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EXPERIMENTAL INVESTIGATION OF PEDESTRIAN LEVEL WINDS USING MULTIPLE MEASURING METHODS

D. Zacho*, P. Michálek*

Abstract: *In the project, methods for the pedestrian wind comfort determination were investigated. Few methods can be used for the qualitative and quantitative measurement of the wind condition at the pedestrian level. Pressure difference measurement by the omnidirectional Irwin probes, the Particle Image Velocimetry, the Hot wire anemometry, flow visualization by a little flags, sand spreading on surface around the building model, were used during solving this project. The Irwin probes are most frequently used for the pedestrian wind comfort measurement. The velocity calibration of the Irwin probe isn't trivial so other methods were used for its verification. In this contribution the comparison of all mentioned methods was described.*

Keywords: ***Pedestrian, pedestrian wind comfort, boundary layer wind tunnel, particle image velocimetry, environment, physical modeling.***

1 Introduction

The expansion of the high-rise building development in Czech city centers needs the prediction of the pedestrian wind condition and it could be interesting for the Civil service of the Czech Republic. The High rise building can greatly affect the wind condition at the pedestrian level.

The forecast of the wind condition at the pedestrian level can be done by the methods of physical or mathematical modeling of the atmospheric boundary layer. The physical modeling includes quantitative and qualitative methods.

The results of the pedestrian wind comfort prediction can use for the planning authority when they have to approve new project of high-rise building in the city centre for example.

2 Methods of the pedestrian wind conditions monitoring

The qualitative methods give information about the wind direction in the parter of the complex of building and the quantitative methods can give information about the wind speed and the wind speed fluctuation at the monitored positions. The pedestrian wind comfort is assessed in accordance with the criteria which were developed for the specific locality (Nederland, Denmark, USA, ...). During these works was used follows methods: Visualization by cotton fiber or small paper flags, Visualization by sending, The Hot Wire Anemometry, Irwin probes, Particle Image Velocimetry measurement.

3 Results

This article describes the result of few experiments and measurement which were performed in Boundary Layer Wind Tunnel (BLWT) in Výzkumný a zkušební letecký ústav, a.s. (VZLU). Simulation of the atmospheric boundary layer in BLWT VZLU is correct and its similarity with real atmospheric boundary layer is in scale approximately 1:350. There was used simulation of the III. category of terrain as it is prescribed in codes (EUROCOD, Czech standard, ...). The typical problem of the high-rise building and its influence to the pedestrian wind comfort was chosen. It is the DownWash (DW) effect (see Fig. 3).

* Mgr. David Zacho: Výzkumný a zkušební letecký ústav, a.s., Beranových 130; 199 05, Prague; CZ, e-mail: zacho@vzlu.cz

* Ing. Petr Michálek, Ph.D.: Výzkumný a zkušební letecký ústav, a.s., Beranových 130; 199 05, Prague; CZ, e-mail: michalek@vzlu.cz

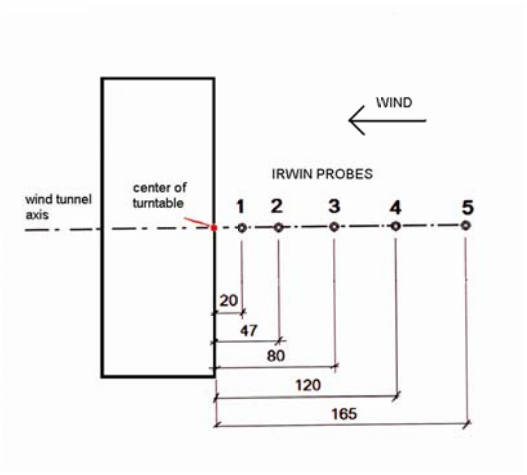

Fig. 1: Experimental arrangement, downwash measurement.

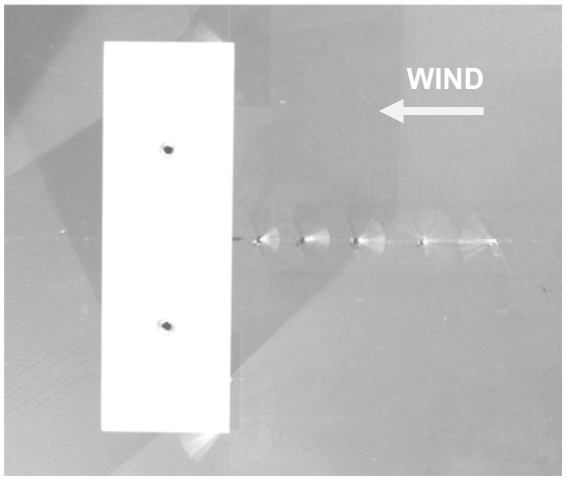

Fig. 2: Visualization of the wind flow by the paper flags.

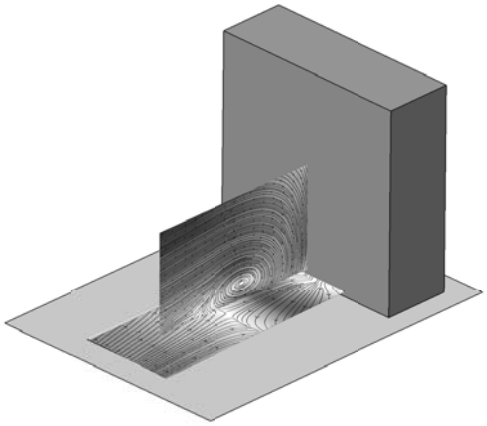

Fig. 3: The PIV results at the sagital and the transversal plan.

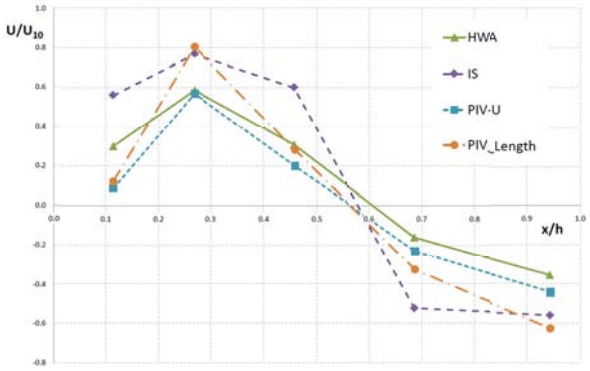

Fig. 4: Graph of the pedestrian wind measurement.

4 Conclusions

Correct prediction of the wind conditions at the pedestrian level around the new high-rise building can be create on base of combination of few methods of measurement and visualization.

The suitable solution of the pedestrian wind comfort assessment is the using of combination of mentioned methods. The visualization can show areas with strong wind exposition and there could be perform measurement with the HWA, IP or PIV. These case studies of the pedestrian wind comfort have to be carried out with consideration to effective employment of means.

Acknowledgement

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