on pedestrian needs. The emergence of railways and the rapid development of road transport became an indispensable need for the construction of bridges with fairly large spans and lengths.

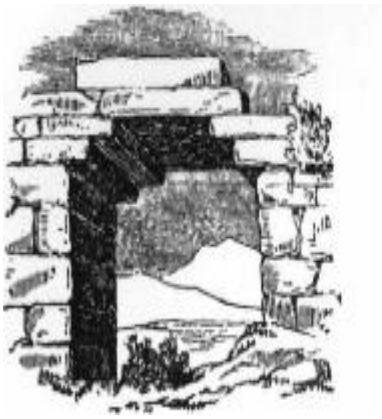
The development of railways in Europe since 1850 has given a boost to the development of metal structures and has contributed greatly to the faster economic development of industrial countries. At that time, railway bridges were most often built from simple trusses, with parallel trusses, in which case no measures were taken against lateral deformations of the joints in the upper belt, which has led to a large number of disasters, namely the collapse of certain bridges of this type. This has caused great concern and discussion in the world of construction, for which a large number of technical articles have been published.

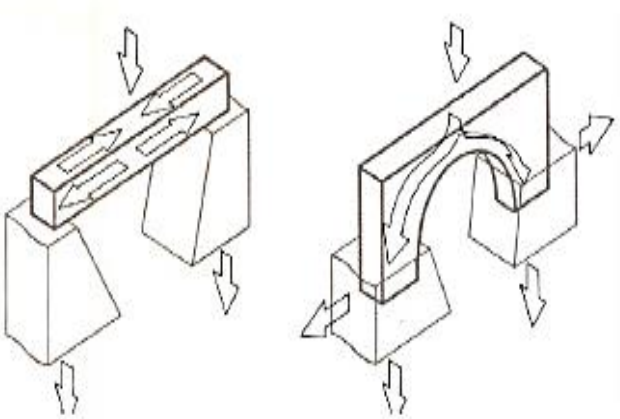
The development of numerical calculation methods, especially those of finite elements using various software, enabled reliable achievements in the static and dynamic aspects, as well as those of linear and nonlinear analysis of structures. Although bridge designers are directly related to the calculations of supporting structures, it is necessary to have a fairly high level of knowledge of this field in order to achieve adequate results. Bridge designers must also have high knowledge of construction materials for the realization of supporting structures.

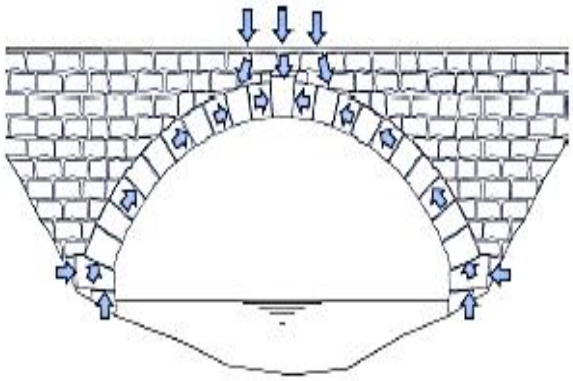
2. General knowledge about bridges

Bridges are structures whose function is to ensure the passage of natural or artificial obstacles which can be: the flow of rivers, lakes, straits, deep valleys, road traffic, buildings or other various objects.

Based on the function they perform, or the type of road traffic (or flows), and based on the connections they have, we distinguish different types of bridges. At the beginning of the examination of bridges, general knowledge about bridge constructions and their types will be provided.







