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Car Park Ventilation by *Jet Thrust System*

- Example smoke control project-
- London, UK-

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What is CFD?

What is CFD?

- Stands for Computational Fluid Dynamics

- Consists of a mathematical method called Finite Volume Analysis where the following equations are used:

  - Conservation of mass (continuity equation)

  - Conservation of linear momentum (Newton's second law)

  - Conservation of energy (First law of thermodynamics)

Why use CFD?

Why use CFD?

- CFD is an effective means to ensure that there is a good distribution of the airflow throughout the car park.

- Rather than simply complying with regulations CFD offers the opportunity to provide an engineered solution to car park ventilation.

- CFD is an integral part of the systems that we offer.

Design Criteria for car park

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General Ventilation

The ventilation system is to provide 6 air changes per hour as defined in Approved documents F1 section 2.8, 2.9.

Emergency Ventilation

The ventilation system is to provide 10 air changes per hour as defined in Approved documents B3 section 12 or be designed in accordance with the BS7346 part 7 to cope with a fire load in an unsprinkled car park.

The fans must be suitable for 300 degrees Celsius for 1 hour, with the extract flowrate divided between at least 2 fans.

Special instructions

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• The ventilation system is to achieve smoke control in emergency ventilation in order to aid fire fighter access to the seat of the fire.
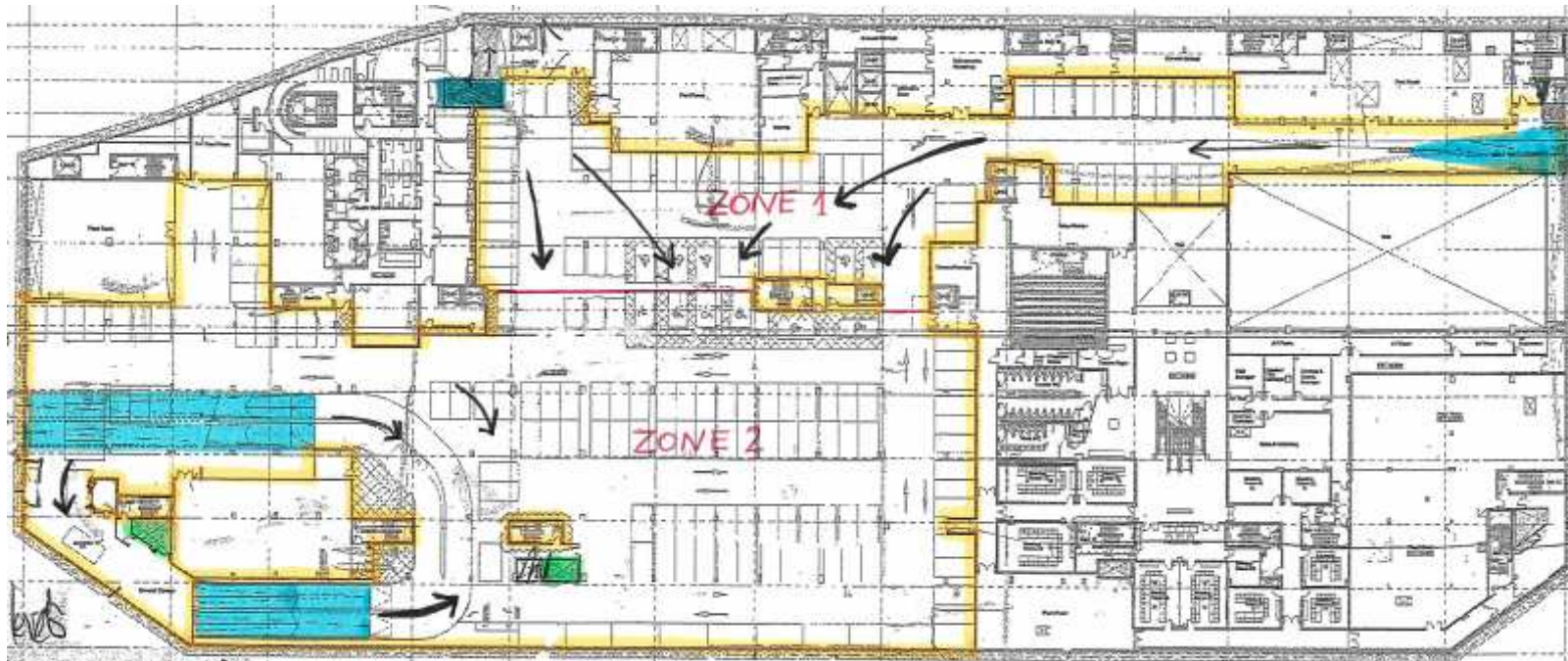
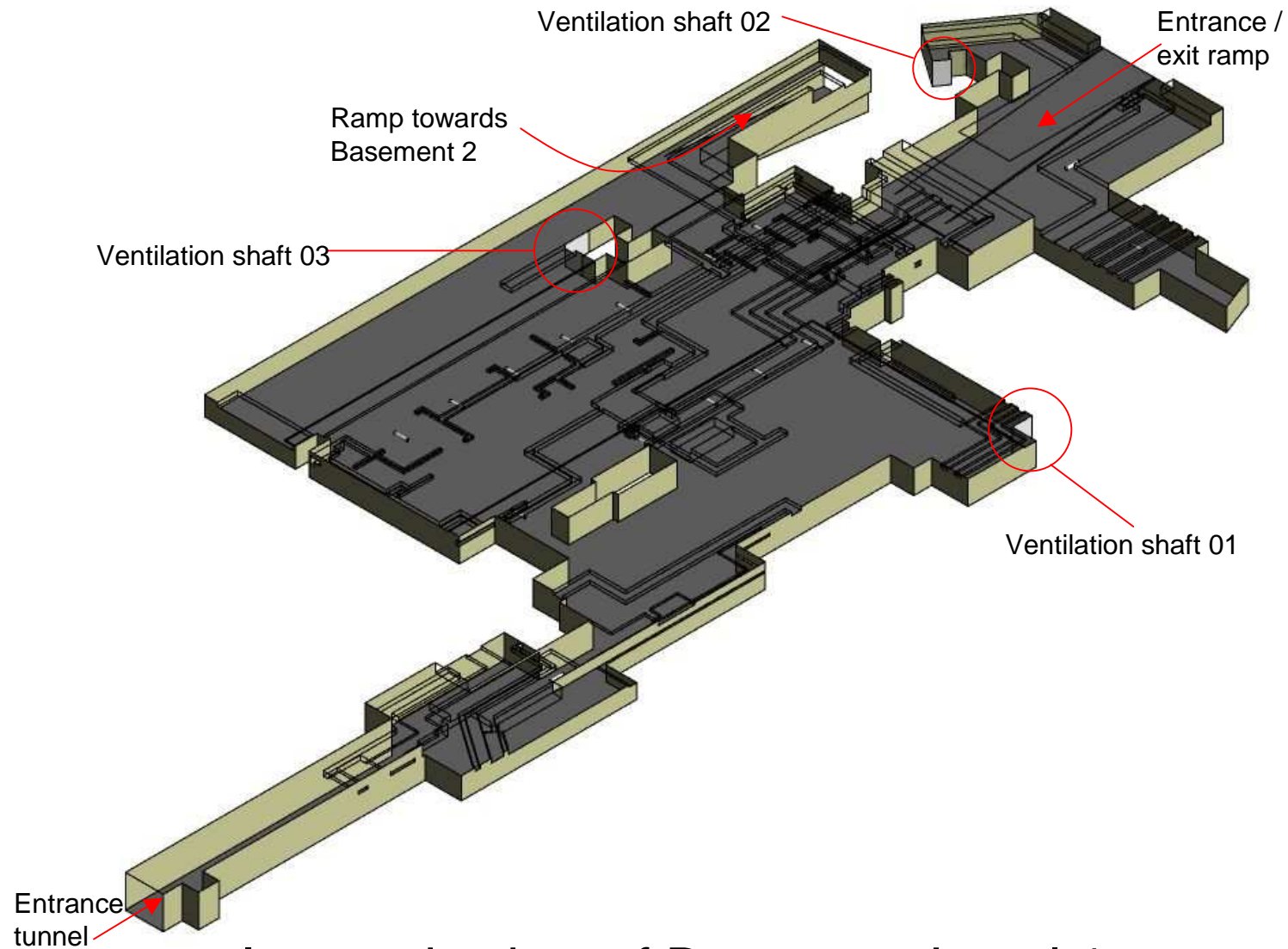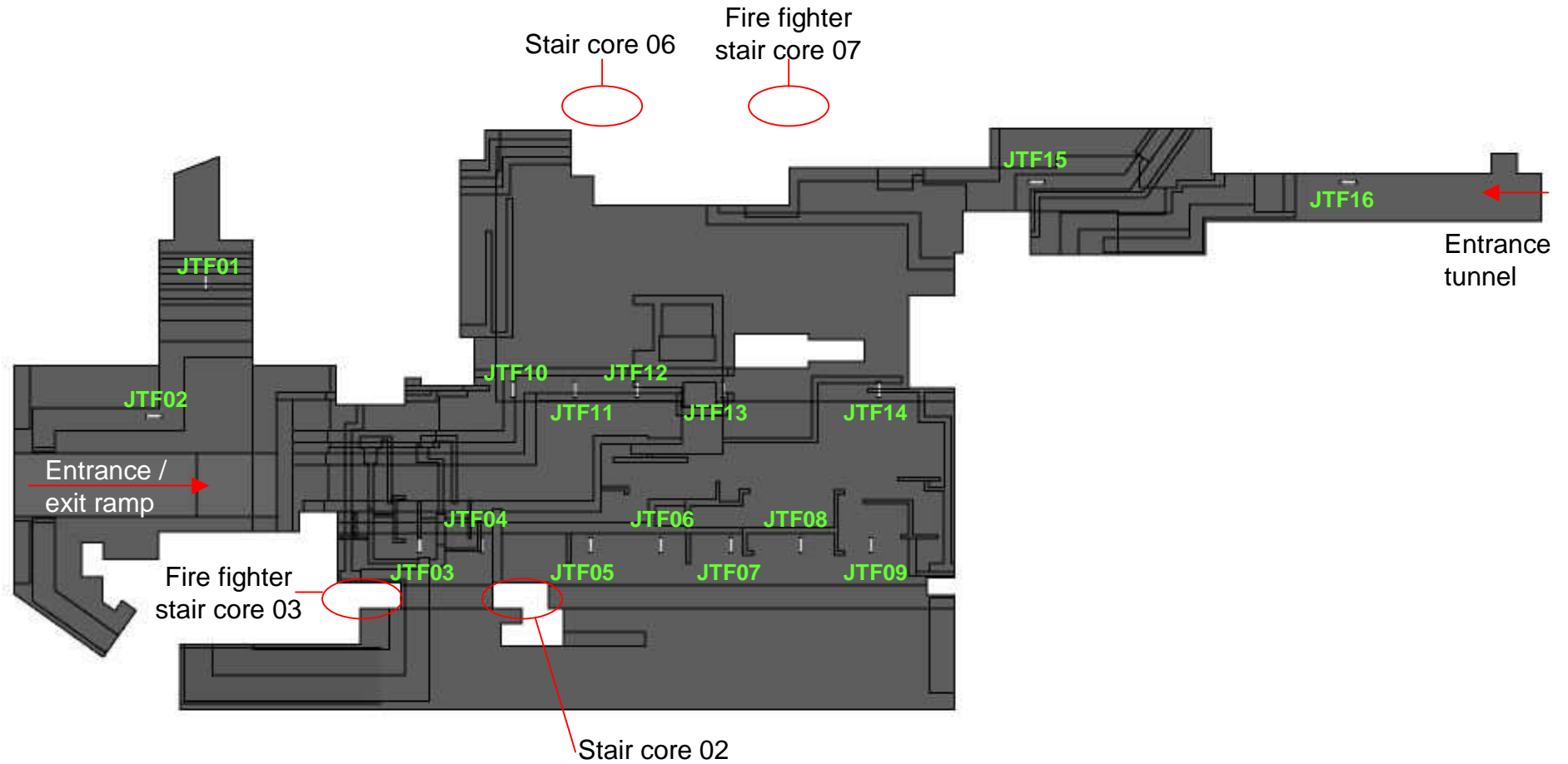# How is the CFD model constructed?

