Use of Prestressed Steel Flexural Members for Bridge Construction

Eléments métalliques précontraints dans la construction de ponts

Vorspannung von Stahlbiegeträgern bei Brücken

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SUMMARY

In past several decades there is increase in use of new forms and shape for buildings, bridges, dams, power station in which technological competence and economic awareness play an important role. One of most important method for reducing the cost of steel bridges is use of prestressing in steel structure. Use of open web section of high tensile steel with prestressing gives a considerable saving in overall cost of bridges.

1. INTRODUCTION

1.0.1 Design example presented here is of flexural member of a deck type bridge for class A loading. An effective span of 30.0m and thickness of R.C.C. slab inclusive of wearing coat is 250 mm have been considered. Conventional structure is compared with open web section of mild steel and high tensile steel without and with prestressing.

2. ANALYSIS

2.0.1 As four plate girder are provided at 3 m c/c.
The intermediate plate girder of bridge is subjected maximum load. Therefore maximum bending moment and shear force due to deadload, liveload including impact are

a) Maximum Bending Moment = 5686.74 KNm
b) Maximum Shear force = 786.00 KN

3. DESIGN

3.0.1 Bridge girder is designed for maximum bending moment and shear force due to deadload, liveload, including impact by using different type of section such as

1. Using solid web section of M.S.
2. Using open web section of M.S.
3. Using open web section of H.T. steel
4. Using open web section of M.S. with prestressing
5. Using open web section of H.T. steel with prestressing.

3.0.2 Open web section used for construction of bridge girder is made up of standard rolled angles with cover plate. Theory of open web section is very simple, it is ideally suitable section where bending action is predominent. For prestressing of girder tendon is placed externally below the girder section on tension side. It increases the efficiency of structure.

4. COST CALCULATION AND COMPARISION

4.0.1 Based on the design prepared for bridge girder the cost of construction is calculated and compared. It is seen that open web section of H.T. steel with prestressing helps in reducing the cost of bridge girder.

5. METHOD OF CONSTRUCTION

5.0.1 Prestressing of steel structure can be carried out by two ways. (1) Pretensioning the Structure (2) Posttensioning the Structure.
In the first method girder is prestressed before the concreting of slab. Thus opposite stresses are developed in girder only.
In the second method girder is prestressed after complete construction of bridge but before its actual use.

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