ISBN978-4-8189-5001-6

AIJ Benchmarks for Validation of CFD Simulations Applied to Pedestrian Wind Environment around Buildings

AIJ-2016

Architectural Institute of Japan

—

AIJ Benchmarks for Validation of CFD Simulations
Applied to Pedestrian Wind Environment around Buildings

—

Architectural Institute of Japan
5-26-20, Shiba, Minato-ku, Tokyo 108-8414, JAPAN
Tel: +81-3-3456-2051
Fax: +81-3-3456-2058
https://www.aij.or.jp/

—

Issued September 26, 2016
ISBN978-4-8189-5001-6 C3052

—

Edited and published by Architectural Institute of Japan

—

PREFACE

As computer facilities and computational fluid dynamics (CFD) software have been significantly improved in recent years, the prediction and assessment of the pedestrian wind environment around buildings using CFD have become practical at design stages. Therefore, guidelines that summarize important points for using the CFD technique for appropriate prediction of the pedestrian wind environment are required. To this end, a working group for CFD prediction of the pedestrian wind environment around buildings was established in the Architectural Institute of Japan (AIJ); they started providing practical guidelines for applying CFD to the pedestrian wind environment around buildings from 2001. After years of discussion and experience on numerical and physical experimental studies, in 2007, the working group compiled and published '*The guidebook of CFD for predicting pedestrian wind environment around buildings: guidelines and validation database'* in Japanese, which contains the proposed guidelines, fundamental knowledge of CFD applied to an urban wind environment, and the results of benchmark tests. The results of the benchmark tests formed the basis for the guidelines. In the benchmark tests, cross comparisons were conducted between the results of CFD predictions, wind tunnel tests, and field measurements for seven test cases, which have been conducted for investigating the influence of many types of computational conditions for various flow fields. This part also includes information on the computational details used by the working group members. The proposed guidelines by AIJ has been published as a peer-reviewed journal paper in English (Tominaga et al., 2008) and it has been referred to by researchers worldwide. However, complete results of the benchmark test have not been published in English, although some parts have already been published as English journal papers (Mochida, 2002; Tominaga et al., 2004; Yoshie et al., 2007).

Owing to strong requests from inside and outside Japan, AIJ has decided to publish this booklet in English in order to share the complete results of the benchmark tests with the international research community. These benchmark tests were mainly conducted from 2005 to 2006. Although we are convinced that most of the results are still useful for researchers and practitioners at present, relevant studies have progressed annually. We recommend you use this booklet along with other relevant recent research.

July, 2016

Architectural Institute of Japan

List of Committee memberss:

Research Committee on Environmental Engineering

Chairman	Hirofumi Hayama		
Secretaries	Toshie Iwata	Koki Kikuta	Hisashi Kotani
Members	(omitted)		

Managing Committee on Publication of Environmental Engineering

Chairman	Kimiya Murakami	
Secretaries	Junta Nakano	Takahiro Tanaka
Members	(omitted)	

Sub Committee for CFD Prediction of pedestrian wind environment around buildings

Chairman	Akashi Mochida (Tohoku University)
Secretaries	Yoshihide Tominaga (Niigata Institute of Technology)
Members	Yoshihiro Ishida (Institute of Industrial Science, the University of Tokyo)
	Takeshi Ishihara (The University of Tokyo)
	Kiyoshi Uehara (National Institute for Environmental Studies)
	Hiroto Kataoka (Obayashi Corporation)
	Takashi Kurabuchi (Tokyo University of Science)
	Nobuyuki Kobayashi (Tokyo Polytechnic University)
	Ryozo Ooka (Institute of Industrial Science, the University of Tokyo)
	Taichi Shirasawa (Tokyo Polytechnic University)
	Naoya Tsuchiya (Takenaka Corporation)
	Yoshitami Nonomura (Fujita Corporation)
	Tsuyoshi Nozu (Shimizu Corporation)
	Kazuyoshi Harimoto (Taisei Corporation)
	Kazuki Hibi (Shimizu Corporation)
	Shuzo Murakami (Keio University)
	Ryuichiro Yoshie (Tokyo Polytechnic University)
	Masaru Yoshikawa (Taisei Corporation)
	(Members and their affiliations in the published year of the original guidebook)

References:

Mochida, A., Tominaga, Y., Murakami, S., Yoshie, R., Ishihara, T., Ooka, R., 2002. Comparison of various k–ϵmodel and DSM applied to flow around a high-rise building - report on AIJ cooperative project for CFD prediction of wind environment -, Wind & Structures 5, 227-244.

Tominaga, Y., Mochida, A., Shirasawa, T., Yoshie, R., Kataoka, H., Harimoto, K., Nozu, T., 2004. Cross comparisons of CFD results of wind environment at pedestrian level around a high-rise building and within a building complex, Journal of Asian Architecture and Building Engineering 3, 63-70.

Yoshie, R., Mochida, A., Tominaga, Y., Kataoka, H., Harimoto, K., Nozu, T., Shirasawa, T., 2005. Cooperative

project for CFD prediction of pedestrian wind environment in the Architectural Institute of Japan, Journal of Wind Engineering and Industrial Aerodynamics 95, 1551-1578.

Tominaga, Y., Mochida, A., Yoshie, R., Kataoka, H., Nozu, T., Yoshikawa, M., Shirasawa, T., 2008. AIJ guidelines for practical applications of CFD to pedestrian wind environment around buildings, Journal of Wind Engineering and Industrial Aerodynamics 96, 1749-1761.

Contents