VENTO CFD

Break free from limitations

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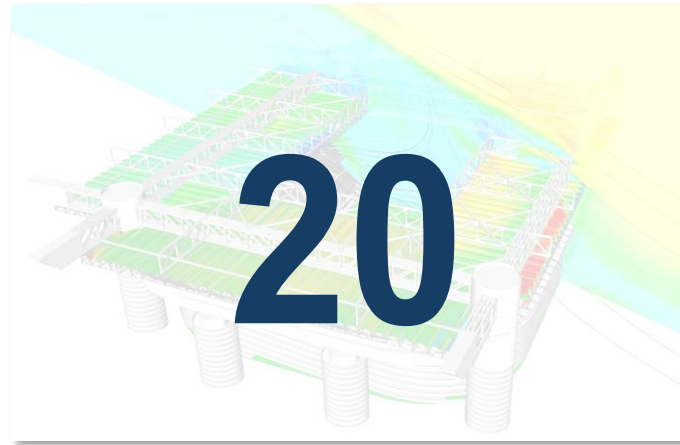Structural Engineer - CFD analysis
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Vento CFD transforms the way to do CFD analysis

At Vento, our passionate team forms the bedrock of our innovation-driven organizaton. We bring toghether over **two decades of relentless R&D and a combined expertise spanning 50 years** in the field of Computational Fluid Dynamics (CFD).

This journey of expertise reached a significant milestone – Vento's recent investment from **Galaxia**, the Italian Technology Transfer Hub on Aerospace

"Our ambition? Break the entry barriers to CFD and unlock its full benefits to the professionals of the built environment."

Marco Mulas, CEO and Founder

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20

x20

2.0

It took more than a dozen years of development and improve the IB technique well beyond today's state of art

- Unparalleled speed and ease-of-use.

The preparation of cases of normal and high geometrical complexity may take days with the most popular CFD products
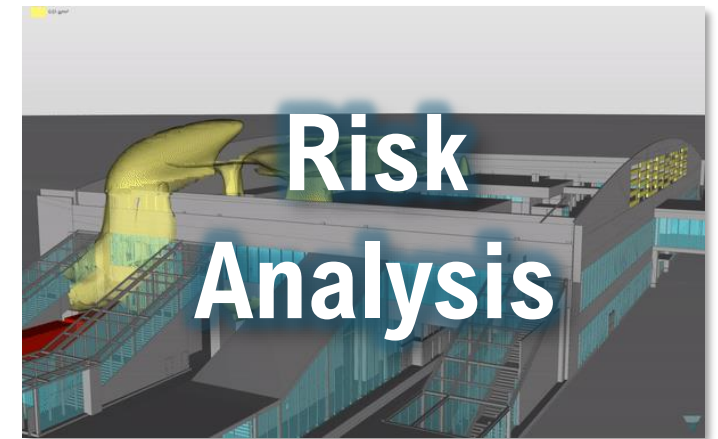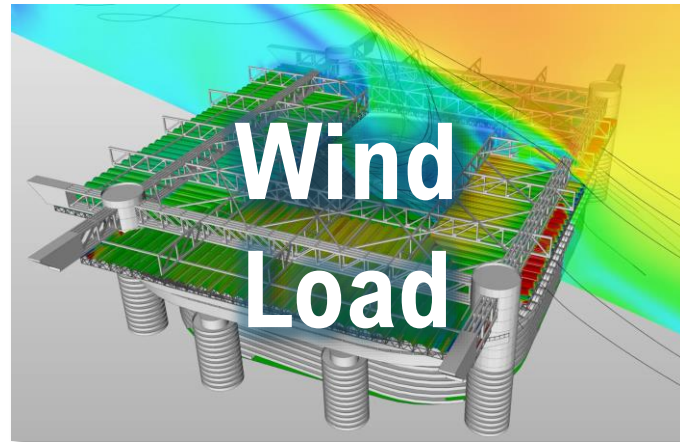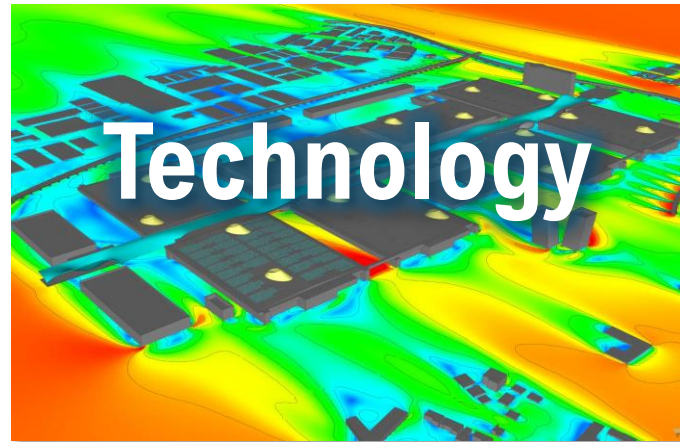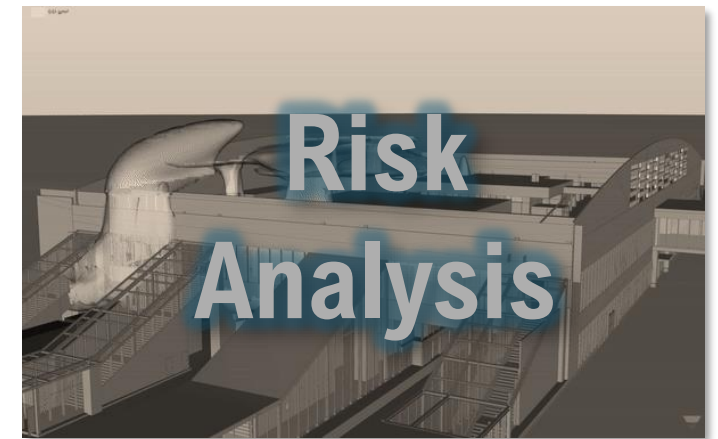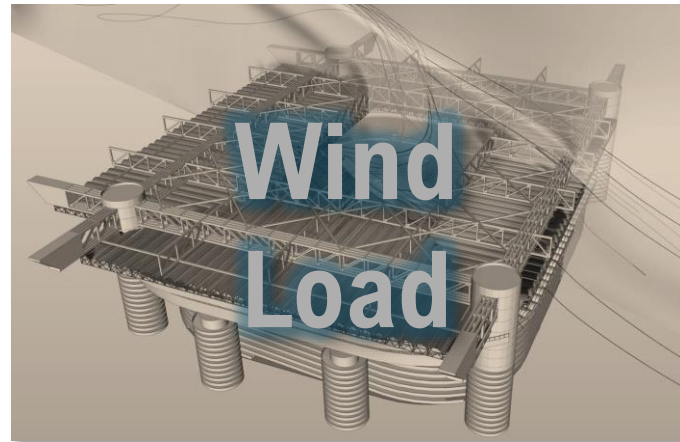
- Analysis in minutes

Their latest version, IB 2.0, is capable of identifying all sub-grid geometrical scales, and treat them appropriately.

