

CFD Study

# BERLINER BREMSSENWERK

Pedestrian Wind Comfort Assessment using  
Computational Fluid Dynamics for the Berliner Bremsenwerk

### Berliner Bremsenwerk

Am Bremsenwerk 1

10317 Berlin

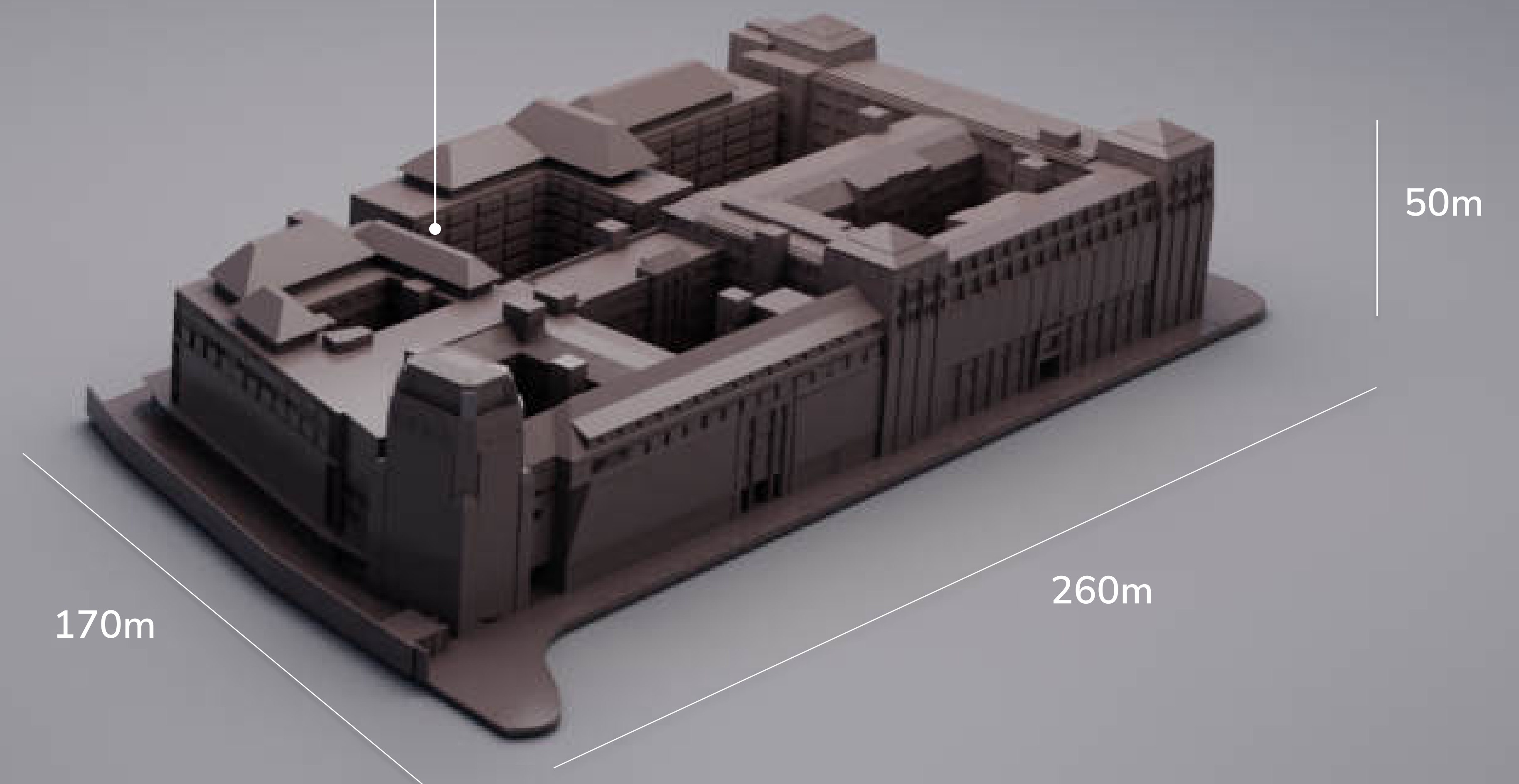
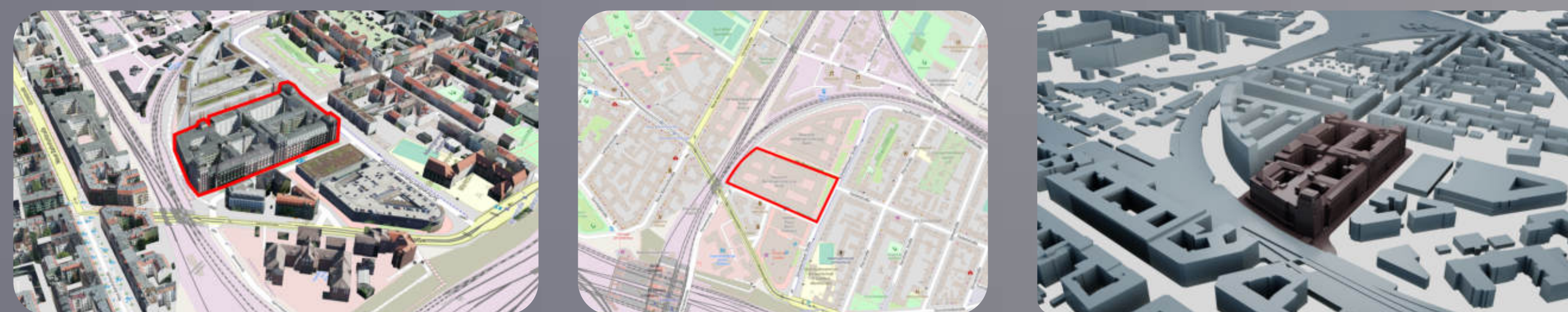
Latitude: 52.505772°

Longitude: 13.473673°

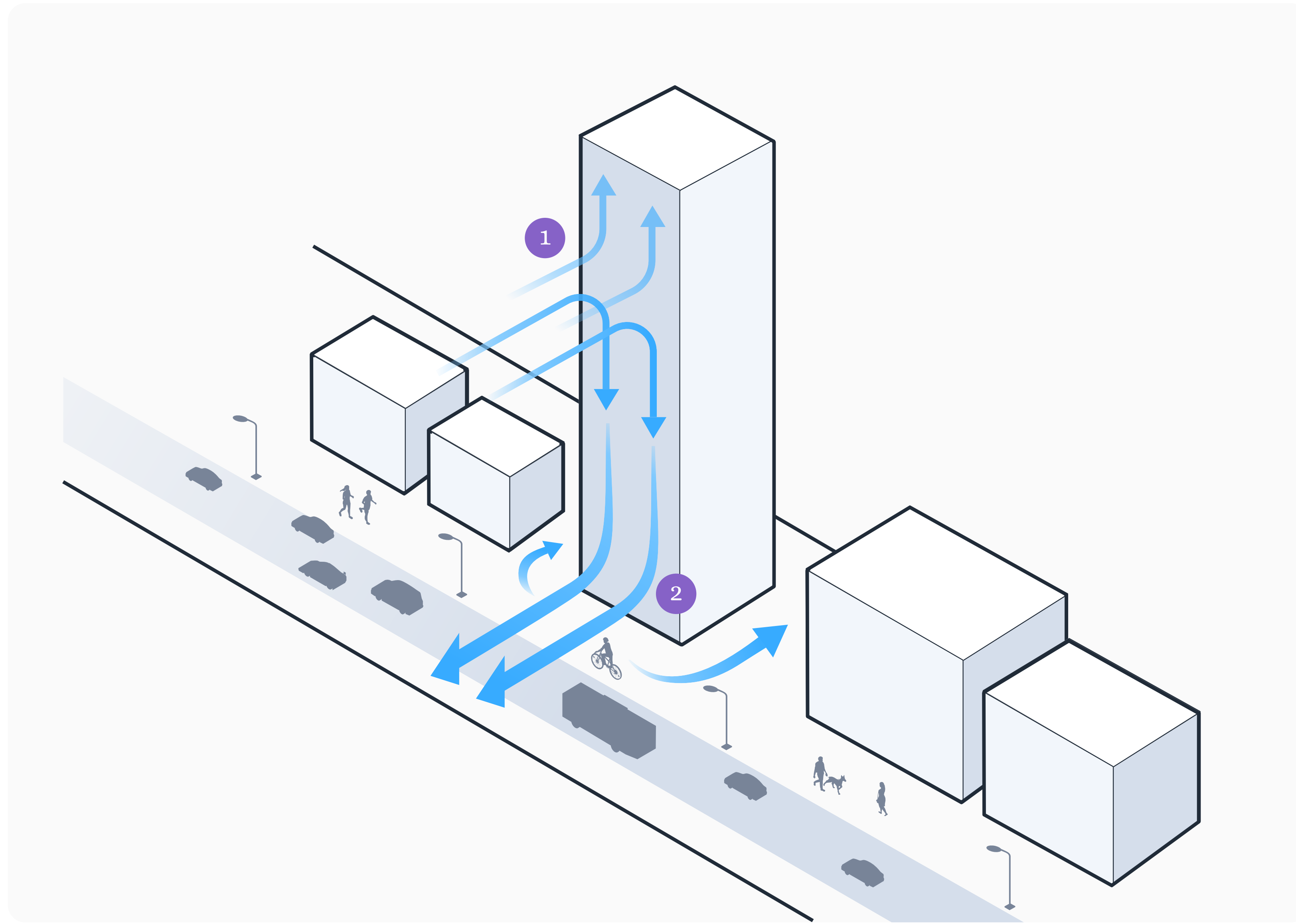
Wind Exposure: 0° to 360°: Urban environment

Weather Station: Berlin Tempelhof

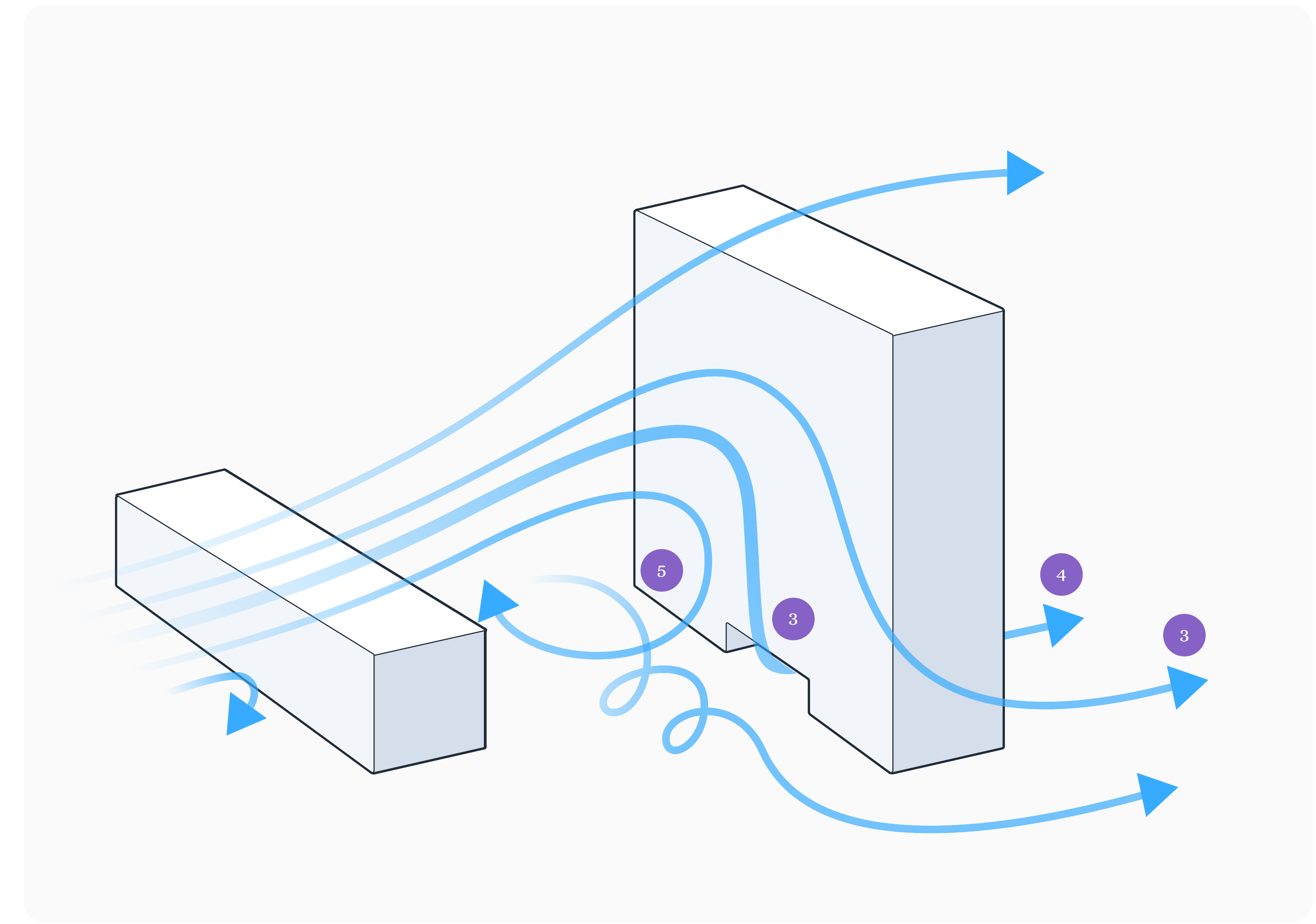
Wind Action Standard: EN 1991-1-4:2005+A1:2010



## Why is Pedestrian Wind Comfort (PWC) important?



- 1 When air hits a tall building it is pushed up, down or around the corners
- 2 When the air is forced downwards it increases wind speed at street level

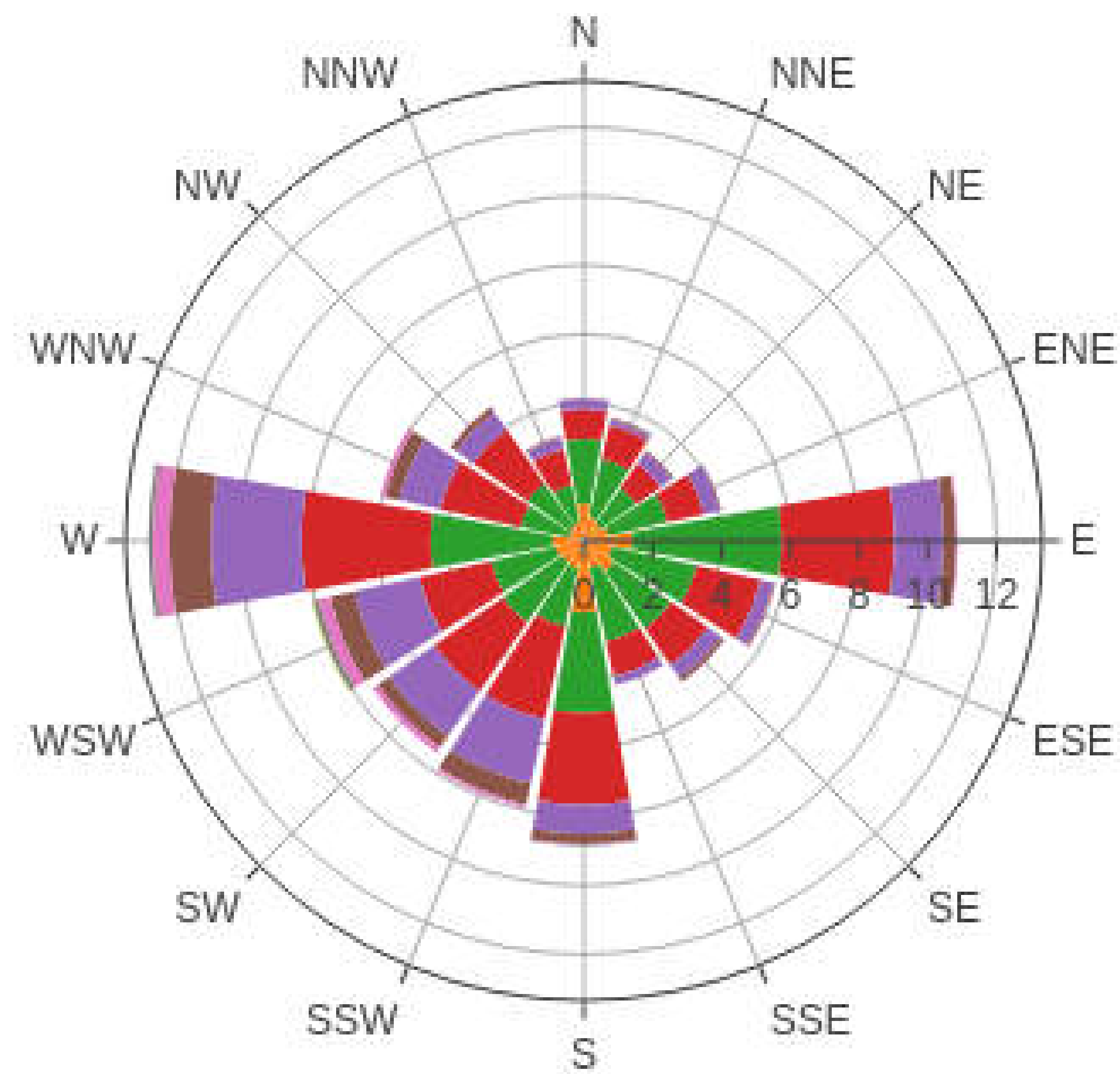


- 3 Strong wind generated at corners
- 4 Flow through narrow spaces
- 5 Reverse flow pattern

