A STUDY OF END-BLOCKS FOR POST-TENSIONED BEAMS

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SYNOPSIS

The stress distribution in end-blocks of post-tensioned prestressed concrete beams has become important due to extensive use of prestressed concrete beams. An attempt has been made to present the research work of some predominant authorities on this topic in this writing.

The following three approaches have been identified in this report: 1) the two-dimensional analysis by Y. Guyon, 2) the two-dimensional analysis by Sundra Raja Iyengar, and 3) the physical analog method by R. J. Lenschow and M. A. Sozen.

Finally, comparison of these methods has been made by solving numerical examples. The methods are also compared with photoelastic investigation by S. P. Christodoulides.

INTRODUCTION

The development of the technique of prestressed concrete in modern construction is becoming more and more important due to its multifold advantages, such as 1) high durability due to the use of high strength concrete, and the absence of cracking, 2) long span beams, with economical cross section, which greatly help when bridges are located over soils unsuited for foundation support by eliminating the need for intermediate piers, 3) quickness in erection and reduction of falsework. With the increase in transport facilities and lifting devices capable of handling them, prestressed beams and slabs are used extensively in the modern world.

In very long prestressed beams and slabs, heavy prestressing forces are transferred at the ends. Hence investigation of the stresses at the ends of beams becomes very important. This problem is of general character and is not confined solely to prestressed beams, but with these it attains considerable importance owing to the magnitude of the forces involved.

Lack of complete knowledge of this problem does not prevent our designing such beams and slabs but this uncertainty results in increased cost as we apply higher factors of safety in our designs. To find an exact solution, and then to provide the exact amount of reinforcement, becomes too laborious and will not be of practical use. Hence the better solution is to use some approximation which will be quicker to solve and will lead to a change in the result on the safe side by an acceptable percentage. This has been attempted by Y. Guyon, G. Magnel, Lenschow and Sozen and other authors. Each one has used his own approach to satisfactorily approximate exact solutions.

The writer of this report has made an attempt to present and compare the approaches of Y. Guyon, R. J. Lenschow and M. A. Sozen, and exact two-dimensional analysis by K. T. Sundra Raja Iyengar. The data are collected from current literature on the subject.