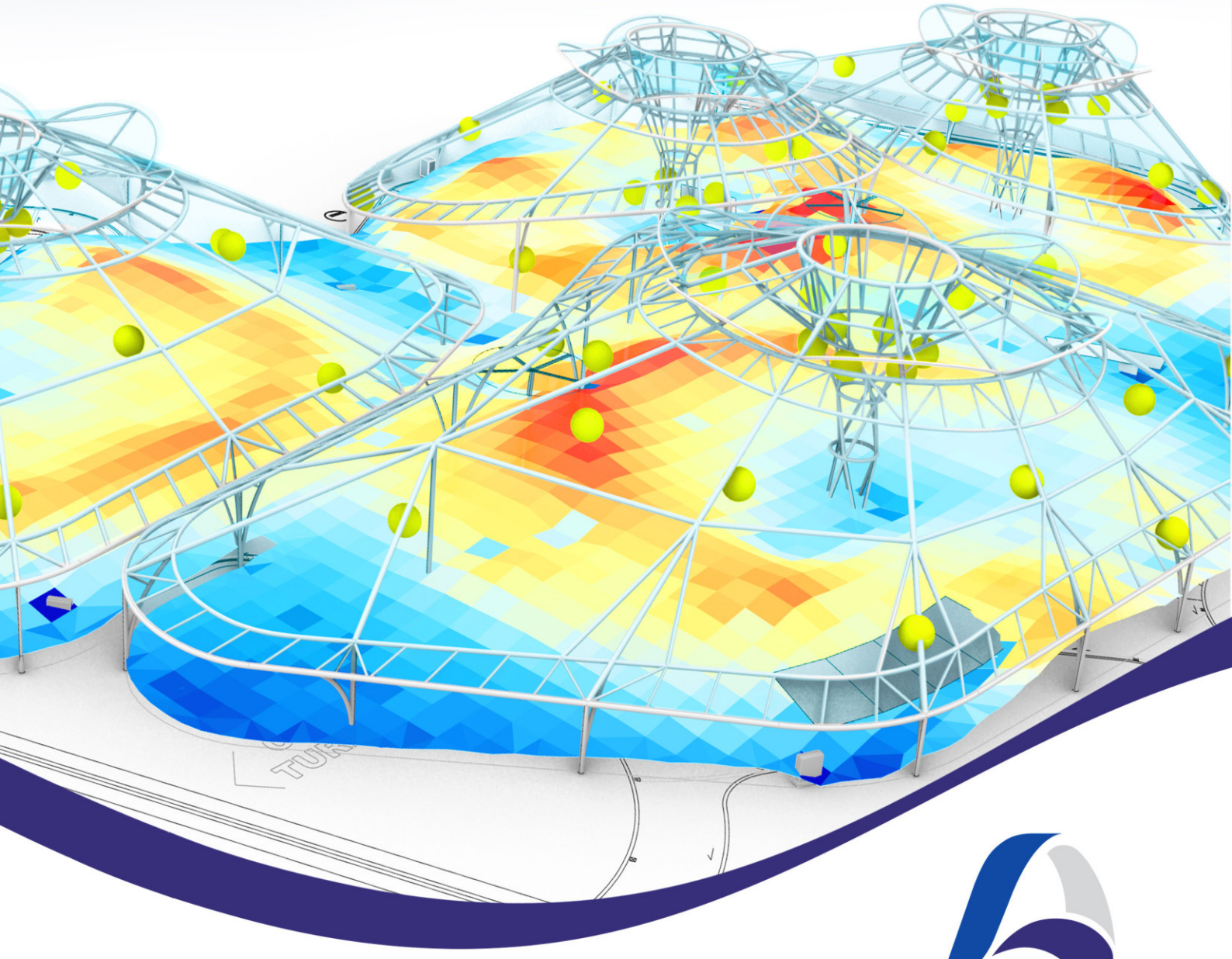
ADAS®

Advanced Analysis

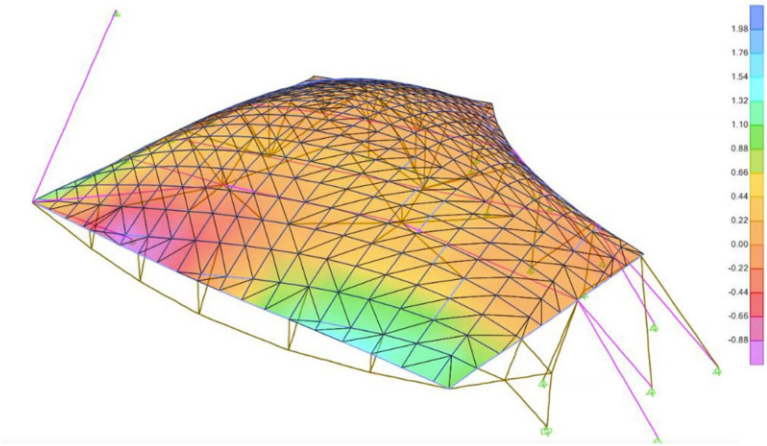


ADAS

MULTIMEDIA ENGINEERING PTE LTD

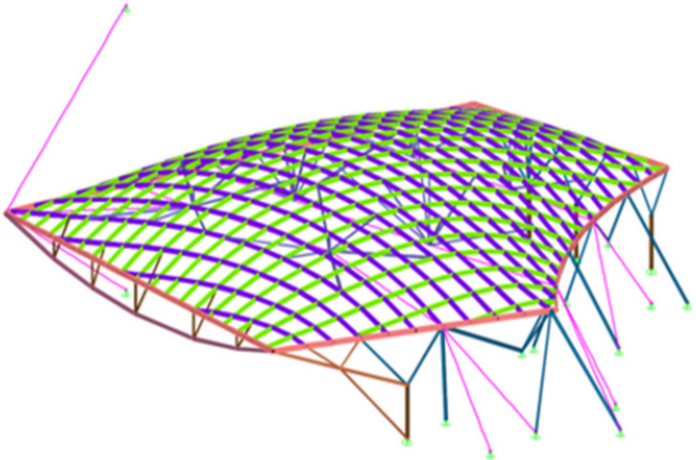
Since 1988

- Design and build Archi-Engineering firm
- Over 30 years experience with more than 650 projects
- Lightweight long span structure specialist
- Low risk with tested & proven design detailst