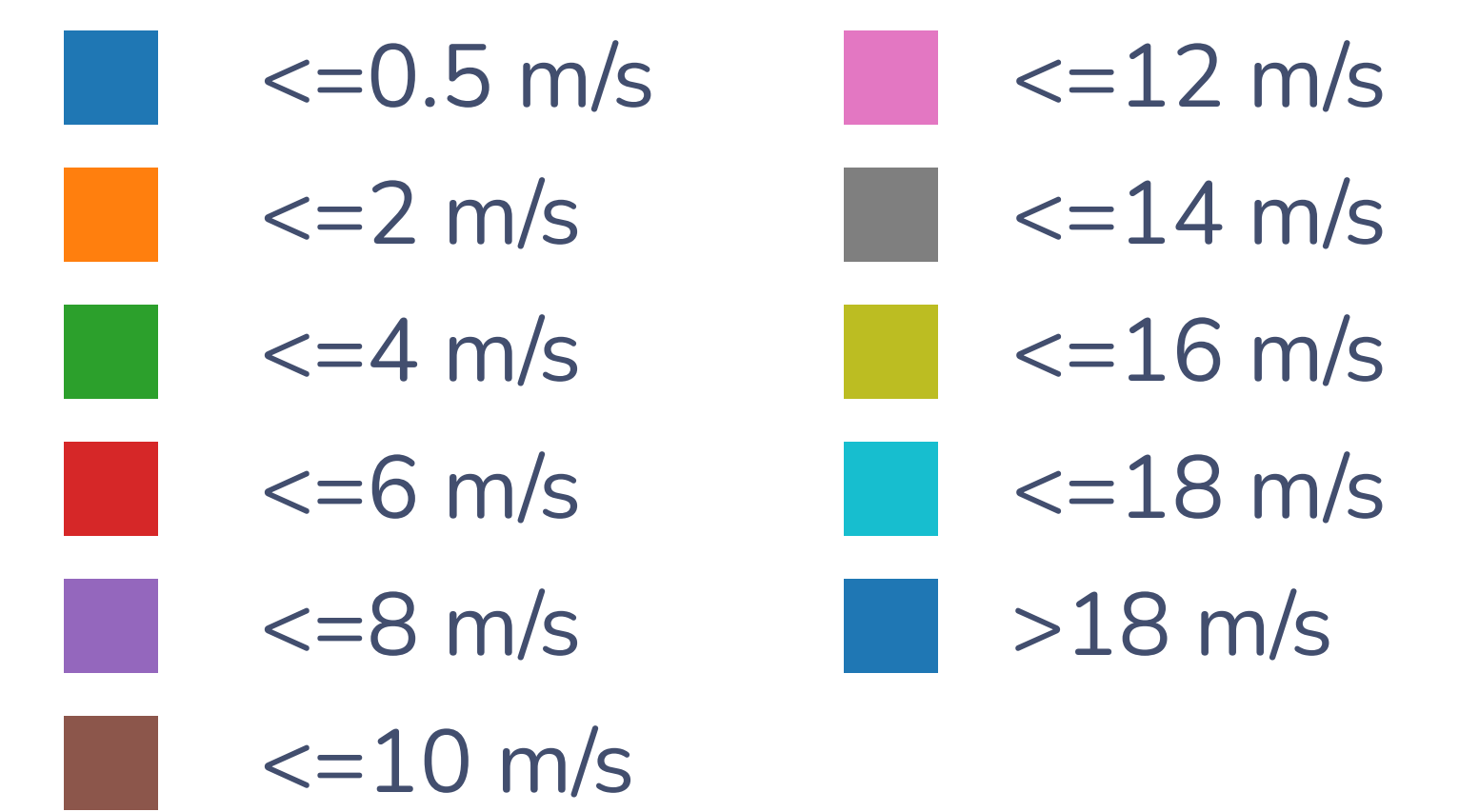
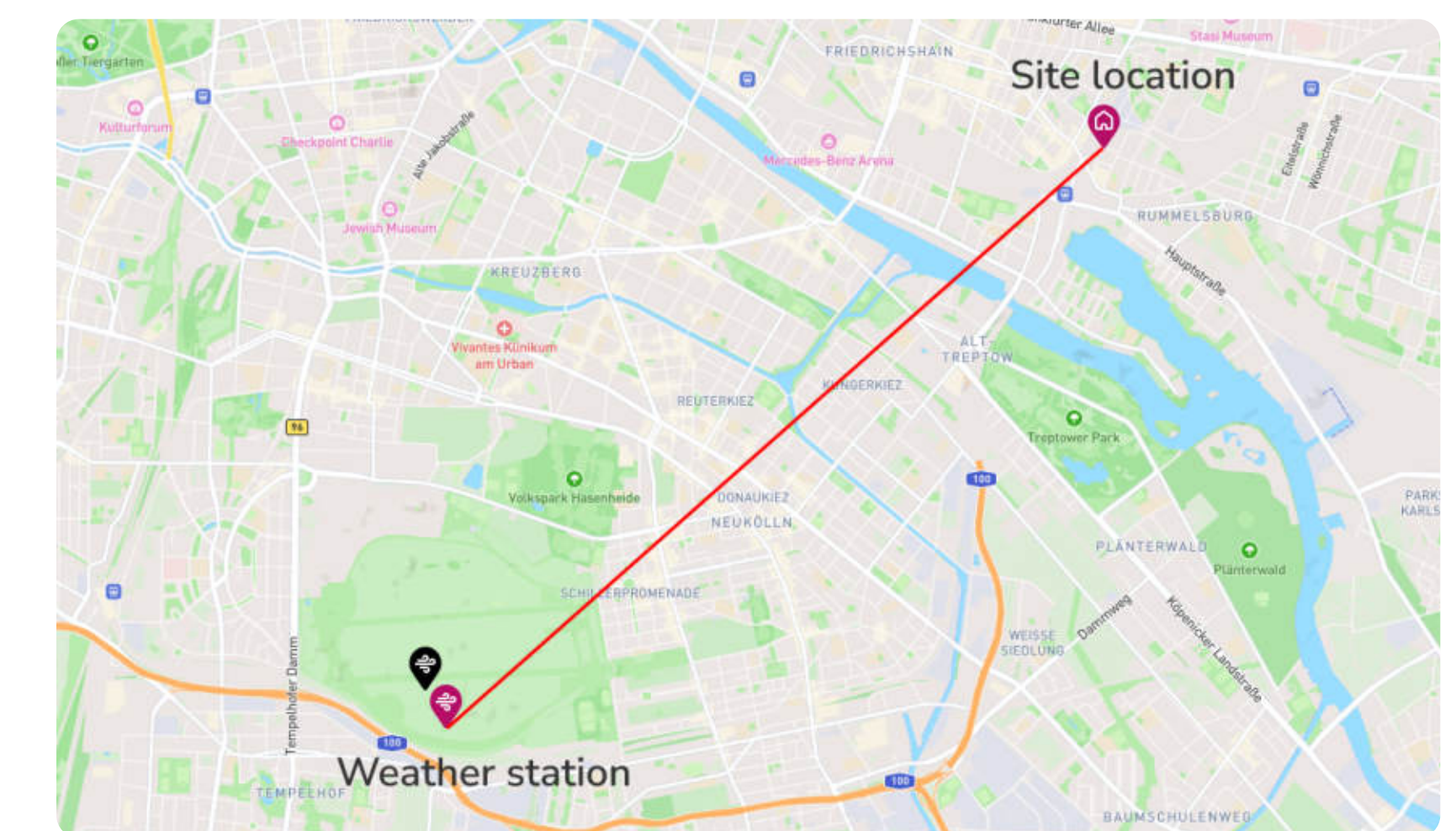
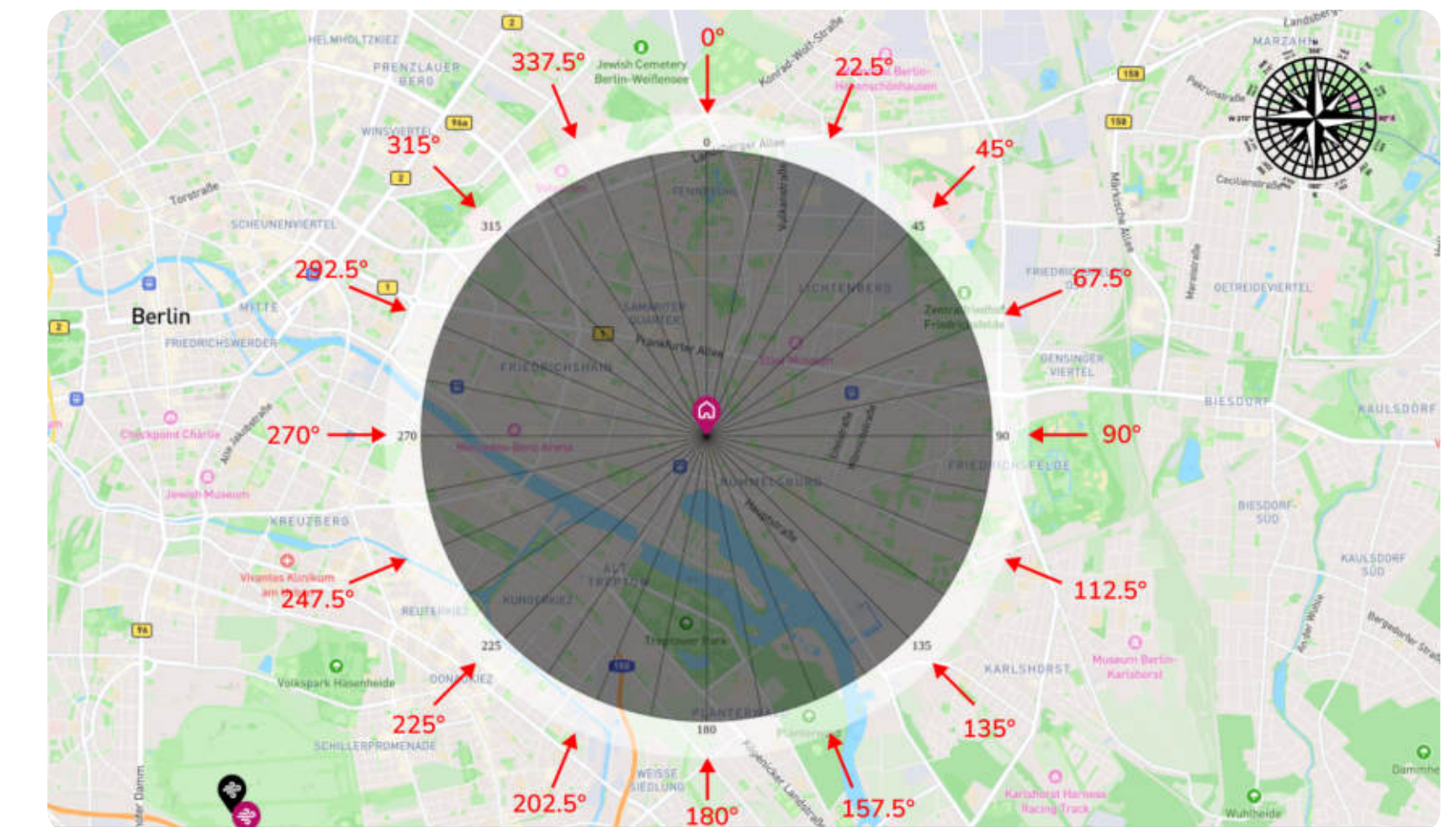
*"Smart aerodynamics foster pleasant microclimates in public areas."*

