Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 190 (2017) 536 – 539

Procedia Engineering

www.elsevier.com/locate/procedia

Structural and Physical Aspects of Construction Engineering

Verification of the Vertical Bearing Capacity of a Reinforced Concrete Pile

Lubomir Prekop[a,*]

[a]*STU in Bratislava, Faculty of Civil Engineering, Radlinskeho 11, Bratislava 810 05, Slovak Republic*

Abstract

This paper deals with the modeling of the load test of vertical resistance of reinforced concrete piles. The pile is a part of a group of piles with reinforced concrete heads. The head is pressed with steel arches of a bridge on highway Jablonov - Studenec. Pile model is created in ANSYS with several models of foundation having properties found out from geotechnical survey. Finally some crucial results obtained from computer models are presented and compared with these obtained from experiment.

Peer-review under responsibility of the organizing committee of SPACE 2016

Keywords: Reinforced Concrete; Pile; Modeling; Experiment.

1. Introduction

This paper deals with modeling the vertical load test resistance of reinforced concrete piles. The pilot is a part of a group of piles with reinforced concrete heads. The head is pressed with steel arches bridge construction on highway bridge Jablonov – Studenec.

1.1. Description of the object

Bridge structure consists of three parts (Fig. 1), its total span is 668.6 meters:

- 3 pre-stressed reinforced concrete clearways of spans 26.0 meters, 32.0 m and 26.3 m; total span of 84.3 meters;
- 7 major steel arch bridge fields with spans of 2x60 m, 2x70 m and 3x80 m; comprehensive length of 500 m;

* Corresponding author. Tel.:+ 421 (2) 59 274 445
E-mail address: lubomir.prekop@stuba.sk

Peer-review under responsibility of the organizing committee of SPACE 2016
doi:10.1016/j.proeng.2017.05.376

- 3 pre-stressed reinforced concrete clearways of spans 26.0 meters, 32.0 m and 26.3 m; total span of 84.3 meters.

Fig. 1. General view of the bridge structure.

The assessed pilot is located in 7th pillar supporting steel arches of the bridge (Fig. 2). In the preliminary stage, followed by a detailed survey, 10 exploring wells as a basis of 7 models of soil subgrade were realized. From them the model of the subsoil at the site of exploratory drilling 205-7 / V 7 was used as the calculation model. During the phase of control survey overall 8 wells were completed.

Fig. 2. View of steel bridge arch.

1.2. Load test of a pile

Different load tests on vertical and horizontal strength of piles were conducted. The purpose of the tests was to create a basis for any design modifications of the pile foundation of the bridge and verify the bearing capacity of piles for vertical loads and assess the deflection - load relationship in the given geological conditions as well. A detailed description may be found in [1].

1.3. Foundation conditions

Geological profile at the site of tested pilot by the test contractor was as follows:

- 0.0 – 8.5 m proluvial sandy clay with moderate plasticity (F4, CS),
- 8.5 – 10.5 m paleogene - heavily weathered and decomposed claystone (R5, F6, CI),
- 10.5 – 13.5 m paleogene - heavily weathered and decomposed claystone (R5-R6, F6, CI),
- 13.5 – 14.7 m paleogene - replacing of 10-30 cm thick layers of heavily weathered sandstone (R5, R4).

Ground water encountered in cracked claystone was found at a depth of 13.6 meters.

1.4. Information about test pilots

An axially - loaded test pile, commercial was made in the area of building Motorway D1 Jablonov - Studenec, SO 205 Bridge on the D1 1 650 km. Pillar Nr.7 by a drilling equipment WIRTH 22, the well of pile was protected by sheeting casing pipe to a depth of about 8 m. Nominal diameter of piles was 1200 mm and a length of 12.4 meters. Project required a maximum test load of the pile of 5 000 kN.