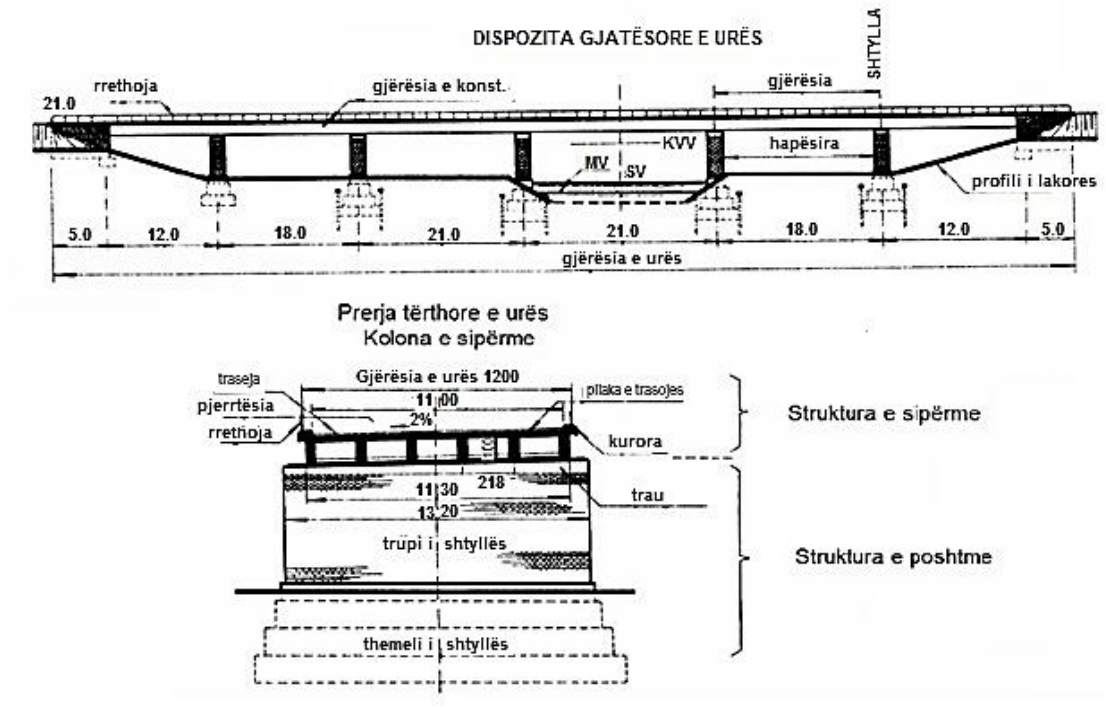


fig.1 - Shembull, Urë beton - arme në formë trau, njohuri dhe emërtimi i pjesëve.

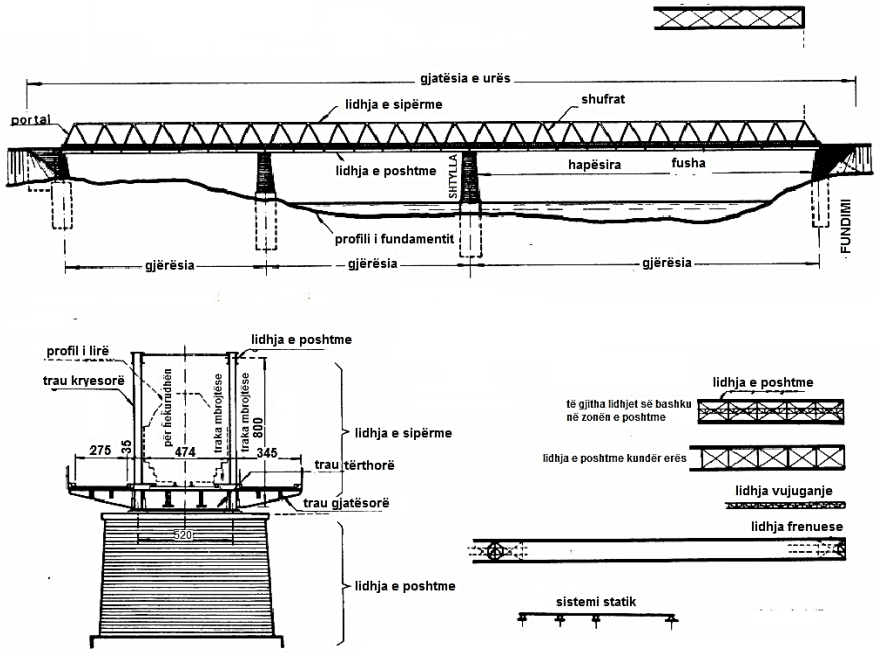


fig.2 - Shembull i trasojes së kombinuar, Urë prej celiku formë hekurudhë - gypa me konstruksion kapriatë, dispozitat dhe klasifikimi i tyre.