- Waste no time in cleaning the geometry

ROBUSTNESS AND ACCURACY IN NO TIME

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Technology

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Indoor Comfort

Wind Load

Outdoor Comfort

Risk Analysis

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The Non-Conformal Grid technique from Vento: a disruptive innovation in CFD

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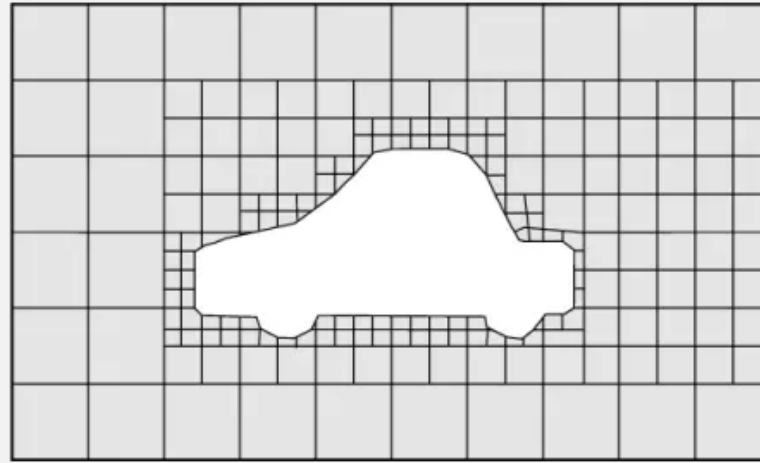Email: mpolastri@simpol.be

Traditionally, CFD uses **conformal meshes**, in which all the nodes that define the object are also the nodes of the 3D mesh. However, this technique often leads to **distortion of cells**, particularly near objects, resulting in **inaccurate calculations**. Although sophisticated 3D mesh generators have been developed to address this issue, they are often **time-consuming and technically challenging** to implement.

The **Non-Conformal Grid (NCG) technique developed by Vento** is a game changer in the industry. With NCG, the mesh and the object's nodes are treated as two separate entities: the shape and position of the object are reconstructed by proprietary NCG algorithms, independent of the mesh typology. The benefit? The ability to run **accurate simulations, even on super complex geometries**, without the need for simplification or "cleaning" of input files.

https://vento-cfd.com/validations/

Non-conformal grid

Conformal grid

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Easy to use

With Vento, mesh construction is automatic. This means that CFD analysis can be learned at a more efficient pace.

Automatic mesh construction

Faster turnaround time

Save up to 90% of pre-processing time, enabling focus on design and increasing productivity for you and your team
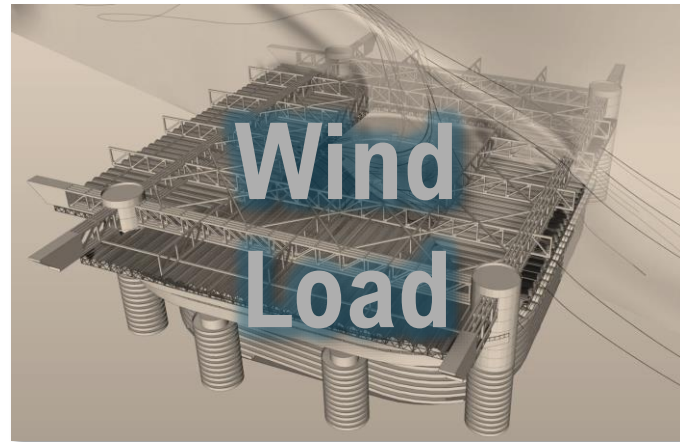
Increase in productivity

BIM ready

With Vento you can interact directly with the BIM environment and import extremely complex and realistic IFC models.

Interact with BIM environment

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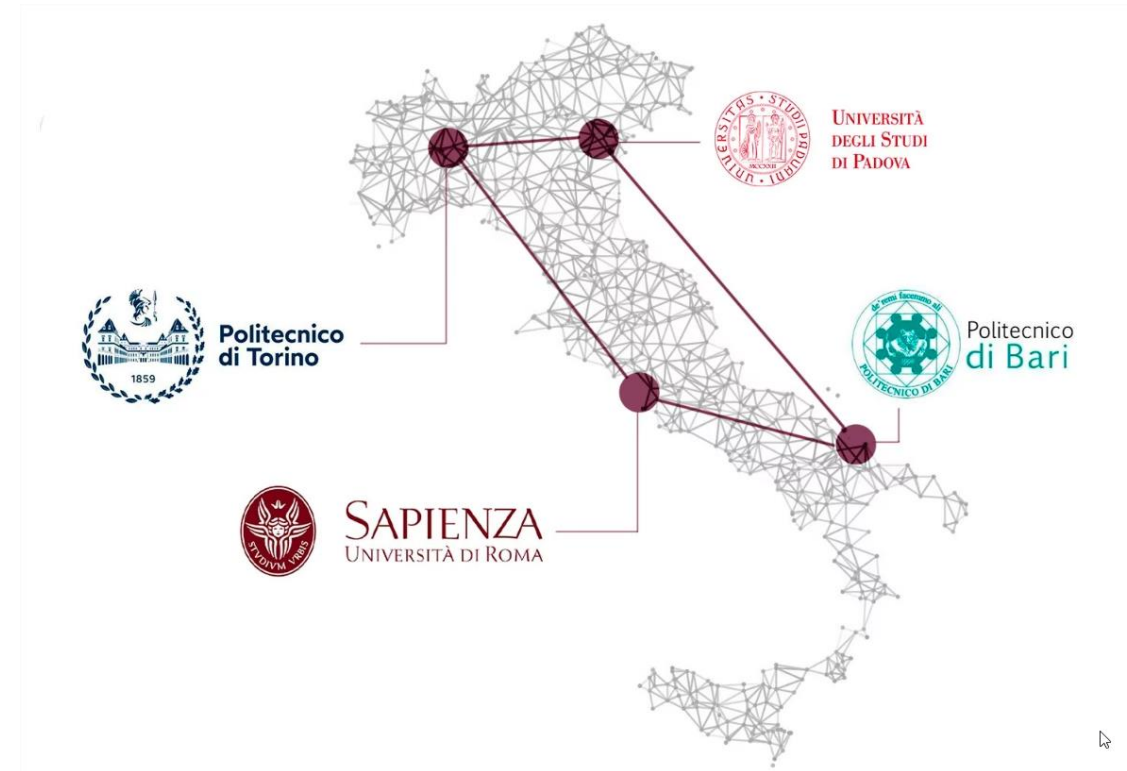
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Galaxia partner institutions are: Politecnico di Torino, Politecnico di Bari, Università La Sapienza and Università di Padova.