• An enclosure in constructed that defines the outline of the car park.

• Into this enclosure the car park geometry is added.

• Ventilation components are added such as Jet Thrust Fans and extract / supply fans.
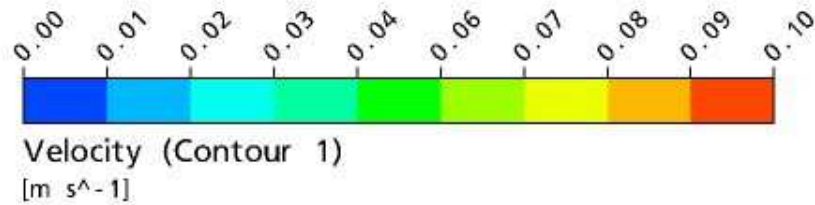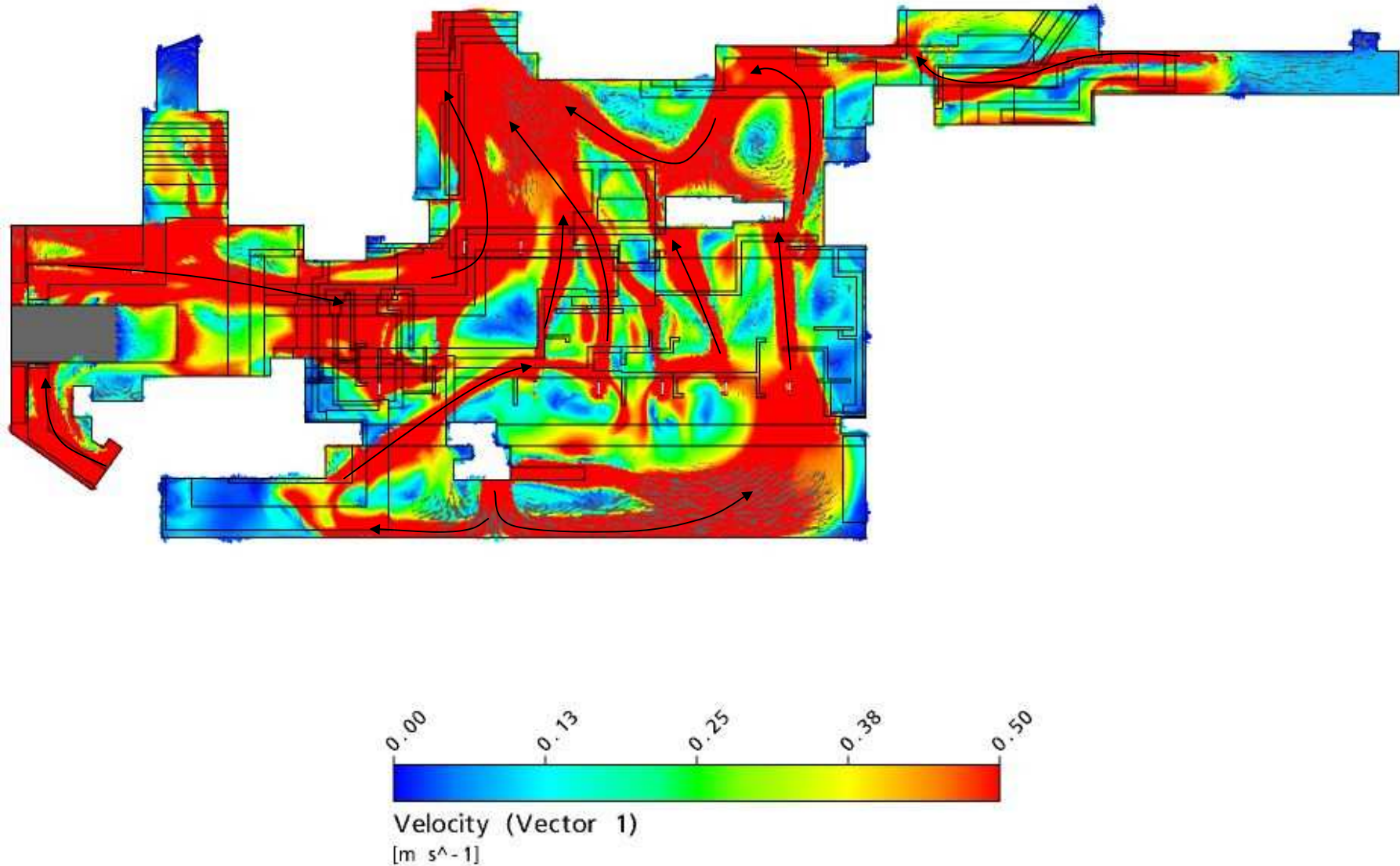
Geometry & Results