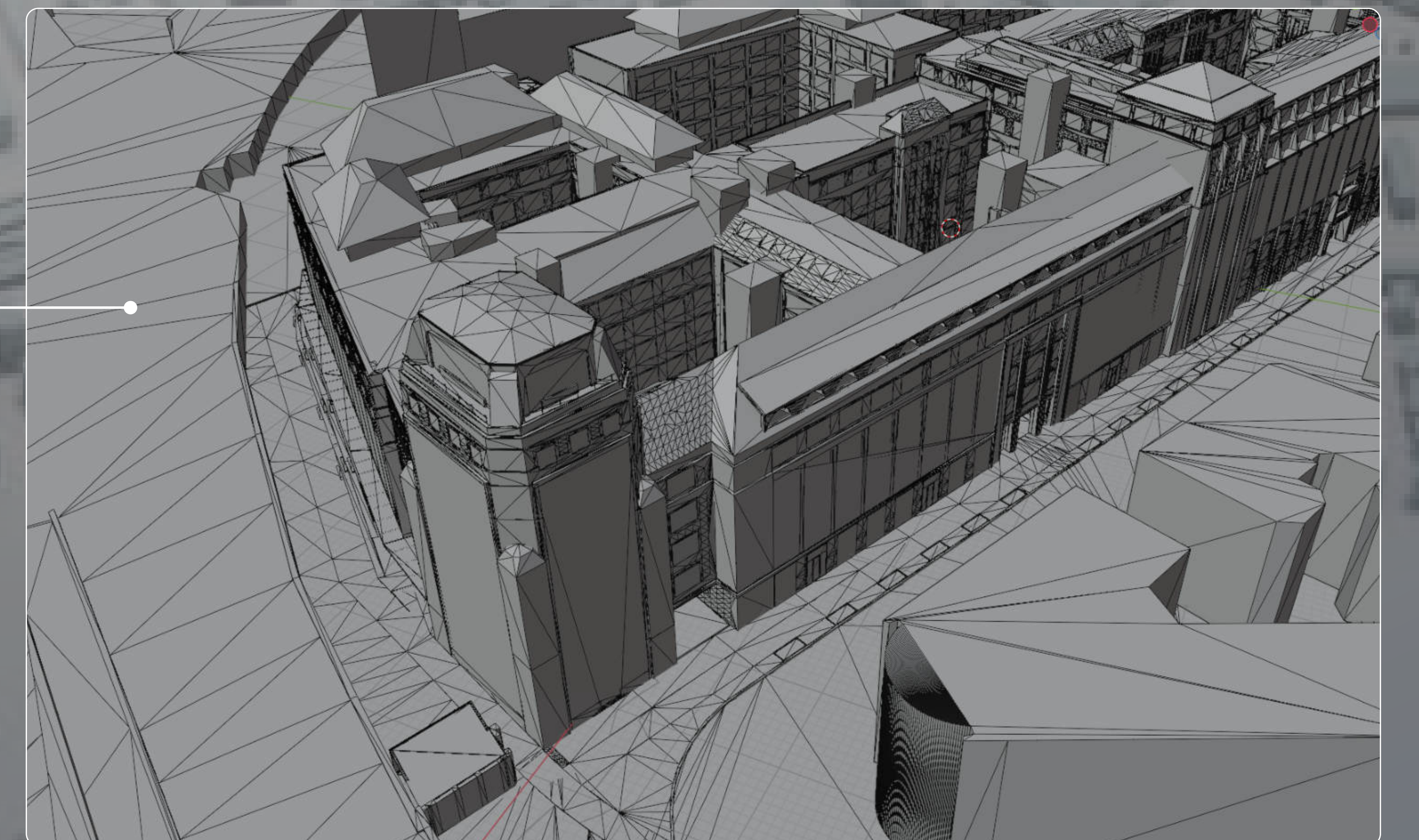
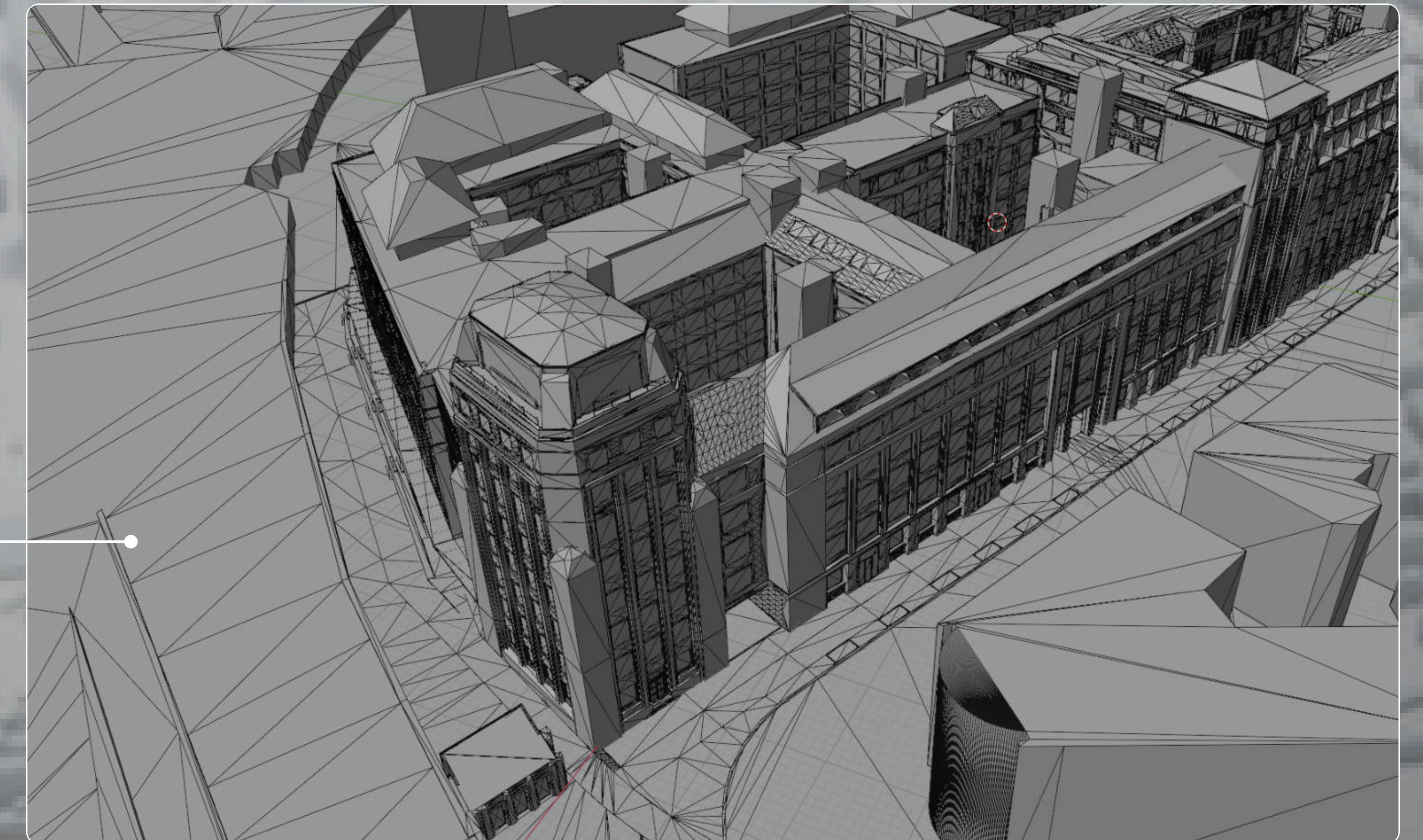
### Meteorological Data

Direction [deg]	Frequency	Velocity [m/s]
270 (W)	12.66	4.31
90 (E)	10.89	3.40
180 (S)	8.85	2.72
247.5 (WSW)	8.10	4.12
202.5 (SSW)	7.93	4.36
225 (SW)	7.48	4.00
292.5 (WNW)	6.04	4.34
112.5 (ESE)	5.72	3.17
135 (SE)	5.02	2.79
315 (NW)	4.78	3.73
157.5 (SSE)	4.3	2.79
0 (N)	4.14	2.37
67.5 (ENE)	4.10	2.99
22.5 (NNE)	3.65	2.95
45 (NE)	3.19	2.95
337.5 (NNW)	3.15	3.14



Wind rose for years 1938 - 2007  
Weather Station: Berlin Tempelhof





### Original vs Simplified Geometry

Included intricate facades and open windows in original model. Simplified by closing most windows and removing minor details to cut computational costs and time.

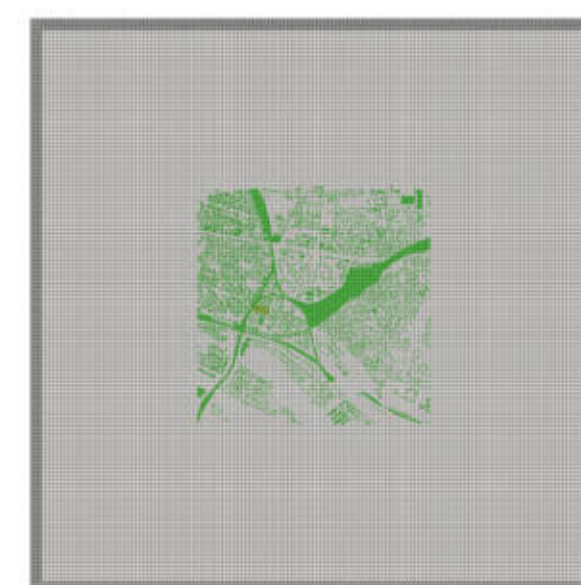
## Computational Domain

### Best Practice Guidelines:

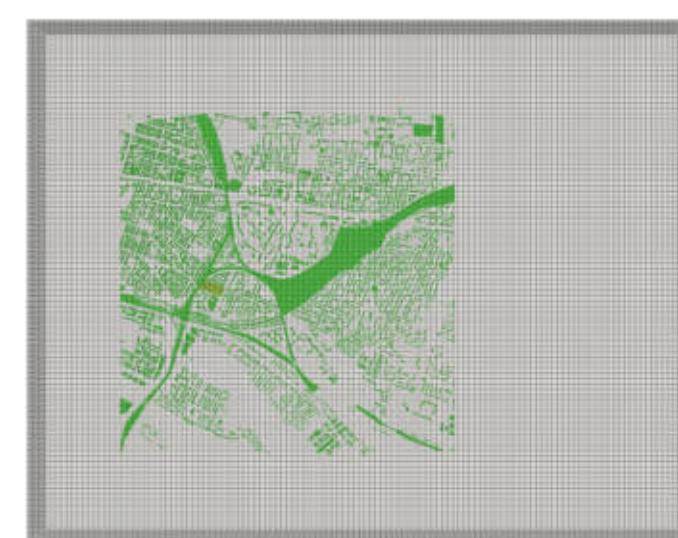
- Top boundary at  $5H_{max}$
- Outflow at  $15H_{max}$
- Blockage ratio under 3%

### Evaluated Domain Types:

- Standard Box: Simple, high computational load
- Rotating Box: Most accurate, needs multiple calculations
- Cylindrical: Balanced accuracy and efficiency



Standard  
Box



Rotating  
Box



Cylindrical  
Domain

### Best Choice for Bremsenwerk:

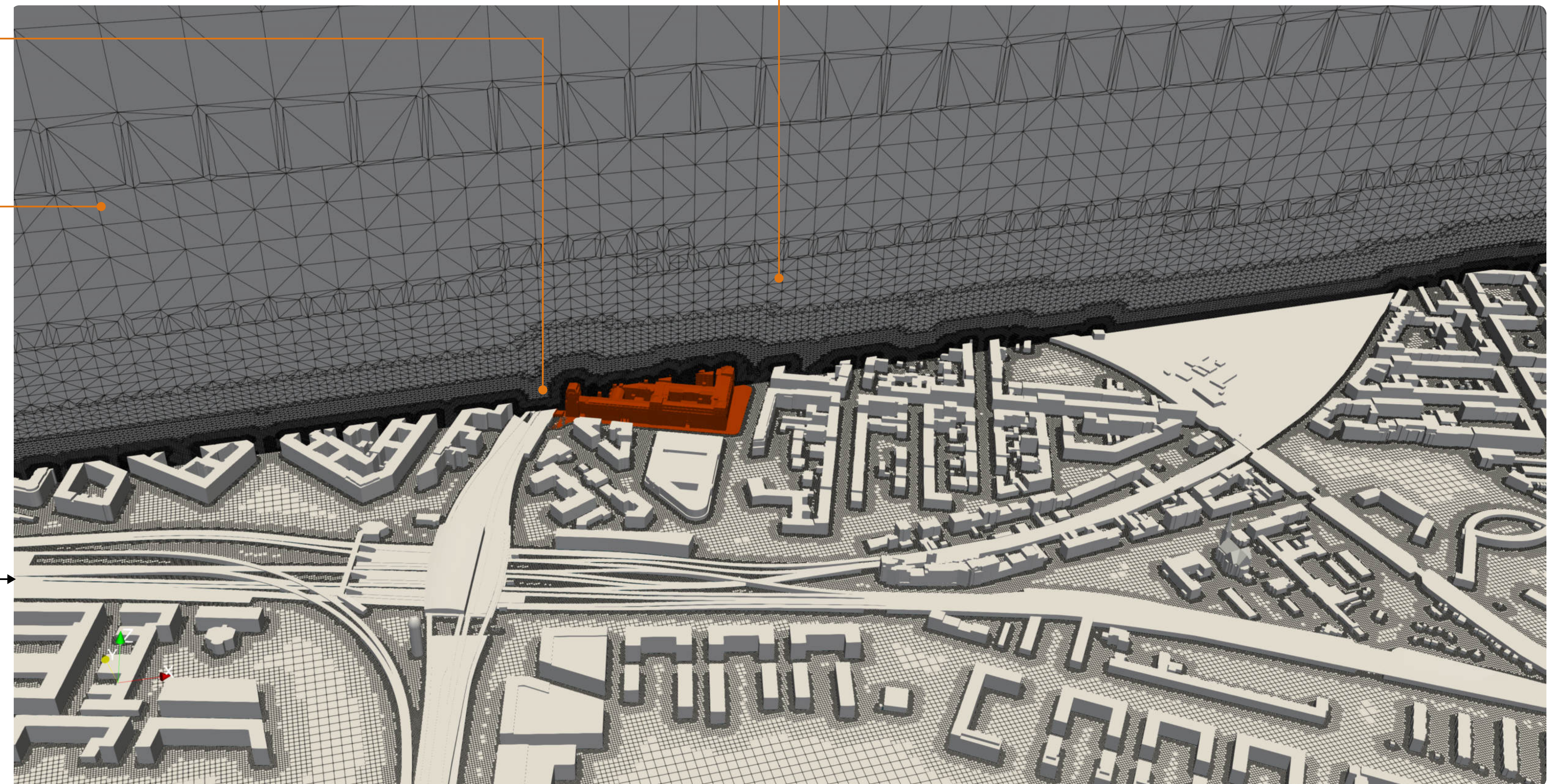
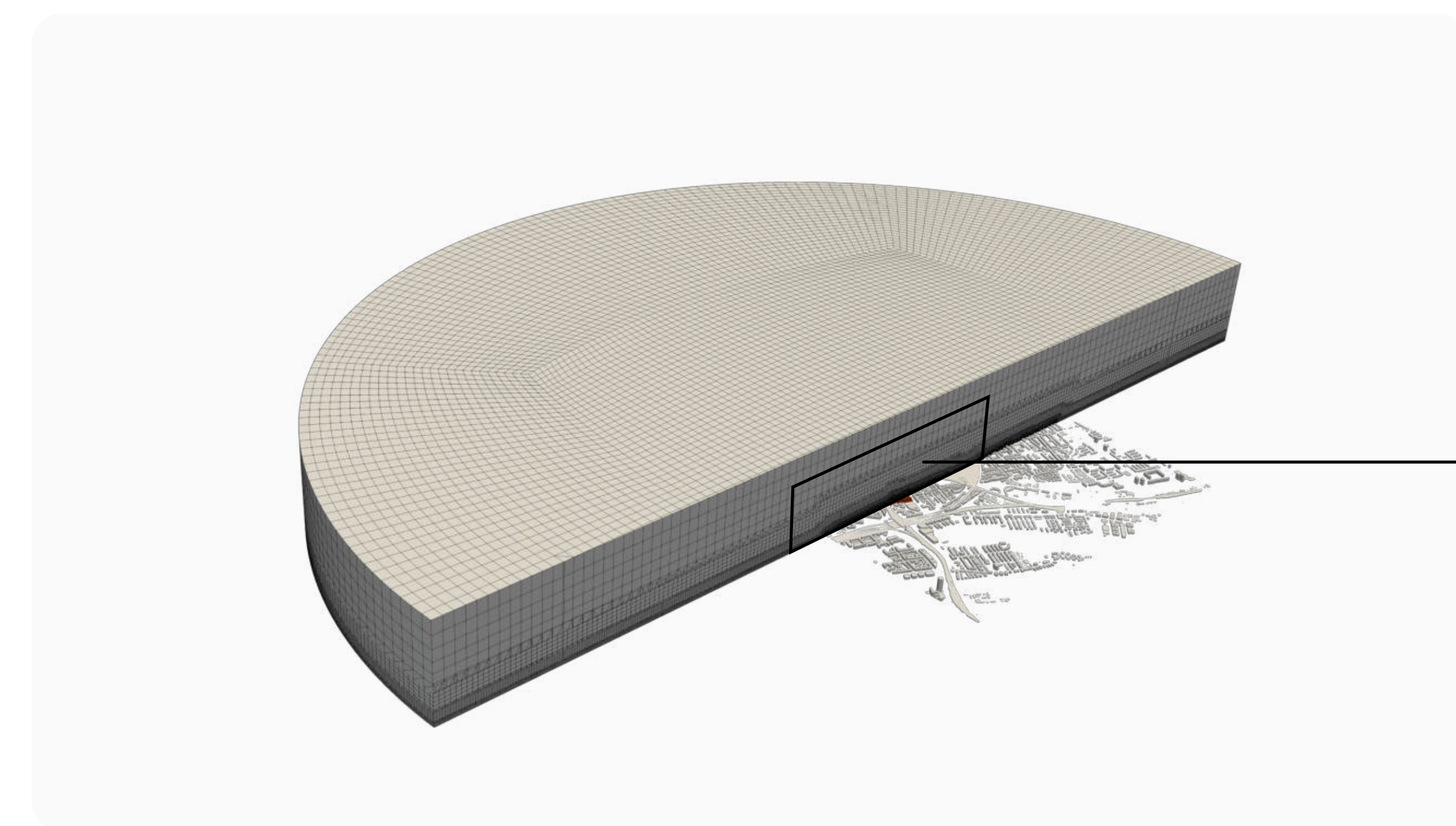


