



Overview of C2D

C2D Solutions Pte Ltd is a holistic knowledge-based engineering solutions provider with a wealth of experience. We are committed to deliver the most optimal solution based on sound engineering principles.

Problem Statement

This study involves CFD analysis to investigate the airflow patterns and to determine if the temperature distributions in the above ground transformer bay and the cable basement of a common service tunnel are largely maintained below 40°C.

Challenge

In the above ground transformer bay, the high temperature is primarily caused by heat emitted by the 8 transformers, which amounts up to 2.64MW. There are 4 jet fans blowing at each transformer bay, therefore there are 32 jet fans in the 8 transformer bays. The flow rate of each jet fan is 3200cmh and the total extraction rate in the transformer bay is 1440000cmh.

In the cable basement, the 80 numbers of 22kV feeders with heat load of 100W/m and 8 numbers of 230kV feeders with heat load of 100W/m emitting a total of 0.355MW. Total air supply rate of the basement is 240000cmh and the extract rate is 240500cmh.

Solution

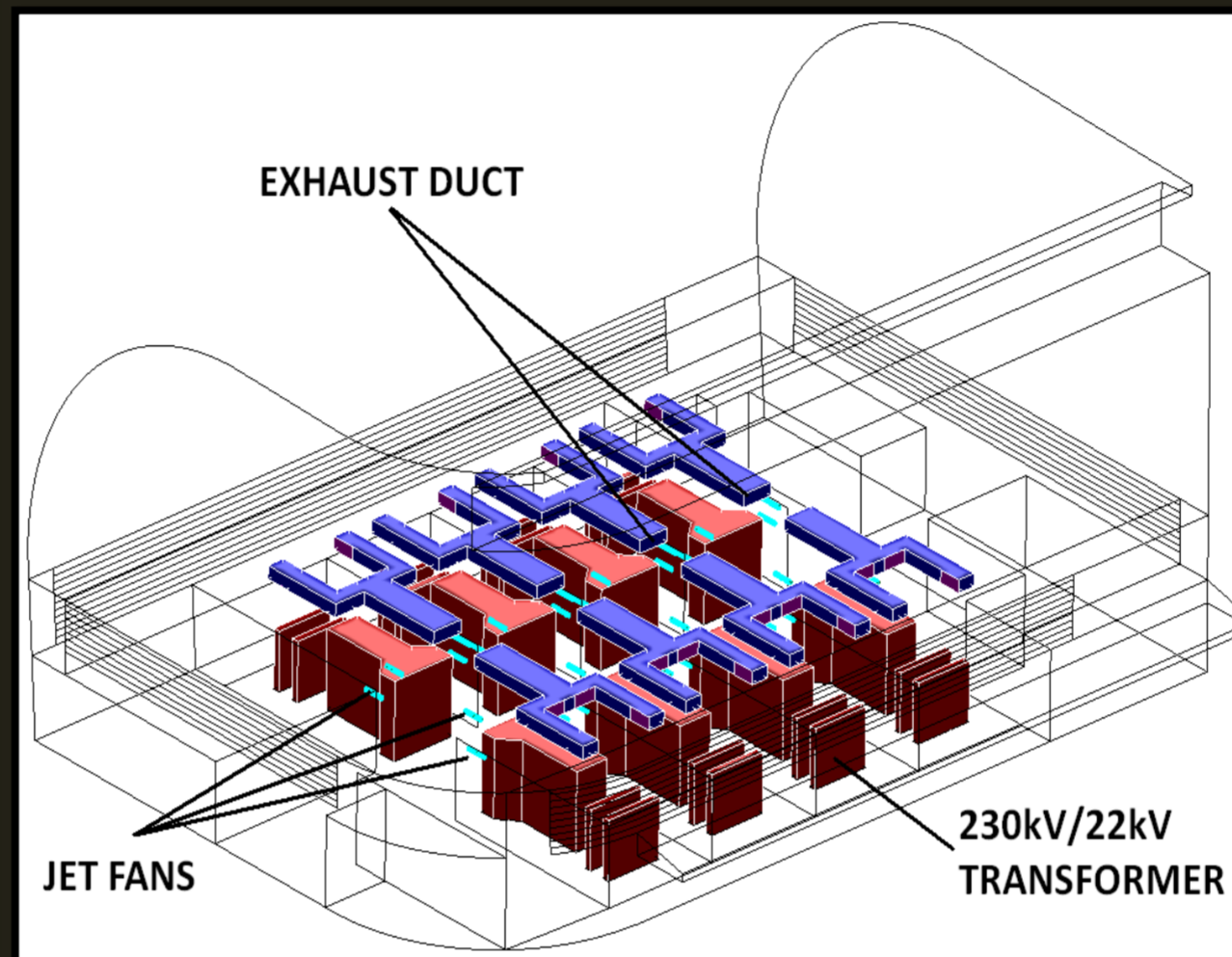
Computational Fluid Dynamics (CFD) software was used to simulate the flow field and the temperature distribution in the above ground transformer bay and the cable basement in this development. The simulation was performed under steady state and in still wind conditions. CFD was used to optimise the design to meet the performance criteria.