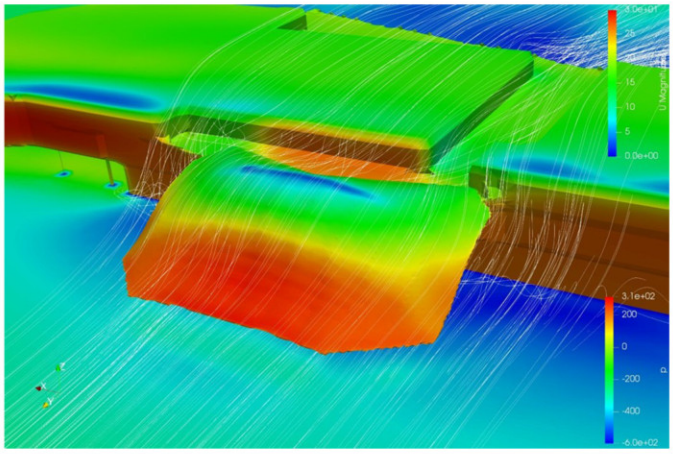


ADAS® Advanced Analysis

Apart from meeting European and local standards, we perform advanced engineering analyses for all irregularly shaped structures to determine the model form and buckling behaviour. We also utilise the Finite Element Method FEM) extensively for structural and component stress analysis.