# Computational Grid

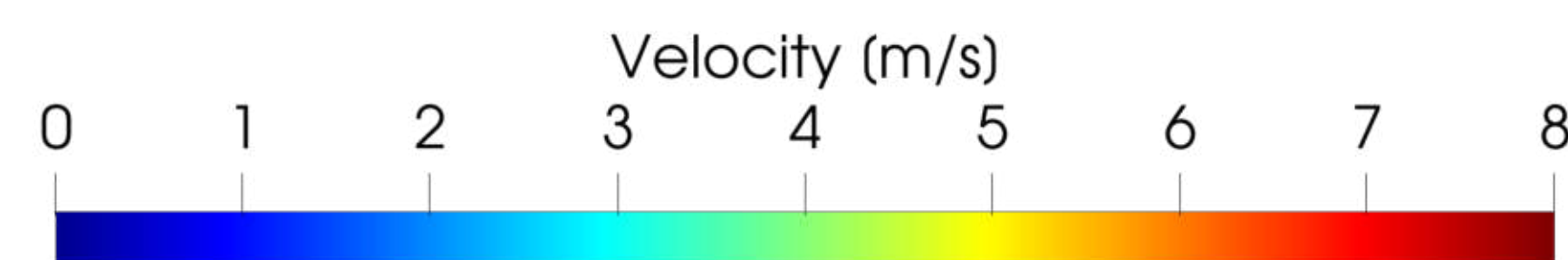
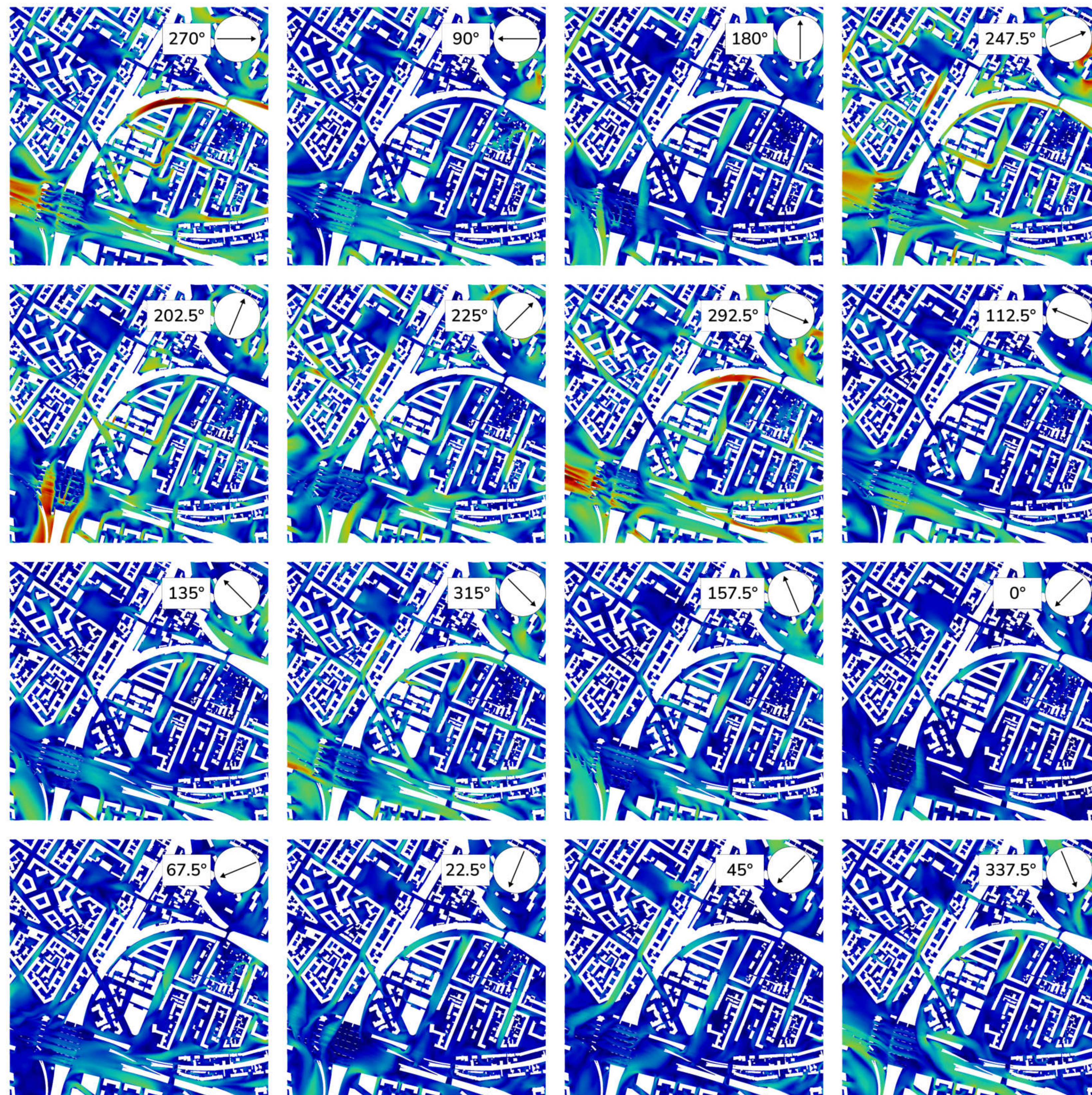
**Hybrid Meshing:**  
Fine near buildings, coarse elsewhere

**Cell Ratio 1:1:1 in key areas**

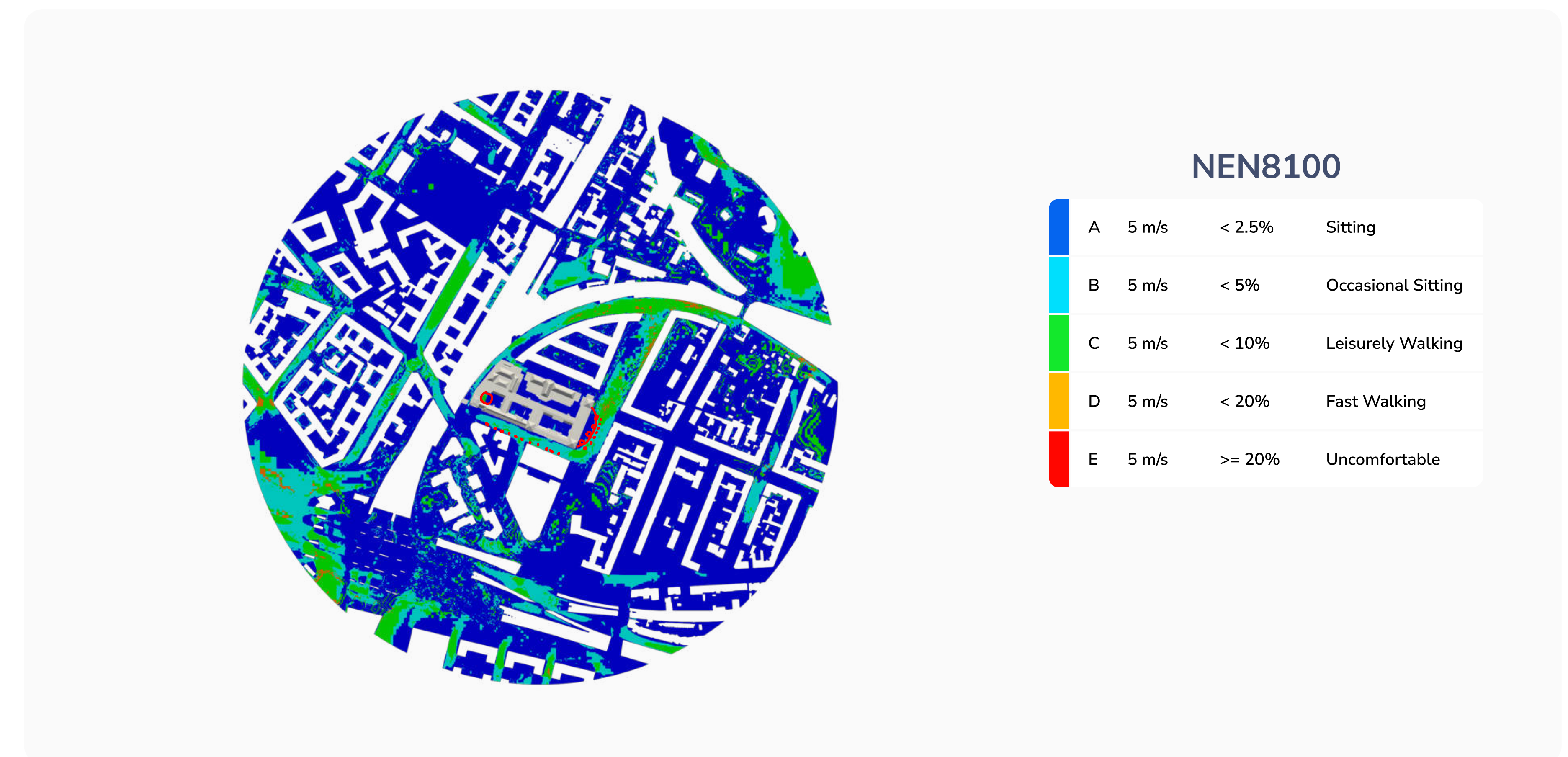
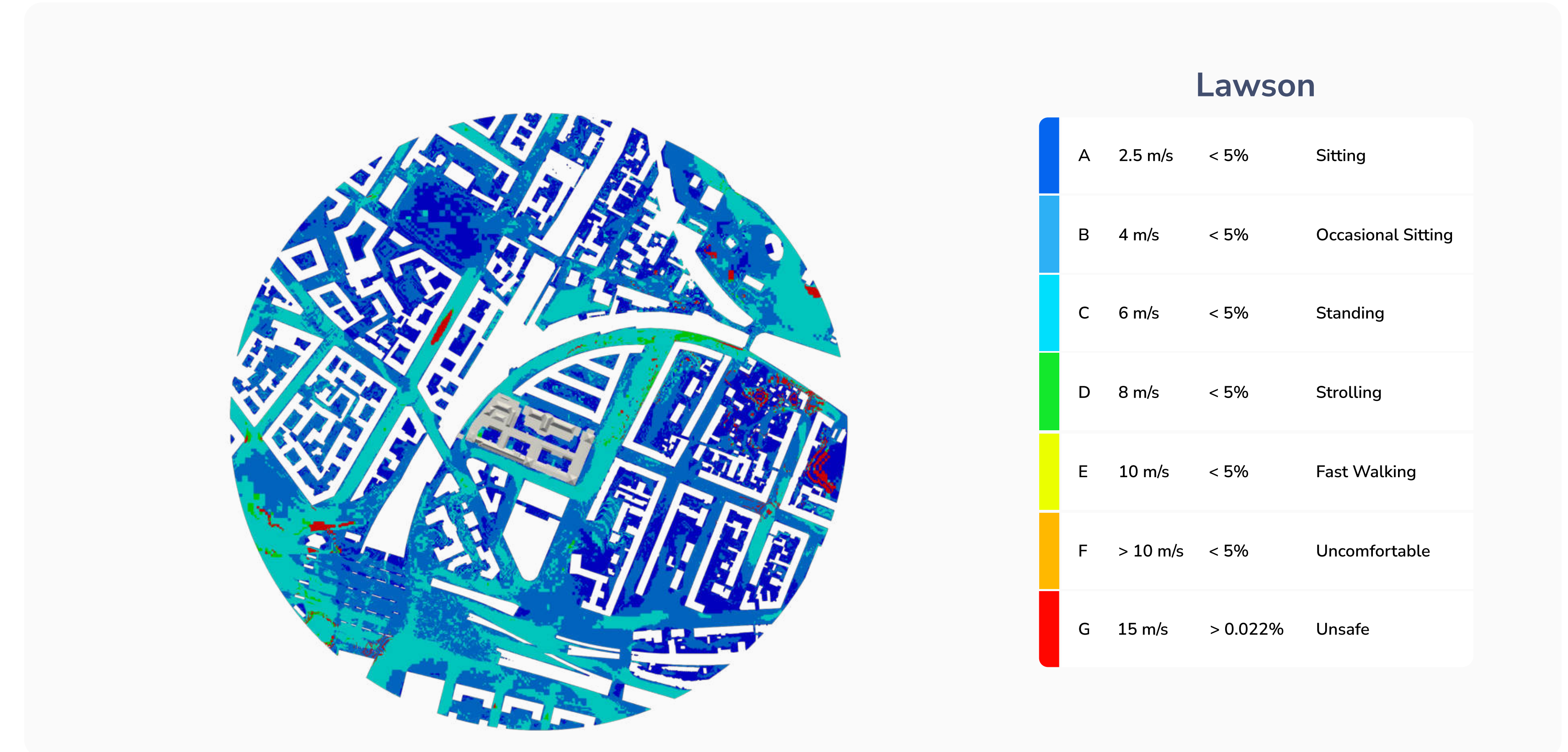
**Final Mesh:**  
69.7M cells, optimized for accuracy and compute time