➢ Its mission is to transform ground-breaking innovations developed by national scientists into global market leaders

➢ The New Space Economy has opened up a huge opportunity for emerging players to enter the market and grow big

➢ Galaxia promotes deep-tech start ups leveraging IP developed at national research centres and universities with the goal of disrupting the Aerospace market by investing early stage in talented scientists and entrepreneurs

https://galaxia.vc/en/

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Feasibility studies for high-performance energy systems	+	Energy diagnosis	+	Verification of Compliance with Minimum Environmental Criteria (CAM)	+
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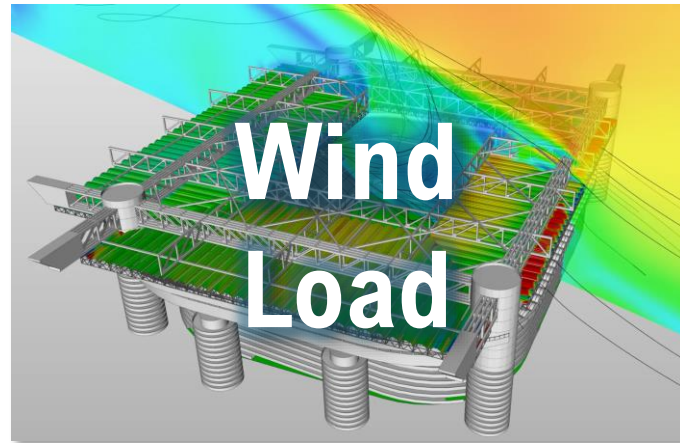SUTHEP, MUANG DISTRICT
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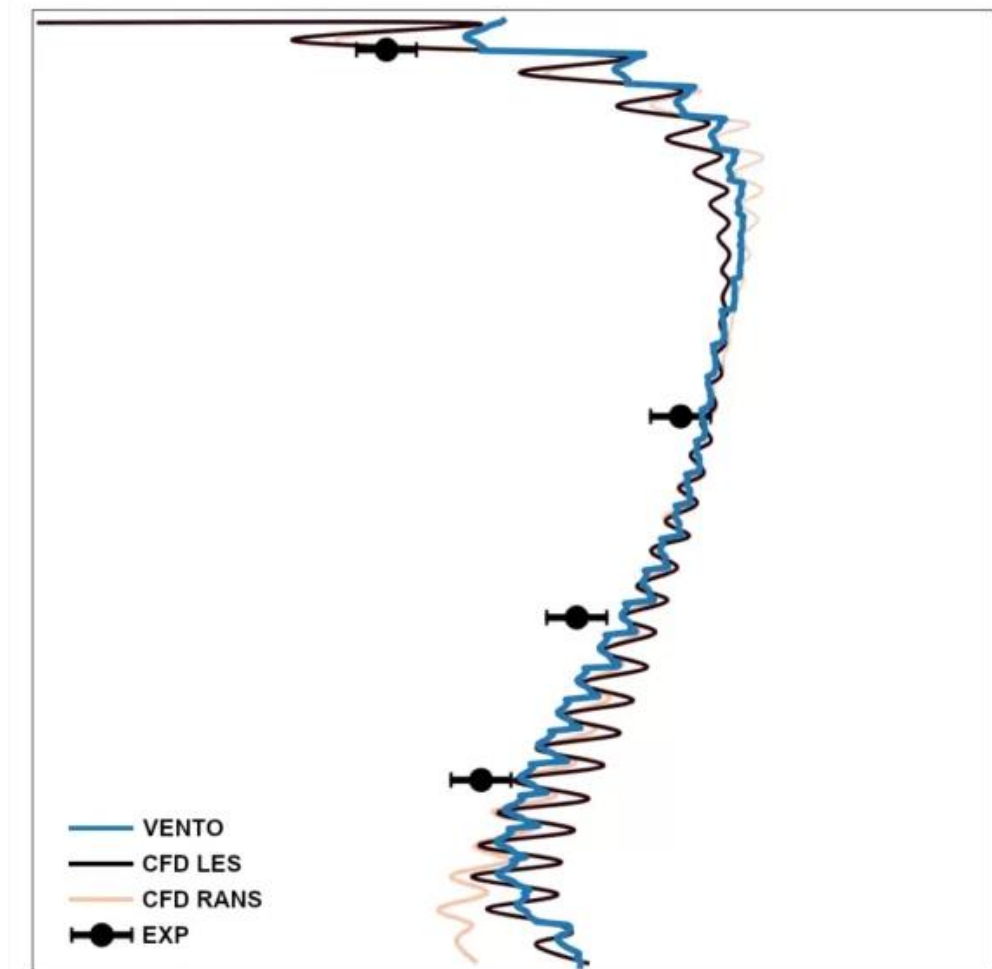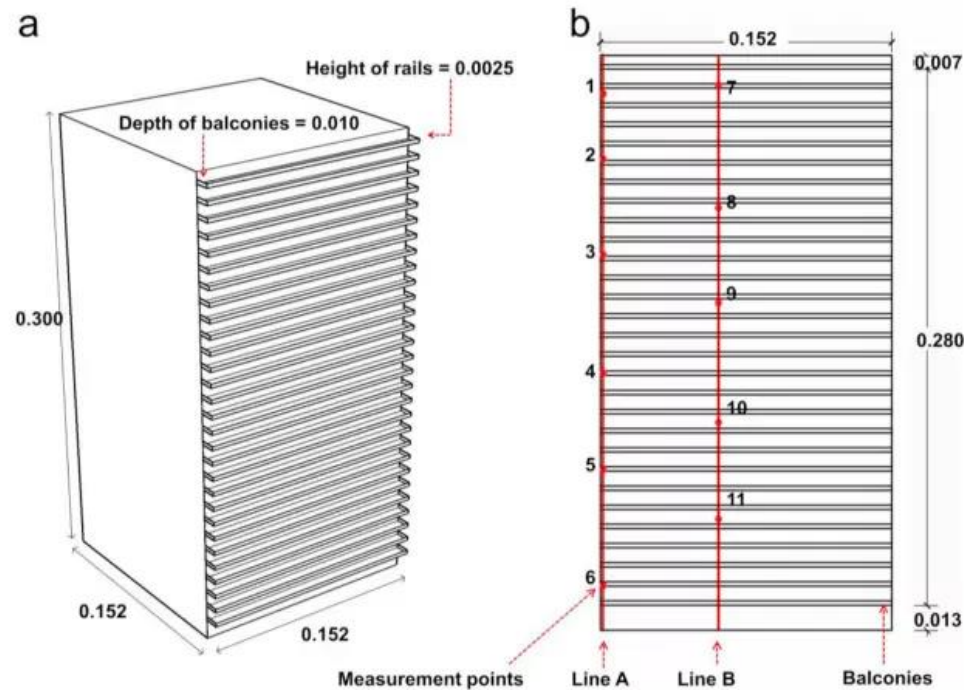# BURO MILAN

