Analysis of the Shear Strength of Joints in Segmental Prestressed Concrete Bridges

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Abstract

Joints in segmental prestressed concrete bridge (SPCB) are weak links and shear failures are likely to take place under loads. Determining the shear strength is an important part in the design of a SPCB. The shear strength in the joint relates closely to the joint form (as dry joints, epoxy joints, flat joints and keyed joints). The strength can be divided into three main parts: (1) The strength of the dry plane connection, known mainly as concrete surface friction; (2) The strength of the epoxy plane connection; and (3) The strength of the shear key root. This paper analyzes the failure mechanism and shear strength of these three parts .It also considers the influences of the shear key size and the seam height to shear strength, and establishes calculation formulas of the joint section strength in a united form. This provides a guide for the joint design in precast segmental bridges.

Keywords: Segmental prestressed concrete bridge (SPCB); joints; shear strength; shear keys.

1 Introduction

Precast segmental construction method of concrete bridges is an important construction technique. The method has many advantages, such as standardized prefabrication, controllable quality, short construction period and little environment affection. Compared with monolithic structures, there exist weakness section at assembly joints in segmental assembling structures. On condition of great shear force and high stirrup ratio, direct-shear failure may appear at the joints. Therefore, the shear strength of the joints between the precast segments needs to be checked in design.

Many scholars have carried on research on the shear strength of the joints. K.Koseki, J.E.Breen [1], J. Turmo [2] from Texas University, M.M.Bakhoum [3] from MIT, Xiangming Zhou [4], Shuangyan Wang [5] from HongKong University of Science & Technology, Jianchao Wang [6], Shoutan Song [7] from Southeast University have experimented on the shear strength of the joints in various forms, which come up with the coincident conclusions: dry joints have lower strength and larger ultimate displacement compared with epoxy joints, the strength of the planed joints is lower than that of shear key joints under same size condition, and the failures occur basically at the ends of the shear keys. Zeck,U.I.

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