Ventilation shaft 02

Entrance / exit ramp

Ramp towards Basement 2

Ventilation shaft 03

Ventilation shaft 01

Entrance tunnel
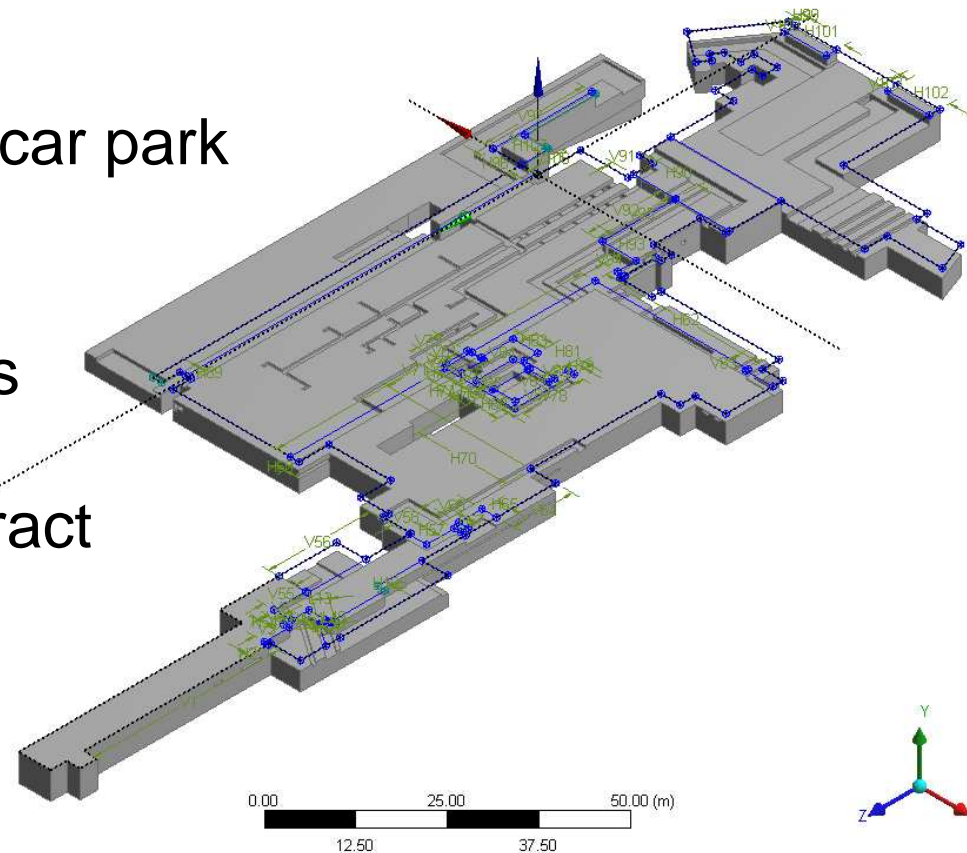
Isometric view of Basement Level 1
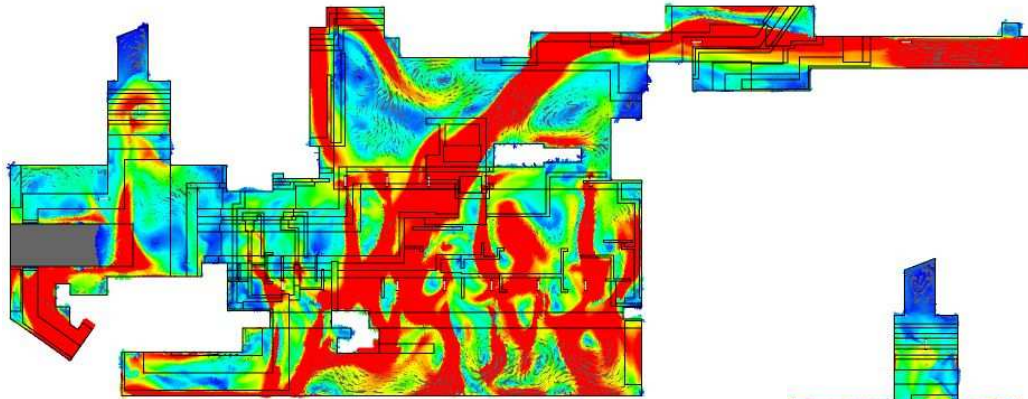
Plan view of Basement Level 1