over 1000
projects of which

70 ongoing in over
30 countries

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Recent RWDI study demonstrates that when determining structural wind loads, wind tunnel testing offers significant savings vs. local code-based approach
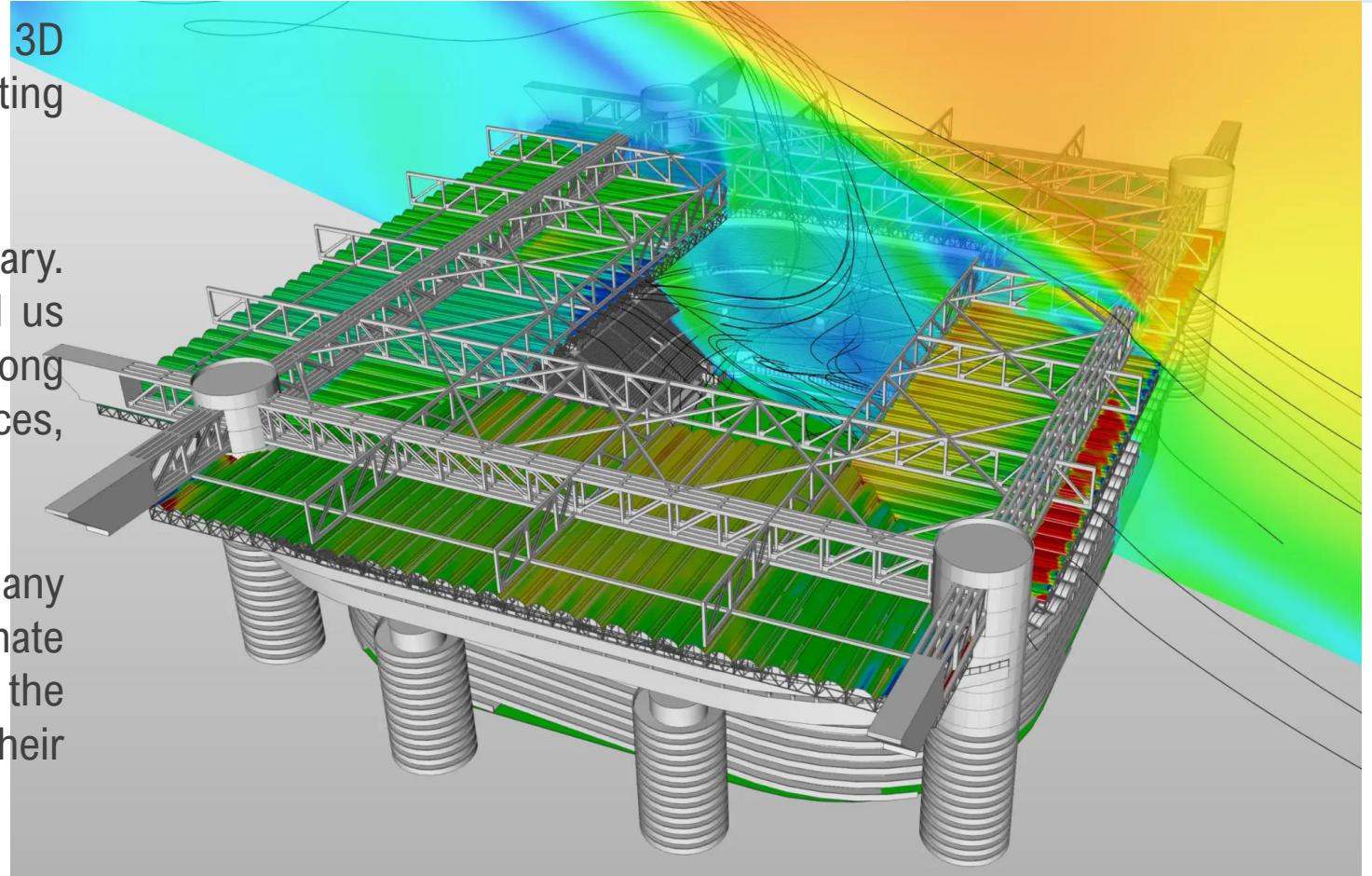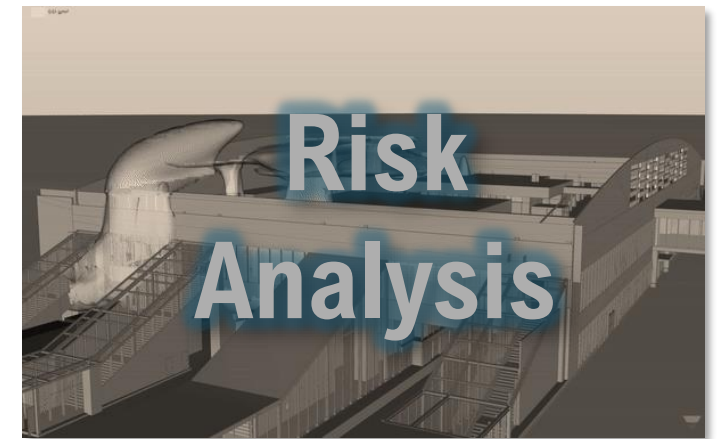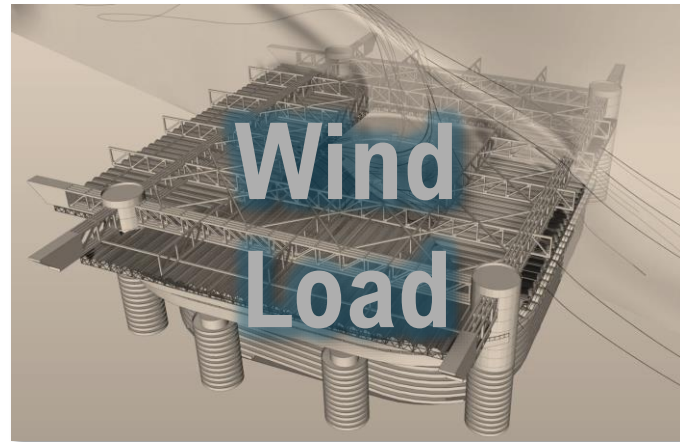
Endorsed reliability