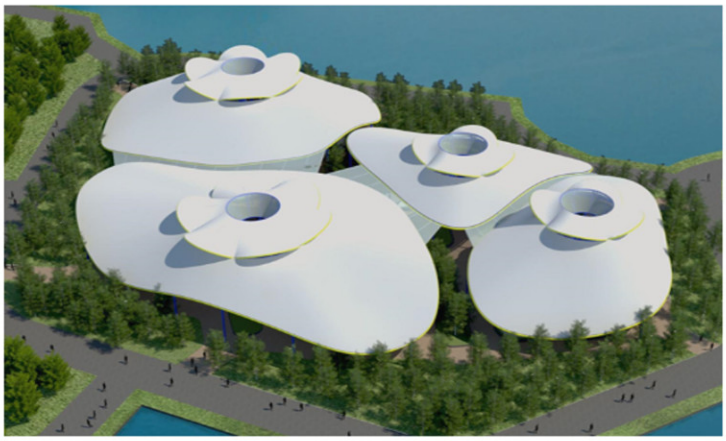


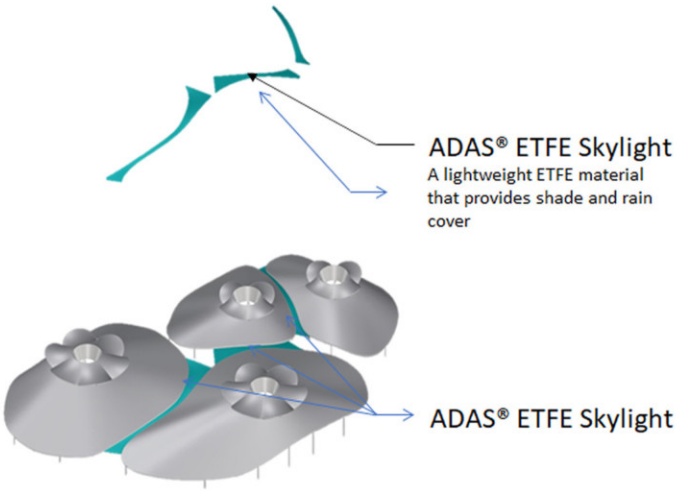
ADAS® CFD Analysis



Our company strives continuously to improve our analysis capabilities to further enhance the performance of our structures. Through Computational Fluid Dynamics (CFD) analyses, we are able to model the behaviour of airflow around each structure, which in turn provides more accurate calculations with regards to wind-loading and simulations concerning the thermal comfort of occupants. Our CFD analysis capabilities also include Wind-Driven Rain analyses to ensure protection against incoming rain during stormy weather.

CASE STUDY: Legoland Miniland Malaysia

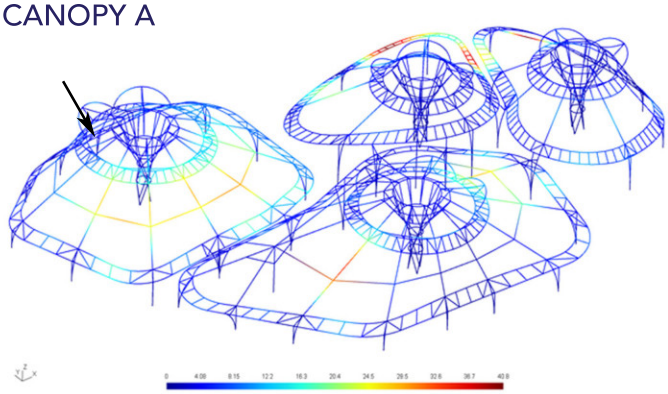


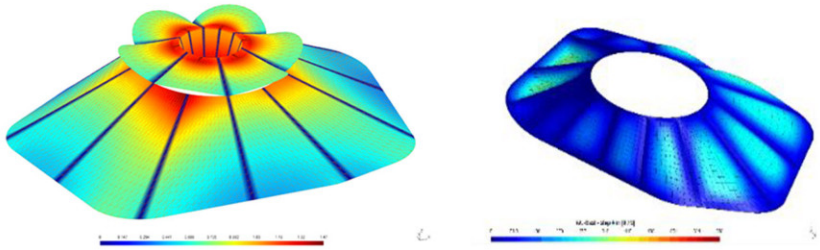


** 13,800 sqm using ETFE and PTFE material.*

Finite Element Method (FEM)

CANOPY A





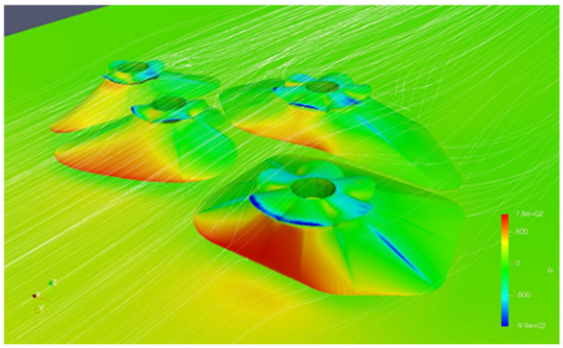
** FEM stress results for PTFE (Canopy A)*

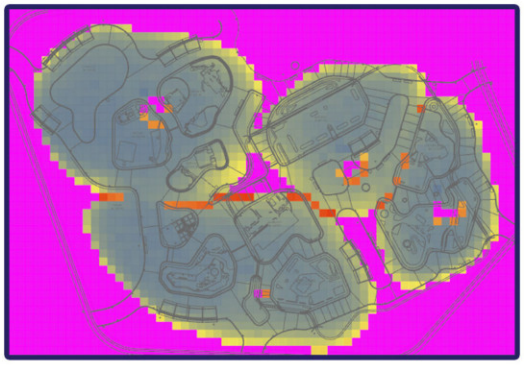
Due to the complex nature of many of our projects, we use our in-house advanced analysis software to carry out non-linear stress analysis.

