



## Traffic characteristics and load responses of specific bridge based on the measured WIM data

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### Abstract

This paper gathers 190 days traffic data measured by the WIM (weigh in motion) system on Jiashao Bridge, and analyse the characteristics of vehicle and vehicle weight in lateral lanes. Loading responses of several featured structural effects which are important for condition evaluation of Jiashao Bridge are studied under actual traffic condition. The response values are then compared with those calculated from the standard traffic load model in D60. Results show that the characteristics of transverse distribution of traffic flow is significant. Light vehicles tend to choose the inside lanes, while multi-axis vehicles barely choose passing lane. Loading responses present significant differences on lateral lanes. Lane 1 gets the largest loading response and the responses of the rest inner two-lanes are similar. All the loading responses of overall lanes are under 50% of the values calculated by design codes. In conclusion, the safety and usability of the structure can meet the requirements in the current traffic flow, and the design and evaluation models for different lanes should be analyzed differently.

**Keywords:** WIM data; multiple lanes; load characteristics; multi-pylon cable stayed bridge; featured effects; load response

### 1 Introduction

Vehicle load as the main variable action of bridge is the key parameter for bridge design and evaluation. Since the load level of traffic condition is different for bridges nationwide, it is hard to reflect the actual traffic conditions via using a uniform loading model in design code. Meanwhile, the high randomness and time-varying of the vehicle and vehicle load make it is difficult to acquire the regulation of vehicle load distribution and statistical features. Therefore, it is necessary to analyze the characteristic of vehicle load and load response basing on the collected traffic data in situ.

Weigh in Motion is a new technique to measure the actual vehicle information without interference the operation of traffic flow, and characteristics of vehicle and vehicle queue including traffic volume, vehicle type, vehicle weight, axle load, vehicle length, vehicle velocity and time-variation

regularity of traffic flow can be gathered by WIM system. (O'Brien et al. 2008). Then complete information of traffic flow can be restored, which provide basic information for the research of traffic load characteristic and bridge loading response.

In this paper, Jiashao Bridge located in Zhejiang Province, China is taken as the background of the research. This bridge is a six-pylon cable-stayed bridge with the span arrangement of 70+200+5×428+200+70m. The facade layout is shown in figure 1. The standard section and lane distribution are shown in figure 2. Figure 3 indicates the lane position of Jiashao Bridge. Due to the arrangement of multiple pylons, displacement in middle span and the mechanical behaviour of middle pylon are the critical concerns for Jiashao Bridge (Virlogeux, 2001). It is strongly to know the bridge condition under actual traffic running statuses.