Results

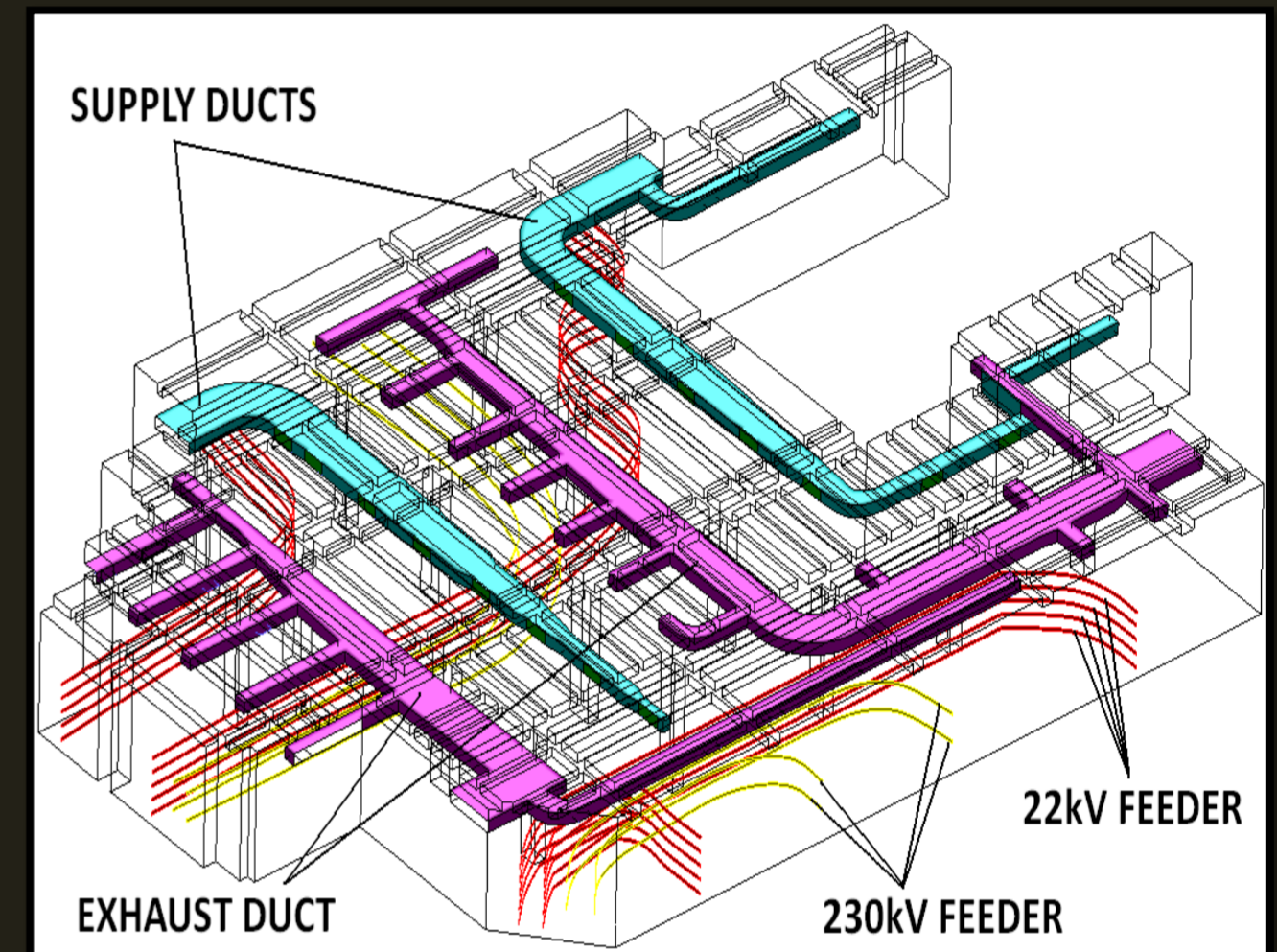
The regions in the transformer bay where the temperatures are above 40°C are located in the immediate area around the transformers, which is expected. The temperature in the corridor (behind the transformers) is low (about 32°C to 33°C) at Human Height. The temperatures along the driveway are higher (35°C to 38°C) at Human Height, but generally below 40°C.