### CFD Results



### Pedestrian Comfort Maps



# Roof Deck

Pavilion D



Height: 26.90m

Pavilion A

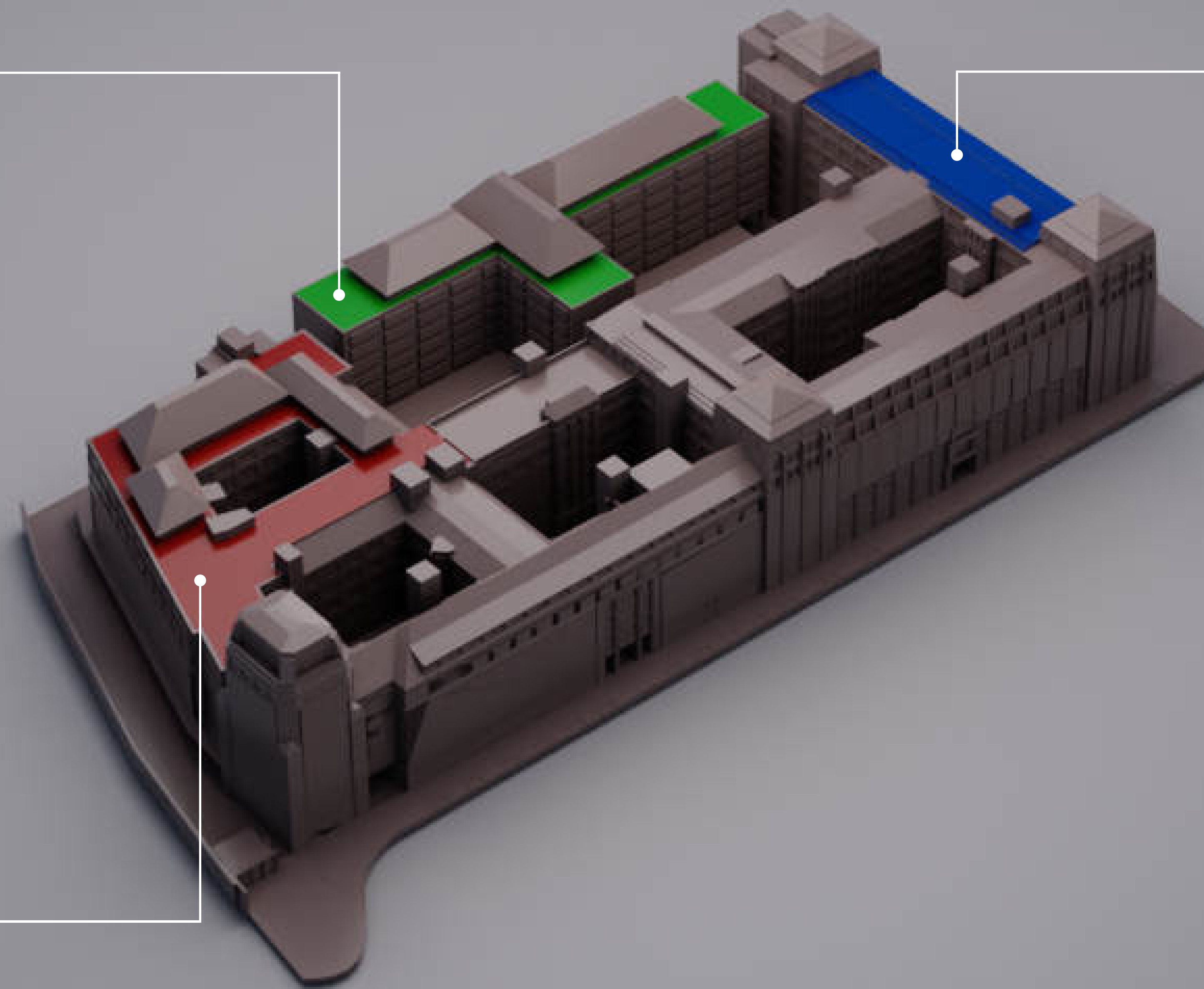


Height: 25.23m

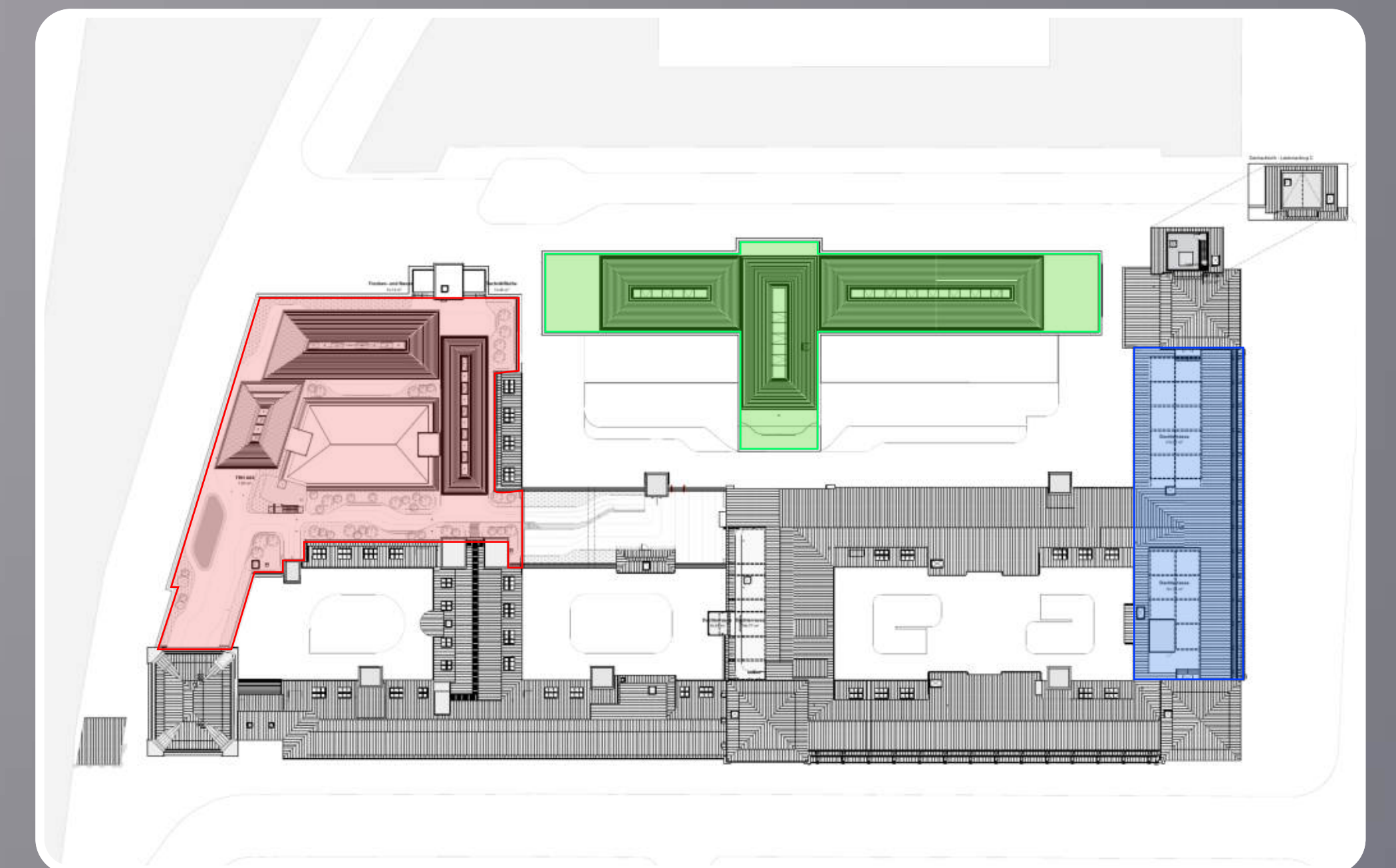
Roof Decks C1, C2



Height: 29.16m

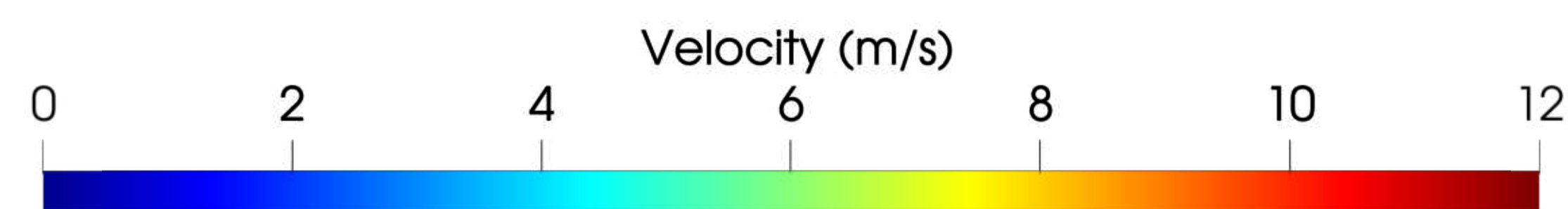
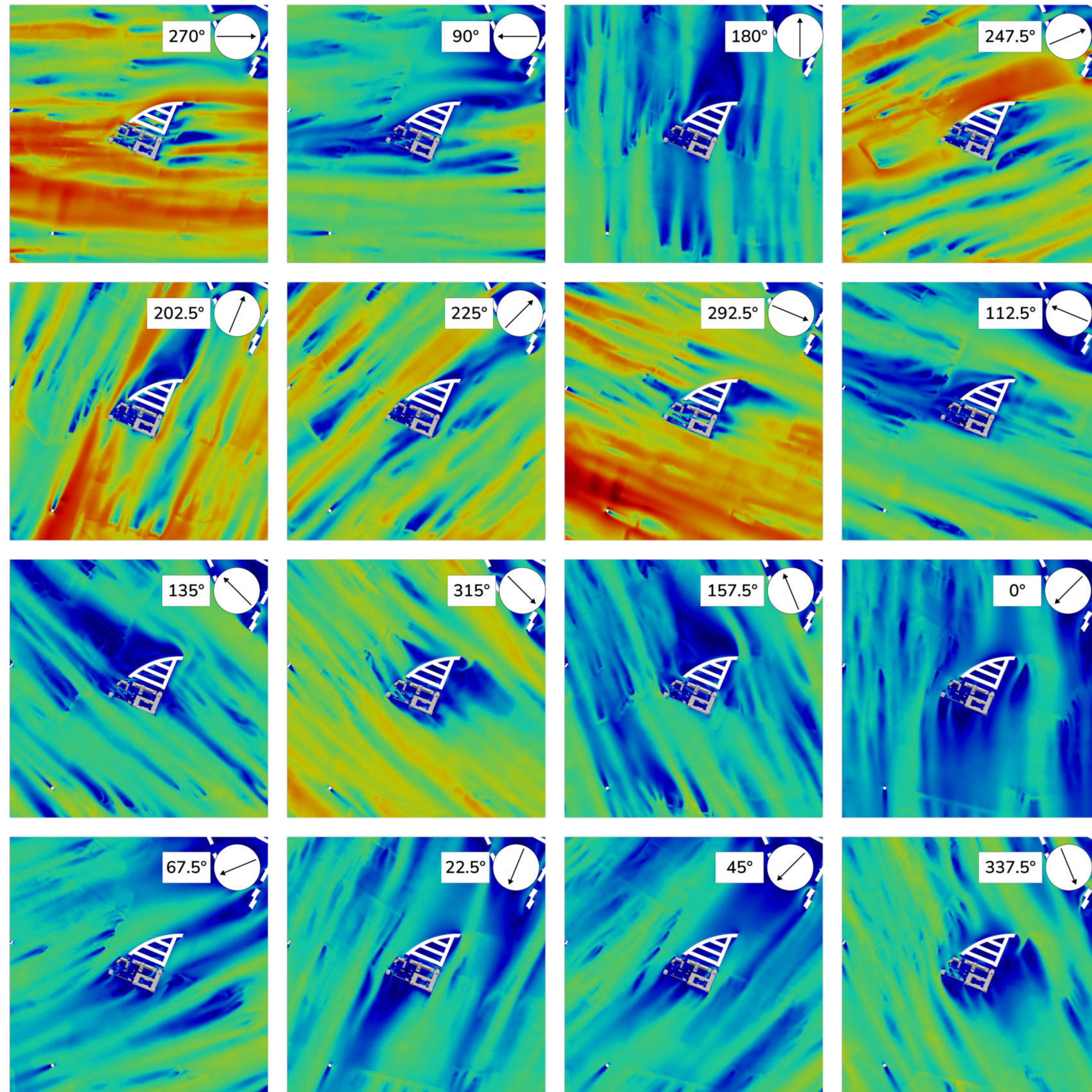


Roof Engineering Design Plan

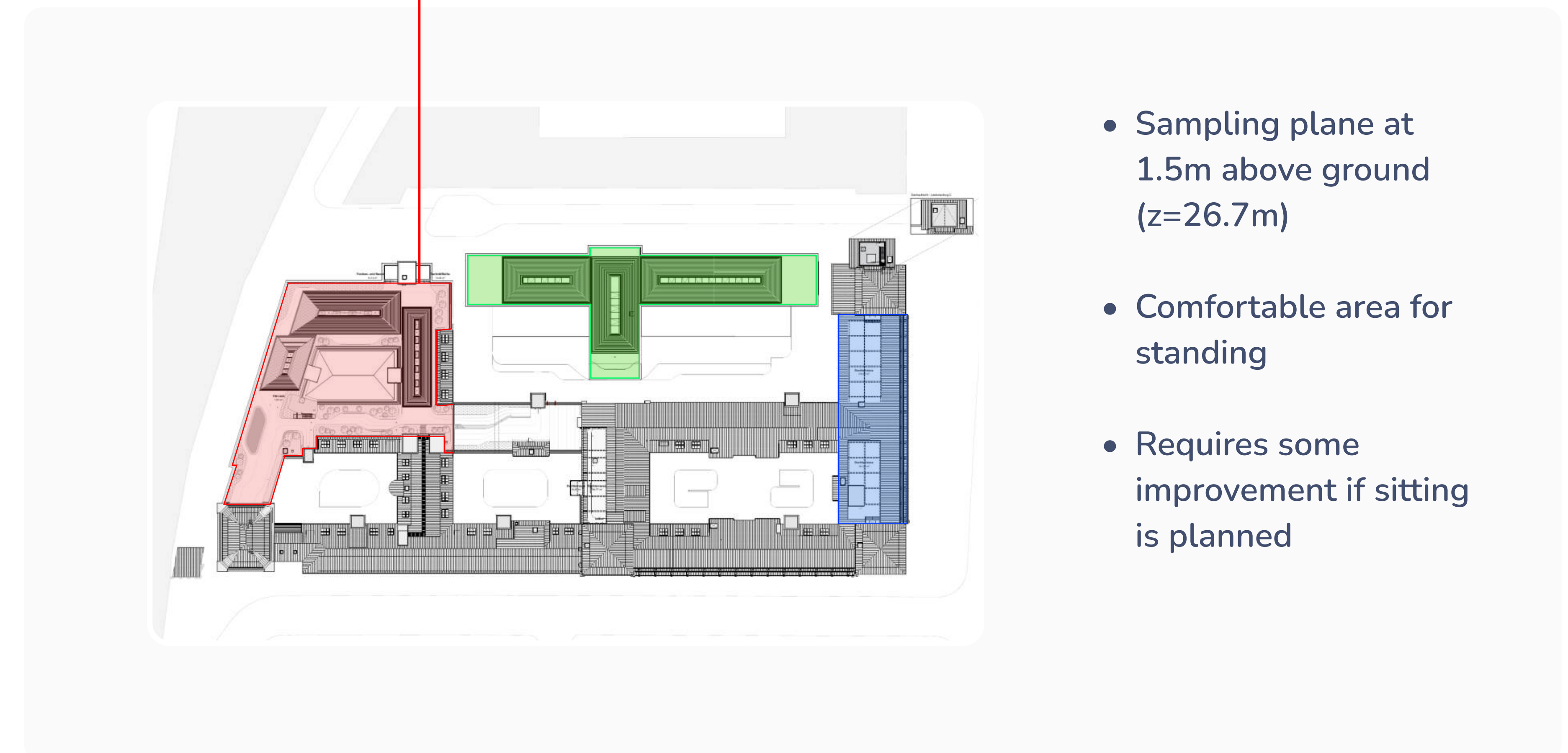
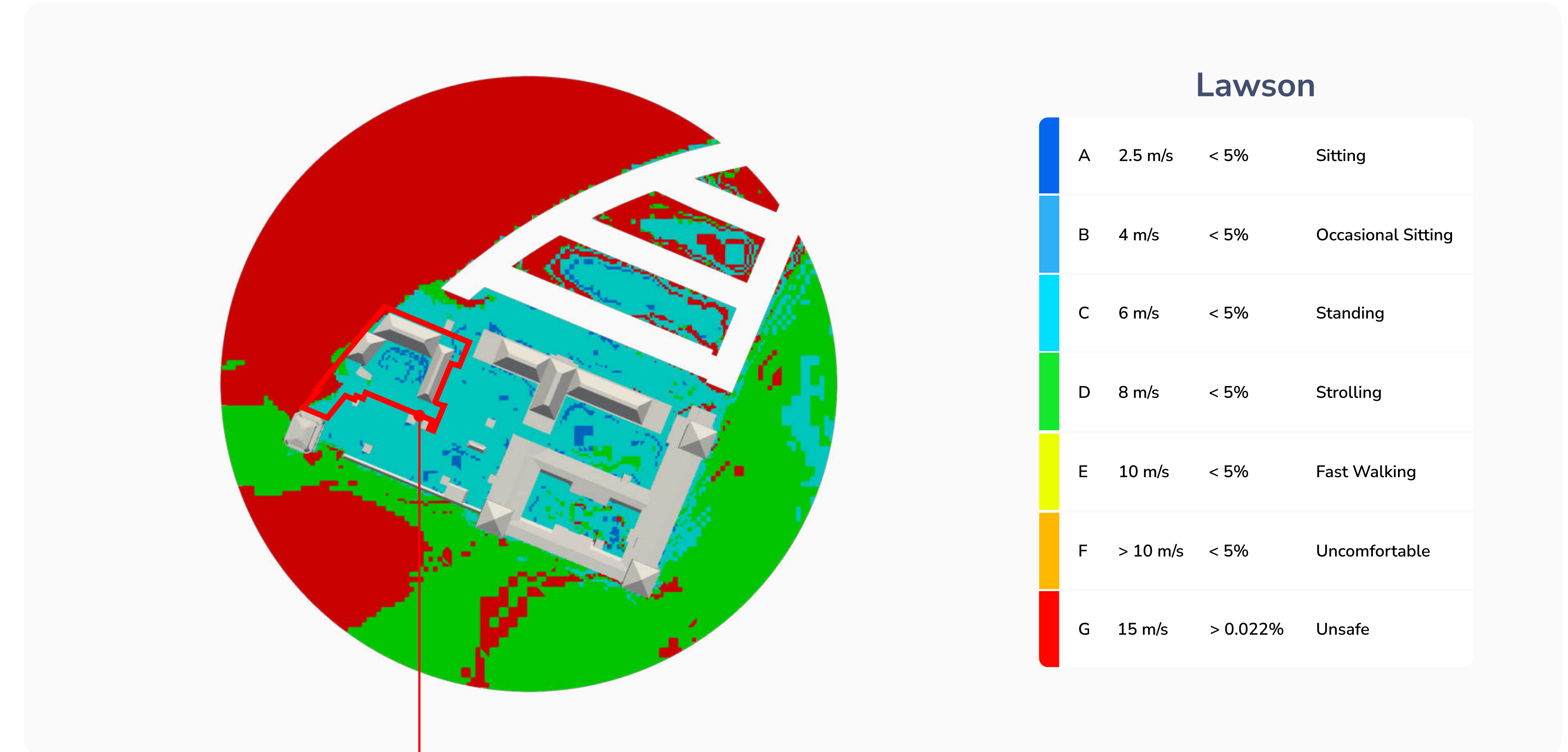


