FIRE VENTILATION STRATEGIES FOR BUILDING WITH WORLD’S TALLEST ATRIUM

Our customer is an industrial house developing a super luxury building that is tallest in India. At 220m, the building houses tallest atrium in the world. The dimensions of the building are so unique that national building codes do not apply to them. The building being tall requires elaborate safety measures in case of fire including ventilation of smoke in prescribed time. Visibility of the residents during fire was also main concern for design as visibility loss causes panic. CFD studies were to give inputs on the smoke movement due to various fires and also provide inputs to the building management system in case of an emergency.

Study was done for fires ranging from 10 MW to 40 MW on various locations on the base of the atrium and upper floors. Since the effect of ambient air in different seasons can affect ventilation pattern, metrology data was obtained and simulations were done for various seasons including the rainy season with high relative humidity.

Simulations showed that the increase in temperature in the atrium was negligible as the volume of the atrium is large. In case of ambient air with relative humidity, cold smoke phenomenon was occurring where the smoke would not clear the living area due to chimney effect. Mechanical ventilation required to vent out the smoke in prescribed time was estimated and given as input to the building management system. For fires in living area, duct tapping were designed and mechanical ventilation capacity required was estimated. Equidistance placement of smoke detection sensors was found to be inadequate and locations were changed for early detection. The inputs of CFD studies have gone into the building management system.