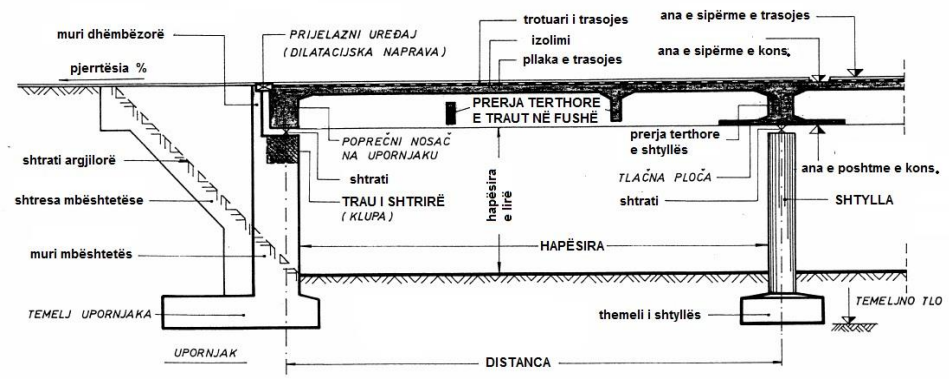


fig. 3 - Shembull, Dispozita gjatësore e urës me tra prej betoni, njohuri dhe klasifikimi i tyre.

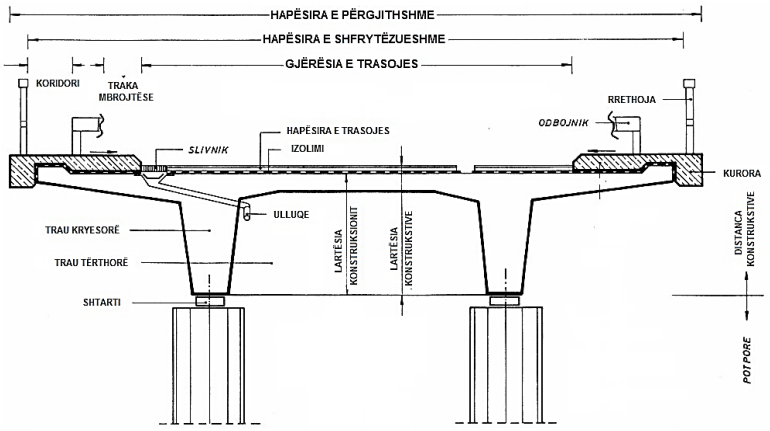


fig.4 - Dispozita tërthore e urës me tra prej betoni, njohuritë dhe klasifikimi i elementeve.

3. Classification of bridge structures

Each of the parts of the bridge structures can be divided into the upper and lower parts. Most of the structural elements are mentioned and some of them are also explained in graphical form.