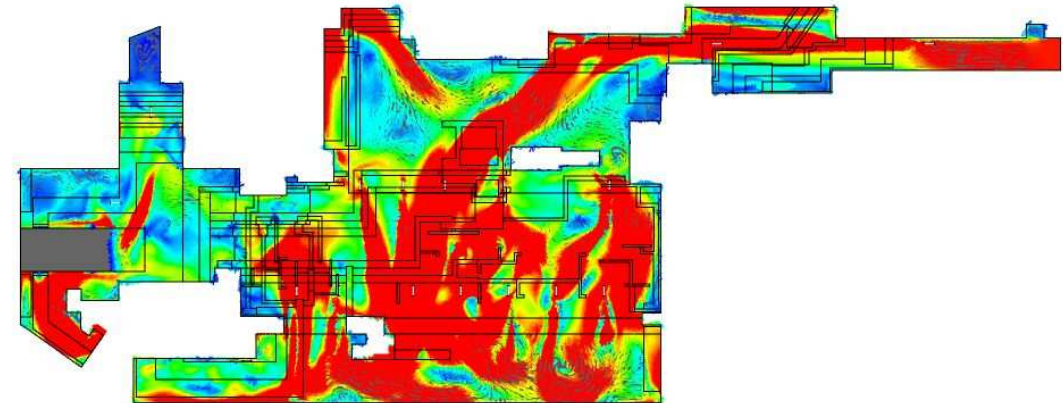# General Ventilation

General Ventilation - Speed plot at mid level

General Ventilation - Velocity plot at mid level

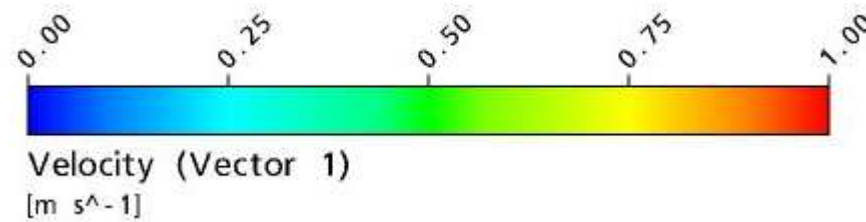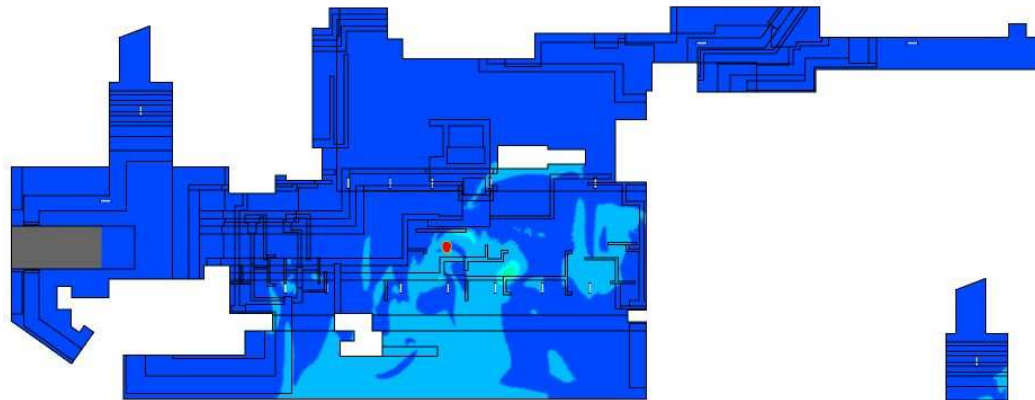# Emergency Ventilation