The regions in the cable basement where the temperatures are above 40°C are located in the immediate area around the power transmission cables area, which is expected. The temperature in the cable basement is generally around 32°C to 35°C at Human Height. So the temperatures in the human operation areas are generally maintained well below 40°C.

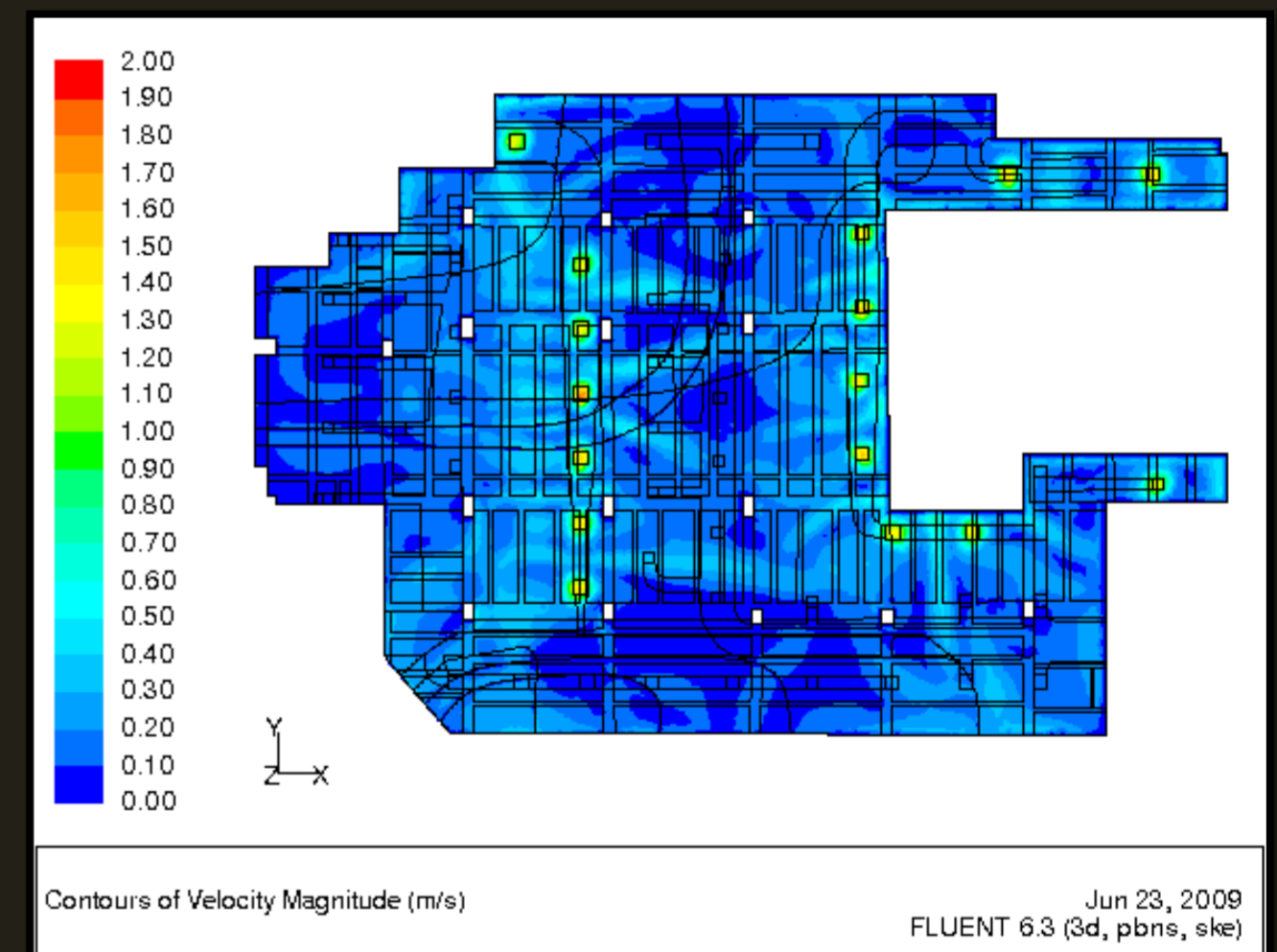
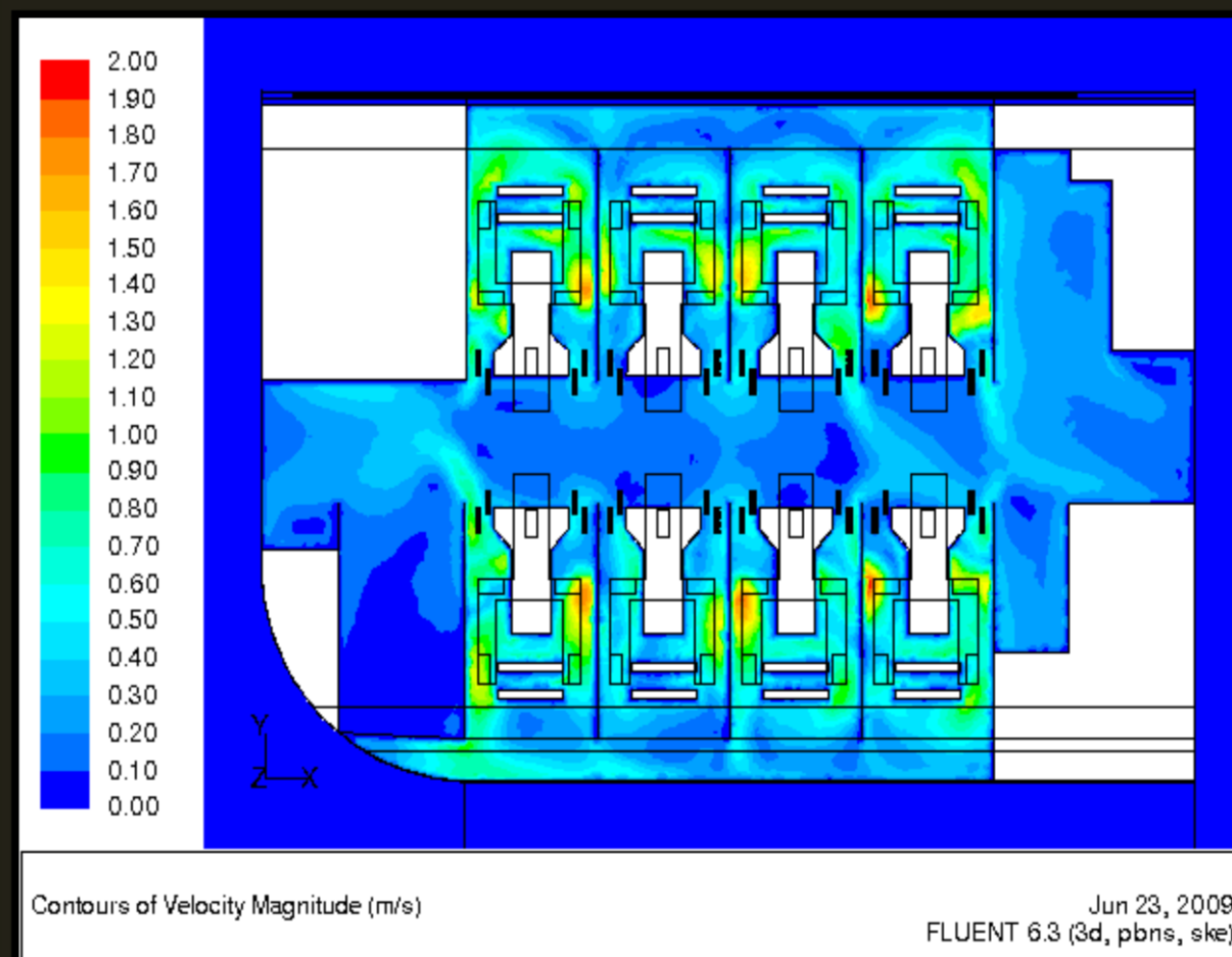
Above Ground Transformer Bay