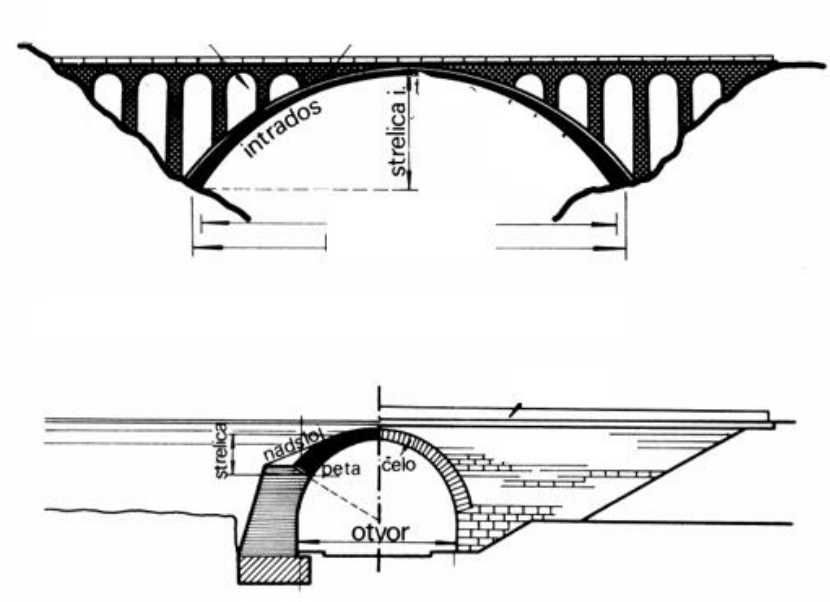


Figure.3.1-Examples of arch bridges

Forth Rail Bridge-Skoci (1890)

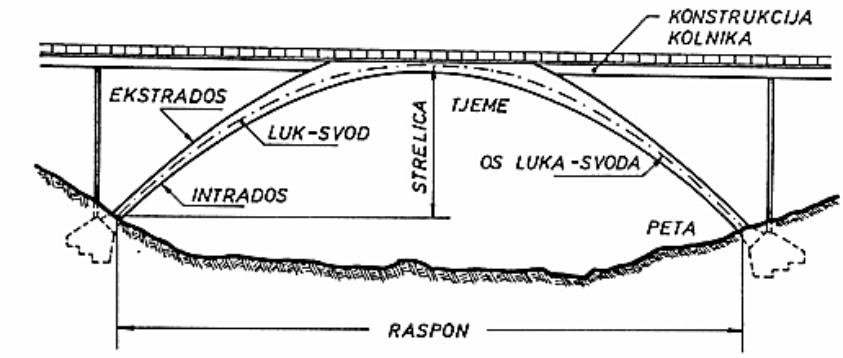


Figure.3.2-Examples of contemporary arch bridges

4. Definitions, terminology, division and elements of bridges

4.1. Definition of bridges: The first part of the definition: Bridges are objects - which indicate that they are built from certain materials (or more types), to meet the needs of people which are explained in the second part of the definition: that span, carry, over obstacles. It should be noted that bridges are objects that contain supporting structures of constructions. Construction is one of the essential and very important elements in bridges.

From the expression of the purpose of bridges, which is the reason for the construction "that the track-railway, carry-carry, over obstacles-overpasses", the need for a bridge arises where the road lane that is foreseen for realization presents an obstacle over which the road lane must be realized, if the same cannot be realized (or is not rational) directly by relying on the ground or by filling.

For some types of bridges we use some of the following terms:

• **Overpass is a small** bridge (with a span of up to 5.0m),

• **Viaduct** is a bridge that allows the crossing of dry valleys,

• **Overpass** is a bridge that allows the crossing of a road or railway over a highway or railway traffic.

• **Underpass** is a bridge that allows the crossing of a road under a highway or railway traffic.

4.1.2. Terminologies related to the appearance of bridges

• **Longitudinal layout** or longitudinal layout of bridges is the graphic part presented with all elements viewed from the side (fig.4.1).
• **Transverse layout or transverse** layout of bridges is the graphic part of the elements of bridges in cross section (fig.4.2).
• **Free profile** is the space through which one can move freely under or on the bridge without any obstacles.
• **The road** is the basic line in the longitudinal section of bridges which represents the intersection of the road surface and the vertical plane which passes through the axis of the bridge road.
• **The supporting structure** is the supporting structure which enables the passage of obstacles through bridges.
• **The bridge lane** is the space dedicated for the passage of vehicles over the bridge.
• **Pedestrian paths are** the spaces dedicated for the circulation of pedestrians over bridges.