CFD has been used for 30 years in the aeronautical and automotive industries, proving it is a highly reliable alternative to wind tunnel tests.

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An example of unparalleled CFD performance

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➢ We successfully processed a highly intricate 3D STL model of **Stadio Meazza in Milan**, consisting of **4 million elements**.

➢ No cleaning of the model was necessary. Our **"non-conformal grid"** technology enabled us to handle the complex roof truss structure along with all the intricate small scale elements (fences, railings, stairs, seats and more)

➢ **Wind load values** can be extracted in many different ways (other than the CP vs coordinate shown above) in order to satisfy the needs of the **structural engineers** for passing load data to their **FEA software**.

➢ The entire setup, which involved grid generation, **was completed in just 20 minutes**.

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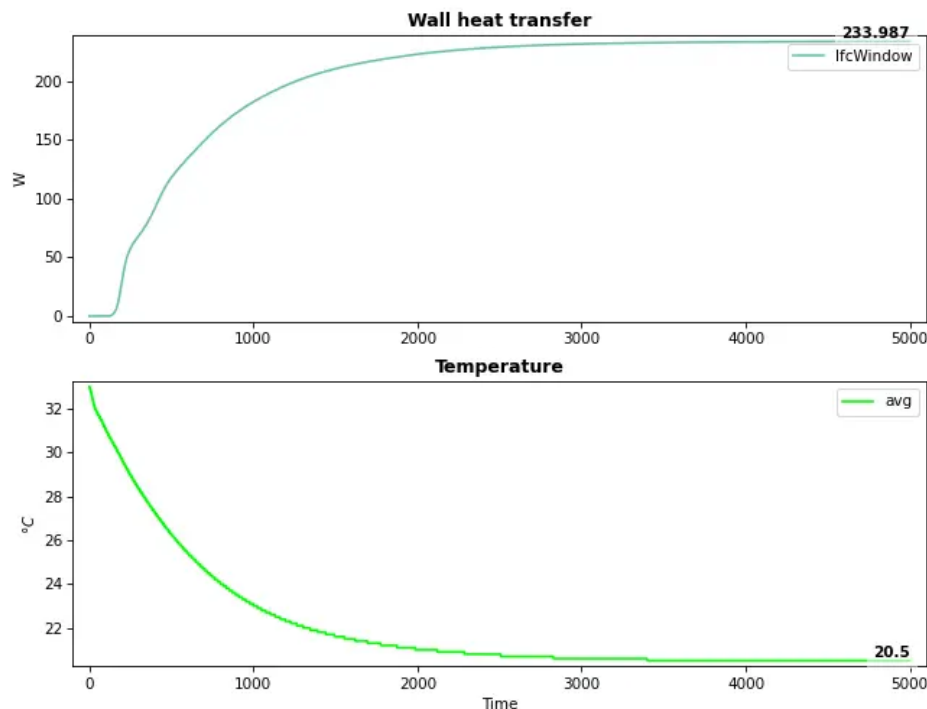Email: mpolastri@simpol.be

