Analysis of the Steel Structural Reliability under the Big Data Condition

Fang Yongfeng*

School of Mechanical Engineering, Guizhou University of Science Engineering, Bijie, China

Tao Wenliang[a]

School of Chemical Engineering, Guizhou Minzu University, Guiyang, China

Abstract: In this paper, the reliability of steel roof under the big data loads is analyzed. Firstly, the roof of steel structure is analyzed. The relationship between roof span and stress composed of hollow steel joist beam is obtained, and the parameters of the structure of the open web steel joists that is made by the wide flange steel is given. Secondly, according to the random distribution parameters of steel roof and the big data loads, the limit state function of steel roof structural calculation is given. The function is an implicit function. Monte Carlo method is used to calculate reliability index of the steel structural roof with considering the dead loads and the big data loads. Finally, the reasonable suggestions for the reliability and safe operation of the steel structural roof are given from the reliability of the calculated of the steel structural roof.

Keywords: big data, load, steel structures, roof, reliability

1.Introduction

During the period of the service of the steel structure roof, the snow, rain load is usually happened. During its service, the steel structure roof not only bears the wind, dead load and other working loads, but also bears the other loads such as wind, snow, corrosion, vibration, etc. The big data has been obtained timely, and the bid data would be analyzed and sorted, the reliability of the steel roof would be accurately analyzed, it is possible to provide strong data and policy support for the operation of these steel structure roofs, so as to propose effective maintenance and maintenance measures. The structural reliability from time response has been studied (Fang Y. F., TAo W, Tee KF. 2019), it is consider that the reliability of the structure is time-dependent due to several factors. The damage of buildings under snow load was established from the perspective of physicality and economy, it is considered that it is very important for the early maintenance and maintenance of steel roofs (Strobel K, Liel A. 2013).

In this paper, the big data is collected from the steel roof beard the loads. The collapse of the steel roof structure under load may damage the building occupants, the buildings and equipment or goods, and increase the maintenance costs,etc.. In this

paper, the reliability of the steel roof is supported by the open web steel joists is analyzed under considering the uncertainty of load. The reliability of the steel structural roof ia obtained by using the Monte Carlo method to simulate the static load and the capacity of the steel roof. Finally, it is shown that the method is feasibility and effectiveness by an example.

2. Conclusion

The reliability of steel structural roof is computed under big data loads. According to the safety rules of the building and serviceability objectives, the Monte Carlo method is used to consider the uncertainty of roof load and the big data loads on the roof. The reliability of the steel structural roof under the big data loads was obtained. However, it should be noted that this reliability assessment is usually less than 25-45%. Although the reliability is similar, even if the roof design has the same load exceeding 50 years of the load, the substantial difference in probability shape will result in the distribution of the maximum snow load per year. Producing different reliability results, these are important for roof snow loads.

In addition, the application of this analysis method should be fully consider the difference climate and geological distribution. The annual maximum snow load has a great impact on the reliability analysis. At the same time, changing the physical characteristics of the roof has little effect on the reliability index. Secondly, there is a strong correlation between the reliability and maintainability of steel roofs. Finally, for the steel structural roof, the design of the deflection limit results in a larger cross-sectional dimension, resulting in considerable improvement in safety, maintainability, and reliability.