180 seconds

360 seconds

Velocity (Vector 1)
[m s^-1]
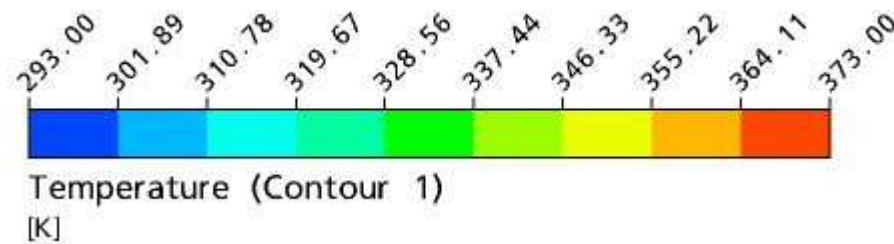
Emergency Ventilation – Velocity plots

180 seconds

360 seconds

293.00 301.89 310.78 319.67 328.56 337.44 346.33 355.22 364.11 373.00

Temperature (Contour 1)
[K]
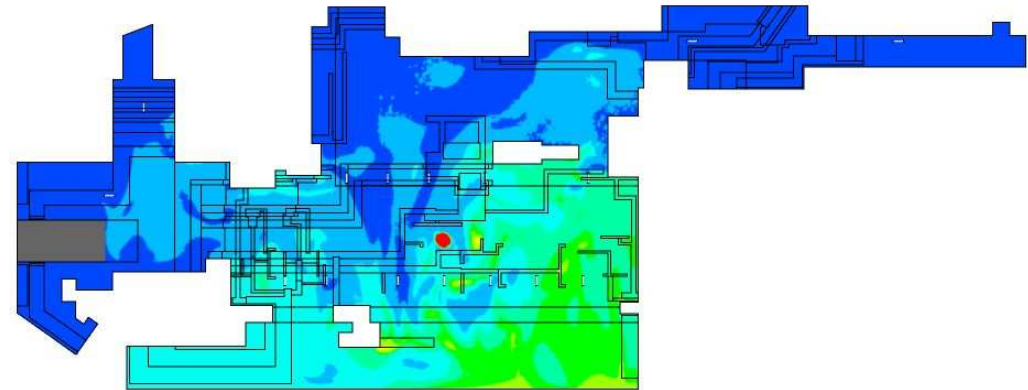
Emergency Ventilation – Temperature plots

180 seconds

360 seconds

Visib (Contour 1)
[m]
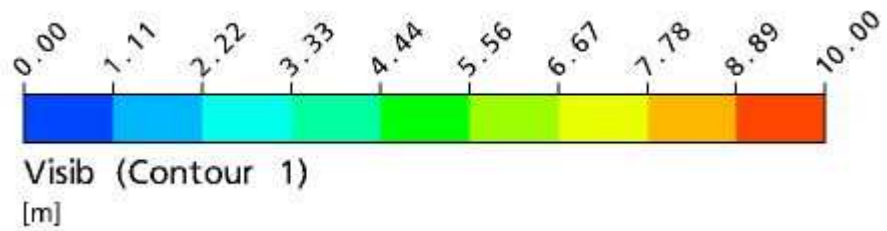
Emergency Ventilation – Visibility plots

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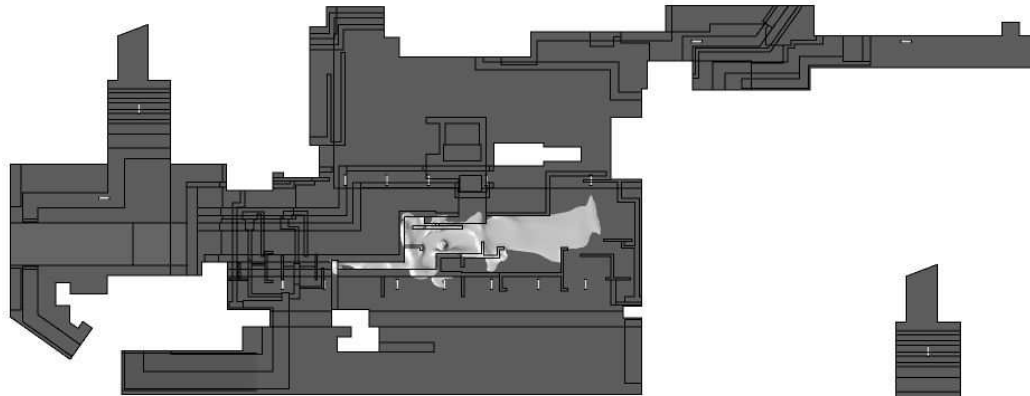
180 seconds