Case study: Office environment, handling the most challenging IFC files

This case study, conducted by the University of Padua, aimed to **assess the performance of two CFD software solutions (ANSYS Fluent vs. VENTO AEC) in an air conditioning scenario on a typical summer day** within a real departmental office. The study involved comparing temperature values calculated by both software packages against data from seven measurement points located within the office.
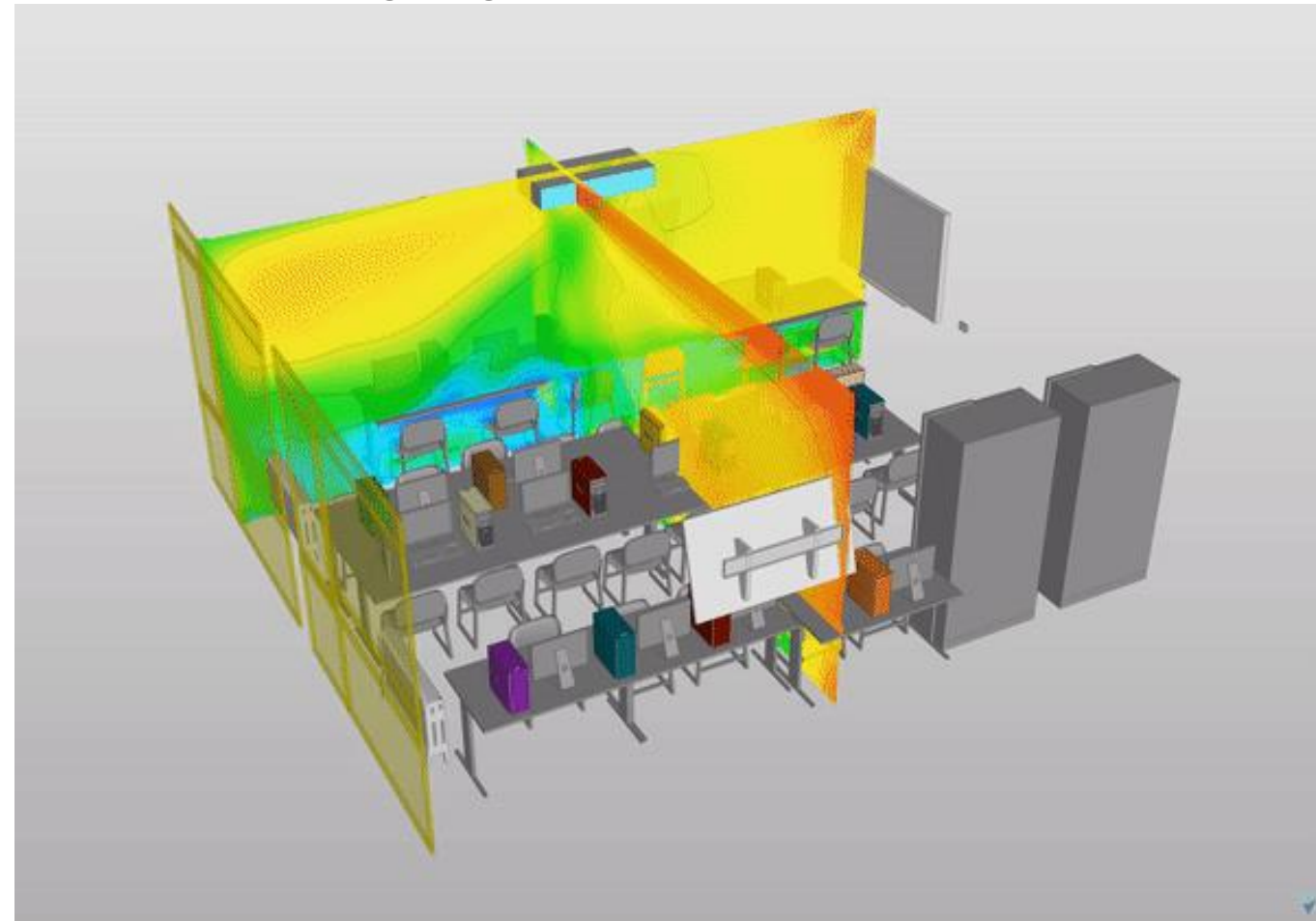
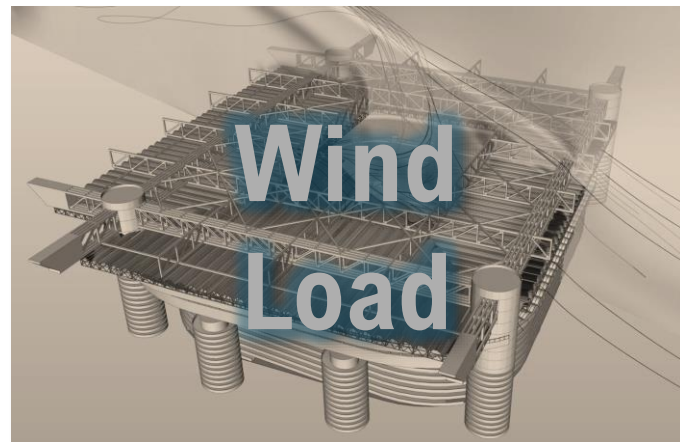Moreover, the video demonstrates our outstanding post-processing technique.
Key parameters:
> Inlet and Outlet located at the ceiling: T=20 C, 0.55 Kg/s
> Diabatic windows with assigned transmittance
> External air temperature T=33 C

The graphs illustrate wall heat transfer via diabatic windows, along with the average temperature. These visuals demonstrate a seamless convergence toward a steady-state regime.