Top View

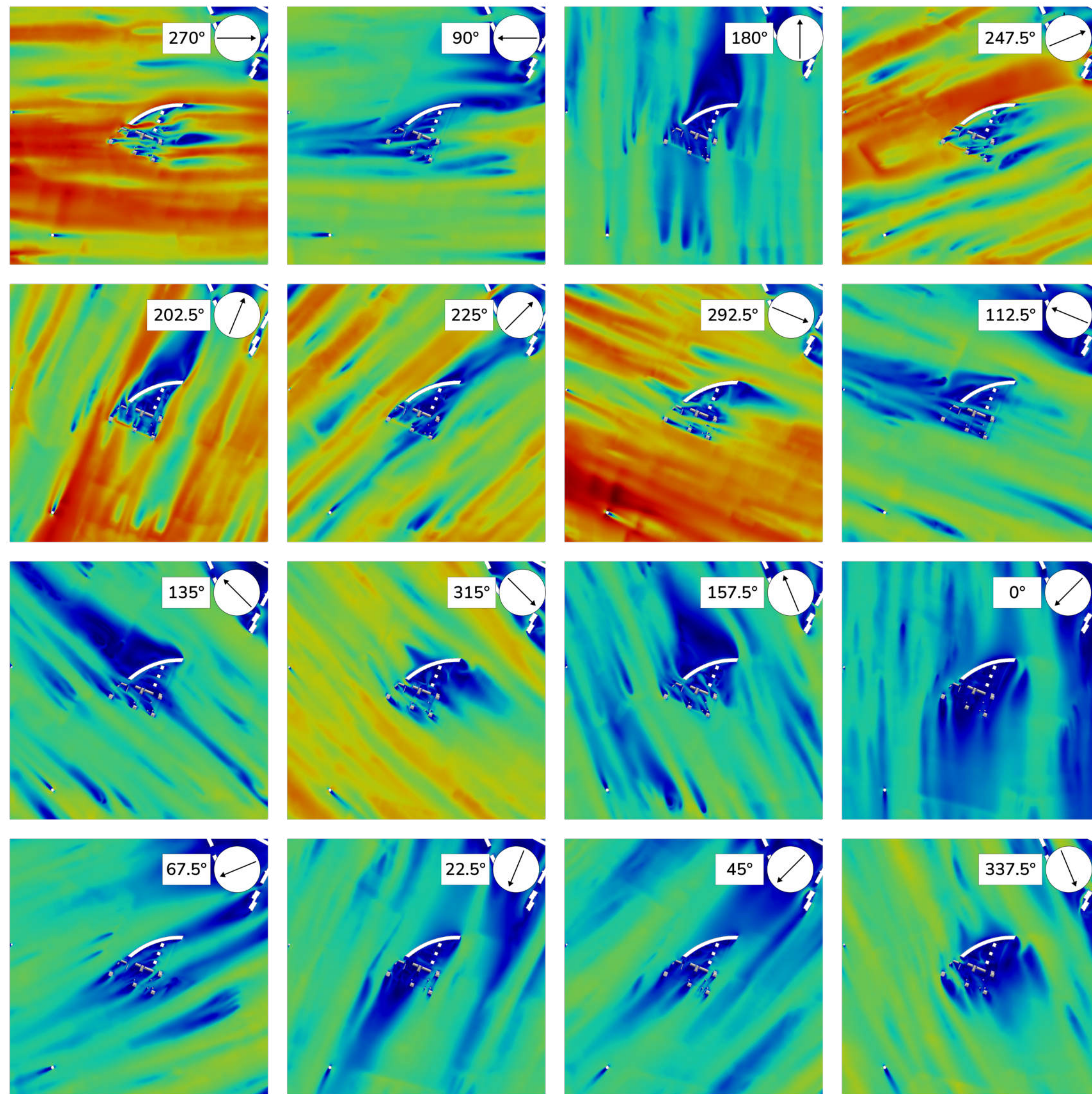
### CFD Results - Pavilion A



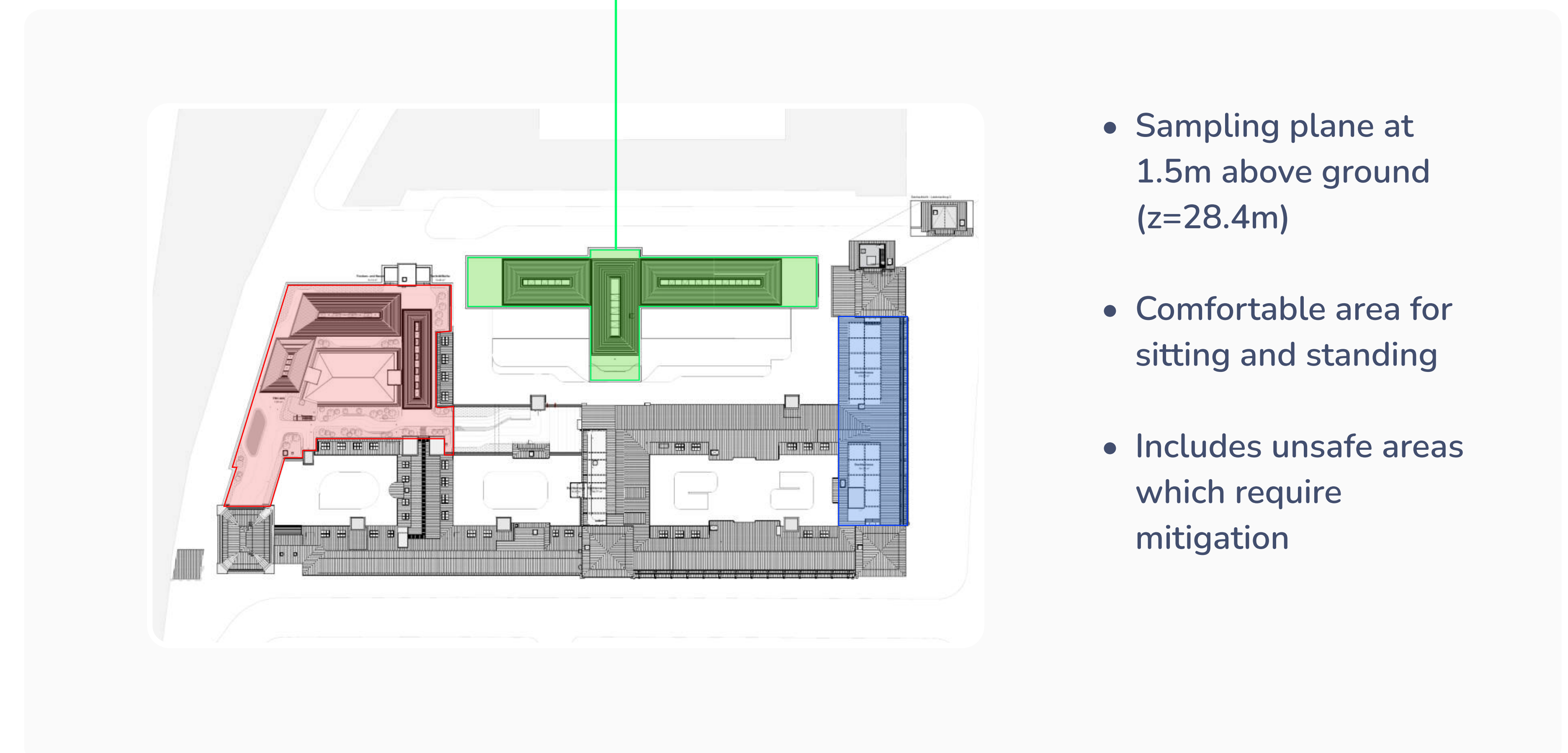
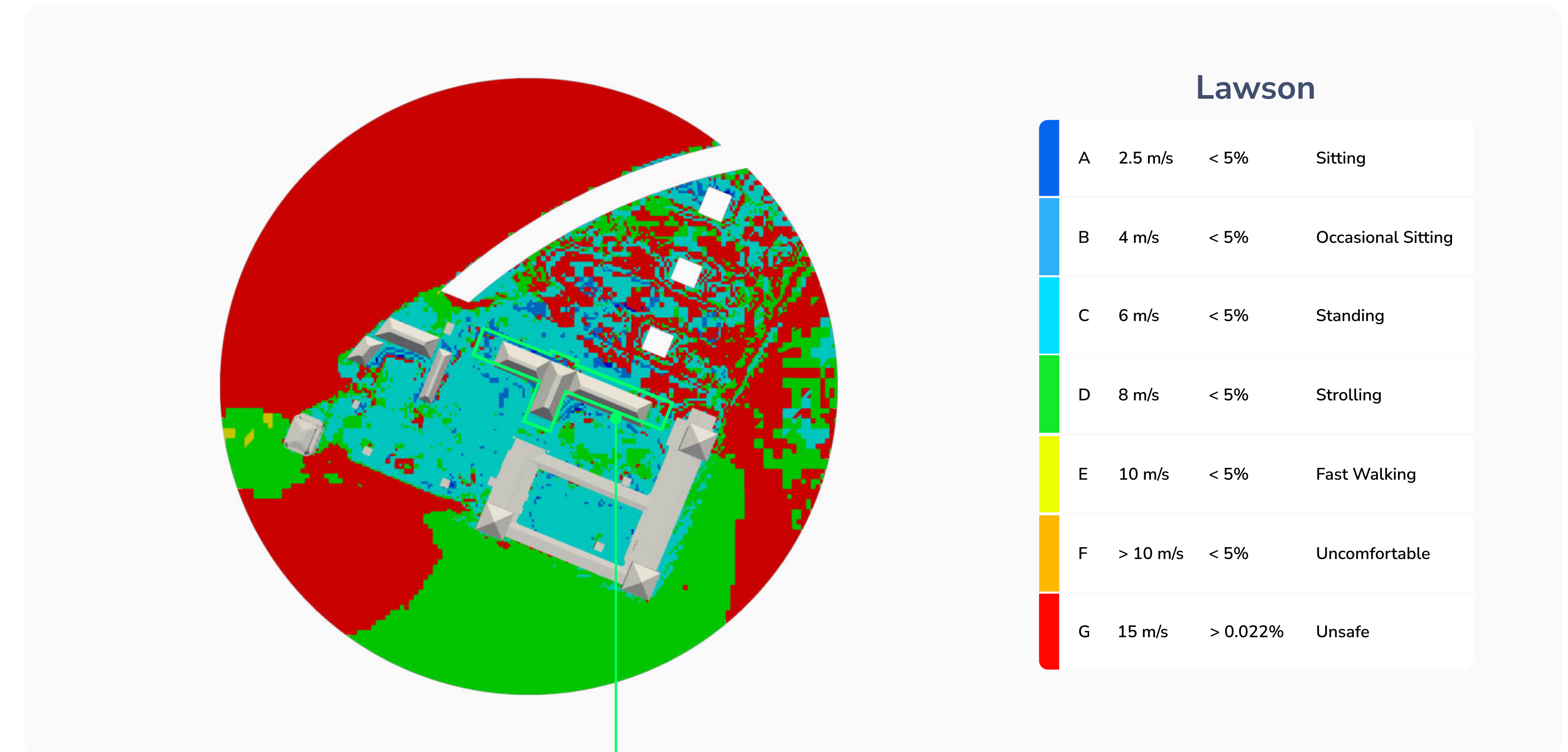
### Pedestrian Comfort Maps - Pavilion A



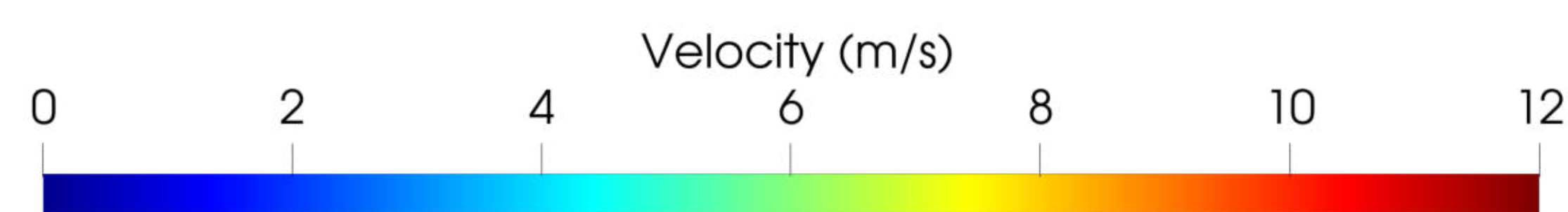
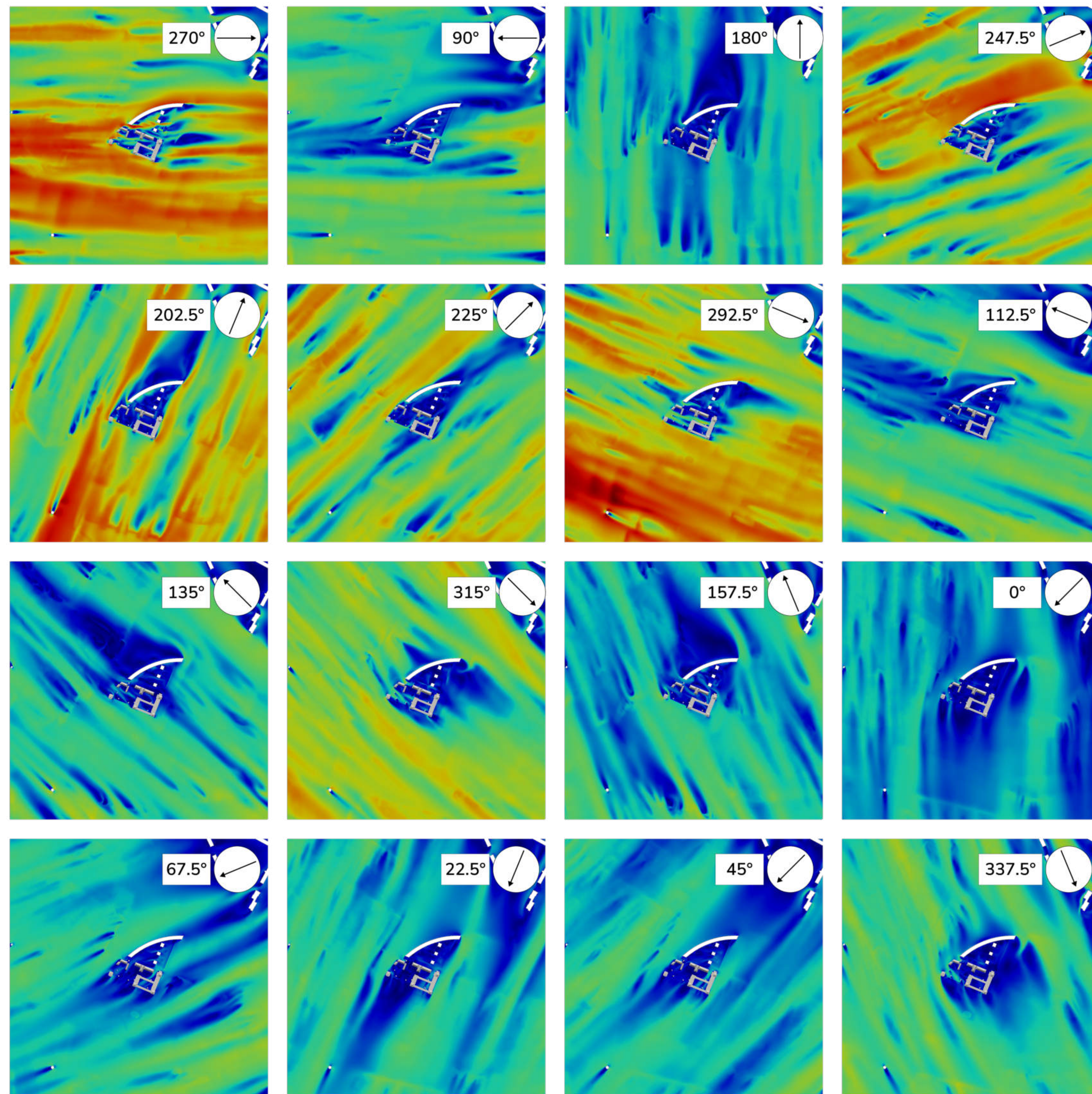
### CFD Results - Pavilion D