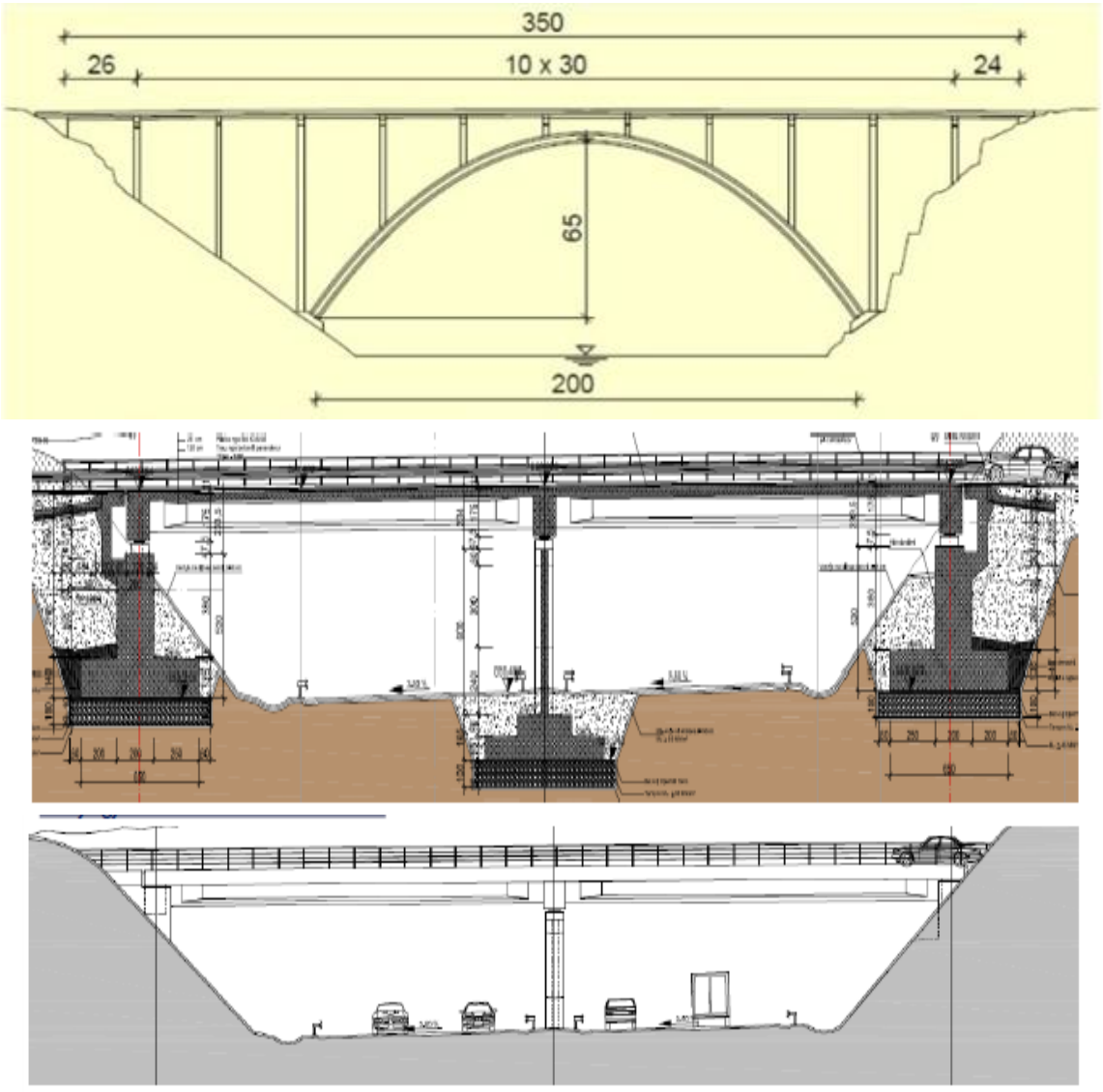


Figure.4.1-Longitudinal layout of the bridge and longitudinal appearance of the bridge structure

