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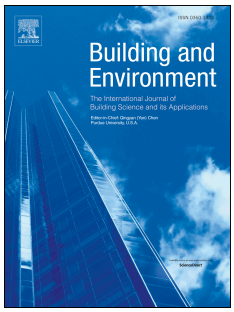

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PII: S0360-1323(18)30194-X

DOI: 10.1016/j.buildenv.2018.03.059

Reference: BAE 5393

To appear in: *Building and Environment*

Received Date: 2 November 2017

Revised Date: 28 March 2018

Accepted Date: 29 March 2018

Please cite this article as: Yu Y, Yang Y, Xie Z, A new inflow turbulence generator for large eddy simulation evaluation of wind effects on a standard high-rise building, *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.03.059.

A new inflow turbulence generator for large eddy simulation evaluation of wind effects on a standard high-rise building

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ABSTRACT

The generation of inflow turbulence is among the key issues that affect the large eddy simulation (LES) of atmospheric boundary layer (ABL) flow. An improved inflow turbulence generator for LES, the narrowband synthesis random flow generator (NSRFG), is proposed in this study based on previous random flow generation (RFG) techniques. The novel NSRFG technique yields a more concise expression and overcomes some defects in the previous study of RFG techniques by strictly maintaining a divergence-free condition, coherency function, and turbulent spectra of the ABL flow theoretically. The new technique was validated by simulating a typical turbulent ABL flow, and comparisons between the NSRFG method and the consistent discretizing and synthesizing RFG method are presented. The new technique was then applied to the numerical simulation of the turbulent flow around the CAARC standard building model, which was tested in the boundary layer wind tunnel of the South China University of Technology. A detailed comparison of the wind effects obtained from numerical simulations and a wind tunnel test, including wind pressures, base moments, and wind-induced responses, was finally performed to demonstrate the feasibility and effectiveness of the new technique.

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