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## Effectiveness of post-tensioned prestressed concrete road bridge realization in the light of research under dynamic loads

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### Abstract

The paper presents the results of experimental research conducted on the newly constructed post-tensioned pre-stressed concrete road bridge situated over water plant of water reservoir under dynamic field load tests in Topola village (Poland). The dynamic loads consist of four heavy trucks passing at different speeds, through threshold and braking at the midspan. The obtained results from field load tests and the calculation of dynamic coefficients, values of amplitudes of vibration velocities and frequencies of two bridge spans have allowed to assessment of effectiveness of structural solutions applied at this bridge and establish some guidelines for using of this type of construction process in design structural solutions located over water plants in the future engineering practice. Wide range of conducted dynamic tests have allowed for comprehensive evaluation of the concrete elements effort of bridge structure. Final conclusions confirmed the observations taken from the research under static load.

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*Keywords:* road bridge, water plant, dynamic load test, post-tensioned prestressed concrete beam, deck slab, dynamic coefficient, vibration frequency, vibration velocity;

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### 1. Introduction

The subject of this paper is a new post-tensioned prestressed concrete road bridge over a water plant on a water reservoir across Nysa Kłodzka River in Topola (Poland). This structure was subjected to thorough study [1,2]. The main aim of the this paper is to present the results of the research on the new bridge in the dynamic load test domain

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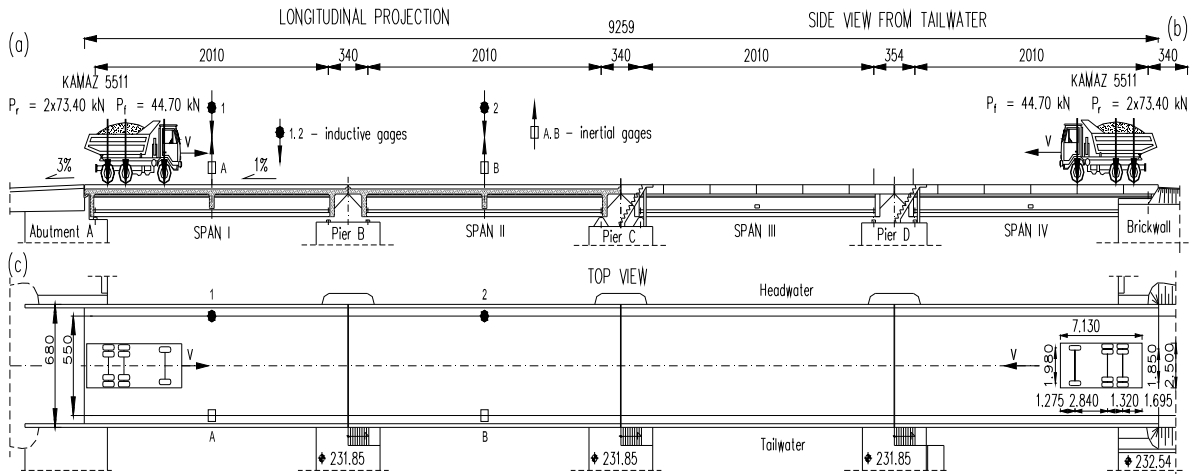


Fig. 1. Localization of measured gages and technical parameters of trucks type KAMAZ 5511 used during dynamic field tests of spans I and II: (a) longitudinal bridge section, (b) side view from tailwater, and (c) top view.

of studies as the basis upon which the quality of realization, durability, critical speed magnitude, dynamic coefficients, coefficient of velocity, vibration frequency were determined [3]. Due to the of non-typical location of the bridge in the road over a water plant on a water reservoir and considering fact, that is new structure as well as the comprehensive and thorough research on the structure together with the detailed analysis of the results obtained (from analysis of displacements and dynamic effects), the conclusions derived from this complex study can be very helpful in engineering practice, especially in the field of research control and acceptance of carried out tests and examinations during construction of post-tensioned prestressed concrete (particularly in bridges of similar geometric structure and similar material characteristics [4,5].

## 2. Description of bridge structure

A provisional design by the Gdańsk Transprojekt, considering the stages of assembly and regular service, was adopted as the bridge design. The design was prepared by the Hydroprojekt of Wrocław [6]. The bridge is a four-span structure (Fig. 1). Each span is simple-supported and consists of four prefabricated pre-tensioned prestressed concrete

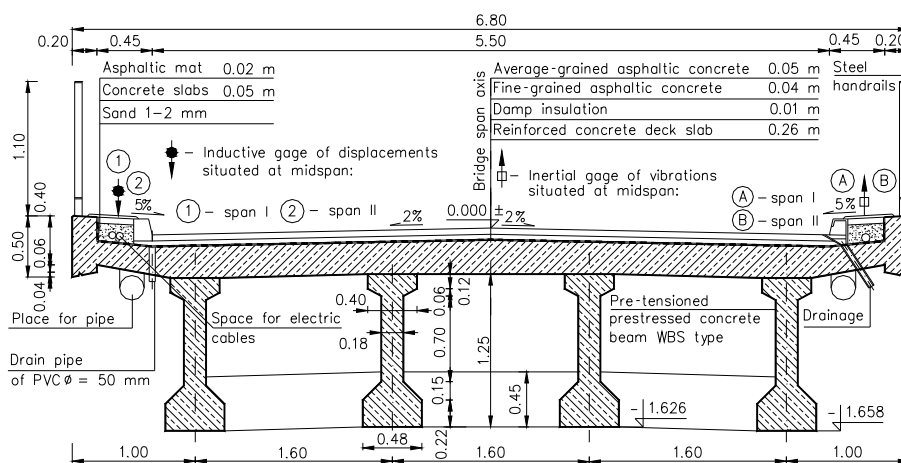


Fig. 2. Cross-section of bridge span and localization of dynamic gages.

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