HEXAGON

Case study

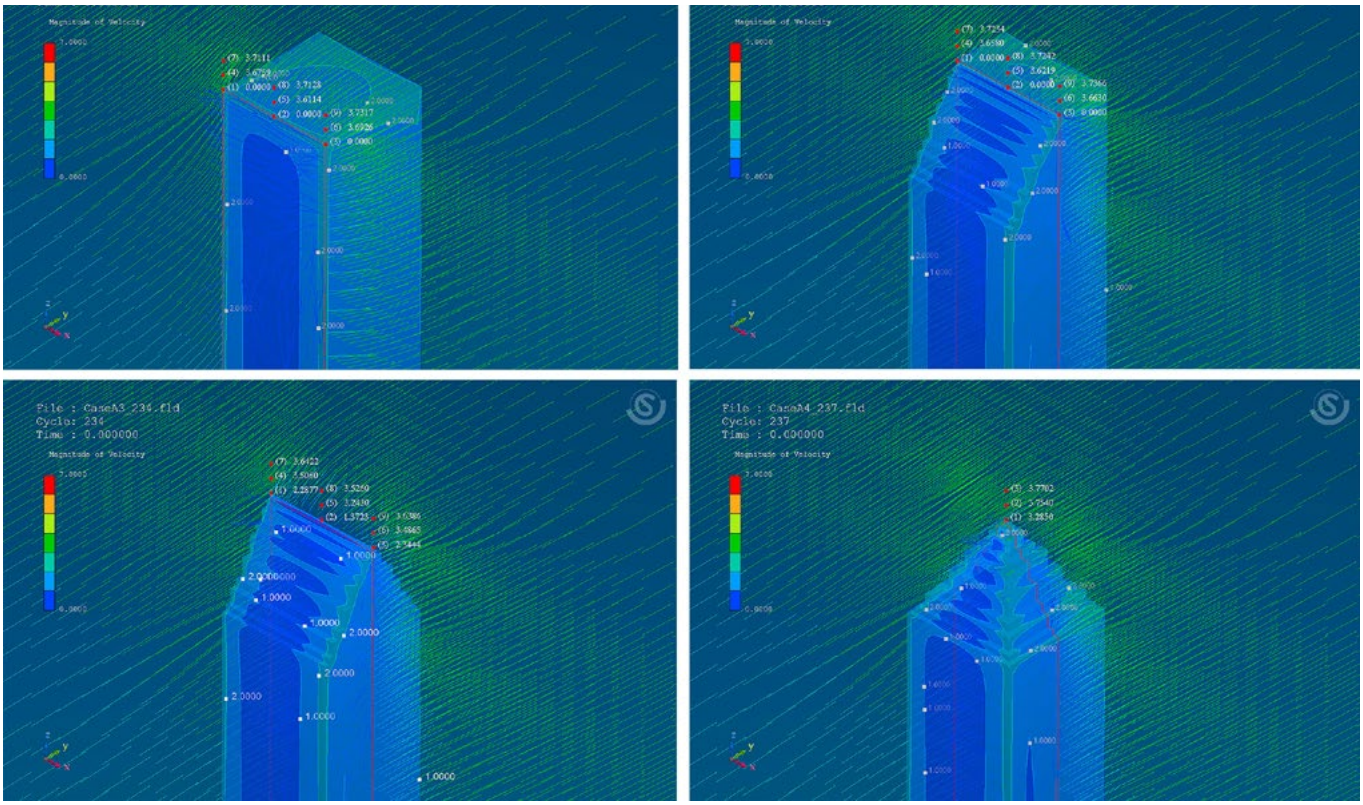
Artisan Architects delivers sustainable building design through simulation

Easy mesh generation and high-speed simulations allow easy design validation for effective study of airflows for sustainable building design.

Artisan Architects Company Ltd, an architecture and interior design services firm based in Bangkok, Thailand, specialises in large scale residential and commercial projects.

Established in 2008, the company provides sustainable design solutions as a part of the Environmental Impact Assessment (EIA). In 2019, the company expanded its services to provide green building consulting services using Computational Fluid Dynamics (CFD) simulations.

To meet the growing demand for greener and environment-friendly buildings, Artisan Architects works with Dr Pattaranan Takkanon, a CFD expert and green building consultant, an Associate Professor Department of Building Innovation, Faculty of Architecture Kasetsart University.



Dr Takkanon specialises in thermal design, airflow analysis for indoor and outdoor environments, and whole-building performance assessment for green building certification. In her projects, she uses CFD to study the impact of new high-rise buildings on urban wind environment as part of the Environmental Impact Assessment report to obtain a construction permit. The company finds simulation an effective tool to study airflows in sustainable building design solutions such as a façade design for ventilation in pig barn farmhouse.

They often work on urban wind analysis, enabling large-scale calculation, generating the mesh quickly. However, performing high-speed simulations can be challenging. For example, when coping with thermal parameters; temperature, humidity, air movement, and radiation, all at once, it is hard to speed up the simulation process.