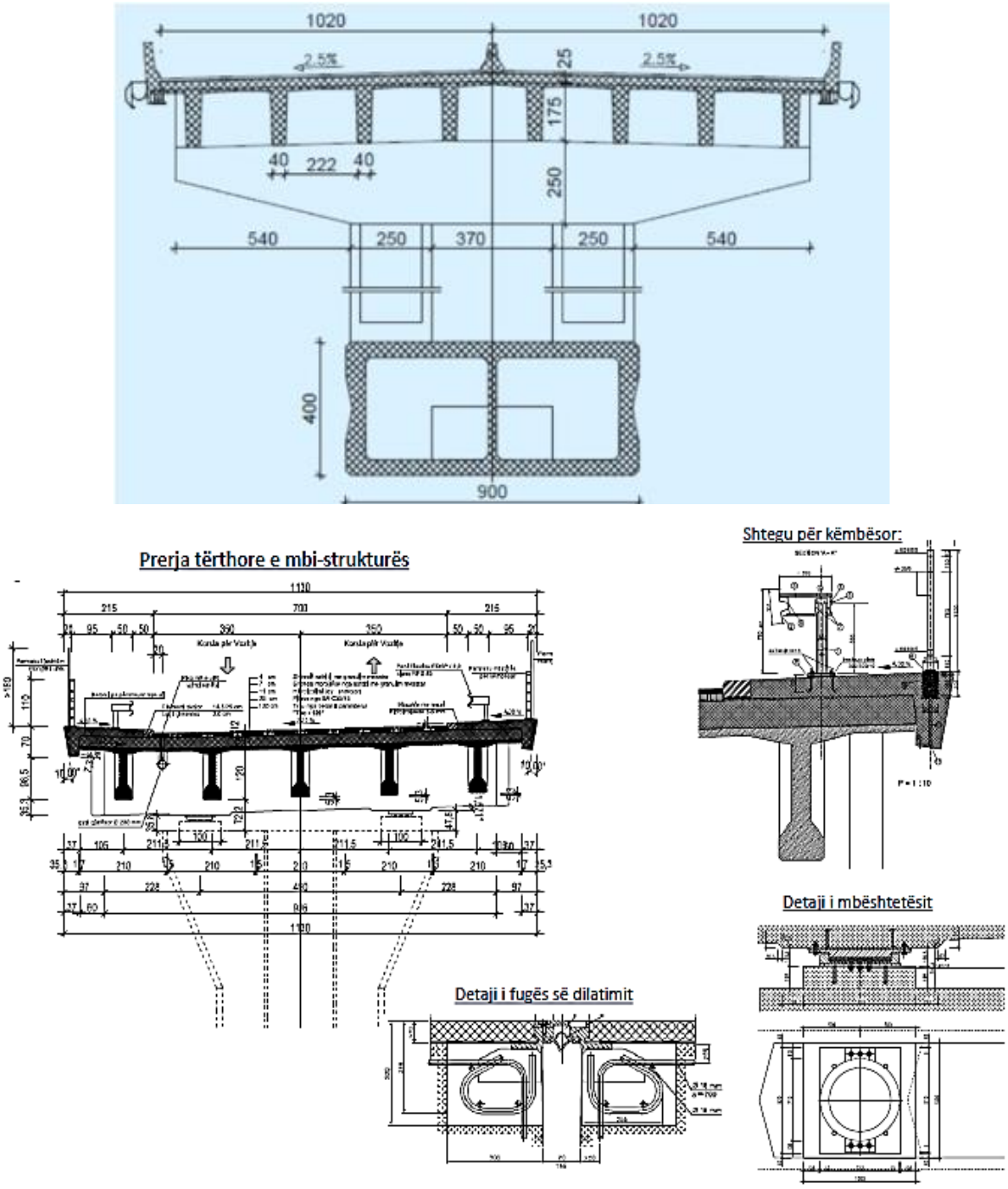


Figure 4.2-Transverse arrangement of the bridge

Example for design and calculation of a reinforced concrete road bridge

Task: To design a reinforced concrete road bridge which has a regional road as an obstacle to be crossed./ A public road officially categorized as a regional road, connecting two or more large cities/. R-38 Symbol for Regional Road

1.0 Technical Description

1.1 Standards

During this work, the European standards "Eurocodes" EN were taken as a basis, which are divided into several groups that deal in more detail with different engineering problems. The standards on which we have mostly relied in this work are:

- EN 1990 - deals with the basis of structural design
- EN 1990/A1 - Bridges
- EN 1991 - deals with the effects on structures
- EN 1992-1 - design of reinforced concrete structures
- EN 1992-2 - design of bridges
- EN 1998 - design of earthquake-resistant structures.
- EN 1998 –2-Bridges

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