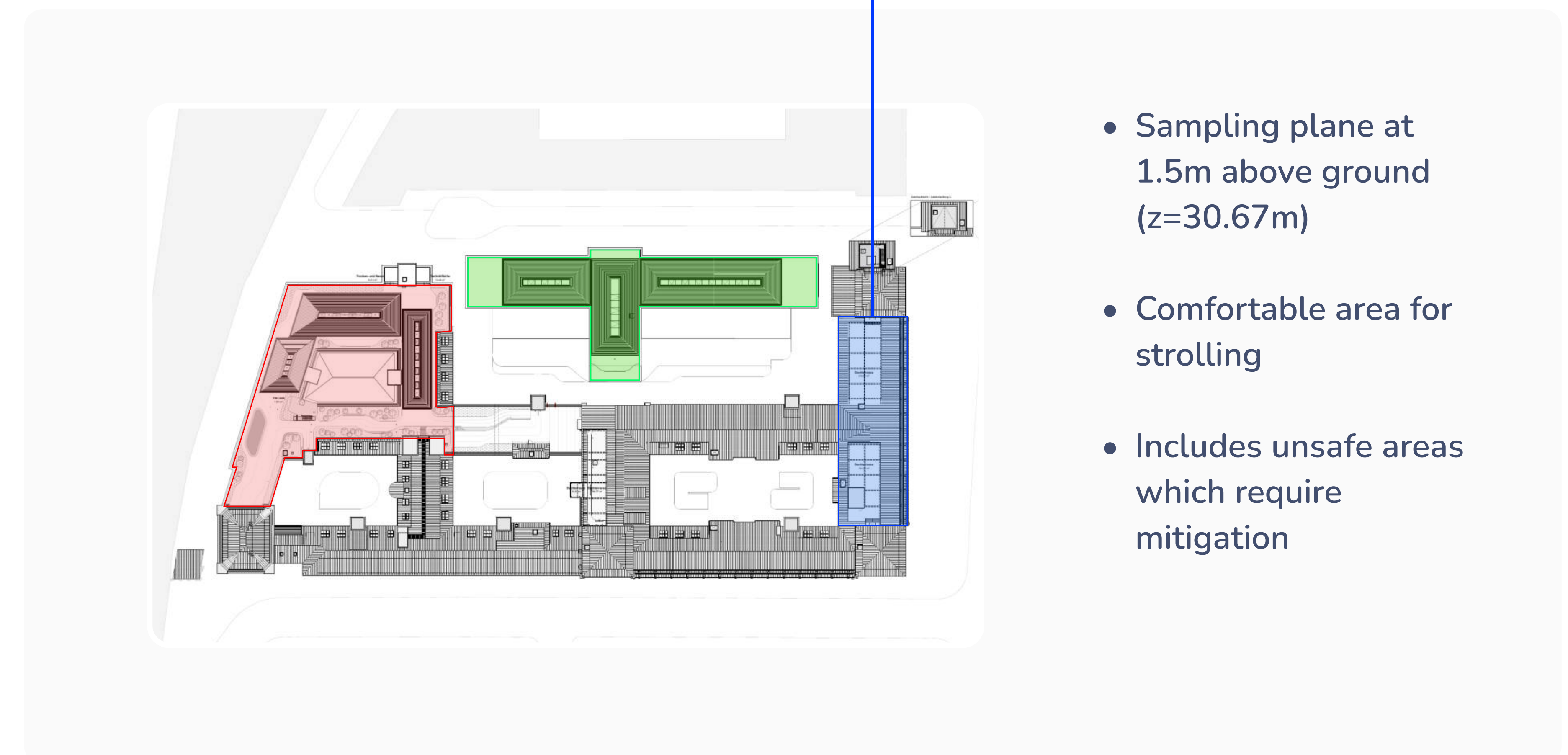
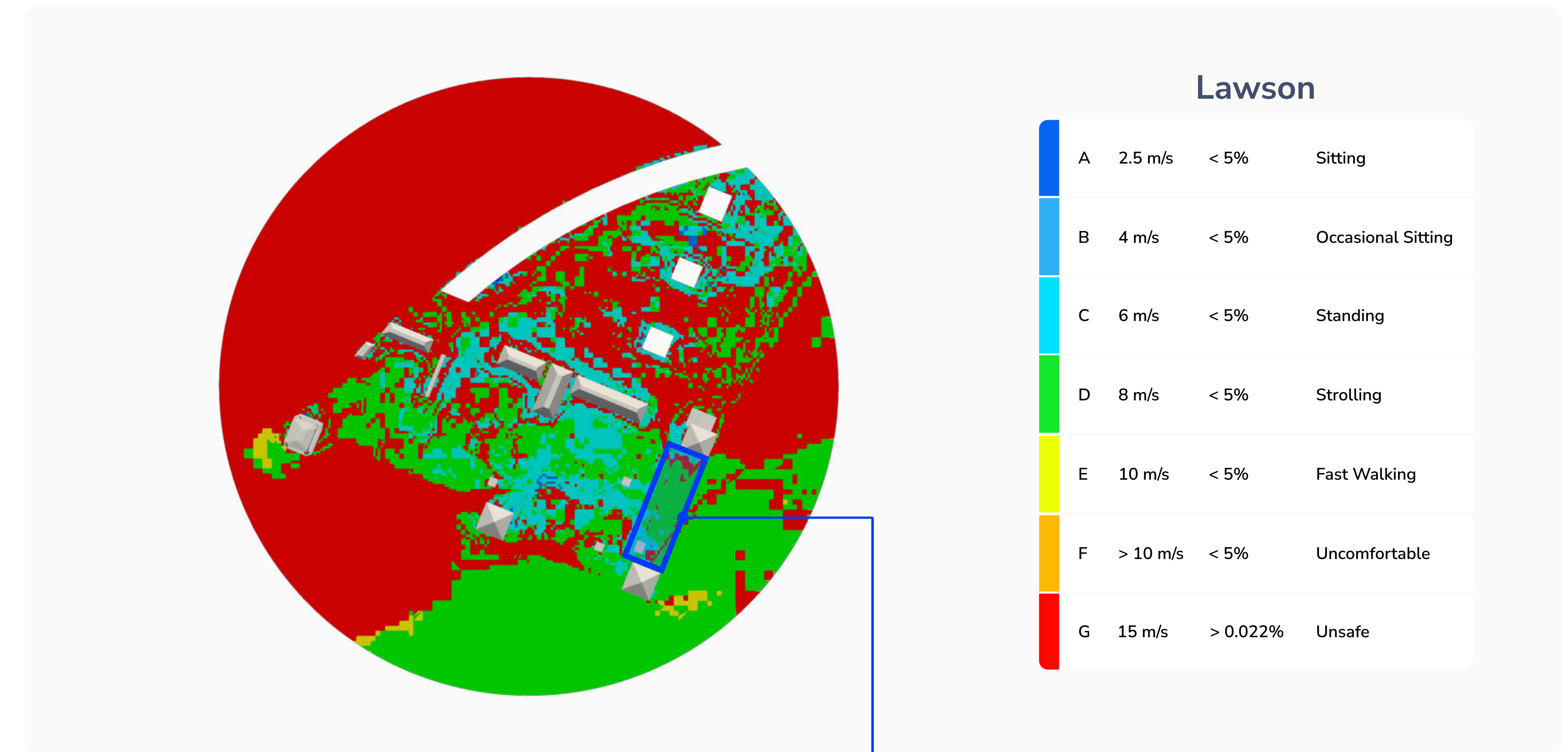
### Pedestrian Comfort Maps - Pavilion D