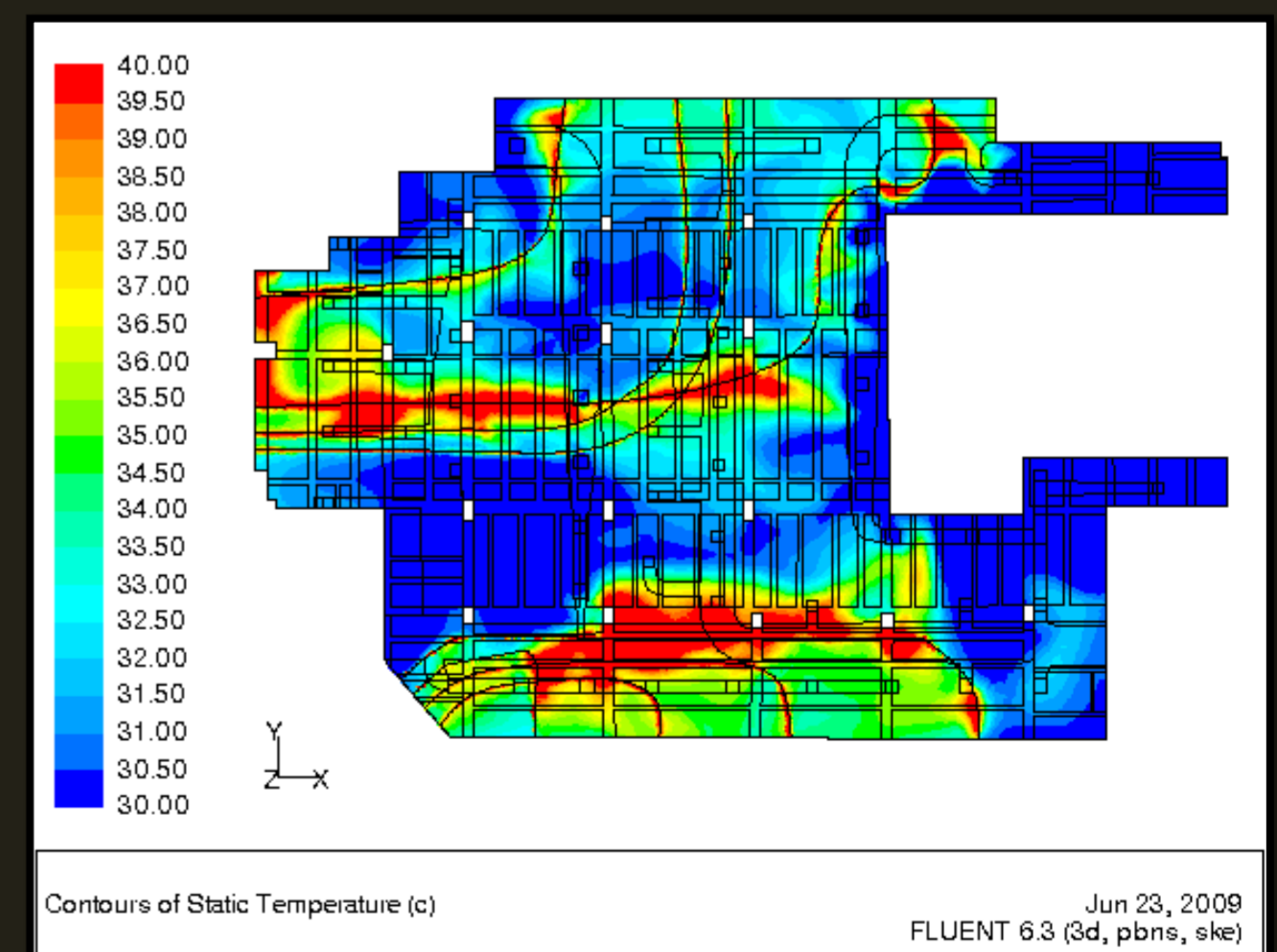
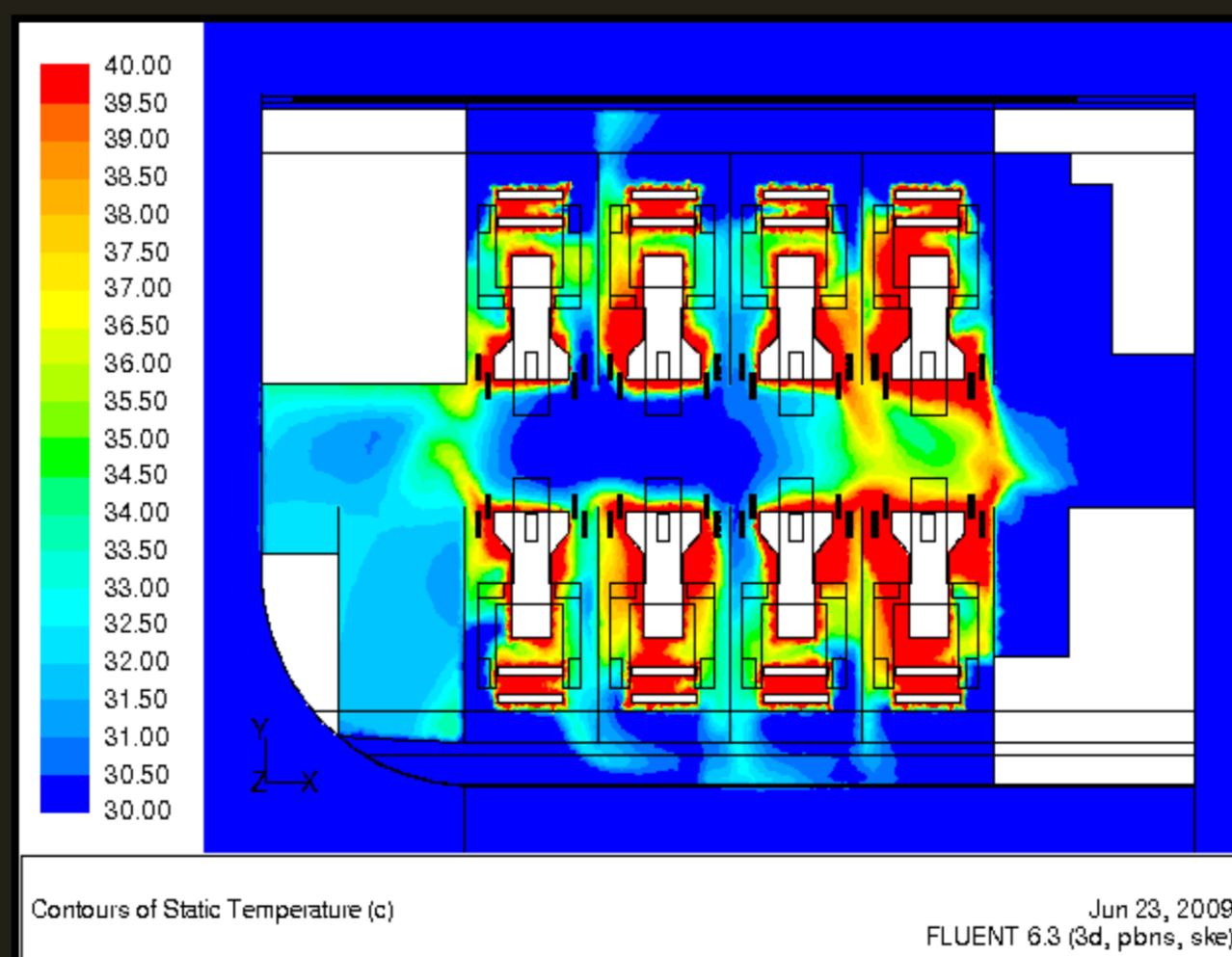
Cable Basement



Computational Domain Models



Velocity Distribution at Human Height (1.7m) from finished Floor level



Temperature Distribution at Human Height (1.7m) from the finished Floor level