



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

The proposed development was interfaced with the cooling towers and tunnel vent grilles of an existing underground train station. Due to the required relocation of the cooling tower and vents, the authorities were concerned of recirculation from the exhaust vents to the intake vents.

Challenge

The extent of contaminants eluding from the tunnel vent grilles and the cooling tower exhausts were not available, so a tracer species was used for the simulation instead. The methodology used involves fully (100%) tracing the exhausted air or cooling tower air discharge and analyzing the weighted percentage of recirculation into the intake vents or entrance in order to assess the risk to occupant safety and health.

Solution

Computational Fluid Dynamics (CFD) is used to run detailed air flow simulations to study the extent of the recirculation from various exhaust vents to the supply vents. The steady-state CFD simulations were carried out under still wind conditions. It is because the presence of wind will act to disperse the pollutants and thus, a windless day would pose the highest risk of possible recirculation. The main objectives of this study is to monitor the pollutant levels recirculating to the intake vents.

Results

By using CFD to simulate the operation of cooling towers with respect to the recirculation of exhaust flow to the supply vents, we would know with certainty that even in the worse case scenario of a windless day, the pollutants at the supply vents will be below the TLV limits to ensure that the air supplied into the building will be of quality and clean of contaminants.

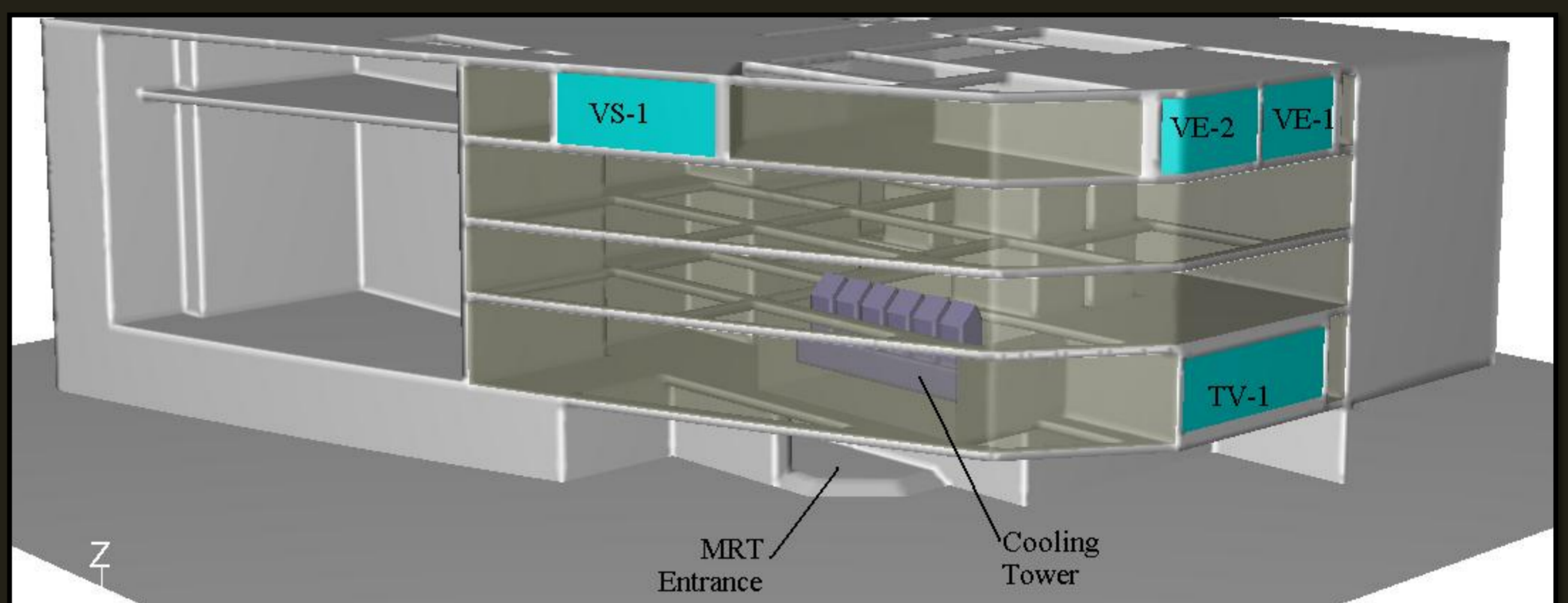


Fig 1: Computational Domain of the Train Depot

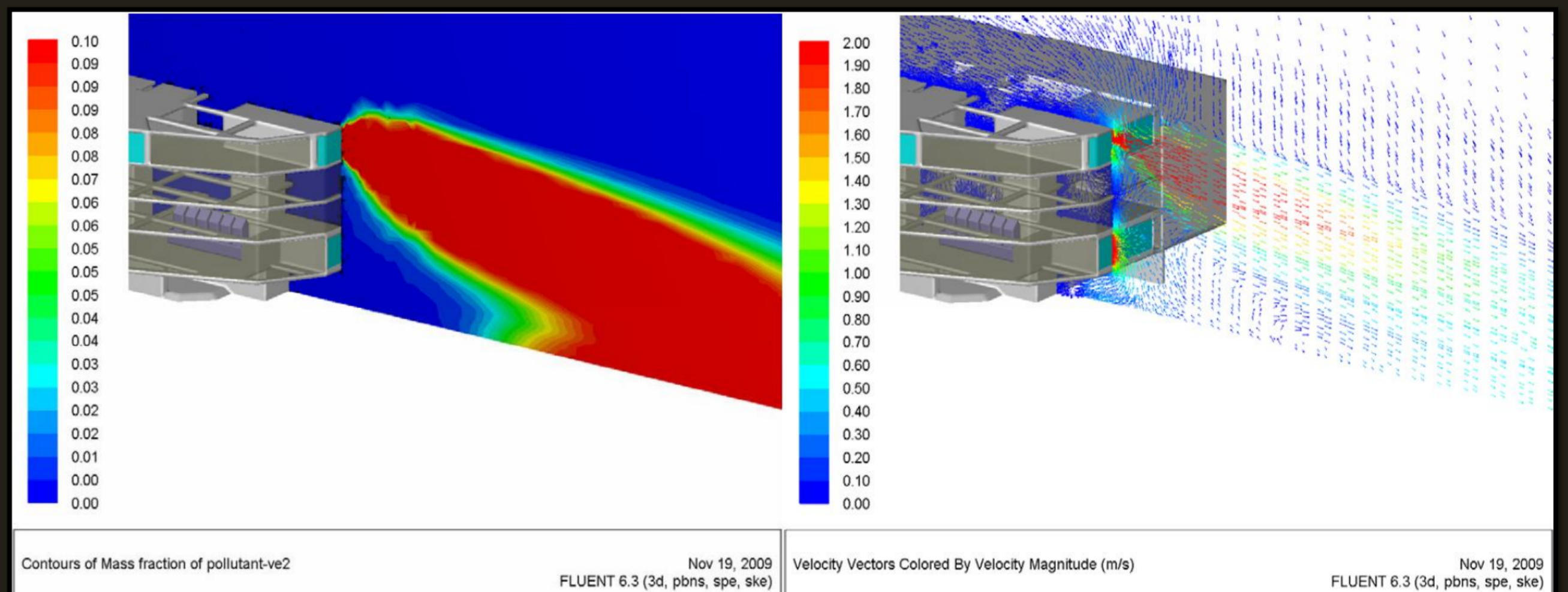


Fig. 2: Velocity Contour and Vector Plots (Recirculation from VE-1 & VE-2 to TV-1 Shaft)

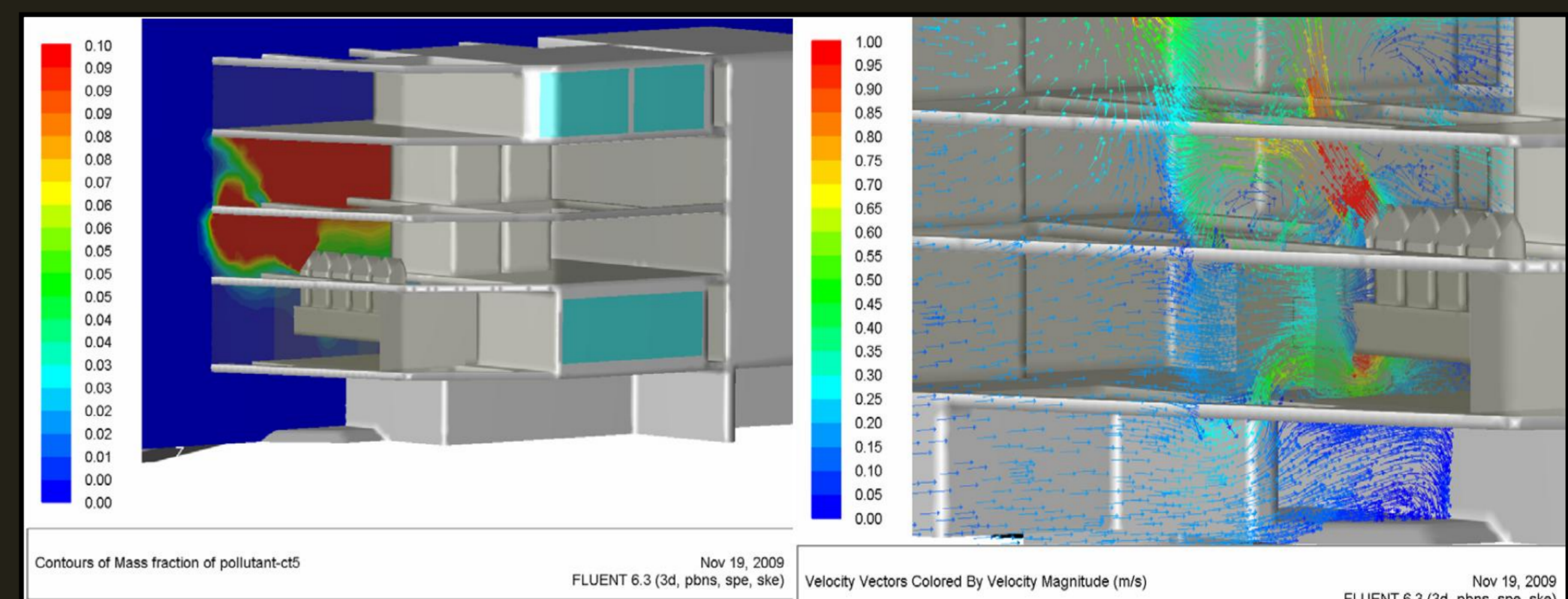


Fig. 3: Velocity Contour & Vector Plots (Possibility of Short-Circuiting of Cooling Tower & Recirculation from Cooling Tower to VS-1 Shaft)