The Finite Element Method (FEM) is commonly applied during structural and component stress analysis, as illustrated with our Legoland Miniland project.

Computational Fluid Dynamics Analysis (CFD)

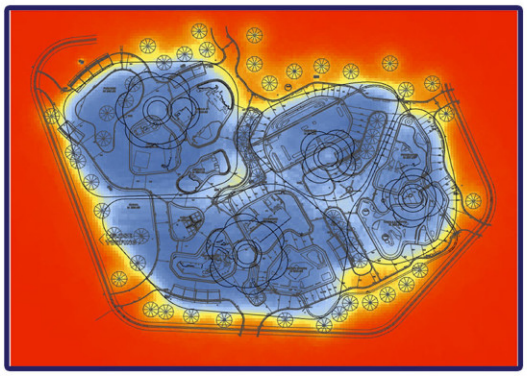
The CFD analyses for the Legoland Miniland structures were carried out to indicate the stress of wind pressure on the membranes, and to ensure constant airflow underneath the canopies for the comfort of the park visitors.





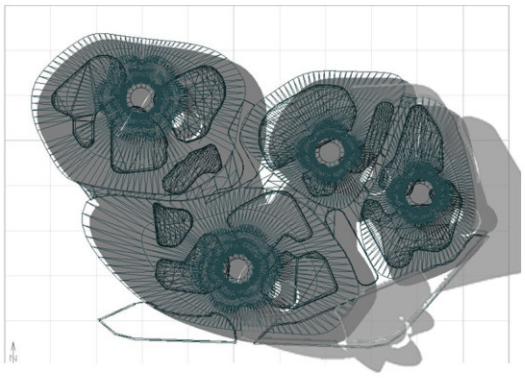
Daylight Study - June

The study indicates that overly strong daylight levels have reduced to 17.4% under the constructed canopy.



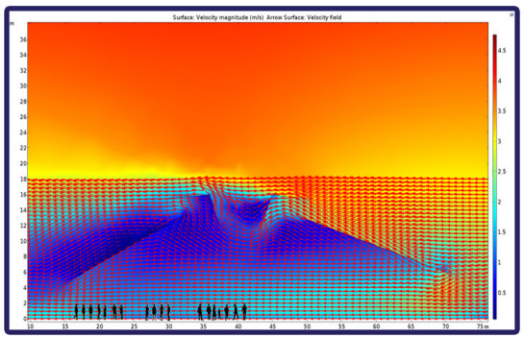
Radiation Analysis - June

Radiation analysis is performed to understand the temperature difference between the interior and exterior of the structure.



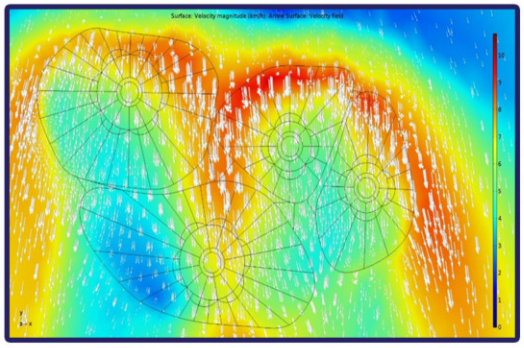
Shadow Analysis

Shadow analysis over the course of a single day is studied to understand the effective capacity and coverage of the structure.