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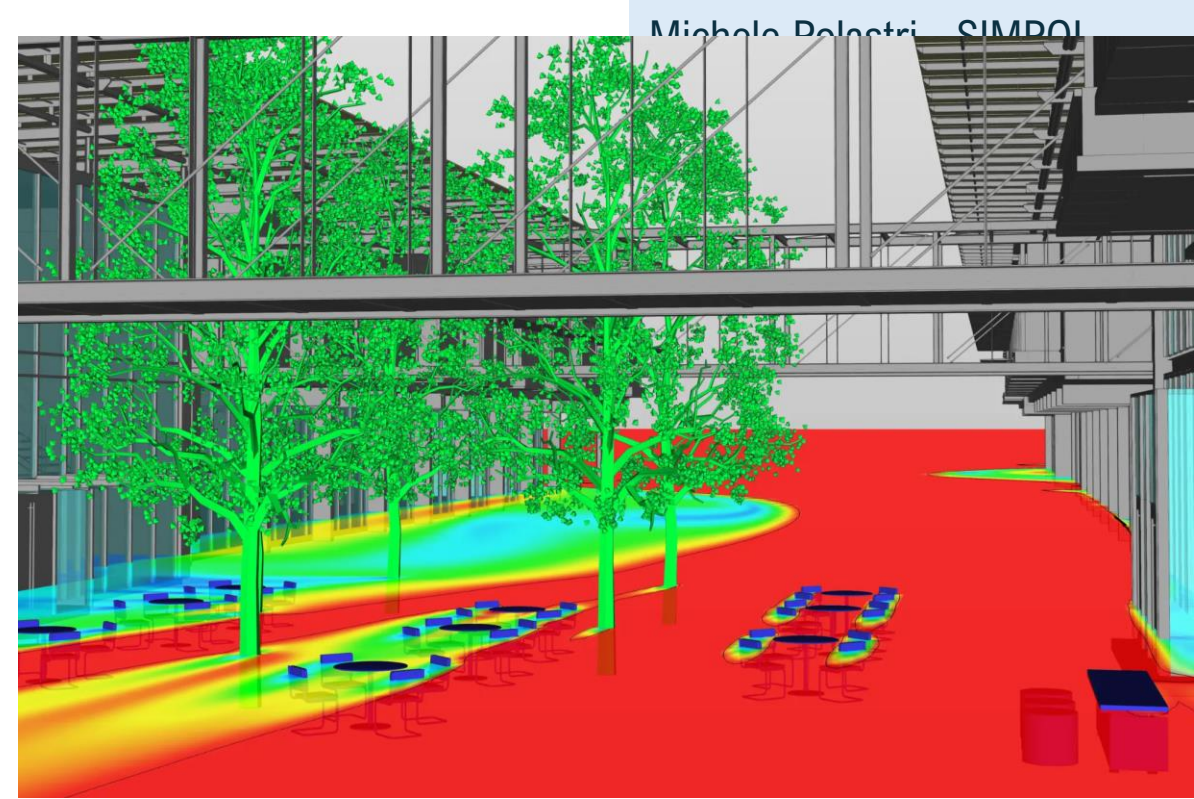Structural Engineer - CFD analysis
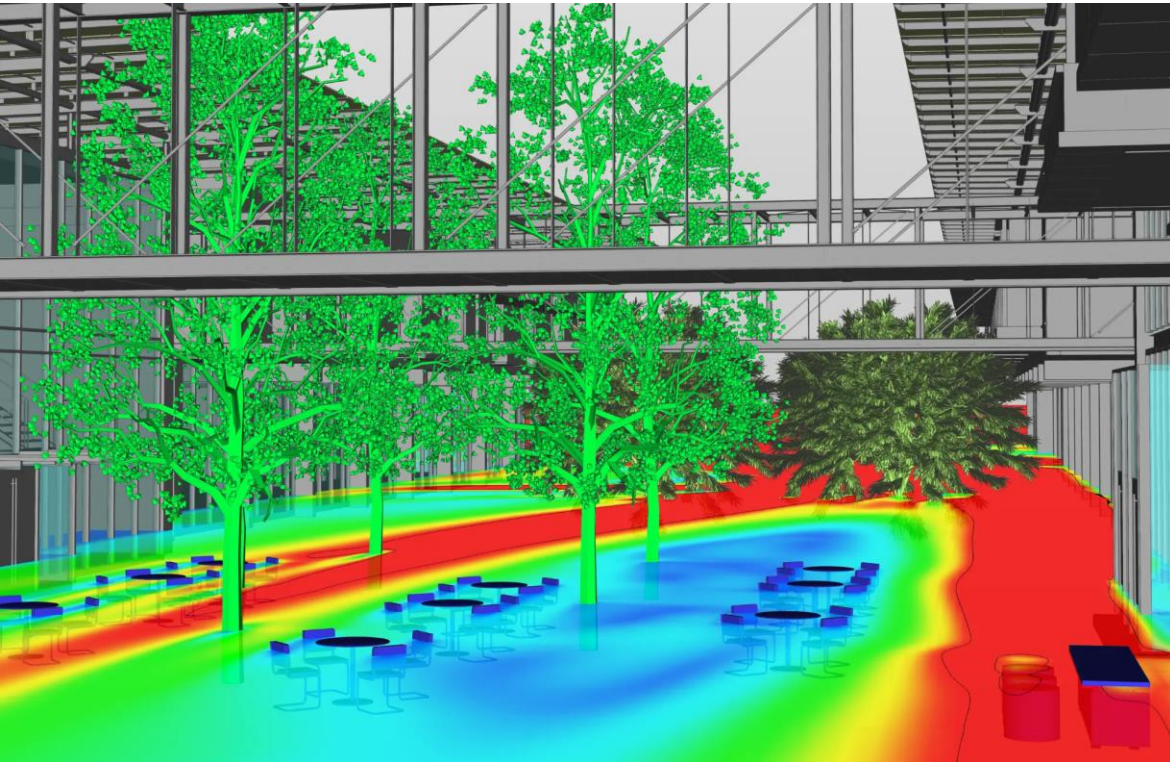Email: mpolastri@simpol.be

Case study: upfront simulation for early-stage guidance

This simulations offer a distinct advantage by enabling architects to explore, optimize and validate design directions efficiently, saving time and resources while ensuring **performance and sustainability goals** are met.

Within landscape architecture, greenery and trees are increasingly important, as they not only elevate aesthetic appeal, but also promote environmental sustainability and play a key role in mitigating urban heat island effects.
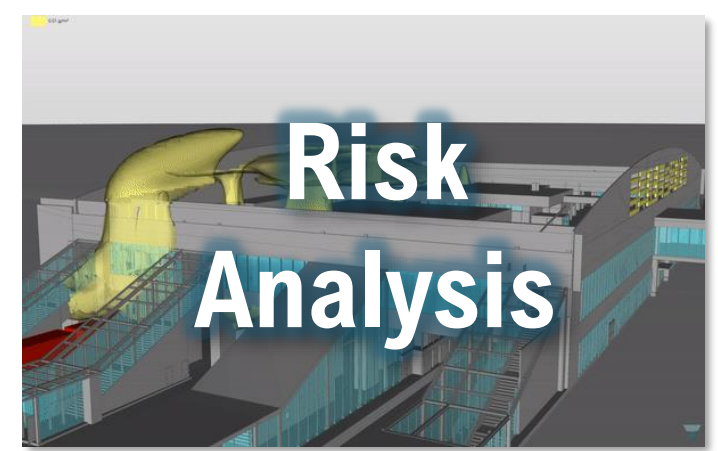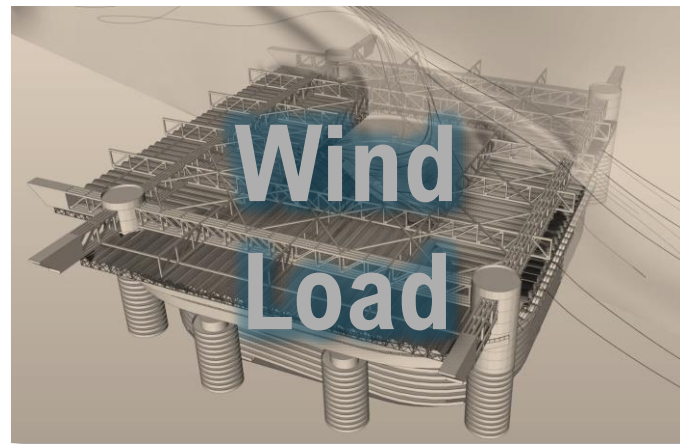

