Experimental Investigation on the Wind Force of a Scaffolding System

Fuh-Min Fang[1], Shi-Xian Chang[2], Chen-Yang Chung[3], Yi-Chao Li[4] and Chern-Hwa Chen[5]

[1] *Professor, Department of Civil Engineering, National Chung Hsing University, Taichung, Taiwan,*
fmfang@nchu.edu.tw
[2] *Research Assistant, Department of Civil Engineering, National Chung Hsing University, Taichung, Taiwan,*
csh9119@yahoo.com.tw
[3] *Research Associate, Aerospace Science and Technology Research Center, National Cheng Kung University,*
Tainan, Taiwan, slaterlieyou@gmail.com
[4] *Research Fellow, Wind Engineering Research Center, Tamkang University, New Taipei City, Taiwan,*
Liyichao223@gmail.com
[5] *Professor, Department of Civil and Environmental Engineering, National University of Kaohsiung, Taiwan,*
chchen@nuk.edu.tw

ABSTRACT

A 1/50 model of a scaffolding system, built at one side of the exterior surfaces of a model building with a square cross-section (0.6 m × 0.6 m × 1.0 m), was set in the ABRI wind tunnel to measure the wind forces on the system at various oncoming wind flow directions by using a six-beam force balance (Fig. 1). The scaffolding system is a combination of 510 (17×30) unit panels. The building is considered in an open terrain with a ground condition subject to type C exposure. The cases of the scaffolding system with an additional protecting screen at three porosity ratios (γ = 0%, 15% and 30%) were also tested to examine how the existing screen can affect the wind load on the scaffolding system, compared with the results without the existence of the screen (γ = 100%).

Based on the results of measurements, Fig. 2 illustrates the variations of the total force coefficient (C_{Fx}) in the direction normal to the building surface (positive inwards) in relation to the oncoming wind flow attack angle (θ). It is found that when θ is greater than about 60°, the scaffolding system tends to undertake a total pull-out force. When the orientation of the scaffolding system is parallel to the oncoming flow direction (θ=90°), the total pull-out force becomes maximum. In addition, the use of the protecting screen tends to promote the magnitude of the resulting force. However, this tendency becomes less significant as the porosity ratio of the screen increases.
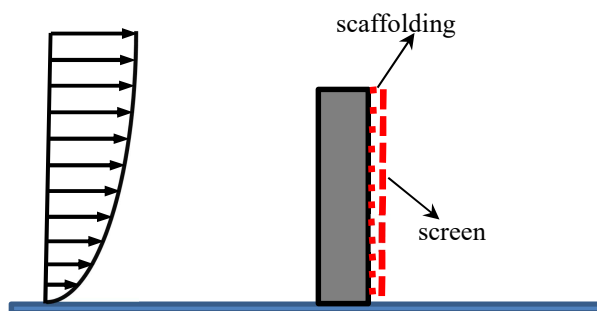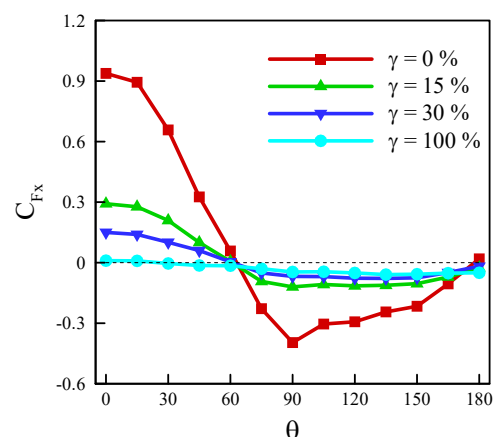
Keywords: Scaffolding, Wind load, Wind tunnel experiment

Fig. 1: Schematic of Problem

Fig. 2 : Total inward force on scaffolding