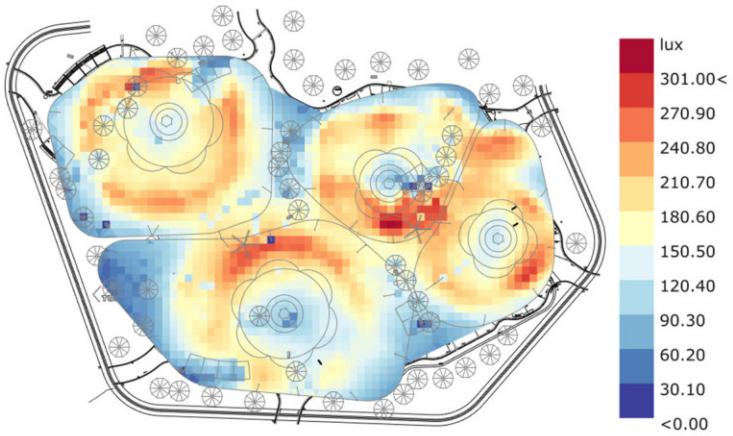
Ventilation Analysis

Ventilation analysis is carried out on each free-form structure to ensure human comfort levels through wind flow.



Human Comfort Analysis

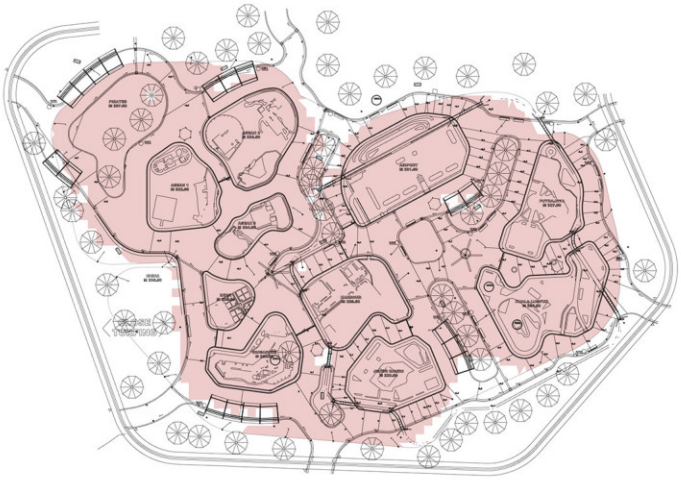
By taking an XY cut plane at 1.7m (adult) and 1m (child) above ground, the resulting wind speed diagram indicates that all areas are in light air and light breeze conditions.



Simulation Result Summary

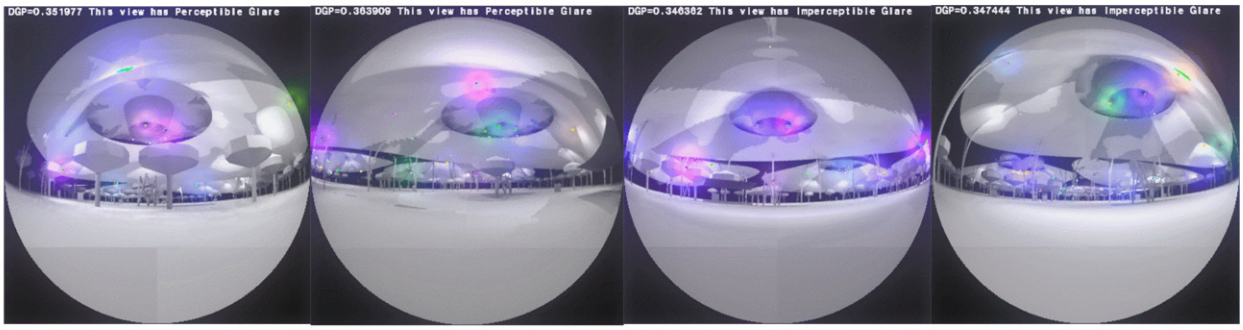
Average illumination (lux)	132
Minimum Illumination (lux)	0
Maximum illumination (lux)	301
Area coverage over 100 lux (%)	80
Area coverage over 75 lux (%)	90

Sensor point location with maximum distance of 2 meters from ground level.



75> Lux Coverage Area

90% of the circulation area below the membrane has an illuminance level of over 75 lux.



Glare Simulation Result

Glare probability from human perspective from Zone A (left) to Zone D (right).