Simulating urban wind forces using scSTREAM

The existing software needed considerable time for meshing since architectural projects, unlike product development or object analysis, have a wide range of element sizes starting from the scope of railing to opaque wall. This affected the gridding process. The models are often created by modelling programs such as SketchUp, 3D Max, and Rhino. These software file formats are often incompatible with CFD programs.

Dr Takkanon decided to use scSTREAM for CFD simulation since it has a structured mesh function, saving time. It also offers a plant canopy function which is useful urban green area studies. ScSTREAM accepts various model file formats. The Building Information Models (BIM) can easily be imported into scSTREAM. The program also has a structured grid and mesh function that saves working time.

Modelling multiple formats with structured meshing led to better efficiency

ScSTREAM provides accurate and reliable results that are beneficial to business. It enables easy mesh generation and high-speed simulations, thus saving calculation time. The original meshing problem was solved, and the meshing time has been reduced by about half compared to other software packages.

Using simulation in the early stages of the design process allowed the team to iterate quickly and validate design choices as a project progresses. Further, scSTREAM enabled Artisan Architect's CFD experts to understand urban winds better and identify areas with potential discomfort.

The post-processing features of the CFD tool generate visually compelling and persuasive images that communicate design to clients and competitions.

Way forward

Given its wide range of features such as diffusion, outdoor ventilation, and plant canopy simulation, the team is considering the use of scSTREAM to study indoor ventilation for designing post-COVID-19 spaces such as classrooms and office spaces in hot-humid climates, to study urban wind environment and effects of green areas on outdoor thermal conditions for a new research project titled “Local Climate Zone and Green Area Classification for Bangkok Urban Planning on Climate Change.”

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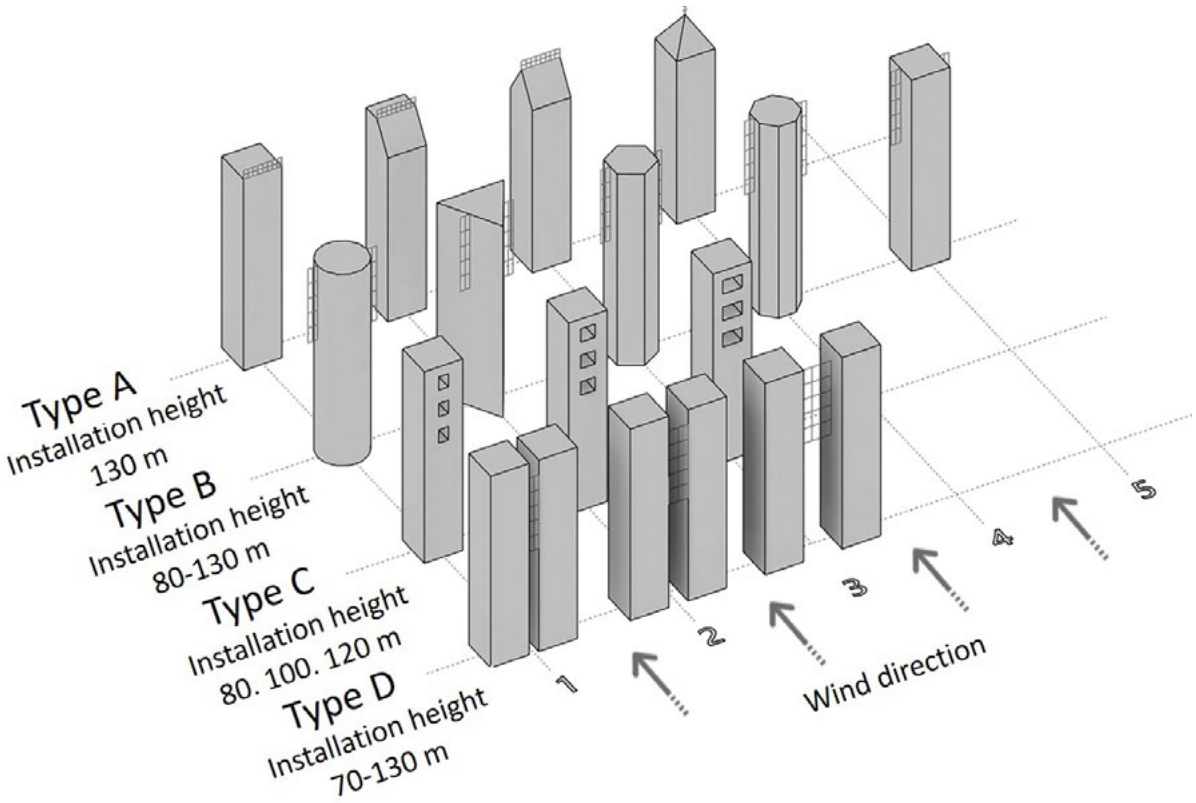

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