In this case study, we investigated the impact of trees on the perceived comfort of a relaxation area, furnished with garden chairs and tables, subject to a wind intensity of 10 m/s.

The two images show the wind speed at a 70 cm height above the ground, highlighting red zones where wind speeds exceeding 3 m/s. Typically, this speed threshold is the upper limit to ensure comfort.

Thanks to our proprietary and unique Non-Conformal Grid technique, we used true models of trees and extremely complex IFC building models.

Each setup, included the grid generation of about 5M cells, took less than 20 minutes. The simulations took a few hours each.

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Case study: Assessing smoke dispersion in a train station

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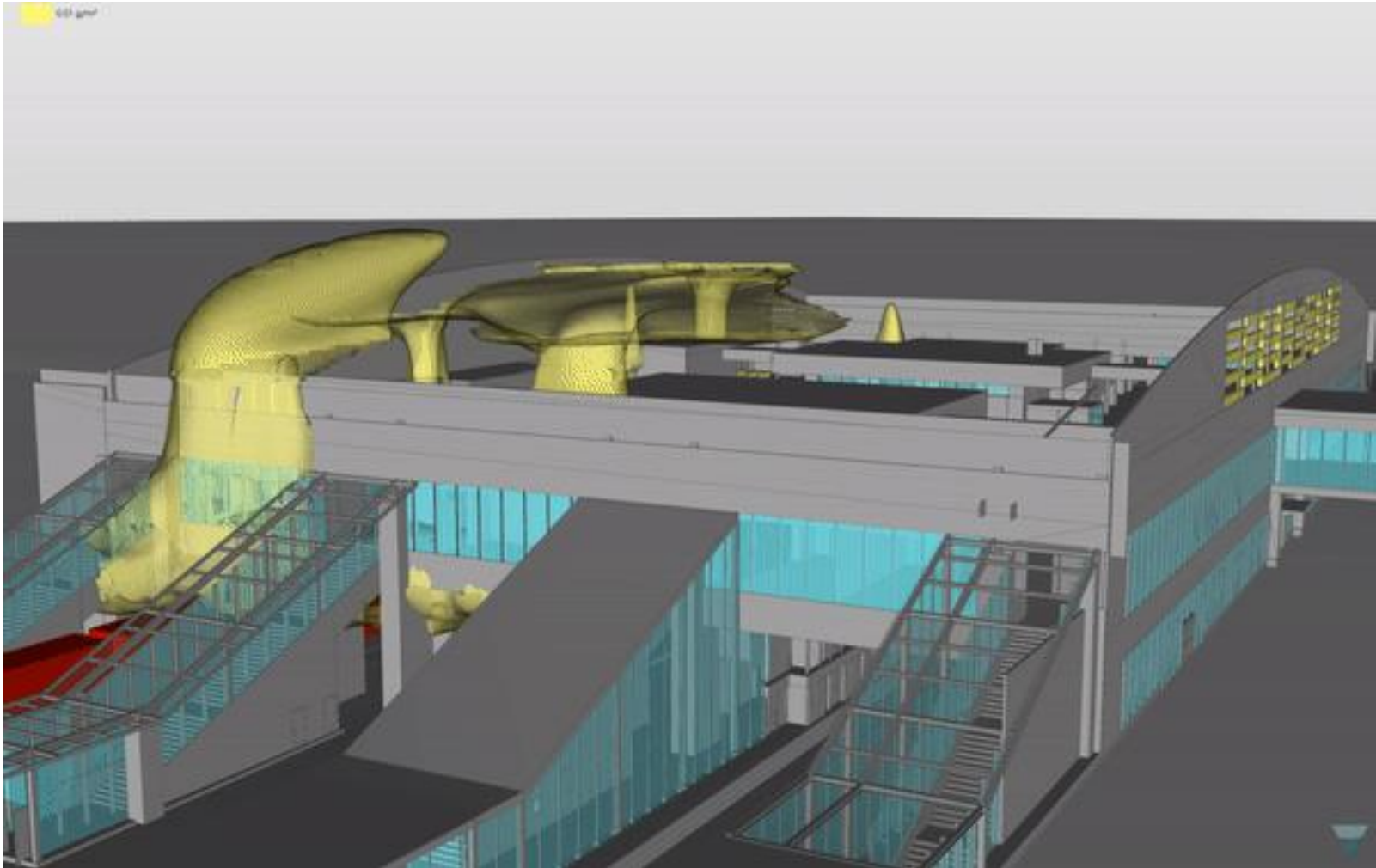Email: mpolastri@simpol.be

This case study was carried out in collaboration with the Department of Industrial Engineering of the University of Roma Tor Vergata for Italferr, the no.1 Engineering company in Italy.

The objective was to **examine the smoke dispersion** within a train station and its potential impact on the **evacuation plan.**

The focus lies on the critical initial 4-5 minutes post-incident, aiming to identify areas where smoke concentration might impede the station evacuation and assessing the duration of such effects.

The image shows the complexity of the IFC model, which includes dozens of staircases and escalators. Multiple rounds of simulations have been run to factor open or closed doorways.

It displays the smoke clouds 3 minutes post-incident: the smoke not only enveloped the platforms but also ascended to the concourse level through various pathways, notably escalators. The upward columns of heated smoke within the Concourse level ultimately reach the ceiling and disperse.

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