360 seconds

Emergency Ventilation – Smoke spread plots

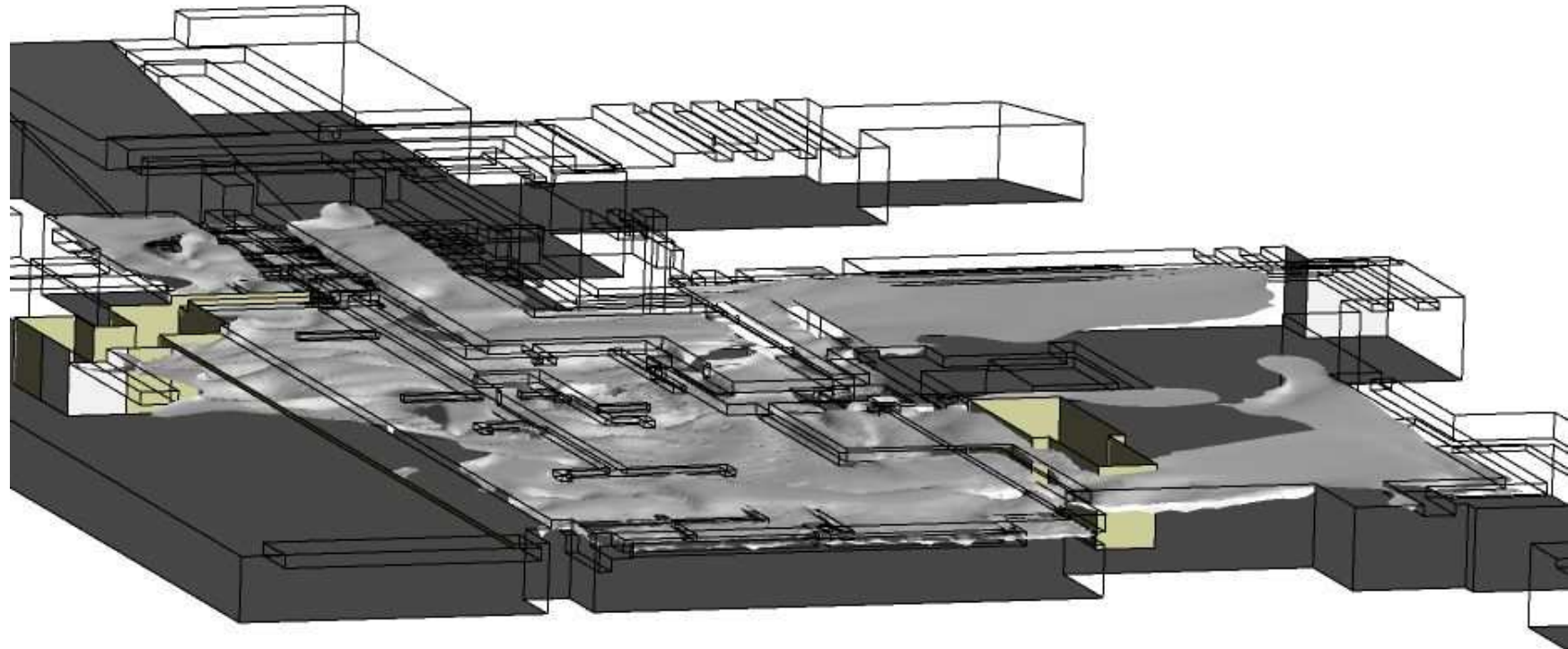**FläktWoods**

360 seconds

Emergency Ventilation – Smoke spread plots

Emergency Ventilation – Smoke Test

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Emergency Ventilation – Smoke Test

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Summary & Conclusions

- The results of the CFD analysis demonstrate that the scheme provides a good distribution of air throughout the car park prior to extraction, for both general and emergency ventilation scenarios.

- The ventilation system provides good smoke control in the case of a fire taking place Basement Level 1.

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Any Questions???

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