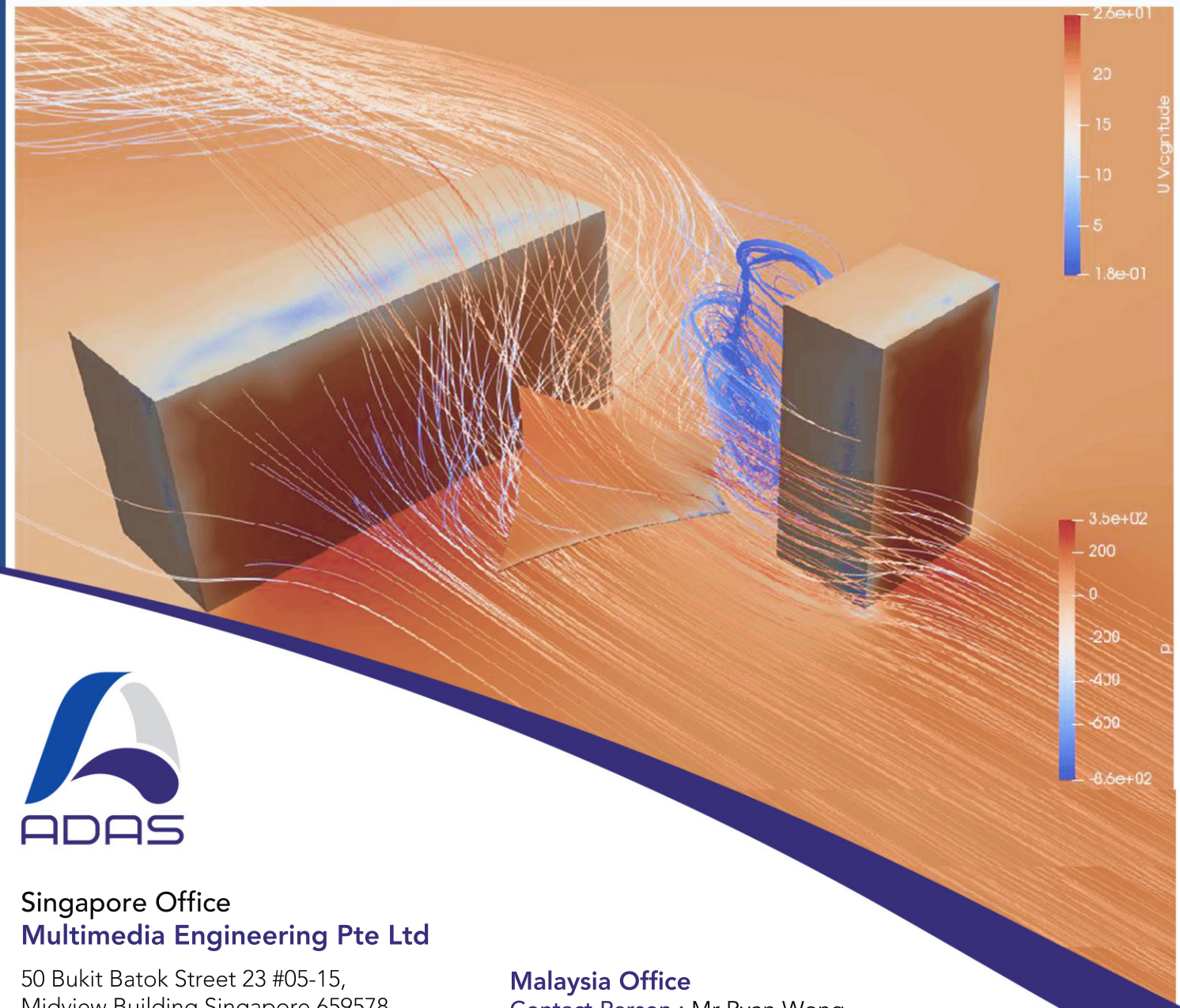
Imperceptible Glare	[0.35 > DGP]
Perceptible Glare	[0.4 > DGP >= 0.35]
Disturbing Glare	[0.45 > DGP >= 0.4]
Intolerable Glare	[DGP >= 0.45]

ADAS® ADVANCED ANALYSIS

ADAS® Advanced Analysis is used to ensure our structures perform up to optimum standards of quality and to strike a good balance between structural rigidity and material efficiency.

With ADAS® Advanced Analysis, we can predict how our structures will react to external factors such as the sun, wind and rain. By incorporating these considerations into the design process, our clients will be able to reap the benefits through improved occupant comfort and reduced energy costs associated with artificial cooling and lighting.

Our services include solar analysis, shading and glare analysis, thermal comfort simulations, rainwater analysis, and computational fluid dynamics (CFD) analysis.



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