### CFD Results - Roof Decks C1, C2



### Pedestrian Comfort Maps - Roof Decks C1, C2



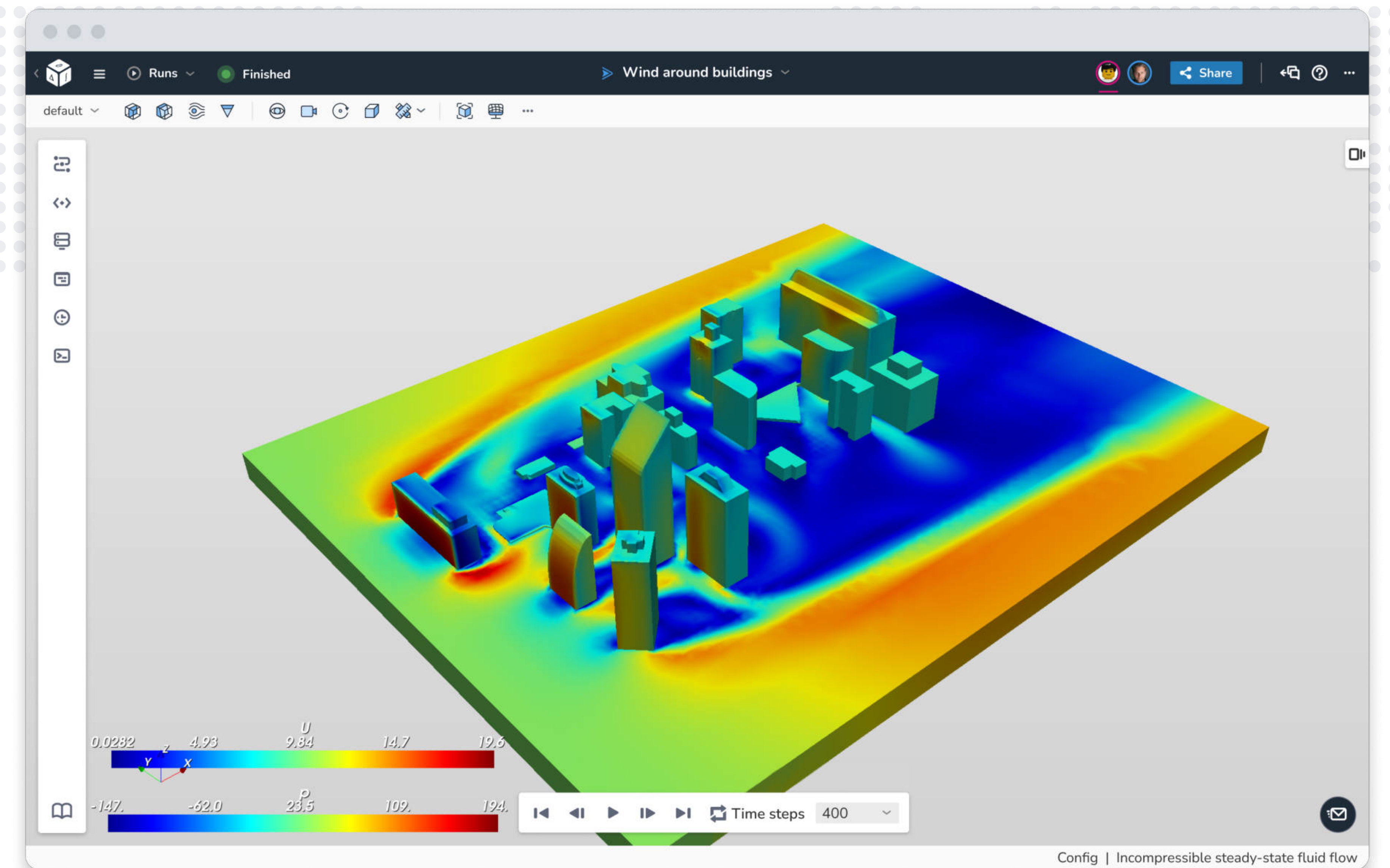
# About dicehub

Computational Fluid Dynamics (CFD) simulations platform

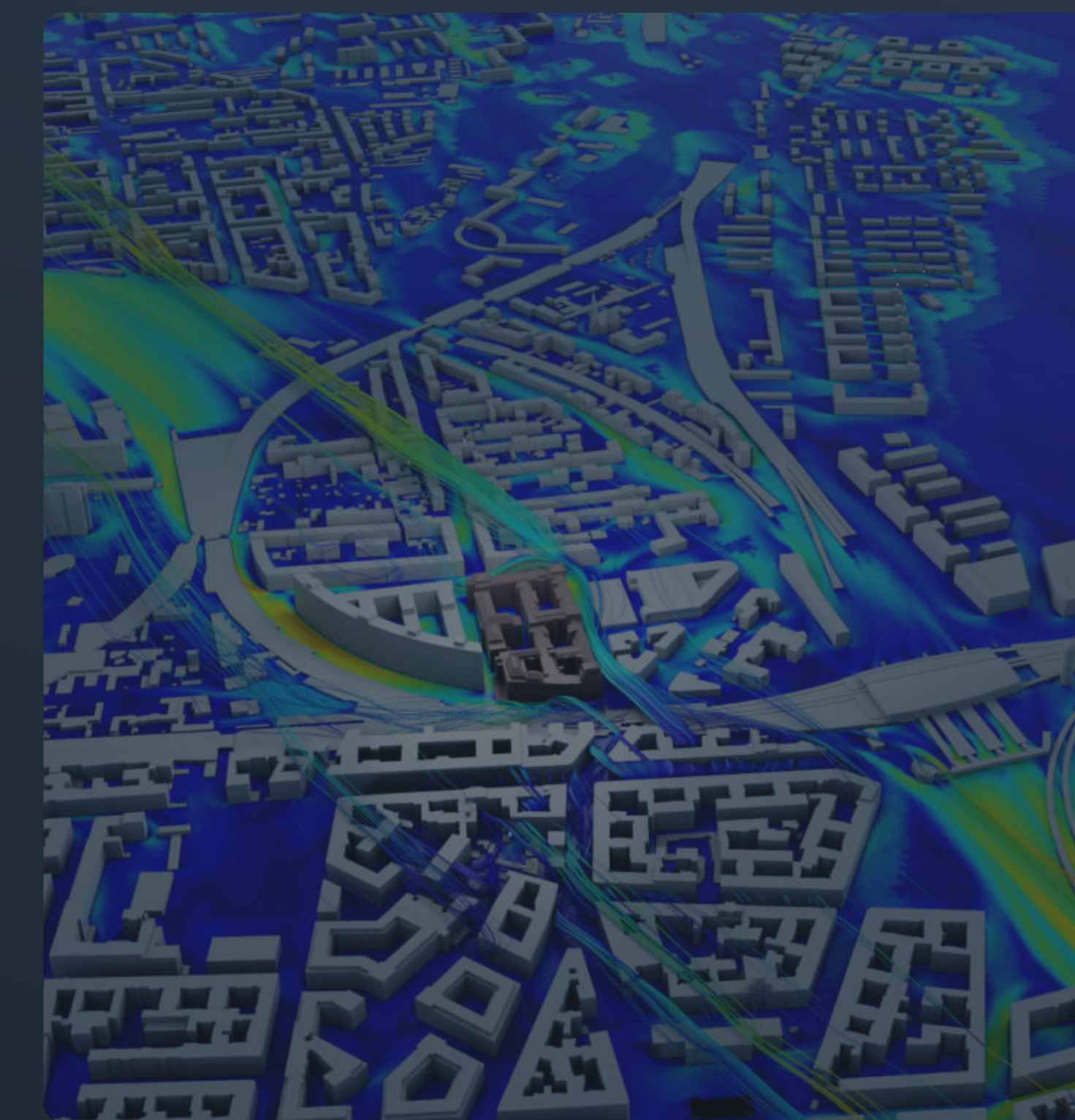
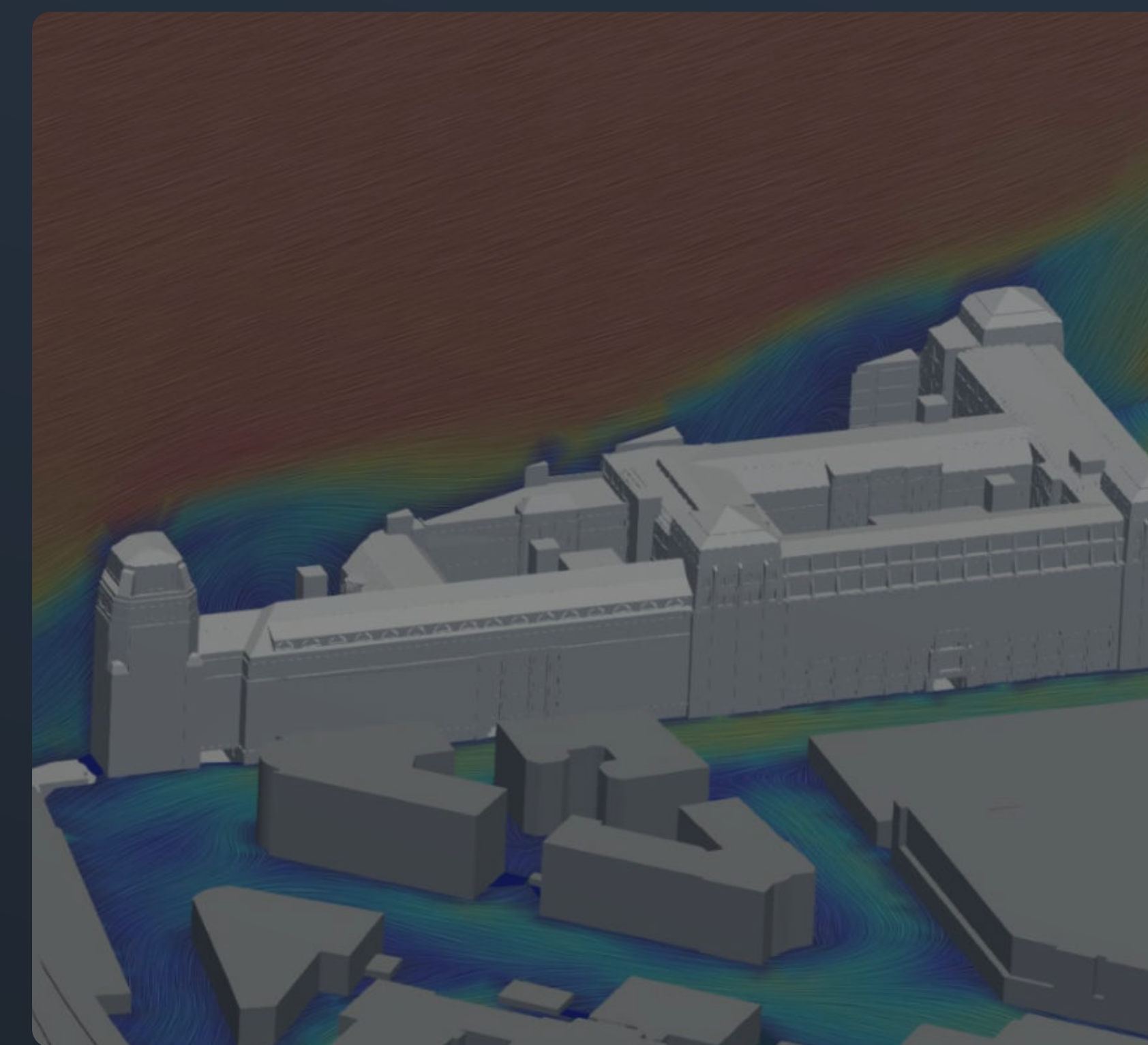
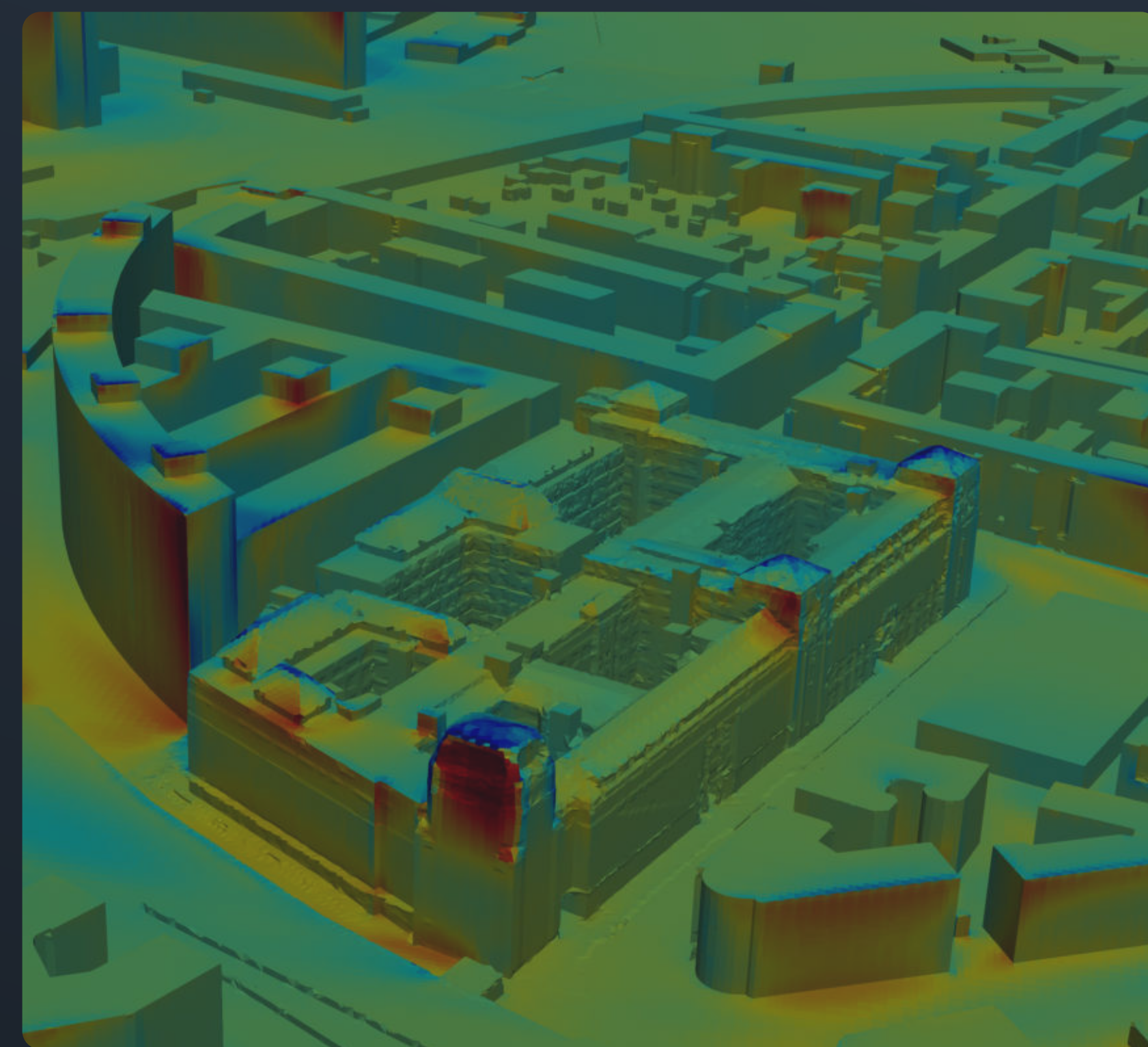
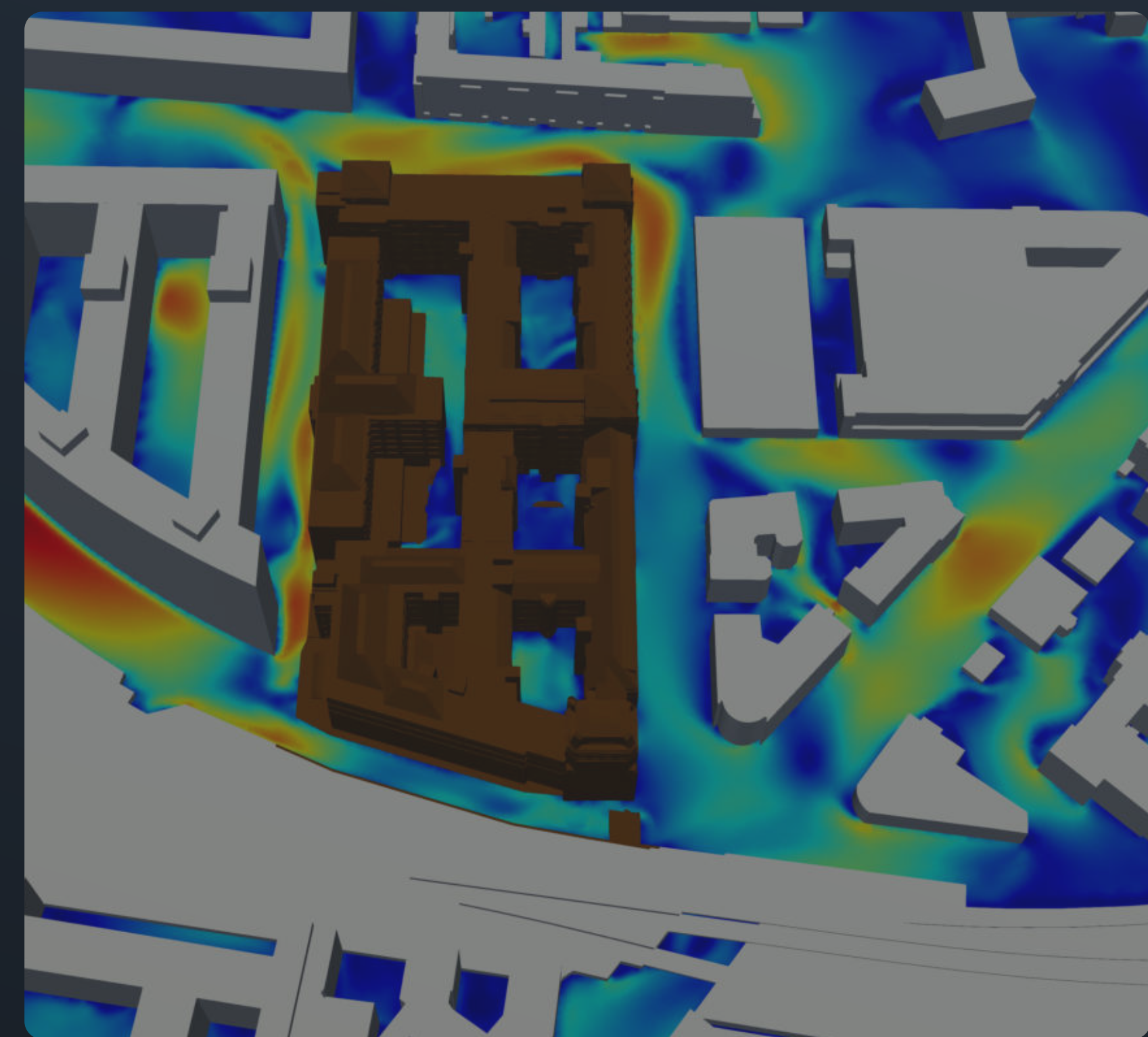
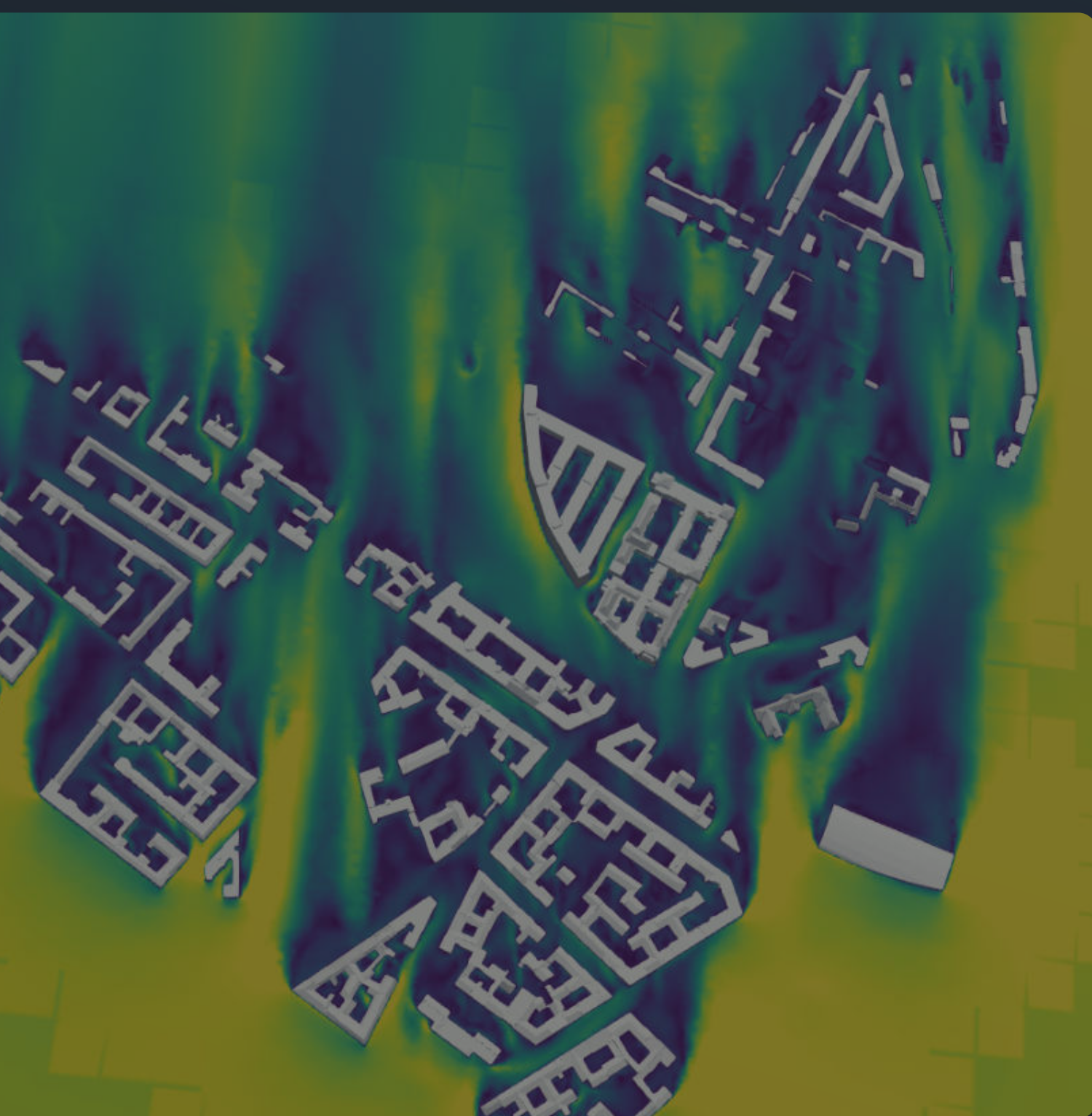
Simplifies simulation workflows

Includes real-time collaboration, scaling, and automation

Cloud-based and locally deployable



Dynamic Interfaces for Computation and Evaluation Hub



dicehub

CFD Study

**BERLINER BREMSSENWERK**